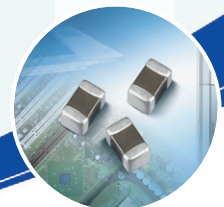
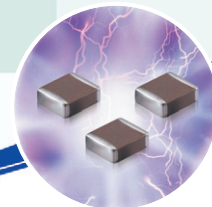


November 2010



# MULTILAYER CERAMIC CAPACITORS



**SAMSUNG**  
ELECTRO-MECHANICS







## We, Samsung, declare that our component MLCC is produced in accordance with EU RoHS directive.

### 1. RoHS Compliance and restriction of Br

The following restricted materials are not used in packaging materials as well as products in compliance with the law and restriction.

- Cd, Pb, Hg, Cr+6, As, Br and the compounds, PCB, asbestos
- Bromic materials : PBBs, PBBOs, PBDO, PBDE, PBB

### 2. No use of materials breaking Ozone layer

The following ODS materials are not used in our fabrication process.

- ODS material : Freon, Haron, 1-1-1 TCE, CCl4, HCFC

If you want more detailed Information, Please Visit Samsung Electro-mechanics Website  
[<http://www.sem.samsung.com>, <http://www.sem1cr.com>]

Please, see the last page of this catalog for our environmental certification list.



## CONTENTS

|                                                      |    |                                                |
|------------------------------------------------------|----|------------------------------------------------|
| Part Numbering System .....                          | 4  | Part Numbering System                          |
| General Capacitors .....                             | 6  | General Capacitors                             |
| High Capacitance Capacitors .....                    | 23 | High Capacitance Capacitors                    |
| Super Small Size Capacitors .....                    | 37 | Super Small Size Capacitors                    |
| Medium-High Voltage Capacitors .....                 | 41 | Medium-High Voltage Capacitors                 |
| Array Type Capacitors .....                          | 52 | Array Type Capacitors                          |
| Low ESL Capacitors .....                             | 55 | Low ESL Capacitors                             |
| Reliability Test Condition .....                     | 58 | Reliability Test Condition                     |
| Premium Capacitors for Automotive Applications ..... | 62 | Premium Capacitors for Automotive Applications |
| Packaging Specification .....                        | 78 | Packaging Specification                        |
| Application Manual for Surface Mounting .....        | 82 | Application Manual for Surface Mounting        |

| *Size tolerance |            |            |            |            |
|-----------------|------------|------------|------------|------------|
| Size<br>Code    | 0201(0603) | 0402(1005) | 0603(1608) | 0805(2012) |
| S               | ±0.05      | ±0.07      | ±0.07      |            |
| Q               | ±0.07      | ±0.1       | ±0.15      | ±0.15      |
| R               | ±0.1       | ±0.15      | ±0.2       | ±0.2       |
| U               | -          | +0.2       | -          | -          |

## Class I (Temperature Compensation)

| Symbol | EIA Code | Operation Temperature Range(°C) | Temperature Coefficient Range(ppm/°C) |
|--------|----------|---------------------------------|---------------------------------------|
| C      | C0G      | -55 ~ +125                      | 0 ±30                                 |

★  
Class II (High Dielectric Constant)

| Symbol | EIA Code | Operation Temperature Range(°C) | Capacitance Change(ΔC %) |
|--------|----------|---------------------------------|--------------------------|
| A      | X5R      | -55 ~ + 85                      | ±15                      |
| B      | X7R      | -55 ~ +125                      | ±15                      |
| X      | X6S      | -55 ~ +105                      | ±22                      |
| F      | Y5V      | -30 ~ + 85                      | -82 ~ +22                |
| Y      | X7S      | -55 ~ +125                      | ±22                      |

## ★★

| Series | TC                | Capacitance Step |     |     |     |     |     |     |     |     |     |     |     |
|--------|-------------------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| E-3    | Y5V               | 1.0              |     |     |     | 2.2 |     |     |     | 4.7 |     |     |     |
| E-6    | X5R<br>X7R<br>X6S | 1.0              |     | 1.5 |     | 2.2 |     | 3.3 |     | 4.7 |     | 6.8 |     |
| E-12   | C0G               | 1.0              | 1.2 | 1.5 | 1.8 | 2.2 | 2.7 | 3.3 | 3.9 | 4.7 | 5.6 | 6.8 | 8.2 |

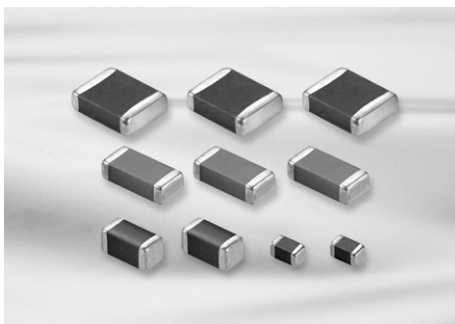
## ★★★

| Size        | Code | Thickness(mm) | Spec(mm)        | Size       | Code | Thickness(mm) | Spec(mm) |
|-------------|------|---------------|-----------------|------------|------|---------------|----------|
| 01005(0402) | 2    | 0.20          | ±0.02           | 1210(3225) | H    | 1.60          | ±0.20    |
| 0201(0603)  | 3    | 0.30          | ±0.03           |            | U    | 1.80          | ±0.20    |
| 0402(1005)  | 5    | 0.50          | ±0.05           |            | I    | 2.00          | ±0.20    |
| 0603(1608)  | 5    | 0.50          | +0.0/-0.1       |            | J    | 2.50          | ±0.20    |
|             | 8    | 0.80          | ±0.10           |            | V    | 2.50          | ±0.30    |
| 0805(2012)  | A    | 0.65          | ±0.10           | 1808(4520) | F    | 1.25          | ±0.20    |
|             | C    | 0.85          | ±0.10           |            | H    | 1.60          | ±0.20    |
|             | D    | 1.00          | ±0.15           |            | I    | 2.00          | ±0.20    |
|             | F    | 1.25          | ±0.10           | 1812(4532) | F    | 1.25          | ±0.20    |
|             | Q    | 1.25          | ±0.15           |            | H    | 1.60          | ±0.20    |
|             | Y    | 1.25          | ±0.2            |            | I    | 2.00          | ±0.20    |
| 1206(3216)  | C    | 0.85          | ±0.15<br>*±0.10 | 2220(5750) | F    | 1.25          | ±0.20    |
|             | D    | 1.00          | ±0.15           |            | H    | 1.60          | ±0.20    |
|             | E    | 1.10          | ±0.10           |            | I    | 2.00          | ±0.20    |
|             | P    | 1.15          | ±0.10           |            | J    | 2.50          | ±0.20    |
|             | F    | 1.25          | ±0.15           | 2220(5750) | L    | 3.20          | ±0.30    |
|             | H    | 1.60          | ±0.20           |            | F    | 1.25          | ±0.20    |
| 1210(3225)  | C    | 0.85          | ±0.15<br>*±0.10 |            | H    | 1.60          | ±0.20    |
|             | 9    | 0.90          | ±0.10           |            | I    | 2.00          | ±0.20    |
|             | M    | 1.15          | ±0.10           |            | J    | 2.50          | ±0.20    |
|             | F    | 1.25          | ±0.20           |            | L    | 3.20          | ±0.30    |
|             | S    | 1.35          | ±0.15           |            |      |               |          |
|             |      |               |                 |            |      |               |          |

- \* Mark is only applicable to "L" code, 12<sup>th</sup> code in part number.
- Please discuss with sales person with regard to Pd products.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

# General Capacitors



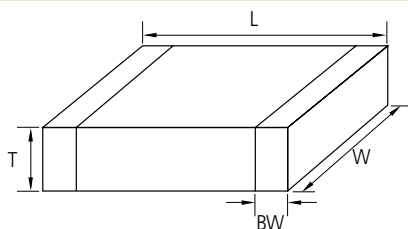
## Feature

- Wide selection of size : from 0402 to 2220
- Highly reliable tolerance and high speed automatic chip placement on PCBs
- Wide capacitance range
- Wide temperature compensation and voltage range : from COG to Y5V and from 6.3V to 50V
- Highly reliable performance
- Highly resistant termination metal
- Tape & reel for surface mount assembly

## Application

- HHP, DSC, DVC, LCD, TV, Car Navigation, Memory Module, PDA, Game Machine
  - Tuner (Product code C is suitable.)
- ※ Medical, Aviation, Automobile device should be following a special specification.

## Structure and Dimensions



| Size Code | EIA Code | Dimension(mm)   |                 |                    |                |                 |
|-----------|----------|-----------------|-----------------|--------------------|----------------|-----------------|
|           |          | L               | W               | T                  | Thickness Code | BW              |
| 05        | 0402     | $1.00 \pm 0.05$ | $0.50 \pm 0.05$ | $0.50 \pm 0.05$    | 5              | $0.2+0.15/-0.1$ |
| 10        | 0603     | $1.60 \pm 0.10$ | $0.80 \pm 0.10$ | $0.50+0.0/-0.1$    | 5              | $0.30 \pm 0.20$ |
|           |          |                 |                 | $0.80 \pm 0.10$    | 8              |                 |
| 21        | 0805     | $2.00 \pm 0.10$ | $1.25 \pm 0.10$ | $0.85 \pm 0.10$    | C              | $0.5+0.2/-0.3$  |
|           |          |                 |                 | $1.25 \pm 0.10$    | F              |                 |
|           |          | $2.00 \pm 0.15$ | $1.25 \pm 0.15$ | $1.25 \pm 0.15$    | Q              |                 |
|           |          | $2.00 \pm 0.20$ | $1.25 \pm 0.20$ | $1.25 \pm 0.20$    | Y              |                 |
| 31        | 1206     | $3.20 \pm 0.20$ | $1.60 \pm 0.20$ | $0.60 \pm 0.10$    | 6              | $0.50 \pm 0.30$ |
|           |          |                 |                 | $0.85 \pm 0.15$    | C              |                 |
|           |          |                 |                 | $0.85 \pm 0.10(*)$ | P              |                 |
|           |          | $3.20 \pm 0.15$ | $1.60 \pm 0.15$ | $1.25 \pm 0.15$    | F              |                 |
|           |          |                 |                 | $1.60 \pm 0.20$    | H              |                 |
| 32        | 1210     | $3.20 \pm 0.30$ | $2.50 \pm 0.20$ | $0.85 \pm 0.15$    | C              | $0.60 \pm 0.30$ |
|           |          |                 |                 | $0.85 \pm 0.10(*)$ | 9              |                 |
|           |          |                 |                 | $0.90 \pm 0.10$    | H              |                 |
|           |          |                 |                 | $1.60 \pm 0.20$    | U              |                 |
|           |          |                 |                 | $1.80 \pm 0.20$    | I              |                 |
|           |          |                 |                 | $2.00 \pm 0.20$    | J              |                 |
|           |          | $3.20 \pm 0.40$ | $2.50 \pm 0.30$ | $2.50 \pm 0.30$    | v              |                 |
| 42        | 1808     | $4.50 \pm 0.40$ | $2.00 \pm 0.20$ | $2.00 \pm 0.20$    | I              | $0.80 \pm 0.30$ |
| 43        | 1812     | $4.50 \pm 0.40$ | $3.20 \pm 0.30$ | $3.20 \pm 0.30$    | L              | $0.80 \pm 0.30$ |
| 55        | 2220     | $5.70 \pm 0.40$ | $5.00 \pm 0.40$ | $3.20 \pm 0.30$    | L              | $1.00 \pm 0.30$ |

■ \* Mark is only applicable to "L" code , 12<sup>th</sup> code in part number.

## General Capacitors Table (C0G)

| Size(mm)   | Vr(V) | Capacitance |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
|------------|-------|-------------|---|----|----|----|-----|-----|-----|-----|-----|---|-----|-----|-----|-----|----|----|----|----|----|----|-----|-----|-----|
|            |       | pF          |   |    |    |    |     |     |     |     |     |   |     | nF  |     |     |    |    |    |    |    |    |     |     |     |
|            |       | 0.5         | 1 | 10 | 22 | 47 | 100 | 220 | 330 | 470 | 560 | 1 | 2.2 | 3.3 | 4.7 | 6.8 | 10 | 22 | 27 | 33 | 47 | 68 | 100 | 120 | 150 |
| 0402(1005) | 25    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
|            | 50    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
| 0603(1608) | 25    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
|            | 50    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
| 0805(2012) | 25    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
|            | 50    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
| 1206(3216) | 16    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
|            | 25    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
|            | 50    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
| 1210(3225) | 50    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
| 1812(4532) | 25    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
|            | 50    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |
| 2220(5750) | 50    |             |   |    |    |    |     |     |     |     |     |   |     |     |     |     |    |    |    |    |    |    |     |     |     |

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## General Capacitors Table (X5R)

| Size(mm)   | Vr(V) | Capacitance (uF) |      |      |   |     |     |    |    |    |     |
|------------|-------|------------------|------|------|---|-----|-----|----|----|----|-----|
|            |       | 0.1              | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 | 22 | 47 | 100 |
| 0402(1005) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
| 0603(1608) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 0805(2012) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 1206(3216) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 1210(3225) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |



## General Capacitors Table\_Low Profile (X5R)

| Size(mm)   | Tmax<br>(mm) | Vr(V) | Capacitance (uF) |     |            |            |    |    |            |
|------------|--------------|-------|------------------|-----|------------|------------|----|----|------------|
|            |              |       | 1                | 2.2 | 4.7        | 10         | 22 | 33 | 47         |
| 0402(1005) | 0.3          | 6.3   | X6S              |     |            |            |    |    |            |
|            |              | 10    |                  |     |            |            |    |    |            |
|            |              | 16    |                  |     |            |            |    |    |            |
| 0603(1608) | 0.5          | 6.3   |                  |     |            |            |    |    |            |
|            |              | 10    |                  |     |            |            |    |    |            |
|            |              | 16    |                  |     |            |            |    |    |            |
|            |              | 25    |                  |     |            |            |    |    |            |
| 0805(2012) | 0.7          | 10    |                  |     |            |            |    |    |            |
|            |              | 16    |                  |     |            |            |    |    |            |
|            |              | 25    |                  |     |            |            |    |    |            |
|            | 0.95         | 4     |                  |     |            |            |    |    | (Tmax=1.0) |
|            |              | 6.3   |                  |     |            |            |    |    | (Tmax=1.0) |
|            |              | 10    |                  |     |            |            |    |    |            |
|            |              | 16    |                  |     |            |            |    |    |            |
|            |              | 25    |                  |     |            | X6S        |    |    |            |
| 1206(3216) | 0.7          | 10    |                  |     |            |            |    |    |            |
|            | 0.95         | 6.3   |                  |     |            |            |    |    |            |
|            |              | 10    |                  |     |            |            |    |    |            |
|            |              | 16    |                  |     |            |            |    |    |            |
|            |              | 25    |                  |     |            | X6S        |    |    |            |
|            |              | 50    |                  |     | (Tmax=1.0) | (Tmax=1.0) |    |    |            |
| 1210(3225) | 0.95         | 16    |                  |     |            |            |    |    |            |
|            | 2.0          | 25    |                  |     |            |            |    |    |            |
|            |              | 35    |                  |     |            |            |    |    |            |
|            |              | 50    |                  |     |            |            |    |    |            |

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

### General Capacitors Table (X6S)

| Size(mm)   | Vr(V) | Capacitance (uF) |      |      |   |     |     |    |    |    |     |
|------------|-------|------------------|------|------|---|-----|-----|----|----|----|-----|
|            |       | 0.1              | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 | 22 | 47 | 100 |
| 0402(1005) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
| 0603(1608) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
| 0805(2012) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
| 1206(3216) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
| 1210(3225) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |

## General Capacitors Table (X7R)

| Size(mm)   | Vr(V) | Capacitance (uF) |      |      |   |     |     |    |    |    |     |
|------------|-------|------------------|------|------|---|-----|-----|----|----|----|-----|
|            |       | 0.1              | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 | 22 | 47 | 100 |
| 0402(1005) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
| 0603(1608) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 0805(2012) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 35    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 1206(3216) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 35    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 1210(3225) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting



## General Capacitors Table (Y5V)

| Size(mm)   | Vr(V) | Capacitance (uF) |      |      |   |     |     |    |    |    |
|------------|-------|------------------|------|------|---|-----|-----|----|----|----|
|            |       | 0.1              | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 | 22 | 47 |
| 0402(1005) | 6.3   |                  |      |      |   |     |     |    |    |    |
|            | 10    |                  |      |      |   |     |     |    |    |    |
|            | 16    |                  |      |      |   |     |     |    |    |    |
|            | 25    |                  |      |      |   |     |     |    |    |    |
| 0603(1608) | 6.3   |                  |      |      |   |     |     |    |    |    |
|            | 10    |                  |      |      |   |     |     |    |    |    |
|            | 16    |                  |      |      |   |     |     |    |    |    |
|            | 25    |                  |      |      |   |     |     |    |    |    |
|            | 50    |                  |      |      |   |     |     |    |    |    |
| 0805(2012) | 6.3   |                  |      |      |   |     |     |    |    |    |
|            | 10    |                  |      |      |   |     |     |    |    |    |
|            | 16    |                  |      |      |   |     |     |    |    |    |
|            | 25    |                  |      |      |   |     |     |    |    |    |
|            | 50    |                  |      |      |   |     |     |    |    |    |
| 1206(3216) | 10    |                  |      |      |   |     |     |    |    |    |
|            | 16    |                  |      |      |   |     |     |    |    |    |
|            | 25    |                  |      |      |   |     |     |    |    |    |
|            | 50    |                  |      |      |   |     |     |    |    |    |
| 1210(3225) | 6.3   |                  |      |      |   |     |     |    |    |    |
|            | 10    |                  |      |      |   |     |     |    |    |    |
|            | 16    |                  |      |      |   |     |     |    |    |    |
|            | 25    |                  |      |      |   |     |     |    |    |    |
|            | 35    |                  |      |      |   |     |     |    |    |    |
|            | 50    |                  |      |      |   |     |     |    |    |    |
|            | 50    |                  |      |      |   |     |     |    |    |    |

## Product Lineup (General Capacitors-C0G)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1  | CL05C0R5CB5NNN □ | 1.00 × 0.50     | 0.5pF       | 50                  | ±0.25pF               | 0.55                |
| 2  | CL05CR75CB5NNN □ |                 | 0.75pF      | 50                  | ±0.25pF               | 0.55                |
| 3  | CL05C010CB5NNN □ |                 | 1.0pF       | 50                  | ±0.25pF               | 0.55                |
| 4  | CL05C1R2CB5NNN □ |                 | 1.2pF       | 50                  | ±0.25pF               | 0.55                |
| 5  | CL05C1R5CB5NNN □ |                 | 1.5pF       | 50                  | ±0.25pF               | 0.55                |
| 6  | CL05C1R8CB5NNN □ |                 | 1.8pF       | 50                  | ±0.25pF               | 0.55                |
| 7  | CL05C020CB5NNN □ |                 | 2.0pF       | 50                  | ±0.25pF               | 0.55                |
| 8  | CL05C2R2CB5NNN □ |                 | 2.2pF       | 50                  | ±0.25pF               | 0.55                |
| 9  | CL05C2R4CB5NNN □ |                 | 2.4pF       | 50                  | ±0.25pF               | 0.55                |
| 10 | CL05C2R5CB5NNN □ |                 | 2.5pF       | 50                  | ±0.25pF               | 0.55                |
| 11 | CL05C2R7CB5NNN □ |                 | 2.7pF       | 50                  | ±0.25pF               | 0.55                |
| 12 | CL05C030CB5NNN □ |                 | 3.0pF       | 50                  | ±0.25pF               | 0.55                |
| 13 | CL05C3R3CB5NNN □ |                 | 3.3pF       | 50                  | ±0.25pF               | 0.55                |
| 14 | CL05C3R5CB5NNN □ |                 | 3.5pF       | 50                  | ±0.25pF               | 0.55                |
| 15 | CL05C3R6CB5NNN □ |                 | 3.6pF       | 50                  | ±0.25pF               | 0.55                |
| 16 | CL05C3R9CB5NNN □ |                 | 3.9pF       | 50                  | ±0.25pF               | 0.55                |
| 17 | CL05C040CB5NNN □ |                 | 4.0pF       | 50                  | ±0.25pF               | 0.55                |
| 18 | CL05C4R3CB5NNN □ |                 | 4.3pF       | 50                  | ±0.25pF               | 0.55                |
| 19 | CL05C4R7CB5NNN □ |                 | 4.7pF       | 50                  | ±0.25pF               | 0.55                |
| 20 | CL05C050DB5NNN □ |                 | 5.0pF       | 50                  | ±0.5pF                | 0.55                |
| 21 | CL05C5R6DB5NNN □ |                 | 5.6pF       | 50                  | ±0.5pF                | 0.55                |
| 22 | CL05C060DB5NNN □ |                 | 6.0pF       | 50                  | ±0.5pF                | 0.55                |
| 23 | CL05C6R2DB5NNN □ |                 | 6.2pF       | 50                  | ±0.5pF                | 0.55                |
| 24 | CL05C6R8DB5NNN □ |                 | 6.8pF       | 50                  | ±0.5pF                | 0.55                |
| 25 | CL05C070DB5NNN □ |                 | 7.0pF       | 50                  | ±0.5pF                | 0.55                |
| 26 | CL05C080DB5NNN □ |                 | 8.0pF       | 50                  | ±0.5pF                | 0.55                |
| 27 | CL05C8R2DB5NNN □ |                 | 8.2pF       | 50                  | ±0.5pF                | 0.55                |
| 28 | CL05C090DB5NNN □ |                 | 9.0pF       | 50                  | ±0.5pF                | 0.55                |
| 29 | CL05C9R1DB5NNN □ |                 | 9.1pF       | 50                  | ±0.5pF                | 0.55                |
| 30 | CL05C100JB5NNN □ |                 | 10pF        | 50                  | ±5%                   | 0.55                |
| 31 | CL05C110JB5NNN □ |                 | 11pF        | 50                  | ±5%                   | 0.55                |
| 32 | CL05C120JB5NNN □ |                 | 12pF        | 50                  | ±5%                   | 0.55                |
| 33 | CL05C130JB5NNN □ |                 | 13pF        | 50                  | ±5%                   | 0.55                |
| 34 | CL05C150JB5NNN □ |                 | 15pF        | 50                  | ±5%                   | 0.55                |
| 35 | CL05C160JB5NNN □ |                 | 16pF        | 50                  | ±5%                   | 0.55                |
| 36 | CL05C180JB5NNN □ |                 | 18pF        | 50                  | ±5%                   | 0.55                |
| 37 | CL05C200JB5NNN □ |                 | 20pF        | 50                  | ±5%                   | 0.55                |
| 38 | CL05C220JA5NNN □ |                 | 22pF        | 25                  | ±5%                   | 0.55                |
| 39 | CL05C220JB5NNN □ |                 | 22pF        | 50                  | ±5%                   | 0.55                |
| 40 | CL05C240JB5NNN □ |                 | 24pF        | 50                  | ±5%                   | 0.55                |
| 41 | CL05C270JB5NNN □ |                 | 27pF        | 50                  | ±5%                   | 0.55                |
| 42 | CL05C270JA5NNN □ |                 | 27pF        | 25                  | ±5%                   | 0.55                |
| 43 | CL05C300JB5NNN □ |                 | 30pF        | 50                  | ±5%                   | 0.55                |
| 44 | CL05C330JB5NNN □ |                 | 33pF        | 50                  | ±5%                   | 0.55                |
| 45 | CL05C360JB5NNN □ |                 | 36pF        | 50                  | ±5%                   | 0.55                |
| 46 | CL05C390JB5NNN □ |                 | 39pF        | 50                  | ±5%                   | 0.55                |
| 47 | CL05C430JB5NNN □ |                 | 43pF        | 50                  | ±5%                   | 0.55                |
| 48 | CL05C470JB5NNN □ |                 | 47pF        | 50                  | ±5%                   | 0.55                |
| 49 | CL05C510JB5NNN □ |                 | 51pF        | 50                  | ±5%                   | 0.55                |
| 50 | CL05C560JB5NNN □ |                 | 56pF        | 50                  | ±5%                   | 0.55                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## Product Lineup (General Capacitors-C0G)

|    | Part Number       | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|-------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 51 | CL05C620JB5NNN □  | 1.00×0.50        | 62pF        | 50                        | ±5%                      | 0.55                   |
| 52 | CL05C680JB5NNN □  |                  | 68pF        | 50                        | ±5%                      | 0.55                   |
| 53 | CL05C750JB5NNN □  |                  | 75pF        | 50                        | ±5%                      | 0.55                   |
| 54 | CL05C820JB5NNN □  |                  | 82pF        | 50                        | ±5%                      | 0.55                   |
| 55 | CL05C910JB5NNN □  |                  | 91pF        | 50                        | ±5%                      | 0.55                   |
| 56 | CL05C101JB5NNN □  |                  | 100pF       | 50                        | ±5%                      | 0.55                   |
| 57 | CL05C121JB5NNN □  |                  | 120pF       | 50                        | ±5%                      | 0.55                   |
| 58 | CL05C151JB5NNN □  |                  | 150pF       | 50                        | ±5%                      | 0.55                   |
| 59 | CL05C181JB5NNN □  |                  | 180pF       | 50                        | ±5%                      | 0.55                   |
| 60 | CL05C201JB5NNN □  |                  | 200pF       | 50                        | ±5%                      | 0.55                   |
| 61 | CL05C221JB5NNN □  |                  | 220pF       | 50                        | ±5%                      | 0.55                   |
| 62 | CL05C271JB5NNN □  |                  | 270pF       | 50                        | ±5%                      | 0.55                   |
| 63 | CL05C331JB5NNN □  |                  | 330pF       | 50                        | ±5%                      | 0.55                   |
| 64 | CL05C391JB5NNN □  |                  | 390pF       | 50                        | ±5%                      | 0.55                   |
| 65 | CL05C471JB5NNN □  |                  | 470pF       | 50                        | ±5%                      | 0.55                   |
| 66 | CL05C471JO5NNN □  |                  | 470pF       | 16                        | ±5%                      | 0.55                   |
| 67 | CL05C681JB5NNN □  |                  | 680pF       | 50                        | ±5%                      | 0.55                   |
| 68 | CL05C821JB5NNN □  |                  | 820pF       | 50                        | ±5%                      | 0.55                   |
| 69 | CL05C102JB5NNN □  |                  | 1nF         | 50                        | ±5%                      | 0.55                   |
| 70 | CL05C102JA5NNN □  |                  | 1nF         | 25                        | ±5%                      | 0.55                   |
| 71 | CL05C102JO5NNN □  |                  | 1nF         | 16                        | ±5%                      | 0.55                   |
| 1  | CL10C0R3CB8NNN □  | 1.60×0.80        | 0.3pF       | 50                        | ±0.25pF                  | 0.90                   |
| 2  | CL10C0R5CB8NNN □  |                  | 0.5pF       | 50                        | ±0.25pF                  | 0.90                   |
| 3  | CL10C0R75CB8NNN □ |                  | 0.75pF      | 50                        | ±0.25pF                  | 0.90                   |
| 4  | CL10C010CB8NNN □  |                  | 1.0pF       | 50                        | ±0.25pF                  | 0.90                   |
| 5  | CL10C1R2CB8NNN □  |                  | 1.2pF       | 50                        | ±0.25pF                  | 0.90                   |
| 6  | CL10C1R5CB8NNN □  |                  | 1.5pF       | 50                        | ±0.25pF                  | 0.90                   |
| 7  | CL10C1R8CB8NNN □  |                  | 1.8pF       | 50                        | ±0.25pF                  | 0.90                   |
| 8  | CL10C020CB8NNN □  |                  | 2.0pF       | 50                        | ±0.25pF                  | 0.90                   |
| 9  | CL10C2R2CB8NNN □  |                  | 2.2pF       | 50                        | ±0.25pF                  | 0.90                   |
| 10 | CL10C2R4CB8NNN □  |                  | 2.4pF       | 50                        | ±0.25pF                  | 0.90                   |
| 11 | CL10C2R5CB8NNN □  |                  | 2.5pF       | 50                        | ±0.25pF                  | 0.90                   |
| 12 | CL10C2R7CB8NNN □  |                  | 2.7pF       | 50                        | ±0.25pF                  | 0.90                   |
| 13 | CL10C030CB8NNN □  |                  | 3.0pF       | 50                        | ±0.25pF                  | 0.90                   |
| 14 | CL10C3R3CB8NNN □  |                  | 3.3pF       | 50                        | ±0.25pF                  | 0.90                   |
| 15 | CL10C3R5CB8NNN □  |                  | 3.5pF       | 50                        | ±0.25pF                  | 0.90                   |
| 16 | CL10C3R6CB8NNN □  |                  | 3.6pF       | 50                        | ±0.25pF                  | 0.90                   |
| 17 | CL10C3R9CB8NNN □  |                  | 3.9pF       | 50                        | ±0.25pF                  | 0.90                   |
| 18 | CL10C040CB8NNN □  |                  | 4.0pF       | 50                        | ±0.25pF                  | 0.90                   |
| 19 | CL10C4R3CB8NNN □  |                  | 4.3pF       | 50                        | ±0.25pF                  | 0.90                   |
| 20 | CL10C4R7CB8NNN □  |                  | 4.7pF       | 50                        | ±0.25pF                  | 0.90                   |
| 21 | CL10C050DB8NNN □  |                  | 5.0pF       | 50                        | ±0.5pF                   | 0.90                   |
| 22 | CL10C5R6DB8NNN □  |                  | 5.6pF       | 50                        | ±0.5pF                   | 0.90                   |
| 23 | CL10C060DB8NNN □  |                  | 6.0pF       | 50                        | ±0.5pF                   | 0.90                   |
| 24 | CL10C6R2DB8NNN □  |                  | 6.2pF       | 50                        | ±0.5pF                   | 0.90                   |
| 25 | CL10C6R8DB8NNN □  |                  | 6.8pF       | 50                        | ±0.5pF                   | 0.90                   |
| 26 | CL10C070DB8NNN □  |                  | 7.0pF       | 50                        | ±0.5pF                   | 0.90                   |
| 27 | CL10C7R5DB8NNN □  |                  | 7.5pF       | 50                        | ±0.5pF                   | 0.90                   |
| 28 | CL10C080DB8NNN □  |                  | 8.0pF       | 50                        | ±0.5pF                   | 0.90                   |
| 29 | CL10C8R2DB8NNN □  |                  | 8.2pF       | 50                        | ±0.5pF                   | 0.90                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

## Product Lineup (General Capacitors-C0G)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 30 | CL10C090DB8NNN □ | 1.60 × 0.80     | 9.0pF       | 50                  | ±0.5pF                | 0.90                |
| 31 | CL10C9R1DB8NNN □ |                 | 9.1pF       | 50                  | ±0.5pF                | 0.90                |
| 32 | CL10C100JB8NNN □ |                 | 10pF        | 50                  | ±5%                   | 0.90                |
| 33 | CL10C110JB8NNN □ |                 | 11pF        | 50                  | ±5%                   | 0.90                |
| 34 | CL10C120JB8NNN □ |                 | 12pF        | 50                  | ±5%                   | 0.90                |
| 35 | CL10C130JB8NNN □ |                 | 13pF        | 50                  | ±5%                   | 0.90                |
| 36 | CL10C140JB8NNN □ |                 | 14pF        | 50                  | ±5%                   | 0.90                |
| 37 | CL10C150JB8NNN □ |                 | 15pF        | 50                  | ±5%                   | 0.90                |
| 38 | CL10C160JB8NNN □ |                 | 16pF        | 50                  | ±5%                   | 0.90                |
| 39 | CL10C180JB8NNN □ |                 | 18pF        | 50                  | ±5%                   | 0.90                |
| 40 | CL10C200JB8NNN □ |                 | 20pF        | 50                  | ±5%                   | 0.90                |
| 41 | CL10C220JB8NNN □ |                 | 22pF        | 50                  | ±5%                   | 0.90                |
| 42 | CL10C240JB8NNN □ |                 | 24pF        | 50                  | ±5%                   | 0.90                |
| 43 | CL10C250JB8NNN □ |                 | 25pF        | 50                  | ±5%                   | 0.90                |
| 44 | CL10C270JB8NNN □ |                 | 27pF        | 50                  | ±5%                   | 0.90                |
| 45 | CL10C300JB8NNN □ |                 | 30pF        | 50                  | ±5%                   | 0.90                |
| 46 | CL10C330JB8NNN □ |                 | 33pF        | 50                  | ±5%                   | 0.90                |
| 47 | CL10C360JB8NNN □ |                 | 36pF        | 50                  | ±5%                   | 0.90                |
| 48 | CL10C390JB8NNN □ |                 | 39pF        | 50                  | ±5%                   | 0.90                |
| 49 | CL10C430JB8NNN □ |                 | 43pF        | 50                  | ±5%                   | 0.90                |
| 50 | CL10C470JB8NNN □ |                 | 47pF        | 50                  | ±5%                   | 0.90                |
| 51 | CL10C510JB8NNN □ |                 | 51pF        | 50                  | ±5%                   | 0.90                |
| 52 | CL10C560JB8NNN □ |                 | 56pF        | 50                  | ±5%                   | 0.90                |
| 53 | CL10C620JB8NNN □ |                 | 62pF        | 50                  | ±5%                   | 0.90                |
| 54 | CL10C680JB8NNN □ |                 | 68pF        | 50                  | ±5%                   | 0.90                |
| 55 | CL10C750JB8NNN □ |                 | 75pF        | 50                  | ±5%                   | 0.90                |
| 56 | CL10C820JB8NNN □ |                 | 82pF        | 50                  | ±5%                   | 0.90                |
| 57 | CL10C910JB8NNN □ |                 | 91pF        | 50                  | ±5%                   | 0.90                |
| 58 | CL10C101JB8NNN □ |                 | 100pF       | 50                  | ±5%                   | 0.90                |
| 59 | CL10C111JB8NNN □ |                 | 110pF       | 50                  | ±5%                   | 0.90                |
| 60 | CL10C121JB8NNN □ |                 | 120pF       | 50                  | ±5%                   | 0.90                |
| 61 | CL10C131JB8NNN □ |                 | 130pF       | 50                  | ±5%                   | 0.90                |
| 62 | CL10C151JB8NNN □ |                 | 150pF       | 50                  | ±5%                   | 0.90                |
| 63 | CL10C161JB8NNN □ |                 | 160pF       | 50                  | ±5%                   | 0.90                |
| 64 | CL10C181JB8NNN □ |                 | 180pF       | 50                  | ±5%                   | 0.90                |
| 65 | CL10C201JB8NNN □ |                 | 200pF       | 50                  | ±5%                   | 0.90                |
| 66 | CL10C221JB8NNN □ |                 | 220pF       | 50                  | ±5%                   | 0.90                |
| 67 | CL10C241JB8NNN □ |                 | 240pF       | 50                  | ±5%                   | 0.90                |
| 68 | CL10C271JB8NNN □ |                 | 270pF       | 50                  | ±5%                   | 0.90                |
| 69 | CL10C301JB8NNN □ |                 | 300pF       | 50                  | ±5%                   | 0.90                |
| 70 | CL10C331JB8NNN □ |                 | 330pF       | 50                  | ±5%                   | 0.90                |
| 71 | CL10C361JB8NNN □ |                 | 360pF       | 50                  | ±5%                   | 0.90                |
| 72 | CL10C391JB8NNN □ |                 | 390pF       | 50                  | ±5%                   | 0.90                |
| 73 | CL10C431JB8NNN □ |                 | 430pF       | 50                  | ±5%                   | 0.90                |
| 74 | CL10C471JB8NNN □ |                 | 470pF       | 50                  | ±5%                   | 0.90                |
| 75 | CL10C511JB8NNN □ |                 | 510pF       | 50                  | ±5%                   | 0.90                |
| 76 | CL10C561JB8NNN □ |                 | 560pF       | 50                  | ±5%                   | 0.90                |
| 77 | CL10C621JB8NNN □ |                 | 620pF       | 50                  | ±5%                   | 0.90                |
| 78 | CL10C681JB8NNN □ |                 | 680pF       | 50                  | ±5%                   | 0.90                |
| 79 | CL10C751JB8NNN □ |                 | 750pF       | 50                  | ±5%                   | 0.90                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting



## Product Lineup (General Capacitors-C0G)

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 80 | CL10C821JB8NNN □ | 1.60×0.80        | 820pF       | 50                        | ±5%                      | 0.90                   |
| 81 | CL10C102JB8NNN □ |                  | 1nF         | 50                        | ±5%                      | 0.90                   |
| 82 | CL10C182JB8NNN □ |                  | 1.8nF       | 50                        | ±5%                      | 0.90                   |
| 83 | CL10C222JB8NNN □ |                  | 2.2nF       | 50                        | ±5%                      | 0.90                   |
| 84 | CL10C562JB8NNN □ |                  | 5.6nF       | 50                        | ±5%                      | 0.90                   |
| 1  | CL21CR47CBANNN □ | 2.00×1.25        | 0.47pF      | 50                        | ±0.25pF                  | 0.75                   |
| 2  | CL21C0R5CBANNN □ |                  | 0.5pF       | 50                        | ±0.25pF                  | 0.75                   |
| 3  | CL21C010CBANNN □ |                  | 1.0pF       | 50                        | ±0.25pF                  | 0.75                   |
| 4  | CL21C1R2CBANNN □ |                  | 1.2pF       | 50                        | ±0.25pF                  | 0.75                   |
| 5  | CL21C1R5CBANNN □ |                  | 1.5pF       | 50                        | ±0.25pF                  | 0.75                   |
| 6  | CL21C1R8CBANNN □ |                  | 1.8pF       | 50                        | ±0.25pF                  | 0.75                   |
| 7  | CL21C020CBANNN □ |                  | 2.0pF       | 50                        | ±0.25pF                  | 0.75                   |
| 8  | CL21C2R2CBANNN □ |                  | 2.2pF       | 50                        | ±0.25pF                  | 0.75                   |
| 9  | CL21C2R4CBANNN □ |                  | 2.4pF       | 50                        | ±0.25pF                  | 0.75                   |
| 10 | CL21C2R5CBANNN □ |                  | 2.5pF       | 50                        | ±0.25pF                  | 0.75                   |
| 11 | CL21C2R7CBANNN □ |                  | 2.7pF       | 50                        | ±0.25pF                  | 0.75                   |
| 12 | CL21C030CBANNN □ |                  | 3.0pF       | 50                        | ±0.25pF                  | 0.75                   |
| 13 | CL21C3R2CBANNN □ |                  | 3.2pF       | 50                        | ±0.25pF                  | 0.75                   |
| 14 | CL21C3R3CBANNN □ |                  | 3.3pF       | 50                        | ±0.25pF                  | 0.75                   |
| 15 | CL21C3R6CBANNN □ |                  | 3.6pF       | 50                        | ±0.25pF                  | 0.75                   |
| 16 | CL21C3R9CBANNN □ |                  | 3.9pF       | 50                        | ±0.25pF                  | 0.75                   |
| 17 | CL21C040CBANNN □ |                  | 4.0pF       | 50                        | ±0.25pF                  | 0.75                   |
| 18 | CL21C4R7CBANNN □ |                  | 4.7pF       | 50                        | ±0.25pF                  | 0.75                   |
| 19 | CL21C5R6DBANNN □ |                  | 5.6pF       | 50                        | ±0.5pF                   | 0.75                   |
| 20 | CL21C060DBANNN □ |                  | 6.0pF       | 50                        | ±0.5pF                   | 0.75                   |
| 21 | CL21C6R8DBANNN □ |                  | 6.8pF       | 50                        | ±0.5pF                   | 0.75                   |
| 22 | CL21C070DBANNN □ |                  | 7.0pF       | 50                        | ±0.5pF                   | 0.75                   |
| 23 | CL21C7R5DBANNN □ |                  | 7.5pF       | 50                        | ±0.5pF                   | 0.75                   |
| 24 | CL21C080DBANNN □ |                  | 8.0pF       | 50                        | ±0.5pF                   | 0.75                   |
| 25 | CL21C8R2DBANNN □ |                  | 8.2pF       | 50                        | ±0.5pF                   | 0.75                   |
| 26 | CL21C090DBANNN □ |                  | 9.0pF       | 50                        | ±0.5pF                   | 0.75                   |
| 27 | CL21C100JBANNN □ |                  | 10pF        | 50                        | ±5%                      | 0.75                   |
| 28 | CL21C120JBANNN □ |                  | 12pF        | 50                        | ±5%                      | 0.75                   |
| 29 | CL21C130JBANNN □ |                  | 13pF        | 50                        | ±5%                      | 0.75                   |
| 30 | CL21C140JBANNN □ |                  | 14pF        | 50                        | ±5%                      | 0.75                   |
| 31 | CL21C150JBANNN □ |                  | 15pF        | 50                        | ±5%                      | 0.75                   |
| 32 | CL21C160JBANNN □ |                  | 16pF        | 50                        | ±5%                      | 0.75                   |
| 33 | CL21C180JBANNN □ |                  | 18pF        | 50                        | ±5%                      | 0.75                   |
| 34 | CL21C200JBANNN □ |                  | 20pF        | 50                        | ±5%                      | 0.75                   |
| 35 | CL21C220JBANNN □ |                  | 22pF        | 50                        | ±5%                      | 0.75                   |
| 36 | CL21C240JBANNN □ |                  | 24pF        | 50                        | ±5%                      | 0.75                   |
| 37 | CL21C250JBANNN □ |                  | 25pF        | 50                        | ±5%                      | 0.75                   |
| 38 | CL21C270JBANNN □ |                  | 27pF        | 50                        | ±5%                      | 0.75                   |
| 39 | CL21C300JBANNN □ |                  | 30pF        | 50                        | ±5%                      | 0.75                   |
| 40 | CL21C330JBANNN □ |                  | 33pF        | 50                        | ±5%                      | 0.75                   |
| 41 | CL21C360JBANNN □ |                  | 36pF        | 50                        | ±5%                      | 0.75                   |
| 42 | CL21C390JBANNN □ |                  | 39pF        | 50                        | ±5%                      | 0.75                   |
| 43 | CL21C430JBANNN □ |                  | 43pF        | 50                        | ±5%                      | 0.75                   |
| 44 | CL21C470JBANNN □ |                  | 47pF        | 50                        | ±5%                      | 0.75                   |
| 45 | CL21C510JBANNN □ |                  | 51pF        | 50                        | ±5%                      | 0.75                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

## Product Lineup (General Capacitors-C0G)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 46 | CL21C560JBANNN □ | 2.00 × 1.25     | 56pF        | 50                  | ±5%                   | 0.75                |
| 47 | CL21C620JBANNN □ |                 | 62pF        | 50                  | ±5%                   | 0.75                |
| 48 | CL21C680JBANNN □ |                 | 68pF        | 50                  | ±5%                   | 0.75                |
| 49 | CL21C750JBANNN □ |                 | 75pF        | 50                  | ±5%                   | 0.75                |
| 50 | CL21C820JBANNN □ |                 | 82pF        | 50                  | ±5%                   | 0.75                |
| 51 | CL21C910JBANNN □ |                 | 91pF        | 50                  | ±5%                   | 0.75                |
| 52 | CL21C101JBANNN □ |                 | 100pF       | 50                  | ±5%                   | 0.75                |
| 53 | CL21C111JBANNN □ |                 | 110pF       | 50                  | ±5%                   | 0.75                |
| 54 | CL21C121JBANNN □ |                 | 120pF       | 50                  | ±5%                   | 0.75                |
| 55 | CL21C131JBANNN □ |                 | 130pF       | 50                  | ±5%                   | 0.75                |
| 56 | CL21C151JBANNN □ |                 | 150pF       | 50                  | ±5%                   | 0.75                |
| 57 | CL21C161JBANNN □ |                 | 160pF       | 50                  | ±5%                   | 0.75                |
| 58 | CL21C181JBANNN □ |                 | 180pF       | 50                  | ±5%                   | 0.75                |
| 59 | CL21C201JBANNN □ |                 | 200pF       | 50                  | ±5%                   | 0.75                |
| 60 | CL21C221JBANNN □ |                 | 220pF       | 50                  | ±5%                   | 0.75                |
| 61 | CL21C241JBANNN □ |                 | 240pF       | 50                  | ±5%                   | 0.75                |
| 62 | CL21C271JBANNN □ |                 | 270pF       | 50                  | ±5%                   | 0.75                |
| 63 | CL21C301JBANNN □ |                 | 300pF       | 50                  | ±5%                   | 0.75                |
| 64 | CL21C331JBANNN □ |                 | 330pF       | 50                  | ±5%                   | 0.75                |
| 65 | CL21C361JBANNN □ |                 | 360pF       | 50                  | ±5%                   | 0.75                |
| 66 | CL21C391JBANNN □ |                 | 390pF       | 50                  | ±5%                   | 0.75                |
| 67 | CL21C431JBANNN □ |                 | 430pF       | 50                  | ±5%                   | 0.75                |
| 68 | CL21C471JBANNN □ |                 | 470pF       | 50                  | ±5%                   | 0.75                |
| 69 | CL21C511JBANNN □ |                 | 510pF       | 50                  | ±5%                   | 0.75                |
| 70 | CL21C561JBANNN □ |                 | 560pF       | 50                  | ±5%                   | 0.75                |
| 71 | CL21C621JBCNNN □ |                 | 620pF       | 50                  | ±5%                   | 0.95                |
| 72 | CL21C681JBCNNN □ |                 | 680pF       | 50                  | ±5%                   | 0.95                |
| 73 | CL21C751JBCNNN □ |                 | 750pF       | 50                  | ±5%                   | 0.95                |
| 74 | CL21C821JBCNNN □ |                 | 820pF       | 50                  | ±5%                   | 0.95                |
| 75 | CL21C102JBCNNN □ |                 | 1nF         | 50                  | ±5%                   | 0.95                |
| 76 | CL21C122JBFNNN □ |                 | 1.2nF       | 50                  | ±5%                   | 1.35                |
| 77 | CL21C152JBFNNN □ |                 | 1.5nF       | 50                  | ±5%                   | 1.35                |
| 78 | CL21C182JBFNNN □ |                 | 1.8nF       | 50                  | ±5%                   | 1.35                |
| 79 | CL21C222JBFNNN □ |                 | 2.2nF       | 50                  | ±5%                   | 1.35                |
| 80 | CL21C332JAFNNN □ |                 | 3.3nF       | 25                  | ±5%                   | 1.35                |
| 81 | CL21C332JBFNNN □ |                 | 3.3nF       | 50                  | ±5%                   | 1.35                |
| 82 | CL21C392JAFNNN □ |                 | 3.9nF       | 25                  | ±5%                   | 0.75                |
| 83 | CL21C392JBFNNN □ |                 | 3.9nF       | 50                  | ±5%                   | 1.35                |
| 84 | CL21C472JAFNNN □ |                 | 4.7nF       | 25                  | ±5%                   | 1.35                |
| 85 | CL21C472JBFNNN □ |                 | 4.7nF       | 50                  | ±5%                   | 1.35                |
| 86 | CL21C562JBFNNN □ |                 | 5.6nF       | 50                  | ±5%                   | 1.35                |
| 87 | CL21C822JAFNNN □ |                 | 8.2nF       | 25                  | ±5%                   | 1.35                |
| 88 | CL21C103JBFNNN □ |                 | 10nF        | 50                  | ±5%                   | 1.35                |
| 1  | CL31C0R5CBCNNN □ | 3.20 × 1.60     | 0.5pF       | 50                  | ±0.25pF               | 1.0                 |
| 2  | CL31C010CBCNNN □ |                 | 1.0pF       | 50                  | ±0.25pF               | 1.0                 |
| 3  | CL31C1R5CBCNNN □ |                 | 1.5pF       | 50                  | ±0.25pF               | 1.0                 |
| 4  | CL31C1R8CBCNNN □ |                 | 1.8pF       | 50                  | ±0.25pF               | 1.0                 |
| 5  | CL31C020CBCNNN □ |                 | 2.0pF       | 50                  | ±0.25pF               | 1.0                 |
| 6  | CL31C2R2CBCNNN □ |                 | 2.2pF       | 50                  | ±0.25pF               | 1.0                 |
| 7  | CL31C2R7CBCNNN □ |                 | 2.7pF       | 50                  | ±0.25pF               | 1.0                 |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## Product Lineup (General Capacitors-C0G)

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 8  | CL31C030CBCNNN □ | 3.20×1.60        | 3.0pF       | 50                        | ±0.25pF                  | 1.0                    |
| 9  | CL31C3R3CBCNNN □ |                  | 3.3pF       | 50                        | ±0.25pF                  | 1.0                    |
| 10 | CL31C040CBCNNN □ |                  | 4.0pF       | 50                        | ±0.25pF                  | 1.0                    |
| 11 | CL31C4R7CBCNNN □ |                  | 4.7pF       | 50                        | ±0.25pF                  | 1.0                    |
| 12 | CL31C100JBCNNN □ |                  | 10pF        | 50                        | ±5%                      | 1.0                    |
| 13 | CL31C120JBCNNN □ |                  | 12pF        | 50                        | ±5%                      | 1.0                    |
| 14 | CL31C150JBCNNN □ |                  | 15pF        | 50                        | ±5%                      | 1.0                    |
| 15 | CL31C180JBCNNN □ |                  | 18pF        | 50                        | ±5%                      | 1.0                    |
| 16 | CL31C200JBCNNN □ |                  | 20pF        | 50                        | ±5%                      | 1.0                    |
| 17 | CL31C220JBCNNN □ |                  | 22pF        | 50                        | ±5%                      | 1.0                    |
| 18 | CL31C270JBCNNN □ |                  | 27pF        | 50                        | ±5%                      | 1.0                    |
| 19 | CL31C300JBCNNN □ |                  | 30pF        | 50                        | ±5%                      | 1.0                    |
| 20 | CL31C330JBCNNN □ |                  | 33pF        | 50                        | ±5%                      | 1.0                    |
| 21 | CL31C390JBCNNN □ |                  | 39pF        | 50                        | ±5%                      | 1.0                    |
| 22 | CL31C470JBCNNN □ |                  | 47pF        | 50                        | ±5%                      | 1.0                    |
| 23 | CL31C510JBCNNN □ |                  | 51pF        | 50                        | ±5%                      | 1.0                    |
| 24 | CL31C560JBCNNN □ |                  | 56pF        | 50                        | ±5%                      | 1.0                    |
| 25 | CL31C680JBCNNN □ |                  | 68pF        | 50                        | ±5%                      | 1.0                    |
| 26 | CL31C750JBCNNN □ |                  | 75pF        | 50                        | ±5%                      | 1.0                    |
| 27 | CL31C820JBCNNN □ |                  | 82pF        | 50                        | ±5%                      | 1.0                    |
| 28 | CL31C101JBCNNN □ |                  | 100pF       | 50                        | ±5%                      | 1.0                    |
| 29 | CL31C121JBCNNN □ |                  | 120pF       | 50                        | ±5%                      | 1.0                    |
| 30 | CL31C151JBCNNN □ |                  | 150pF       | 50                        | ±5%                      | 1.0                    |
| 31 | CL31C181JBCNNN □ |                  | 180pF       | 50                        | ±5%                      | 1.0                    |
| 32 | CL31C221JBCNNN □ |                  | 220pF       | 50                        | ±5%                      | 1.0                    |
| 33 | CL31C271JBCNNN □ |                  | 270pF       | 50                        | ±5%                      | 1.0                    |
| 34 | CL31C331JBCNNN □ |                  | 330pF       | 50                        | ±5%                      | 1.0                    |
| 35 | CL31C391JBCNNN □ |                  | 390pF       | 50                        | ±5%                      | 1.0                    |
| 36 | CL31C471JBCNNN □ |                  | 470pF       | 50                        | ±5%                      | 1.0                    |
| 37 | CL31C561JBCNNN □ |                  | 560pF       | 50                        | ±5%                      | 1.0                    |
| 38 | CL31C681JBCNNN □ |                  | 680pF       | 50                        | ±5%                      | 1.0                    |
| 39 | CL31C821JBCNNN □ |                  | 820pF       | 50                        | ±5%                      | 1.0                    |
| 40 | CL31C102JBCNNN □ |                  | 1nF         | 50                        | ±5%                      | 1.0                    |
| 41 | CL31C122JBCNNN □ |                  | 1.2nF       | 50                        | ±5%                      | 1.0                    |
| 42 | CL31C152JBCNNN □ |                  | 1.5nF       | 50                        | ±5%                      | 1.0                    |
| 43 | CL31C182JBCNNN □ |                  | 1.8nF       | 50                        | ±5%                      | 1.0                    |
| 44 | CL31C222JBCNNN □ |                  | 2.2nF       | 50                        | ±5%                      | 1.0                    |
| 45 | CL31C272JBFNNN □ |                  | 2.7nF       | 50                        | ±5%                      | 1.4                    |
| 46 | CL31C332JBFNNN □ |                  | 3.3nF       | 50                        | ±5%                      | 1.4                    |
| 47 | CL31C472JBFNNN □ |                  | 4.7nF       | 50                        | ±5%                      | 1.4                    |
| 48 | CL31C682JBHNNN □ |                  | 6.8nF       | 50                        | ±5%                      | 1.8                    |
| 49 | CL31C103JAFNNN □ |                  | 10nF        | 25                        | ±5%                      | 1.4                    |
| 50 | CL31C223JBHNNN □ |                  | 22nF        | 50                        | ±5%                      | 1.8                    |
| 51 | CL31C333JBHNNN □ |                  | 33nF        | 50                        | ±5%                      | 1.8                    |
| 1  | CL32C472JBFNNN □ | 3.20×2.50        | 4.7nF       | 50                        | ±5%                      | 1.45                   |
| 2  | CL32C103JBFNNN □ |                  | 10nF        | 50                        | ±5%                      | 1.45                   |
| 3  | CL32C223JBHNNN □ |                  | 22nF        | 50                        | ±5%                      | 1.80                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

## Product Lineup (General Capacitors-X7R)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1  | CL05B471KB5NNN □ | 1.00 × 0.50     | 470pF       | 50                  | ±10%                  | 0.55                |
| 2  | CL05B221KB5NNN □ |                 | 220pF       | 50                  | ±10%                  | 0.55                |
| 3  | CL05B681KB5NNN □ |                 | 680pF       | 50                  | ±10%                  | 0.55                |
| 4  | CL05B102KB5NNN □ |                 | 1nF         | 50                  | ±10%                  | 0.55                |
| 5  | CL05B102KA5NNN □ |                 | 1nF         | 25                  | ±10%                  | 0.55                |
| 6  | CL05B222KB5NNN □ |                 | 2.2nF       | 50                  | ±10%                  | 0.55                |
| 7  | CL05B472KB5NNN □ |                 | 4.7nF       | 50                  | ±10%                  | 0.55                |
| 8  | CL05B472KA5NNN □ |                 | 4.7nF       | 25                  | ±10%                  | 0.55                |
| 9  | CL05B682KB5NNN □ |                 | 6.8nF       | 50                  | ±10%                  | 0.55                |
| 10 | CL05B682KA5NNN □ |                 | 6.8nF       | 25                  | ±10%                  | 0.55                |
| 11 | CL05B103KB5NNN □ |                 | 10nF        | 50                  | ±10%                  | 0.55                |
| 12 | CL05B103KA5NNN □ |                 | 10nF        | 25                  | ±10%                  | 0.55                |
| 13 | CL05B223KA5NNN □ |                 | 22nF        | 25                  | ±10%                  | 0.55                |
| 14 | CL05B473KO5NNN □ |                 | 47nF        | 16                  | ±10%                  | 0.55                |
| 15 | CL05B473KP5NNN □ |                 | 47nF        | 10                  | ±10%                  | 0.55                |
| 16 | CL05B683KO5NNN □ |                 | 68nF        | 16                  | ±10%                  | 0.55                |
| 17 | CL05B683KP5NNN □ |                 | 68nF        | 10                  | ±10%                  | 0.55                |
| 18 | CL05B104KO5NNN □ |                 | 100nF       | 16                  | ±10%                  | 0.55                |
| 19 | CL05B104KP5NNN □ |                 | 100nF       | 10                  | ±10%                  | 0.55                |
| 20 | CL05B104KQ5NNN □ |                 | 100nF       | 6.3                 | ±10%                  | 0.55                |
| 1  | CL10B101KB8NNN □ | 1.60 × 0.80     | 100pF       | 50                  | ±10%                  | 0.9                 |
| 2  | CL10B221KB8NNN □ |                 | 220pF       | 50                  | ±10%                  | 0.9                 |
| 3  | CL10B471KB8NNN □ |                 | 470pF       | 50                  | ±10%                  | 0.9                 |
| 4  | CL10B681KB8NNN □ |                 | 680pF       | 50                  | ±10%                  | 0.9                 |
| 5  | CL10B102KB8NNN □ |                 | 1nF         | 50                  | ±10%                  | 0.9                 |
| 6  | CL10B102KA8NNN □ |                 | 1nF         | 25                  | ±10%                  | 0.9                 |
| 7  | CL10B222KB8NNN □ |                 | 2.2nF       | 50                  | ±10%                  | 0.9                 |
| 8  | CL10B472KB8NNN □ |                 | 4.7nF       | 50                  | ±10%                  | 0.9                 |
| 9  | CL10B472KA8NNN □ |                 | 4.7nF       | 25                  | ±10%                  | 0.9                 |
| 10 | CL10B682KB8NNN □ |                 | 6.8nF       | 50                  | ±10%                  | 0.9                 |
| 11 | CL10B103KB8NNN □ |                 | 10nF        | 50                  | ±10%                  | 0.9                 |
| 12 | CL10B103KA8NNN □ |                 | 10nF        | 25                  | ±10%                  | 0.9                 |
| 13 | CL10B223KA8NNN □ |                 | 22nF        | 25                  | ±10%                  | 0.9                 |
| 14 | CL10B473KB8NNN □ |                 | 47nF        | 50                  | ±10%                  | 0.9                 |
| 15 | CL10B473KA8NNN □ |                 | 47nF        | 25                  | ±10%                  | 0.9                 |
| 16 | CL10B683KB8NNN □ |                 | 68nF        | 50                  | ±10%                  | 0.9                 |
| 17 | CL10B683KA8NNN □ |                 | 68nF        | 25                  | ±10%                  | 0.9                 |
| 18 | CL10B104KB8NNN □ |                 | 100nF       | 50                  | ±10%                  | 0.9                 |
| 19 | CL10B224KA8NNN □ |                 | 220nF       | 25                  | ±10%                  | 0.9                 |
| 20 | CL10B224KO8NNN □ |                 | 220nF       | 16                  | ±10%                  | 0.9                 |
| 21 | CL10B225KQ8NNN □ |                 | 2.2uF       | 63                  | ±10%                  | 0.9                 |
| 1  | CL21B221KBANNN □ | 2.00 × 1.25     | 220pF       | 50                  | ±10%                  | 0.75                |
| 2  | CL21B471KBANNN □ |                 | 470pF       | 50                  | ±10%                  | 0.75                |
| 3  | CL21B681KBANNN □ |                 | 680pF       | 50                  | ±10%                  | 0.75                |
| 4  | CL21B102KBANNN □ |                 | 1nF         | 50                  | ±10%                  | 0.75                |
| 5  | CL21B102KBCNNN □ |                 | 1nF         | 50                  | ±10%                  | 0.95                |
| 6  | CL21B222KBANNN □ |                 | 2.2nF       | 50                  | ±10%                  | 0.75                |
| 7  | CL21B222KBCNNN □ |                 | 2.2nF       | 50                  | ±10%                  | 0.95                |
| 8  | CL21B682KBANNN □ |                 | 6.8nF       | 50                  | ±10%                  | 0.75                |
| 9  | CL21B103KBANNN □ |                 | 10nF        | 50                  | ±10%                  | 0.75                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

※ For parts of higher capacitance than those above listed, refer to the product lineup of 'High Capacitance' subcategory.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## Product Lineup (General Capacitors-X7R)

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 10 | CL21B103KBCNNN □ | 2.00×1.25        | 10nF        | 50                        | ± 10%                    | 0.95                   |
| 11 | CL21B223KBANNN □ |                  | 22nF        | 50                        | ± 10%                    | 0.75                   |
| 12 | CL21B223KBCNNN □ |                  | 22nF        | 50                        | ± 10%                    | 0.95                   |
| 13 | CL21B473KBANNN □ |                  | 47nF        | 50                        | ± 10%                    | 0.75                   |
| 14 | CL21B473KBCNNN □ |                  | 47nF        | 50                        | ± 10%                    | 0.95                   |
| 15 | CL21B683KAANNN □ |                  | 68nF        | 25                        | ± 10%                    | 0.75                   |
| 16 | CL21B683KBCNNN □ |                  | 68nF        | 50                        | ± 10%                    | 0.95                   |
| 17 | CL21B683KBFNNN □ |                  | 68nF        | 50                        | ± 10%                    | 1.35                   |
| 18 | CL21B104KBCNNN □ |                  | 100nF       | 50                        | ± 10%                    | 0.95                   |
| 19 | CL21B104KBFNNN □ |                  | 100nF       | 50                        | ± 10%                    | 1.35                   |
| 20 | CL21B224KBFNNN □ |                  | 220nF       | 50                        | ± 10%                    | 1.35                   |
| 21 | CL21B224KAFNNN □ |                  | 220nF       | 25                        | ± 10%                    | 1.35                   |
| 22 | CL21B224KOCNNN □ |                  | 220nF       | 16                        | ± 10%                    | 0.95                   |
| 23 | CL21B224KOFNNN □ |                  | 220nF       | 16                        | ± 10%                    | 1.35                   |
| 24 | CL21B474KBFNNN □ |                  | 470nF       | 50                        | ± 10%                    | 1.35                   |
| 25 | CL21B474KAFNNN □ |                  | 470nF       | 25                        | ± 10%                    | 1.35                   |
| 26 | CL21B474KOFNNN □ |                  | 470nF       | 16                        | ± 10%                    | 1.35                   |
| 27 | CL21B684KOFNNN □ |                  | 680nF       | 16                        | ± 10%                    | 1.35                   |
| 28 | CL21B684KPFNNN □ |                  | 680nF       | 10                        | ± 10%                    | 1.35                   |
| 1  | CL31B221KBCNNN □ | 3.20×1.60        | 220pF       | 50                        | ± 10%                    | 1.0                    |
| 2  | CL31B471KBCNNN □ |                  | 470pF       | 50                        | ± 10%                    | 1.0                    |
| 3  | CL31B681KBCNNN □ |                  | 680pF       | 50                        | ± 10%                    | 1.0                    |
| 4  | CL31B102KBCNNN □ |                  | 1nF         | 50                        | ± 10%                    | 1.0                    |
| 5  | CL31B222KBCNNN □ |                  | 2.2nF       | 50                        | ± 10%                    | 1.0                    |
| 6  | CL31B472KBCNNN □ |                  | 4.7nF       | 50                        | ± 10%                    | 1.0                    |
| 7  | CL31B682KBCNNN □ |                  | 6.8nF       | 50                        | ± 10%                    | 1.0                    |
| 8  | CL31B103KBCNNN □ |                  | 10nF        | 50                        | ± 10%                    | 1.0                    |
| 9  | CL31B223KBCNNN □ |                  | 22nF        | 50                        | ± 10%                    | 1.0                    |
| 10 | CL31B473KBCNNN □ |                  | 47nF        | 50                        | ± 10%                    | 1.0                    |
| 11 | CL31B683KBCNNN □ |                  | 68nF        | 50                        | ± 10%                    | 1.0                    |
| 12 | CL31B104KBCNNN □ |                  | 100nF       | 50                        | ± 10%                    | 1.0                    |
| 13 | CL31B104KACNNN □ |                  | 100nF       | 25                        | ± 10%                    | 1.0                    |
| 14 | CL31B224KBCNNN □ |                  | 220nF       | 50                        | ± 10%                    | 1.0                    |
| 15 | CL31B224KAFNNN □ |                  | 220nF       | 25                        | ± 10%                    | 1.4                    |
| 16 | CL31B474KBFNNN □ |                  | 470nF       | 50                        | ± 10%                    | 1.4                    |
| 17 | CL31B474KAHNNN □ |                  | 470nF       | 25                        | ± 10%                    | 1.8                    |
| 18 | CL31B474KOCNNN □ |                  | 470nF       | 16                        | ± 10%                    | 1.0                    |
| 19 | CL31B684KBHNNN □ |                  | 680nF       | 50                        | ± 10%                    | 1.8                    |
| 20 | CL31B684KAHNNN □ |                  | 680nF       | 25                        | ± 10%                    | 1.8                    |
| 21 | CL31B105KBHNNN □ |                  | 1μF         | 50                        | ± 10%                    | 1.8                    |
| 22 | CL31B105KAHNNN □ |                  | 1μF         | 25                        | ± 10%                    | 1.8                    |
| 23 | CL31B105KOFNNN □ |                  | 1μF         | 16                        | ± 10%                    | 1.4                    |
| 24 | CL31B225KBHNNN □ |                  | 2.2μF       | 50                        | ± 10%                    | 1.8                    |
| 25 | CL31B225KAHNNN □ |                  | 2.2μF       | 25                        | ± 10%                    | 1.8                    |
| 26 | CL31B225KOHNNN □ |                  | 2.2μF       | 16                        | ± 10%                    | 1.8                    |
| 27 | CL31B225KPFNNN □ |                  | 2.2μF       | 10                        | ± 10%                    | 1.4                    |
| 1  | CL32B104KBFNNN □ | 3.20×2.50        | 100nF       | 50                        | ± 10%                    | 1.45                   |
| 2  | CL32B224KBFNNN □ |                  | 220nF       | 50                        | ± 10%                    | 1.45                   |
| 3  | CL32B105KBFNNN □ |                  | 1μF         | 50                        | ± 10%                    | 1.45                   |
| 4  | CL32B105KAHNNN □ |                  | 1μF         | 25                        | ± 10%                    | 1.8                    |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

※ For parts of higher capacitance than those above listed, refer to the product lineup of 'High Capacitance' subcategory.



## Product Lineup (General Capacitors-X7R)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 5  | CL32B104KBFNNN □ | 3.20 × 2.50     | 100nF       | 50                  | ± 10%                 | 1.45                |
| 6  | CL32B224KBFNNN □ |                 | 220nF       | 50                  | ± 10%                 | 1.45                |
| 7  | CL32B105KBFNNN □ |                 | 1 μF        | 50                  | ± 10%                 | 1.45                |
| 8  | CL32B105KAHNNN □ |                 | 1 μF        | 25                  | ± 10%                 | 1.8                 |
| 9  | CL32B225KBINNN □ |                 | 2.2 μF      | 50                  | ± 10%                 | 2.2                 |
| 10 | CL32B225KAJNNN □ |                 | 2.2 μF      | 25                  | ± 10%                 | 2.7                 |
| 11 | CL32B474KBFNNN □ |                 | 470nF       | 50                  | ± 10%                 | 1.45                |
| 12 | CL32B474KAFNNN □ |                 | 470nF       | 25                  | ± 10%                 | 1.45                |
| 13 | CL32B475KOINNN □ |                 | 4.7 μF      | 16                  | ± 10%                 | 2.2                 |
| 1  | CL43B224KBFNNN □ | 4.50 × 3.20     | 220nF       | 50                  | ± 10%                 | 1.45                |
| 2  | CL43B474KBFNNN □ |                 | 470nF       | 50                  | ± 10%                 | 1.45                |
| 3  | CL43B684KBFNNN □ |                 | 680nF       | 50                  | ± 10%                 | 1.45                |
| 4  | CL43B105KBFNNN □ |                 | 1 μF        | 50                  | ± 10%                 | 1.45                |
| 5  | CL43B106KALNNN □ |                 | 10 μF       | 25                  | ± 10%                 | 3.5                 |
| 6  | CL43B226KPJNNN □ |                 | 22 μF       | 10                  | ± 10%                 | 2.7                 |
| 1  | CL55B475KBJNNN □ | 5.70 × 5.00     | 4.7 μF      | 50                  | ± 10%                 | 2.7                 |

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

## Product Lineup (General Capacitors-X5R)

|   | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|---|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1 | CL05A223KO5NNN □ | 1.00 × 0.50     | 22nF        | 16                  | ± 10%                 | 0.55                |
| 2 | CL05A104KA5NNN □ |                 | 100nF       | 25                  | ± 10%                 | 0.55                |
| 3 | CL05A104KO5NNN □ |                 | 100nF       | 16                  | ± 10%                 | 0.55                |
| 4 | CL05A104KP5NNN □ |                 | 100nF       | 10                  | ± 10%                 | 0.55                |
| 5 | CL05A104KQ5NNN □ |                 | 100nF       | 6.3                 | ± 10%                 | 0.55                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

※ For parts of higher capacitance than those above listed, refer to the product lineup of 'High Capacitance' subcategory.

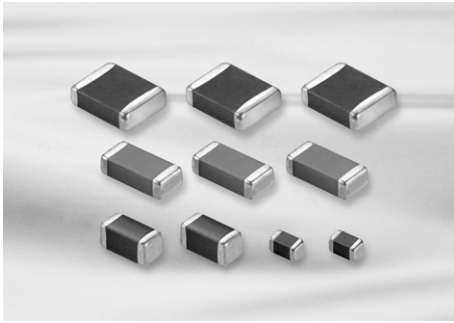
## Product Lineup (General Capacitors-Y5V)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1  | CL05F103ZB5NNN □ | 1.00 × 0.50     | 10nF        | 50                  | +80%~-20%             | 0.55                |
| 2  | CL05F103ZO5NNN □ |                 | 10nF        | 16                  | +80%~-20%             | 0.55                |
| 3  | CL05F223ZA5NNN □ |                 | 22nF        | 25                  | +80%~-20%             | 0.55                |
| 4  | CL05F223ZO5NNN □ |                 | 22nF        | 16                  | +80%~-20%             | 0.55                |
| 5  | CL05F473ZO5NNN □ |                 | 47nF        | 16                  | +80%~-20%             | 0.55                |
| 6  | CL05F683ZO5NNN □ |                 | 68nF        | 16                  | +80%~-20%             | 0.55                |
| 7  | CL05F104ZO5NNN □ |                 | 100nF       | 16                  | +80%~-20%             | 0.55                |
| 1  | CL10F103ZB8NNN □ | 1.60 × 0.80     | 10nF        | 50                  | +80%~-20%             | 0.9                 |
| 2  | CL10F223ZB8NNN □ |                 | 22nF        | 50                  | +80%~-20%             | 0.9                 |
| 3  | CL10F473ZB8NNN □ |                 | 47nF        | 50                  | +80%~-20%             | 0.9                 |
| 4  | CL10F473ZA8NNN □ |                 | 47nF        | 25                  | +80%~-20%             | 0.9                 |
| 5  | CL10F473ZO8NNN □ |                 | 47nF        | 16                  | +80%~-20%             | 0.9                 |
| 6  | CL10F683ZB8NNN □ |                 | 68nF        | 50                  | +80%~-20%             | 0.9                 |
| 7  | CL10F104ZB8NNN □ |                 | 100nF       | 50                  | +80%~-20%             | 0.9                 |
| 8  | CL10F104ZA8NNN □ |                 | 100nF       | 25                  | +80%~-20%             | 0.9                 |
| 9  | CL10F224ZB8NNN □ |                 | 220nF       | 50                  | +80%~-20%             | 0.9                 |
| 10 | CL10F224ZA8NNN □ |                 | 220nF       | 25                  | +80%~-20%             | 0.9                 |
| 11 | CL10F225ZP8NNN □ |                 | 2.2μF       | 10                  | +80%~-20%             | 0.9                 |
| 12 | CL10F225ZQ8NNN □ |                 | 2.2μF       | 6.3                 | +80%~-20%             | 0.9                 |
| 1  | CL21F103ZBANNN □ | 2.00 × 1.25     | 10nF        | 50                  | +80%~-20%             | 0.75                |
| 2  | CL21F223ZBANNN □ |                 | 22nF        | 50                  | +80%~-20%             | 0.75                |
| 3  | CL21F473ZBANNN □ |                 | 47nF        | 50                  | +80%~-20%             | 0.75                |
| 4  | CL21F683ZBANNN □ |                 | 68nF        | 50                  | +80%~-20%             | 0.75                |
| 5  | CL21F104ZBANNN □ |                 | 100nF       | 50                  | +80%~-20%             | 0.75                |
| 6  | CL21F104ZBCNNN □ |                 | 100nF       | 50                  | +80%~-20%             | 0.95                |
| 7  | CL21F224ZBCNNN □ |                 | 220nF       | 50                  | +80%~-20%             | 0.95                |
| 8  | CL21F224ZBFNNN □ |                 | 220nF       | 50                  | +80%~-20%             | 1.35                |
| 9  | CL21F224ZOANNN □ |                 | 220nF       | 16                  | +80%~-20%             | 0.75                |
| 10 | CL21F474ZACNNN □ |                 | 470nF       | 25                  | +80%~-20%             | 0.95                |
| 11 | CL21F474ZBFNNN □ |                 | 470nF       | 50                  | +80%~-20%             | 1.35                |
| 12 | CL21F474ZBFNNN □ |                 | 470nF       | 50                  | +80%~-20%             | 1.35                |
| 13 | CL21F684ZAFNNN □ |                 | 680nF       | 25                  | +80%~-20%             | 1.35                |
| 14 | CL21F684ZOANNN □ |                 | 680nF       | 16                  | +80%~-20%             | 0.75                |
| 15 | CL21F225ZAFNNN □ |                 | 2.2μF       | 25                  | +80%~-20%             | 1.35                |
| 16 | CL21F225ZOFNNN □ |                 | 2.2μF       | 16                  | +80%~-20%             | 1.35                |
| 1  | CL31F103ZBCNNN □ | 3.20 × 1.60     | 10nF        | 50                  | +80%~-20%             | 1.0                 |
| 2  | CL31F104ZBCNNN □ |                 | 100nF       | 50                  | +80%~-20%             | 1.0                 |
| 3  | CL31F224ZBCNNN □ |                 | 220nF       | 50                  | +80%~-20%             | 1.0                 |
| 4  | CL31F474ZBCNNN □ |                 | 470nF       | 50                  | +80%~-20%             | 1.0                 |
| 5  | CL31F105ZBCNNN □ |                 | 1μF         | 50                  | +80%~-20%             | 1.0                 |
| 6  | CL31F105ZAFNNN □ |                 | 1μF         | 25                  | +80%~-20%             | 1.4                 |
| 7  | CL31F105ZOCNNN □ |                 | 1μF         | 16                  | +80%~-20%             | 1.0                 |
| 8  | CL31F225ZAFNNN □ |                 | 2.2μF       | 25                  | +80%~-20%             | 1.4                 |
| 9  | CL31F225ZOCNNN □ |                 | 2.2μF       | 16                  | +80%~-20%             | 1.0                 |
| 1  | CL32F475ZAHNNN □ | 3.20 × 2.50     | 4.7μF       | 25                  | +80%~-20%             | 1.8                 |
| 1  | CL43A476MQJNNN □ | 4.50 × 3.20     | 10μF        | 6.3                 | +80%~-20%             | 2.7                 |
| 2  | CL43A107MQLNNN □ |                 | 100μF       | 6.3                 | +80%~-20%             | 3.5                 |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

※ For parts of higher capacitance than those above listed, refer to the product lineup of 'High Capacitance' subcategory.

# High Capacitance Capacitors



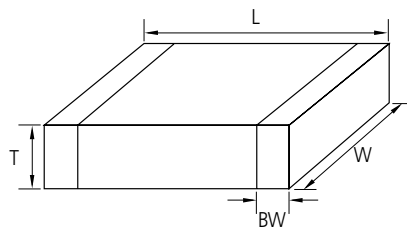
## Feature

- Wide selection of size : from 0402 to 1812
- Highly reliable tolerance and high speed automatic chip placement on PCBs
- Wide capacitance range
- Highly reliable performance
- Highly resistant termination metal
- Tape & reel for surface mount assembly

## Application

- Desktop PC, Note PC, HHP, DC-DC Converter, DSC
- LCD TV, LCD Monitor
- ※ For using special purpose like Military, Medical, Aviation, Automobile device should be following a special specification.

## Structure and Dimensions



| Size Code | EIA Code | Dimension(mm)   |                 |                 |                |                   |
|-----------|----------|-----------------|-----------------|-----------------|----------------|-------------------|
|           |          | L               | W               | T               | Thickness Code | BW                |
| 05        | 0402     | $1.00 \pm 0.05$ | $0.50 \pm 0.05$ | $0.50 \pm 0.05$ | 5              | $0.2 + 0.15/-0.1$ |
| 10        | 0603     | $1.60 \pm 0.10$ | $0.80 \pm 0.10$ | $0.50 \pm 0.05$ | 5              | $0.30 \pm 0.20$   |
|           |          |                 |                 | $0.80 \pm 0.10$ | 8              |                   |
| 21        | 0805     | $2.00 \pm 0.10$ | $1.25 \pm 0.10$ | $0.85 \pm 0.10$ | C              | $0.5 + 0.2/-0.3$  |
|           |          |                 |                 | $1.25 \pm 0.10$ | F              |                   |
|           |          | $2.00 \pm 0.15$ | $1.25 \pm 0.15$ | $1.25 \pm 0.15$ | Q              |                   |
|           |          | $2.00 \pm 0.20$ | $1.25 \pm 0.20$ | $1.25 \pm 0.20$ | Y              |                   |
| 31        | 1206     | $3.20 \pm 0.20$ | $1.60 \pm 0.20$ | $0.60 \pm 0.10$ | 6              | $0.50 \pm 0.30$   |
|           |          |                 |                 | $0.85 \pm 0.10$ | C              |                   |
|           |          |                 |                 | $1.15 \pm 0.10$ | P              |                   |
|           |          | $3.20 \pm 0.15$ | $1.60 \pm 0.15$ | $1.25 \pm 0.15$ | F              |                   |
| 32        | 1210     | $3.20 \pm 0.30$ | $2.50 \pm 0.20$ | $1.60 \pm 0.20$ | H              | $0.60 \pm 0.30$   |
|           |          |                 |                 | $1.80 \pm 0.20$ | U              |                   |
|           |          |                 |                 | $2.00 \pm 0.20$ | I              |                   |
|           |          |                 |                 | $2.50 \pm 0.20$ | J              |                   |
|           |          |                 |                 | $2.50 \pm 0.30$ | v              |                   |
|           |          |                 |                 | $4.50 \pm 0.40$ | I              |                   |
|           |          |                 |                 | $2.00 \pm 0.20$ | L              |                   |
| 42        | 1808     | $4.50 \pm 0.40$ | $2.00 \pm 0.20$ | $2.00 \pm 0.20$ | I              | $0.80 \pm 0.30$   |
| 43        | 1812     | $4.50 \pm 0.40$ | $3.20 \pm 0.30$ | $3.20 \pm 0.30$ | L              | $0.80 \pm 0.30$   |

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

### High Capacitance Table (X5R)

| Size(mm)   | Vr(V) | Capacitance (uF) |      |      |   |     |     |    |    |    |     |
|------------|-------|------------------|------|------|---|-----|-----|----|----|----|-----|
|            |       | 0.1              | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 | 22 | 47 | 100 |
| 0402(1005) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
| 0603(1608) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 0805(2012) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 1206(3216) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 1210(3225) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |

## High Capacitance Table\_Low Profile (X5R)

| Size(mm)   | Tmax<br>(mm) | Vr(V) | Capacitance (uF) |     |     |     |    |    |            |
|------------|--------------|-------|------------------|-----|-----|-----|----|----|------------|
|            |              |       | 1                | 2.2 | 4.7 | 10  | 22 | 33 | 47         |
| 0402(1005) | 0.3          | 6.3   | X6S              |     |     |     |    |    |            |
|            |              | 10    |                  |     |     |     |    |    |            |
|            |              | 16    |                  |     |     |     |    |    |            |
| 0603(1608) | 0.5          | 6.3   |                  |     |     |     |    |    |            |
|            |              | 10    |                  |     |     |     |    |    |            |
|            |              | 16    |                  |     |     |     |    |    |            |
|            |              | 25    |                  |     |     |     |    |    |            |
| 0805(2012) | 0.7          | 10    |                  |     |     |     |    |    |            |
|            |              | 16    |                  |     |     |     |    |    |            |
|            |              | 25    |                  |     |     |     |    |    |            |
|            | 0.95         | 4     |                  |     |     |     |    |    | (Tmax=1.0) |
|            |              | 6.3   |                  |     |     |     |    |    | (Tmax=1.0) |
|            |              | 10    |                  |     |     |     |    |    |            |
|            |              | 16    |                  |     |     |     |    |    |            |
|            |              | 25    |                  |     |     | X6S |    |    |            |
| 1206(3216) | 0.7          | 10    |                  |     |     |     |    |    |            |
|            | 0.95         | 6.3   |                  |     |     |     |    |    |            |
|            |              | 10    |                  |     |     |     |    |    |            |
|            |              | 16    |                  |     |     |     |    |    |            |
|            |              | 25    |                  |     | X6S |     |    |    |            |
|            |              | 50    |                  |     |     |     |    |    |            |
| 1210(3225) | 0.95         | 16    |                  |     |     |     |    |    |            |
|            | 2.0          | 25    |                  |     |     |     |    |    |            |
|            |              | 35    |                  |     |     |     |    |    |            |
|            |              | 50    |                  |     |     |     |    |    |            |

Part Numbering  
System

General  
Capacitors

High Capacitance  
Capacitors

Super Small Size  
Capacitors

Medium-High  
Voltage Capacitors

Array Type  
Capacitors

Low ESL  
Capacitors

Reliability Test  
Condition

Premium Capacitors  
for Automotive  
Applications

Packaging  
Specification

Application Manual  
for Surface Mounting



### High Capacitance Table (X6S)

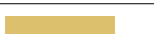
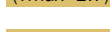
| Size(mm)   | Vr(V) | Capacitance (uF) |      |      |   |     |     |    |    |    |     |
|------------|-------|------------------|------|------|---|-----|-----|----|----|----|-----|
|            |       | 0.1              | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 | 22 | 47 | 100 |
| 0402(1005) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
| 0603(1608) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
| 0805(2012) | 4     |                  |      |      |   |     |     |    |    |    |     |
|            | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
| 1206(3216) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
| 1210(3225) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |

High Capacitance Table (X7R)

| Size(mm)   | Vr(V) | Capacitance (uF) |      |      |   |     |     |    |    |    |     |
|------------|-------|------------------|------|------|---|-----|-----|----|----|----|-----|
|            |       | 0.1              | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 | 22 | 47 | 100 |
| 0402(1005) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
| 0603(1608) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
| 0805(2012) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     | X7S |    |    |    |     |
|            | 35    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 1206(3216) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 35    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |
| 1210(3225) | 6.3   |                  |      |      |   |     |     |    |    |    |     |
|            | 10    |                  |      |      |   |     |     |    |    |    |     |
|            | 16    |                  |      |      |   |     |     |    |    |    |     |
|            | 25    |                  |      |      |   |     |     |    |    |    |     |
|            | 50    |                  |      |      |   |     |     |    |    |    |     |

- Part Numbering System
- General Capacitors
- High Capacitance Capacitors
- Super Small Size Capacitors
- Medium-High Voltage Capacitors
- Array Type Capacitors
- Low ESL Capacitors
- Reliability Test Condition
- Premium Capacitors for Automotive Applications
- Packaging Specification
- Application Manual for Surface Mounting

### High Capacitance Table (Y5V)

| Size(mm)   | Vr(V) | Capacitance (uF)                                                                                                  |      |      |   |     |     |    |    |    |  |
|------------|-------|-------------------------------------------------------------------------------------------------------------------|------|------|---|-----|-----|----|----|----|--|
|            |       | 0.1                                                                                                               | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 | 22 | 47 |  |
| 0402(1005) | 6.3   |                                 |      |      |   |     |     |    |    |    |  |
|            | 10    |                                  |      |      |   |     |     |    |    |    |  |
|            | 16    |                                  |      |      |   |     |     |    |    |    |  |
| 0603(1608) | 6.3   |                                 |      |      |   |     |     |    |    |    |  |
|            | 10    |                                 |      |      |   |     |     |    |    |    |  |
|            | 16    |                                  |      |      |   |     |     |    |    |    |  |
|            | 25    |                                  |      |      |   |     |     |    |    |    |  |
|            | 50    |                                  |      |      |   |     |     |    |    |    |  |
| 0805(2012) | 6.3   |                                |      |      |   |     |     |    |    |    |  |
|            | 10    |                                |      |      |   |     |     |    |    |    |  |
|            | 16    |                                 |      |      |   |     |     |    |    |    |  |
|            | 25    |                               |      |      |   |     |     |    |    |    |  |
|            | 50    |                                |      |      |   |     |     |    |    |    |  |
| 1206(3216) | 10    |                              |      |      |   |     |     |    |    |    |  |
|            | 16    |                              |      |      |   |     |     |    |    |    |  |
| 1210(3225) | 6.3   |                              |      |      |   |     |     |    |    |    |  |
|            | 10    | <br>(Tmax=2.7)<br>(Tmax=2.0) |      |      |   |     |     |    |    |    |  |
|            | 16    | <br>(Tmax=1.2)               |      |      |   |     |     |    |    |    |  |
|            | 25    | <br>(Tmax=1.8)<br>(Tmax=1.5) |      |      |   |     |     |    |    |    |  |
|            | 35    | <br>(Tmax=1.4)<br>(Tmax=1.6) |      |      |   |     |     |    |    |    |  |

## Product Lineup (High Capacitance-X5R)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1  | CL05A224KQ5NNN □ | 100 × 0.50      | 0.22 μF     | 6.3                 | ±10%                  | 0.55                |
| 2  | CL05A224KR5NNN □ |                 | 0.22 μF     | 4                   | ±10%                  | 0.55                |
| 3  | CL05A224KA5NNN □ |                 | 0.22 μF     | 25                  | ±10%                  | 0.55                |
| 4  | CL05A224KO5NNN □ |                 | 0.22 μF     | 16                  | ±10%                  | 0.55                |
| 5  | CL05A224KP5NNN □ |                 | 0.22 μF     | 10                  | ±10%                  | 0.55                |
| 6  | CL05A334KA5NNN □ |                 | 0.33 μF     | 25                  | ±10%                  | 0.55                |
| 7  | CL05A334KQ5NNN □ |                 | 0.33 μF     | 6.3                 | ±10%                  | 0.55                |
| 8  | CL05A334KR5NNN □ |                 | 0.33 μF     | 4                   | ±10%                  | 0.55                |
| 9  | CL05A474KA5NNN □ |                 | 0.47 μF     | 25                  | ±10%                  | 0.55                |
| 10 | CL05A474KO5NNN □ |                 | 0.47 μF     | 16                  | ±10%                  | 0.55                |
| 11 | CL05A474KP5NNN □ |                 | 0.47 μF     | 10                  | ±10%                  | 0.55                |
| 12 | CL05A474KQ5NNN □ |                 | 0.47 μF     | 6.3                 | ±10%                  | 0.55                |
| 13 | CL05A474KR5NNN □ |                 | 0.47 μF     | 4                   | ±10%                  | 0.55                |
| 14 | CL05A105KA5NQN □ |                 | 1 μF        | 25                  | ±10%                  | 0.60                |
| 15 | CL05A105KO5NNN □ |                 | 1 μF        | 16                  | ±10%                  | 0.55                |
| 16 | CL05A105KO3LQN □ |                 | 1 μF        | 16                  | ±10%                  | 0.33                |
| 17 | CL05A105KP5NNN □ |                 | 1 μF        | 10                  | ±10%                  | 0.55                |
| 18 | CL05A105KP3LNN □ |                 | 1 μF        | 10                  | ±10%                  | 0.33                |
| 19 | CL05A105KQ5NNN □ |                 | 1 μF        | 6.3                 | ±10%                  | 0.55                |
| 20 | CL05A105KQ3LNN □ |                 | 1 μF        | 6.3                 | ±10%                  | 0.33                |
| 21 | CL05A105KR5NNN □ |                 | 1 μF        | 4                   | ±10%                  | 0.55                |
| 22 | CL05A105KR3LNN □ |                 | 1 μF        | 4                   | ±10%                  | 0.33                |
| 23 | CL05A225KO5NQN □ |                 | 2.2 μF      | 16                  | ±10%                  | 0.60                |
| 24 | CL05A225MP5NSN □ |                 | 2.2 μF      | 10                  | ±20%                  | 0.57                |
| 25 | CL05A225KP3LRN □ |                 | 2.2 μF      | 10                  | ±10%                  | 0.33                |
| 26 | CL05A225MQ5NNN □ |                 | 2.2 μF      | 6.3                 | ±20%                  | 0.55                |
| 27 | CL05A225KQ3LRN □ |                 | 2.2 μF      | 6.3                 | ±10%                  | 0.33                |
| 28 | CL05A225MR5NNN □ |                 | 2.2 μF      | 4                   | ±20%                  | 0.55                |
| 29 | CL05A225KR3LRN □ |                 | 2.2 μF      | 4                   | ±10%                  | 0.33                |
| 30 | CL05A475MP5NRN □ |                 | 4.7 μF      | 10                  | ±20%                  | 0.65                |
| 31 | CL05A475MQ5NRN □ |                 | 4.7 μF      | 6.3                 | ±20%                  | 0.65                |
| 32 | CL05A475MR5NRN □ |                 | 4.7 μF      | 4                   | ±20%                  | 0.65                |
| 33 | CL05A106MQ5NUN □ |                 | 10 μF       | 6.3                 | ±20%                  | 0.70                |
| 34 | CL05A106MR5NRN □ |                 | 10 μF       | 4                   | ±20%                  | 0.65                |
| 1  | CL10A474KB8NNN □ | 1.60 × 0.80     | 0.47 μF     | 50                  | ±10%                  | 0.90                |
| 2  | CL10A474KA8NNN □ |                 | 0.47 μF     | 25                  | ±10%                  | 0.90                |
| 3  | CL10A474KP8NNN □ |                 | 0.47 μF     | 10                  | ±10%                  | 0.90                |
| 4  | CL10A474KQ8NNN □ |                 | 0.47 μF     | 6.3                 | ±10%                  | 0.90                |
| 5  | CL10A474KR8NNN □ |                 | 0.47 μF     | 4                   | ±10%                  | 0.90                |
| 6  | CL10A105KB8NNN □ |                 | 1 μF        | 50                  | ±10%                  | 0.90                |
| 7  | CL10A105KA85NN □ |                 | 1 μF        | 25                  | ±10%                  | 0.55                |
| 8  | CL10A105KA8NNN □ |                 | 1 μF        | 25                  | ±10%                  | 0.90                |
| 9  | CL10A105KO8NNN □ |                 | 1 μF        | 16                  | ±10%                  | 0.90                |
| 10 | CL10A105KO5LNN □ |                 | 1 μF        | 16                  | ±10%                  | 0.55                |
| 11 | CL10A105KP8NNN □ |                 | 1 μF        | 10                  | ±10%                  | 0.90                |
| 12 | CL10A105KP5LNN □ |                 | 1 μF        | 10                  | ±10%                  | 0.55                |
| 13 | CL10A105KQ8NNN □ |                 | 1 μF        | 6.3                 | ±10%                  | 0.90                |
| 14 | CL10A105KQ5LNN □ |                 | 1 μF        | 6.3                 | ±10%                  | 0.55                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

**Product Lineup (High Capacitance-X5R)**

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 15 | CL10A105KR8NNN □ | 1.60×0.80        | 1 μF        | 4                         | ±10%                     | 0.90                   |
| 16 | CL10A105KR5LNN □ |                  | 1 μF        | 4                         | ±10%                     | 0.55                   |
| 17 | CL10A225KA8NNN □ |                  | 2.2 μF      | 25                        | ±10%                     | 0.90                   |
| 18 | CL10A105KA85NN □ |                  | 2.2 μF      | 25                        | ±10%                     | 0.55                   |
| 19 | CL10A225KO8NNN □ |                  | 2.2 μF      | 16                        | ±10%                     | 0.90                   |
| 20 | CL10A225KO5LNN □ |                  | 2.2 μF      | 16                        | ±10%                     | 0.55                   |
| 21 | CL10A225KP8NNN □ |                  | 2.2 μF      | 10                        | ±10%                     | 0.90                   |
| 22 | CL10A225KP5LNN □ |                  | 2.2 μF      | 10                        | ±10%                     | 0.55                   |
| 23 | CL10A225KQ8NNN □ |                  | 2.2 μF      | 6.3                       | ±10%                     | 0.90                   |
| 24 | CL10A225KQ5LNN □ |                  | 2.2 μF      | 6.3                       | ±10%                     | 0.55                   |
| 25 | CL10A225KR8NNN □ |                  | 2.2 μF      | 4                         | ±10%                     | 0.90                   |
| 26 | CL10A225KR5LNN □ |                  | 2.2 μF      | 4                         | ±10%                     | 0.55                   |
| 27 | CL10A335KQ8NNN □ |                  | 3.3 μF      | 6.3                       | ±10%                     | 0.90                   |
| 28 | CL10A335KR8NNN □ |                  | 3.3 μF      | 4                         | ±10%                     | 0.90                   |
| 29 | CL10A475KA8NQN □ |                  | 4.7 μF      | 25                        | ±10%                     | 0.95                   |
| 30 | CL10A475KO8NNN □ |                  | 4.7 μF      | 16                        | ±10%                     | 0.90                   |
| 31 | CL10A475KP8NNN □ |                  | 4.7 μF      | 10                        | ±10%                     | 0.90                   |
| 32 | CL10A475KP5NNN □ |                  | 4.7 μF      | 10                        | ±10%                     | 0.55                   |
| 33 | CL10A475KQ5LNN □ |                  | 4.7 μF      | 6.3                       | ±10%                     | 0.55                   |
| 34 | CL10A475KQ8NNN □ |                  | 4.7 μF      | 6.3                       | ±10%                     | 0.90                   |
| 35 | CL10A475KR5LNN □ |                  | 4.7 μF      | 4                         | ±10%                     | 0.55                   |
| 36 | CL10A475KR8NNN □ |                  | 4.7 μF      | 4                         | ±10%                     | 0.90                   |
| 37 | CL10A106MO8NQN □ |                  | 10 μF       | 16                        | ±20%                     | 0.95                   |
| 38 | CL10A106MP8NNN □ |                  | 10 μF       | 10                        | ±20%                     | 0.90                   |
| 39 | CL10A106KQ8NNN □ |                  | 10 μF       | 6.3                       | ±10%                     | 0.90                   |
| 40 | CL10A106MQ5NRN □ |                  | 10 μF       | 6.3                       | ±10%                     | 0.55                   |
| 41 | CL10A106KR8NNN □ |                  | 10 μF       | 4                         | ±10%                     | 0.90                   |
| 42 | CL10A106MR5NRN □ |                  | 10 μF       | 4                         | ±10%                     | 0.55                   |
| 43 | CL10A226MQ8NRN □ |                  | 22 μF       | 6.3                       | ±20%                     | 1.00                   |
| 44 | CL10A226MR8NRN □ |                  | 22 μF       | 4                         | ±20%                     | 1.00                   |
| 1  | CL21A105KBQNNN □ | 2.00×1.25        | 1 μF        | 50                        | ±10%                     | 1.40                   |
| 2  | CL21A105KAFNNN □ |                  | 1 μF        | 25                        | ±10%                     | 1.35                   |
| 3  | CL21A105KA6LNN □ |                  | 1 μF        | 25                        | ±10%                     | 0.70                   |
| 4  | CL21A105KOFNNN □ |                  | 1 μF        | 16                        | ±10%                     | 1.35                   |
| 5  | CL21A105KO6LNN □ |                  | 1 μF        | 16                        | ±10%                     | 0.70                   |
| 6  | CL21A105KQFNNN □ |                  | 1 μF        | 6.3                       | ±10%                     | 1.35                   |
| 7  | CL21A105KRFNNN □ |                  | 1 μF        | 4                         | ±10%                     | 1.35                   |
| 8  | CL21A225KBQNNN □ |                  | 2.2 μF      | 50                        | ±10%                     | 1.40                   |
| 9  | CL21A225KAFNNN □ |                  | 2.2 μF      | 25                        | ±10%                     | 1.35                   |
| 10 | CL21A225KO6LNN □ |                  | 2.2 μF      | 16                        | ±10%                     | 0.70                   |
| 11 | CL21A225KOFNNN □ |                  | 2.2 μF      | 16                        | ±10%                     | 1.35                   |
| 12 | CL21A225KPFNNN □ |                  | 2.2 μF      | 10                        | ±10%                     | 1.35                   |
| 13 | CL21A225KQFNNN □ |                  | 2.2 μF      | 6.3                       | ±10%                     | 1.35                   |
| 14 | CL21A225KRFNNN □ |                  | 2.2 μF      | 4                         | ±10%                     | 1.35                   |
| 15 | CL21A475KBQNNN □ |                  | 4.7 μF      | 50                        | ±10%                     | 1.40                   |
| 16 | CL21A475KAQNNN □ |                  | 4.7 μF      | 25                        | ±10%                     | 1.40                   |
| 17 | CL21A475KACLNN □ |                  | 4.7 μF      | 25                        | ±10%                     | 0.95                   |
| 18 | CL21A475KOFNNN □ |                  | 4.7 μF      | 16                        | ±10%                     | 1.35                   |
| 19 | CL21A475KOCLNN □ |                  | 4.7 μF      | 16                        | ±10%                     | 0.70                   |
| 20 | CL21A475KPFNNN □ |                  | 4.7 μF      | 10                        | ±10%                     | 1.35                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p 80.

## Product Lineup (High Capacitance-X5R)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 21 | CL21A475KPCLNN □ | 2.00 × 1.25     | 4.7 μF      | 10                  | ±10%                  | 0.95                |
| 22 | CL21A475KQFNNN □ |                 | 4.7 μF      | 6.3                 | ±10%                  | 1.35                |
| 23 | CL21A475KQCLNN □ |                 | 4.7 μF      | 6.3                 | ±10%                  | 0.95                |
| 24 | CL21A475KRFNNN □ |                 | 4.7 μF      | 4                   | ±10%                  | 1.35                |
| 25 | CL21A106KAYNNN □ |                 | 10 μF       | 25                  | ±10%                  | 1.45                |
| 26 | CL21A106KACLRN □ |                 | 10 μF       | 25                  | ±10%                  | 0.95                |
| 27 | CL21A106KOFNNN □ |                 | 10 μF       | 16                  | ±10%                  | 1.35                |
| 28 | CL21A106KOQNNN □ |                 | 10 μF       | 16                  | ±10%                  | 1.40                |
| 29 | CL21A106KOCLRN □ |                 | 10 μF       | 16                  | ±10%                  | 0.70                |
| 30 | CL21A106KPFNNN □ |                 | 10 μF       | 10                  | ±10%                  | 1.35                |
| 31 | CL21A106KPCLQN □ |                 | 10 μF       | 10                  | ±20%                  | 0.95                |
| 32 | CL21A106KQFNNN □ |                 | 10 μF       | 6.3                 | ±10%                  | 1.35                |
| 33 | CL21A106KQCLNN □ |                 | 10 μF       | 6.3                 | ±10%                  | 0.95                |
| 34 | CL21A475KRCLNN □ |                 | 4.7 μF      | 4                   | ±10%                  | 0.95                |
| 35 | CL21A106KRFNNN □ |                 | 10 μF       | 4                   | ±10%                  | 1.35                |
| 36 | CL21A106KRCLNN □ |                 | 10 μF       | 4                   | ±10%                  | 0.95                |
| 37 | CL21A226MPQNNN □ |                 | 22 μF       | 10                  | ±20%                  | 1.40                |
| 38 | CL21A226MPCLRN □ |                 | 22 μF       | 10                  | ±20%                  | 0.95                |
| 39 | CL21A226MQQNNN □ |                 | 22 μF       | 6.3                 | ±20%                  | 1.40                |
| 40 | CL21A226MQCLRN □ |                 | 22 μF       | 6.3                 | ±20%                  | 0.95                |
| 41 | CL21A226MRQNNN □ |                 | 22 μF       | 4                   | ±20%                  | 1.40                |
| 42 | CL21A226MRCLRN □ |                 | 22 μF       | 4                   | ±20%                  | 0.95                |
| 43 | CL21A336MQELNN □ |                 | 33 μF       | 6.3                 | ±20%                  | 1.20                |
| 44 | CL21A336MQ9LNN □ |                 | 33 μF       | 6.3                 | ±20%                  | 1.00                |
| 45 | CL21A336MRELNN □ |                 | 33 μF       | 4                   | ±20%                  | 1.20                |
| 46 | CL21A336MR9LNN □ |                 | 33 μF       | 4                   | ±20%                  | 1.00                |
| 47 | CL21A476MQYNNN □ |                 | 47 μF       | 6.3                 | ±20%                  | 1.45                |
| 48 | CL21A476MRYNNN □ |                 | 47 μF       | 4.0                 | ±20%                  | 1.45                |
| 1  | CL31A475KBHNNN □ | 3.20 × 1.60     | 4.7 μF      | 50                  | ±10%                  | 1.80                |
| 2  | CL31A475KB9LNN □ |                 | 4.7 μF      | 50                  | ±10%                  | 1.00                |
| 3  | CL31A475KAHNNN □ |                 | 4.7 μF      | 25                  | ±10%                  | 1.80                |
| 4  | CL31A475KACLNN □ |                 | 4.7 μF      | 25                  | ±10%                  | 0.95                |
| 5  | CL31A475KOHNNN □ |                 | 4.7 μF      | 16                  | ±10%                  | 1.80                |
| 6  | CL31A475KOCLNN □ |                 | 4.7 μF      | 16                  | ±10%                  | 0.95                |
| 7  | CL31A475KPHNNN □ |                 | 4.7 μF      | 10                  | ±10%                  | 1.80                |
| 8  | CL31A475KQHNNN □ |                 | 4.7 μF      | 6.3                 | ±10%                  | 1.80                |
| 9  | CL31A475KRHNNN □ |                 | 4.7 μF      | 4                   | ±10%                  | 1.80                |
| 10 | CL31A106KBHNNN □ |                 | 10 μF       | 50                  | ±10%                  | 1.80                |
| 11 | CL31A106KAHNNN □ |                 | 10 μF       | 25                  | ±10%                  | 1.80                |
| 12 | CL31A106KACLNN □ |                 | 10 μF       | 25                  | ±10%                  | 0.95                |
| 13 | CL31A106KOHNNN □ |                 | 10 μF       | 16                  | ±10%                  | 1.80                |
| 14 | CL31A106KOCLNN □ |                 | 10 μF       | 16                  | ±10%                  | 0.95                |
| 15 | CL31A106KPHNNN □ |                 | 10 μF       | 10                  | ±10%                  | 1.80                |
| 16 | CL31A106KPCLNN □ |                 | 10 μF       | 10                  | ±10%                  | 0.95                |
| 17 | CL31A106KQHNNN □ |                 | 10 μF       | 6.3                 | ±10%                  | 1.80                |
| 18 | CL31A106KRHNNN □ |                 | 10 μF       | 4                   | ±10%                  | 1.80                |
| 19 | CL31A156KQHNNN □ |                 | 15 μF       | 6.3                 | ±10%                  | 1.80                |
| 20 | CL31A156KRHNNN □ |                 | 15 μF       | 4                   | ±10%                  | 1.80                |
| 21 | CL31A226KAHNNN □ |                 | 22 μF       | 25                  | ±10%                  | 1.80                |
| 22 | CL31A226KOHNNN □ |                 | 22 μF       | 16                  | ±10%                  | 1.80                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p 80.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting



**Product Lineup (High Capacitance-X5R)**

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 23 | CL31A226KOCLNN □ | 3.20×1.60        | 22μF        | 16                        | ±10%                     | 0.95                   |
| 24 | CL31A226KPHNNN □ |                  | 22μF        | 10                        | ±10%                     | 1.80                   |
| 25 | CL31A226KPCLNN □ |                  | 22μF        | 10                        | ±10%                     | 0.95                   |
| 26 | CL31A226KQHNNN □ |                  | 22μF        | 6.3                       | ±10%                     | 1.80                   |
| 27 | CL31A226KRHNNN □ |                  | 22μF        | 4.0                       | ±10%                     | 1.80                   |
| 28 | CL31A476MQHNNN □ |                  | 47μF        | 6.3                       | ±20%                     | 1.80                   |
| 29 | CL31A476MRHNNN □ |                  | 47μF        | 4.0                       | ±20%                     | 1.80                   |
| 30 | CL31A107MQHNNN □ |                  | 100μF       | 6.3                       | ±20%                     | 1.80                   |
| 31 | CL31A107MRHNNN □ |                  | 100μF       | 4.0                       | ±20%                     | 1.80                   |
| 1  | CL32A106KQCLNN □ | 3.20×2.50        | 10μF        | 6.3                       | ±10%                     | 0.95                   |
| 2  | CL32A106KRCLNN □ |                  | 10μF        | 4.0                       | ±10%                     | 0.95                   |
| 3  | CL32A106KBULNN □ |                  | 10μF        | 50                        | ±10%                     | 2.00                   |
| 4  | CL32A106KAJNNN □ |                  | 10μF        | 25                        | ±10%                     | 2.70                   |
| 5  | CL32A106KAULNN □ |                  | 10μF        | 25                        | ±10%                     | 2.00                   |
| 6  | CL32A106KOJNNN □ |                  | 10μF        | 16                        | ±10%                     | 2.70                   |
| 7  | CL32A106KPJNNN □ |                  | 10μF        | 10                        | ±10%                     | 2.70                   |
| 8  | CL32A226KAJNNN □ |                  | 22μF        | 25                        | ±10%                     | 2.70                   |
| 9  | CL32A226KOJNNN □ |                  | 22μF        | 16                        | ±10%                     | 2.70                   |
| 10 | CL32A226KOCLNN □ |                  | 22μF        | 16                        | ±10%                     | 0.95                   |
| 11 | CL32A226KPJNNN □ |                  | 22μF        | 10                        | ±10%                     | 2.70                   |
| 12 | CL32A226KQJNNN □ |                  | 22μF        | 6.3                       | ±10%                     | 2.70                   |
| 13 | CL32A226MQCLNN □ |                  | 22μF        | 6.3                       | ±20%                     | 0.95                   |
| 14 | CL32A226KRJNNN □ |                  | 22μF        | 4.0                       | ±10%                     | 2.70                   |
| 15 | CL32A226MRCLNN □ |                  | 22μF        | 4.0                       | ±20%                     | 0.95                   |
| 16 | CL32A476KPJNNN □ |                  | 47μF        | 10                        | ±10%                     | 2.70                   |
| 17 | CL32A476MQJNNN □ |                  | 47μF        | 6.3                       | ±20%                     | 2.70                   |
| 18 | CL32A476MRJNNN □ |                  | 47μF        | 4.0                       | ±20%                     | 2.70                   |
| 19 | CL32A107MPVNNN □ |                  | 100μF       | 10                        | ±20%                     | 2.80                   |
| 20 | CL32A107MQVNNN □ |                  | 100μF       | 6.3                       | ±20%                     | 2.80                   |
| 21 | CL32A107MRVNNN □ |                  | 100μF       | 4.0                       | ±20%                     | 2.80                   |
| 1  | CL43A476MQJNNN □ | 4.50×3.20        | 47μF        | 6.3                       | ±20%                     | 2.70                   |
| 2  | CL43A476MRJNNN □ |                  | 47μF        | 4.0                       | ±20%                     | 2.70                   |
| 3  | CL43A107KQLNNN □ |                  | 100μF       | 6.3                       | ±20%                     | 3.50                   |
| 4  | CL43A107KRLNNN □ |                  | 100μF       | 4.0                       | ±20%                     | 3.50                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p 80.

## Product Lineup (High Capacitance-X6S)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1  | CL05X224KP5NNN □ | 1.00 × 0.50     | 0.22 μF     | 10                  | ±10%                  | 0.55                |
| 2  | CL05X224KQ5NNN □ |                 | 0.22 μF     | 6.3                 | ±10%                  | 0.55                |
| 3  | CL05X224KR5NNN □ |                 | 0.22 μF     | 4                   | ±10%                  | 0.55                |
| 4  | CL05X474KP5NNN □ |                 | 0.47 μF     | 10                  | ±10%                  | 0.55                |
| 5  | CL05X474KQ5NNN □ |                 | 0.47 μF     | 6.3                 | ±10%                  | 0.55                |
| 6  | CL05X474KR5NNN □ |                 | 0.47 μF     | 4                   | ±10%                  | 0.55                |
| 7  | CL05X105KP5NNN □ |                 | 1 μF        | 10                  | ±10%                  | 0.55                |
| 8  | CL05X105MQ3LNN □ |                 | 1 μF        | 6.3                 | ±20%                  | 0.33                |
| 9  | CL05X105KQ5NNN □ |                 | 1 μF        | 6.3                 | ±10%                  | 0.55                |
| 10 | CL05X105MR3LNN □ |                 | 1 μF        | 4                   | ±20%                  | 0.33                |
| 11 | CL05X105KR5NNN □ |                 | 1 μF        | 4                   | ±10%                  | 0.55                |
| 12 | CL05X225MQ5NSN □ |                 | 2.2 μF      | 6.3                 | ±20%                  | 0.57                |
| 13 | CL05X225MR5NSN □ |                 | 2.2 μF      | 4                   | ±20%                  | 0.57                |
| 1  | CL10X474KA8NNN □ | 1.60 × 0.80     | 0.47 μF     | 25                  | ±10%                  | 0.90                |
| 2  | CL10X474KO8NNN □ |                 | 0.47 μF     | 16                  | ±10%                  | 0.90                |
| 3  | CL10X474KP8NNN □ |                 | 0.47 μF     | 10                  | ±10%                  | 0.90                |
| 4  | CL10X474KQ8NNN □ |                 | 0.47 μF     | 6.3                 | ±10%                  | 0.90                |
| 5  | CL10X474KR8NNN □ |                 | 0.47 μF     | 4                   | ±10%                  | 0.90                |
| 6  | CL10X105KA8NNN □ |                 | 1 μF        | 25                  | ±10%                  | 0.90                |
| 7  | CL10X105KO8NNN □ |                 | 1 μF        | 16                  | ±10%                  | 0.90                |
| 8  | CL10X105KP8NNN □ |                 | 1 μF        | 10                  | ±10%                  | 0.90                |
| 9  | CL10X105KQ8NNN □ |                 | 1 μF        | 6.3                 | ±10%                  | 0.90                |
| 10 | CL10X105KR8NNN □ |                 | 1 μF        | 4                   | ±10%                  | 0.90                |
| 11 | CL10X225KA8NQN □ |                 | 2.2 μF      | 25                  | ±10%                  | 0.90                |
| 12 | CL10X225KO8NNN □ |                 | 2.2 μF      | 16                  | ±10%                  | 0.90                |
| 13 | CL10X225KP8NNN □ |                 | 2.2 μF      | 10                  | ±10%                  | 0.90                |
| 14 | CL10X225KQ8NNN □ |                 | 2.2 μF      | 6.3                 | ±10%                  | 0.90                |
| 15 | CL10X225KR8NNN □ |                 | 2.2 μF      | 4                   | ±10%                  | 0.90                |
| 16 | CL10X475KA8NQN □ |                 | 4.7 μF      | 25                  | ±10%                  | 0.90                |
| 17 | CL10X475KO8NQN □ |                 | 4.7 μF      | 16                  | ±10%                  | 0.90                |
| 18 | CL10X475KP5NNN □ |                 | 4.7 μF      | 10                  | ±10%                  | 0.90                |
| 19 | CL10X475KQ8NNN □ |                 | 4.7 μF      | 6.3                 | ±10%                  | 0.90                |
| 20 | CL10X475KR8NNN □ |                 | 4.7 μF      | 4                   | ±10%                  | 0.90                |
| 21 | CL10X106MP8NNN □ |                 | 10 μF       | 10                  | ±20%                  | 0.90                |
| 22 | CL10X106KQ8NNN □ |                 | 10 μF       | 6.3                 | ±10%                  | 0.90                |
| 23 | CL10X106KR8NNN □ |                 | 10 μF       | 4                   | ±10%                  | 0.90                |
| 1  | CL21X105KAFNNN □ | 2.00 × 1.25     | 1 μF        | 25                  | ±10%                  | 1.35                |
| 2  | CL21X105KOFNNN □ |                 | 1 μF        | 16                  | ±10%                  | 1.35                |
| 3  | CL21X105KPFNNN □ |                 | 1 μF        | 10                  | ±10%                  | 1.35                |
| 4  | CL21X105KQFNNN □ |                 | 1 μF        | 6.3                 | ±10%                  | 1.35                |
| 5  | CL21X105KRFNNN □ |                 | 1 μF        | 4                   | ±10%                  | 1.35                |
| 6  | CL21X225KAFNNN □ |                 | 2.2 μF      | 25                  | ±10%                  | 1.35                |
| 7  | CL21X225KOFNNN □ |                 | 2.2 μF      | 16                  | ±10%                  | 1.35                |
| 8  | CL21X225KPFNNN □ |                 | 2.2 μF      | 10                  | ±10%                  | 1.35                |
| 9  | CL21X225KQFNNN □ |                 | 2.2 μF      | 6.3                 | ±10%                  | 1.35                |
| 10 | CL21X225KRFNNN □ |                 | 2.2 μF      | 4                   | ±10%                  | 1.35                |
| 11 | CL21X475KAQNNN □ |                 | 4.7 μF      | 25                  | ±10%                  | 1.40                |
| 12 | CL21X475KOFNNN □ |                 | 4.7 μF      | 16                  | ±10%                  | 1.35                |
| 13 | CL21X475KPFNNN □ |                 | 4.7 μF      | 10                  | ±10%                  | 1.35                |
| 14 | CL21X475KQFNNN □ |                 | 4.7 μF      | 6.3                 | ±10%                  | 1.35                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p 80.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## Product Lineup (High Capacitance -X7R)

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 15 | CL21X475KRFNNN □ | 2.00×1.25        | 4.7μF       | 4                         | ±10%                     | 1.35                   |
| 16 | CL21X106KACLRN □ |                  | 10μF        | 25                        | ±10%                     | 0.95                   |
| 17 | CL21X106KAYNNN □ |                  | 10μF        | 25                        | ±10%                     | 1.45                   |
| 18 | CL21X106KOYNNN □ |                  | 10μF        | 16                        | ±10%                     | 1.45                   |
| 19 | CL21X106KPCLNN □ |                  | 10μF        | 10                        | ±10%                     | 0.95                   |
| 20 | CL21X106KPYNNN □ |                  | 10μF        | 10                        | ±10%                     | 1.45                   |
| 21 | CL21X106KQQNNN □ |                  | 10μF        | 6.3                       | ±10%                     | 1.40                   |
| 22 | CL21X106KRQNNN □ |                  | 10μF        | 4                         | ±10%                     | 1.40                   |
| 23 | CL21X106KRCLNN □ |                  | 10μF        | 4                         | ±10%                     | 0.95                   |
| 24 | CL21X226MQQNNN □ |                  | 22μF        | 6.3                       | ±20%                     | 1.40                   |
| 25 | CL21X226MRQNNN □ |                  | 22μF        | 4                         | ±20%                     | 1.40                   |
| 26 | CL21X476MRYNNN □ |                  | 47μF        | 4                         | ±20%                     | 1.45                   |
| 1  | CL31X475KAHNNN □ | 3.20×1.60        | 4.7μF       | 25                        | ±10%                     | 1.80                   |
| 2  | CL31X475KACLNN □ |                  | 4.7μF       | 25                        | ±10%                     | 0.95                   |
| 3  | CL31X475KOHNNN □ |                  | 4.7μF       | 16                        | ±10%                     | 1.80                   |
| 4  | CL31X475KPHNNN □ |                  | 4.7μF       | 10                        | ±10%                     | 1.80                   |
| 5  | CL31X475MQHNNN □ |                  | 4.7μF       | 6.3                       | ±20%                     | 1.80                   |
| 6  | CL31X475KRHNNN □ |                  | 4.7μF       | 4                         | ±10%                     | 1.80                   |
| 7  | CL31X106KACLNN □ |                  | 10μF        | 25                        | ±10%                     | 0.95                   |
| 8  | CL31X106KAHNNN □ |                  | 10μF        | 25                        | ±10%                     | 1.80                   |
| 9  | CL31X106KOHNNN □ |                  | 10μF        | 16                        | ±10%                     | 1.80                   |
| 10 | CL31X106KPHNNN □ |                  | 10μF        | 10                        | ±10%                     | 1.80                   |
| 11 | CL31X106KQHNNN □ |                  | 10μF        | 6.3                       | ±10%                     | 1.80                   |
| 12 | CL31X106KRHNNN □ |                  | 10μF        | 4                         | ±10%                     | 1.80                   |
| 13 | CL31X226KOHNNN □ |                  | 22μF        | 16                        | ±10%                     | 1.80                   |
| 14 | CL31X226KPHNNN □ |                  | 22μF        | 10                        | ±10%                     | 1.80                   |
| 15 | CL31X226KQHNNN □ |                  | 22μF        | 6.3                       | ±10%                     | 1.80                   |
| 16 | CL31X226KRHNNN □ |                  | 22μF        | 4                         | ±10%                     | 1.80                   |
| 17 | CL31X107MQHNNN □ |                  | 100μF       | 6.3                       | ±20%                     | 1.80                   |
| 18 | CL31X107MRHNNN □ |                  | 100μF       | 4                         | ±20%                     | 1.80                   |
| 1  | CL32X106KAUNNN □ | 3.20×2.50        | 10μF        | 25                        | ±10%                     | 2.00                   |
| 2  | CL32X106KOJNNN □ |                  | 10μF        | 16                        | ±10%                     | 2.70                   |
| 3  | CL32X106KPJNNN □ |                  | 10μF        | 10                        | ±10%                     | 2.70                   |
| 4  | CL32X106KQJNNN □ |                  | 10μF        | 6.3                       | ±10%                     | 2.70                   |
| 5  | CL32X106KRJNNN □ |                  | 10μF        | 4                         | ±10%                     | 2.70                   |
| 6  | CL32X226KAJNNN □ |                  | 22μF        | 25                        | ±10%                     | 2.70                   |
| 7  | CL32X226KOJNNN □ |                  | 22μF        | 16                        | ±10%                     | 2.70                   |
| 8  | CL32X226KPJNNN □ |                  | 22μF        | 10                        | ±10%                     | 2.70                   |
| 9  | CL32X226KQJNNN □ |                  | 22μF        | 6.3                       | ±10%                     | 2.70                   |
| 10 | CL32X226KRJNNN □ |                  | 22μF        | 4                         | ±10%                     | 2.70                   |
| 11 | CL32X476MPJNNN □ |                  | 47μF        | 10                        | ±20%                     | 2.70                   |
| 12 | CL32X476KQJNNN □ |                  | 47μF        | 6.3                       | ±10%                     | 2.70                   |
| 13 | CL32X476KRJNNN □ |                  | 47μF        | 4                         | ±10%                     | 2.70                   |
| 14 | CL32X107MQVNNN □ |                  | 100μF       | 6.3                       | ±20%                     | 2.70                   |
| 15 | CL32X107MRVNNN □ |                  | 100μF       | 4                         | ±20%                     | 2.70                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

## Product Lineup (High Capacitance -X7R)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1  | CL05B224KO5NNN □ | 1.00 × 0.50     | 0.22 μF     | 16                  | ±10%                  | 0.55                |
| 2  | CL05B224KP5NNN □ |                 | 0.22 μF     | 10                  | ±10%                  | 0.55                |
| 3  | CL05B224KQ5NNN □ |                 | 0.22 μF     | 6.3                 | ±10%                  | 0.55                |
| 1  | CL10B474KA8NNN □ | 1.60 × 0.80     | 0.47 μF     | 25                  | ±10%                  | 0.90                |
| 2  | CL10B474KO8NNN □ |                 | 0.47 μF     | 16                  | ±10%                  | 0.90                |
| 3  | CL10B474KP8NNN □ |                 | 0.47 μF     | 10                  | ±10%                  | 0.90                |
| 4  | CL10B474KQ8NNN □ |                 | 0.47 μF     | 6.3                 | ±10%                  | 0.90                |
| 5  | CL10B105KA8NNN □ |                 | 1 μF        | 25                  | ±10%                  | 0.90                |
| 6  | CL10B105KO8NNN □ |                 | 1 μF        | 16                  | ±10%                  | 0.90                |
| 7  | CL10B105KP8NNN □ |                 | 1 μF        | 10                  | ±10%                  | 0.90                |
| 8  | CL10B105KQ8NNN □ |                 | 1 μF        | 6.3                 | ±10%                  | 0.90                |
| 9  | CL10B225KP8NNN □ |                 | 2.2 μF      | 10                  | ±10%                  | 0.90                |
| 10 | CL10B225KQ8NNN □ |                 | 2.2 μF      | 6.3                 | ±10%                  | 0.90                |
| 1  | CL21B105KBNNN □  | 2.00 × 1.25     | 1 μF        | 50                  | ±10%                  | 1.35                |
| 2  | CL21B105KLNNN □  |                 | 1 μF        | 35                  | ±10%                  | 1.35                |
| 3  | CL21B105KAFNNN □ |                 | 1 μF        | 25                  | ±10%                  | 1.35                |
| 4  | CL21B105KOFNNN □ |                 | 1 μF        | 16                  | ±10%                  | 1.35                |
| 5  | CL21B105KPFNNN □ |                 | 1 μF        | 10                  | ±10%                  | 1.35                |
| 6  | CL21B105KQFNNN □ |                 | 1 μF        | 6.3                 | ±10%                  | 1.35                |
| 7  | CL21B225KAFNNN □ |                 | 2.2 μF      | 25                  | ±10%                  | 1.35                |
| 8  | CL21B225KOFNNN □ |                 | 2.2 μF      | 16                  | ±10%                  | 1.35                |
| 9  | CL21B225KPFNNN □ |                 | 2.2 μF      | 10                  | ±10%                  | 1.35                |
| 10 | CL21B225KQFNNN □ |                 | 2.2 μF      | 6.3                 | ±10%                  | 1.35                |
| 11 | CL21B475KOFNFN □ |                 | 4.7 μF      | 16                  | ±10%                  | 1.35                |
| 12 | CL21B475KPFNNN □ |                 | 4.7 μF      | 10                  | ±10%                  | 1.35                |
| 13 | CL21B475KQNNN □  |                 | 4.7 μF      | 6.3                 | ±10%                  | 1.35                |
| 14 | CL21B106KOQNNN □ |                 | 10 μF       | 16                  | ±10%                  | 1.40                |
| 15 | CL21B106KPQNNN □ |                 | 10 μF       | 10                  | ±10%                  | 1.35                |
| 16 | CL21B106KQQNNN □ |                 | 10 μF       | 6.3                 | ±10%                  | 1.35                |
| 1  | CL31B475KBHNNN □ | 3.20 × 1.60     | 4.7 μF      | 50                  | ±10%                  | 1.80                |
| 2  | CL31B475KLHNNN □ |                 | 4.7 μF      | 35                  | ±10%                  | 1.80                |
| 3  | CL31B475KAHNNN □ |                 | 4.7 μF      | 25                  | ±10%                  | 1.80                |
| 4  | CL31B475KOHNNN □ |                 | 4.7 μF      | 16                  | ±10%                  | 1.80                |
| 5  | CL31B475KPHNNN □ |                 | 4.7 μF      | 10                  | ±10%                  | 1.80                |
| 6  | CL31B475KQHNNN □ |                 | 4.7 μF      | 6.3                 | ±10%                  | 1.80                |
| 7  | CL31B106KLHNNN □ |                 | 10 μF       | 35                  | ±10%                  | 1.80                |
| 8  | CL31B106KAHNNN □ |                 | 10 μF       | 25                  | ±10%                  | 1.80                |
| 9  | CL31B106KOHNNN □ |                 | 10 μF       | 16                  | ±10%                  | 1.80                |
| 10 | CL31B106KPHNNN □ |                 | 10 μF       | 10                  | ±10%                  | 1.80                |
| 11 | CL31B106KQHNNN □ |                 | 10 μF       | 6.3                 | ±10%                  | 1.80                |
| 1  | CL32B106KBNNN □  | 3.20 × 2.50     | 10 μF       | 50                  | ±10%                  | 2.70                |
| 2  | CL32B106KAJNNN □ |                 | 10 μF       | 25                  | ±10%                  | 2.70                |
| 3  | CL32B106KOJNNN □ |                 | 10 μF       | 16                  | ±10%                  | 2.70                |
| 4  | CL32B106KPINNN □ |                 | 10 μF       | 10                  | ±10%                  | 2.70                |
| 5  | CL32B106KQJNNN □ |                 | 10 μF       | 6.3                 | ±10%                  | 2.70                |
| 6  | CL32B226KAJNNN □ |                 | 22 μF       | 25                  | ±10%                  | 2.70                |
| 7  | CL32B226KOJNNN □ |                 | 22 μF       | 16                  | ±10%                  | 2.70                |
| 8  | CL32B226KPJNNN □ |                 | 22 μF       | 10                  | ±10%                  | 2.70                |
| 9  | CL32B226KQJNNN □ |                 | 22 μF       | 6.3                 | ±10%                  | 2.70                |
| 10 | CL32B476MQJNNN □ |                 | 47 μF       | 6.3                 | ±20%                  | 2.70                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

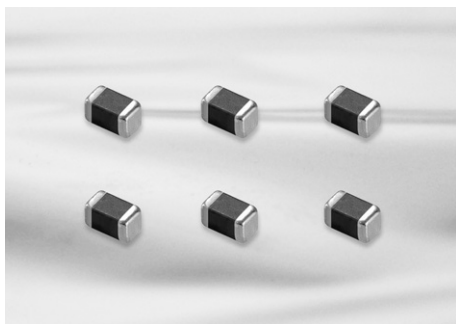
Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## Product Lineup (High Capacitance -Y5V)

|   | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|---|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 1 | CL05F224ZO5NNN □ | 1.00×0.50        | 0.22μF      | 16                        | 80%/-20%                 | 0.55                   |
| 2 | CL05F224ZP5NNN □ |                  | 0.22μF      | 10                        | 80%/-20%                 | 0.55                   |
| 3 | CL05F224ZQ5NNN □ |                  | 0.22μF      | 6.3                       | 80%/-20%                 | 0.55                   |
| 4 | CL05F474ZP5NNN □ |                  | 0.47μF      | 10                        | 80%/-20%                 | 0.55                   |
| 5 | CL05F474ZQ5NNN □ |                  | 0.47μF      | 6.3                       | 80%/-20%                 | 0.55                   |
| 6 | CL05F105ZQ5NNN □ |                  | 1μF         | 6.3                       | 80%/-20%                 | 0.55                   |
| 1 | CL10F474ZB8NNN □ | 1.60×0.80        | 0.47μF      | 50                        | 80%/-20%                 | 0.90                   |
| 2 | CL10F474ZA8NNN □ |                  | 0.47μF      | 25                        | 80%/-20%                 | 0.90                   |
| 3 | CL10F474ZO8NNN □ |                  | 0.47μF      | 16                        | 80%/-20%                 | 0.90                   |
| 4 | CL10F474ZP8NNN □ |                  | 0.47μF      | 10                        | 80%/-20%                 | 0.90                   |
| 5 | CL10F105ZO8NNN □ |                  | 1μF         | 16                        | 80%/-20%                 | 0.90                   |
| 6 | CL10F105ZP8NNN □ |                  | 1μF         | 10                        | 80%/-20%                 | 0.90                   |
| 7 | CL10F225ZP8NNN □ |                  | 2.2μF       | 10                        | 80%/-20%                 | 0.90                   |
| 8 | CL10F225ZQ8NNN □ |                  | 2.2μF       | 6.3                       | 80%/-20%                 | 0.90                   |
| 9 | CL10F475ZQ8NNN □ |                  | 4.7μF       | 6.3                       | 80%/-20%                 | 0.90                   |
| 1 | CL21F105ZBFNNN □ | 2.00×1.25        | 1μF         | 50                        | 80%/-20%                 | 1.35                   |
| 2 | CL21F105ZAFNNN □ |                  | 1μF         | 25                        | 80%/-20%                 | 1.35                   |
| 3 | CL21F105ZOFNNN □ |                  | 1μF         | 16                        | 80%/-20%                 | 1.35                   |
| 4 | CL21F225ZAFNNN □ |                  | 2.2μF       | 25                        | 80%/-20%                 | 1.35                   |
| 5 | CL21F225ZOFNNN □ |                  | 2.2μF       | 16                        | 80%/-20%                 | 1.35                   |
| 6 | CL21F475ZQFNNN □ |                  | 4.7μF       | 6.3                       | 80%/-20%                 | 1.35                   |
| 1 | CL21F475ZOFNNN □ |                  | 4.7μF       | 16                        | 80%/-20%                 | 1.35                   |
| 2 | CL21F475ZPFNNN □ |                  | 4.7μF       | 10                        | 80%/-20%                 | 1.35                   |
| 3 | CL21F106ZPFNNN □ |                  | 10μF        | 10                        | 80%/-20%                 | 1.35                   |
| 4 | CL21F106ZPCLNN □ |                  | 10μF        | 10                        | 80%/-20%                 | 0.95                   |
| 5 | CL21F106ZQFNNN □ |                  | 10μF        | 6.3                       | 80%/-20%                 | 1.35                   |
| 6 | CL21F106ZQCLNN □ |                  | 10μF        | 6.3                       | 80%/-20%                 | 0.95                   |
| 1 | CL31F475ZOHNNN □ | 3.20×1.60        | 4.7μF       | 16                        | 80%/-20%                 | 1.80                   |
| 2 | CL31F475ZPHNNN □ |                  | 4.7μF       | 10                        | 80%/-20%                 | 1.80                   |
| 3 | CL31F475ZQHNNN □ |                  | 4.7μF       | 6.3                       | 80%/-20%                 | 1.80                   |
| 4 | CL31F106ZOHNNN □ |                  | 10μF        | 16                        | 80%/-20%                 | 1.80                   |
| 5 | CL31F106ZPHNNN □ |                  | 10μF        | 10                        | 80%/-20%                 | 1.80                   |
| 6 | CL31F106ZQHNNN □ |                  | 10μF        | 6.3                       | 80%/-20%                 | 1.80                   |
| 7 | CL31F226ZPHNNN □ |                  | 22μF        | 10                        | 80%/-20%                 | 1.80                   |
| 8 | CL31F226ZQHNNN □ |                  | 22μF        | 6.3                       | 80%/-20%                 | 1.80                   |
| 1 | CL32F106ZAHLNN □ | 3.20×2.50        | 10μF        | 25                        | 80%/-20%                 | 1.80                   |
| 2 | CL32F106ZOELNN □ |                  | 10μF        | 16                        | 80%/-20%                 | 2.00                   |
| 3 | CL32F226ZPJNNN □ |                  | 22μF        | 10                        | 80%/-20%                 | 2.70                   |
| 4 | CL32F226ZPULNN □ |                  | 22μF        | 10                        | 80%/-20%                 | 2.00                   |
| 5 | CL32F476ZQJNNN □ |                  | 47μF        | 6.3                       | 80%/-20%                 | 2.70                   |
| 6 | CL32F107ZQJNNN □ |                  | 100μF       | 6.3                       | 80%/-20%                 | 2.70                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

# Super Small Size Capacitors



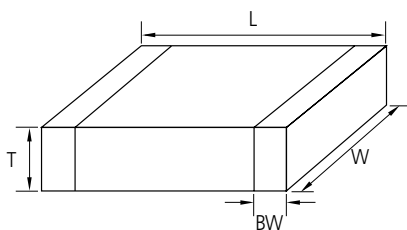
## Feature

- Small chip size
- 03 Series(COG) MLCC shows very low ESR value.
- 02 and 03 Series are suited to only reflow soldering
- 02 and 03 Series are suited to miniature RF module, portable equipment and high frequency circuit

## Application

- VCO, Tuner, RF Module
  - MCM Module
  - Mobile phone, Wireless LAN, Note PC
- ※ For using special purpose like Military, Medical, Aviation, Automobile device should be following a special specification.

## Structure and Dimensions



| Code | EIA Code | Dimension(mm)  |                |                |                 |
|------|----------|----------------|----------------|----------------|-----------------|
|      |          | L              | W              | T              | BW              |
| 02   | 01005    | $0.4 \pm 0.02$ | $0.2 \pm 0.02$ | $0.2 \pm 0.02$ | 0.07~0.14       |
| 03   | 0201     | $0.6 \pm 0.03$ | $0.3 \pm 0.03$ | $0.3 \pm 0.03$ | $0.15 \pm 0.05$ |

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting



### Super Small Size Capacitance Table (C0G)

| Size(mm) | Tmax<br>(mm) | Vr(V) | Capacitance (pF) |   |    |    |    |     |     |     |
|----------|--------------|-------|------------------|---|----|----|----|-----|-----|-----|
|          |              |       | 0.5              | 1 | 10 | 22 | 47 | 100 | 220 | 330 |
| C0G      | 01005(0402)  | 6.3   |                  |   |    |    |    |     |     |     |
|          |              | 16    |                  |   |    |    |    |     |     |     |
|          | 0201(0603)   | 25    |                  |   |    |    |    |     |     |     |
|          |              | 50    |                  |   |    |    |    |     |     |     |

### Super Small Size Capacitance Table (X5R, X7R, Y5V)

| TC  | Size<br>(mm) | Vr(V) | Capacitance (uF) |      |      |   |     |     |    |    |
|-----|--------------|-------|------------------|------|------|---|-----|-----|----|----|
|     |              |       | 0.1              | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 | 22 |
| X5R | 01005(0402)  | 6.3   |                  |      |      |   |     |     |    |    |
|     | 0201(0603)   | 4     |                  |      |      |   |     |     |    |    |
|     |              | 6.3   |                  |      |      |   |     |     |    |    |
|     |              | 10    |                  |      |      |   |     |     |    |    |
|     |              | 16    |                  |      |      |   |     |     |    |    |
|     |              | 25    |                  |      |      |   |     |     |    |    |
| X7R | 01005(0402)  | 10    |                  |      |      |   |     |     |    |    |
|     | 0201(0603)   | 10    |                  |      |      |   |     |     |    |    |
|     |              | 16    |                  |      |      |   |     |     |    |    |
| Y5V | 0201(0603)   | 6.3   |                  |      |      |   |     |     |    |    |

## Product Lineup (Super Small Size Capacitors -C0G)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |        |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|--------|
| 1  | CL02C0R5C02ANN □ | 0.40 × 0.20     | 0.5 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 2  | CL02C010C02ANN □ |                 | 1.0 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 3  | CL02C1R2C02ANN □ |                 | 1.2 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 4  | CL02C1R5C02ANN □ |                 | 1.5 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 5  | CL02C1R8C02ANN □ |                 | 1.8 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 6  | CL02C020C02ANN □ |                 | 2.0 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 7  | CL02C2R2C02ANN □ |                 | 2.2 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 8  | CL02C2R7C02ANN □ |                 | 2.7 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 9  | CL02C030C02ANN □ |                 | 3.0 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 10 | CL02C3R3C02ANN □ |                 | 3.3 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 11 | CL02C3R9C02ANN □ |                 | 3.9 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 12 | CL02C4R7C02ANN □ |                 | 4.7 pF      | 16                  | ±0.25 pF              | 0.22                |        |
| 13 | CL02C5R6D02ANN □ |                 | 5.6 pF      | 16                  | ±0.5 pF               | 0.22                |        |
| 14 | CL02C6R8D02ANN □ |                 | 6.8 pF      | 16                  | ±0.5 pF               | 0.22                |        |
| 15 | CL02C8R2D02ANN □ |                 | 8.2 pF      | 16                  | ±0.5 pF               | 0.22                |        |
| 16 | CL02C090D02ANN □ |                 | 9.0 pF      | 16                  | ±0.5 pF               | 0.22                |        |
| 17 | CL02C100J02ANN □ |                 | 10 pF       | 16                  | ±5%                   | 0.22                |        |
| 18 | CL02C150J02ANN □ |                 | 15 pF       | 16                  | ±5%                   | 0.22                |        |
| 19 | CL02C180J02ANN □ |                 | 18 pF       | 16                  | ±5%                   | 0.22                |        |
| 20 | CL02C220J02ANN □ |                 | 22 pF       | 16                  | ±5%                   | 0.22                |        |
| 21 | CL02C270J02ANN □ |                 | 27 pF       | 16                  | ±5%                   | 0.22                |        |
| 22 | CL02C330J02ANN □ |                 | 33 pF       | 16                  | ±5%                   | 0.22                |        |
| 23 | CL02C390J02ANN □ |                 | 39 pF       | 16                  | ±5%                   | 0.22                |        |
| 24 | CL02C470J02ANN □ |                 | 47 pF       | 16                  | ±5%                   | 0.22                |        |
| 25 | CL02C560JQ2ANN □ |                 | 56 pF       | 6.3                 | ±5%                   | 0.22                |        |
| 26 | CL02C680JQ2ANN □ |                 | 68 pF       | 6.3                 | ±5%                   | 0.22                |        |
| 27 | CL02C820JQ2ANN □ |                 | 82 pF       | 6.3                 | ±5%                   | 0.22                |        |
| 28 | CL02C101JQ2ANN □ |                 | 100 pF      | 6.3                 | ±5%                   | 0.22                |        |
| 1  | CL03C0R5CA3GNN □ | 0.60 × 0.30     | 0.5 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 2  | CL03C010CA3GNN □ |                 | 1.0 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 3  | CL03C1R2CA3GNN □ |                 | 1.2 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 4  | CL03C1R5CA3GNN □ |                 | 1.5 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 5  | CL03C1R8CA3GNN □ |                 | 1.8 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 6  | CL03C020CA3GNN □ |                 | 2.0 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 7  | CL03C2R2CA3GNN □ |                 | 2.2 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 8  | CL03C2R7CA3GNN □ |                 | 2.7 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 9  | CL03C030CA3GNN □ |                 | 3.0 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 10 | CL03C3R3CA3GNN □ |                 | 3.3 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 11 | CL03C3R9CA3GNN □ |                 | 3.9 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 12 | CL03C4R7CA3GNN □ |                 | 4.7 pF      | 25                  | ±0.25 pF              | 0.33                | High-Q |
| 13 | CL03C5R6DA3GNN □ |                 | 5.6 pF      | 25                  | ±0.5 pF               | 0.33                | High-Q |
| 14 | CL03C6R8DA3GNN □ |                 | 6.8 pF      | 25                  | ±0.5 pF               | 0.33                | High-Q |
| 15 | CL03C8R2DA3GNN □ |                 | 8.2 pF      | 25                  | ±0.5 pF               | 0.33                | High-Q |
| 16 | CL03C090DA3GNN □ |                 | 9.0 pF      | 25                  | ±0.5 pF               | 0.33                | High-Q |
| 17 | CL03C100JA3GNN □ |                 | 10 pF       | 25                  | ±5%                   | 0.33                | High-Q |
| 18 | CL03C150JA3GNN □ |                 | 15 pF       | 25                  | ±5%                   | 0.33                | High-Q |
| 19 | CL03C180JA3GNN □ |                 | 18 pF       | 25                  | ±5%                   | 0.33                | High-Q |
| 20 | CL03C220JA3GNN □ |                 | 22 pF       | 25                  | ±5%                   | 0.33                | High-Q |
| 21 | CL03C270JA3GNN □ |                 | 27 pF       | 25                  | ±5%                   | 0.33                | High-Q |
| 22 | CL03C330JA3GNN □ |                 | 33 pF       | 25                  | ±5%                   | 0.33                | High-Q |
| 23 | CL03C390JA3ANN □ |                 | 39 pF       | 25                  | ±5%                   | 0.33                |        |
| 24 | CL03C470JA3ANN □ |                 | 47 pF       | 25                  | ±5%                   | 0.33                |        |
| 25 | CL03C101JA3ANN □ |                 | 100 pF      | 25                  | ±5%                   | 0.33                |        |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## Product Lineup (Super Small Size Capacitors -X7R)

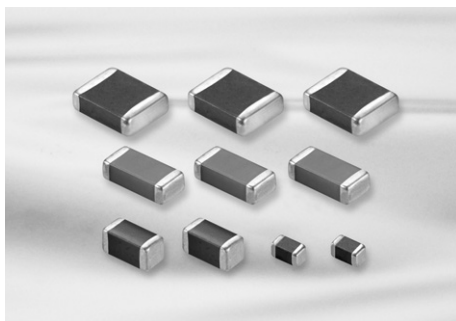
|   | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|---|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 1 | CL02B101KP2NNN □ | 0.40×0.20        | 100pF       | 10                        | ±10%                     | 0.22                   |
| 2 | CL02B151KP2NNN □ |                  | 150pF       | 10                        | ±10%                     | 0.22                   |
| 3 | CL02B221KP2NNN □ |                  | 220pF       | 10                        | ±10%                     | 0.22                   |
| 4 | CL02B331KP2NNN □ |                  | 330pF       | 10                        | ±10%                     | 0.22                   |
| 5 | CL02B471KP2NNN □ |                  | 470pF       | 10                        | ±10%                     | 0.22                   |
| 6 | CL02B681KP2NNN □ |                  | 680pF       | 10                        | ±10%                     | 0.22                   |
| 7 | CL02B102KP2NNN □ |                  | 1.0nF       | 10                        | ±10%                     | 0.22                   |
| 1 | CL03B331KO3NNN □ | 0.60×0.30        | 330pF       | 16                        | ±10%                     | 0.33                   |
| 2 | CL03B102KO3NNN □ |                  | 1nF         | 16                        | ±10%                     | 0.33                   |
| 3 | CL03B472KQ3NNN □ |                  | 4.7nF       | 6.3                       | ±10%                     | 0.33                   |
| 4 | CL03B103KP3NNN □ |                  | 10nF        | 10                        | ±10%                     | 0.33                   |

## Product Lineup (Super Small Size Capacitors -X5R)

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 1  | CL02A151KQ2NNN □ | 0.40×0.20        | 150pF       | 6.3                       | ±10%                     | 0.22                   |
| 2  | CL02A221KQ2NNN □ |                  | 220pF       | 6.3                       | ±10%                     | 0.22                   |
| 3  | CL02A331KQ2NNN □ |                  | 330pF       | 6.3                       | ±10%                     | 0.22                   |
| 4  | CL02A471KQ2NNN □ |                  | 470pF       | 6.3                       | ±10%                     | 0.22                   |
| 5  | CL02A681KQ2NNN □ |                  | 680pF       | 6.3                       | ±10%                     | 0.22                   |
| 6  | CL02A102KQ2NNN □ |                  | 1nF         | 6.3                       | ±10%                     | 0.22                   |
| 7  | CL02A152KQ2NNN □ |                  | 1.5nF       | 6.3                       | ±10%                     | 0.22                   |
| 8  | CL02A222KQ2NNN □ |                  | 2.2nF       | 6.3                       | ±10%                     | 0.22                   |
| 9  | CL02A332KQ2NNN □ |                  | 3.2nF       | 6.3                       | ±10%                     | 0.22                   |
| 10 | CL02A472KQ2NNN □ |                  | 4.7nF       | 6.3                       | ±10%                     | 0.22                   |
| 11 | CL02A682KQ2NNN □ |                  | 6.8nF       | 6.3                       | ±10%                     | 0.22                   |
| 12 | CL02A103KQ2NNN □ |                  | 10nF        | 6.3                       | ±10%                     | 0.22                   |
| 13 | CL02A104KQ2NNN □ |                  | 100nF       | 6.3                       | ±10%                     | 0.22                   |
| 1  | CL03A103KP3NNN □ | 0.60×0.30        | 10nF        | 10                        | ±10%                     | 0.33                   |
| 2  | CL03A223KQ3NNN □ |                  | 22nF        | 6.3                       | ±10%                     | 0.33                   |
| 3  | CL03A473KQ3NNN □ |                  | 47nF        | 6.3                       | ±10%                     | 0.33                   |
| 4  | CL03A104MA3NNN □ |                  | 100nF       | 25                        | ±20%                     | 0.33                   |
| 5  | CL03A104KO3NNN □ |                  | 100nF       | 16                        | ±10%                     | 0.33                   |
| 6  | CL03A104KP3NNN □ |                  | 100nF       | 10                        | ±10%                     | 0.33                   |
| 7  | CL03A104KQ3NNN □ |                  | 100nF       | 6.3                       | ±10%                     | 0.33                   |
| 8  | CL03A224KQ3NNN □ |                  | 220nF       | 6.3                       | ±10%                     | 0.33                   |
| 9  | CL03A224KP3NNN □ |                  | 200nF       | 10                        | ±10%                     | 0.33                   |
| 10 | CL03A105MQ3CSN □ |                  | 1μF         | 6.3                       | ±20%                     | 0.35                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

# Medium-High Voltage Capacitors



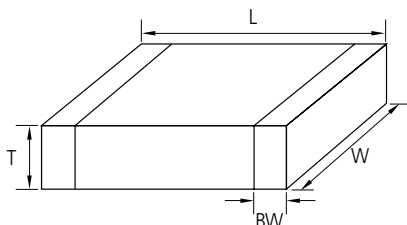
## Feature

- Highly reliable performance
- Operating at high voltage level
- Wide voltage level: from 100V to 3000V
- High withstanding voltage
- Tape & reel surface mount assembly

## Application

- Switching Power Circuit(SMPS)
  - Lighting Ballast, LCD back lighting inverter
  - DC-DC converter input filter, snubber circuit
  - Phone, Fax, Modem
  - Network(IEEE802.3)
- ※ For using special purpose like Military, Medical, Aviation, Automobile device should be following a special specification.

## Structure and Dimensions



Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

| Code | EIA Code | Dimension(mm)  |                |                 |                     |
|------|----------|----------------|----------------|-----------------|---------------------|
|      |          | L              | W              | T               | BW                  |
| 10   | 0603     | $1.6 \pm 0.1$  | $0.8 \pm 0.1$  | $0.8 \pm 0.1$   | $0.3 \pm 0.2$       |
| 21   | 0805     | $2.0 \pm 0.1$  | $1.25 \pm 0.1$ | $1.25 \pm 0.1$  | $0.5 + 0.2 / - 0.3$ |
| 31   | 1206     | $3.2 \pm 0.2$  | $1.6 \pm 0.2$  | $1.6 \pm 0.2$   | $0.5 \pm 0.3$       |
|      |          | $3.2 \pm 0.15$ | $1.6 \pm 0.15$ | $1.25 \pm 0.15$ |                     |
|      |          |                |                | $0.85 \pm 0.15$ |                     |
| 32   | 1210     | $3.2 \pm 0.3$  | $2.5 \pm 0.2$  | $2.5 \pm 0.2$   | $0.6 \pm 0.3$       |
| 42   | 1808     | $4.5 \pm 0.4$  | $2.0 \pm 0.2$  | $2.0 \pm 0.2$   | $0.8 \pm 0.3$       |
| 43   | 1812     | $4.5 \pm 0.4$  | $3.2 \pm 0.3$  | $2.5 \pm 0.2$   | $0.8 \pm 0.3$       |
| 55   | 2220     | $5.7 \pm 0.4$  | $5.0 \pm 0.4$  | $2.5 \pm 0.2$   | $1.0 \pm 0.3$       |

### Medium-High Voltage Capacitors Table (C0G)

| Vr   | Size(mm)   | Capacitance |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|------|------------|-------------|-----|-----|-----|-----|-----|---|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|
|      |            | (pF)        |     |     |     |     |     |   | (nF) |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      |            | 330         | 390 | 470 | 560 | 680 | 820 | 1 | 1.2  | 1.5 | 1.8 | 2.2 | 2.7 | 3.3 | 3.9 | 4.7 | 5.6 | 6.8 | 8.2 | 10 | 12 | 15 | 18 | 22 | 27 | 33 | 47 | 56 | 68 |
| 100V | 0603(1608) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 0805(2012) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1206(3216) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1210(3225) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1812(4532) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 2220(5750) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
| 200V | 0603(1608) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 0805(2012) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1206(3216) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1210(3225) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1812(4532) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 2220(5750) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
| 250V | 0603(1608) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 0805(2012) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1206(3216) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1210(3225) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1812(4532) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 2220(5750) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
| 500V | 1206(3216) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1210(3225) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1812(4532) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 2220(5750) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
| 630V | 1206(3216) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1210(3225) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 1812(4532) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |
|      | 2220(5750) |             |     |     |     |     |     |   |      |     |     |     |     |     |     |     |     |     |     |    |    |    |    |    |    |    |    |    |    |

Medium-High Voltage Capacitors Table (C0G)

| Vr  | Size(mm)   | Capacitance |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|-----|------------|-------------|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|--|
|     |            | (pF)        |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     | (nF) |     |     |     |     |     |     |     |     |     |  |  |
|     |            | 47          | 56 | 68 | 82 | 100 | 120 | 150 | 180 | 220 | 270 | 330 | 390 | 470 | 560 | 680 | 820 | 1    | 1.2 | 1.5 | 1.8 | 2.2 | 2.7 | 3.3 | 3.9 | 4.7 | 5.6 |  |  |
| 1KV | 1206(3216) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|     | 1210(3225) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|     | 1812(4532) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|     | 2220(5750) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
| 2KV | 1206(3216) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|     | 1210(3225) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|     | 1808(4520) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|     | 1812(4532) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|     | 2220(5750) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
| 3KV | 1808(4520) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|     | 1812(4532) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |
|     | 2220(5750) |             |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |     |     |  |  |

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting



### Medium-High Voltage Capacitors Table (X7R)

| Size(mm) | Vr(V)      | Capacitance (nF) |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|----------|------------|------------------|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|------|------|------|
|          |            | 4.7              | 10 | 15 | 22 | 33 | 47 | 68 | 100 | 150 | 220 | 330 | 470 | 680 | 1000 | 1500 | 2200 |
| 100V     | 0603(1608) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 0805(2012) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1206(3216) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1210(3225) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1812(4532) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 2220(5750) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
| 200V     | 0805(2012) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1206(3216) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1210(3225) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1812(4532) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 2220(5750) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
| 250V     | 0805(2012) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1206(3216) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1210(3225) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1812(4532) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 2220(5750) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
| 350V     | 1206(3216) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
| 500V     | 1206(3216) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1210(3225) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1812(4532) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 2220(5750) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
| 630V     | 1206(3216) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1210(3225) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 1812(4532) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |
|          | 2220(5750) |                  |    |    |    |    |    |    |     |     |     |     |     |     |      |      |      |

Medium-High Voltage Capacitors Table (X7R)

| Size(mm) | Vr(V)      | Capacitance (nF) |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
|----------|------------|------------------|-----|-----|-----|-----|-----|----|----|----|----|----|----|-----|-----|-----|-----|
|          |            | 1                | 1.5 | 2.2 | 3.3 | 4.7 | 6.8 | 10 | 15 | 22 | 33 | 47 | 68 | 100 | 150 | 220 | 330 |
| 1K       | 1206(3216) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
|          | 1210(3225) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
|          | 1812(4532) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
|          | 2220(5750) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
| 2KV      | 1206(3216) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
|          | 1210(3225) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
|          | 1808(4520) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
|          | 1812(4532) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
|          | 2220(5750) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |
| 3KV      | 1808(4520) |                  |     |     |     |     |     |    |    |    |    |    |    |     |     |     |     |

- Part Numbering System
- General Capacitors
- High Capacitance Capacitors
- Super Small Size Capacitors
- Medium-High Voltage Capacitors
- Array Type Capacitors
- Low ESL Capacitors
- Reliability Test Condition
- Premium Capacitors for Automotive Applications
- Packaging Specification
- Application Manual for Surface Mounting

**Product Lineup (Medium-High Voltage Capacitors-C0G)**

|    | Part Number       | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|-------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 1  | CL10C100JC8NNN □  | 1.60×0.80        | 10pF        | 100                       | ±5%                      | 0.90                   |
| 2  | CL10C150JC8NNN □  |                  | 15pF        | 100                       | ±5%                      | 0.90                   |
| 3  | CL10C330JC8NNN □  |                  | 33pF        | 100                       | ±5%                      | 0.90                   |
| 4  | CL10C390JC8NNN □  |                  | 39pF        | 100                       | ±5%                      | 0.90                   |
| 5  | CL10C470JC8NNN □  |                  | 47pF        | 100                       | ±5%                      | 0.90                   |
| 6  | CL10C560JC8NNN □  |                  | 560pF       | 100                       | ±5%                      | 0.90                   |
| 7  | CL10C101JC8NNN □  |                  | 100pF       | 100                       | ±5%                      | 0.90                   |
| 8  | CL10C121JC8NNN □  |                  | 120pF       | 100                       | ±5%                      | 0.90                   |
| 9  | CL10C151JC8NNN □  |                  | 150pF       | 100                       | ±5%                      | 0.90                   |
| 10 | CL10C331JC8NNN □  |                  | 330pF       | 100                       | ±5%                      | 0.90                   |
| 11 | CL10C331JD8NNN □  |                  | 330pF       | 200                       | ±5%                      | 0.90                   |
| 12 | CL10C331JE8NNN □  |                  | 330pF       | 250                       | ±5%                      | 0.90                   |
| 13 | CL10C391JD8NNN □  |                  | 390pF       | 200                       | ±5%                      | 0.90                   |
| 14 | CL10C391JE8NNN □  |                  | 390pF       | 250                       | ±5%                      | 0.90                   |
| 15 | CL10C471JC8NNN □  |                  | 470pF       | 100                       | ±5%                      | 0.90                   |
| 16 | CL10C471JD8NNN □  |                  | 470pF       | 200                       | ±5%                      | 0.90                   |
| 17 | CL10C471JE8NNN □  |                  | 470pF       | 250                       | ±5%                      | 0.90                   |
| 18 | CL10C561JD8NNN □  |                  | 560pF       | 200                       | ±5%                      | 0.90                   |
| 19 | CL10C561JE8NNN □  |                  | 560pF       | 250                       | ±5%                      | 0.90                   |
| 20 | CL10C681JC8NNN □  |                  | 680pF       | 100                       | ±5%                      | 0.90                   |
| 21 | CL10C681JD8NNN □  |                  | 680pF       | 200                       | ±5%                      | 0.90                   |
| 22 | CL10C681JE8NNN □  |                  | 680pF       | 250                       | ±5%                      | 0.90                   |
| 23 | CL10C821JC8NNN □  |                  | 820pF       | 100                       | ±5%                      | 0.90                   |
| 24 | CL10C102JC8NNN □  |                  | 1nF         | 100                       | ±5%                      | 0.90                   |
| 25 | CL10C122JC8NNN □  |                  | 1.2nF       | 100                       | ±5%                      | 0.90                   |
| 1  | CL21C100JCANNN □  | 2.00×1.25        | 10pF        | 100                       | ±5%                      | 0.75                   |
| 2  | CL21C120JCANNN □  |                  | 12pF        | 100                       | ±5%                      | 0.75                   |
| 3  | CL21C150JDCNNN □  |                  | 15pF        | 200                       | ±5%                      | 0.95                   |
| 4  | CL21C150JCANNN □  |                  | 15pF        | 100                       | ±5%                      | 0.75                   |
| 5  | CL21C180JDCNNN □  |                  | 18pF        | 200                       | ±5%                      | 0.95                   |
| 6  | CL21C180JCANNN □  |                  | 18pF        | 100                       | ±5%                      | 0.75                   |
| 7  | CL21C220JCANNN □  |                  | 22pF        | 100                       | ±5%                      | 0.75                   |
| 8  | CL21C270JCANNN □  |                  | 27pF        | 100                       | ±5%                      | 0.75                   |
| 9  | CL21C330JCANNN □  |                  | 33pF        | 100                       | ±5%                      | 0.75                   |
| 10 | CL21C330JDCNNN □  |                  | 33pF        | 200                       | ±5%                      | 0.95                   |
| 11 | CL21C390JDCNNN □  |                  | 39pF        | 200                       | ±5%                      | 0.95                   |
| 12 | CL21C470JCANNN □  |                  | 47pF        | 100                       | ±5%                      | 0.75                   |
| 13 | CL21C470JDCNNN □  |                  | 47pF        | 200                       | ±5%                      | 0.95                   |
| 14 | CL21C560JCCNNN □  |                  | 56pF        | 100                       | ±5%                      | 0.95                   |
| 15 | CL21C560JDCNNN □  |                  | 56pF        | 200                       | ±5%                      | 0.95                   |
| 16 | CL21C680JCANNN □  |                  | 68pF        | 100                       | ±5%                      | 0.75                   |
| 17 | CL21C680JDCNNN □  |                  | 68pF        | 200                       | ±5%                      | 0.95                   |
| 18 | CL21C820JCCNNN □  |                  | 82pF        | 100                       | ±5%                      | 0.95                   |
| 19 | CL21C101JDCNNN □  |                  | 100pF       | 200                       | ±5%                      | 0.95                   |
| 20 | CL21C101J ECNNN □ |                  | 100pF       | 250                       | ±5%                      | 0.95                   |
| 21 | CL21C101JCANNN □  |                  | 100pF       | 100                       | ±5%                      | 0.75                   |
| 22 | CL21C121JDCNNN □  |                  | 120pF       | 200                       | ±5%                      | 0.95                   |
| 23 | CL21C151JCANNN □  |                  | 150pF       | 100                       | ±5%                      | 0.75                   |
| 24 | CL21C221JCANNN □  |                  | 220pF       | 100                       | ±5%                      | 0.75                   |
| 25 | CL21C221JDCNNN □  |                  | 220pF       | 200                       | ±5%                      | 0.95                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

## Product Lineup (Medium-High Voltage Capacitors-C0G)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 26 | CL21C331JCANN □  | 2.00 × 1.25     | 330pF       | 100                 | ±5%                   | 0.75                |
| 27 | CL21C471JCCNN □  |                 | 470pF       | 100                 | ±5%                   | 0.95                |
| 28 | CL21C561JCCNN □  |                 | 560pF       | 100                 | ±5%                   | 0.95                |
| 29 | CL21C681JCCNN □  |                 | 680pF       | 100                 | ±5%                   | 0.95                |
| 30 | CL21C102JCFNN □  |                 | 1nF         | 100                 | ±5%                   | 1.35                |
| 31 | CL21C102JDFNN □  |                 | 1nF         | 200                 | ±5%                   | 1.35                |
| 32 | CL21C272JDFNN □  |                 | 2.7nF       | 200                 | ±5%                   | 1.35                |
| 33 | CL21C272JEFNN □  |                 | 2.7nF       | 250                 | ±5%                   | 1.35                |
| 34 | CL21C472JCFNN □  |                 | 4.7nF       | 100                 | ±5%                   | 1.35                |
| 1  | CL31C150JGFNN □  | 3.20 × 1.60     | 15pF        | 500                 | ±5%                   | 1.40                |
| 2  | CL31C180JGFNN □  |                 | 18pF        | 500                 | ±5%                   | 1.40                |
| 3  | CL31C220JGFNN □  |                 | 22pF        | 500                 | ±5%                   | 1.40                |
| 4  | CL31C220JHNN □   |                 | 22pF        | 2000                | ±5%                   | 1.80                |
| 5  | CL31C270JGFNN □  |                 | 27pF        | 500                 | ±5%                   | 1.40                |
| 6  | CL31C330JGFNN □  |                 | 33pF        | 500                 | ±5%                   | 1.40                |
| 7  | CL31C390JGFNN □  |                 | 39pF        | 500                 | ±5%                   | 1.40                |
| 8  | CL31C470JHFNN □  |                 | 47pF        | 630                 | ±5%                   | 1.40                |
| 9  | CL31C470JGFNN □  |                 | 47pF        | 500                 | ±5%                   | 1.40                |
| 10 | CL31C470JHNN □   |                 | 47pF        | 2000                | ±5%                   | 1.80                |
| 11 | CL31C560JGFNN □  |                 | 56pF        | 500                 | ±5%                   | 1.40                |
| 12 | CL31C680JCCNN □  |                 | 68pF        | 100                 | ±5%                   | 1.00                |
| 13 | CL31C680JHFNN □  |                 | 68pF        | 630                 | ±5%                   | 1.40                |
| 14 | CL31C680JGFNN □  |                 | 68pF        | 500                 | ±5%                   | 1.40                |
| 15 | CL31C680JIFNN □  |                 | 68pF        | 1000                | ±5%                   | 1.40                |
| 16 | CL31C820JGFNCN □ |                 | 82pF        | 500                 | ±5%                   | 1.40                |
| 17 | CL31C101JGFNN □  |                 | 100pF       | 500                 | ±5%                   | 1.40                |
| 18 | CL31C101JHFNN □  |                 | 100pF       | 630                 | ±5%                   | 1.40                |
| 19 | CL31C101JIFNN □  |                 | 100pF       | 1000                | ±5%                   | 1.40                |
| 20 | CL31C101JHNN □   |                 | 100pF       | 2000                | ±5%                   | 1.80                |
| 21 | CL31C121JGFNN □  |                 | 120pF       | 500                 | ±5%                   | 1.40                |
| 22 | CL31C151JGFNN □  |                 | 150pF       | 500                 | ±5%                   | 1.40                |
| 23 | CL31C181JGFNN □  |                 | 180pF       | 500                 | ±5%                   | 1.40                |
| 24 | CL31C221JGFNN □  |                 | 220pF       | 500                 | ±5%                   | 1.40                |
| 25 | CL31C271JGFNN □  |                 | 270pF       | 500                 | ±5%                   | 1.40                |
| 26 | CL31C271JCCNN □  |                 | 270pF       | 100                 | ±5%                   | 1.00                |
| 27 | CL31C331JGFNN □  |                 | 330pF       | 500                 | ±5%                   | 1.40                |
| 28 | CL31C331JHNN □   |                 | 330pF       | 1000                | ±5%                   | 1.80                |
| 29 | CL31C391JCCNN □  |                 | 390pF       | 100                 | ±5%                   | 1.00                |
| 30 | CL31C471JGFNN □  |                 | 470pF       | 500                 | ±5%                   | 1.40                |
| 31 | CL31C561JCCNN □  |                 | 560pF       | 100                 | ±5%                   | 1.00                |
| 32 | CL31C561JGFNN □  |                 | 560pF       | 500                 | ±5%                   | 1.40                |
| 33 | CL31C681JGFNN □  |                 | 680pF       | 500                 | ±5%                   | 1.80                |
| 34 | CL31C102JCCNN □  |                 | 1nF         | 100                 | ±5%                   | 1.00                |
| 35 | CL31C102JGHNN □  |                 | 1nF         | 500                 | ±5%                   | 1.80                |
| 36 | CL31C152JCCNN □  |                 | 1.5nF       | 100                 | ±5%                   | 1.00                |
| 37 | CL31C222JCCNN □  |                 | 2.2nF       | 100                 | ±5%                   | 1.00                |
| 38 | CL31C332JGHNN □  |                 | 3.3nF       | 500                 | ±5%                   | 1.80                |
| 39 | CL31C332JHNN □   |                 | 3.3nF       | 630                 | ±5%                   | 1.80                |
| 40 | CL31C392JCHNN □  |                 | 3.9nF       | 100                 | ±5%                   | 1.80                |
| 41 | CL31C822JDHNN □  |                 | 8.2nF       | 200                 | ±5%                   | 1.80                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

**Product Lineup (Medium-High Voltage Capacitors-C0G)**

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 42 | CL31C822JEHNNN □ | 3.20×1.60        | 8.2nF       | 250                       | ±5%                      | 1.80                   |
| 43 | CL31C183JCHNNN □ |                  | 18nF        | 100                       | ±5%                      | 1.80                   |
| 1  | CL32C101JJFNNN □ | 3.20×2.50        | 100pF       | 2000                      | ±5%                      | 1.45                   |
| 2  | CL32C471JJJNNN □ |                  | 470pF       | 2000                      | ±5%                      | 2.70                   |
| 3  | CL32C821JJJNNN □ |                  | 820pF       | 1000                      | ±5%                      | 2.70                   |
| 4  | CL32C103JGJNNN □ |                  | 10nF        | 500                       | ±5%                      | 2.70                   |
| 5  | CL32C103JHJNNN □ |                  | 10nF        | 630                       | ±5%                      | 2.70                   |
| 6  | CL32C273JDJNNN □ |                  | 27nF        | 200                       | ±5%                      | 2.70                   |
| 7  | CL32C273JEJNNN □ |                  | 27nF        | 250                       | ±5%                      | 2.70                   |
| 8  | CL32C563JCJNNN □ |                  | 56nF        | 100                       | ±5%                      | 2.70                   |
| 1  | CL42C100JFNNN □  | 4.50×2.00        | 10pF        | 3000                      | ±5%                      | 1.45                   |
| 2  | CL42C151JKJNNN □ |                  | 150pF       | 3000                      | ±5%                      | 2.20                   |
| 3  | CL42C221JJHNNN □ |                  | 220pF       | 2000                      | ±5%                      | 1.80                   |
| 1  | CL43C391JKJNNN □ | 4.50×3.20        | 390pF       | 2000                      | ±5%                      | 2.70                   |
| 2  | CL43C102JHNNN □  |                  | 1.0nF       | 1000                      | ±5%                      | 1.80                   |
| 3  | CL43C122JHNNN □  |                  | 1.2nF       | 1000                      | ±5%                      | 2.20                   |
| 4  | CL43C182JHNNN □  |                  | 1.8nF       | 1000                      | ±5%                      | 2.70                   |
| 5  | CL43C182JJJNNN □ |                  | 1.8nF       | 2000                      | ±5%                      | 2.70                   |
| 6  | CL43C223JGJNNN □ |                  | 22nF        | 500                       | ±5%                      | 2.70                   |
| 7  | CL43C223JHJNNN □ |                  | 22nF        | 630                       | ±5%                      | 2.70                   |
| 8  | CL43C473JDJNNN □ |                  | 47nF        | 200                       | ±5%                      | 2.70                   |
| 9  | CL43C473JEJNNN □ |                  | 47nF        | 250                       | ±5%                      | 2.70                   |
| 10 | CL43C563JCJNNN □ |                  | 56nF        | 100                       | ±5%                      | 2.70                   |
| 1  | CL55C102JJJNNN □ | 5.70×5.00        | 1nF         | 2000                      | ±5%                      | 2.70                   |
| 2  | CL55C102JKJNNN □ |                  | 1nF         | 3000                      | ±5%                      | 2.70                   |
| 3  | CL55C362JJJNNN □ |                  | 3.3nF       | 1000                      | ±5%                      | 2.70                   |
| 4  | CL55C223JGJNNN □ |                  | 22nF        | 500                       | ±5%                      | 2.70                   |
| 5  | CL55C223JHJNNN □ |                  | 22nF        | 630                       | ±5%                      | 2.70                   |
| 6  | CL55C473JDJNNN □ |                  | 47nF        | 200                       | ±5%                      | 2.70                   |
| 7  | CL55C473JEJNNN □ |                  | 47nF        | 250                       | ±5%                      | 2.70                   |
| 8  | CL55C683JCJNNN □ |                  | 68nF        | 100                       | ±5%                      | 2.70                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

## Product Lineup (Medium-High Voltage Capacitors-X7R)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1  | CL10B102KC8NNN □ | 1.60 × 0.80     | 1 nF        | 100                 | ±10%                  | 0.90                |
| 2  | CL10B472KC8NNN □ |                 | 4.7 nF      | 100                 | ±10%                  | 0.90                |
| 3  | CL10B103KC8NNN □ |                 | 10 nF       | 100                 | ±10%                  | 0.90                |
| 1  | CL21B221KDCNNN □ | 2.00 × 1.25     | 220 pF      | 200                 | ±10%                  | 0.95                |
| 2  | CL21B221KCANNN □ |                 | 220 pF      | 100                 | ±10%                  | 0.75                |
| 3  | CL21B331KDCNNN □ |                 | 330 pF      | 200                 | ±10%                  | 0.95                |
| 4  | CL21B471KCANNN □ |                 | 470 pF      | 100                 | ±10%                  | 0.75                |
| 5  | CL21B102KDCNNN □ |                 | 1 nF        | 200                 | ±10%                  | 0.95                |
| 6  | CL21B102KCANNN □ |                 | 1 nF        | 100                 | ±10%                  | 0.75                |
| 7  | CL21B222KDCNNN □ |                 | 2.2 nF      | 200                 | ±10%                  | 0.95                |
| 8  | CL21B222KCANNN □ |                 | 2.2 nF      | 100                 | ±10%                  | 0.75                |
| 9  | CL21B332KCANNN □ |                 | 3.3 nF      | 100                 | ±10%                  | 0.75                |
| 10 | CL21B472KDCNNN □ |                 | 4.7 nF      | 200                 | ±10%                  | 0.95                |
| 11 | CL21B472KCANNN □ |                 | 4.7 nF      | 100                 | ±10%                  | 0.75                |
| 12 | CL21B682KCANNN □ |                 | 6.8 nF      | 100                 | ±10%                  | 0.75                |
| 13 | CL21B103KDCNNN □ |                 | 10 nF       | 200                 | ±10%                  | 0.95                |
| 14 | CL21B103KCANNN □ |                 | 10 nF       | 100                 | ±10%                  | 0.75                |
| 15 | CL21B153KEFNNN □ |                 | 15 nF       | 250                 | ±10%                  | 1.35                |
| 16 | CL21B153KDFNNN □ |                 | 15 nF       | 200                 | ±10%                  | 1.35                |
| 17 | CL21B153KCCNNN □ |                 | 15 nF       | 100                 | ±10%                  | 0.95                |
| 18 | CL21B223KCFNNN □ |                 | 22 nF       | 100                 | ±10%                  | 1.35                |
| 19 | CL21B473KCFNNN □ |                 | 47 nF       | 100                 | ±10%                  | 1.35                |
| 20 | CL21B683KCFNNN □ |                 | 68 nF       | 100                 | ±10%                  | 1.35                |
| 21 | CL21B104KCFNNN □ |                 | 100 nF      | 100                 | ±10%                  | 1.35                |
| 22 | CL21B154KCFNNN □ |                 | 150 nF      | 100                 | ±10%                  | 1.35                |
| 23 | CL21B224KCFNNN □ |                 | 220 nF      | 100                 | ±10%                  | 1.35                |
| 1  | CL31B221KGFNNN □ | 3.20 × 1.60     | 220 pF      | 500                 | ±10%                  | 1.40                |
| 2  | CL31B471KGFNNN □ |                 | 470 pF      | 500                 | ±10%                  | 1.40                |
| 3  | CL31B471KDCNNN □ |                 | 470 pF      | 200                 | ±10%                  | 1.00                |
| 4  | CL31B102KJHNNN □ |                 | 1 nF        | 2000                | ±10%                  | 1.80                |
| 5  | CL31B102KIFNNN □ |                 | 1 nF        | 1000                | ±10%                  | 1.40                |
| 6  | CL31B102KGFNNN □ |                 | 1 nF        | 500                 | ±10%                  | 1.40                |
| 7  | CL31B102KHFNNN □ |                 | 1 nF        | 630                 | ±10%                  | 1.40                |
| 8  | CL31B152KGFNNN □ |                 | 1.5 nF      | 500                 | ±10%                  | 1.40                |
| 9  | CL31B152KJHNNN □ |                 | 1.5 nF      | 2000                | ±10%                  | 1.80                |
| 10 | CL31B222KIFNNN □ |                 | 2.2 nF      | 1000                | ±10%                  | 1.40                |
| 11 | CL31B222KDCNNN □ |                 | 2.2 nF      | 200                 | ±10%                  | 1.00                |
| 12 | CL31B222KGFNNN □ |                 | 2.2 nF      | 500                 | ±10%                  | 1.40                |
| 13 | CL31B222KJHNNN □ |                 | 2.2 nF      | 2000                | ±10%                  | 1.80                |
| 14 | CL31B332KGFNNN □ |                 | 3.3 nF      | 500                 | ±10%                  | 1.40                |
| 15 | CL31B332KIFNNN □ |                 | 3.3 nF      | 1000                | ±10%                  | 1.40                |
| 16 | CL31B472KGFNNN □ |                 | 4.7 nF      | 500                 | ±10%                  | 1.40                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

**Product Lineup (Medium-High Voltage Capacitors-X7R)**

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 17 | CL31B472KDCNNN □ | 3.20×1.60        | 4.7nF       | 200                       | ±10%                     | 1.00                   |
| 18 | CL31B682KGFNNN □ |                  | 6.8nF       | 500                       | ±10%                     | 1.40                   |
| 19 | CL31B103KHFNNN □ |                  | 10nF        | 630                       | ±10%                     | 1.40                   |
| 20 | CL31B103KGFNNN □ |                  | 10nF        | 500                       | ±10%                     | 1.40                   |
| 21 | CL31B103KFCSNN □ |                  | 10nF        | 350                       | ±10%                     | 1.00                   |
| 22 | CL31B153KDCNNN □ |                  | 15nF        | 200                       | ±10%                     | 1.00                   |
| 23 | CL31B153KFCSNN □ |                  | 15nF        | 350                       | ±10%                     | 1.00                   |
| 24 | CL31B153KCCNNN □ |                  | 15nF        | 100                       | ±10%                     | 1.00                   |
| 25 | CL31B153KGFNNN □ |                  | 15nF        | 500                       | ±10%                     | 1.40                   |
| 26 | CL31B153KHFNNN □ |                  | 15nF        | 630                       | ±10%                     | 1.40                   |
| 27 | CL31B223KDCNNN □ |                  | 22nF        | 200                       | ±10%                     | 1.00                   |
| 28 | CL31B223KCCNNN □ |                  | 22nF        | 100                       | ±10%                     | 1.00                   |
| 29 | CL31B223KFCSNN □ |                  | 22nF        | 350                       | ±10%                     | 1.00                   |
| 30 | CL31B223KGHNNN □ |                  | 22nF        | 500                       | ±10%                     | 1.80                   |
| 31 | CL31B223KHNNN □  |                  | 22nF        | 630                       | ±10%                     | 1.80                   |
| 32 | CL31B333KDFNNN □ |                  | 33nF        | 200                       | ±10%                     | 1.40                   |
| 33 | CL31B333KFESNN □ |                  | 33nF        | 350                       | ±10%                     | 1.25                   |
| 34 | CL31B333KCCNNN □ |                  | 33nF        | 100                       | ±10%                     | 1.00                   |
| 35 | CL31B333KGHNNN □ |                  | 33nF        | 500                       | ±10%                     | 1.80                   |
| 36 | CL31B333KHNNN □  |                  | 33nF        | 630                       | ±10%                     | 1.80                   |
| 37 | CL31B473KDFNNN □ |                  | 47nF        | 200                       | ±10%                     | 1.40                   |
| 38 | CL31B473KFHSNN □ |                  | 47nF        | 350                       | ±10%                     | 1.80                   |
| 39 | CL31B473KCCNNN □ |                  | 47nF        | 100                       | ±10%                     | 1.00                   |
| 40 | CL31B473KEHNNN □ |                  | 47nF        | 250                       | ±10%                     | 1.80                   |
| 41 | CL31B683KEHNNN □ |                  | 68nF        | 250                       | ±10%                     | 1.80                   |
| 42 | CL31B104KDHNNN □ |                  | 100nF       | 200                       | ±10%                     | 1.80                   |
| 43 | CL31B104KCFNNN □ |                  | 100nF       | 100                       | ±10%                     | 1.40                   |
| 44 | CL31B104KEHNNN □ |                  | 100nF       | 250                       | ±10%                     | 1.80                   |
| 45 | CL31B154KCHNNN □ |                  | 150nF       | 100                       | ±10%                     | 1.80                   |
| 46 | CL31B105KCHNNN □ |                  | 1μF         | 100                       | ±10%                     | 1.80                   |
| 47 | CL31B155KCHNNN □ |                  | 1.5μF       | 100                       | ±10%                     | 1.80                   |
| 48 | CL31B225KCHNNN □ |                  | 2.2μF       | 100                       | ±10%                     | 1.80                   |
| 1  | CL32B102KJFNNN □ | 3.20×2.50        | 1nF         | 2000                      | ±10%                     | 1.45                   |
| 2  | CL32B472KHFNNN □ |                  | 4.7nF       | 630                       | ±10%                     | 1.45                   |
| 3  | CL32B472KIFNNN □ |                  | 4.7nF       | 1000                      | ±10%                     | 1.45                   |
| 4  | CL32B682KIFNNN □ |                  | 6.8nF       | 1000                      | ±10%                     | 1.45                   |
| 5  | CL32B103KCFNNN □ |                  | 10nF        | 100                       | ±10%                     | 1.45                   |
| 6  | CL32B153KGFNNN □ |                  | 15nF        | 500                       | ±10%                     | 1.45                   |
| 7  | CL32B223KGFNNN □ |                  | 22nF        | 500                       | ±10%                     | 1.45                   |
| 8  | CL32B333KHNNN □  |                  | 33nF        | 630                       | ±10%                     | 1.80                   |
| 9  | CL32B333KGHNNN □ |                  | 33nF        | 500                       | ±10%                     | 1.80                   |
| 10 | CL32B473KHNNN □  |                  | 47nF        | 630                       | ±10%                     | 1.80                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.



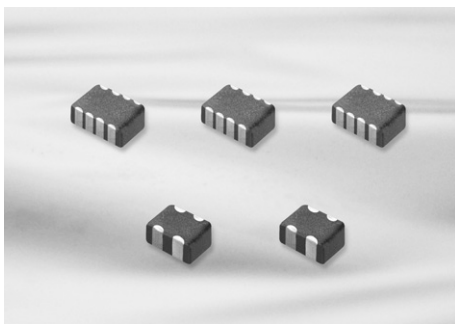
## Product Lineup (Medium-High Voltage Capacitors-X7R)

|    | Part Number       | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|-------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 11 | CL32B473KDHNNN □  | 3.20 × 2.50     | 47nF        | 200                 | ±10%                  | 1.80                |
| 12 | CL32B473KGHNNN □  |                 | 47nF        | 500                 | ±10%                  | 1.80                |
| 13 | CL32B683KDINNN □  |                 | 68nF        | 200                 | ±10%                  | 2.20                |
| 14 | CL32B104KE JNNN □ |                 | 100nF       | 250                 | ±10%                  | 2.70                |
| 15 | CL32B104KDINNN □  |                 | 100nF       | 200                 | ±10%                  | 2.20                |
| 16 | CL32B154KCFNNN □  |                 | 150nF       | 100                 | ±10%                  | 1.45                |
| 17 | CL32B154KDJNNN □  |                 | 150nF       | 200                 | ±10%                  | 2.70                |
| 18 | CL32B154KEJNNN □  |                 | 150nF       | 250                 | ±10%                  | 2.70                |
| 19 | CL32B224KCHNNN □  |                 | 220nF       | 100                 | ±10%                  | 1.80                |
| 20 | CL32B224KDJNNN □  |                 | 220nF       | 200                 | ±10%                  | 2.70                |
| 21 | CL32B224KEJNNN □  |                 | 220nF       | 250                 | ±10%                  | 2.70                |
| 22 | CL32B334KCHNNN □  |                 | 330nF       | 100                 | ±10%                  | 1.80                |
| 23 | CL32B474KCINNN □  |                 | 470nF       | 100                 | ±10%                  | 2.20                |
| 24 | CL32B105KCJNNN □  |                 | 1μF         | 100                 | ±10%                  | 2.70                |
| 25 | CL32B155KCHNNN □  |                 | 1.5μF       | 100                 | ±10%                  | 1.80                |
| 26 | CL32B225KCJNNN □  |                 | 2.2μF       | 100                 | ±10%                  | 2.70                |
| 1  | CL43B102KJFNNN □  | 4.50 × 3.20     | 1nF         | 2000                | ±10%                  | 1.45                |
| 2  | CL43B152KJFNNN □  |                 | 1.5nF       | 2000                | ±10%                  | 1.45                |
| 3  | CL43B222KJFNNN □  |                 | 2.2nF       | 1000                | ±10%                  | 1.45                |
| 4  | CL43B222KJFNNN □  |                 | 2.2nF       | 2000                | ±10%                  | 1.45                |
| 5  | CL43B332KJFNNN □  |                 | 3.3nF       | 2000                | ±10%                  | 1.45                |
| 6  | CL43B103KJFNNN □  |                 | 10nF        | 1000                | ±10%                  | 1.45                |
| 7  | CL43B333KIJNNN □  |                 | 33nF        | 1000                | ±10%                  | 2.70                |
| 8  | CL43B473KGFNNN □  |                 | 47nF        | 500                 | ±10%                  | 1.45                |
| 9  | CL43B473KHFNNN □  |                 | 47nF        | 630                 | ±10%                  | 1.45                |
| 10 | CL43B473KIJNNN □  |                 | 47nF        | 1000                | ±10%                  | 2.70                |
| 11 | CL43B104KGINNN □  |                 | 100nF       | 500                 | ±10%                  | 2.20                |
| 12 | CL43B104KDFNNN □  |                 | 100nF       | 200                 | ±10%                  | 1.45                |
| 13 | CL43B104KHINNN □  |                 | 100nF       | 630                 | ±10%                  | 2.20                |
| 14 | CL43B224KCFNNN □  |                 | 220nF       | 100                 | ±10%                  | 1.45                |
| 15 | CL43B334KCFNNN □  |                 | 330nF       | 100                 | ±10%                  | 1.45                |
| 16 | CL43B474KEJNNN □  |                 | 470nF       | 250                 | ±10%                  | 2.70                |
| 17 | CL43B474KCHNNN □  |                 | 470nF       | 100                 | ±10%                  | 1.80                |
| 18 | CL43B474KDJNNN □  |                 | 470nF       | 200                 | ±10%                  | 2.70                |
| 19 | CL43B105KCJNNN □  |                 | 1μF         | 100                 | ±10%                  | 2.70                |
| 1  | CL55B103KJHNNN □  | 5.70 × 5.00     | 10nF        | 2000                | ±10%                  | 1.80                |
| 2  | CL55B473KIINNN □  |                 | 47nF        | 1000                | ±10%                  | 2.20                |
| 3  | CL55B224KGJNNN □  |                 | 220nF       | 500                 | ±10%                  | 2.70                |
| 4  | CL55B224KHJNNN □  |                 | 220nF       | 630                 | ±10%                  | 2.70                |
| 5  | CL55B105KCHNNN □  |                 | 1μF         | 100                 | ±10%                  | 1.80                |
| 6  | CL55B105KDJNNN □  |                 | 1μF         | 200                 | ±10%                  | 2.70                |
| 7  | CL55B105KEJNNN □  |                 | 1μF         | 250                 | ±10%                  | 2.70                |
| 8  | CL55B475KCJNNN □  |                 | 4.7μF       | 100                 | ±10%                  | 2.70                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

# Array Type Capacitors



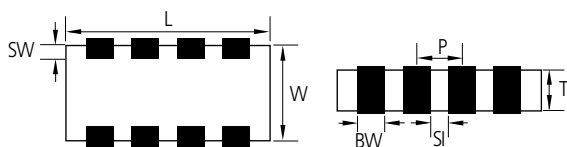
## Feature

- Reduction in required space (more than 50%)
- Reduction in cost and time for replacement of PCB
- Reduction in amount of solder joints
- Easier PCB design
- Reduced waste from tape and reel packaging process
- It protect EMI bypassing digital signal line noise

## Application

- A bypass for digital and analog signal line noise generated by telecommunication equipment and other common electronic circuits
- ※ For using special purpose like Military, Medical, Aviation, Automobile device should be following a special specification.

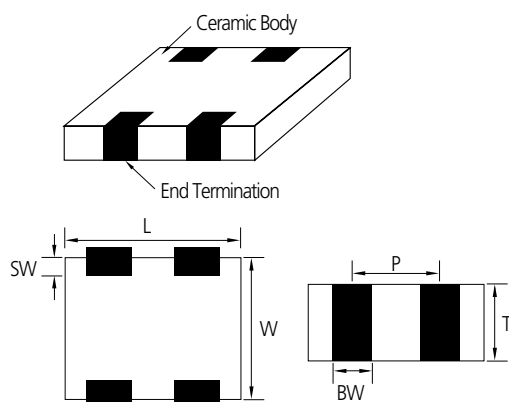
## Structure and Dimensions



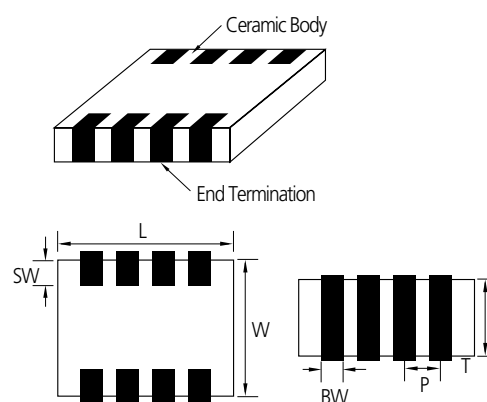
| Code | EIA Code | Dimension(mm)   |                 |                                                                          |                 |                 |                 |
|------|----------|-----------------|-----------------|--------------------------------------------------------------------------|-----------------|-----------------|-----------------|
|      |          | L               | W               | T                                                                        | BW              | SW              | P               |
| A    | 0906     | $0.90 \pm 0.05$ | $0.60 \pm 0.05$ | $0.45 \pm 0.05$                                                          | $0.25 \pm 0.05$ | $0.15 \pm 0.1$  | $0.45 \pm 0.05$ |
| A    | 0504     | $1.37 \pm 0.15$ | $1.0 \pm 0.15$  | $0.35 \pm 0.05$<br>$0.50 \pm 0.05$<br>$0.60 \pm 0.06$<br>$0.80 \pm 0.08$ | $0.36 \pm 0.1$  | $0.2 \pm 0.1$   | $0.64 \pm 0.1$  |
| A    | 0805     | $2.0 \pm 0.15$  | $1.25 \pm 0.15$ | $0.85 \pm 0.1$                                                           | $0.5 \pm 0.2$   | $0.25 \pm 0.15$ | $1.0 \pm 0.1$   |
| B    | 0805     | $2.0 \pm 0.15$  | $1.25 \pm 0.15$ | $0.85 \pm 0.1$                                                           | $0.25 \pm 0.1$  | $0.25 \pm 0.15$ | $0.5 \pm 0.1$   |
| B    | 1206     | $3.2 \pm 0.15$  | $1.6 \pm 0.15$  | $0.85 \pm 0.15$                                                          | $0.4 \pm 0.2$   | $0.3 \pm 0.15$  | $0.8 \pm 0.2$   |

## Structure and Control Code

### ■ A : ARRAY(2-element)



### ■ B : ARRAY(4-element)



Array Type Capacitors Table (C0G, X5R, X7R, Y5V)

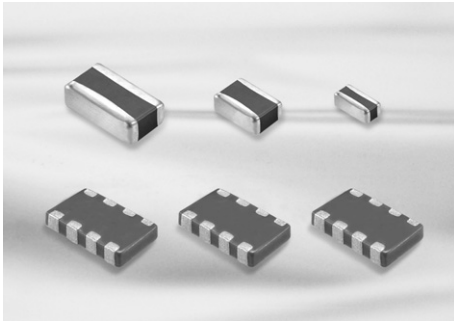
| TC  | Size(mm)   | Type        | Vr(V)      | Tmax<br>(mm) | Capacitance (pF) |      |             |    |     |     |     |     |     |      |      |  |
|-----|------------|-------------|------------|--------------|------------------|------|-------------|----|-----|-----|-----|-----|-----|------|------|--|
|     |            |             |            |              | 10               | 22   | 27          | 47 | 100 | 470 |     |     |     |      |      |  |
| C0G | 0504(1410) | 2-element   | 25         | 0.88         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     | 1206(3216) | 4-element   | 50         | 1.0          | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            |              |                  |      |             |    |     |     |     |     |     |      |      |  |
| TC  | Size(mm)   | Type        | Vr(V)      | Tmax<br>(mm) | Capacitance (nF) |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            |              | 1                | 2.2  | 4.7         | 10 | 22  | 47  | 100 | 220 | 470 | 1000 | 2200 |  |
| X5R | 0302(0906) | 2-element   | 6.3        | 0.5          | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             | 10         |              | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     | 0504(1410) | 2-element   | 6.3        | 0.88         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.66         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.55         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.4          | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             | 10         | 0.88         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.66         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.55         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.4          | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             | 16         | 0.88         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.66         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.55         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.4          | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             | 25         | 0.88         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.66         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             |            | 0.55         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             | 0805(2012) | 2-element    | 6.3              | 0.95 | <div></div> |    |     |     |     |     |     |      |      |  |
|     | 10         | <div></div> |            |              |                  |      |             |    |     |     |     |     |     |      |      |  |
|     | 16         | <div></div> |            |              |                  |      |             |    |     |     |     |     |     |      |      |  |
| X7R | 0805(2012) | 4-element   | 10         | 0.95         | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             | 16         |              | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     | 1206(3216) | 4-element   | 16         | 1.0          | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             | 25         |              | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             | 50         |              | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
| Y5V | 1206(3216) | 4-element   | 25         | 1.0          | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |
|     |            |             | 50         |              | <div></div>      |      |             |    |     |     |     |     |     |      |      |  |

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## Product Lineup (Array Type Capacitors)

|    | Part Number        | Element Type | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|--------------------|--------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1  | CL14C270KA6NAN □   | 2-Array      | 1.40 × 1.00     | 27pF        | 25                  | ±10%                  | 0.66                |
| 1  | CL31C100 JBCNBN □  | 4-Array      | 3.20 × 1.60     | 10pF        | 50                  | ±5%                   | 1.0                 |
| 2  | CL31C150 JBCNBN □  |              |                 | 15pF        | 50                  | ±5%                   | 1.0                 |
| 3  | CL31C220J BCNBN □  |              |                 | 22pF        | 50                  | ±5%                   | 1.0                 |
| 4  | CL31C270 JBCNBN □  |              |                 | 27pF        | 50                  | ±5%                   | 1.0                 |
| 5  | CL31C330KBCNBN □   |              |                 | 33pF        | 50                  | ±10%                  | 1.0                 |
| 6  | CL31C390KBCNBN □   |              |                 | 39pF        | 50                  | ±10%                  | 1.0                 |
| 7  | CL31C680J BCNBN □  |              |                 | 68pF        | 50                  | ±5%                   | 1.0                 |
| 8  | CL31C820 JBCNBN □  |              |                 | 82pF        | 50                  | ±5%                   | 1.0                 |
| 9  | CL31C101JB CNBN □  |              |                 | 100pF       | 50                  | ±5%                   | 1.0                 |
| 10 | CL31C151KBCNBN □   |              |                 | 150pF       | 50                  | ±10%                  | 1.0                 |
| 11 | CL31C181JB CNBN □  |              |                 | 180pF       | 50                  | ±5%                   | 1.0                 |
| 12 | CL31C331J B CNBN □ |              |                 | 330pF       | 50                  | ±5%                   | 1.0                 |
| 13 | CL31C471JB CNBN □  |              |                 | 470pF       | 50                  | ±5%                   | 1.0                 |
| 1  | CL21B471KBCNBN □   | 4-Array      | 2.00 × 1.25     | 470pF       | 50                  | ±10%                  | 0.95                |
| 2  | CL21B104KOCNBN □   |              |                 | 100nF       | 16                  | ±10%                  | 0.95                |
| 3  | CL21B104MPCNBN □   |              |                 | 100nF       | 10                  | ±20%                  | 0.95                |
| 1  | CL31B102MBCNBN □   | 4-Array      | 3.20 × 1.60     | 1nF         | 50                  | ±20%                  | 1.00                |
| 2  | CL31B103MBCNBN □   |              |                 | 10nF        | 50                  | ±20%                  | 1.00                |
| 3  | CL31B153KBCNBN □   |              |                 | 15nF        | 50                  | ±10%                  | 1.00                |
| 4  | CL31B473KACNBN □   |              |                 | 47nF        | 25                  | ±10%                  | 1.00                |
| 5  | CL31B104KACNBN □   |              |                 | 100nF       | 25                  | ±10%                  | 1.00                |
| 6  | CL31B104KOCNBN □   |              |                 | 100nF       | 16                  | ±10%                  | 1.00                |
| 1  | CL09A104KQ4SAN □   | 2-Array      | 0.90 × 0.60     | 100nF       | 6.3                 | ±10%                  | 0.5                 |
| 2  | CL09A104KP4SAN □   |              |                 | 100nF       | 10                  | ±10%                  | 0.5                 |
| 1  | CL14A104KA6NAN □   | 2-Array      | 1.40 × 1.00     | 100nF       | 25                  | ±10%                  | 0.66                |
| 2  | CL14A104KO6NAN □   |              |                 | 100nF       | 16                  | ±10%                  | 0.66                |
| 3  | CL14A104KP6NAN □   |              |                 | 100nF       | 10                  | ±10%                  | 0.66                |
| 1  | CL14A105MA5NAN □   | 2-Array      | 1.40 × 1.00     | 1μF         | 25                  | ±20%                  | 0.55                |
| 2  | CL14A105KP8NAN □   |              |                 | 1μF         | 10                  | ±10%                  | 0.88                |
| 3  | CL14A105MO3NAN □   |              |                 | 1μF         | 16                  | ±20%                  | 0.4                 |
| 4  | CL14A105MO8NAN □   |              |                 | 1μF         | 16                  | ±20%                  | 0.88                |
| 5  | CL14A105MP3NAN □   |              |                 | 1μF         | 10                  | ±20%                  | 0.4                 |
| 6  | CL14A105MP5NAN □   |              |                 | 1μF         | 10                  | ±20%                  | 0.55                |
| 7  | CL14A225KP8NAN □   |              |                 | 2.2μF       | 10                  | ±10%                  | 0.88                |
| 8  | CL14A225KQ8NAN □   |              |                 | 2.2μF       | 6.3                 | ±10%                  | 0.88                |
| 9  | CL14A105MO5NAN □   |              |                 | 1μF         | 16                  | ±20%                  | 0.55                |
| 1  | CL21A105KOCNAN □   | 2-Array      | 2.00 × 1.25     | 1μF         | 16                  | ±10%                  | 0.95                |
| 2  | CL21A105MPCNAN □   | 2-Array      | 1.40 × 1.00     | 1μF         | 10                  | ±20%                  | 0.88                |
| 1  | CL31F473ZB CNBN □  | 4-Array      | 3.20 × 1.60     | 47nF        | 50                  | 80%/-20%              | 1.0                 |
| 2  | CL31F104ZACNBN □   |              |                 | 100nF       | 25                  | 80%/-20%              | 1.0                 |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.



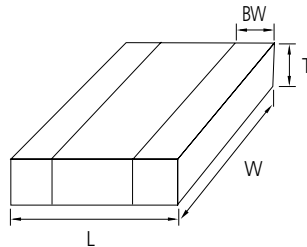
### Feature

- Low ESL, good for noise reduction for high frequency
- Highly reliable tolerance and high speed automatic chip placement on PCBs
- Highly reliable performance
- Highly resistant termination metal
- Tape & reel for surface mount assembly

### Application

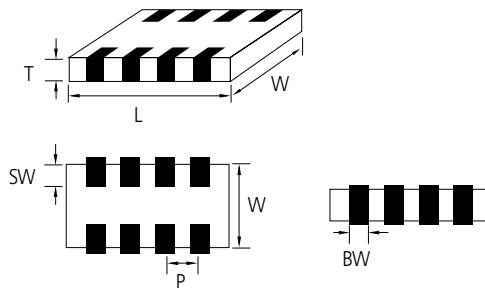
- High Speed Microprocessor
- High Frequency Digital Equipment
- ※ For using special purpose like Military, Medical, Aviation, Automobile device should be following a special specification.

### LICC(Low Inductance chip capacitors)



| Code | EIA Code | Dimension(mm)   |                |                      |                 |
|------|----------|-----------------|----------------|----------------------|-----------------|
|      |          | L               | W              | T                    | BW              |
| L5   | 0204     | $0.52 \pm 0.05$ | $1.0 \pm 0.05$ | $0.3 \pm 0.05$       | $0.18 \pm 0.08$ |
| 01   | 0306     | $0.8 \pm 0.15$  | $1.6 \pm 0.2$  | $0.5 + 0.05 / - 0.1$ | $0.25 + 0.15$   |

### SLIC(Super Low Inductance capacitors)



| Code | EIA Code | Dimension(mm) |                |                     |                |                |               |
|------|----------|---------------|----------------|---------------------|----------------|----------------|---------------|
|      |          | L             | W              | T                   | BW             | SW             | P             |
| 10   | 0603     | $1.6 \pm 0.1$ | $0.8 \pm 0.1$  | $0.5 / +0.05 - 0.1$ | $0.25 \pm 0.1$ | $0.15 \pm 0.1$ | $0.4 \pm 0.1$ |
| 21   | 0805     | $2.0 \pm 0.1$ | $1.25 \pm 0.1$ | $0.5 / +0.05 - 0.1$ | $0.25 \pm 0.1$ | $0.18 \pm 0.1$ | $0.5 \pm 0.1$ |

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

### Low ESL Capacitors Table (LICC)

| TC          | Size(mm)   | Tmax(mm) | Vr(V) | Capacitance (uF) |       |       |     |      |      |   |     |     |    |
|-------------|------------|----------|-------|------------------|-------|-------|-----|------|------|---|-----|-----|----|
|             |            |          |       | 0.01             | 0.022 | 0.047 | 0.1 | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 |
| X6S<br>/X7S | 0204(0510) | 0.35     | 4     |                  |       |       |     |      |      |   |     |     |    |
|             |            |          | 6.3   |                  |       |       |     |      |      |   |     |     |    |
|             | 0306(0816) | 0.55     | 4     |                  |       |       |     |      |      |   |     |     |    |

| TC          | Size(mm)   | Tmax(mm) | Vr(V) | Capacitance (uF) |       |       |     |      |      |   |     |     |    |
|-------------|------------|----------|-------|------------------|-------|-------|-----|------|------|---|-----|-----|----|
|             |            |          |       | 0.01             | 0.022 | 0.047 | 0.1 | 0.22 | 0.47 | 1 | 2.2 | 4.7 | 10 |
| X7R<br>/X5R | 0306(0816) | 0.55     | 6.3   |                  |       |       |     |      |      |   |     |     |    |
|             |            |          | 0     |                  |       |       |     |      |      |   |     |     |    |
|             |            |          | 16    |                  |       |       |     |      |      |   |     |     |    |
|             |            |          | 25    |                  |       |       |     |      |      |   |     |     |    |
|             |            |          | 50    |                  |       |       |     |      |      |   |     |     |    |

### Low ESL Capacitors Table (SLIC)

| TC                  | Size(mm)   | Tmax(mm) | Vr(V) | Capacitance (uF) |      |      |   |     |     |    |    |
|---------------------|------------|----------|-------|------------------|------|------|---|-----|-----|----|----|
|                     |            |          |       | 0.1              | 0.47 | 0.68 | 1 | 2.2 | 4.7 | 10 | 22 |
| X7R<br>/X7S<br>/X7T | 0603(1608) | 0.55     | 2.5   |                  |      |      |   |     |     |    |    |
|                     |            |          | 4     |                  |      |      |   |     |     |    |    |
|                     | 0805(2012) | 0.55     | 4     |                  |      |      |   |     |     |    |    |
|                     |            |          | 6.3   |                  |      |      |   |     |     |    |    |
|                     |            |          | 16    |                  |      |      |   |     |     |    |    |

## Product Lineup (Low ESL Capacitors-X7R, X6S, X7S)

|   | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|---|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 1 | CL21B104MO5NJN □ | 2.00 × 1.25     | 100nF       | 16                  | ±20%                  | 0.55                |
| 2 | CL21B684MO5NJN □ |                 | 680nF       | 16                  | ±20%                  | 0.55                |
| 3 | CL21B684MQ5NJN □ |                 | 680nF       | 6.3                 | ±20%                  | 0.55                |
| 1 | CLL5X224MR3NLN □ | 0.50 × 1.00     | 220nF       | 4                   | ±20%                  | 0.35                |
| 2 | CLL5X474MR3NLN □ |                 | 470nF       | 4                   | ±20%                  | 0.35                |
| 1 | CLL5Y104MQ3NLN □ | 0.50 × 1.00     | 100nF       | 6.3                 | ±20%                  | 0.35                |
| 2 | CL01Y105MR5NLN □ | 0.80 × 1.60     | 1μF         | 4                   | ±20%                  | 0.55                |
| 3 | CL01Y225MR5NLN □ |                 | 2.2μF       | 4                   | ±20%                  | 0.55                |
| 4 | CL10Y474MR5NJN □ | 1.60 × 0.80     | 470nF       | 4                   | ±20%                  | 0.55                |
| 5 | CL10Y105MR5NJN □ |                 | 1μF         | 4                   | ±20%                  | 0.55                |
| 6 | CL10Y225MR5NJN □ |                 | 2.2μF       | 4                   | ±20%                  | 0.55                |
| 7 | CL21Y105MR5NJN □ | 2.00 × 1.25     | 1μF         | 4                   | ±20%                  | 0.55                |
| 8 | CL21Y225MR5NJN □ |                 | 2.2μF       | 4                   | ±20%                  | 0.55                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

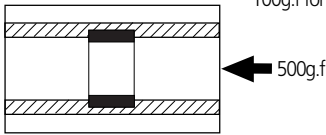
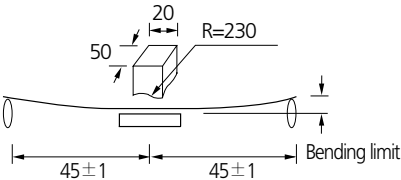
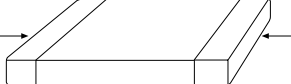
Packaging Specification

Application Manual for Surface Mounting



# Reliability Test Condition

| No | Item                  |          | Performance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                  |                    |
|----|-----------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------|
| 1  | Appearance            |          | No abnormal exterior appearance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Visual Inspection through Microscope( $\times 10$ )                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                    |
| 2  | Insulation Resistance |          | 10,000M $\Omega$ min. or 500M $\Omega \cdot \mu F$ min.(or $\ast$ 100M $\Omega \cdot \mu F$ ) product whichever is smaller<br>(Rated voltage $\leq 16V$ : 10,000M $\Omega$ min. or 100M $\Omega \cdot \mu F$ min. product whichever is smaller)                                                                                                                                                                                                                                                                                                                                                                                                                    | Apply the rated voltage for 60~120 sec.<br>Rated voltage $> 500V$ : Insulation Resistance shall be measured with $500 \pm 50Vdc$                                                                                                                                                                                                                                                                                                                                                                                       |                  |                    |
| 3  | Withstanding Voltage  |          | No dielectric breakdown or mechanical breakdown                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Apply the specified voltage $\ast$ for 1~5 sec.<br>Charge/Discharge current limit: 50mA max.<br>$\ast$ CLASS I (Rated Voltage $< 100V$ ): 300% of the rated Voltage<br>CLASS II (Rated Voltage $< 100V$ ): 250% of the rated Voltage<br>In the case of $V_r \geq 100V$ products, following condition should be applied.<br>100V $\leq$ Rated Voltage $< 500V$ : 200% of the rated Voltage<br>500V $\leq$ Rated Voltage $< 1000V$ : 150% of the rated Voltage<br>Rated Voltage $\geq 1000V$ : 120% of the rated Voltage |                  |                    |
| 4  | Capacitance           | CLASS I  | Within the specified tolerance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Capacitance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Frequency        | Voltage            |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $\leq 1,000pF$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1MHz $\pm 10\%$  | 0.5 ~ 5 Vrms       |
|    |                       | CLASS II | Within the specified tolerance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | $> 1,000pF$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1KHz $\pm 10\%$  |                    |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Capacitance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Frequency        | Voltage            |
| 5  | Tan $\delta$          | CLASS I  | Capacitance $\geq 30pF$ : $Q \geq 1,000$<br>$< 30pF$ : $Q \geq 400 + 20 \times C$<br>(C : Capacitance)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | $\leq 10\mu F$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1KHz $\pm 10\%$  | 1.0 $\pm 0.2$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $> 10\mu F$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 120Hz $\pm 20\%$ | 0.5 $\pm 0.1$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1KHz $\pm 10\%$  | 0.5 $\pm 0.1$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Capacitance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Frequency        | Voltage            |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $\leq 1,000pF$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1MHz $\pm 10\%$  | 0.5 ~ 5 Vrms       |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $> 1,000pF$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1KHz $\pm 10\%$  |                    |
|    |                       | CLASS II | 1. Characteristic: A(X5R)<br>Rated Voltage      Spec<br>50V / 35V      0.025 max / 0.05 max*<br>25V      0.025 max / 0.05 max* / 0.10 max*<br>16V      0.035 max / 0.05 max* / 0.10 max*<br>$\leq 10V$ 0.05 max / 0.10 max*<br>2. Characteristic: B(X7R), X(X6S), Y(X7S)<br>Rated Voltage      Spec<br>50V $\geq$ / 35V / 25V      0.025 max / 0.05 max* / 0.10 max*<br>16V      0.035 max / 0.10 max*<br>$\leq 10V$ 0.05 max / 0.10 max*<br>3. Characteristic: F(Y5V)<br>Rated Voltage      Spec<br>50V / 35V / 25V      0.05 max / 0.07 max* / 0.09 max*<br>16V      0.07 max / 0.09 max* / 0.125 max*<br>10V      0.125 max / 0.16 max*<br>$\leq 6.3V$ 0.16 max | $\leq 10\mu F$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1KHz $\pm 10\%$  | 1.0 $\pm 0.2$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $> 10\mu F$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 120Hz $\pm 20\%$ | 0.5 $\pm 0.1$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1KHz $\pm 10\%$  | 0.5 $\pm 0.1$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Capacitance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Frequency        | Voltage            |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $\leq 10\mu F$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1KHz $\pm 10\%$  | 1.0 $\pm 0.2$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $> 10\mu F$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 120Hz $\pm 20\%$ | 0.5 $\pm 0.1$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1KHz $\pm 10\%$  | 0.5 $\pm 0.1$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Capacitance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Frequency        | Voltage            |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $\leq 10\mu F$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 1KHz $\pm 10\%$  | 1.0 $\pm 0.2$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | $> 10\mu F$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 120Hz $\pm 20\%$ | 0.5 $\pm 0.1$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1KHz $\pm 10\%$  | 0.5 $\pm 0.1$ Vrms |
|    |                       |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | You can check the specification at the web site or contact sales people for each product with mark*                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                    |

| No                    | Item                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                     | Performance                                                                                                                                                                                                                                                                         | Test Condition                                                                                                                                                                                                                                                                                          |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------|----------|--------------|-------------|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------|--------|---|--------------------------|---|--------|
| 6                     | Temperature Characteristics of Capacitance                                                                                                                                                                                        | CLASS I                                                                                                                                                                                                                                                                                                             | <table><tr><th>Characteristic</th><th>Temp.Coefficient(PPM/°C)</th></tr><tr><td>C</td><td>0 ± 30</td></tr></table>                                                                                                                                                                  | Characteristic                                                                                                                                                                                                                                                                                          | Temp.Coefficient(PPM/°C) | C                                       | 0 ± 30       | Capacitance shall be measured by the steps shown in the following table<br><table><tr><th>Step</th><th>Temperature(°C)</th></tr><tr><td>1</td><td>25 ± 2</td></tr><tr><td>2</td><td>Min. Operating Temp. ± 2</td></tr><tr><td>3</td><td>25 ± 2</td></tr><tr><td>4</td><td>Max. Operating Temp. ± 2</td></tr><tr><td>5</td><td>25 ± 2</td></tr></table><br>(1) CLASS I<br>Temperature Coefficient shall be calculated from the formula as below<br>Temp. Coefficient= $\frac{C2 - C1}{C1 \times \Delta T} \times 10^6$ [ppm/°C]<br>C1: Capacitance at step 3<br>C2: Capacitance at 125°C<br>ΔT: 100°C(=125°C-25°C)<br>(2) CLASS II<br>Capacitance Change shall be calculated from the formula as below<br>$\Delta C = \frac{C2 - C1}{C1} \times 100(\%)$<br>C1: Capacitance at step 3<br>C2: Capacitance at step 2 or 4 | Step      | Temperature(°C)                | 1        | 25 ± 2       | 2           | Min. Operating Temp. ± 2   | 3                                                                                                                                   | 25 ± 2 | 4 | Max. Operating Temp. ± 2 | 5 | 25 ± 2 |
|                       |                                                                                                                                                                                                                                   | Characteristic                                                                                                                                                                                                                                                                                                      | Temp.Coefficient(PPM/°C)                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| C                     | 0 ± 30                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Step                  | Temperature(°C)                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| 1                     | 25 ± 2                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| 2                     | Min. Operating Temp. ± 2                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| 3                     | 25 ± 2                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| 4                     | Max. Operating Temp. ± 2                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| 5                     | 25 ± 2                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| CLASS II              | <table><tr><th>Characteristic</th><th>Capacitance Change(%) with No bias</th></tr><tr><td>A(X5R) / B(X7R)</td><td>± 15%</td></tr><tr><td>X(X6S), Y(X7S)</td><td>± 22%</td></tr><tr><td>F(Y5V)</td><td>+22%~-82%</td></tr></table> | Characteristic                                                                                                                                                                                                                                                                                                      | Capacitance Change(%) with No bias                                                                                                                                                                                                                                                  | A(X5R) / B(X7R)                                                                                                                                                                                                                                                                                         | ± 15%                    | X(X6S), Y(X7S)                          | ± 22%        | F(Y5V)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | +22%~-82% |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Characteristic        | Capacitance Change(%) with No bias                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| A(X5R) / B(X7R)       | ± 15%                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| X(X6S), Y(X7S)        | ± 22%                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| F(Y5V)                | +22%~-82%                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| 7                     | Adhesive Strength of Termination                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                     | No indication of peeling shall occur on the terminal electrode                                                                                                                                                                                                                      | Apply 500g.f* pressure for 10 ± 1 sec. *200g.f for 0201<br>*100g.f for 01005<br>                                                                                                                                    |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| 8                     | Appearance                                                                                                                                                                                                                        | No indication of peeling shall occur                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"><li>• Bending Limit: 1mm</li><li>• Test Speed: 1.0mm/sec.</li><li>• Keep the test board at the limit point in 5 sec.</li><li>• Then Measure Capacitance</li></ul>                 |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
|                       | Bending Strength                                                                                                                                                                                                                  | Capacitance                                                                                                                                                                                                                                                                                                         | <table><tr><th>Characteristic</th><th>Capacitance Change</th></tr><tr><td>CLASS I</td><td>± 5% or ± 0.5 pF whichever is larger</td></tr><tr><td rowspan="2">CLASS II</td><td>A(X5R), B(X7R), X(X6S), Y(X7S)</td><td>± 12.5%</td></tr><tr><td>F(Y5V)</td><td>± 30%</td></tr></table> |                                                                                                                                                                                                                                                                                                         | Characteristic           | Capacitance Change                      | CLASS I      | ± 5% or ± 0.5 pF whichever is larger                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | CLASS II  | A(X5R), B(X7R), X(X6S), Y(X7S) | ± 12.5%  | F(Y5V)       | ± 30%       |                            |                                                                                                                                     |        |   |                          |   |        |
| Characteristic        | Capacitance Change                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| CLASS I               | ± 5% or ± 0.5 pF whichever is larger                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| CLASS II              | A(X5R), B(X7R), X(X6S), Y(X7S)                                                                                                                                                                                                    | ± 12.5%                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
|                       | F(Y5V)                                                                                                                                                                                                                            | ± 30%                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| 9                     | Solderability                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                     | More than 75% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve<br>                                                                                   | <table><tr><td>Solder</td><td>Sn-3Ag-0.5Cu</td></tr><tr><td>Solder Temp.</td><td>245 ± 5°C</td></tr><tr><td>Flux</td><td>RMA Type</td></tr><tr><td>Dip time</td><td>3 ± 0.3 sec.</td></tr><tr><td>Pre-heating</td><td>at 80~120°C for 10~30 sec.</td></tr></table>                                      | Solder                   | Sn-3Ag-0.5Cu                            | Solder Temp. | 245 ± 5°C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Flux      | RMA Type                       | Dip time | 3 ± 0.3 sec. | Pre-heating | at 80~120°C for 10~30 sec. |                                                                                                                                     |        |   |                          |   |        |
| Solder                | Sn-3Ag-0.5Cu                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Solder Temp.          | 245 ± 5°C                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Flux                  | RMA Type                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Dip time              | 3 ± 0.3 sec.                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Pre-heating           | at 80~120°C for 10~30 sec.                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| 10                    | Appearance                                                                                                                                                                                                                        | No mechanical damage shall occur                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                     | Solder temperature: 270 ± 5°C DIP TIME: 10 ± 1 sec.<br>Each termination shall be fully immersed and preheated as below:<br><table><tr><th>Step</th><th>Temperature(°C)</th><th>Time (sec.)</th></tr><tr><td>1</td><td>80~100</td><td>60</td></tr><tr><td>2</td><td>150~180</td><td>60</td></tr></table> | Step                     | Temperature(°C)                         | Time (sec.)  | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 80~100    | 60                             | 2        | 150~180      | 60          |                            |                                                                                                                                     |        |   |                          |   |        |
|                       | Step                                                                                                                                                                                                                              | Temperature(°C)                                                                                                                                                                                                                                                                                                     | Time (sec.)                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
|                       | 1                                                                                                                                                                                                                                 | 80~100                                                                                                                                                                                                                                                                                                              | 60                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
|                       | 2                                                                                                                                                                                                                                 | 150~180                                                                                                                                                                                                                                                                                                             | 60                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
|                       | Capacitance                                                                                                                                                                                                                       | <table><tr><th>Characteristic</th><th>Capacitance Change</th></tr><tr><td>CLASS I</td><td>± 2.5% or ± 0.25 pF whichever is larger</td></tr><tr><td rowspan="2">CLASS II</td><td>A(X5R), B(X7R)</td><td>± 7.5%</td></tr><tr><td>X(X6S), Y(X7S)</td><td>± 20%</td></tr><tr><td>F(Y5V)</td><td>± 20%</td></tr></table> | Characteristic                                                                                                                                                                                                                                                                      | Capacitance Change                                                                                                                                                                                                                                                                                      | CLASS I                  | ± 2.5% or ± 0.25 pF whichever is larger | CLASS II     | A(X5R), B(X7R)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ± 7.5%    | X(X6S), Y(X7S)                 | ± 20%    | F(Y5V)       | ± 20%       |                            | Leave the capacitor in ambient condition for specified time* before measurement<br>*24 ± 2 hours(CLASS I)<br>24 ± 2 hours(CLASS II) |        |   |                          |   |        |
|                       |                                                                                                                                                                                                                                   | Characteristic                                                                                                                                                                                                                                                                                                      | Capacitance Change                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
|                       |                                                                                                                                                                                                                                   | CLASS I                                                                                                                                                                                                                                                                                                             | ± 2.5% or ± 0.25 pF whichever is larger                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
|                       | CLASS II                                                                                                                                                                                                                          | A(X5R), B(X7R)                                                                                                                                                                                                                                                                                                      | ± 7.5%                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| X(X6S), Y(X7S)        |                                                                                                                                                                                                                                   | ± 20%                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| F(Y5V)                | ± 20%                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Q (CLASS I)           | Within the specified initial value                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Tanδ (CLASS II)       | Within the specified initial value                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Insulation resistance | Within the specified initial value                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |
| Withstanding voltage  | Within the specified initial value                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                         |                          |                                         |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |           |                                |          |              |             |                            |                                                                                                                                     |        |   |                          |   |        |

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

| No                      | Item                                                                                                                                  | Performance             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Test Condition                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| 11                      | Vibration Test                                                                                                                        | Appearance              | No mechanical damage shall occur                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                    | The capacitor shall be subjected to a harmonic motion having a total amplitude of 1.5mm changing frequency from 10Hz to 55Hz and back to 10Hz in about 1 min.<br><br>Repeat this for 2hours each in 3 mutually perpendicular directions.                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                        |
|                         |                                                                                                                                       | Capacitance             | Characteristic                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Capacitance Change                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
|                         |                                                                                                                                       |                         | CLASS I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm 2.5\%$ or $\pm 0.25$ pF whichever is larger       |
|                         |                                                                                                                                       |                         | CLASS II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A(X5R), B(X7R)                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm 5\%$                                              |
|                         |                                                                                                                                       |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | X(X6S), Y(X7S)                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm 10\%$                                             |
|                         |                                                                                                                                       | F(Y5V)                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | $\pm 20\%$                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
|                         |                                                                                                                                       | Q (CLASS I)             | Within the specified initial value                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
| Tan $\delta$ (CLASS II) | Within the specified initial value                                                                                                    |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
| Insulation resistance   | Within the specified initial value                                                                                                    |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
| 12                      | Moisture Resistance                                                                                                                   | Appearance              | No mechanical damage shall occur                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                    | Applied Voltage: rated voltage<br>Temperature: $40 \pm 2^{\circ}\text{C}$<br>Humidity: 90~95% RH<br>Duration Time: 500+12/0 Hr.<br>Charge/Discharge Current: 50mA max.<br><br>Perform the initial measurement according to Note1.<br>Perform the final measurement according to Note2.<br><br>This test is only applied to $V_r \leq 500\text{V}$ products.<br>You can check the specification at the web site or contact sales people for each product with mark*                                                                                                                                                                                               |                                                        |
|                         |                                                                                                                                       | Capacitance             | Characteristic                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Capacitance Change                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
|                         |                                                                                                                                       |                         | CLASS I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm 7.5\%$ or $\pm 0.75\text{pF}$ whichever is larger |
|                         |                                                                                                                                       |                         | CLASS II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A(X5R), B(X7R), X(X6S), Y(X7S)                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm 12.5\%$                                           |
|                         |                                                                                                                                       |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | F(Y5V)                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm 30\%$                                             |
|                         |                                                                                                                                       | Q (CLASS I)             | Capacitance $\geq 30\text{pF}$ : $Q \geq 200$<br>$< 30\text{pF}$ : $Q \geq 100+10/3 \times C$ (C: Capacitance)                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
|                         |                                                                                                                                       | Tan $\delta$ (CLASS II) | 1.Capacitance: A(X5R)<br>0.05 max / 0.075 max* (35V / 50V)<br>0.05 max / 0.075 max* / 0.125 max*(16V / 25V)<br>0.075 max / 0.125 max* ( $\leq 10\text{V}$ )<br>2.Capacitance: B(X7R), X(X6S)<br>0.05 max / 0.125 max* (16V / 25V / 35V / 50V $\geq$ )<br>0.075 max / 0.125 max* ( $\leq 10\text{V}$ )<br>3.Capacitance: F(Y5V)<br>0.09 max (50V)<br>0.09 max / 0.125 max* (25V / 35V)<br>0.09 max / 0.125 max* / 0.16 max* (16V)<br>0.16 max / 0.195 max* (10V)<br>0.195 max (4V / 6.3V) |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
| Insulation resistance   | 500M $\Omega$ min. or 25M $\Omega \cdot \mu\text{F}$ min.<br>product whichever is smaller / 12.5M $\Omega \cdot \mu\text{F}$ or over* |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
| 13                      | High Temperature Resistance                                                                                                           | Appearance              | No mechanical damage shall occur                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                    | Temperature : max. operating temperature<br><br>Duration Time: 1000+48/0 Hr.<br>Charge/Discharge Current: 50mA max.<br><br>$V_r \leq 200\text{V}$ : 200% of the rated Voltage<br>$250\text{V} \leq V_r \leq 500\text{V}$ : 150% of the rated Voltage<br>$V_r = 630\text{V}$ : 120% of the rated Voltage<br>$1000\text{V} \leq V_r \leq 3000\text{V}$ : 100% of the rated Voltage<br>* : 150% or 100% of the rated Voltage<br><br>Perform the initial measurement according to Note1 for class II<br>Perform the final measurement according to Note2.<br><br>You can check the specification at the web site or contact sales people for each product with mark* |                                                        |
|                         |                                                                                                                                       | Capacitance             | Characteristic                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Capacitance Change                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
|                         |                                                                                                                                       |                         | CLASS I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm 3\%$ or $\pm 0.3$ pF whichever is larger          |
|                         |                                                                                                                                       |                         | CLASS II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | A(X5R), B(X7R), X(X6S), Y(X7S)                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm 12.5\%$                                           |
|                         |                                                                                                                                       |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | F(Y5V)                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | $\pm 30\%$                                             |
|                         |                                                                                                                                       | Q (CLASS I)             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Capacitance $\geq 30\text{pF}$ : $Q \geq 350$<br>$10 \leq \text{Capacitance} < 30\text{pF}$ : $Q \geq 275+2.5 \times C$<br>Capacitance $< 10\text{pF}$ : $Q \geq 200+10 \times C$ (C: Capacitance) |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
|                         |                                                                                                                                       | Tan $\delta$ (CLASS II) | 1.Capacitance: A(X5R)<br>0.05 max / 0.075 max* (35V / 50V)<br>0.05 max / 0.075 max* / 0.125 max*(16V / 25V)<br>0.075 max / 0.125 max* ( $\leq 10\text{V}$ )<br>2.Capacitance: B(X7R), X(X6S)<br>0.05 max / 0.125 max* (16V / 25V / 35V / 50V $\geq$ )<br>0.075 max / 0.125 max* ( $\leq 10\text{V}$ )<br>3.Capacitance: F(Y5V)<br>0.09 max (50V)<br>0.09 max / 0.125 max* (25V / 35V)<br>0.09 max / 0.125 max* / 0.16 max* (16V)<br>0.16 max / 0.195 max* (10V)<br>0.195 max (4V / 6.3V) |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |
| Insulation resistance   | 1,000M $\Omega$ min. or 50M $\Omega \cdot \mu\text{F}$ min.<br>product whichever is smaller / 25M $\Omega \cdot \mu\text{F}$ or over* |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                        |

| No                       | Item                                                  | Performance                |                                    |                         | Test Condition                                            |                                                                                                                                                |                                     |            |
|--------------------------|-------------------------------------------------------|----------------------------|------------------------------------|-------------------------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|------------|
| 14                       | Temperature Cycle                                     | Appearance                 | No mechanical damage shall occur   |                         |                                                           | Capacitor shall be subjected to 5 cycles.<br>Condition for 1 cycle:                                                                            |                                     |            |
|                          |                                                       | Capacitance                | Characteristic                     |                         | Capacitance Change                                        |                                                                                                                                                |                                     |            |
|                          |                                                       |                            | CLASS I                            |                         | $\pm 2.5\%$ or $\pm 0.25\text{pF}$<br>whichever is larger | Step                                                                                                                                           | Temperature( $^{\circ}\text{C}$ )   | Time(min.) |
|                          |                                                       |                            | CLASS II                           | A(X5R), B(X7R)          | $\pm 7.5\%$                                               | 1                                                                                                                                              | min. operating<br>temperature +0/-3 | 30         |
|                          |                                                       |                            |                                    | X(X6S), Y(X7S)          | $\pm 15\%$                                                | 2                                                                                                                                              | 25                                  | 2~3        |
|                          |                                                       |                            |                                    | F(Y5V)                  | $\pm 20\%$                                                | 3                                                                                                                                              | max. operating<br>temperature +0/-3 | 30         |
|                          |                                                       | Q<br>(CLASS I)             | Within the specified initial value |                         |                                                           | 4                                                                                                                                              | 25                                  | 2~3        |
|                          |                                                       | Tan $\delta$<br>(CLASS II) | Within the specified initial value |                         |                                                           | Leave the capacitor in ambient condition for specified time* before<br>measurement<br>*24 $\pm$ 2 hours(CLASS I)<br>24 $\pm$ 2 hours(CLASS II) |                                     |            |
| Insulation<br>resistance | Within the specified initial value                    |                            |                                    |                         |                                                           |                                                                                                                                                |                                     |            |
| No                       | Recommended Soldering Method                          |                            |                                    |                         |                                                           |                                                                                                                                                |                                     |            |
| 15                       | Recommended Soldering Method<br>By Size & Capacitance | Size<br>inch(mm)           | Temperature<br>Characteristic      | Capacitance             | Condition                                                 |                                                                                                                                                |                                     |            |
|                          |                                                       |                            |                                    |                         | Flow                                                      | Reflow                                                                                                                                         |                                     |            |
|                          |                                                       | 01005(0402)                | -                                  | -                       | -                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       | 0201 (0603)                |                                    |                         |                                                           |                                                                                                                                                |                                     |            |
|                          |                                                       | 0402 (1005)                |                                    |                         |                                                           |                                                                                                                                                |                                     |            |
|                          |                                                       | 0603(1608)                 | Class I                            | -                       | ○                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       |                            | Class II                           | $C < 1\mu\text{F}$      | ○                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       |                            |                                    | $C \geq 1\mu\text{F}$   | -                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       | 0805 (2012)                | Class I                            | -                       | ○                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       |                            | Class II                           | $C < 4.7\mu\text{F}$    | ○                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       |                            |                                    | $C \geq 4.7\mu\text{F}$ | -                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       |                            | Array                              | -                       | -                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       | 1206 (3216)                | Class I                            | -                       | ○                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       |                            | Class II                           | $C < 10\mu\text{F}$     | ○                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       |                            |                                    | $C \geq 10\mu\text{F}$  | -                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       |                            | Array                              | -                       | -                                                         | ○                                                                                                                                              |                                     |            |
|                          |                                                       | 1210 (3225)                | -                                  | -                       | -                                                         | ○                                                                                                                                              |                                     |            |
| 1808 (4520)              | ○                                                     |                            |                                    |                         |                                                           |                                                                                                                                                |                                     |            |
| 1812 (4532)              | ○                                                     |                            |                                    |                         |                                                           |                                                                                                                                                |                                     |            |
| 2220 (5750)              | ○                                                     |                            |                                    |                         |                                                           |                                                                                                                                                |                                     |            |

## Note1. Initial Measurement For Class II

Perform the heat treatment at 150°C+0/-10°C for 1 hour. Then Leave the capacitor in ambient condition for 24  $\pm$  2 hours before measurement. Then perform the measurement.

## Note2. Latter Measurement

## 1. CLASS I

Leave the capacitor in ambient condition for 24  $\pm$  2 hours before measurement. Then perform the measurement.

## 2. CLASS II

Perform the heat treatment at 150°C+0/-10°C for 1 hour. Then Leave the capacitor in ambient condition for 24  $\pm$  2 hours before measurement. Then perform the measurement.

Note3. All Size in Reliability Test Condition Section is "inch"

Note4. Camera Strobe Circuit Capacitors Should be Following a Special Reliability Test Condition.  
Please check with our sales representatives or product engineers.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

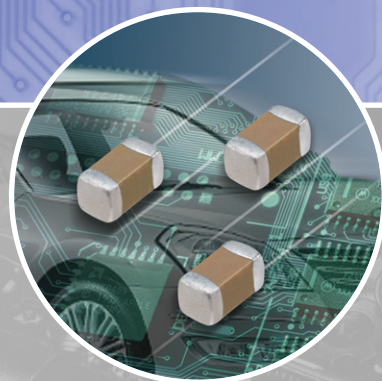


S A M S U N G E L E C T R O - M E C H A N I C S





*Premium Capacitors for Automotive Applications*



SAMSUNG  
ELECTRO-MECHANICS

SAMSUNG

# Premium Capacitors for Automotive Applications

## Part Numbering System (Automotive Capacitors)

|                                                                                                                                                                                                                                                                                                             | CL | 10 | B | 104 | K | B | 8 | 5 | P | N  | C  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|---|-----|---|---|---|---|---|----|----|
|                                                                                                                                                                                                                                                                                                             | 1  | 2  | 3 | 4   | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| <b>1. SERIES CODE</b> _____<br>CL=Multi layer Ceramic Capacitors                                                                                                                                                                                                                                            |    |    |   |     |   |   |   |   |   |    |    |
| <b>2. SIZE CODE</b> — <b>inch (mm)</b> _____<br>05=1005(0402)    10=1608(0603)    21=2012(0805)<br>31=3216(1206)    32=3225(1210)                                                                                                                                                                           |    |    |   |     |   |   |   |   |   |    |    |
| <b>3. DIELECTRIC CODE</b> _____<br>C=C0G (Class I)    B=X7R (Class II)                                                                                                                                                                                                                                      |    |    |   |     |   |   |   |   |   |    |    |
| <b>4. CAPACITANCE CODE</b> _____<br>Capacitance expressed in pF. 2 significant digits plus number of zeros.<br>example) 106=10 × 10 <sup>6</sup> =10000000pF<br>For Values < 10pF, Letter R denotes decimal point<br>example) 1R5=1.5pF                                                                     |    |    |   |     |   |   |   |   |   |    |    |
| <b>5. TOLERANCE CODE</b> _____<br>C=±0.25pF    D=±0.5pF    F=±1pF, ±1%*    G=±2%<br>J=±5%    K=±10%    M=±20%<br>*For Values ≤10pF, F=±1pF, Values>10pF, F=±1%<br>※This code has only typical specifications. Please refer to individual specifications.                                                    |    |    |   |     |   |   |   |   |   |    |    |
| <b>6. RATED VOLTAGE CODE</b> _____<br>P=10V    O=16V<br>A=25V    B=50V    C=100V                                                                                                                                                                                                                            |    |    |   |     |   |   |   |   |   |    |    |
| <b>7. THICKNESS CODE</b> _____<br>5 = 0.50mm    6= 0.60mm    8 = 0.80mm    C = 0.85mm<br>P = 1.15mm    F = 1.25mm    H = 1.60mm    J = 2.50mm<br>※This code has only typical specifications. Please refer to individual specifications.                                                                     |    |    |   |     |   |   |   |   |   |    |    |
| <b>8. DESIGN CODE</b> _____<br>1=Ni/Cu/Ni Barrier/Sn 100%/Standard<br>4=Ni/Cu+Ag-Epoxy/Ni Barrier/Sn 100%/Standard<br>5=Ni/Cu+Ag-Epoxy/Ni Barrier/Sn 100%/Open Mode<br>※This code has only typical specifications. Please refer to individual specifications.                                               |    |    |   |     |   |   |   |   |   |    |    |
| <b>9. PRODUCT CODE</b> _____<br>P=Automotive product meet AEC-Q-200.<br>※If orders are placed without returned specification, please allow us to judge that specification is accepted by your side.                                                                                                         |    |    |   |     |   |   |   |   |   |    |    |
| <b>10. GRADE CODE</b> _____<br>N=Standard                                                                                                                                                                                                                                                                   |    |    |   |     |   |   |   |   |   |    |    |
| <b>11. PACKAGING CODE</b> _____<br>B = Bulk    O = Cardboard Tape, 10" Reel    E = Embossed Type, 7" Reel<br>P = Bulk Case    D = Cardboard Tape, 13" Reel(10,000ea)    F = Embossed Type, 13" Reel<br>C = Cardboard Tape, 7" Reel    L = Cardboard Tape, 13" Reel(15,000ea)    S = Embossed Type, 10" Reel |    |    |   |     |   |   |   |   |   |    |    |

This catalog has only typical specifications because there is no space for detailed specifications.  
Please approve our product specifications or transact the approval sheet for product specifications before ordering.



★  
Class I

| Symbol | EIA Code | Operation Temperature Range(°C) | Temperature Coefficient Range(ppm/°C) |
|--------|----------|---------------------------------|---------------------------------------|
| C      | COG      | -55 ~ +125                      | 0 ±30                                 |

## Class II

| Symbol | EIA Code | Operation Temperature Range(°C) | Capacitance Change (ΔC %) |
|--------|----------|---------------------------------|---------------------------|
| B      | X7R      | -55 ~ +125                      | 0 ±15                     |

★★  
Capacitance Tolerance

| Code | Capacitance Tolerance | TC  | Capacitance Step | Rated Capacitance |
|------|-----------------------|-----|------------------|-------------------|
| C    | ± 0.25 pF             | COG | Under 5 pF       | E-12 series ★     |
| D    | ± 0.5 pF              | COG | 6.0 to 9.0 pF    | E-12 series ★     |
| J    | ± 5 %                 | COG | Over 10 pF       | E-12 series       |
| K    | ± 10 %                | X7R | Under 0.01 μF    | E-3 series        |
|      |                       |     | Over 0.01 μF     | E-6 series        |
| M    | ± 20 %                | X7R | Under 0.01 μF    | E-3 series        |
|      |                       |     | Over 0.01 μF     | E-6 series        |

★E-24 series is also available

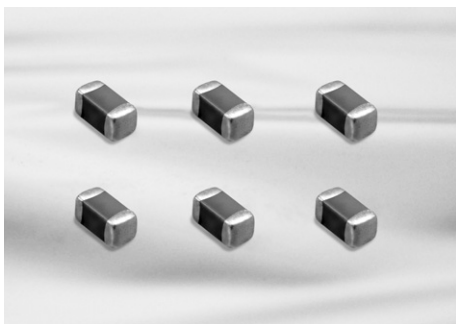
| Series | Capacitance Step |     |     |     |     |     |     |     |     |     |     |     |
|--------|------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| E-3    | 1.0              |     |     |     | 2.2 |     |     |     | 4.7 |     |     |     |
| E-6    | 1.0              |     | 1.5 |     | 2.2 |     | 3.3 |     | 4.7 |     | 6.8 |     |
| E-12   | 1.0              | 1.2 | 1.5 | 1.8 | 2.2 | 2.7 | 3.3 | 3.9 | 4.7 | 5.6 | 6.8 | 8.2 |
| E-24   | 1.0              | 1.1 | 1.2 | 1.3 | 2.2 | 2.4 | 2.7 | 3.0 | 4.7 | 5.1 | 5.6 | 6.2 |
|        | 1.5              | 1.6 | 1.8 | 2.0 | 3.3 | 3.6 | 3.9 | 4.3 | 6.8 | 7.5 | 8.2 | 9.1 |

## ★★★

| Size       | Code | Thickness(mm) | Spec(mm) ★ |
|------------|------|---------------|------------|
| 0402(1005) | 5    | 0.50          | ±0.05      |
| 0603(1608) | 8    | 0.80          | ±0.10      |
| 0805(2012) | 6    | 0.60          | ±0.10      |
|            | C    | 0.85          | ±0.10      |
|            | F    | 1.25          | ±0.10      |
| 1206(3216) | C    | 0.85          | ±0.15      |
|            | P    | 1.15          | ±0.10      |
|            | H    | 1.60          | ±0.20      |

★The tolerance will be changed by Customer' standards and our new products. (High Capacitance)  
Please check with our sales representatives or product engineers before ordering.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting



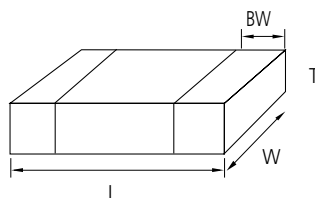
## Feature

- Automotive products are manufactured in state of the art facilities recommended for registration to ISO/TS 16949:2002.
- Automotive products meet AEC-Q-200 requirements.
- Automotive products are RoHS compliant.
- Samsung terminations are suitable for all flow and reflow soldering systems. (10/21/31 size type only)
- Automotive products meet JEDEC-020-D requirements.
- COG dielectric components contain BME and copper terminations with a Ni/Sn plated overcoat.
- X7R dielectric components have BME and soft terminations with a Ni/Sn plated overcoat.

## Application

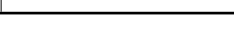
- Automotive Electronic Equipment  
(Powertrain, Safety, Body & Chassis, Convenience, Infotainment)

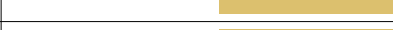
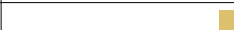
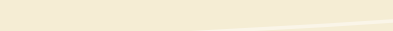
## Structure and Dimensions



| Code | EIA Code | Dimension(mm)   |                 |                   |                    |
|------|----------|-----------------|-----------------|-------------------|--------------------|
|      |          | L               | W               | T                 | BW                 |
| 05   | 0402     | $1.00 \pm 0.05$ | $0.50 \pm 0.05$ | $0.50 (\pm 0.05)$ | $0.2+0.15/-0.1$    |
| 10   | 0603     | $1.60 \pm 0.10$ | $0.80 \pm 0.10$ | $0.80 (\pm 0.10)$ | $0.3 \pm 0.2$      |
| 21   | 0805     | $2.00 \pm 0.10$ | $1.25 \pm 0.10$ | $0.60 (\pm 0.10)$ | $0.5 \pm 0.2/-0.3$ |
|      |          |                 |                 | $0.85 (\pm 0.10)$ |                    |
|      |          |                 |                 | $1.25 (\pm 0.10)$ |                    |
| 31   | 1206     | $3.20 \pm 0.20$ | $1.60 \pm 0.20$ | $0.85 (\pm 0.15)$ | $0.5 \pm 0.3$      |
|      |          |                 |                 | $1.15 (\pm 0.10)$ |                    |
|      |          |                 |                 | $1.60 (\pm 0.20)$ |                    |

Automotive Capacitors Table (C0G, X7R)

| TC  | Size(mm)   | Vr  | Capacitance (pF)                                                                   |     |     | Capacitance (nF) |     |     |    |    |    |     |
|-----|------------|-----|------------------------------------------------------------------------------------|-----|-----|------------------|-----|-----|----|----|----|-----|
|     |            |     | 100                                                                                | 220 | 470 | 1                | 2.2 | 4.7 | 10 | 22 | 47 | 100 |
| COG | 0402(1005) | 50  |   |     |     |                  |     |     |    |    |    |     |
|     |            | 100 |   |     |     |                  |     |     |    |    |    |     |
|     | 0603(1608) | 50  |   |     |     |                  |     |     |    |    |    |     |
|     |            | 100 |   |     |     |                  |     |     |    |    |    |     |
|     | 0805(2012) | 50  |  |     |     |                  |     |     |    |    |    |     |
|     |            | 100 |   |     |     |                  |     |     |    |    |    |     |

| TC  | Size(mm)   | Thickness (mm) | Vr  | Capacitance (nF)                                                                     |    |    |     |     |     | Capacitance (uF) |     |     |    |
|-----|------------|----------------|-----|--------------------------------------------------------------------------------------|----|----|-----|-----|-----|------------------|-----|-----|----|
|     |            |                |     | 10                                                                                   | 22 | 47 | 100 | 220 | 470 | 1                | 2.2 | 4.7 | 10 |
| X7R | 0603(1608) | 0.8            | 10  |    |    |    |     |     |     |                  |     |     |    |
|     |            | 0.8            | 16  |    |    |    |     |     |     |                  |     |     |    |
|     |            | 0.8            | 25  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 0.8            | 50  |   |    |    |     |     |     |                  |     |     |    |
|     |            | 0.8            | 100 |   |    |    |     |     |     |                  |     |     |    |
|     | 0805(2012) | 1.25           | 10  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 0.85           | 16  |   |    |    |     |     |     |                  |     |     |    |
|     |            | 1.25           | 16  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 0.6            | 25  |   |    |    |     |     |     |                  |     |     |    |
|     |            | 0.85           | 25  |   |    |    |     |     |     |                  |     |     |    |
|     |            | 1.25           | 25  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 0.6            | 50  |   |    |    |     |     |     |                  |     |     |    |
|     |            | 0.85           | 50  |   |    |    |     |     |     |                  |     |     |    |
|     |            | 1.25           | 50  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 0.6            | 100 |   |    |    |     |     |     |                  |     |     |    |
|     |            | 0.85           | 100 |   |    |    |     |     |     |                  |     |     |    |
|     |            | 1.25           | 100 |   |    |    |     |     |     |                  |     |     |    |
|     | 1206(3216) | 1.6            | 10  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 1.15           | 16  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 1.6            | 16  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 0.85           | 25  |   |    |    |     |     |     |                  |     |     |    |
|     |            | 1.15           | 25  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 1.6            | 25  |  |    |    |     |     |     |                  |     |     |    |
|     |            | 0.85           | 50  |   |    |    |     |     |     |                  |     |     |    |
|     |            | 1.15           | 50  |   |    |    |     |     |     |                  |     |     |    |
|     |            | 1.6            | 50  |  |    |    |     |     |     |                  |     |     |    |

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

## Product Lineup (Automotive Capacitors\_COG)

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 1  | CL05C010CB51PN □ | 1.00×0.50        | 1.0pF       | 50                        | ±0.25pF                  | 0.55                   |
| 2  | CL05C010CC51PN □ |                  | 1.0pF       | 100                       | ±0.25pF                  | 0.55                   |
| 3  | CL05C1R5CB51PN □ |                  | 1.5pF       | 50                        | ±0.25pF                  | 0.55                   |
| 4  | CL05C1R5CC51PN □ |                  | 1.5pF       | 100                       | ±0.25pF                  | 0.55                   |
| 5  | CL05C2R2CB51PN □ |                  | 2.2pF       | 50                        | ±0.25pF                  | 0.55                   |
| 6  | CL05C2R2CC51PN □ |                  | 2.2pF       | 100                       | ±0.25pF                  | 0.55                   |
| 7  | CL05C3R3CB51PN □ |                  | 3.3pF       | 50                        | ±0.25pF                  | 0.55                   |
| 8  | CL05C3R3CC51PN □ |                  | 3.3pF       | 100                       | ±0.25pF                  | 0.55                   |
| 9  | CL05C4R7CB51PN □ |                  | 4.7pF       | 50                        | ±0.25pF                  | 0.55                   |
| 10 | CL05C4R7CC51PN □ |                  | 4.7pF       | 100                       | ±0.25pF                  | 0.55                   |
| 11 | CL05C6R8DB51PN □ |                  | 6.8pF       | 50                        | ±0.5pF                   | 0.55                   |
| 12 | CL05C6R8DC51PN □ |                  | 6.8pF       | 100                       | ±0.5pF                   | 0.55                   |
| 13 | CL05C100JB51PN □ |                  | 10pF        | 50                        | ±5%                      | 0.55                   |
| 14 | CL05C100JC51PN □ |                  | 10pF        | 100                       | ±5%                      | 0.55                   |
| 15 | CL05C120JB51PN □ |                  | 12pF        | 50                        | ±5%                      | 0.55                   |
| 16 | CL05C120JC51PN □ |                  | 12pF        | 100                       | ±5%                      | 0.55                   |
| 17 | CL05C150JB51PN □ |                  | 15pF        | 50                        | ±5%                      | 0.55                   |
| 18 | CL05C150JC51PN □ |                  | 15pF        | 100                       | ±5%                      | 0.55                   |
| 19 | CL05C180JB51PN □ |                  | 18pF        | 50                        | ±5%                      | 0.55                   |
| 20 | CL05C180JC51PN □ |                  | 18pF        | 100                       | ±5%                      | 0.55                   |
| 21 | CL05C220JB51PN □ |                  | 22pF        | 50                        | ±5%                      | 0.55                   |
| 22 | CL05C220JC51PN □ |                  | 22pF        | 100                       | ±5%                      | 0.55                   |
| 23 | CL05C270JB51PN □ |                  | 27pF        | 50                        | ±5%                      | 0.55                   |
| 24 | CL05C270JC51PN □ |                  | 27pF        | 100                       | ±5%                      | 0.55                   |
| 25 | CL05C330JB51PN □ |                  | 33pF        | 50                        | ±5%                      | 0.55                   |
| 26 | CL05C330JC51PN □ |                  | 33pF        | 100                       | ±5%                      | 0.55                   |
| 27 | CL05C390JB51PN □ |                  | 39pF        | 50                        | ±5%                      | 0.55                   |
| 28 | CL05C390JC51PN □ |                  | 39pF        | 100                       | ±5%                      | 0.55                   |
| 29 | CL05C470JB51PN □ |                  | 47pF        | 50                        | ±5%                      | 0.55                   |
| 30 | CL05C470JC51PN □ |                  | 47pF        | 100                       | ±5%                      | 0.55                   |
| 31 | CL05C560JB51PN □ |                  | 56pF        | 50                        | ±5%                      | 0.55                   |
| 32 | CL05C560JC51PN □ |                  | 56pF        | 100                       | ±5%                      | 0.55                   |
| 33 | CL05C680JB51PN □ |                  | 68pF        | 50                        | ±5%                      | 0.55                   |
| 34 | CL05C680JC51PN □ |                  | 68pF        | 100                       | ±5%                      | 0.55                   |
| 35 | CL05C820JB51PN □ |                  | 82pF        | 50                        | ±5%                      | 0.55                   |
| 36 | CL05C820JC51PN □ |                  | 82pF        | 100                       | ±5%                      | 0.55                   |
| 37 | CL05C101JB51PN □ |                  | 100pF       | 50                        | ±5%                      | 0.55                   |
| 38 | CL05C101JC51PN □ |                  | 100pF       | 100                       | ±5%                      | 0.55                   |
| 39 | CL05C121JB51PN □ |                  | 120pF       | 50                        | ±5%                      | 0.55                   |
| 40 | CL05C151JB51PN □ |                  | 150pF       | 50                        | ±5%                      | 0.55                   |
| 41 | CL05C221JB51PN □ |                  | 220pF       | 50                        | ±5%                      | 0.55                   |
| 1  | CL10C010CB81PN □ | 1.60×0.80        | 1.0pF       | 50                        | ±0.25pF                  | 0.9                    |
| 2  | CL10C010CC81PN □ |                  | 1.0pF       | 100                       | ±0.25pF                  | 0.9                    |
| 3  | CL10C1R5CB81PN □ |                  | 1.5pF       | 50                        | ±0.25pF                  | 0.9                    |
| 4  | CL10C1R5CC81PN □ |                  | 1.5pF       | 100                       | ±0.25pF                  | 0.9                    |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

## Product Lineup (Automotive Capacitors\_COG)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 5  | CL10C2R2CB81PN □ | 1.60 × 0.80     | 2.2 pF      | 50                  | ±0.25 pF              | 0.9                 |
| 6  | CL10C2R2CC81PN □ |                 | 2.2 pF      | 100                 | ±0.25 pF              | 0.9                 |
| 7  | CL10C3R3CB81PN □ |                 | 3.3 pF      | 50                  | ±0.25 pF              | 0.9                 |
| 8  | CL10C3R3CC81PN □ |                 | 3.3 pF      | 100                 | ±0.25 pF              | 0.9                 |
| 9  | CL10C4R7CB81PN □ |                 | 4.7 pF      | 50                  | ±0.25 pF              | 0.9                 |
| 10 | CL10C4R7CC81PN □ |                 | 4.7 pF      | 100                 | ±0.25 pF              | 0.9                 |
| 11 | CL10C6R8DB81PN □ |                 | 6.8 pF      | 50                  | ±0.5 pF               | 0.9                 |
| 12 | CL10C6R8DC81PN □ |                 | 6.8 pF      | 100                 | ±0.5 pF               | 0.9                 |
| 13 | CL10C100JB81PN □ |                 | 10 pF       | 50                  | ±5%                   | 0.9                 |
| 14 | CL10C100JC81PN □ |                 | 10 pF       | 100                 | ±5%                   | 0.9                 |
| 15 | CL10C120JB81PN □ |                 | 12 pF       | 50                  | ±5%                   | 0.9                 |
| 16 | CL10C120JC81PN □ |                 | 12 pF       | 100                 | ±5%                   | 0.9                 |
| 17 | CL10C150JB81PN □ |                 | 15 pF       | 50                  | ±5%                   | 0.9                 |
| 18 | CL10C150JC81PN □ |                 | 15 pF       | 100                 | ±5%                   | 0.9                 |
| 19 | CL10C180JB81PN □ |                 | 18 pF       | 50                  | ±5%                   | 0.9                 |
| 20 | CL10C180JC81PN □ |                 | 18 pF       | 100                 | ±5%                   | 0.9                 |
| 21 | CL10C220JB81PN □ |                 | 22 pF       | 50                  | ±5%                   | 0.9                 |
| 22 | CL10C220JC81PN □ |                 | 22 pF       | 100                 | ±5%                   | 0.9                 |
| 23 | CL10C270JB81PN □ |                 | 27 pF       | 50                  | ±5%                   | 0.9                 |
| 24 | CL10C270JC81PN □ |                 | 27 pF       | 100                 | ±5%                   | 0.9                 |
| 25 | CL10C330JB81PN □ |                 | 33 pF       | 50                  | ±5%                   | 0.9                 |
| 26 | CL10C330JC81PN □ |                 | 33 pF       | 100                 | ±5%                   | 0.9                 |
| 27 | CL10C390JB81PN □ |                 | 39 pF       | 50                  | ±5%                   | 0.9                 |
| 28 | CL10C390JC81PN □ |                 | 39 pF       | 100                 | ±5%                   | 0.9                 |
| 29 | CL10C470JB81PN □ |                 | 47 pF       | 50                  | ±5%                   | 0.9                 |
| 30 | CL10C470JC81PN □ |                 | 47 pF       | 100                 | ±5%                   | 0.9                 |
| 31 | CL10C560JB81PN □ |                 | 56 pF       | 50                  | ±5%                   | 0.9                 |
| 32 | CL10C560JC81PN □ |                 | 56 pF       | 100                 | ±5%                   | 0.9                 |
| 33 | CL10C680JB81PN □ |                 | 68 pF       | 50                  | ±5%                   | 0.9                 |
| 34 | CL10C680JC81PN □ |                 | 68 pF       | 100                 | ±5%                   | 0.9                 |
| 35 | CL10C820JB81PN □ |                 | 82 pF       | 50                  | ±5%                   | 0.9                 |
| 36 | CL10C820JC81PN □ |                 | 82 pF       | 100                 | ±5%                   | 0.9                 |
| 37 | CL10C101JB81PN □ |                 | 100 pF      | 50                  | ±5%                   | 0.9                 |
| 38 | CL10C101JC81PN □ |                 | 100 pF      | 100                 | ±5%                   | 0.9                 |
| 39 | CL10C121JB81PN □ |                 | 120 pF      | 50                  | ±5%                   | 0.9                 |
| 40 | CL10C151JB81PN □ |                 | 150 pF      | 50                  | ±5%                   | 0.9                 |
| 41 | CL10C221JB81PN □ |                 | 220 pF      | 50                  | ±5%                   | 0.9                 |
| 42 | CL10C271JB81PN □ |                 | 270 pF      | 50                  | ±5%                   | 0.9                 |
| 43 | CL10C331JB81PN □ |                 | 330 pF      | 50                  | ±5%                   | 0.9                 |
| 44 | CL10C391JB81PN □ |                 | 390 pF      | 50                  | ±5%                   | 0.9                 |
| 45 | CL10C471JB81PN □ |                 | 470 pF      | 50                  | ±5%                   | 0.9                 |
| 46 | CL10C561JB81PN □ |                 | 560 pF      | 50                  | ±5%                   | 0.9                 |
| 47 | CL10C681JB81PN □ |                 | 680 pF      | 50                  | ±5%                   | 0.9                 |
| 48 | CL10C821JB81PN □ |                 | 820 pF      | 50                  | ±5%                   | 0.9                 |
| 49 | CL10C102JB81PN □ |                 | 1000 pF     | 50                  | ±5%                   | 0.9                 |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

## Product Lineup (Automotive Capacitors\_COG)

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 1  | CL21C100JB61PN □ | 2.00×1.25        | 10pF        | 50                        | ±5%                      | 0.7                    |
| 2  | CL21C100JC61PN □ |                  | 10pF        | 100                       | ±5%                      | 0.7                    |
| 3  | CL21C120JB61PN □ |                  | 12pF        | 50                        | ±5%                      | 0.7                    |
| 4  | CL21C120JC61PN □ |                  | 12pF        | 100                       | ±5%                      | 0.7                    |
| 5  | CL21C150JB61PN □ |                  | 15pF        | 50                        | ±5%                      | 0.7                    |
| 6  | CL21C150JC61PN □ |                  | 15pF        | 100                       | ±5%                      | 0.7                    |
| 7  | CL21C180JB61PN □ |                  | 18pF        | 50                        | ±5%                      | 0.7                    |
| 8  | CL21C180JC61PN □ |                  | 18pF        | 100                       | ±5%                      | 0.7                    |
| 9  | CL21C220JB61PN □ |                  | 22pF        | 50                        | ±5%                      | 0.7                    |
| 10 | CL21C220JC61PN □ |                  | 22pF        | 100                       | ±5%                      | 0.7                    |
| 11 | CL21C270JC61PN □ |                  | 27pF        | 100                       | ±5%                      | 0.7                    |
| 12 | CL21C330JB61PN □ |                  | 33pF        | 50                        | ±5%                      | 0.7                    |
| 13 | CL21C330JC61PN □ |                  | 33pF        | 100                       | ±5%                      | 0.7                    |
| 14 | CL21C390JB61PN □ |                  | 39pF        | 50                        | ±5%                      | 0.7                    |
| 15 | CL21C390JC61PN □ |                  | 39pF        | 100                       | ±5%                      | 0.7                    |
| 16 | CL21C470JB61PN □ |                  | 47pF        | 50                        | ±5%                      | 0.7                    |
| 17 | CL21C470JC61PN □ |                  | 47pF        | 100                       | ±5%                      | 0.7                    |
| 18 | CL21C560JB61PN □ |                  | 56pF        | 50                        | ±5%                      | 0.7                    |
| 19 | CL21C560JC61PN □ |                  | 56pF        | 100                       | ±5%                      | 0.7                    |
| 20 | CL21C680JB61PN □ |                  | 68pF        | 50                        | ±5%                      | 0.7                    |
| 21 | CL21C680JC61PN □ |                  | 68pF        | 100                       | ±5%                      | 0.7                    |
| 22 | CL21C820JB61PN □ |                  | 82pF        | 50                        | ±5%                      | 0.7                    |
| 23 | CL21C820JC61PN □ |                  | 82pF        | 100                       | ±5%                      | 0.7                    |
| 24 | CL21C101JB61PN □ |                  | 100pF       | 50                        | ±5%                      | 0.7                    |
| 25 | CL21C101JC61PN □ |                  | 100pF       | 100                       | ±5%                      | 0.7                    |
| 26 | CL21C121JB61PN □ |                  | 120pF       | 50                        | ±5%                      | 0.7                    |
| 27 | CL21C121JC61PN □ |                  | 120pF       | 100                       | ±5%                      | 0.7                    |
| 28 | CL21C151JB61PN □ |                  | 150pF       | 50                        | ±5%                      | 0.7                    |
| 29 | CL21C151JC61PN □ |                  | 150pF       | 100                       | ±5%                      | 0.7                    |
| 30 | CL21C221JB61PN □ |                  | 220pF       | 50                        | ±5%                      | 0.7                    |
| 31 | CL21C221JC61PN □ |                  | 220pF       | 100                       | ±5%                      | 0.7                    |
| 32 | CL21C271JB61PN □ |                  | 270pF       | 50                        | ±5%                      | 0.7                    |
| 33 | CL21C271JC61PN □ |                  | 270pF       | 100                       | ±5%                      | 0.7                    |
| 34 | CL21C331JB61PN □ |                  | 330pF       | 50                        | ±5%                      | 0.7                    |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.



## Product Lineup (Automotive Capacitors\_COG)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 35 | CL21C331JC61PN □ | 2.00 × 1.25     | 330pF       | 100                 | ±5%                   | 0.7                 |
| 36 | CL21C471JBC1PN □ |                 | 470pF       | 50                  | ±5%                   | 0.95                |
| 37 | CL21C471JCC1PN □ |                 | 470pF       | 100                 | ±5%                   | 0.95                |
| 38 | CL21C561JBC1PN □ |                 | 560pF       | 50                  | ±5%                   | 0.95                |
| 39 | CL21C561JCC1PN □ |                 | 560pF       | 100                 | ±5%                   | 0.95                |
| 40 | CL21C681JBC1PN □ |                 | 680pF       | 50                  | ±5%                   | 0.95                |
| 41 | CL21C681JCC1PN □ |                 | 680pF       | 100                 | ±5%                   | 0.95                |
| 42 | CL21C821JBC1PN □ |                 | 820pF       | 50                  | ±5%                   | 0.95                |
| 43 | CL21C821JCC1PN □ |                 | 820pF       | 100                 | ±5%                   | 0.95                |
| 44 | CL21C102JBC1PN □ |                 | 1000pF      | 50                  | ±5%                   | 0.95                |
| 45 | CL21C102JCC1PN □ |                 | 1000pF      | 100                 | ±5%                   | 0.95                |
| 46 | CL21C102JCF1PN □ |                 | 1000pF      | 100                 | ±5%                   | 1.35                |
| 47 | CL21C122JBC1PN □ |                 | 1200pF      | 50                  | ±5%                   | 0.95                |
| 48 | CL21C152JBC1PN □ |                 | 1500pF      | 50                  | ±5%                   | 0.95                |
| 49 | CL21C182JBC1PN □ |                 | 1800pF      | 50                  | ±5%                   | 0.95                |
| 50 | CL21C222JBC1PN □ |                 | 2200pF      | 50                  | ±5%                   | 0.95                |
| 51 | CL21C272JBC1PN □ |                 | 2700pF      | 50                  | ±5%                   | 0.95                |
| 52 | CL21C332JBC1PN □ |                 | 3300pF      | 50                  | ±5%                   | 0.95                |
| 53 | CL21C392JBC1PN □ |                 | 3900pF      | 50                  | ±5%                   | 0.95                |
| 54 | CL21C472JBC1PN □ |                 | 4700pF      | 50                  | ±5%                   | 0.95                |
| 55 | CL21C562JBC1PN □ |                 | 5600pF      | 50                  | ±5%                   | 0.95                |
| 56 | CL21C102JBF1PN □ |                 | 1000pF      | 50                  | ±5%                   | 1.35                |
| 57 | CL21C122JBF1PN □ |                 | 1200pF      | 50                  | ±5%                   | 1.35                |
| 58 | CL21C152JBF1PN □ |                 | 1500pF      | 50                  | ±5%                   | 1.35                |
| 59 | CL21C182JBF1PN □ |                 | 1800pF      | 50                  | ±5%                   | 1.35                |
| 60 | CL21C222JBF1PN □ |                 | 2200pF      | 50                  | ±5%                   | 1.35                |
| 61 | CL21C272JBF1PN □ |                 | 2700pF      | 50                  | ±5%                   | 1.35                |
| 62 | CL21C332JBF1PN □ |                 | 3300pF      | 50                  | ±5%                   | 1.35                |
| 63 | CL21C392JBF1PN □ |                 | 3900pF      | 50                  | ±5%                   | 1.35                |
| 64 | CL21C472JBF1PN □ |                 | 4700pF      | 50                  | ±5%                   | 1.35                |
| 65 | CL21C562JBF1PN □ |                 | 5600pF      | 50                  | ±5%                   | 1.35                |
| 66 | CL21C682JBF1PN □ |                 | 6800pF      | 50                  | ±5%                   | 1.35                |
| 67 | CL21C822JBF1PN □ |                 | 8200pF      | 50                  | ±5%                   | 1.35                |
| 68 | CL21C103JBF1PN □ |                 | 10000pF     | 50                  | ±5%                   | 1.35                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering  
System

General  
Capacitors

High Capacitance  
Capacitors

Super Small Size  
Capacitors

Medium-High  
Voltage Capacitors

Array Type  
Capacitors

Low ESL  
Capacitors

Reliability Test  
Condition

Premium Capacitors  
for Automotive  
Applications

Packaging  
Specification

Application Manual  
for Surface Mounting

## Product Lineup (Automotive Capacitors\_X7R)

|    | Part Number      | Size L×W<br>(mm) | Capacitance | Rated<br>Voltage<br>(Vdc) | Capacitance<br>Tolerance | Thickness<br>Max. (mm) |
|----|------------------|------------------|-------------|---------------------------|--------------------------|------------------------|
| 1  | CL10B221KC85PN □ | 1.60×0.80        | 0.22nF      | 100                       | ±10%                     | 0.90                   |
| 2  | CL10B471KC85PN □ |                  | 0.47nF      | 100                       | ±10%                     | 0.90                   |
| 3  | CL10B102KB85PN □ |                  | 1.0nF       | 50                        | ±10%                     | 0.90                   |
| 4  | CL10B102KC85PN □ |                  | 1.0nF       | 100                       | ±10%                     | 0.90                   |
| 5  | CL10B222KB85PN □ |                  | 2.2nF       | 50                        | ±10%                     | 0.90                   |
| 6  | CL10B222KC85PN □ |                  | 2.2nF       | 100                       | ±10%                     | 0.90                   |
| 7  | CL10B472KB85PN □ |                  | 4.7nF       | 50                        | ±10%                     | 0.90                   |
| 8  | CL10B472KC85PN □ |                  | 4.7nF       | 100                       | ±10%                     | 0.90                   |
| 9  | CL10B103KA85PN □ |                  | 10nF        | 25                        | ±10%                     | 0.90                   |
| 10 | CL10B103KB85PN □ |                  | 10nF        | 50                        | ±10%                     | 0.90                   |
| 11 | CL10B103KC85PN □ |                  | 10nF        | 100                       | ±10%                     | 0.90                   |
| 12 | CL10B153KA85PN □ |                  | 15nF        | 25                        | ±10%                     | 0.90                   |
| 13 | CL10B153KB85PN □ |                  | 15nF        | 50                        | ±10%                     | 0.90                   |
| 14 | CL10B223KA85PN □ |                  | 22nF        | 25                        | ±10%                     | 0.90                   |
| 15 | CL10B223KB85PN □ |                  | 22nF        | 50                        | ±10%                     | 0.90                   |
| 16 | CL10B333KA85PN □ |                  | 33nF        | 25                        | ±10%                     | 0.90                   |
| 17 | CL10B333KB85PN □ |                  | 33nF        | 50                        | ±10%                     | 0.90                   |
| 18 | CL10B473KO85PN □ |                  | 47nF        | 16                        | ±10%                     | 0.90                   |
| 19 | CL10B473KA85PN □ |                  | 47nF        | 25                        | ±10%                     | 0.90                   |
| 20 | CL10B473KB85PN □ |                  | 47nF        | 50                        | ±10%                     | 0.90                   |
| 21 | CL10B683KO85PN □ |                  | 68nF        | 16                        | ±10%                     | 0.90                   |
| 22 | CL10B683KA85PN □ |                  | 68nF        | 25                        | ±10%                     | 0.90                   |
| 23 | CL10B683KB85PN □ |                  | 68nF        | 50                        | ±10%                     | 0.90                   |
| 24 | CL10B104KO85PN □ |                  | 100nF       | 16                        | ±10%                     | 0.90                   |
| 25 | CL10B104KA85PN □ |                  | 100nF       | 25                        | ±10%                     | 0.90                   |
| 26 | CL10B104KB85PN □ |                  | 100nF       | 50                        | ±10%                     | 0.90                   |
| 27 | CL10B154KO84PN □ |                  | 150nF       | 16                        | ±10%                     | 0.90                   |
| 28 | CL10B154KA84PN □ |                  | 150nF       | 25                        | ±10%                     | 0.90                   |
| 29 | CL10B224KO84PN □ |                  | 220nF       | 16                        | ±10%                     | 0.90                   |
| 30 | CL10B224KA84PN □ |                  | 220nF       | 25                        | ±10%                     | 0.90                   |
| 31 | CL10B334KO84PN □ |                  | 330nF       | 16                        | ±10%                     | 0.90                   |
| 32 | CL10B334KA84PN □ |                  | 330nF       | 25                        | ±10%                     | 0.90                   |
| 33 | CL10B474KO84PN □ |                  | 470nF       | 16                        | ±10%                     | 0.90                   |
| 34 | CL10B474KA84PN □ |                  | 470nF       | 25                        | ±10%                     | 0.90                   |
| 1  | CL21B102KB65PN □ | 2.00×1.25        | 1.0nF       | 50                        | ±10%                     | 0.70                   |
| 2  | CL21B102KC65PN □ |                  | 1.0nF       | 100                       | ±10%                     | 0.70                   |
| 3  | CL21B222KB65PN □ |                  | 2.2nF       | 50                        | ±10%                     | 0.70                   |
| 4  | CL21B222KC65PN □ |                  | 2.2nF       | 100                       | ±10%                     | 0.70                   |
| 5  | CL21B472KB65PN □ |                  | 4.7nF       | 50                        | ±10%                     | 0.70                   |
| 6  | CL21B472KC65PN □ |                  | 4.7nF       | 100                       | ±10%                     | 0.70                   |
| 7  | CL21B103KB65PN □ |                  | 10nF        | 50                        | ±10%                     | 0.70                   |
| 8  | CL21B103KC65PN □ |                  | 10nF        | 100                       | ±10%                     | 0.70                   |
| 9  | CL21B153KB65PN □ |                  | 15nF        | 50                        | ±10%                     | 0.70                   |
| 10 | CL21B153KC65PN □ |                  | 15nF        | 100                       | ±10%                     | 0.70                   |
| 11 | CL21B223KB65PN □ |                  | 22nF        | 50                        | ±10%                     | 0.70                   |
| 12 | CL21B223KC65PN □ |                  | 22nF        | 100                       | ±10%                     | 0.70                   |
| 13 | CL21B333KBC5PN □ |                  | 33nF        | 50                        | ±10%                     | 0.95                   |
| 14 | CL21B333KCC5PN □ |                  | 33nF        | 100                       | ±10%                     | 0.95                   |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

## Product Lineup (Automotive Capacitors\_X7R)

|    | Part Number      | Size L × W (mm) | Capacitance | Rated Voltage (Vdc) | Capacitance Tolerance | Thickness Max. (mm) |
|----|------------------|-----------------|-------------|---------------------|-----------------------|---------------------|
| 15 | CL21B473KAC5PN □ | 2.00 × 1.25     | 47nF        | 25                  | ±10%                  | 0.95                |
| 16 | CL21B473KBC5PN □ |                 | 47nF        | 50                  | ±10%                  | 0.95                |
| 17 | CL21B473KCC5PN □ |                 | 47nF        | 100                 | ±10%                  | 0.95                |
| 18 | CL21B683KAC5PN □ |                 | 68nF        | 25                  | ±10%                  | 0.95                |
| 19 | CL21B683KBC5PN □ |                 | 68nF        | 50                  | ±10%                  | 0.95                |
| 20 | CL21B683KCC5PN □ |                 | 68nF        | 100                 | ±10%                  | 0.95                |
| 21 | CL21B104KOC5PN □ |                 | 100nF       | 16                  | ±10%                  | 0.95                |
| 22 | CL21B104KAC5PN □ |                 | 100nF       | 25                  | ±10%                  | 0.95                |
| 23 | CL21B104KBC5PN □ |                 | 100nF       | 50                  | ±10%                  | 0.95                |
| 24 | CL21B104KBF5PN □ |                 | 100nF       | 50                  | ±10%                  | 1.35                |
| 25 | CL21B104KCC5PN □ |                 | 100nF       | 100                 | ±10%                  | 0.95                |
| 26 | CL21B104KCF5PN □ |                 | 100nF       | 100                 | ±10%                  | 1.35                |
| 27 | CL21B154KOF4PN □ |                 | 150nF       | 16                  | ±10%                  | 1.35                |
| 28 | CL21B154KAF4PN □ |                 | 150nF       | 25                  | ±10%                  | 1.35                |
| 29 | CL21B154KBF4PN □ |                 | 150nF       | 50                  | ±10%                  | 1.35                |
| 30 | CL21B224KOF4PN □ |                 | 220nF       | 16                  | ±10%                  | 1.35                |
| 31 | CL21B224KAF4PN □ |                 | 220nF       | 25                  | ±10%                  | 1.35                |
| 32 | CL21B224KBF4PN □ |                 | 220nF       | 50                  | ±10%                  | 1.35                |
| 33 | CL21B334KOF4PN □ |                 | 330nF       | 16                  | ±10%                  | 1.35                |
| 34 | CL21B334KAF4PN □ |                 | 330nF       | 25                  | ±10%                  | 1.35                |
| 35 | CL21B334KBF4PN □ |                 | 330nF       | 50                  | ±10%                  | 1.35                |
| 36 | CL21B474KOF4PN □ |                 | 470nF       | 16                  | ±10%                  | 1.35                |
| 37 | CL21B474KAF4PN □ |                 | 470nF       | 25                  | ±10%                  | 1.35                |
| 38 | CL21B474KBF4PN □ |                 | 470nF       | 50                  | ±10%                  | 1.35                |
| 39 | CL21B684KOF4PN □ |                 | 680nF       | 16                  | ±10%                  | 1.35                |
| 40 | CL21B684KAF4PN □ |                 | 680nF       | 25                  | ±10%                  | 1.35                |
| 41 | CL21B105KOF4PN □ |                 | 1μF         | 16                  | ±10%                  | 1.35                |
| 42 | CL21B105KAF4PN □ |                 | 1μF         | 25                  | ±10%                  | 1.35                |
| 1  | CL31B104KBC5PN □ | 3.20 × 1.60     | 100nF       | 50                  | ±10%                  | 1.00                |
| 2  | CL31B154KBP5PN □ |                 | 150nF       | 50                  | ±10%                  | 1.25                |
| 3  | CL31B224KAC5PN □ |                 | 220nF       | 25                  | ±10%                  | 1.00                |
| 4  | CL31B224KBP5PN □ |                 | 220nF       | 50                  | ±10%                  | 1.25                |
| 5  | CL31B334KAC5PN □ |                 | 330nF       | 25                  | ±10%                  | 1.00                |
| 6  | CL31B334KBH5PN □ |                 | 330nF       | 50                  | ±10%                  | 1.80                |
| 7  | CL31B474KAC5PN □ |                 | 470nF       | 25                  | ±10%                  | 1.00                |
| 8  | CL31B474KBH5PN □ |                 | 470nF       | 50                  | ±10%                  | 1.80                |
| 9  | CL31B684KAP5PN □ |                 | 680nF       | 25                  | ±10%                  | 1.25                |
| 10 | CL31B684KBH5PN □ |                 | 680nF       | 50                  | ±10%                  | 1.80                |
| 11 | CL31B105KOP5PN □ |                 | 1μF         | 16                  | ±10%                  | 1.25                |
| 12 | CL31B105KAP5PN □ |                 | 1μF         | 25                  | ±10%                  | 1.25                |
| 13 | CL31B105KBH5PN □ |                 | 1μF         | 50                  | ±10%                  | 1.80                |
| 14 | CL31B155KOH4PN □ |                 | 1.5μF       | 16                  | ±10%                  | 1.80                |
| 15 | CL31B155KAH4PN □ |                 | 1.5μF       | 25                  | ±10%                  | 1.80                |
| 16 | CL31B155KBH4PN □ |                 | 1.5μF       | 50                  | ±10%                  | 1.80                |
| 17 | CL31B225KOH4PN □ |                 | 2.2μF       | 16                  | ±10%                  | 1.80                |
| 18 | CL31B225KAH4PN □ |                 | 2.2μF       | 25                  | ±10%                  | 1.80                |
| 19 | CL31B225KBH4PN □ |                 | 2.2μF       | 50                  | ±10%                  | 1.80                |

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p80.

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## Reliability Test Condition (Automotive Capacitors)

| No | Item                                |                                                           | Performance                     | Test Condition                                                                                                            |                                                                                                         |
|----|-------------------------------------|-----------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 1  | Pre-and Post-Stress Electrical Test |                                                           | -                               |                                                                                                                           |                                                                                                         |
| 2  | High Temperature Exposure           | Appearance                                                | No abnormal exterior appearance | Unpowered, 1000hrs@T=150℃<br>Measurement at 24±2hrs after test conclusion                                                 |                                                                                                         |
|    |                                     | Capacitance Change                                        | CLASS I                         |                                                                                                                           | Within ±2.5% or 0.25pF, (Whichever is larger)                                                           |
|    |                                     |                                                           | CLASS II                        |                                                                                                                           | Within ±10%                                                                                             |
|    |                                     | Q                                                         | CLASS I                         |                                                                                                                           | Capacitance ≥ 30pF : Q ≥ 1,000<br>< 30pF : Q ≥ 400 +20×C<br>( C : Capacitance)                          |
|    |                                     | Tanδ                                                      | CLASS II                        |                                                                                                                           | Rated Voltage ≥ 25V : 0.03 max<br>≥ 16V : 0.05 max<br>≥ 10V : 0.075 max                                 |
| IR |                                     | More than 10,000 MΩ or 500 MΩ × μF (Whichever is smaller) |                                 |                                                                                                                           |                                                                                                         |
| 3  | Temperature Cycling                 | Appearance                                                | No abnormal exterior appearance | 1000Cycles<br>Measurement at 24±2hrs after test conclusion                                                                |                                                                                                         |
|    |                                     | Capacitance Change                                        | CLASS I                         |                                                                                                                           | Within ±2.5% or 0.25pF, (Whichever is larger)                                                           |
|    |                                     |                                                           | CLASS II                        |                                                                                                                           | Within ±10%                                                                                             |
|    |                                     | Q                                                         | CLASS I                         |                                                                                                                           | Capacitance ≥ 30pF : Q ≥ 1,000<br>< 30pF : Q ≥ 400 +20×C<br>( C : Capacitance)                          |
|    |                                     | Tanδ                                                      | CLASS II                        |                                                                                                                           | Rated Voltage ≥ 25V : 0.03 max<br>≥ 16V : 0.05 max<br>≥ 10V : 0.075max                                  |
| IR |                                     | More than 10,000 MΩ or 500 MΩ × μF (Whichever is smaller) |                                 |                                                                                                                           |                                                                                                         |
| 4  | Destructive Physical Analysis       |                                                           | No defects or abnormalities     | Per EIA 469                                                                                                               |                                                                                                         |
| 5  | Moisture Resistance                 | Appearance                                                | No abnormal exterior appearance | 10Cycles, t=24hrs/cycle<br>Heat (25~65℃) and humidity (80~98%), Unpowered<br>measurement at 24±2hrs after test conclusion |                                                                                                         |
|    |                                     | Capacitance Change                                        | CLASS I                         |                                                                                                                           | Within ±2.5% or 0.25pF, (Whichever is larger)                                                           |
|    |                                     |                                                           | CLASS II                        |                                                                                                                           | Within ±12.5%                                                                                           |
|    |                                     | Q                                                         | CLASS I                         |                                                                                                                           | Capacitance ≥ 30pF : Q ≥ 350<br>< 10pF : Q ≥ 275+(5/2)×C<br>< 10pF : Q ≥ 200+10×C<br>( C : Capacitance) |
|    |                                     | Tanδ                                                      | CLASS II                        |                                                                                                                           | Rated Voltage ≥ 25V : 0.03 max<br>≥ 16V : 0.05 max<br>≥ 10V : 0.075max                                  |
| IR |                                     | More than 10,000 MΩ or 500 MΩ × μF (Whichever is smaller) |                                 |                                                                                                                           |                                                                                                         |

| Step | Temperature(℃)          | Time(min.) |
|------|-------------------------|------------|
| 1    | Min. operating Temp. ±2 | 15±3       |
| 2    | 25±2                    | 1          |
| 3    | Max. operating Temp. ±2 | 15±3       |
| 4    | 25±2                    | 1          |

\* For the more detail Specification, Please refer to the Samsung MLCC catalogue.

| No   | Item                            |                                                                                 | Performance                     |                                                                                                           | Test Condition                                                                                                                                                                                                                                               |           |          |      |        |       |           |
|------|---------------------------------|---------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|------|--------|-------|-----------|
| 6    | Biased Humidity                 | Appearance                                                                      |                                 | No abnormal exterior appearance                                                                           | 1000hrs 85 °C/85%RH, Rated Voltate and 1.3~1.5V,<br>(add 100kohm resistor)<br>Measurement at 24 ± 2hrs after test conclusion<br>The charge/discharge current is less than 50mA.                                                                              |           |          |      |        |       |           |
|      |                                 | Capacitance Change                                                              | CLASS I                         | Within ± 2.5% or 0.25pF, (Whichever is larger)                                                            |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 |                                                                                 | CLASS II                        | Within ± 12.5%                                                                                            |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 | Q                                                                               | CLASS I                         | Capacitance ≥ 30pF : Q ≥ 200<br>< 30pF : Q ≥ 100 +(10/3)× C<br>( C : Capacitance)                         |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 | Tanδ                                                                            | CLASS II                        | Rated Voltage ≥ 25V : 0.035 max<br>≥ 16V : 0.05 max<br>≥ 10V : 0.075max                                   |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 | IR                                                                              |                                 | More than 500 MΩ or 25 MΩ × μF (Whichever is Smaller)                                                     |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
| 7    | High Temperature Operating Life | Appearance                                                                      |                                 | No abnormal exterior appearance                                                                           | 1000hrs @ TA=125 °C, 200% Rated Voltage,<br>Measurement at 24 ± 2hrs after test conclusion<br>The charge/discharge current is less than 50mA.                                                                                                                |           |          |      |        |       |           |
|      |                                 | Capacitance Change                                                              | CLASS I                         | Within ± 3.0% or 0.3pF, (Whichever is larger)                                                             |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 |                                                                                 | CLASS II                        | Within ± 12.5%                                                                                            |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 | Q                                                                               | CLASS I                         | Capacitance ≥ 30pF : Q ≥ 350<br>≥ 10pF : Q ≥ 275+(5/2)× C<br>< 10pF : Q ≥ 200+10× C<br>( C : Capacitance) |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 | Tanδ                                                                            | CLASS II                        | Rated Voltage ≥ 25V : 0.035 max<br>≥ 16V : 0.05 max<br>≥ 10V : 0.075max                                   |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 | IR                                                                              |                                 | More than 1,000 MΩ or 50 MΩ × μF (Whichever is smaller)                                                   |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
| 8    | External Visual                 |                                                                                 | No abnormal exterior appearance |                                                                                                           | Microscope (x10)                                                                                                                                                                                                                                             |           |          |      |        |       |           |
| 9    | Physical Dimensions             |                                                                                 | Within the specified dimensions |                                                                                                           | Using the calipers                                                                                                                                                                                                                                           |           |          |      |        |       |           |
| 10   | Mechanical Shock                | Appearance                                                                      |                                 | No abnormal exterior appearance                                                                           | Three shocks in each direction should be applied along<br>3 mutually perpendicular axes of the test specimen (18 shocks)<br><table><tr><td>Peakvalue</td><td>Duration</td><td>Wave</td></tr><tr><td>1,500G</td><td>0.5ms</td><td>Half sine</td></tr></table> | Peakvalue | Duration | Wave | 1,500G | 0.5ms | Half sine |
|      |                                 | Peakvalue                                                                       | Duration                        | Wave                                                                                                      |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 | 1,500G                                                                          | 0.5ms                           | Half sine                                                                                                 |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 | Capacitance Change                                                              | CLASS I                         | Within ± 2.5% or 0.25pF, (Whichever is larger)                                                            |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 |                                                                                 | CLASS II                        | Within ± 10%                                                                                              |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
| Q    | CLASS I                         | Capacitance ≥ 30pF : Q ≥ 1,000<br>< 30pF : Q ≥ 400 +20× C<br>( C : Capacitance) |                                 |                                                                                                           |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
| Tanδ | CLASS II                        | Rated Voltage ≥ 25V : 0.025 max<br>≥ 16V : 0.035 max<br>≥ 10V : 0.05max         |                                 |                                                                                                           |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |
|      |                                 | IR                                                                              |                                 | More than 10,000 MΩ or 500 MΩ × μF (Whichever is smaller)                                                 |                                                                                                                                                                                                                                                              |           |          |      |        |       |           |

\* For the more detail Specification, Please refer to the Samsung MLCC catalogue.

Part Numbering  
System

General  
Capacitors

High Capacitance  
Capacitors

Super Small Size  
Capacitors

Medium-High  
Voltage Capacitors

Array Type  
Capacitors

Low ESL  
Capacitors

Reliability Test  
Condition

Premium Capacitors  
for Automotive  
Applications

Packaging  
Specification

Application Manual  
for Surface Mounting

| No | Item                      |                    | Performance                                                                                                                     | Test Condition                                                                                                                                                                                                                           |
|----|---------------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 11 | Vibration                 | Appearance         | No abnormal exterior appearance                                                                                                 | 5g's for 20min., 12cycles each of 3 orientations,<br>Use 8" x5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2000 Hz. |
|    |                           | Capacitance Change | CLASS I<br>Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)                                                                  |                                                                                                                                                                                                                                          |
|    |                           |                    | CLASS II<br>Within $\pm 10\%$                                                                                                   |                                                                                                                                                                                                                                          |
|    |                           | Q                  | CLASS I<br>Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$<br>$< 30\text{pF}$ : $Q \geq 400 + 20 \times C$<br>(C : Capacitance) |                                                                                                                                                                                                                                          |
|    |                           | Tan $\delta$       | CLASS II<br>Rated Voltage $\geq 25\text{V}$ : 0.025 max<br>$\geq 16\text{V}$ : 0.035 max<br>$\geq 10\text{V}$ : 0.05max         |                                                                                                                                                                                                                                          |
| 12 | Resistance to Solder Heat | IR                 | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$<br>(Whichever is smaller)                           | Solder pot : $260 \pm 5^\circ\text{C}$ , $10 \pm 1\text{sec}$ .                                                                                                                                                                          |
|    |                           | Appearance         | No abnormal exterior appearance                                                                                                 |                                                                                                                                                                                                                                          |
|    |                           | Capacitance Change | CLASS I<br>Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)                                                                  |                                                                                                                                                                                                                                          |
|    |                           |                    | CLASS II<br>Within $\pm 10\%$                                                                                                   |                                                                                                                                                                                                                                          |
|    |                           | Q                  | CLASS I<br>Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$<br>$< 30\text{pF}$ : $Q \geq 400 + 20 \times C$<br>(C : Capacitance) |                                                                                                                                                                                                                                          |
| 13 | Thermal Shock             | Tan $\delta$       | CLASS II<br>Rated Voltage $\geq 25\text{V}$ : 0.025 max<br>$\geq 16\text{V}$ : 0.035 max<br>$\geq 10\text{V}$ : 0.05max         | $-55^\circ\text{C}/+125^\circ\text{C}$<br>Note: Number of cycles required - 300,<br>Maximum transfer time-20 sec,<br>Dwell time-15min. Air-Air                                                                                           |
|    |                           | IR                 | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$<br>(Whichever is smaller)                           |                                                                                                                                                                                                                                          |
|    |                           | Appearance         | No abnormal exterior appearance                                                                                                 |                                                                                                                                                                                                                                          |
|    |                           | Capacitance Change | CLASS I<br>Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)                                                                  |                                                                                                                                                                                                                                          |
|    |                           |                    | CLASS II<br>Within $\pm 10\%$                                                                                                   |                                                                                                                                                                                                                                          |
| 14 | ESD                       | Q                  | CLASS I<br>Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$<br>$< 30\text{pF}$ : $Q \geq 400 + 20 \times C$<br>(C : Capacitance) | AEC-Q200-002                                                                                                                                                                                                                             |
|    |                           | Tan $\delta$       | CLASS II<br>Rated Voltage $\geq 25\text{V}$ : 0.025 max<br>$\geq 16\text{V}$ : 0.035 max<br>$\geq 10\text{V}$ : 0.05max         |                                                                                                                                                                                                                                          |
|    |                           | IR                 | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$<br>(Whichever is smaller)                           |                                                                                                                                                                                                                                          |
|    |                           | Capacitance Change | CLASS I<br>Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)                                                                  |                                                                                                                                                                                                                                          |
|    |                           |                    | CLASS II<br>Within $\pm 10\%$                                                                                                   |                                                                                                                                                                                                                                          |
| 15 | Humidity                  | Appearance         | No abnormal exterior appearance                                                                                                 | 85%RH, 40~55 $^\circ\text{C}$ , 1000hrs                                                                                                                                                                                                  |
|    |                           | Capacitance Change | CLASS I<br>Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)                                                                  |                                                                                                                                                                                                                                          |
|    |                           |                    | CLASS II<br>Within $\pm 10\%$                                                                                                   |                                                                                                                                                                                                                                          |
|    |                           | Q                  | CLASS I<br>Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$<br>$< 30\text{pF}$ : $Q \geq 400 + 20 \times C$<br>(C : Capacitance) |                                                                                                                                                                                                                                          |
|    |                           | Tan $\delta$       | CLASS II<br>Rated Voltage $\geq 25\text{V}$ : 0.025 max<br>$\geq 16\text{V}$ : 0.035 max<br>$\geq 10\text{V}$ : 0.05max         |                                                                                                                                                                                                                                          |
| 16 | Mechanical Shock          | IR                 | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$<br>(Whichever is smaller)                           | 1500g, 11ms, 1000times                                                                                                                                                                                                                   |
|    |                           | Appearance         | No abnormal exterior appearance                                                                                                 |                                                                                                                                                                                                                                          |
|    |                           | Capacitance Change | CLASS I<br>Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)                                                                  |                                                                                                                                                                                                                                          |
|    |                           |                    | CLASS II<br>Within $\pm 10\%$                                                                                                   |                                                                                                                                                                                                                                          |
|    |                           | Q                  | CLASS I<br>Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$<br>$< 30\text{pF}$ : $Q \geq 400 + 20 \times C$<br>(C : Capacitance) |                                                                                                                                                                                                                                          |
| 17 | Mechanical Vibration      | Tan $\delta$       | CLASS II<br>Rated Voltage $\geq 25\text{V}$ : 0.025 max<br>$\geq 16\text{V}$ : 0.035 max<br>$\geq 10\text{V}$ : 0.05max         | 5g's for 20min., 12cycles each of 3 orientations,<br>Use 8" x5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2000 Hz. |
|    |                           | IR                 | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$<br>(Whichever is smaller)                           |                                                                                                                                                                                                                                          |
|    |                           | Appearance         | No abnormal exterior appearance                                                                                                 |                                                                                                                                                                                                                                          |
|    |                           | Capacitance Change | CLASS I<br>Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)                                                                  |                                                                                                                                                                                                                                          |
|    |                           |                    | CLASS II<br>Within $\pm 10\%$                                                                                                   |                                                                                                                                                                                                                                          |
| 18 | Mechanical Shock          | Q                  | CLASS I<br>Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$<br>$< 30\text{pF}$ : $Q \geq 400 + 20 \times C$<br>(C : Capacitance) | 1500g, 11ms, 1000times                                                                                                                                                                                                                   |
|    |                           | Tan $\delta$       | CLASS II<br>Rated Voltage $\geq 25\text{V}$ : 0.025 max<br>$\geq 16\text{V}$ : 0.035 max<br>$\geq 10\text{V}$ : 0.05max         |                                                                                                                                                                                                                                          |
|    |                           | IR                 | More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$<br>(Whichever is smaller)                           |                                                                                                                                                                                                                                          |
|    |                           | Capacitance Change | CLASS I<br>Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)                                                                  |                                                                                                                                                                                                                                          |
|    |                           |                    | CLASS II<br>Within $\pm 10\%$                                                                                                   |                                                                                                                                                                                                                                          |

\* For the more detail Specification, Please refer to the Samsung MLCC catalogue.

| No                      | Item                                    |                                                              |                                                  | Performance                                                                                                                                                                                                                                                                                                                                                 | Test Condition                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|-------------------------|-----------------------------------------|--------------------------------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------|------|---------|----------|------------|-------------------------|----------|------------|-------------|----------|---------|-------------------------|-------------|---------|-------------|-------------|
| 15                      | Solderability                           |                                                              |                                                  | 95% of the terminations is to be soldered evenly and continuously                                                                                                                                                                                                                                                                                           | a) Preheat at 155℃ for 4 hours, Immerse in solder for 5s at 235±5℃<br>b) Steam aging for 8 hours, Immerse in solder for 5s at 235±5℃<br>c) Steam aging for 8 hours, Immerse in solder for 120s at 260±5℃<br>solder : a solution ethanol and rosin                                                                                                                                                                                                                               |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
| 16                      | Electrical Characterization             | Capacitance                                                  |                                                  | Within specified tolerance                                                                                                                                                                                                                                                                                                                                  | <div>The Capacitance /D.F. should be measured at 25℃,</div> <table><tr><td>Class</td><td>Capacitance</td><td>Frequency</td><td>Vrms</td></tr><tr><td rowspan="2">Class I</td><td>1000pF ↓</td><td>1 MHz ±10%</td><td>0.5~5Vrms</td></tr><tr><td>1000pF ↑</td><td>1 kHz ±10%</td><td>1.0±0.2Vrms</td></tr><tr><td rowspan="2">Class II</td><td>10 μF ↓</td><td>1 kHz ±10%</td><td>1.0±0.2Vrms</td></tr><tr><td>10 μF ↑</td><td>120 Hz ±20%</td><td>0.5±0.1Vrms</td></tr></table> | Class                                           | Capacitance                                                             | Frequency                                                               | Vrms | Class I | 1000pF ↓ | 1 MHz ±10% | 0.5~5Vrms               | 1000pF ↑ | 1 kHz ±10% | 1.0±0.2Vrms | Class II | 10 μF ↓ | 1 kHz ±10%              | 1.0±0.2Vrms | 10 μF ↑ | 120 Hz ±20% | 0.5±0.1Vrms |
|                         |                                         | Class                                                        | Capacitance                                      | Frequency                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Vrms                                            |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | Class I                                                      | 1000pF ↓                                         | 1 MHz ±10%                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 0.5~5Vrms                                       |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         |                                                              | 1000pF ↑                                         | 1 kHz ±10%                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1.0±0.2Vrms                                     |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | Class II                                                     | 10 μF ↓                                          | 1 kHz ±10%                                                                                                                                                                                                                                                                                                                                                  | 1.0±0.2Vrms                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         |                                                              | 10 μF ↑                                          | 120 Hz ±20%                                                                                                                                                                                                                                                                                                                                                 | 0.5±0.1Vrms                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | Q                                                            | CLASS I                                          | Capacitance ≥ 30pF : Q ≥ 1,000<br>< 30pF : Q ≥ 400 +20×C<br>(C: Capacitance)                                                                                                                                                                                                                                                                                | <div>I.R. should be measured with a DC voltage not exceeding<br/>Rated Voltage @25℃, @125℃ for 60~120 sec.</div><br><br><div>Dielectric Strength : 250% of the rated voltage for 1~5 seconds<br/>The charge/discharge current is less than 50mA.</div>                                                                                                                                                                                                                          |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         |                                                              |                                                  |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Tanδ                                            | CLASS II                                                                | Rated Voltage ≥ 25V : 0.025 max<br>≥ 16V : 0.035 max<br>≥ 10V : 0.05max |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | IR@25℃                                                       | CLASS I                                          | More than 100,000 MΩ or 1,000 MΩ × μF<br>(Whichever is smaller)                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         |                                                              | CLASS II                                         | More than 10,000 MΩ or 500 MΩ × μF<br>(Whichever is smaller)                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
| IR@125℃                 | CLASS I                                 | More than 10,000 MΩ or 100 MΩ × μF<br>(Whichever is smaller) |                                                  |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         | CLASS II                                | More than 1,000 MΩ or 10 MΩ × μF<br>(Whichever is smaller)   |                                                  |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
| Dielectric Strength     |                                         | No dielectric breakdown or mechanical breakdown              |                                                  |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
| 17                      | Board Flex                              | Appearance                                                   |                                                  | <div>Bending to the limit for 5 seconds<br/>Limit : Class I - 3mm<br/>Class II - 2mm</div>                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | Capacitance Change                                           | CLASS I                                          |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Within ±5.0% or 0.5pF,<br>(Whichever is larger) |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         |                                                              | CLASS II                                         |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Within ±10%                                     |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | 18                                                           | Terminal Strength(SMD)                           |                                                                                                                                                                                                                                                                                                                                                             | Appearance                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                 | <div>18N, for 60±1 sec.<br/>* 0603(1608) –10N,<br/>0402(1005) –2N</div> |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
| Capacitance Change      | CLASS I                                 |                                                              |                                                  | Within ±2.5% or 0.25pF,<br>(Whichever is larger)                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         | CLASS II                                |                                                              |                                                  | Within ±10%                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
| 19                      | Beam Load                               |                                                              |                                                  | <div>Destruction value should be exceed<br/>Chip Length ≤2.5mm<br/>a) Chip Thickness &gt; 0.5mm : 20N<br/>b) Chip Thickness ≤0.5mm : 8N<br/>Chip Length ≥ 3.2mm<br/>a) Chip Thickness ≥ 1.25mm : 54.5N<br/>b) Chip Thickness &lt; 1.25mm : 15N</div><br><div>Beam speed<br/>Chip Length ≤2.5mm, 0.5±0.05mm/sec<br/>Chip Length ≥3.2mm, 2.5±0.25mm/sec</div> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         |                                                              |                                                  |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
| 20                      | Capacitance Temperature Characteristics | Capacitance Change                                           | CLASS I                                          | 0±30 ppm/℃                                                                                                                                                                                                                                                                                                                                                  | <table><tr><td>Step</td><td>Temperature(℃)</td><td>Time(min)</td></tr><tr><td>1</td><td>25 ± 2</td><td>1</td></tr><tr><td>2</td><td>Min. Operating Temp. ±2</td><td>15±3</td></tr><tr><td>3</td><td>25 ± 2</td><td>1</td></tr><tr><td>4</td><td>Max. Operating Temp. ±2</td><td>15±3</td></tr><tr><td>5</td><td>25 ± 2</td><td>1</td></tr></table>                                                                                                                              | Step                                            | Temperature(℃)                                                          | Time(min)                                                               | 1    | 25 ± 2  | 1        | 2          | Min. Operating Temp. ±2 | 15±3     | 3          | 25 ± 2      | 1        | 4       | Max. Operating Temp. ±2 | 15±3        | 5       | 25 ± 2      | 1           |
|                         |                                         |                                                              | Step                                             | Temperature(℃)                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Time(min)                                       |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | 1                                                            | 25 ± 2                                           | 1                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | 2                                                            | Min. Operating Temp. ±2                          | 15±3                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | 3                                                            | 25 ± 2                                           | 1                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | 4                                                            | Max. Operating Temp. ±2                          | 15±3                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         | 5                                                            | 25 ± 2                                           | 1                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
| CLASS II                | Within ±15%                             |                                                              |                                                  |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
| Temperature Coefficient | CLASS I                                 | 0±30 ppm/℃                                                   |                                                  |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         | Capacitance Drift                       | CLASS I                                                      | Within ±0.2% or 0.05pF,<br>(Whichever is larger) |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         |                                                              |                                                  |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |
|                         |                                         |                                                              |                                                  |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                 |                                                                         |                                                                         |      |         |          |            |                         |          |            |             |          |         |                         |             |         |             |             |

\* For the more detail Specification, Please refer to the Samsung MLCC catalogue.

Part Numbering  
System

General  
Capacitors

High Capacitance  
Capacitors

Super Small Size  
Capacitors

Medium-High  
Voltage Capacitors

Array Type  
Capacitors

Low ESL  
Capacitors

Reliability Test  
Condition

Premium Capacitors  
for Automotive  
Applications

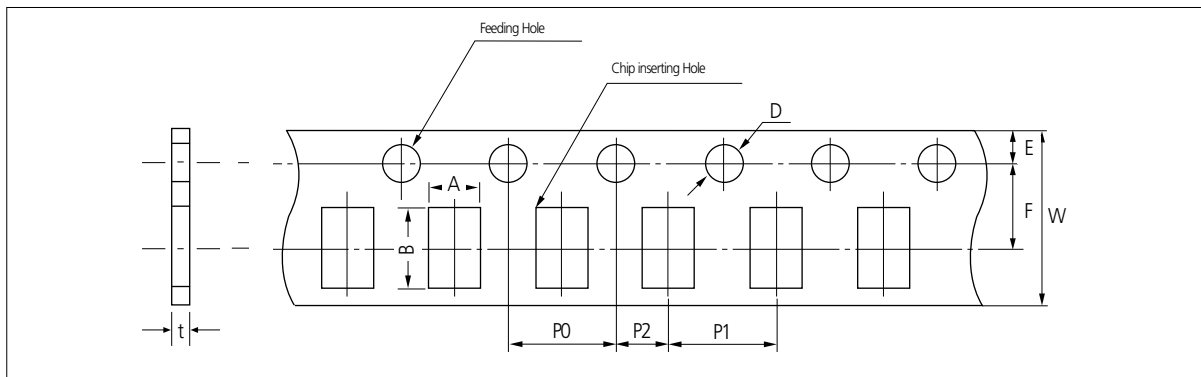
Packaging  
Specification

Application Manual  
for Surface Mounting



# Packaging Specifications

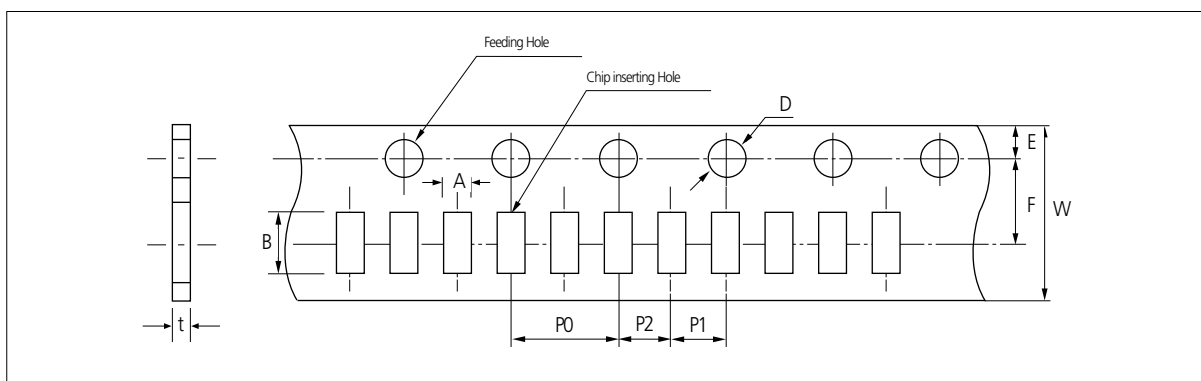
## Cardboard Paper Tape(4mm)



Unit: inch(mm)

| Symbol    |                            | A           | B           | W           | F            | E            | P1          | P2           | P0          | D               | t            |
|-----------|----------------------------|-------------|-------------|-------------|--------------|--------------|-------------|--------------|-------------|-----------------|--------------|
| Type      |                            |             |             |             |              |              |             |              |             |                 |              |
| Dimension | 0504<br>(1410)             | 1.3<br>±0.2 | 1.7<br>±0.2 | 8.0<br>±0.3 | 3.5<br>±0.05 | 1.75<br>±0.1 | 4.0<br>±0.1 | 2.0<br>±0.05 | 4.0<br>±0.1 | Ø1.5<br>+0.1/-0 | 1.1<br>Below |
|           | 0603 0306<br>(1608) (0816) | 1.1<br>±0.2 | 1.9<br>±0.2 |             |              |              |             |              |             |                 |              |
|           | 0805 0508<br>(2012) (1220) | 1.6<br>±0.2 | 2.4<br>±0.2 |             |              |              |             |              |             |                 |              |
|           | 1206 0612<br>(3216) (1632) | 2.0<br>±0.2 | 3.6<br>±0.2 |             |              |              |             |              |             |                 |              |

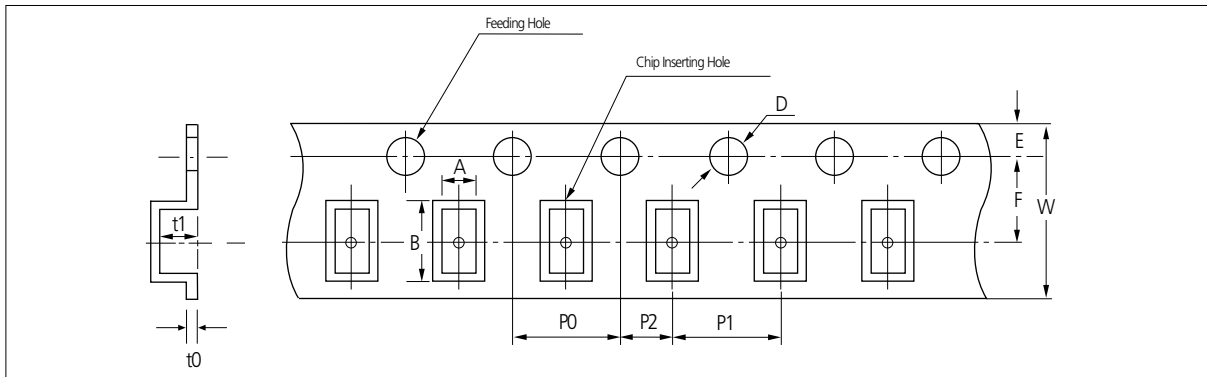
## Cardboard Paper Tape(2mm)



Unit: inch(mm)

| Symbol    |                 | A             | B             | W           | F            | E             | P1           | P2           | P0          | D                       | t             |
|-----------|-----------------|---------------|---------------|-------------|--------------|---------------|--------------|--------------|-------------|-------------------------|---------------|
| Type      |                 |               |               |             |              |               |              |              |             |                         |               |
| Dimension | 01005<br>(0402) | 0.26<br>±0.03 | 0.46<br>±0.03 | 8.0<br>±0.3 | 3.5<br>±0.05 | 1.75<br>±0.05 | 2.0<br>±0.05 | 2.0<br>±0.05 | 4.0<br>±0.1 | Ø1.550<br>±0.02         | 0.26<br>±0.03 |
|           | 0201<br>(0603)  | 0.38<br>±0.03 | 0.68<br>±0.03 |             |              | 1.75<br>±0.1  | 2.0<br>±0.05 | 2.0<br>±0.05 | 4.0<br>±0.1 | Ø1.5<br>+0.1/<br>- 0.03 | 0.37<br>±0.03 |
|           | 0402<br>(1005)  | 0.62<br>±0.04 | 1.12<br>±0.04 |             |              |               |              |              |             |                         | 0.6<br>±0.05  |
|           |                 |               |               |             |              |               |              |              |             |                         | 0.37<br>±0.05 |

## Embossed Plastic Tape



Unit: inch(mm)

| Symbol    |                            | A             | B            | W            | F             | E            | P1          | P2           | P0          | D                    | t1         | t0           |
|-----------|----------------------------|---------------|--------------|--------------|---------------|--------------|-------------|--------------|-------------|----------------------|------------|--------------|
| Type      |                            |               |              |              |               |              |             |              |             |                      |            |              |
| Dimension | 0603<br>(1608)             | 1.05<br>±0.15 | 1.9<br>±0.15 | 8.0<br>±0.3  | 3.5<br>±0.05  | 1.75<br>±0.1 | 4.0<br>±0.1 | 2.0<br>±0.05 | 4.0<br>±0.1 | Ø1.5<br>+0.1/<br>- 0 | 2.8<br>max | 0.6<br>BELOW |
|           | 0805<br>(2012)             | 1.45<br>±0.2  | 2.3<br>±0.2  |              |               |              |             |              |             |                      |            |              |
|           | 1206 0612<br>(3216) (1632) | 1.9<br>±0.2   | 3.5<br>±0.2  |              |               |              |             |              |             |                      |            |              |
|           | 1210<br>(3225)             | 2.8<br>±0.2   | 3.6<br>±0.2  | 12.0<br>±0.3 | 5.60<br>±0.05 | 8.0<br>±0.1  |             |              |             |                      |            |              |
|           | 1808<br>(4520)             | 2.3<br>±0.2   | 4.9<br>±0.2  |              |               |              |             |              |             |                      |            |              |
|           | 1812<br>(4532)             | 3.6<br>±0.2   | 4.9<br>±0.2  |              |               |              |             |              |             |                      |            |              |
|           | 2220<br>(5750)             | 5.5<br>±0.2   | 6.2<br>±0.2  |              |               |              |             |              |             |                      |            |              |

Part Numbering  
System

General  
Capacitors

High Capacitance  
Capacitors

Super Small Size  
Capacitors

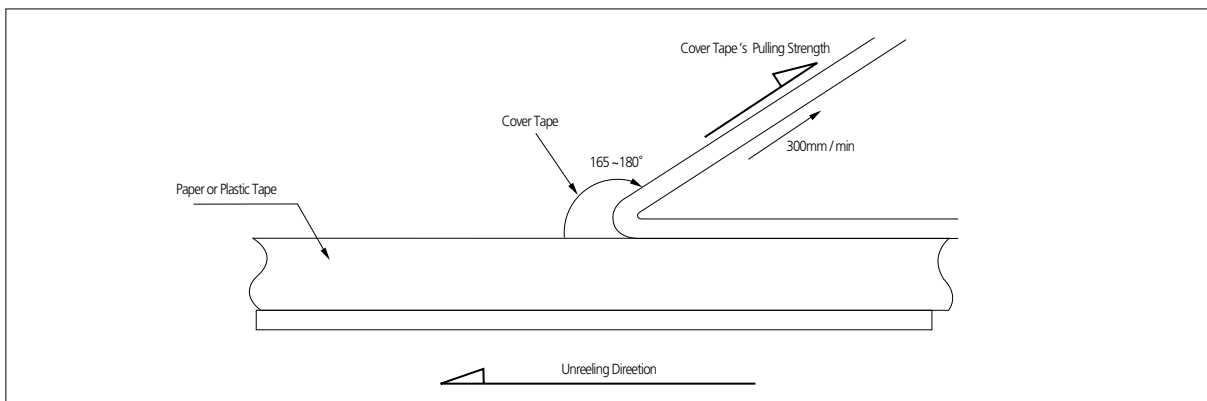
Medium-High  
Voltage Capacitors

Array Type  
Capacitors

Low ESL  
Capacitors

## Peeling off of Cover Tape

- 5 g.f ≤ Peel off force ≤ 70 g.f



Reliability Test  
Condition

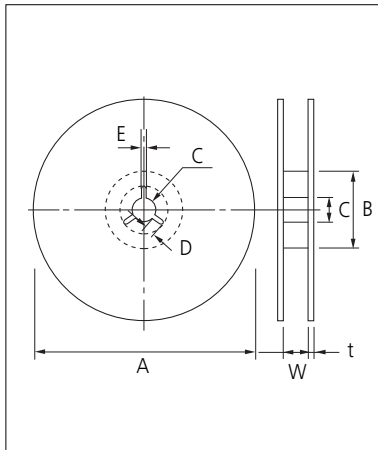
Premium Capacitors  
for Automotive  
Applications

Packaging  
Specification

Application Manual  
for Surface Mounting



## Reel Dimensions



Unit: mm

| Symbol   | Tape Width | A                        | B                       | C                       | D          |
|----------|------------|--------------------------|-------------------------|-------------------------|------------|
| 7" Reel  | 8mm        | $\varnothing 180+0/-3$   | $\varnothing 60+1/-0$   | $\varnothing 13\pm 0.3$ | $4\pm 0.2$ |
|          | 12mm       | $\varnothing 180+0/-3$   | $\varnothing 60+1/-0$   | $\varnothing 13\pm 0.3$ | $4\pm 0.2$ |
| 10" Reel | 8mm        | $\varnothing 258+0/-3$   | $\varnothing 80+1/-0$   | $\varnothing 13\pm 0.3$ | $4\pm 0.2$ |
|          | 12mm       | $\varnothing 258+0/-3$   | $\varnothing 80+1/-0$   | $\varnothing 13\pm 0.3$ | $4\pm 0.2$ |
| 13" Reel | 8mm        | $\varnothing 330\pm 2.0$ | $\varnothing 80\pm 1.0$ | $\varnothing 13\pm 0.3$ | $4\pm 0.2$ |
|          | 12mm       | $\varnothing 330\pm 2.0$ | $\varnothing 80\pm 1.0$ | $\varnothing 13\pm 0.3$ | $4\pm 0.2$ |

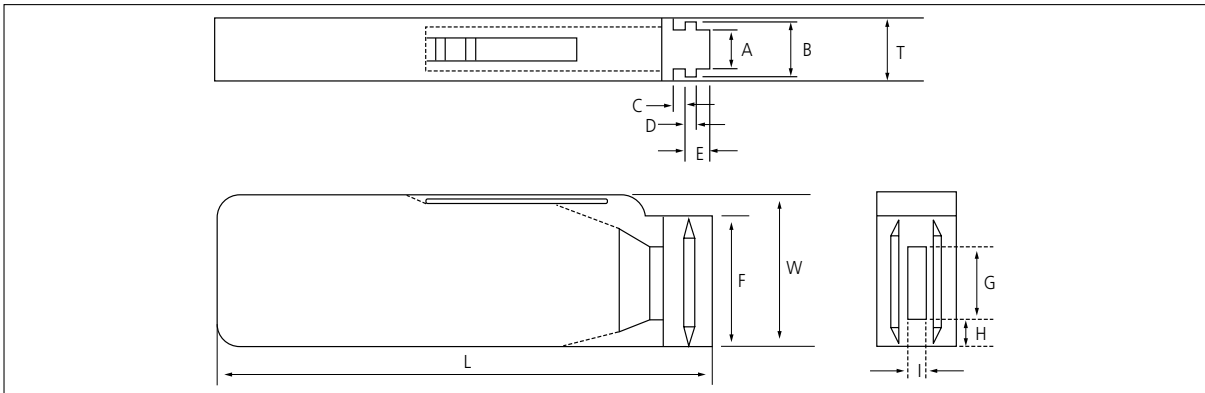
  

| Symbol   | Tape Width | E            | W           | t            |
|----------|------------|--------------|-------------|--------------|
| 7" Reel  | 8mm        | $2.0\pm 0.5$ | $9\pm 0.5$  | $1.2\pm 0.2$ |
|          | 12mm       | $2.0\pm 0.5$ | $13\pm 0.5$ | $1.2\pm 0.2$ |
| 10" Reel | 8mm        | $2.0\pm 0.5$ | $9\pm 0.5$  | $1.8\pm 0.2$ |
|          | 12mm       | $2.0\pm 0.5$ | $13\pm 0.5$ | $1.8\pm 0.2$ |
| 13" Reel | 8mm        | $2.0\pm 0.5$ | $9\pm 0.5$  | $2.2\pm 0.2$ |
|          | 12mm       | $2.0\pm 0.5$ | $13\pm 0.5$ | $2.2\pm 0.2$ |

Part Numbering  
SystemGeneral  
CapacitorsHigh Capacitance  
CapacitorsSuper Small Size  
CapacitorsMedium-High  
Voltage CapacitorsArray Type  
CapacitorsLow ESL  
CapacitorsReliability Test  
ConditionPremium Capacitors  
for Automotive  
ApplicationsPackaging  
SpecificationApplication Manual  
for Surface Mounting

## Bulk Case Packaging

- Bulk case packaging can reduce the stock space and transportation costs.
- The bulk feeding system can increase the productivity.
- It can eliminate the components loss.



Unit: mm

| Symbol    | A            | B            | T           | C            | D          | E            |
|-----------|--------------|--------------|-------------|--------------|------------|--------------|
| Dimension | $6.8\pm 0.1$ | $8.8\pm 0.1$ | $12\pm 0.1$ | $1.5+0.1/-0$ | $2+0/-0.1$ | $3.0+0.2/-0$ |

| Symbol    | F             | W           | G            | H           | L            | I           |
|-----------|---------------|-------------|--------------|-------------|--------------|-------------|
| Dimension | $31.5+0.2/-0$ | $36+0/-0.2$ | $19\pm 0.35$ | $7\pm 0.35$ | $110\pm 0.7$ | $5\pm 0.35$ |

### • QUANTITY

Unit: inch(mm) and pcs

| Size     | 0402(1005) | 0603(1608)       | 0805(2012) |                 |
|----------|------------|------------------|------------|-----------------|
|          |            |                  | T=0.65mm   | T=0.85mm        |
| Quantity | 50,000     | 10,000 or 15,000 | 10,000     | 5,000 or 10,000 |

# Application Manual for Surface Mounting

## 1.Storage of products

### 1-1. Storage Environment

Tape packing materials are designed to withstand long-term storage, but they will degrade more rapidly in the presence of high temperature or high humidity. Therefore, the products must be stored in an ambient 5~40℃ with a relative humidity of 20~70%. Allowable storage period is within 6 months from the outgoing date of delivery.

### 1-2. Corrosive Gases

Since sulfur and chlorine may degrade the solderability of the end termination, it is important to store the capacitors in an environment free of these gases

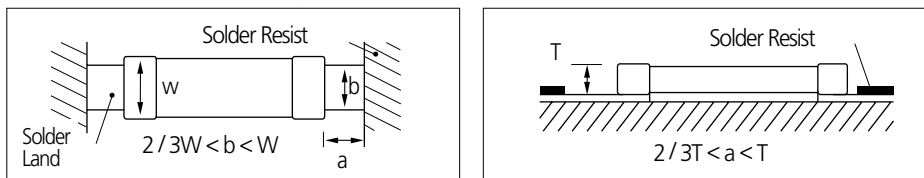
### 1-3. Temperature Fluctuations

Since dew condensation may occur by the differences in temperature when the products are taken out of storage, it is important to maintain a temperature-controlled environment.

## 2.Design of Solder Land Pattern

When designing printed circuit boards, the shape and size of the solder lands must allow for the proper amount of solder on the capacitor. The amount of solder at the end terminations has a direct effect on the probability that the chip will crack. The greater amount of solder, the larger amount of stress on the chip, and the more likely that it will break. Use the following illustrations as guidelines for proper Solder land design.

Recommendation of solder Land Shape and Size



## 3.Adhesives

MLCCs generally require the use of an adhesive to position the chips to the circuit board prior to soldering.

### 3-1. Requirements for Adhesives

They must have enough adhesion so that the chips will not fall off or move during the handling of the circuit board.

They must maintain their adhesive strength when exposed to soldering temperatures.

They should not spread or run when applied to the circuit board.

They should have a long pot life.

They should harden quickly.

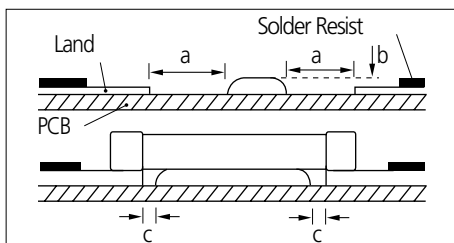
They should not corrode the circuit board or chip material.

They should be a good insulator.

They should be non-toxic, and not produce harmful gases, nor be harmful when touched.

### 3-2. Application Method

It is important to use the proper amount of adhesive. Too little will cause poor adhesion to the circuit board, and too much may strain the conductor pattern, thereby causing defective soldering. The following illustrations show the proper quantity of adhesive.



| Unit: mm |          |          |
|----------|----------|----------|
| Type     | 21       | 31       |
| a        | 0.2min   | 0.2min   |
| b        | 70~100μm | 70~100μm |
| c        | >0       | >0       |

### 3-3. Adhesive hardening Characteristics

To prevent oxidation of the terminations, the adhesive must harden at 160℃ or less, within 2 minutes or less.

## 4. Mounting

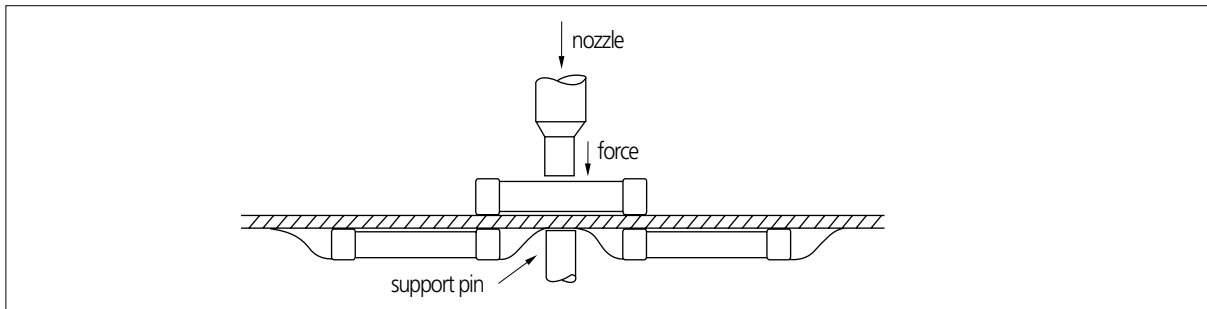
### 4-1. Mounting Head Pressure

Excessive pressure will cause chip capacitors to crack. The pressure between nozzle and chip capacitor will be 300g maximum during mounting.

### 4-2. Bending Stress

Bending of printed circuit board by mounting head when double-sided circuit boards are used, chip capacitors first are mounted and soldered onto one side of the board. When the capacitors are mounted onto the other side, it is important to support the board as shown in the illustration.

If the circuit board is not supported, it may bend, causing the already-installed capacitors to crack.



Part Numbering  
System

General  
Capacitors

High Capacitance  
Capacitors

Super Small Size  
Capacitors

Medium-High  
Voltage Capacitors

Array Type  
Capacitors

Low ESL  
Capacitors

Reliability Test  
Condition

Premium Capacitors  
for Automotive  
Applications

Packaging  
Specification

Application Manual  
for Surface Mounting

## 5. Flux

Although highly-activated flux gives better solderability, substances which increase activity may also degrade the insulation of the chip capacitors. To avoid such degradation, it is recommended that a mildly activated rosin flux (less than 0.2% chlorine) be used.

## 6. Soldering

Since a multilayer ceramic chip capacitor comes into direct contact with melted solder during soldering, it is exposed to potentially mechanical stress caused by the sudden temperature change. The capacitor may also be subject to silver migration, and to contamination by the flux. Because of these factors, soldering technique is critical.

### 6-1. Soldering Methods

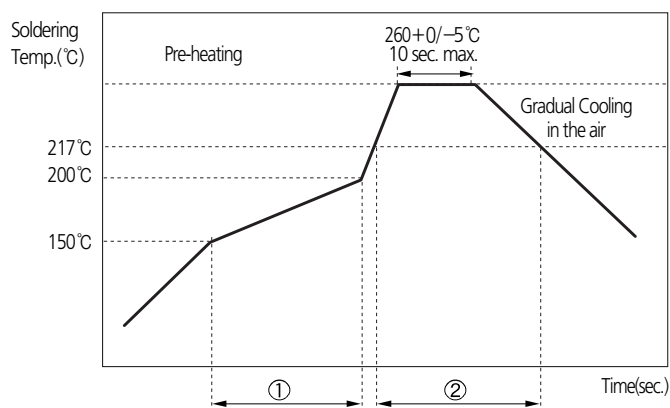
| Method           | Classification                 |                                                       |
|------------------|--------------------------------|-------------------------------------------------------|
| Reflow soldering | · Overall heating              | · Infrared rays<br>· Hot plate<br>· VPS (Vapor phase) |
|                  | · Local heating                | · Air heater<br>· Laser<br>· Light beam               |
| Flow Soldering   | · Single wave<br>· Double wave |                                                       |

### 6-2. Soldering Profile

To avoid the crack problem by sudden temperature change, follow the temperature profile in the adjacent graph.

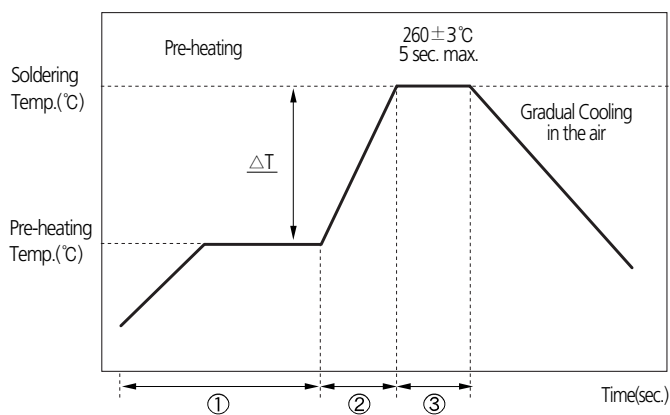
## 6-2-1 Pb-Free (Sn 100%) Plating

### ▪ REFLOW SOLDERING



| SolderingTemp.<br>(°C) | Pre-heating Time<br>(①, sec.) | Soldering Time<br>(②, sec.) |
|------------------------|-------------------------------|-----------------------------|
| 260+0/-5°C             | 60~120                        | 60~150                      |

### ▪ FLOW SOLDERING



| ΔT (°C)                       | Soldering Temp.<br>(°C) | Pre-heatingTime<br>(①+②, sec.) | SolderingTime<br>(③, sec.) |
|-------------------------------|-------------------------|--------------------------------|----------------------------|
| ≤150<br>(1206 and below size) | 260±3                   | ≥ 120                          | ≤5                         |

### ▪ SOLDER IRON(Hand Soldering)

| Variation of<br>Temp.(°C) | Soldering<br>Temp(°C) | Pre-heating<br>Time(sec.) | Soldering<br>Time(sec.) | Cooling<br>Time(sec.) | Condition of Iron Facilities |                 |                   |
|---------------------------|-----------------------|---------------------------|-------------------------|-----------------------|------------------------------|-----------------|-------------------|
|                           |                       |                           |                         |                       | Wattage                      | Tip<br>Diameter | Soldering<br>Time |
| ΔT≤130                    | 300±10°Cmax.          | ≥ 60 sec.                 | ≤ 4 sec.                | -                     | 20W max.                     | 3mm max.        | 4 sec max.        |

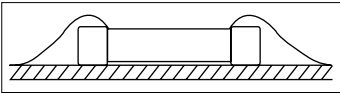
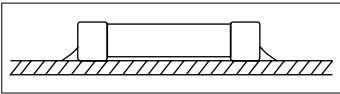
※ Caution - Iron tip should not contact with ceramic body directly



6-3. Manual Soldering

Manual soldering can pose a great risk of creating thermal cracks in chip capacitors. The hot soldering iron tip comes into direct contact with the end terminations, and operator’s carelessness may cause the tip of the soldering iron to come into direct contact with the ceramic body of the capacitor. Therefore the soldering iron must be handled carefully, and close attention must be paid to the selection of the soldering iron tip and to temperature control of the tip.

6-4. Amount of Solder

|                   |                                                                                   |                                                                            |
|-------------------|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------|
| Too much Solder   |  | Cracks tend to occur due to large stress.                                  |
| Not enough solder |  | Weak holding force may cause bad connections or detaching of the capacitor |

6-5. Cooling

Natural cooling using air is recommended. If the chips are dipped into solvent for cleaning, the temperature difference ( $\Delta T$ ) must be less than 100°C

6-6. Cleaning

If rosin flux is used, cleaning usually is unnecessary. When strongly activated flux is used, chlorine in the flux may dissolve into some types of cleaning fluids, thereby affecting the chip capacitors. This means that the cleaning fluid must be carefully selected, and should always be new.

7. Notes for Separating Multiple, Shared PC Boards

A multi-PC board is separated into many individual circuit boards after soldering has been completed. If the board is bent or distorted at the time of separation, cracks may occur in the chip capacitors. Carefully choose a separation method that minimizes the bending of the circuit board.

Part Numbering  
System

General  
Capacitors

High Capacitance  
Capacitors

Super Small Size  
Capacitors

Medium-High  
Voltage Capacitors

Array Type  
Capacitors

Low ESL  
Capacitors

Reliability Test  
Condition

Premium Capacitors  
for Automotive  
Applications

Packaging  
Specification

Application Manual  
for Surface Mounting



**SAMSUNG**  
**ELECTRO-MECHANICS**

**Sony Green Partner**

**Certificate  
Green Partner**

Presented To: SKD 5431  
Samsung Japan Corporation  
SAMSUNG ELECTRO-MECHANICS CO., LTD. SUWON FACTORY  
This is to certify that you have successfully established  
an environmental management system  
that has met the requirements of the Sony Green Partner Program  
Term of Validity: 2010/6/1 ~ 2012/5/31  
Issued on: 2010/5/31  
Approved and Issued by: Procurement Group, Sony Corporation

SONY

87574

**ISO/TS 16949**

**Certificate  
of Registration**

QUALITY MANAGEMENT SYSTEM - ISO/TS 16949:2002

This is to certify that  
Samsung Electro-Mechanics Co., Ltd.  
Samsung I/F  
#114, Minsong 3-dong  
Yongin-si  
Gyeonggi-do  
South Korea  
ISO 9001:2008

Model Certificate No. 18 91430-000  
and operates a Quality Management System which complies with the requirements of ISO/TS 16949:2002 for the  
following scope:  
The design and manufacture of multi-layer ceramic capacitors.  
Permitted Exclusion: None

For and on behalf of BSI  
Managing Director, BSI  
Original registered: 2010/05/31  
SC# Number: 00000000  
Latest issue: 2010/05/31  
Expiry Date: 2011/05/31  
Page 1 of 2

BSI  
Management  
Systems

**ISO 14001**

**ENVIRONMENTAL MANAGEMENT SYSTEM CERTIFICATE**  
Registration No. 021100110143002

This is to certify that the environmental management system of  
Samsung High Tech Electro-mechanics (Tianjin) Co., Ltd.  
At: 1, Wanshan Road, Micro-Electronics Industrial Park, Xiqing District,  
Tianjin, 300386, P.R. China  
is in conformity with  
GB/T24001-2004 / ISO14001:2004  
This certificate is valid for the following scope:  
Chip-resistor, Light Emitting Diode, Image Sensor Module  
Production Manage Activity because is involved.

This certificate is valid from April 26, 2009 to April 27, 2012  
It is valid within the scope of validity of all the subcontractors and qualification  
operated in accordance with the regulation of P. R. C.  
In the case that the subcontractors require a separate assessment, this certificate shall  
be valid when used together with the Notice for Maintenance of Use of Certificate and scope.

General Manager: [Signature]  
Date of Issue: April 26, 2009  
CNAS IAF

**OHSAS18001**

**Certificate  
of Registration**  
Occupational Health and Safety Management

This is to certify that  
Samsung Electro-Mechanics Co., Ltd.  
#114, Minsong 3-dong  
Yongin-si  
Gyeonggi-do  
Korea  
Model Certificate No. 021100110143002

and operates an Occupational Health and Safety Management System which complies with the requirements  
of OHSAS 18001:2007 for the following scope:  
The manufacture of computer peripheral, network products and components for  
personal, mobile communication, consumer, video audio.  
The manufacture of HDSingle Density Interconnection, MLC/DWDR Laser  
Circuit components, MCM/SLP Super Thin Device, FQDQ/One Shot (Gate  
Array), (SR)Image Sensor Module and PDS/PS/PS (Printed circuit Board).  
The design of printed circuit board.

For and on behalf of BSI  
Certification Manager, Systems Assessment  
Original registered: 22 May 2009  
Latest issue: 18 Jun 2009  
Expiry date: 05 Jul 2009  
Page 1 of 2

BSI  
Management  
Systems

**Quality System Certification status for each factory site**

| Certification      | Suwon<br>(Korea)                                  | Busan<br>(Korea)                                  | Calamba<br>(Philippines)                          | Tianjin<br>(China)                                | Gaoxin<br>(China)                       |
|--------------------|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------|---------------------------------------------------|-----------------------------------------|
| ISO / TS 16949     | BSI<br>TS 91430-000<br>[Nov.22.2010]              |                                                   | BSI<br>TS 91430-005<br>[Aug.13.2012]              | BSI<br>TS 91430-007<br>[Dec.04.2011]              | BSI<br>TS 91430-008<br>[Dec.04.2011]    |
| TL 9000            | -                                                 | BSI<br>FM90588<br>[Sep.21.2011]                   | -                                                 | -                                                 | -                                       |
| ISO 14001          | UL<br>20003847 UM<br>[Jul.11.2013]                |                                                   | BSI<br>EMS 77354<br>[Aug.03.2012]                 | CCCI<br>02107E1044R4L<br>[Apr.27.2012]            | CCCI<br>02109E10143R2L<br>[Apr.27.2012] |
| OSHAS 18001        | UL<br>20003847 BSOH<br>[Jul.24.2013]              |                                                   | SGS<br>PH08/0220<br>[Mar.16.2011]                 | CCCI<br>02109S10089R2L<br>[Apr.27.2012]           | CCCI<br>02109S10088R2L<br>[Apr.27.2012] |
| Sony Green Partner | Sony<br>SKD 5431<br>[June.01.2010<br>May~31.2012] | Sony<br>SKD 5432<br>[June.01.2010<br>May~31.2012] | Sony<br>SKD 5434<br>[June.01.2010<br>May~31.2012] | Sony<br>SKD 5437<br>[June.01.2010<br>May~31.2012] |                                         |

## Passive components sales offices

### • Head office

206, Cheomdansaneop Road,  
Yeongtong-gu, Suwon-city,  
Gyeonggi province, Korea,  
443-743

Europe  
Tel: +82-31-210-6328  
E-mail: james.pyun@samsung.com

America  
Tel: +82-31-210-6794  
E-mail: randy.kim@samsung.com

Asia  
Tel: +82-31-210-5348  
E-mail: koogi@samsung.com

Domestic  
Tel: +82-31-210-3757  
E-mail: southjoy@samsung.com

### • Manufacturing sites

Suwon Plant (Korea)  
206, Cheomdansaneop Road,  
Yeongtong-gu, Suwon-city,  
Gyeonggi province, Korea,  
443-743  
Tel: +82-31-210-5074  
E-mail: boungho.lee@samsung.com

Busan Plant (Korea)  
1623-2, Songjeong-dong,  
Gangseo-gu, Busan, Korea,  
618-270  
Tel: +82-51-970-7671  
E-mail: kyc.kweon@samsung.com

Tianjin Plant (China)  
27, Heiniucheng-Road, Hexi District,  
Tianjin, 300210 China  
Tel: +86-22-2397-9000(310)  
E-mail: moohantop.Park@samsung.com

High Tech (China)  
Xiqind Dist. Micro-Electronics  
Industrial Park, Jingang Highway,  
Tianjin, China 300485  
Tel: +86-22-23979000-313  
E-mail: enhao.song@samsung.com

Philippines Plant (Philippines)  
Block No.5, Calamba Premiere  
International Park, Batino, Calamba,  
Laguna, Manila, Philippines 4027  
Tel: +63-49-545-0422  
E-mail: donna@samsung.com

### • Asia sales offices

Shenzhen Office  
46 F, New World Center,  
Yitian Road, Futian District,  
Shenzhen, 518026 China  
Tel: 86-755-8608-5571  
E-mail: jackson.xian@samsung.com

Shanghai Office  
Rm. 1211, Shanghai International  
Trade Center, No. 2201 Yan an(W) Rd.,  
Shanghai, 200335 China  
Tel: 86-21-6270-4168(274)  
E-mail: dennis.cha@samsung.com

HongKong Office  
8/F, Central Plaza, 18 Harbour Road,  
Wanchai, Hongkong, China  
Tel: 852-28626344  
E-mail: vivianchan@samsung.com

Qingdao Office  
Rm 1201, Growne Plaza Qingdao 76,  
Xiang Gang Zhong Rd, Qingdao,  
266071 China  
Tel: 86-532-85779102  
E-mail: zhengguo.cui@samsung.com

Taiwan Office  
9F-1, Np. 399 Ruey Kuang Rd., Neihu  
District, Taipei City, Taiwan, 114  
Tel: 886-2-2656-8356  
E-mail: kevin0130.wang@samsung.com

Singapore Office  
3 Church Street Samsung Hub,  
#23-02 Singapore 049483  
Tel: 65-6833-3228  
E-mail: winson.yeong@samsung.com

Bangkok Office  
23rd Floor, Lake Rajada Office Complex  
193/89 Rachadapisek Road,  
Khet Klongtoey, Bangkok 10110, Thailand  
Tel: 66-2-661-8004~5  
E-mail: yangshin.yi@samsung.com

### • America sales office

Irvine Office  
3345 Michelson Drive,  
Suite 350, Irvine, CA 92612, USA  
Tel: 1-949-797-8047  
E-mail: sh386.kim@samsung.com

### • Europe sales offices

Frankfurt Office  
Samsung Haus, Am Kronberger Hang 6,  
D-65824 Schwalbach/Ts. Germany  
Tel: 49-6196-66-7255  
E-mail: frank.goebel@samsung.com

Hungary Office  
H-2310, Leshegy utca 2-4,  
Szigetszentmiklos, Pest megye, Hungary  
Tel: 36-24-551-148  
E-mail: jun21c.lee@samsung.com

### • Domestic Distributors

Korchip Corporation  
817-38, Anyang 2-dong, Manan-gu,  
Anyang-city, Gyeonggi province,  
Korea, 430-812  
Tel: +82-31-361-8100  
E-mail: itasap@korchip.com

Chunghan  
Chunghan Bldg., 121-284, Dansan-dong,  
Youngdeungpo-gu, Seoul, Korea  
Tel: +82-2-718-3322  
E-mail: ish@ichunghan.co.kr

SAMT  
Daekyung Bldg., 983-10, Daechi-dong,  
Gangnam-gu, Seoul, Korea  
Tel: +82-2-3458-9000  
E-mail: info@isamt.com

CHUNGMAC  
#53-5 Wonhyoro-3ga Yongsan-gu,  
Seoul, Korea  
Tel: +82-31-234-2367~8  
E-mail: webmaster@chungmac.co.kr

APEXINT  
Room #905, C-dong Woorimlion's Valley  
371-28, Gasan-dong, Guemcheon-gu,  
Seoul, Korea  
Tel: +82-2-2026-2610(2)  
E-mail: info@apexint.co.kr