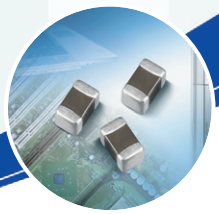
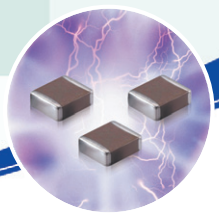
November 2010

3.75g CO_2 기후변화대응
MLCC(03A104K) 1piece

RoHs+Halogen Compliant
ecoparts

MULTILAYER CERAMIC CAPACITORS





SAMSUNG
ELECTRO-MECHANICS

SAMSUNG

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.semlcr.com]

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

CONTENTS

Part Numbering System 4

General Capacitors 6

High Capacitance Capacitors 23

Super Small Size Capacitors 37

Medium-High Voltage Capacitors 41

Array Type Capacitors 52

Low ESL Capacitors 55

Reliability Test Condition 58

Premium Capacitors for Automotive Applications 62

Packaging Specification 78

Application Manual for Surface Mounting 82

Part Numbering System

CL	10	C	101	J	B	8	N	N	N	C
1	2	3	4	5	6	7	8	9	10	11

1. SERIES CODE

CL=Multi layer Ceramic Capacitors

2. SIZE CODE — inch(㎜)

02=01005(0402) 21=0805(2012) 43=1812(4532)
03=0201(0603) 31=1206(3216) 55=2220(5750)
05=0402(1005) 32=1210(3225)
10=0603(1608) 42=1808(4520)

★ 3. DIELECTRIC CODE

Class Ⅰ	Class Ⅱ
C=C0G	A=X5R F=Y5V B=X7R X=X6S Y=X7S

★★ 4. CAPACITANCE CODE

Capacitance expressed in pF. 2 significant digits plus number of zeros.
example) 106=10×10^6=10000000pF
For Values < 10pF, Letter R denotes decimal point
example) 1R5=1.5pF

5. TOLERANCE CODE

A=±0.05pF D=±0.5pF J=±5% Z=+80/-20%
B=±0.1pF F=±1pF, ±1%* K=±10%
C=±0.25pF G=±2% M=±20%

*For Values ≤ 10pF, F=±1pF
Values > 10pF, F=±1%

6. RATED VOLTAGE CODE

R=4V O=16V B=50V E=250V H=630V K=3000V
Q=6.3V A=25V C=100V F=350V I=1000V
P=10V L=35V D=200V G=500V J=2000V

★★★ 7. THICKNESS CODE

3=0.30㎜ A=0.65㎜ F=1.25㎜ L=3.20㎜ S=1.35㎜
5=0.50㎜ C=0.85㎜ H=1.60㎜ M=1.15㎜ U=1.80㎜
8=0.80㎜ D=1.00㎜ I=2.00㎜ P=1.15㎜ V=2.50㎜
9=0.90㎜ E=1.10㎜ J=2.50㎜ Q=1.25㎜ Y=1.25㎜

8. INNER ELECTRODE / TERMINATION / PLATING CODE

A=Normal Product Pd / Ag / Ni barrier / Sn 100%
N=Normal Product Ni / Cu / Ni barrier / Sn 100%
G=Normal Product Cu / Cu / Ni barrier / Sn 100%
L=Low profile Ni / Cu / Ni barrier / Sn 100%
S=Nomal Product Ni/Cu/Ag-Epoxy/Ni barrier /Sn100%

9. PRODUCT CODE

A=Array(2-element) L=LICC
B=Array(4-element) N=Normal

*Size tolerance

Code \ Size	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	-	-

10. SPECIAL CODE

N=special code

11. PACKAGING CODE

B=Bulk
P=Bulk Case
C=Cardboard Tape, 7"Reel
O=Cardboard Tape, 10"Reel
D=Cardboard Tape, 13"Reel(10,000ea)
L=Cardboard Tape, 13"Reel(15,000ea)
E=Embossed Type, 7"Reel
F=Embossed Type, 13"Reel
S=Embossed Type, 10"Reel

Class Ⅰ (Temperature Compensation)

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

★
Class Ⅱ (High Dielectric Constant)

Symbol	EIA Code	Operation Temperature Range(℃)	Capacitance Change(△C %)
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 X7R 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)
01005(0402)	2	0.20	±0.02
0201(0603)	3	0.30	±0.03
0402(1005)	5	0.50	±0.05
0603(1608)	5	0.50	+0.0/-0.1
	8	0.80	±0.10
0805(2012)	A	0.65	±0.10
	C	0.85	±0.10
	D	1.00	±0.15
	F	1.25	±0.10
	Q	1.25	±0.15
	Y	1.25	±0.2
1206(3216)	C	0.85	±0.15 *±0.10
	D	1.00	±0.15
	E	1.10	±0.10
	P	1.15	±0.10
	F	1.25	±0.15
	H	1.60	±0.20
1210(3225)	C	0.85	±0.15 *±0.10
	9	0.90	±0.10
	M	1.15	±0.10
	F	1.25	±0.20
	S	1.35	±0.15
1210(3225)	H	1.60	±0.20
	U	1.80	±0.20
	I	2.00	±0.20
	J	2.50	±0.20
	V	2.50	±0.30
1808(4520)	F	1.25	±0.20
	H	1.60	±0.20
	I	2.00	±0.20
1812(4532)	F	1.25	±0.20
	H	1.60	±0.20
	I	2.00	±0.20
	J	2.50	±0.20
	L	3.20	±0.30
2220(5750)	F	1.25	±0.20
	H	1.60	±0.20
	I	2.00	±0.20
	J	2.50	±0.20
	L	3.20	±0.30

■ * Mark is only applicable to "L" code , 12th code in part number.
■ Please discuss with sales person with regard to Pd products.

Part Numbering System
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Packaging Specification
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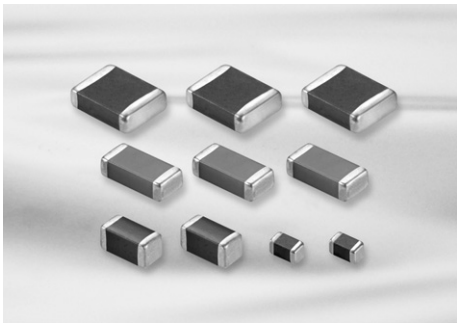
General Capacitors



Feature

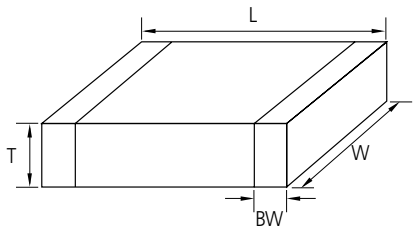
- Wide selection of size : from 0402 to 2220
- Highly reliable tolerance and high speed automatic chip placement on PCBs
- Wide capacitance range
- Wide temperature compensation and voltage range
  : from C0G to Y5V and from 6.3V to 50V
- Highly reliable performance
- Highly resistant termination metal
- 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±0.05	0.50±0.05	0.50±0.05	5	0.2+0.15/-0.1
10	0603	1.60±0.10	0.80±0.10	0.50+0.0/-0.1	5	0.30±0.20
				0.80±0.10	8	
21	0805	2.00±0.10	1.25±0.10	0.85±0.10	C	0.5+0.2/-0.3
				1.25±0.10	F	
		2.00±0.15	1.25±0.15	1.25±0.15	Q	
		2.00±0.20	1.25±0.20	1.25±0.20	Y	
31	1206	3.20±0.20	1.60±0.20	0.60±0.10	6	0.50±0.30
				0.85±0.15 0.85±0.10(*)	C	
				1.15±0.10	P	
		3.20±0.15	1.60±0.15	1.25±0.15	F	
		3.20±0.20	1.60±0.20	1.60±0.20	H	
32	1210	3.20±0.30	2.50±0.20	0.85±0.15 0.85±0.10(*)	C	0.60±0.30
				0.90±0.10	9	
				1.60±0.20	H	
				1.80±0.20	U	
				2.00±0.20	I	
				2.50±0.20	J	
		3.20±0.40	2.50±0.30	2.50±0.30	v	
42	1808	4.50±0.40	2.00±0.20	2.00±0.20	I	0.80±0.30
43	1812	4.50±0.40	3.20±0.30	3.20±0.30	L	0.80±0.30
55	2220	5.70±0.40	5.00±0.40	3.20±0.30	L	1.00±0.30

■ * Mark is only applicable to "L" code , 12th code in part number.

General Capacitors Table (C0G)

Size(mm)	Vr(V)	Capacitance
		pF: 0.5 1 10 22 47 100 220 330 470 560 / nF: 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	43nF – 130nF

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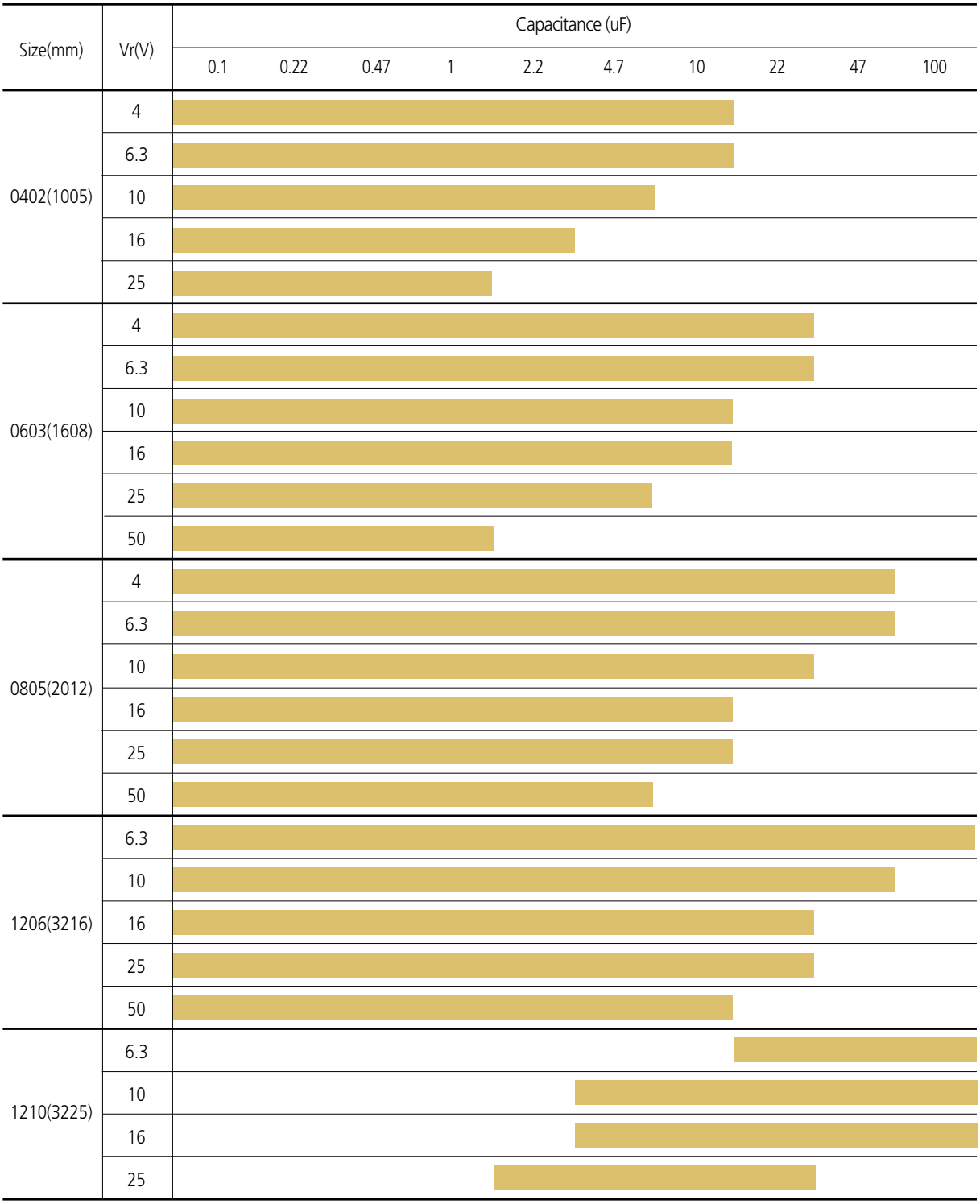
Premium Capacitors for Automotive Applications
Packaging Specification
Application Manual for Surface Mounting

General Capacitors Table (X5R)



General Capacitors Table_Low Profile (X5R)

Size(mm)	Tmax (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	

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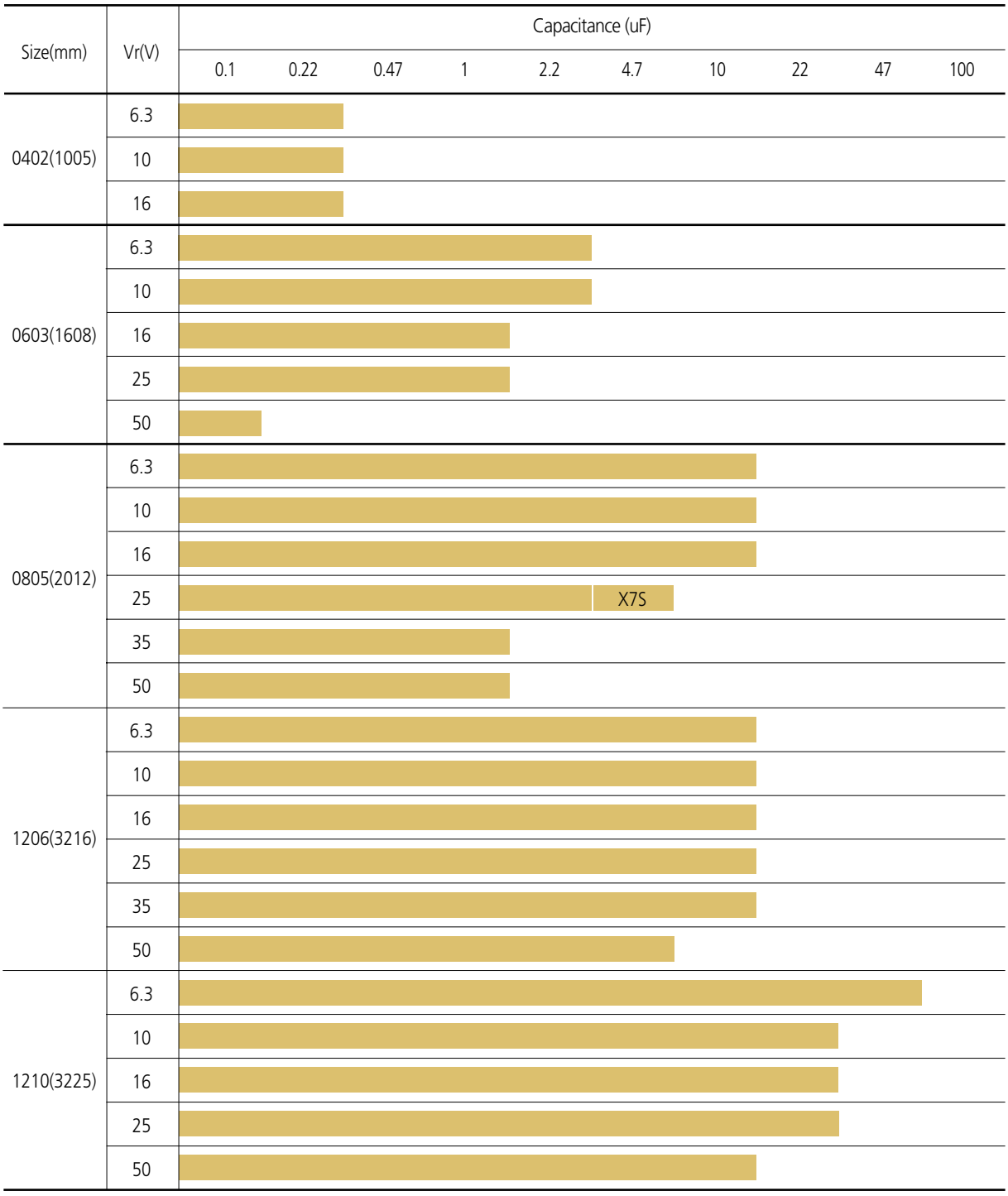
Reliability Test Condition
Premium Capacitors for Automotive Applications
Packaging Specification
Application Manual for Surface Mounting

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)



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General Capacitors
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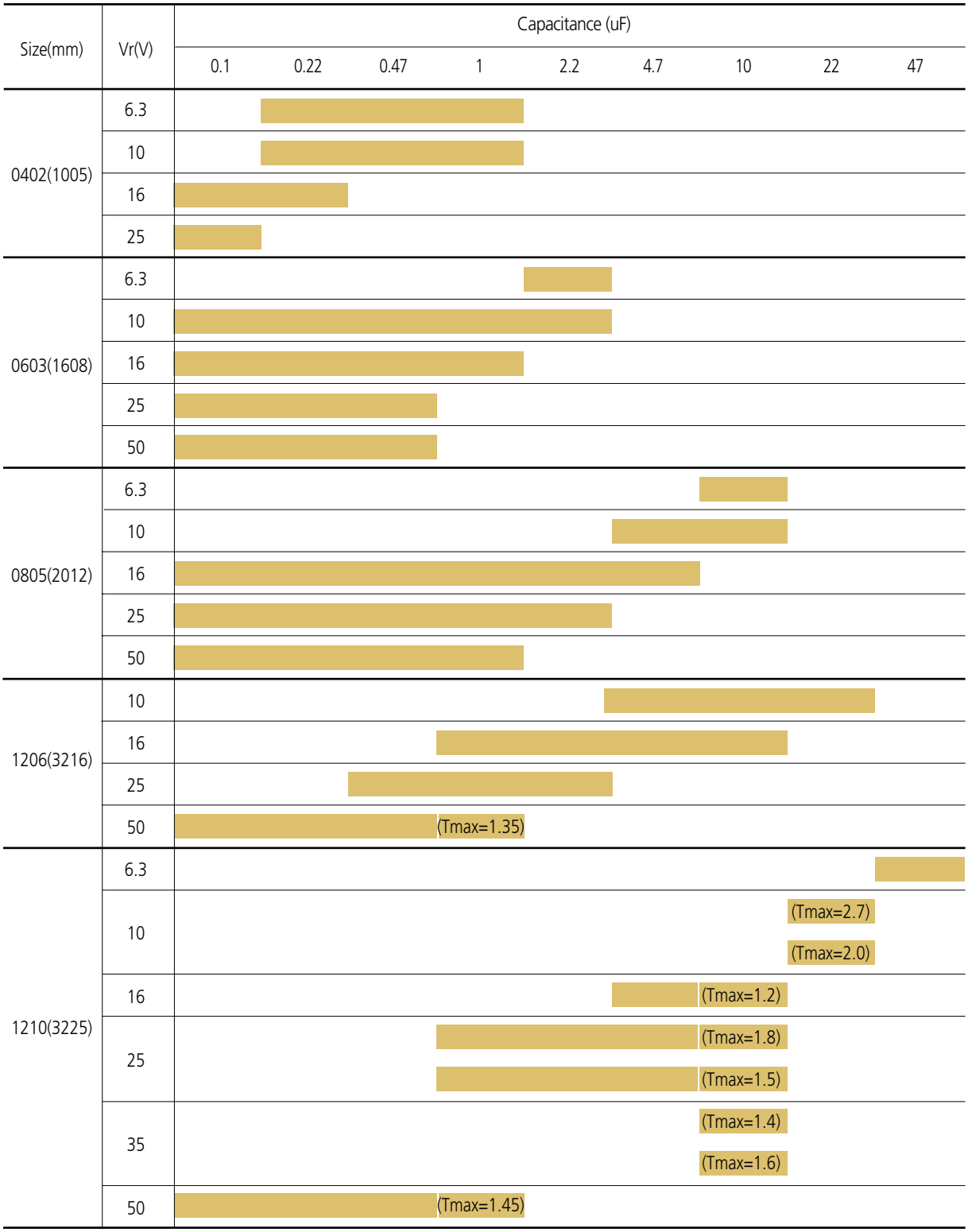
Packaging Specification
Application Manual for Surface Mounting

General Capacitors Table (Y5V)



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.

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Product Lineup (General Capacitors-C0G)

	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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	CL10CR75CB8NNN □		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 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-C0G)

	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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	CL21C392JAANNN □		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

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

Product Lineup (General Capacitors-C0G)

	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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 Cacacitance' subcategory.

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-X7R)

	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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 Cacacitance' 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 □		1μF	50	±10%	1.45
8	CL32B105KAHNNN □		1μF	25	±10%	1.8
9	CL32B225KBINNN □		2.2μF	50	±10%	2.2
10	CL32B225KAJNNN □		2.2μF	25	±10%	2.7
11	CL32B474KBFNNN □		470nF	50	±10%	1.45
12	CL32B474KAFNNN □		470nF	25	±10%	1.45
13	CL32B475KOINNN □		4.7μF	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 □		1μF	50	±10%	1.45
5	CL43B106KALNNN □		10μF	25	±10%	3.5
6	CL43B226KPJNNN □		22μF	10	±10%	2.7
1	CL55B475KBJNNN □	5.70×5.00	4.7μF	50	±10%	2.7

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 Cacacitance' subcategory.

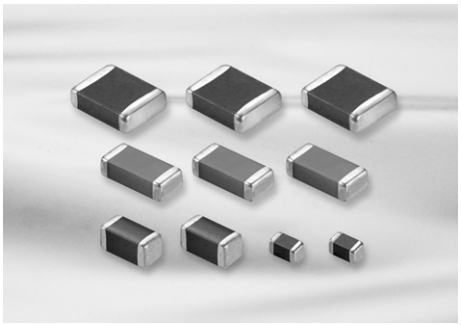
Part Numbering System
General Capacitors
High Capacitance Capacitors
Super Small Size Capacitors
Medium-High Voltage Capacitors
Array Type Capacitors
Low ESL Capacitors
Reliability Test Condition
Premium Capacitors for Automotive Applications
Packaging Specification
Application Manual for Surface Mounting

Product Lineup (General Capacitors-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 Cacacitance' subcategory.

High Capacitance Capacitors



Feature

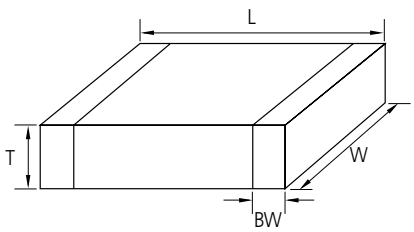
- Wide selection of size : from 0402 to 1812
- Highly reliable tolerance and high speed automatic chip placement on PCBs
- Wide capacitance range
- Highly reliable performance
- Highly resistant termination metal
- Tape & reel for surface mount assembly

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±0.05	0.50±0.05	0.50±0.05	5	0.2+0.15/-0.1
10	0603	1.60±0.10	0.80±0.10	0.50±0.05	5	0.30±0.20
				0.80±0.10	8	
21	0805	2.00±0.10	1.25±0.10	0.85±0.10	C	0.5+0.2/-0.3
				1.25±0.10	F	
		2.00±0.15	1.25±0.15	1.25±0.15	Q	
		2.00±0.20	1.25±0.20	1.25±0.20	Y	
31	1206	3.20±0.20	1.60±0.20	0.60±0.10	6	0.50±0.30
				0.85±0.10	C	
				1.15±0.10	P	
		3.20±0.15	1.60±0.15	1.25±0.15	F	
		3.20±0.20	1.60±0.20	1.60±0.20	H	
32	1210	3.20±0.30	2.50±0.20	0.85±0.10	C	0.60±0.30
				0.90±0.10	9	
				1.60±0.20	H	
				1.80±0.20	U	
				2.00±0.20	I	
				2.50±0.20	J	
		3.20±0.40	2.50±0.30	2.50±0.30	v	
42	1808	4.50±0.40	2.00±0.20	2.00±0.20	I	0.80±0.30
43	1812	4.50±0.40	3.20±0.30	3.20±0.30	L	0.80±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 (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	

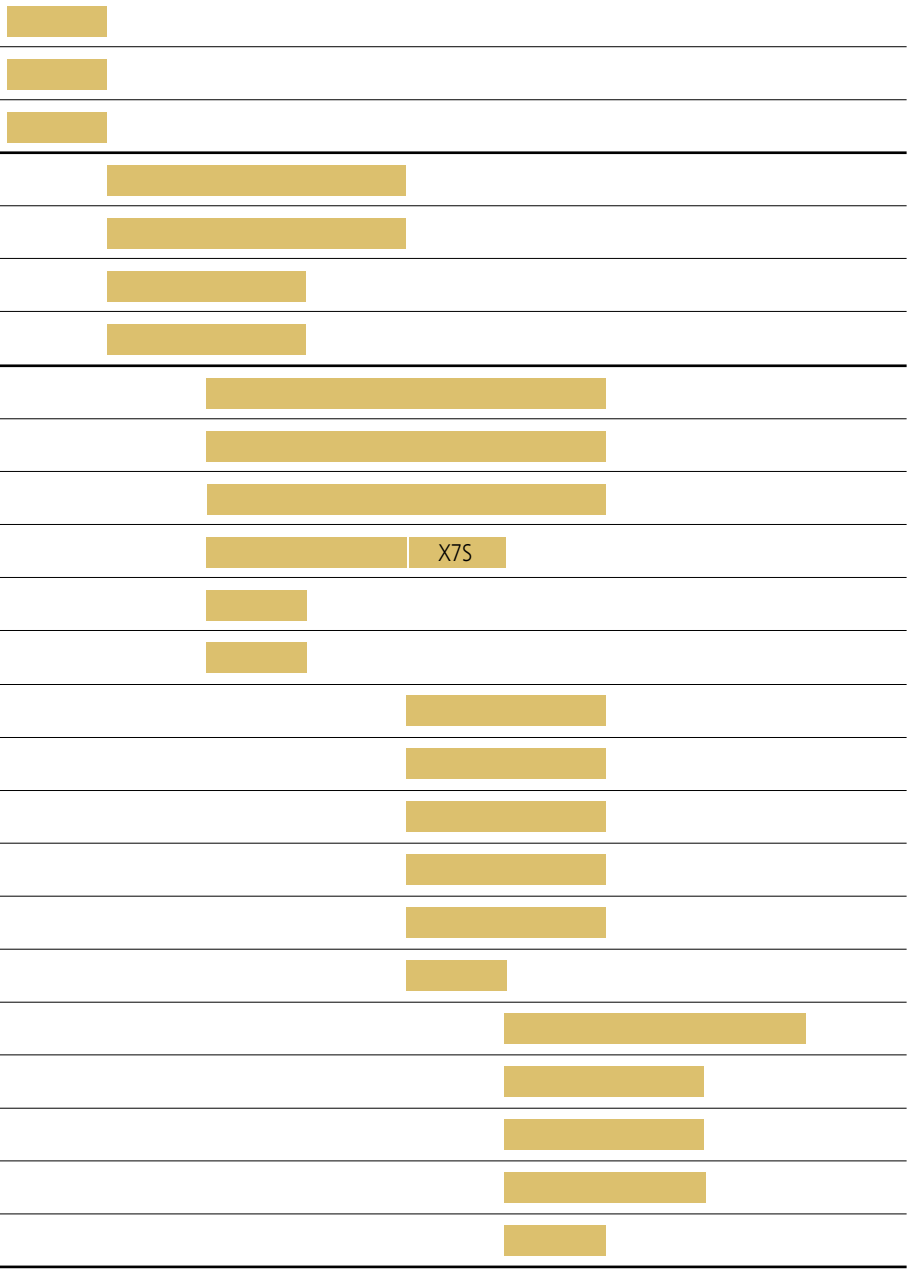
Part Numbering System
General Capacitors
High Capacitance Capacitors
Super Small Size Capacitors
Medium-High Voltage Capacitors
Array Type Capacitors
Low ESL Capacitors
Reliability Test Condition
Premium Capacitors for Automotive Applications
Packaging Specification
Application Manual for Surface Mounting

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	(Tmax=2.7) (Tmax=2.0)
	16	(Tmax=1.2)
	25	(Tmax=1.8) (Tmax=1.5)
	35	(Tmax=1.4) (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	0.22μF	6.3	±10%	0.55
2	CL05A224KR5NNN □		0.22μF	4	±10%	0.55
3	CL05A224KA5NNN □		0.22μF	25	±10%	0.55
4	CL05A224KO5NNN □		0.22μF	16	±10%	0.55
5	CL05A224KP5NNN □		0.22μF	10	±10%	0.55
6	CL05A334KA5NNN □		0.33μF	25	±10%	0.55
7	CL05A334KQ5NNN □		0.33μF	6.3	±10%	0.55
8	CL05A334KR5NNN □		0.33μF	4	±10%	0.55
9	CL05A474KA5NNN □		0.47μF	25	±10%	0.55
10	CL05A474KO5NNN □		0.47μF	16	±10%	0.55
11	CL05A474KP5NNN □		0.47μF	10	±10%	0.55
12	CL05A474KQ5NNN □		0.47μF	6.3	±10%	0.55
13	CL05A474KR5NNN □		0.47μF	4	±10%	0.55
14	CL05A105KA5NQN □		1μF	25	±10%	0.60
15	CL05A105KO5NNN □		1μF	16	±10%	0.55
16	CL05A105KO3LQN □		1μF	16	±10%	0.33
17	CL05A105KP5NNN □		1μF	10	±10%	0.55
18	CL05A105KP3LNN □		1μF	10	±10%	0.33
19	CL05A105KQ5NNN □		1μF	6.3	±10%	0.55
20	CL05A105KQ3LNN □		1μF	6.3	±10%	0.33
21	CL05A105KR5NNN □		1μF	4	±10%	0.55
22	CL05A105KR3LNN □		1μF	4	±10%	0.33
23	CL05A225KO5NQN □		2.2μF	16	±10%	0.60
24	CL05A225MP5NSN □		2.2μF	10	±20%	0.57
25	CL05A225KP3LRN □		2.2μF	10	±10%	0.33
26	CL05A225MQ5NNN □		2.2μF	6.3	±20%	0.55
27	CL05A225KQ3LRN □		2.2μF	6.3	±10%	0.33
28	CL05A225MR5NNN □		2.2μF	4	±20%	0.55
29	CL05A225KR3LRN □		2.2μF	4	±10%	0.33
30	CL05A475MP5NRN □		4.7μF	10	±20%	0.65
31	CL05A475MQ5NRN □		4.7μF	6.3	±20%	0.65
32	CL05A475MR5NRN □		4.7μF	4	±20%	0.65
33	CL05A106MQ5NUN □		10μF	6.3	±20%	0.70
34	CL05A106MR5NRN □		10μF	4	±20%	0.65
1	CL10A474KB8NNN □	1.60×0.80	0.47μF	50	±10%	0.90
2	CL10A474KA8NNN □		0.47μF	25	±10%	0.90
3	CL10A474KP8NNN □		0.47μF	10	±10%	0.90
4	CL10A474KQ8NNN □		0.47μF	6.3	±10%	0.90
5	CL10A474KR8NNN □		0.47μF	4	±10%	0.90
6	CL10A105KB8NNN □		1μF	50	±10%	0.90
7	CL10A105KA85NN □		1μF	25	±10%	0.55
8	CL10A105KA8NNN □		1μF	25	±10%	0.90
9	CL10A105KO8NNN □		1μF	16	±10%	0.90
10	CL10A105KO5LNN □		1μF	16	±10%	0.55
11	CL10A105KP8NNN □		1μF	10	±10%	0.90
12	CL10A105KP5LNN □		1μF	10	±10%	0.55
13	CL10A105KQ8NNN □		1μF	6.3	±10%	0.90
14	CL10A105KQ5LNN □		1μF	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 (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max. (mm)
15	CL10A105KR8NNN □	1.60×0.80	1μF	4	±10%	0.90
16	CL10A105KR5LNN □		1μF	4	±10%	0.55
17	CL10A225KA8NNN □		2.2μF	25	±10%	0.90
18	CL10A105KA85NN □		2.2μF	25	±10%	0.55
19	CL10A225KO8NNN □		2.2μF	16	±10%	0.90
20	CL10A225KO5LNN □		2.2μF	16	±10%	0.55
21	CL10A225KP8NNN □		2.2μF	10	±10%	0.90
22	CL10A225KP5LNN □		2.2μF	10	±10%	0.55
23	CL10A225KQ8NNN □		2.2μF	6.3	±10%	0.90
24	CL10A225KQ5LNN □		2.2μF	6.3	±10%	0.55
25	CL10A225KR8NNN □		2.2μF	4	±10%	0.90
26	CL10A225KR5LNN □		2.2μF	4	±10%	0.55
27	CL10A335KQ8NNN □		3.3μF	6.3	±10%	0.90
28	CL10A335KR8NNN □		3.3μF	4	±10%	0.90
29	CL10A475KA8NQN □		4.7μF	25	±10%	0.95
30	CL10A475KO8NNN □		4.7μF	16	±10%	0.90
31	CL10A475KP8NNN □		4.7μF	10	±10%	0.90
32	CL10A475KP5NNN □		4.7μF	10	±10%	0.55
33	CL10A475KQ5LNN □		4.7μF	6.3	±10%	0.55
34	CL10A475KQ8NNN □		4.7μF	6.3	±10%	0.90
35	CL10A475KR5LNN □		4.7μF	4	±10%	0.55
36	CL10A475KR8NNN □		4.7μF	4	±10%	0.90
37	CL10A106MO8NQN □		10μF	16	±20%	0.95
38	CL10A106MP8NNN □		10μF	10	±20%	0.90
39	CL10A106KQ8NNN □		10μF	6.3	±10%	0.90
40	CL10A106MQ5NRN □		10μF	6.3	±10%	0.55
41	CL10A106KR8NNN □		10μF	4	±10%	0.90
42	CL10A106MR5NRN □		10μF	4	±10%	0.55
43	CL10A226MQ8NRN □		22μF	6.3	±20%	1.00
44	CL10A226MR8NRN □		22μF	4	±20%	1.00
1	CL21A105KBQNNN □	2.00×1.25	1μF	50	±10%	1.40
2	CL21A105KAFNNN □		1μF	25	±10%	1.35
3	CL21A105KA6LNN □		1μF	25	±10%	0.70
4	CL21A105KOFNNN □		1μF	16	±10%	1.35
5	CL21A105KO6LNN □		1μF	16	±10%	0.70
6	CL21A105KQFNNN □		1μF	6.3	±10%	1.35
7	CL21A105KRFNNN □		1μF	4	±10%	1.35
8	CL21A225KBQNNN □		2.2μF	50	±10%	1.40
9	CL21A225KAFNNN □		2.2μF	25	±10%	1.35
10	CL21A225KO6LNN □		2.2μF	16	±10%	0.70
11	CL21A225KOFNNN □		2.2μF	16	±10%	1.35
12	CL21A225KPFNNN □		2.2μF	10	±10%	1.35
13	CL21A225KQFNNN □		2.2μF	6.3	±10%	1.35
14	CL21A225KRFNNN □		2.2μF	4	±10%	1.35
15	CL21A475KBQNNN □		4.7μF	50	±10%	1.40
16	CL21A475KAQNNN □		4.7μF	25	±10%	1.40
17	CL21A475KACLRN □		4.7μF	25	±10%	0.95
18	CL21A475KOFNNN □		4.7μF	16	±10%	1.35
19	CL21A475KOCLNN □		4.7μF	16	±10%	0.70
20	CL21A475KPFNNN □		4.7μF	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㎌	10	±10%	0.95
22	CL21A475KQFNNN □		4.7㎌	6.3	±10%	1.35
23	CL21A475KQCLNN □		4.7㎌	6.3	±10%	0.95
24	CL21A475KRFNNN □		4.7㎌	4	±10%	1.35
25	CL21A106KAYNNN □		10㎌	25	±10%	1.45
26	CL21A106KACLRN □		10㎌	25	±10%	0.95
27	CL21A106KOFNNN □		10㎌	16	±10%	1.35
28	CL21A106KOQNNN □		10㎌	16	±10%	1.40
29	CL21A106KOCLRN □		10㎌	16	±10%	0.70
30	CL21A106KPFNNN □		10㎌	10	±10%	1.35
31	CL21A106KPCLQN □		10㎌	10	±20%	0.95
32	CL21A106KQFNNN □		10㎌	6.3	±10%	1.35
33	CL21A106KQCLNN □		10㎌	6.3	±10%	0.95
34	CL21A475KRCLNN □		4.7㎌	4	±10%	0.95
35	CL21A106KRFNNN □		10㎌	4	±10%	1.35
36	CL21A106KRCLNN □		10㎌	4	±10%	0.95
37	CL21A226MPQNNN □		22㎌	10	±20%	1.40
38	CL21A226MPCLRN □		22㎌	10	±20%	0.95
39	CL21A226MQQNNN □		22㎌	6.3	±20%	1.40
40	CL21A226MQCLRN □		22㎌	6.3	±20%	0.95
41	CL21A226MRQNNN □		22㎌	4	±20%	1.40
42	CL21A226MRCLRN □		22㎌	4	±20%	0.95
43	CL21A336MQELNN □		33㎌	6.3	±20%	1.20
44	CL21A336MQ9LNN □		33㎌	6.3	±20%	1.00
45	CL21A336MRELNN □		33㎌	4	±20%	1.20
46	CL21A336MR9LNN □		33㎌	4	±20%	1.00
47	CL21A476MQYNNN □		47㎌	6.3	±20%	1.45
48	CL21A476MRYNNN □		47㎌	4.0	±20%	1.45
1	CL31A475KBHNNN □	3.20×1.60	4.7㎌	50	±10%	1.80
2	CL31A475KB9LNN □		4.7㎌	50	±10%	1.00
3	CL31A475KAHNNN □		4.7㎌	25	±10%	1.80
4	CL31A475KACLNN □		4.7㎌	25	±10%	0.95
5	CL31A475KOHNNN □		4.7㎌	16	±10%	1.80
6	CL31A475KOCLNN □		4.7㎌	16	±10%	0.95
7	CL31A475KPHNNN □		4.7㎌	10	±10%	1.80
8	CL31A475KQHNNN □		4.7㎌	6.3	±10%	1.80
9	CL31A475KRHNNN □		4.7㎌	4	±10%	1.80
10	CL31A106KBHNNN □		10㎌	50	±10%	1.80
11	CL31A106KAHNNN □		10㎌	25	±10%	1.80
12	CL31A106KACLNN □		10㎌	25	±10%	0.95
13	CL31A106KOHNNN □		10㎌	16	±10%	1.80
14	CL31A106KOCLNN □		10㎌	16	±10%	0.95
15	CL31A106KPHNNN □		10㎌	10	±10%	1.80
16	CL31A106KPCLNN □		10㎌	10	±10%	0.95
17	CL31A106KQHNNN □		10㎌	6.3	±10%	1.80
18	CL31A106KRHNNN □		10㎌	4	±10%	1.80
19	CL31A156KQHNNN □		15㎌	6.3	±10%	1.80
20	CL31A156KRHNNN □		15㎌	4	±10%	1.80
21	CL31A226KAHNNN □		22㎌	25	±10%	1.80
22	CL31A226KOHNNN □		22㎌	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 System
General Capacitors
High Capacitance Capacitors
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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 (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max. (mm)
23	CL31A226KOCLNN □	3.20×1.60	22㎌	16	±10%	0.95
24	CL31A226KPHNNN □		22㎌	10	±10%	1.80
25	CL31A226KPCLNN □		22㎌	10	±10%	0.95
26	CL31A226KQHNNN □		22㎌	6.3	±10%	1.80
27	CL31A226KRHNNN □		22㎌	4.0	±10%	1.80
28	CL31A476MQHNNN □		47㎌	6.3	±20%	1.80
29	CL31A476MRHNNN □		47㎌	4.0	±20%	1.80
30	CL31A107MQHNNN □		100㎌	6.3	±20%	1.80
31	CL31A107MRHNNN □		100㎌	4.0	±20%	1.80
1	CL32A106KQCLNN □	3.20×2.50	10㎌	6.3	±10%	0.95
2	CL32A106KRCLNN □		10㎌	4.0	±10%	0.95
3	CL32A106KBULNN □		10㎌	50	±10%	2.00
4	CL32A106KAJNNN □		10㎌	25	±10%	2.70
5	CL32A106KAULNN □		10㎌	25	±10%	2.00
6	CL32A106KOJNNN □		10㎌	16	±10%	2.70
7	CL32A106KPJNNN □		10㎌	10	±10%	2.70
8	CL32A226KAJNNN □		22㎌	25	±10%	2.70
9	CL32A226KOJNNN □		22㎌	16	±10%	2.70
10	CL32A226KOCLNN □		22㎌	16	±10%	0.95
11	CL32A226KPJNNN □		22㎌	10	±10%	2.70
12	CL32A226KQJNNN □		22㎌	6.3	±10%	2.70
13	CL32A226MQCLNN □		22㎌	6.3	±20%	0.95
14	CL32A226KRJNNN □		22㎌	4.0	±10%	2.70
15	CL32A226MRCLNN □		22㎌	4.0	±20%	0.95
16	CL32A476KPJNNN □		47㎌	10	±10%	2.70
17	CL32A476MQJNNN □		47㎌	6.3	±20%	2.70
18	CL32A476MRJNNN □		47㎌	4.0	±20%	2.70
19	CL32A107MPVNNN □		100㎌	10	±20%	2.80
20	CL32A107MQVNNN □		100㎌	6.3	±20%	2.80
21	CL32A107MRVNNN □		100㎌	4.0	±20%	2.80
1	CL43A476MQJNNN □	4.50×3.20	47㎌	6.3	±20%	2.70
2	CL43A476MRJNNN □		47㎌	4.0	±20%	2.70
3	CL43A107KQLNNN □		100㎌	6.3	±20%	3.50
4	CL43A107KRLNNN □		100㎌	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	0.22μF	10	±10%	0.55
2	CL05X224KQ5NNN □		0.22μF	6.3	±10%	0.55
3	CL05X224KR5NNN □		0.22μF	4	±10%	0.55
4	CL05X474KP5NNN □		0.47μF	10	±10%	0.55
5	CL05X474KQ5NNN □		0.47μF	6.3	±10%	0.55
6	CL05X474KR5NNN □		0.47μF	4	±10%	0.55
7	CL05X105KP5NNN □		1μF	10	±10%	0.55
8	CL05X105MQ3LNN □		1μF	6.3	±20%	0.33
9	CL05X105KQ5NNN □		1μF	6.3	±10%	0.55
10	CL05X105MR3LNN □		1μF	4	±20%	0.33
11	CL05X105KR5NNN □		1μF	4	±10%	0.55
12	CL05X225MQ5NSN □		2.2μF	6.3	±20%	0.57
13	CL05X225MR5NSN □		2.2μF	4	±20%	0.57
1	CL10X474KA8NNN □	1.60×0.80	0.47μF	25	±10%	0.90
2	CL10X474KO8NNN □		0.47μF	16	±10%	0.90
3	CL10X474KP8NNN □		0.47μF	10	±10%	0.90
4	CL10X474KQ8NNN □		0.47μF	6.3	±10%	0.90
5	CL10X474KR8NNN □		0.47μF	4	±10%	0.90
6	CL10X105KA8NNN □		1μF	25	±10%	0.90
7	CL10X105KO8NNN □		1μF	16	±10%	0.90
8	CL10X105KP8NNN □		1μF	10	±10%	0.90
9	CL10X105KQ8NNN □		1μF	6.3	±10%	0.90
10	CL10X105KR8NNN □		1μF	4	±10%	0.90
11	CL10X225KA8NQN □		2.2μF	25	±10%	0.90
12	CL10X225KO8NNN □		2.2μF	16	±10%	0.90
13	CL10X225KP8NNN □		2.2μF	10	±10%	0.90
14	CL10X225KQ8NNN □		2.2μF	6.3	±10%	0.90
15	CL10X225KR8NNN □		2.2μF	4	±10%	0.90
16	CL10X475KA8NQN □		4.7μF	25	±10%	0.90
17	CL10X475KO8NQN □		4.7μF	16	±10%	0.90
18	CL10X475KP5NNN □		4.7μF	10	±10%	0.90
19	CL10X475KQ8NNN □		4.7μF	6.3	±10%	0.90
20	CL10X475KR8NNN □		4.7μF	4	±10%	0.90
21	CL10X106MP8NNN □		10μF	10	±20%	0.90
22	CL10X106KQ8NNN □		10μF	6.3	±10%	0.90
23	CL10X106KR8NNN □		10μF	4	±10%	0.90
1	CL21X105KAFNNN □	2.00×1.25	1μF	25	±10%	1.35
2	CL21X105KOFNNN □		1μF	16	±10%	1.35
3	CL21X105KPFNNN □		1μF	10	±10%	1.35
4	CL21X105KQFNNN □		1μF	6.3	±10%	1.35
5	CL21X105KRFNNN □		1μF	4	±10%	1.35
6	CL21X225KAFNNN □		2.2μF	25	±10%	1.35
7	CL21X225KOFNNN □		2.2μF	16	±10%	1.35
8	CL21X225KPFNNN □		2.2μF	10	±10%	1.35
9	CL21X225KQFNNN □		2.2μF	6.3	±10%	1.35
10	CL21X225KRFNNN □		2.2μF	4	±10%	1.35
11	CL21X475KAQNNN □		4.7μF	25	±10%	1.40
12	CL21X475KOFNNN □		4.7μF	16	±10%	1.35
13	CL21X475KPFNNN □		4.7μF	10	±10%	1.35
14	CL21X475KQFNNN □		4.7μF	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 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 -X7R)

	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max. (mm)
15	CL21X475KRFNNN □	2.00×1.25	4.7㎌	4	±10%	1.35
16	CL21X106KACLRN □		10㎌	25	±10%	0.95
17	CL21X106KAYNNN □		10㎌	25	±10%	1.45
18	CL21X106KOYNNN □		10㎌	16	±10%	1.45
19	CL21X106KPCLNN □		10㎌	10	±10%	0.95
20	CL21X106KPYNNN □		10㎌	10	±10%	1.45
21	CL21X106KQQNNN □		10㎌	6.3	±10%	1.40
22	CL21X106KRQNNN □		10㎌	4	±10%	1.40
23	CL21X106KRCLNN □		10㎌	4	±10%	0.95
24	CL21X226MQQNNN □		22㎌	6.3	±20%	1.40
25	CL21X226MRQNNN □		22㎌	4	±20%	1.40
26	CL21X476MRYNNN □		47㎌	4	±20%	1.45
1	CL31X475KAHNNN □	3.20×1.60	4.7㎌	25	±10%	1.80
2	CL31X475KACLNN □		4.7㎌	25	±10%	0.95
3	CL31X475KOHNNN □		4.7㎌	16	±10%	1.80
4	CL31X475KPHNNN □		4.7㎌	10	±10%	1.80
5	CL31X475MQHNNN □		4.7㎌	6.3	±20%	1.80
6	CL31X475KRHNNN □		4.7㎌	4	±10%	1.80
7	CL31X106KACLNN □		10㎌	25	±10%	0.95
8	CL31X106KAHNNN □		10㎌	25	±10%	1.80
9	CL31X106KOHNNN □		10㎌	16	±10%	1.80
10	CL31X106KPHNNN □		10㎌	10	±10%	1.80
11	CL31X106KQHNNN □		10㎌	6.3	±10%	1.80
12	CL31X106KRHNNN □		10㎌	4	±10%	1.80
13	CL31X226KOHNNN □		22㎌	16	±10%	1.80
14	CL31X226KPHNNN □		22㎌	10	±10%	1.80
15	CL31X226KQHNNN □		22㎌	6.3	±10%	1.80
16	CL31X226KRHNNN □		22㎌	4	±10%	1.80
17	CL31X107MQHNNN □		100㎌	6.3	±20%	1.80
18	CL31X107MRHNNN □		100㎌	4	±20%	1.80
1	CL32X106KAUNNN □	3.20×2.50	10㎌	25	±10%	2.00
2	CL32X106KOJNNN □		10㎌	16	±10%	2.70
3	CL32X106KPJNNN □		10㎌	10	±10%	2.70
4	CL32X106KQJNNN □		10㎌	6.3	±10%	2.70
5	CL32X106KRJNNN □		10㎌	4	±10%	2.70
6	CL32X226KAJNNN □		22㎌	25	±10%	2.70
7	CL32X226KOJNNN □		22㎌	16	±10%	2.70
8	CL32X226KPJNNN □		22㎌	10	±10%	2.70
9	CL32X226KQJNNN □		22㎌	6.3	±10%	2.70
10	CL32X226KRJNNN □		22㎌	4	±10%	2.70
11	CL32X476MPJNNN □		47㎌	10	±20%	2.70
12	CL32X476KQJNNN □		47㎌	6.3	±10%	2.70
13	CL32X476KRJNNN □		47㎌	4	±10%	2.70
14	CL32X107MQVNNN □		100㎌	6.3	±20%	2.70
15	CL32X107MRVNNN □		100㎌	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	0.22μF	16	±10%	0.55
2	CL05B224KP5NNN □		0.22μF	10	±10%	0.55
3	CL05B224KQ5NNN □		0.22μF	6.3	±10%	0.55
1	CL10B474KA8NNN □	1.60×0.80	0.47μF	25	±10%	0.90
2	CL10B474KO8NNN □		0.47μF	16	±10%	0.90
3	CL10B474KP8NNN □		0.47μF	10	±10%	0.90
4	CL10B474KQ8NNN □		0.47μF	6.3	±10%	0.90
5	CL10B105KA8NNN □		1μF	25	±10%	0.90
6	CL10B105KO8NNN □		1μF	16	±10%	0.90
7	CL10B105KP8NNN □		1μF	10	±10%	0.90
8	CL10B105KQ8NNN □		1μF	6.3	±10%	0.90
9	CL10B225KP8NNN □		2.2μF	10	±10%	0.90
10	CL10B225KQ8NNN □		2.2μF	6.3	±10%	0.90
1	CL21B105KBFNNN □	2.00×1.25	1μF	50	±10%	1.35
2	CL21B105KLFNNN □		1μF	35	±10%	1.35
3	CL21B105KAFNNN □		1μF	25	±10%	1.35
4	CL21B105KOFNNN □		1μF	16	±10%	1.35
5	CL21B105KPFNNN □		1μF	10	±10%	1.35
6	CL21B105KQFNNN □		1μF	6.3	±10%	1.35
7	CL21B225KAFNNN □		2.2μF	25	±10%	1.35
8	CL21B225KOFNNN □		2.2μF	16	±10%	1.35
9	CL21B225KPFNNN □		2.2μF	10	±10%	1.35
10	CL21B225KQFNNN □		2.2μF	6.3	±10%	1.35
11	CL21B475KOFNFN □		4.7μF	16	±10%	1.35
12	CL21B475KPFNNN □		4.7μF	10	±10%	1.35
13	CL21B475KQQNNN □		4.7μF	6.3	±10%	1.35
14	CL21B106KOQNNN □		10μF	16	±10%	1.40
15	CL21B106KPQNNN □		10μF	10	±10%	1.35
16	CL21B106KQQNNN □		10μF	6.3	±10%	1.35
1	CL31B475KBHNNN □	3.20×1.60	4.7μF	50	±10%	1.80
2	CL31B475KLHNNN □		4.7μF	35	±10%	1.80
3	CL31B475KAHNNN □		4.7μF	25	±10%	1.80
4	CL31B475KOHNNN □		4.7μF	16	±10%	1.80
5	CL31B475KPHNNN □		4.7μF	10	±10%	1.80
6	CL31B475KQHNNN □		4.7μF	6.3	±10%	1.80
7	CL31B106KLHNNN □		10μF	35	±10%	1.80
8	CL31B106KAHNNN □		10μF	25	±10%	1.80
9	CL31B106KOHNNN □		10μF	16	±10%	1.80
10	CL31B106KPHNNN □		10μF	10	±10%	1.80
11	CL31B106KQHNNN □		10μF	6.3	±10%	1.80
1	CL32B106KBJNNN □	3.20×2.50	10μF	50	±10%	2.70
2	CL32B106KAJNNN □		10μF	25	±10%	2.70
3	CL32B106KOJNNN □		10μF	16	±10%	2.70
4	CL32B106KPINNN □		10μF	10	±10%	2.70
5	CL32B106KQJNNN □		10μF	6.3	±10%	2.70
6	CL32B226KAJNNN □		22μF	25	±10%	2.70
7	CL32B226KOJNNN □		22μF	16	±10%	2.70
8	CL32B226KPJNNN □		22μF	10	±10%	2.70
9	CL32B226KQJNNN □		22μF	6.3	±10%	2.70
10	CL32B476MQJNNN □		47μF	6.3	±20%	2.70

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

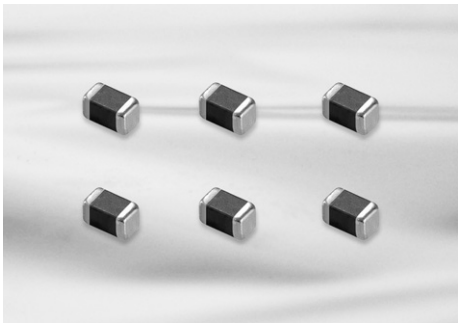
Part Numbering System
General Capacitors
High Capacitance Capacitors
Super Small Size Capacitors
Medium-High Voltage Capacitors
Array Type Capacitors
Low ESL Capacitors
Reliability Test Condition
Premium Capacitors for Automotive Applications
Packaging Specification
Application Manual for Surface Mounting

Product Lineup (High Capacitance -Y5V)

	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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

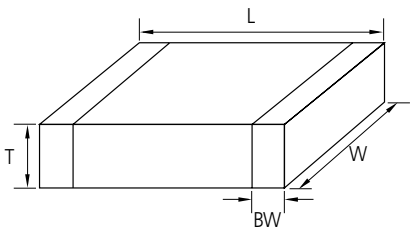
- Small chip size
- 03 Series(C0G) MLCC shows very low ESR valae.
- 02 and 03 Series are suited to only reflow soldering
- 02 and 03 Series are suited to miniature RF module, portable equipment and high frequency circuit

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±0.02	0.2±0.02	0.2±0.02	0.07~0.14
03	0201	0.6±0.03	0.3±0.03	0.3±0.03	0.15±0.05

Part Numbering System
General Capacitors
High Capacitance Capacitors
Super Small Size Capacitors
Medium-High Voltage Capacitors
Array Type Capacitors
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Application Manual for Surface Mounting

Super Small Size Capacitance Table (C0G)

Size(mm)	Tmax (mm)	Vr(V)	Capacitance (pF)
			0.5 / 1 / 10 / 22 / 47 / 100 / 220 / 330
C0G	01005(0402)	6.3	
		16	
	0201(0603)	25	
		50	20pF

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

TC	Size (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	X5R or X6S
		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	CL02C0R5CO2ANN □	0.40×0.20	0.5pF	16	±0.25pF	0.22	
2	CL02C010CO2ANN □		1.0pF	16	±0.25pF	0.22	
3	CL02C1R2CO2ANN □		1.2pF	16	±0.25pF	0.22	
4	CL02C1R5CO2ANN □		1.5pF	16	±0.25pF	0.22	
5	CL02C1R8CO2ANN □		1.8pF	16	±0.25pF	0.22	
6	CL02C020CO2ANN □		2.0pF	16	±0.25pF	0.22	
7	CL02C2R2CO2ANN □		2.2pF	16	±0.25pF	0.22	
8	CL02C2R7CO2ANN □		2.7pF	16	±0.25pF	0.22	
9	CL02C030CO2ANN □		3.0pF	16	±0.25pF	0.22	
10	CL02C3R3CO2ANN □		3.3pF	16	±0.25pF	0.22	
11	CL02C3R9CO2ANN □		3.9pF	16	±0.25pF	0.22	
12	CL02C4R7CO2ANN □		4.7pF	16	±0.25pF	0.22	
13	CL02C5R6DO2ANN □		5.6pF	16	±0.5pF	0.22	
14	CL02C6R8DO2ANN □		6.8pF	16	±0.5pF	0.22	
15	CL02C8R2DO2ANN □		8.2pF	16	±0.5pF	0.22	
16	CL02C090DO2ANN □		9.0pF	16	±0.5pF	0.22	
17	CL02C100JO2ANN □		10pF	16	±5%	0.22	
18	CL02C150JO2ANN □		15pF	16	±5%	0.22	
19	CL02C180JO2ANN □		18pF	16	±5%	0.22	
20	CL02C220JO2ANN □		22pF	16	±5%	0.22	
21	CL02C270JO2ANN □		27pF	16	±5%	0.22	
22	CL02C330JO2ANN □		33pF	16	±5%	0.22	
23	CL02C390JO2ANN □		39pF	16	±5%	0.22	
24	CL02C470JO2ANN □		47pF	16	±5%	0.22	
25	CL02C560JQ2ANN □		56pF	6.3	±5%	0.22	
26	CL02C680JQ2ANN □		68pF	6.3	±5%	0.22	
27	CL02C820JQ2ANN □		82pF	6.3	±5%	0.22	
28	CL02C101JQ2ANN □		100pF	6.3	±5%	0.22	
1	CL03C0R5CA3GNN □	0.60×0.30	0.5pF	25	±0.25pF	0.33	High-Q
2	CL03C010CA3GNN □		1.0pF	25	±0.25pF	0.33	High-Q
3	CL03C1R2CA3GNN □		1.2pF	25	±0.25pF	0.33	High-Q
4	CL03C1R5CA3GNN □		1.5pF	25	±0.25pF	0.33	High-Q
5	CL03C1R8CA3GNN □		1.8pF	25	±0.25pF	0.33	High-Q
6	CL03C020CA3GNN □		2.0pF	25	±0.25pF	0.33	High-Q
7	CL03C2R2CA3GNN □		2.2pF	25	±0.25pF	0.33	High-Q
8	CL03C2R7CA3GNN □		2.7pF	25	±0.25pF	0.33	High-Q
9	CL03C030CA3GNN □		3.0pF	25	±0.25pF	0.33	High-Q
10	CL03C3R3CA3GNN □		3.3pF	25	±0.25pF	0.33	High-Q
11	CL03C3R9CA3GNN □		3.9pF	25	±0.25pF	0.33	High-Q
12	CL03C4R7CA3GNN □		4.7pF	25	±0.25pF	0.33	High-Q
13	CL03C5R6DA3GNN □		5.6pF	25	±0.5pF	0.33	High-Q
14	CL03C6R8DA3GNN □		6.8pF	25	±0.5pF	0.33	High-Q
15	CL03C8R2DA3GNN □		8.2pF	25	±0.5pF	0.33	High-Q
16	CL03C090DA3GNN □		9.0pF	25	±0.5pF	0.33	High-Q
17	CL03C100JA3GNN □		10pF	25	±5%	0.33	High-Q
18	CL03C150JA3GNN □		15pF	25	±5%	0.33	High-Q
19	CL03C180JA3GNN □		18pF	25	±5%	0.33	High-Q
20	CL03C220JA3GNN □		22pF	25	±5%	0.33	High-Q
21	CL03C270JA3GNN □		27pF	25	±5%	0.33	High-Q
22	CL03C330JA3GNN □		33pF	25	±5%	0.33	High-Q
23	CL03C390JA3ANN □		39pF	25	±5%	0.33	
24	CL03C470JA3ANN □		47pF	25	±5%	0.33	
25	CL03C101JA3ANN □		100pF	25	±5%	0.33	

※ □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 (Super Small Size Capacitors -X7R)

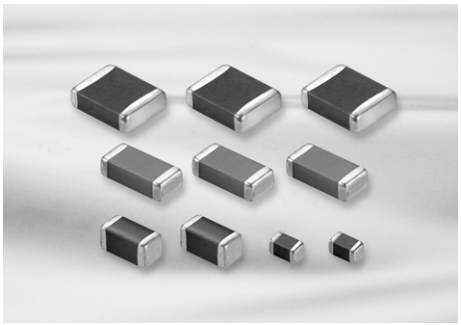
	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max. (mm)
1	CL02B101KP2NNN □	0.40×0.20	100pF	10	±10%	0.22
2	CL02B151KP2NNN □		150pF	10	±10%	0.22
3	CL02B221KP2NNN □		220pF	10	±10%	0.22
4	CL02B331KP2NNN □		330pF	10	±10%	0.22
5	CL02B471KP2NNN □		470pF	10	±10%	0.22
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 (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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 □		1㎋	6.3	±10%	0.22
7	CL02A152KQ2NNN □		1.5㎋	6.3	±10%	0.22
8	CL02A222KQ2NNN □		2.2㎋	6.3	±10%	0.22
9	CL02A332KQ2NNN □		3.2㎋	6.3	±10%	0.22
10	CL02A472KQ2NNN □		4.7㎋	6.3	±10%	0.22
11	CL02A682KQ2NNN □		6.8㎋	6.3	±10%	0.22
12	CL02A103KQ2NNN □		10㎋	6.3	±10%	0.22
13	CL02A104KQ2NNN □		100㎋	6.3	±10%	0.22
1	CL03A103KP3NNN □	0.60×0.30	10㎋	10	±10%	0.33
2	CL03A223KQ3NNN □		22㎋	6.3	±10%	0.33
3	CL03A473KQ3NNN □		47㎋	6.3	±10%	0.33
4	CL03A104MA3NNN □		100㎋	25	±20%	0.33
5	CL03A104KO3NNN □		100㎋	16	±10%	0.33
6	CL03A104KP3NNN □		100㎋	10	±10%	0.33
7	CL03A104KQ3NNN □		100㎋	6.3	±10%	0.33
8	CL03A224KQ3NNN □		220㎋	6.3	±10%	0.33
9	CL03A224KP3NNN □		200㎋	10	±10%	0.33
10	CL03A105MQ3CSN □		1㎌	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

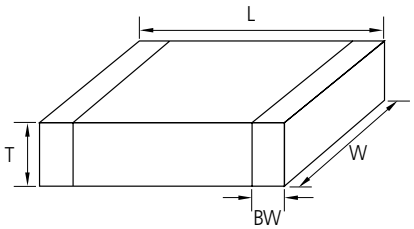
- Highly reliable performance
- Operating at high voltage level
- Wide voltage level: from 100V to 3000V
- High withstanding voltage
- Tape & reel surface mount assembly

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.

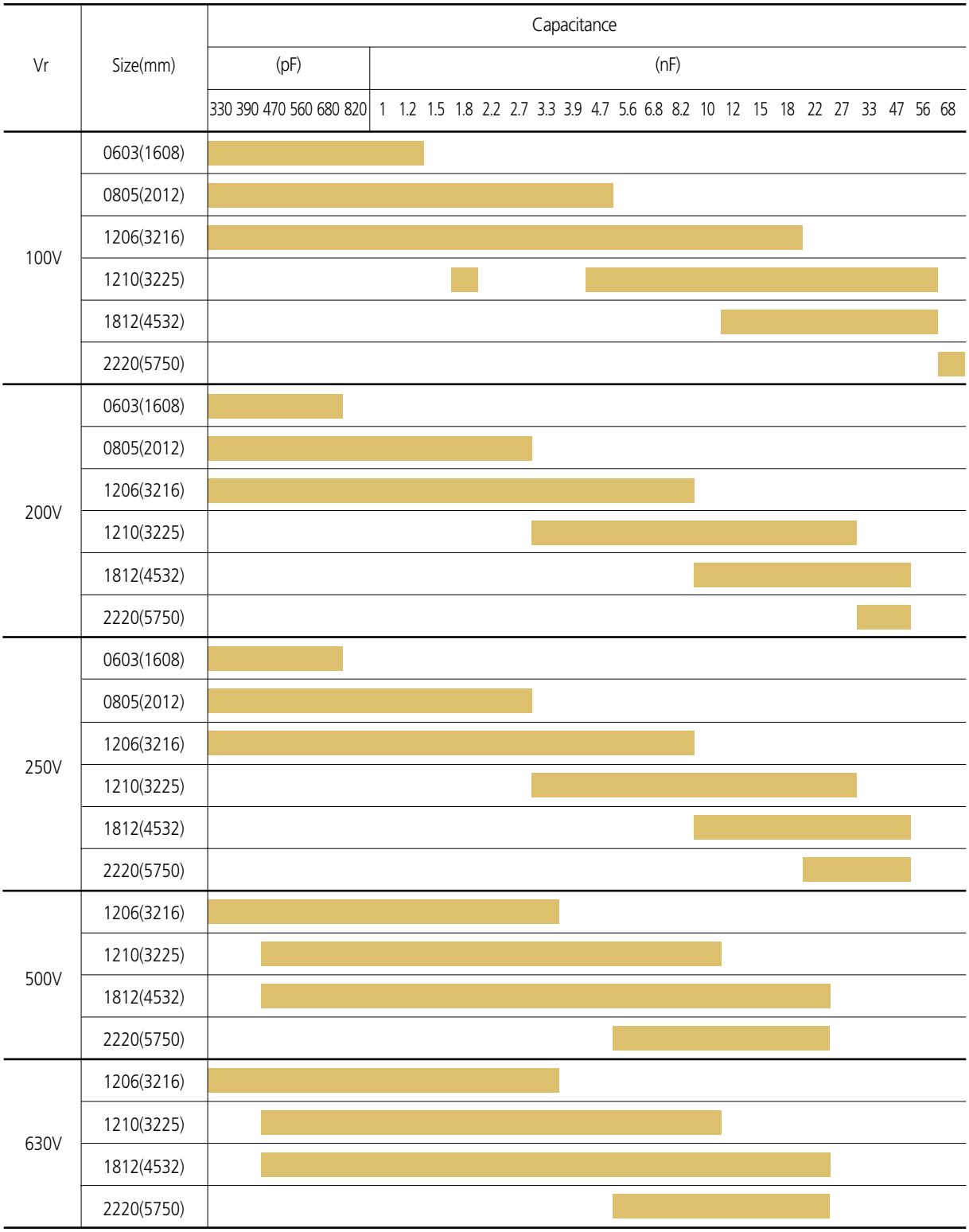
Structure and Dimensions



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

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 (C0G)

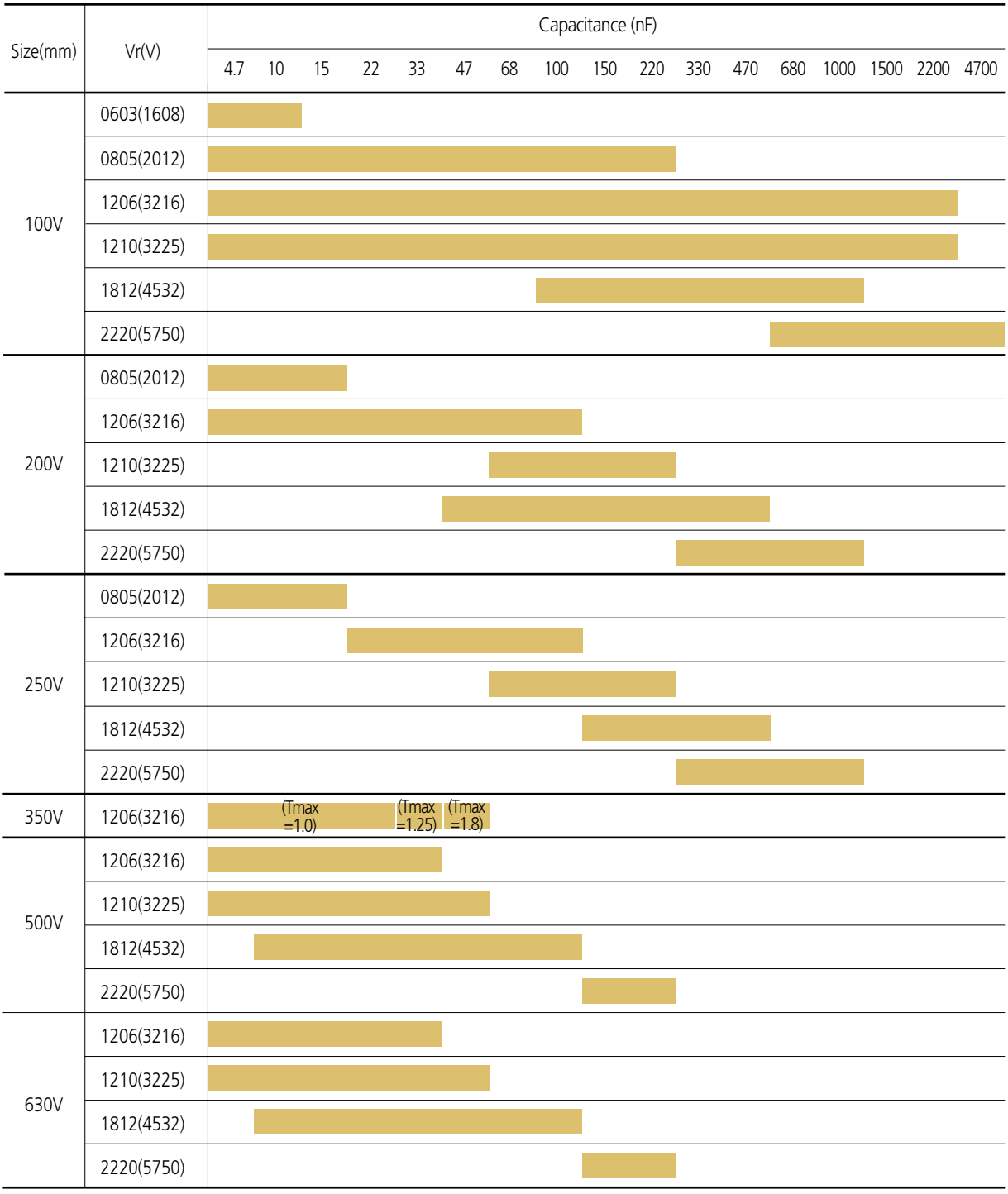


Medium-High Voltage Capacitors Table (C0G)

Vr	Size(mm)	Capacitance (pF): 47 56 68 82 100 120 150 180 220 270 330 390 470 560 680 820	Capacitance (nF): 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)		3600pF
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)



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 (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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	CL21C331JCANNN □	2.00×1.25	330pF	100	±5%	0.75
27	CL21C471JCCNNN □		470pF	100	±5%	0.95
28	CL21C561JCCNNN □		560pF	100	±5%	0.95
29	CL21C681JCCNNN □		680pF	100	±5%	0.95
30	CL21C102JCFNNN □		1nF	100	±5%	1.35
31	CL21C102JDFNNN □		1nF	200	±5%	1.35
32	CL21C272JDFNNN □		2.7nF	200	±5%	1.35
33	CL21C272JEFNNN □		2.7nF	250	±5%	1.35
34	CL21C472JCFNNN □		4.7nF	100	±5%	1.35
1	CL31C150JGFNNN □	3.20×1.60	15pF	500	±5%	1.40
2	CL31C180JGFNNN □		18pF	500	±5%	1.40
3	CL31C220JGFNNN □		22pF	500	±5%	1.40
4	CL31C220JJHNNN □		22pF	2000	±5%	1.80
5	CL31C270JGFNNN □		27pF	500	±5%	1.40
6	CL31C330JGFNNN □		33pF	500	±5%	1.40
7	CL31C390JGFNNN □		39pF	500	±5%	1.40
8	CL31C470JHFNNN □		47pF	630	±5%	1.40
9	CL31C470JGFNNN □		47pF	500	±5%	1.40
10	CL31C470JJHNNN □		47pF	2000	±5%	1.80
11	CL31C560JGFNNN □		56pF	500	±5%	1.40
12	CL31C680JCCNNN □		68pF	100	±5%	1.00
13	CL31C680JHFNNN □		68pF	630	±5%	1.40
14	CL31C680JGFNNN □		68pF	500	±5%	1.40
15	CL31C680JIFNNN □		68pF	1000	±5%	1.40
16	CL31C820JGFNCN □		82pF	500	±5%	1.40
17	CL31C101JGFNNN □		100pF	500	±5%	1.40
18	CL31C101JHFNNN □		100pF	630	±5%	1.40
19	CL31C101JIFNNN □		100pF	1000	±5%	1.40
20	CL31C101JJHNNN □		100pF	2000	±5%	1.80
21	CL31C121JGFNNN □		120pF	500	±5%	1.40
22	CL31C151JGFNNN □		150pF	500	±5%	1.40
23	CL31C181JGFNNN □		180pF	500	±5%	1.40
24	CL31C221JGFNNN □		220pF	500	±5%	1.40
25	CL31C271JGFNNN □		270pF	500	±5%	1.40
26	CL31C271JCCNNN □		270pF	100	±5%	1.00
27	CL31C331JGFNNN □		330pF	500	±5%	1.40
28	CL31C331JIHNNN □		330pF	1000	±5%	1.80
29	CL31C391JCCNNN □		390pF	100	±5%	1.00
30	CL31C471JGFNNN □		470pF	500	±5%	1.40
31	CL31C561JCCNNN □		560pF	100	±5%	1.00
32	CL31C561JGFNNN □		560pF	500	±5%	1.40
33	CL31C681JGFNNN □		680pF	500	±5%	1.80
34	CL31C102JCCNNN □		1nF	100	±5%	1.00
35	CL31C102JGHNNN □		1nF	500	±5%	1.80
36	CL31C152JCCNNN □		1.5nF	100	±5%	1.00
37	CL31C222JCCNNN □		2.2nF	100	±5%	1.00
38	CL31C332JGHNNN □		3.3nF	500	±5%	1.80
39	CL31C332JHHNNN □		3.3nF	630	±5%	1.80
40	CL31C392JCHNNN □		3.9nF	100	±5%	1.80
41	CL31C822JDHNNN □		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 System
General Capacitors
High Capacitance Capacitors
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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 (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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	CL32C821JIJNNN □		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	CL42C100JKFNNN □	4.50×2.00	10pF	3000	±5%	1.45
2	CL42C151JKINNN □		150pF	3000	±5%	2.20
3	CL42C221JJHNNN □		220pF	2000	±5%	1.80
1	CL43C391JKJNNN □	4.50×3.20	390pF	2000	±5%	2.70
2	CL43C102 J I HNNN □		1.0nF	1000	±5%	1.80
3	CL43C122 J I I NNN □		1.2nF	1000	±5%	2.20
4	CL43C182 J I J NNN □		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	CL55C362JIJNNN □		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㎋	100	±10%	0.90
2	CL10B472KC8NNN □		4.7㎋	100	±10%	0.90
3	CL10B103KC8NNN □		10㎋	100	±10%	0.90
1	CL21B221KDCNNN □	2.00×1.25	220pF	200	±10%	0.95
2	CL21B221KCANNN □		220pF	100	±10%	0.75
3	CL21B331KDCNNN □		330pF	200	±10%	0.95
4	CL21B471KCANNN □		470pF	100	±10%	0.75
5	CL21B102KDCNNN □		1㎋	200	±10%	0.95
6	CL21B102KCANNN □		1㎋	100	±10%	0.75
7	CL21B222KDCNNN □		2.2㎋	200	±10%	0.95
8	CL21B222KCANNN □		2.2㎋	100	±10%	0.75
9	CL21B332KCANNN □		3.3㎋	100	±10%	0.75
10	CL21B472KDCNNN □		4.7㎋	200	±10%	0.95
11	CL21B472KCANNN □		4.7㎋	100	±10%	0.75
12	CL21B682KCANNN □		6.8㎋	100	±10%	0.75
13	CL21B103KDCNNN □		10㎋	200	±10%	0.95
14	CL21B103KCANNN □		10㎋	100	±10%	0.75
15	CL21B153KEFNNN □		15㎋	250	±10%	1.35
16	CL21B153KDFNNN □		15nF	200	±10%	1.35
17	CL21B153KCCNNN □		15㎋	100	±10%	0.95
18	CL21B223KCFNNN □		22㎋	100	±10%	1.35
19	CL21B473KCFNNN □		47㎋	100	±10%	1.35
20	CL21B683KCFNNN □		68nF	100	±10%	1.35
21	CL21B104KCFNNN □		100nF	100	±10%	1.35
22	CL21B154KCFNNN □		150nF	100	±10%	1.35
23	CL21B224KCFNNN □		220nF	100	±10%	1.35
1	CL31B221KGFNNN □	3.20×1.60	220pF	500	±10%	1.40
2	CL31B471KGFNNN □		470pF	500	±10%	1.40
3	CL31B471KDCNNN □		470pF	200	±10%	1.00
4	CL31B102KJHNNN □		1㎋	2000	±10%	1.80
5	CL31B102KI FNNN □		1㎋	1000	±10%	1.40
6	CL31B102KGFNNN □		1㎋	500	±10%	1.40
7	CL31B102KHFNNN □		1nF	630	±10%	1.40
8	CL31B152KGFNNN □		1.5㎋	500	±10%	1.40
9	CL31B152KJHNNN □		1.5nF	2000	±10%	1.80
10	CL31B222KI FNNN □		2.2㎋	1000	±10%	1.40
11	CL31B222KDCNNN □		2.2㎋	200	±10%	1.00
12	CL31B222KGFNNN □		2.2㎋	500	±10%	1.40
13	CL31B222KJHNNN □		2.2nF	2000	±10%	1.80
14	CL31B332KGFNNN □		3.3㎋	500	±10%	1.40
15	CL31B332KIFNNN □		3.3nF	1000	±10%	1.40
16	CL31B472KGFNNN □		4.7㎋	500	±10%	1.40

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

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Application Manual for Surface Mounting

Product Lineup (Medium-High Voltage Capacitors-X7R)

	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max. (mm)
17	CL31B472KDCNNN □	3.20×1.60	4.7㎋	200	±10%	1.00
18	CL31B682KGFNNN □		6.8㎋	500	±10%	1.40
19	CL31B103KHFNNN □		10㎋	630	±10%	1.40
20	CL31B103KGFNNN □		10㎋	500	±10%	1.40
21	CL31B103KFCSNN □		10㎋	350	±10%	1.00
22	CL31B153KDCNNN □		15㎋	200	±10%	1.00
23	CL31B153KFCSNN □		15㎋	350	±10%	1.00
24	CL31B153KCCNNN □		15㎋	100	±10%	1.00
25	CL31B153KGFNNN □		15nF	500	±10%	1.40
26	CL31B153KHFNNN □		15nF	630	±10%	1.40
27	CL31B223KDCNNN □		22㎋	200	±10%	1.00
28	CL31B223KCCNNN □		22㎋	100	±10%	1.00
29	CL31B223KFCSNN □		22㎋	350	±10%	1.00
30	CL31B223KGHNNN □		22nF	500	±10%	1.80
31	CL31B223KHHNNN □		22nF	630	±10%	1.80
32	CL31B333KDFNNN □		33㎋	200	±10%	1.40
33	CL31B333KFESNN □		33㎋	350	±10%	1.25
34	CL31B333KCCNNN □		33㎋	100	±10%	1.00
35	CL31B333KGHNNN □		33nF	500	±10%	1.80
36	CL31B333KHHNNN □		33nF	630	±10%	1.80
37	CL31B473KDFNNN □		47㎋	200	±10%	1.40
38	CL31B473KFHSNN □		47㎋	350	±10%	1.80
39	CL31B473KCCNNN □		47㎋	100	±10%	1.00
40	CL31B473KEHNNN □		47㎋	250	±10%	1.80
41	CL31B683KEHNNN □		68nF	250	±10%	1.80
42	CL31B104KDHNNN □		100㎋	200	±10%	1.80
43	CL31B104KCFNNN □		100㎋	100	±10%	1.40
44	CL31B104KEHNNN □		100nF	250	±10%	1.80
45	CL31B154KCHNNN □		150㎋	100	±10%	1.80
46	CL31B105KCHNNN □		1㎌	100	±10%	1.80
47	CL31B155KCHNNN □		1.5㎌	100	±10%	1.80
48	CL31B225KCHNNN □		2.2㎌	100	±10%	1.80
1	CL32B102KJFNNN □	3.20×2.50	1㎋	2000	±10%	1.45
2	CL32B472KHFNNN □		4.7㎋	630	±10%	1.45
3	CL32B472KIFNNN □		4.7nF	1000	±10%	1.45
4	CL32B682KIFNNN □		6.8nF	1000	±10%	1.45
5	CL32B103KCFNNN □		10㎋	100	±10%	1.45
6	CL32B153KGFNNN □		15㎋	500	±10%	1.45
7	CL32B223KGFNNN □		22㎋	500	±10%	1.45
8	CL32B333KHHNNN □		33㎋	630	±10%	1.80
9	CL32B333KGHNNN □		33nF	500	±10%	1.80
10	CL32B473KHHNNN □		47㎋	630	±10%	1.80

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

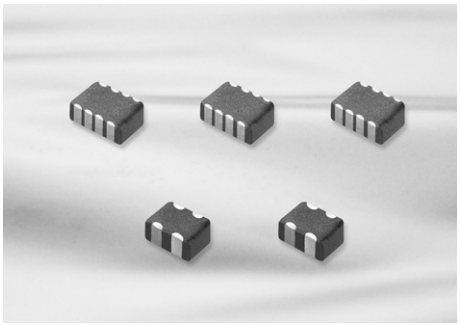
Product Lineup (Medium-High Voltage Capacitors-X7R)

	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max. (mm)
11	CL32B473KDHNNN □	3.20×2.50	47㎋	200	±10%	1.80
12	CL32B473KGHNNN □		47nF	500	±10%	1.80
13	CL32B683KDINNN □		68nF	200	±10%	2.20
14	CL32B104KE JNNN □		100㎋	250	±10%	2.70
15	CL32B104KDINNN □		100nF	200	±10%	2.20
16	CL32B154KCFNNN □		150㎋	100	±10%	1.45
17	CL32B154KDJNNN □		150nF	200	±10%	2.70
18	CL32B154KEJNNN □		150nF	250	±10%	2.70
19	CL32B224KCHNNN □		220㎋	100	±10%	1.80
20	CL32B224KDJNNN □		220nF	200	±10%	2.70
21	CL32B224KEJNNN □		220nF	250	±10%	2.70
22	CL32B334KCHNNN □		330㎋	100	±10%	1.80
23	CL32B474KCINNN □		470㎋	100	±10%	2.20
24	CL32B105KCJNNN □		1㎌	100	±10%	2.70
25	CL32B155KCHNNN □		1.5㎌	100	±10%	1.80
26	CL32B225KCJNNN □		2.2㎌	100	±10%	2.70
1	CL43B102KJFNNN □	4.50×3.20	1nF	2000	±10%	1.45
2	CL43B152KJFNNN □		1.5㎋	2000	±10%	1.45
3	CL43B222KIFNNN □		2.2㎋	1000	±10%	1.45
4	CL43B222KJFNNN □		2.2nF	2000	±10%	1.45
5	CL43B332KJFNNN □		3.3nF	2000	±10%	1.45
6	CL43B103KIFNNN □		10㎋	1000	±10%	1.45
7	CL43B333KIJNNN □		33nF	1000	±10%	2.70
8	CL43B473KGFNNN □		47㎋	500	±10%	1.45
9	CL43B473KHFNNN □		47㎋	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 □		1㎌	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 □		1㎌	100	±10%	1.80
6	CL55B105KDJNNN □		1㎌	200	±10%	2.70
7	CL55B105KEJNNN □		1㎌	250	±10%	2.70
8	CL55B475KCJNNN □		4.7uF	100	±10%	2.70

※ □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

Array Type Capacitors



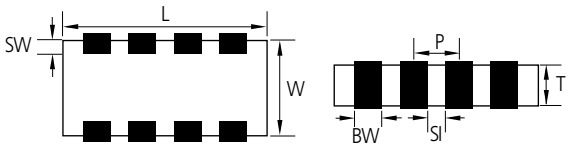
Feature

- 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 nose

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.

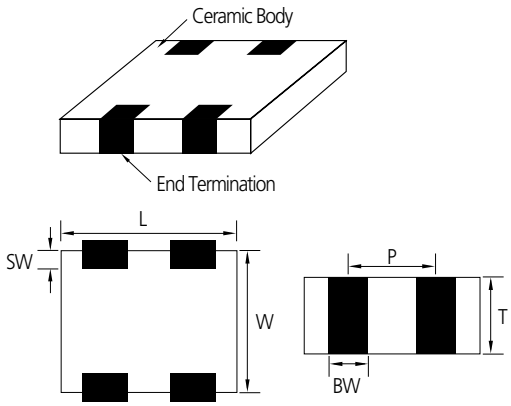
Structure and Dimensions



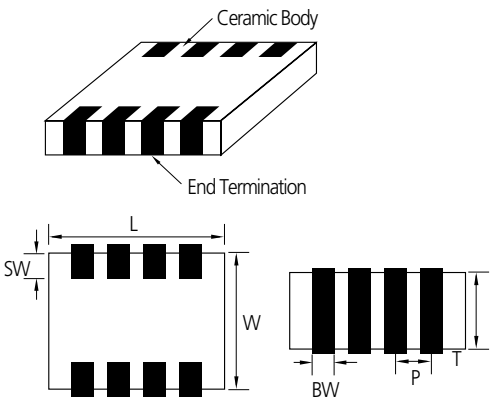
Code	EIA Code	Dimension(mm)					
		L	W	T	BW	SW	P
A	0906	0.90±0.05	0.60±0.05	0.45±0.05	0.25±0.05	0.15±0.1	0.45±0.05
A	0504	1.37±0.15	1.0±0.15	0.35±0.05 0.50±0.05 0.60±0.06 0.80±0.08	0.36±0.1	0.2±0.1	0.64±0.1
A	0805	2.0±0.15	1.25±0.15	0.85±0.1	0.5±0.2	0.25±0.15	1.0±0.1
B	0805	2.0±0.15	1.25±0.15	0.85±0.1	0.25±0.1	0.25±0.15	0.5±0.1
B	1206	3.2±0.15	1.6±0.15	0.85±0.15	0.4±0.2	0.3±0.15	0.8±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 (mm)	Capacitance (pF)
					10 22 27 47 100 470
C0G	0504(1410)	2-element	25	0.88	
	1206(3216)	4-element	50	1.0	

TC	Size(mm)	Type	Vr(V)	Tmax (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	
			10		
	0504(1410)	2-element	6.3	0.88	
				0.66	
				0.55	
				0.4	
			10	0.88	
				0.66	
				0.55	
				0.4	
			16	0.88	
				0.66	
				0.55	
				0.4	
			25	0.88	
				0.66	
				0.55	
	0805(2012)	2-element	6.3	0.95	
			10		
			16		
X7R	0805(2012)	4-element	10	0.95	
			16		
	1206(3216)	4-element	16	1.0	
			25		
			50		
Y5V	1206(3216)	4-element	25	1.0	
			50		

Part Numbering System
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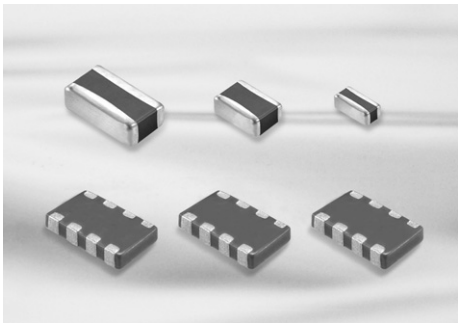
Reliability Test Condition
Premium Capacitors for Automotive Applications
Packaging Specification
Application Manual for Surface Mounting

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.

Low ESL Capacitors



Feature

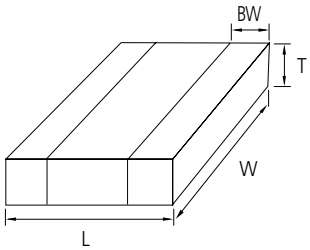
- Low ESL, good for noise reduction for high frequency
- Highly reliable tolerance and high speed automatic chip placement on PCBs
- Highly reliable performance
- Highly resistant termination metal
- Tape & reel for surface mount assembly

Application

- High Speed Microprocessor
- High Frequency Digital Equipment

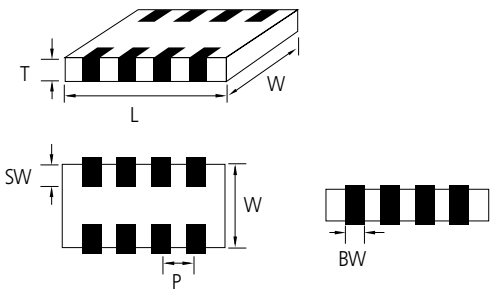
※ For using special purpose like Military, Medical, Aviation, Automobile device should be following a special specification.

LICC(Low Inductance chip capacitors)



Code	EIA Code	Dimension(mm)			
		L	W	T	BW
L5	0204	0.52±0.05	1.0±0.05	0.3±0.05	0.18±0.08
01	0306	0.8±0.15	1.6±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±0.1	0.8±0.1	0.5/+0.05-0.1	0.25±0.1	0.15±0.1	0.4±0.1
21	0805	2.0±0.1	1.25±0.1	0.5/+0.05-0.1	0.25±0.1	0.18±0.1	0.5±0.1

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

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 /X7S	0204(0510)	0.35	4	X6S
			6.3	X7S
	0306(0816)	0.55	4	X7S

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 /X5R	0306(0816)	0.55	6.3	X7R X5R
			0	X7R
			16	X7R
			25	X7R
			50	X7R

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 /X7S /X7T	0603(1608)	0.55	2.5	
			4	X7S
	0805(2012)	0.55	4	X7S
			6.3	X7R
			16	X7R

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

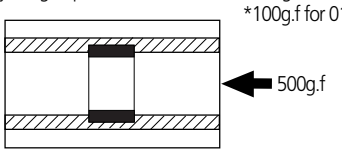
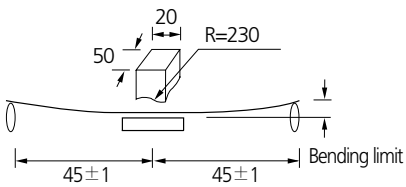
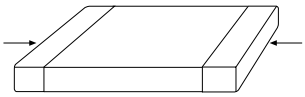
	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max. (mm)
1	CL21B104MO5NJN □	2.00×1.25	100nF	16	±20%	0.55
2	CL21B684MO5NJN □		680nF	16	±20%	0.55
3	CL21B684MQ5NJN □		680nF	6.3	±20%	0.55
1	CLL5X224MR3NLN □	0.50×1.00	220nF	4	±20%	0.35
2	CLL5X474MR3NLN □		470nF	4	±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

<table>
<tr><th>No</th><th colspan="2">Item</th><th>Performance</th><th colspan="3">Test Condition</th></tr>
<tr><td>1</td><td colspan="2">Appearance</td><td>No abnormal exterior appearance</td><td colspan="3">Visual Inspection through Microscope(×10)</td></tr>
<tr><td>2</td><td colspan="2">Insulation Resistance</td><td>10,000MΩ min. or 500MΩ · μF min.(or *100MΩ · μF) product whichever is smaller
(Rated voltage ≤ 16V:10,000MΩ min. or 100MΩ · μF min. product whichever is smaller)</td><td colspan="3">Apply the rated voltage for 60~120 sec.
Rated voltage > 500V: Insulation Resistance shall be measured with 500±50Vdc</td></tr>
<tr><td>3</td><td colspan="2">Withstanding Voltage</td><td>No dielectric breakdown or mechanical breakdown</td><td colspan="3">Apply the specified voltage* for 1~5 sec.
Charge/Discharge current limit: 50mA max.
*CLASS Ⅰ (Rated Voltage < 100V): 300% of the rated Voltage
CLASS Ⅱ (Rated Voltage < 100V): 250% of the rated Voltage
In the case of Vr ≥ 100V products, following condition should be applied.
100V ≤ Rated Voltage < 500V: 200% of the rated Voltage
500V ≤ Rated Voltage < 1000V: 150% of the rated Voltage
Rated Voltage ≥ 1000V: 120% of the rated Voltage</td></tr>
<tr><td rowspan="6">4</td><td rowspan="6">Capacitance</td><td rowspan="3">CLASS Ⅰ</td><td rowspan="3">Within the specified tolerance</td><td>Capacitance</td><td>Frequency</td><td>Voltage</td></tr>
<tr><td>≤ 1,000pF</td><td>1MHz±10%</td><td rowspan="2">0.5 ~ 5 Vrms</td></tr>
<tr><td>> 1,000pF</td><td>1KHz±10%</td></tr>
<tr><td rowspan="3">CLASS Ⅱ</td><td rowspan="3">Within the specified tolerance</td><td>Capacitance</td><td>Frequency</td><td>Voltage</td></tr>
<tr><td>≤ 10μF</td><td>1KHz±10%</td><td>1.0±0.2 Vrms</td></tr>
<tr><td>> 10μF</td><td>120Hz±20%</td><td>0.5±0.1Vrms</td></tr>
<tr><td rowspan="6">5</td><td rowspan="2">Q</td><td rowspan="2">CLASS Ⅰ</td><td rowspan="2">Capacitance ≥ 30pF : Q ≥ 1,000
< 30pF : Q ≥ 400 +20×C
(C : Capacitance)</td><td>Capacitance</td><td>Frequency</td><td>Voltage</td></tr>
<tr><td>≤ 1,000pF</td><td>1MHz±10%</td><td rowspan="2">0.5 ~ 5 Vrms</td></tr>
<tr><td rowspan="4">Tanδ</td><td rowspan="4">CLASS Ⅱ</td><td rowspan="4">1. Characteristic: A(X5R)
<table><tr><th>Rated Voltage</th><th>Spec</th></tr><tr><td>50V / 35V</td><td>0.025 max / 0.05 max*</td></tr><tr><td>25V</td><td>0.025 max /
0.05 max* / 0.10 max*</td></tr><tr><td>16V</td><td>0.035 max /
0.05 max* / 0.10 max*</td></tr><tr><td>≤ 10V</td><td>0.05 max / 0.10 max*</td></tr></table>2. Characteristic: B(X7R), X(X6S), Y(X7S)
<table><tr><th>Rated Voltage</th><th>Spec</th></tr><tr><td>50V ≥ / 35V / 25V</td><td>0.025 max /
0.05 max* / 0.10 max*</td></tr><tr><td>16V</td><td>0.035 max / 0.10 max*</td></tr><tr><td>≤ 10V</td><td>0.05 max / 0.10 max*</td></tr></table>3. Characteristic: F(Y5V)
<table><tr><th>Rated Voltage</th><th>Spec</th></tr><tr><td>50V / 35V / 25V</td><td>0.05 max /
0.07 max* / 0.09 max*</td></tr><tr><td>16V</td><td>0.07 max /
0.09 max* / 0.125 max*</td></tr><tr><td>10V</td><td>0.125 max / 0.16 max*</td></tr><tr><td>≤ 6.3V</td><td>0.16 max</td></tr></table></td><td>Capacitance</td><td>Frequency</td><td>Voltage</td></tr>
<tr><td>≤ 10μF</td><td>1KHz±10%</td><td>1.0±0.2 Vrms</td></tr>
<tr><td>> 10μF</td><td>120Hz±20%</td><td>0.5±0.1Vrms</td></tr>
<tr><td>*</td><td>1KHz±10%</td><td>0.5±0.1Vrms</td></tr>
<tr><td colspan="6">You can check the specification at the web site or contact sales people for each product with mark*</td></tr>
</table>

<table>
<tr><th>No</th><th colspan="2">Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Temperature Characteristics of Capacitance</td><td>CLASS Ⅰ</td><td><table><tr><th>Characteristic</th><th>Temp.Coefficient(PPM/℃)</th></tr><tr><td>C</td><td>0 ± 30</td></tr></table></td><td rowspan="2">Capacitance shall be measured by the steps shown in the following table.<table><tr><th>Step</th><th>Temperature(℃)</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>(1) CLASS Ⅰ
Temperature Coefficient shall be calculated from the formula as below
Temp. Coefficient= $\frac{C2-C1}{C1\times\triangle T}\times 10^6$[ppm/℃]
C1: Capacitance at step 3
C2: Capacitance at 125℃
△T: 100℃(=125℃-25℃)
(2) CLASS Ⅱ
Capacitance Change shall be calculated from the formula as below
$\triangle C=\frac{C2-C1}{C1}\times 100(\%)$
C1: Capacitance at step 3
C2: Capacitance at step 2 or 4</td></tr>
<tr><td>CLASS Ⅱ</td><td><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></td></tr>
<tr><td>7</td><td colspan="2">Adhesive Strength of Termination</td><td>No indication of peeling shall occur on the terminal electrode</td><td>Apply 500g.f* pressure for 10±1 sec. *200g.f for 0201
*100g.f for 01005
  </td></tr>
<tr><td rowspan="4">8</td><td rowspan="4">Bending Strength</td><td>Appearance</td><td>No indication of peeling shall occur</td><td rowspan="4">• Bending Limit: 1mm • Test Speed: 1.0mm/sec.
• Keep the test board at the limit point in 5 sec.
• Then Measure Capacitance
  </td></tr>
<tr><td rowspan="3">Capacitance</td><td>Characteristic</td><td>Capacitance Change</td></tr>
<tr><td>CLASS Ⅰ</td><td>±5% or ± 0.5 pF whichever is larger</td></tr>
<tr><td>CLASS Ⅱ</td><td>A(X5R), B(X7R), X(X6S), Y(X7S)</td><td>±12.5%</td></tr>
<tr><td></td><td>F(Y5V)</td><td>±30%</td></tr>
<tr><td>9</td><td colspan="2">Solderability</td><td>More than 75% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve
  </td><td><table><tr><td>Solder</td><td>Sn-3Ag-0.5Cu</td></tr><tr><td>Solder Temp.</td><td>245±5℃</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℃ for 10~30 sec.</td></tr></table></td></tr>
<tr><td rowspan="7">10</td><td rowspan="7">Resistance to Soldering Heat</td><td>Appearance</td><td>No mechanical damage shall occur</td><td rowspan="7">Solder temperature: 270±5℃ DIP TIME:10±1 sec.
Each termination shall be fully immersed and preheated as below:<table><tr><th>Step</th><th>Temperature(℃)</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>
Leave the capacitor in ambient condition for specified time* before measurement
*24 ± 2 hours(CLASS Ⅰ)
24 ± 2 hours(CLASSⅡ)</td></tr>
<tr><td rowspan="3">Capacitance</td><td>Characteristic</td><td>Capacitance Change</td></tr>
<tr><td>CLASS Ⅰ</td><td>±2.5% or ± 0.25 pF whichever is larger</td></tr>
<tr><td>CLASS Ⅱ</td><td>A(X5R), B(X7R)
X(X6S), Y(X7S)</td><td>±7.5%</td></tr>
<tr><td></td><td>F(Y5V)</td><td>±20%</td></tr>
<tr><td>Q (CLASS Ⅰ)</td><td colspan="2">Within the specified initial value</td></tr>
<tr><td>Tanδ (CLASSⅡ)</td><td colspan="2">Within the specified initial value</td></tr>
<tr><td>Insulation resistance</td><td colspan="2">Within the specified initial value</td></tr>
<tr><td>Withstanding voltage</td><td colspan="2">Within the specified initial value</td></tr>
</table>

Part Numbering System
General Capacitors
High Capacitance Capacitors
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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. Repeat this for 2hours each in 3 mutually perpendicular directions.
		Capacitance	Characteristic		Capacitance Change	
			CLASS Ⅰ		±2.5% or ± 0.25 pF whichever is larger	
			CLASS Ⅱ	A(X5R), B(X7R)	±5%	
				X(X6S), Y(X7S)	±10%	
				F(Y5V)	±20%	
		Q (CLASS Ⅰ)	Within the specified initial value			
		Tanδ (CLASSⅡ)	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 Temperature: 40±2℃ Humidity: 90~95% RH Duration Time: 500+12/-0 Hr. Charge/Discharge Current: 50㎃ max. Perform the initial measurement according to Note1. Perform the final measurement according to Note2. This test is only applied to Vr≤500V products. You can check the specification at the web site or contact sales people for each product with mark*
		Capacitance	Characteristic		Capacitance Change	
			CLASS Ⅰ		±7.5% or ± 0.75pF whichever is larger	
			CLASS Ⅱ	A(X5R), B(X7R), X(X6S), Y(X7S)	±12.5%	
				F(Y5V)	±30%	
		Q (CLASS Ⅰ)	Capacitance≥30pF : Q≥200 <30pF : Q≥100+10/3×C(C: Capacitance)			
		Tanδ (CLASSⅡ)	1.Capacitance: A(X5R) 0.05 max / 0.075 max* (35V / 50V) 0.05 max / 0.075 max* / 0.125 max*(16V / 25V) 0.075 max / 0.125 max* (≤10V) 2.Capacitance: B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V≥) 0.075 max / 0.125 max* (≤10V) 3.Capacitance: F(Y5V) 0.09 max (50V) 0.09 max / 0.125 max* (25V / 35V) 0.09 max / 0.125 max* / 0.16 max* (16V) 0.16 max / 0.195 max* (10V) 0.195 max (4V / 6.3V)			
		Insulation resistance	500㏁ min. or 25㏁·㎌ min. product whichever is smaller / 12.5㏁·㎌ or over*			
13	High Temperature Resistance	Appearance	No mechanical damage shall occur			Temperature : max. operating temperature Duration Time: 1000+48/-0 Hr. Charge/Discharge Current: 50㎃ max. Vr≤200V : 200% of the rated Voltage 250V≤Vr≤500V: 150% of the rated Voltage Vr=630V : 120% of the rated Voltage 1000V≤Vr≤3000V: 100% of the rated Voltage * : 150% or 100% of the rated Voltage Perform the initial measurement according to Note1 for class Ⅱ Perform the final measurement according to Note2. You can check the specification at the web site or contact sales people for each product with mark*
		Capacitance	Characteristic		Capacitance Change	
			CLASS Ⅰ		±3% or ± 0.3 pF whichever is larger	
			CLASS Ⅱ	A(X5R), B(X7R), X(X6S), Y(X7S)	±12.5%	
				F(Y5V)	±30%	
		Q (CLASS Ⅰ)	Capacitance≥30pF : Q≥350 10≤Capacitance<30pF : Q≥275+2.5×C Capacitance<10pF : Q≥200+10×C (C: Capacitance)			
		Tanδ (CLASSⅡ)	1.Capacitance: A(X5R) 0.05 max / 0.075 max* (35V / 50V) 0.05 max / 0.075 max* / 0.125 max*(16V / 25V) 0.075 max / 0.125 max* (≤10V) 2.Capacitance: B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V≥) 0.075 max / 0.125 max* (≤10V) 3.Capacitance: F(Y5V) 0.09 max (50V) 0.09 max / 0.125 max* (25V / 35V) 0.09 max / 0.125 max* / 0.16 max* (16V) 0.16 max / 0.195 max* (10V) 0.195 max (4V / 6.3V)			
		Insulation resistance	1,000㏁ min. or 50㏁·㎌ min. product whichever is smaller / 25㏁·㎌ or over*			

No	Item		Performance		Test Condition
14	Temperature Cycle	Appearance	No mechanical damage shall occur		Capacitor shall be subjected to 5 cycles. Condition for 1 cycle:
		Capacitance	Characteristic	Capacitance Change	
			CLASS Ⅰ	±2.5% or ± 0.25pF whichever is larger	
			CLASS Ⅱ A(X5R), B(X7R)	±7.5%	
			CLASS Ⅱ X(X6S), Y(X7S)	±15%	
			CLASS Ⅱ F(Y5V)	±20%	
		Q (CLASS Ⅰ)	Within the specified initial value		
		Tanδ (CLASSⅡ)	Within the specified initial value		
		Insulation resistance	Within the specified initial value		

Step	Temperature(℃)	Time(min.)
1	min. operating temperature +0/-3	30
2	25	2~3
3	max. operating temperature +0/-3	30
4	25	2~3

Leave the capacitor in ambient condition for specified time* before measurenment
*24 ± 2 hours(CLASS Ⅰ)
24 ± 2 hours(CLASSⅡ)

No	Recommended Soldering Method					
15	Recommended Soldering Method By Size & Capacitance	Size inch(mm)	Temperature Characteristic	Capacitance	Condition	
					Flow	Reflow
		01005(0402)	-	-	-	○
		0201 (0603)				
		0402 (1005)				
		0603(1608)	Class Ⅰ	-	○	○
			Class Ⅱ	C < 1㎌	○	○
				C ≥ 1㎌	-	○
		0805 (2012)	Class Ⅰ	-	○	○
			Class Ⅱ	C < 4.7㎌	○	○
				C ≥ 4.7㎌	-	○
			Array	-	-	○
		1206 (3216)	Class Ⅰ	-	○	○
			Class Ⅱ	C < 10㎌	○	○
				C ≥ 10㎌	-	○
			Array	-	-	○
		1210 (3225)	-	-	-	○
		1808 (4520)				○
		1812 (4532)				○
		2220 (5750)				○

Note1. Initial Measurement For Class Ⅱ

Perform the heat treatment at 150℃+0/-10℃ for 1 hour. Then Leave the capacitor in ambient condition for 24±2 hours before measurement. Then perform the measurement.

Note2. Latter Measurement

1. CLASS Ⅰ
Leave the capacitor in ambient condition for 24±2 hours before measurement. Then perform the measurement.

2. CLASSⅡ
Perform the heat treatment at 150℃+0/-10℃for 1 hour. Then Leave the capacitor in ambient condition for 24±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 System
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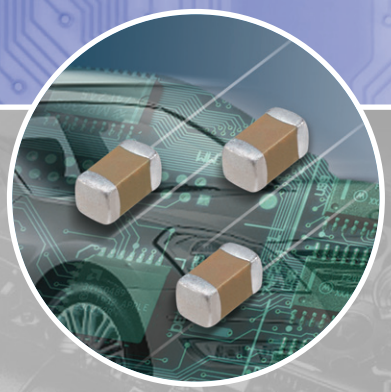
Application Manual for Surface Mounting

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 Capacitorsfor 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

1. SERIES CODE
CL=Multi layer Ceramic Capacitors

2. SIZE CODE — inch(㎜)
05=1005(0402) 10=1608(0603) 21=2012(0805)
31=3216(1206) 32=3225(1210)

★
3. DIELECTRIC CODE
C=C0G (Class Ⅰ) B=X7R (Class Ⅱ)

4. CAPACITANCE CODE
Capacitance expressed in pF. 2 significant digits plus number of zeros.
example) 106=10×10^6=10000000pF
For Values < 10pF, Letter R denotes decimal point
example) 1R5=1.5pF

★★
5. TOLERANCE CODE
C=±0.25pF D=±0.5pF F=±1pF, ±1%* G=±2%
J=±5% K=±10% M=±20%
*For Values ≤10pF, F=±1pF, Values>10pF, F=±1%

※This code has only typical specifications. Please refer to individual specifications.

6. RATED VOLTAGE CODE
P=10V O=16V
A=25V B=50V C=100V

★★★
7. THICKNESS CODE
5 = 0.50㎜ 6= 0.60㎜ 8 = 0.80㎜ C = 0.85㎜
P = 1.15㎜ F = 1.25㎜ H = 1.60㎜ J = 2.50㎜

※This code has only typical specifications. Please refer to individual specifications.

8. DESIGN CODE
1=Ni/Cu/Ni Barrier/Sn 100%/Standard
4=Ni/Cu+Ag-Epoxy/Ni Barrier/Sn 100%/Standard
5=Ni/Cu+Ag-Epoxy/Ni Barrier/Sn 100%/Open Mode

※This code has only typical specifications. Please refer to individual specifications.

9. PRODUCT CODE
P=Automotive product meet AEC-Q-200.

※If orders are placed without returned specification, please allow us to judge that specification is accepted by your side.

10. GRADE CODE
N=Standard

11. PACKAGING CODE
B = Bulk
P = Bulk Case
C = Cardboard Tape, 7"Reel
O = Cardboard Tape, 10"Reel
D = Cardboard Tape, 13"Reel(10,000ea)
L = Cardboard Tape, 13"Reel(15,000ea)
E = Embossed Type, 7"Reel
F = Embossed Type, 13"Reel
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(℃)	Temperature Coefficient Range(ppm/℃)
C	C0G	-55 ~ +125	0 ±30

Class Ⅱ

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

★★

Capacitance Tolerance

Code	Capacitance Tolerance	TC	Capacitance Step	Rated Capacitance
C	±0.25 pF	C0G	Under 5 pF	E-12 series ★
D	±0.5 pF	C0G	6.0 to 9.0 pF	E-12 series ★
J	±5%	C0G	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)
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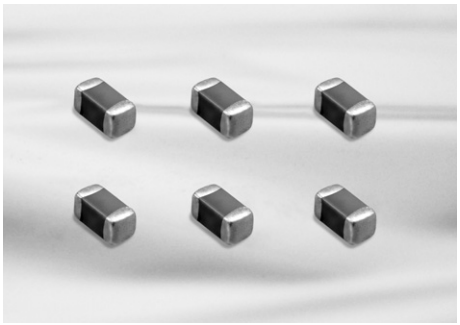


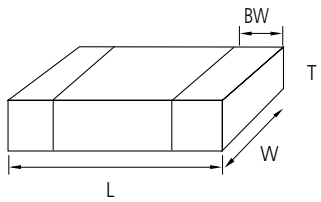
Feature

- 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.
- C0G 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, Infortainment)

Structure and Dimensions



Code	EIA Code	Dimension(mm)			
		L	W	T	BW
05	0402	1.00±0.05	0.50±0.05	0.50(±0.05)	0.2+0.15/-0.1
10	0603	1.60±0.10	0.80±0.10	0.80(±0.10)	0.3±0.2
21	0805	2.00±0.10	1.25±0.10	0.60(±0.10)	0.5±0.2/-0.3
				0.85(±0.10)	
				1.25(±0.10)	
31	1206	3.20±0.20	1.60±0.20	0.85(±0.15)	0.5±0.3
				1.15(±0.10)	
				1.60(±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											
		0.6	25										
		0.85											
		1.25											
		0.6	50										
		0.85											
		1.25											
		0.6	100										
		0.85											
		1.25											
	1206(3216)	1.6	10										
		1.15	16										
		1.6											
		0.85	25										
		1.15											
		1.6											
		0.85	50										
		1.15											
		1.6											

Part Numbering System
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Packaging Specification
Application Manual for Surface Mounting

Product Lineup (Automotive Capacitors_COG)

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

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Part Numbering System
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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 (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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

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Part Numbering System
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Array Type Capacitors
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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 (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness 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

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Array Type Capacitors
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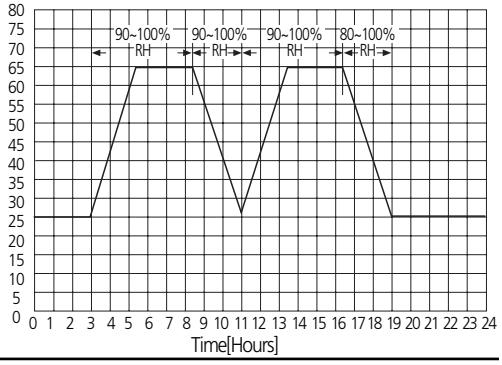
Packaging Specification
Application Manual for Surface Mounting

Reliability Test Condition (Automotive Capacitors)

<table>
<tr><th>No</th><th colspan="3">Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td>1</td><td colspan="3">Pre-and Post-Stress
Electrical Test</td><td>-</td><td></td></tr>
<tr><td rowspan="5">2</td><td rowspan="5">High Temperature
Exposure</td><td>Appearance</td><td></td><td>No abnormal exterior appearance</td><td rowspan="5">Unpowered, 1000hrs@T=150℃
Measurement at 24±2hrs after test conclusion</td></tr>
<tr><td rowspan="2">Capacitance
Change</td><td>CLASS Ⅰ</td><td>Within ±2.5% or 0.25pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS Ⅱ</td><td>Within ±10%</td></tr>
<tr><td>Q</td><td>CLASS Ⅰ</td><td>Capacitance ≥ 30pF : Q ≥1,000
＜30pF : Q ≥400 +20×C
(C : Capacitance)</td></tr>
<tr><td>Tanδ</td><td>CLASS Ⅱ</td><td>Rated Voltage ≥ 25V : 0.03 max
≥ 16V : 0.05 max
≥ 10V : 0.075 max</td></tr>
<tr><td colspan="2">IR</td><td>More than 10,000 MΩor 500MΩ × μF
(Whichever is smaller)</td></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Temperature
Cycling</td><td>Appearance</td><td></td><td>No abnormal exterior appearance</td><td rowspan="5">1000Cycles
Measurement at 24±2hrs after test conclusion
<table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(min.)</th></tr><tr><td>1</td><td>Min. operating
Temp. ±2</td><td>15±3</td></tr><tr><td>2</td><td>25±2</td><td>1</td></tr><tr><td>3</td><td>Max. operating
Temp. ±2</td><td>15±3</td></tr><tr><td>4</td><td>25±2</td><td>1</td></tr></table></td></tr>
<tr><td rowspan="2">Capacitance
Change</td><td>CLASS Ⅰ</td><td>Within ±2.5% or 0.25pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS Ⅱ</td><td>Within ±10%</td></tr>
<tr><td>Q</td><td>CLASS Ⅰ</td><td>Capacitance ≥ 30pF : Q ≥1,000
＜30pF : Q ≥400 +20×C
(C : Capacitance)</td></tr>
<tr><td>Tanδ</td><td>CLASS Ⅱ</td><td>Rated Voltage ≥ 25V : 0.03 max
≥ 16V : 0.05 max
≥ 10V : 0.075max</td></tr>
<tr><td colspan="2">IR</td><td>More than 10,000 MΩor 500MΩ × μF
(Whichever is smaller)</td></tr>
<tr><td>4</td><td colspan="3">Destructive Physical
Analysis</td><td>No defects or abnormalities</td><td>Per EIA 469</td></tr>
<tr><td rowspan="5">5</td><td rowspan="5">Moisture Resistance</td><td>Appearance</td><td></td><td>No abnormal exterior appearance</td><td rowspan="5">10Cycles, t=24hrs/cycle
Heat (25~65℃) and humidity (80~98%), Unpowered
measurement at 24±2hrs after test conclusion
 
</td></tr>
<tr><td rowspan="2">Capacitance
Change</td><td>CLASS Ⅰ</td><td>Within±2.5% or 0.25pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS Ⅱ</td><td>Within ±12.5%</td></tr>
<tr><td>Q</td><td>CLASS Ⅰ</td><td>Capacitance ≥ 30pF : Q ≥350
＜ 10pF : Q ≥275+(5/2)×C
＜ 10pF : Q ≥200+10×C
(C : Capacitance)</td></tr>
<tr><td>Tanδ</td><td>CLASS Ⅱ</td><td>Rated Voltage ≥ 25V : 0.03 max
≥ 16V : 0.05 max
≥ 10V : 0.075max</td></tr>
<tr><td colspan="2">IR</td><td>More than 10,000 MΩor 500MΩ × μF
(Whichever is smaller)</td></tr>
</table>

* 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℃/85%RH, Rated Voltate and 1.3~1.5V, (add 100kohm resistor) Measurement at 24±2hrs after test conclusion 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 ＜30pF : Q ≥100 +(10/3)×C (C : Capacitance)	
		Tanδ	CLASS Ⅱ	Rated Voltage ≥ 25V : 0.035 max ≥ 16V : 0.05 max ≥ 10V : 0.075max	
		IR		More than 500 MΩor 25 MΩ × μF (Whichever is Smaller)	
7	High Temperature Operating Life	Appearance		No abnormal exterior appearance	1000hrs @ TA=125℃, 200% Rated Voltage, Measurement at 24±2hrs after test conclusion 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 ≥ 10pF : Q≥275+(5/2)×C ＜ 10pF : Q≥200+10×C (C : Capacitance)	
		Tanδ	CLASS Ⅱ	Rated Voltage ≥ 25V : 0.035 max ≥ 16V : 0.05 max ≥ 10V : 0.075max	
		IR		More than 1,000 MΩor 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 3 mutually perpendicular axes of the test specimen (18 shocks) Peakvalue: 1,500G / Duration: 0.5ms / Wave: 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 ＜30pF : Q ≥400 +20×C (C : Capacitance)	
		Tanδ	CLASS Ⅱ	Rated Voltage ≥ 25V : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05max	
		IR		More than 10,000 MΩor 500 MΩ × μF (Whichever is smaller)	

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Part Numbering System
General Capacitors
High Capacitance Capacitors
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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, Use 8" ×5" 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㎐.
		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 <30pF : Q ≥400 +20×C (C : Capacitance)	
		Tanδ	CLASS Ⅱ	Rated Voltage ≥ 25V : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05max	
		IR		More than 10,000㏁or 500㏁ × ㎌ (Whichever is smaller)	
12	Resistance to Solder Heat	Appearance		No abnormal exterior appearance	Solder pot : 260±5℃, 10±1sec.
		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 < 30pF: Q ≥400+20×C (C : Capacitance)	
		Tanδ	CLASS Ⅱ	Rated Voltage ≥ 25V : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05max	
		IR		More than 10,000㏁or 500㏁ × ㎌ (Whichever is smaller)	
13	Thermal Shock	Appearance		No abnormal exterior appearance	-55℃/+125℃ Note: Number of cycles required - 300, Maximum transfer time-20 sec, Dwell time-15min. Air-Air
		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 <30pF: Q ≥400+20×C (C : Capacitance)	
		Tanδ	CLASS Ⅱ	Rated Voltage ≥ 25V : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05max	
		IR		More than 10,000㏁or 500㏁ × ㎌ (Whichever is smaller)	
14	ESD	Appearance		No abnormal exterior appearance	AEC-Q200-002
		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 < 30pF : Q ≥400+20×C (C : Capacitance)	
		Tanδ	CLASS Ⅱ	Rated Voltage ≥ 25V : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05max	
		IR		More than 10,000㏁or 500㏁ × ㎌ (Whichever is smaller)	

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

<table>
<tr><th>No</th><th colspan="3">Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td>15</td><td colspan="3">Solderability</td><td>95% of the terminations is to be soldered evenly and continuously</td><td>a) Preheat at 155℃ for 4 hours, Immerse in solder for 5s at 235±5℃
b) Steam aging for 8 hours, Immerse in solder for 5s at 235±5℃
c) Steam aging for 8 hours, Immerse in solder for 120s at 260±5℃
solder : a solution ethanol and rosin</td></tr>
<tr><td rowspan="8">16</td><td rowspan="8">Electrical Characterization</td><td colspan="2">Capacitance</td><td>Within specified tolerance</td><td rowspan="8">The Capacitance /D.F. should be measured at 25℃,
<table><tr><th>Class</th><th>Capacitance</th><th>Frequency</th><th>Vrms</th></tr><tr><td rowspan="2">Class Ⅰ</td><td>1000pF ↓</td><td>1㎒±10%</td><td>0.5~5Vrms</td></tr><tr><td>1000pF ↑</td><td>1㎑±10%</td><td>1.0±0.2Vrms</td></tr><tr><td rowspan="2">Class Ⅱ</td><td>10㎌ ↓</td><td>1㎑±10%</td><td>1.0±0.2Vrms</td></tr><tr><td>10㎌ ↑</td><td>120㎐±20%</td><td>0.5±0.1Vrms</td></tr></table>
I.R. should be measured with a DC voltage not exceeding Rated Voltage @25℃, @125℃ for 60~120 sec.

Dielectric Strength : 250% of the rated voltage for 1~5 seconds
The charge/discharge current is less than 50mA.</td></tr>
<tr><td>Q</td><td>CLASS Ⅰ</td><td>Capacitance ≥ 30pF : Q ≥1,000
＜30pF : Q ≥ 400+20×C
(C: Capacitance)</td></tr>
<tr><td>Tanδ</td><td>CLASS Ⅱ</td><td>Rated Voltage≥ 25V : 0.025 max
≥ 16V : 0.035 max
≥ 10V : 0.05max</td></tr>
<tr><td rowspan="2">IR@25℃</td><td>CLASS Ⅰ</td><td>More than 100,000㏁or 1,000㏁ × ㎌
(Whichever is smaller)</td></tr>
<tr><td>CLASS Ⅱ</td><td>More than 10,000 ㏁or 500㏁ × ㎌
(Whichever is smaller)</td></tr>
<tr><td rowspan="2">IR@125℃</td><td>CLASS Ⅰ</td><td>More than 10,000 ㏁or 100㏁ × ㎌
(Whichever is smaller)</td></tr>
<tr><td>CLASS Ⅱ</td><td>More than 1,000 ㏁or 10㏁ × ㎌
(Whichever is smaller)</td></tr>
<tr><td colspan="2">Dielectric Strength</td><td>No dielectric breakdown or mechanical breakdown</td></tr>
<tr><td rowspan="3">17</td><td rowspan="3">Board Flex</td><td colspan="2">Appearance</td><td>No abnormal exterior appearance</td><td rowspan="3">Bending to the limit for 5 seconds
Limit : Class Ⅰ - 3mm
Class Ⅱ - 2mm</td></tr>
<tr><td rowspan="2">Capacitance Change</td><td>CLASS Ⅰ</td><td>Within ±5.0% or 0.5pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS Ⅱ</td><td>Within ±10%</td></tr>
<tr><td rowspan="3">18</td><td rowspan="3">Terminal Strength(SMD)</td><td colspan="2">Appearance</td><td>No abnormal exterior appearance</td><td rowspan="3">18N, for 60±1 sec.
* 0603(1608) –10N,
0402(1005) –2N</td></tr>
<tr><td rowspan="2">Capacitance Change</td><td>CLASS Ⅰ</td><td>Within ±2.5% or 0.25pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS Ⅱ</td><td>Within ±10%</td></tr>
<tr><td>19</td><td colspan="3">Beam Load</td><td>Destruction value should be exceed
Chip Length ≤2.5㎜
a) Chip Thickness > 0.5㎜ : 20N
b) Chip Thickness ≤0.5㎜ : 8N
Chip Length ≥ 3.2㎜
a) Chip Thickness ≥ 1.25㎜ : 54.5N
b) Chip Thickness < 1.25㎜ : 15N</td><td>Beam speed
Chip Length ≤2.5㎜, 0.5±0.05㎜/sec
Chip Length ≥3.2㎜, 2.5±0.25㎜/sec</td></tr>
<tr><td rowspan="4">20</td><td rowspan="4">Capacitance Temperature Characteristics</td><td rowspan="2">Capacitance Change</td><td>CLASS Ⅰ</td><td>0±30 ppm/℃</td><td rowspan="4"><table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(min)</th></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></td></tr>
<tr><td>CLASS Ⅱ</td><td>Within ±15%</td></tr>
<tr><td>Temperature Coefficient</td><td>CLASS Ⅰ</td><td>0±30 ppm/℃</td></tr>
<tr><td>Capacitance Drift</td><td>CLASS Ⅰ</td><td>Within ±0.2% or 0.05pF,
(Whichever is larger)</td></tr>
</table>

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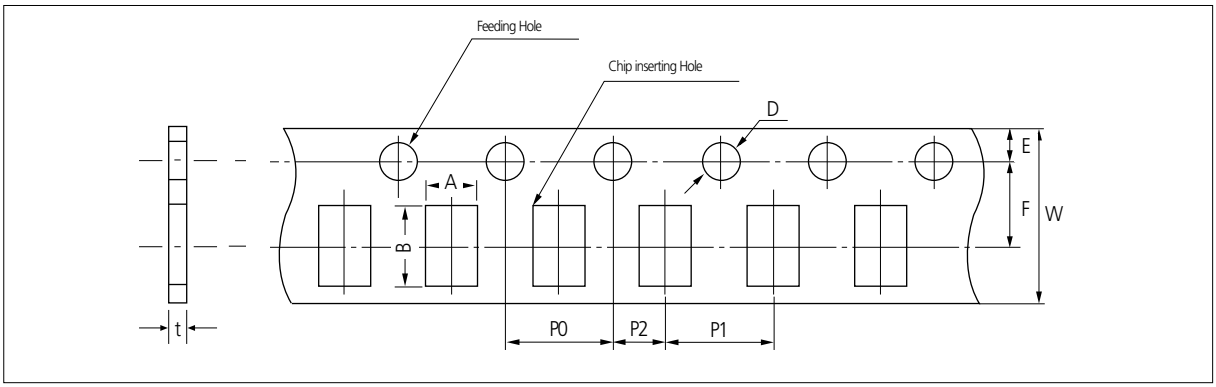
Packaging Specification
Application Manual for Surface Mounting

Packaging Specifications

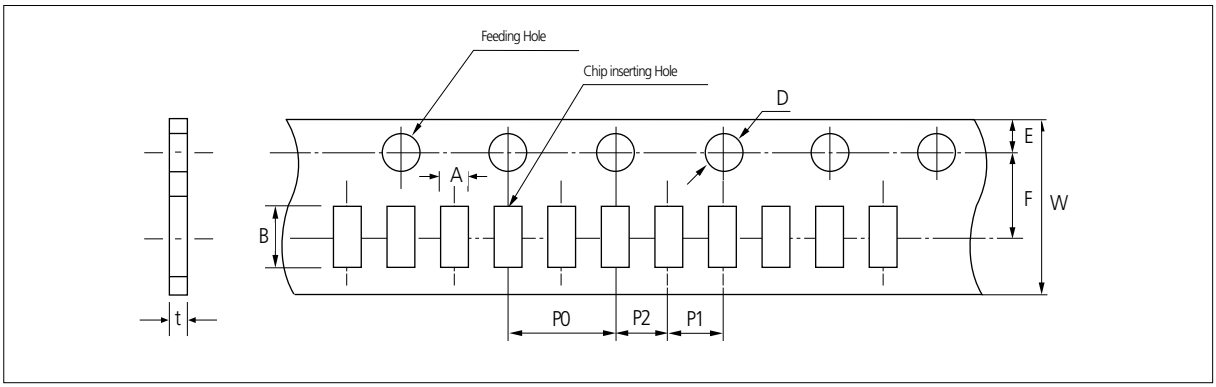
Cardboard Paper Tape(4mm)



Unit: inch(mm)

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

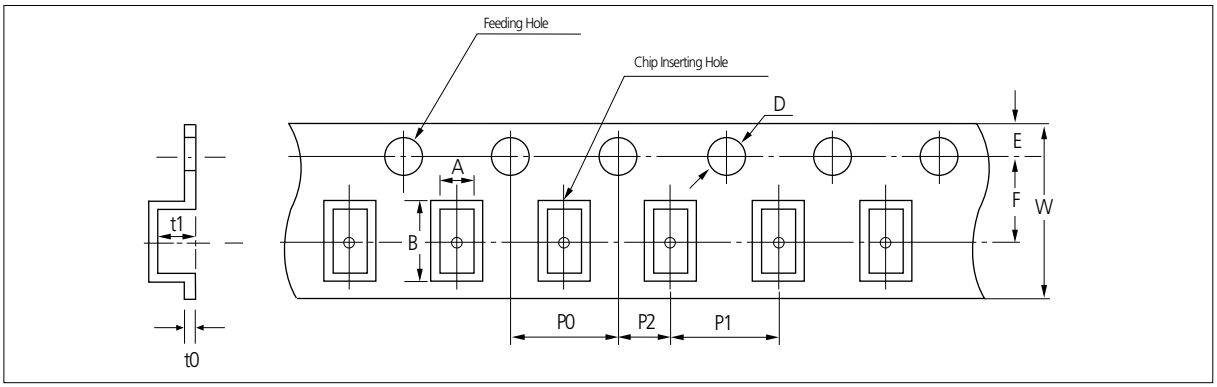
Cardboard Paper Tape(2mm)



Unit: inch(mm)

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

Embossed Plastic Tape

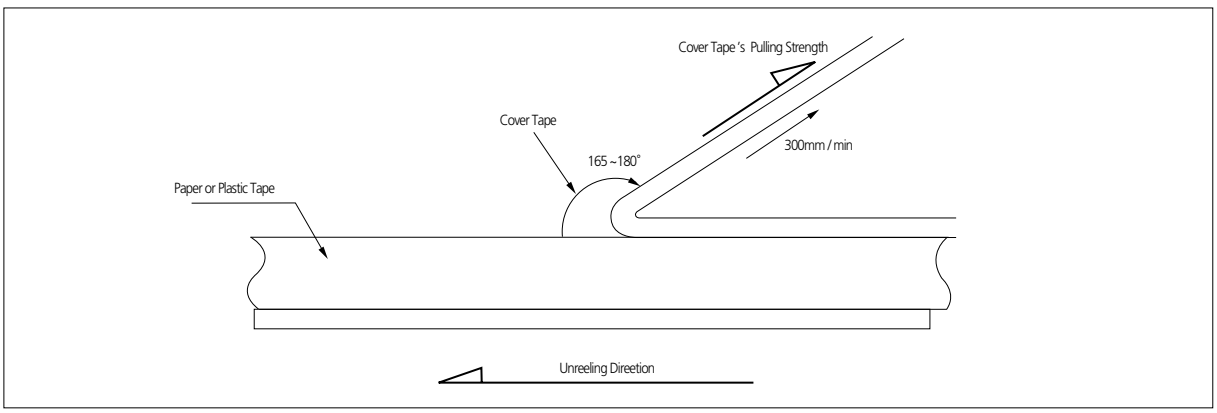


Unit: inch(mm)

Symbol / Type		A	B	W	F	E	P1	P2	P0	D	t1	t0
Dimension	0603 (1608)	1.05 ±0.15	1.9 ±0.15	8.0 ±0.3	3.5 ±0.05	1.75 ±0.1	4.0 ±0.1	2.0 ±0.05	4.0 ±0.1	Ø1.5 +0.1/ - 0	2.8 max	0.6 BELOW
	0805 (2012)	1.45 ±0.2	2.3 ±0.2									
	1206 0612 (3216) (1632)	1.9 ±0.2	3.5 ±0.2									
	1210 (3225)	2.8 ±0.2	3.6 ±0.2									
	1808 (4520)	2.3 ±0.2	4.9 ±0.2	12.0 ±0.3	5.60 ±0.05		8.0 ±0.1				3.8 max	
	1812 (4532)	3.6 ±0.2	4.9 ±0.2									
	2220 (5750)	5.5 ±0.2	6.2 ±0.2									

Peeling off of Cover Tape

• 5 g.f ≤ Peel off force ≤ 70 g.f



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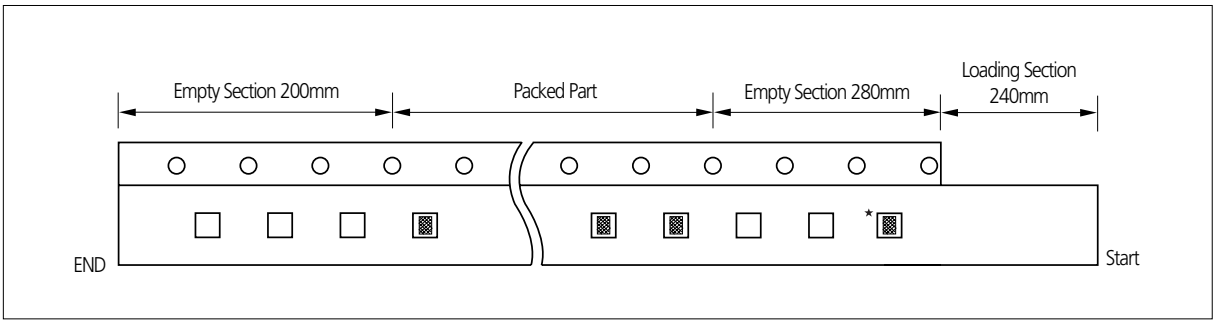
Taping Size

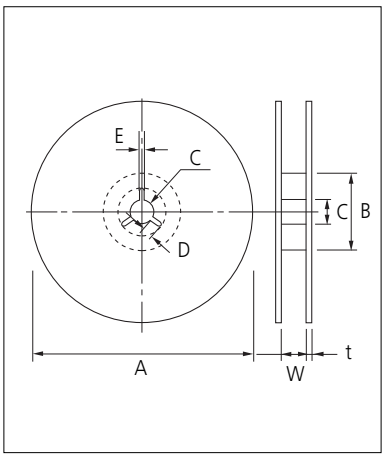


• The chip is only use for identifying the label and packaged products.
Please don't use the chip.

Unit: kpcs

Size	T code	Quantity & Packing Code								
		Paper Type					Plastic Type			
		C (7"reel)	H (7"reel)	O (10"reel)	D (13"reel)	L (13"reel)	E (7"reel)	G (7"reel)	F (13"reel)	S (10"reel)
01005(0402)	2	20	-	-	-	-	50	-	-	-
0201(0603)	3	10	15	30	50	-	-	-	-	-
0402(1005)	3	10	15	30	50	-	-	-	-	-
	5	10	-	30	50	-	-	-	-	-
0504(1410)	8	4	-	10	10	15	-	-	-	-
0603(1608)	5	4	-	30	50	-	-	-	-	-
	8	4	-	10	10	15	-	-	-	-
0604(1610)	D	-	-	-	-	-	3	-	10	6
0805(2012)	A, C	4	-	10	10	15	-	-	-	-
	E, F, Q	-	-	-	-	-	2	3	10	6
1206(3216)	C	4	-	10	10	15	-	-	-	-
	E, F, P	-	-	-	-	-	2	3	10	6
	H	-	-	-	-	-	2	-	8	4
1210(3225)	9, D, C, O	-	-	-	-	-	2	-	10	-
	E, F, M	-	-	-	-	-	2	-	10	-
	H, T	-	-	-	-	-	2	-	8	4
	I, U	-	-	-	-	-	2	-	4	-
	J, V	-	-	-	-	-	1	-	4	-
	S	-	-	-	-	-	2	-	8	-
1808(4520)	F	-	-	-	-	-	2	-	-	-
1812(4532)	F, H, I	-	-	-	-	-	1	-	4	-
	L, J	-	-	-	-	-	-	-	2	-
2220(5750)	H, I, J	-	-	-	-	-	-	-	2	-

Reel Dimensions



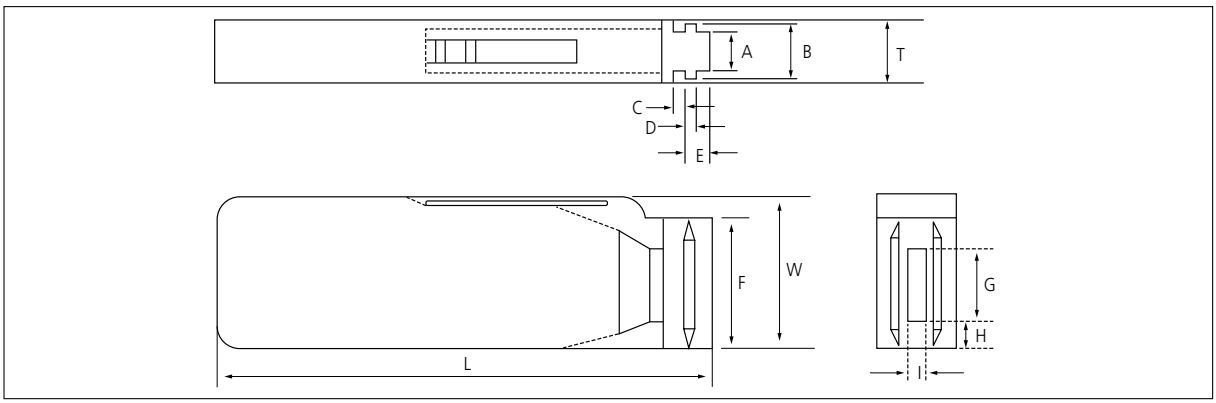
Unit: mm

Symbol	Tape Width	A	B	C	D
7" Reel	8mm	Ø180+0/-3	Ø60+1/-0	Ø13±0.3	4±0.2
	12mm	Ø180+0/-3	Ø60+1/-0	Ø13±0.3	4±0.2
10" Reel	8mm	Ø258+0/-3	Ø80+1/-0	Ø13±0.3	4±0.2
	12mm	Ø258+0/-3	Ø80+1/-0	Ø13±0.3	4±0.2
13" Reel	8mm	Ø330±2.0	Ø80±1.0	Ø13±0.3	4±0.2
	12mm	Ø330±2.0	Ø80±1.0	Ø13±0.3	4±0.2

Symbol	Tape Width	E	W	t
7" Reel	8mm	2.0±0.5	9±0.5	1.2±0.2
	12mm	2.0±0.5	13±0.5	1.2±0.2
10" Reel	8mm	2.0±0.5	9±0.5	1.8±0.2
	12mm	2.0±0.5	13±0.5	1.8±0.2
13" Reel	8mm	2.0±0.5	9±0.5	2.2±0.2
	12mm	2.0±0.5	13±0.5	2.2±0.2

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±0.1	8.8±0.1	12±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±0.35	7±0.35	110±0.7	5±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.

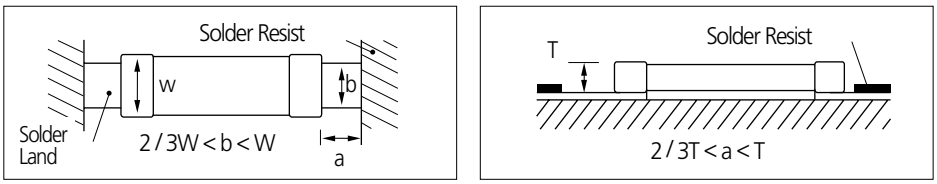
1-2. Corrosive Gases
Since sulfur and chlorine may degrade the solderability of the end termination, it is important to store the capacitors in an environment free of these gases

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

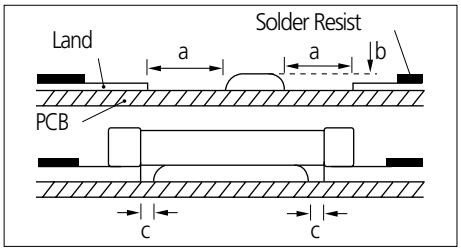


3.Adhesives

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

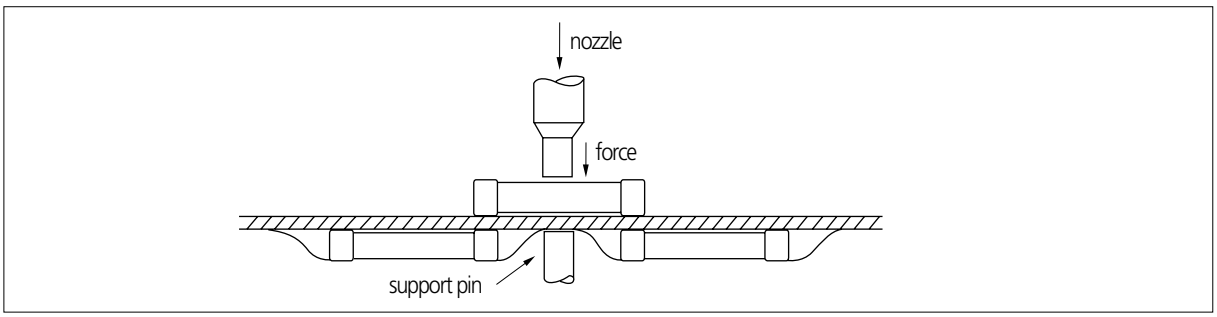
Type	21	31
a	0.2min	0.2min
b	70~100㎛	70~100㎛
c	>0	>0

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.



5. Flux

Although highly-activated flux gives better solderability, substances which increase activity may also degrade the insulation of the chip capactiors, 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

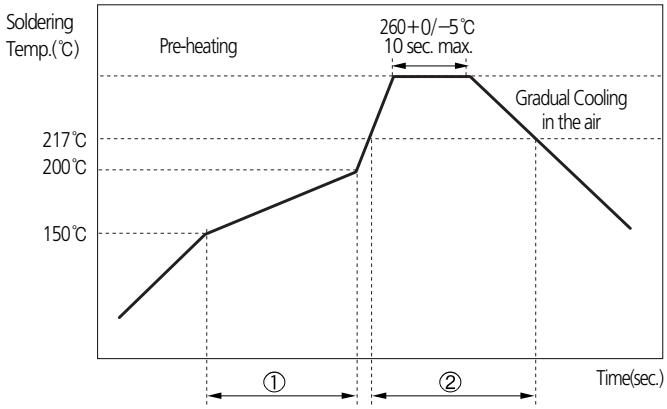
Method	Classification	
Reflow slodering	· Overall heating	· Infrared rays · Hot plate · VPS (Vapor phase)
	· Local heating	· Air heater · Laser · Light beam
Flow Soldering	· Single wave · Double wave	

6-2. Soldering Profile

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

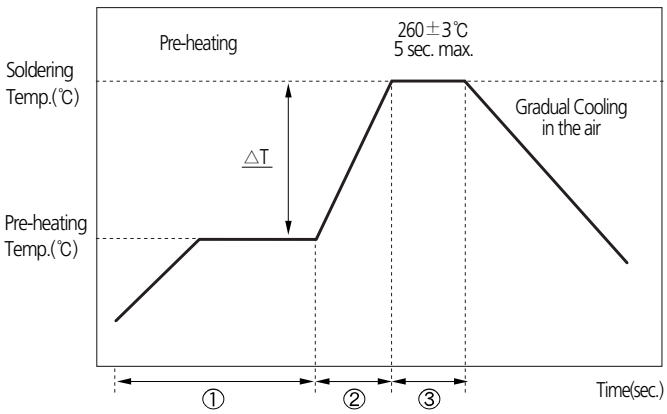
6-2-1 Pb-Free (Sn 100%) Plating

■ **REFLOW SOLDERING**



SolderingTemp. (℃)	Pre-heating Time (①, sec.)	Soldering Time (②, sec.)
260+0/-5℃	60~120	60~150

■ **FLOW SOLDERING**



△T(℃)	Soldering Temp. (℃)	Pre-heatingTime (①+②, sec.)	SolderingTime (③, sec.)
≤150 (1206 and below size)	260±3	≥120	≤5

■ **SOLDER IRON(Hand Soldering)**

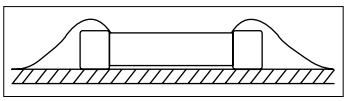
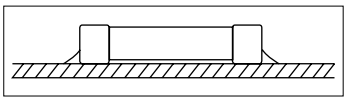
Variation of Temp.(℃)	Soldering Temp(℃)	Pre-heating Time(sec.)	Soldering Time(sec.)	Cooling Time(sec.)	Condition of Iron Facilities		
					Wattage	Tip Diameter	Soldering Time
△T≤130	300±10℃max.	≥ 60 sec.	≤ 4 sec.	-	20W max.	3mm max.	4 sec max.

※ 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 (ΔT) must be less than 100℃

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.

Sony Green Partner	ISO/TS 16949	ISO 14001	OHSAS18001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The design of printed circuit board.
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Certification Manager, Systems Assessment
Originally registered: 22 May 2000 Latest issue: 18 Jul 2006 Expiry date: 09 Jul 2009 Page: 1 of 2
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