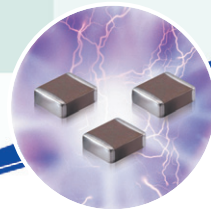
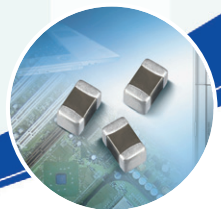


November 2010



MULTILAYER CERAMIC CAPACITORS



SAMSUNG
ELECTRO-MECHANICS





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

1. RoHS Compliance and restriction of Br

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

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

2. No use of materials breaking Ozone layer

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

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

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

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

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

Class I (Temperature Compensation)

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

★
Class II (High Dielectric Constant)

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

★★

Series	TC	Capacitance Step											
E-3	Y5V	1.0				2.2				4.7			
E-6	X5R 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

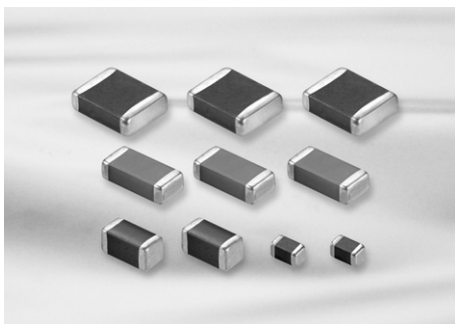
★★★

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

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

Part Numbering
SystemGeneral
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CapacitorsSuper Small Size
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General Capacitors



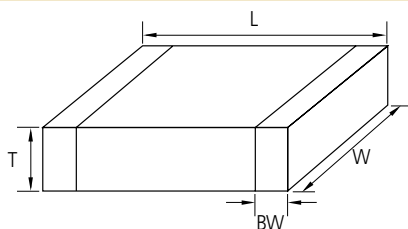
Feature

- 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 COG to Y5V and from 6.3V to 50V
- Highly reliable performance
- Highly resistant termination metal
- Tape & reel for surface mount assembly

Application

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

Structure and Dimensions



Size Code	EIA Code	Dimension(mm)				
		L	W	T	Thickness Code	BW
05	0402	1.00 ± 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	C	
				$0.85 \pm 0.10(*)$	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	C	0.60 ± 0.30
				$0.85 \pm 0.10(*)$	9	
				0.90 ± 0.10	H	
				1.60 ± 0.20	U	
				1.80 ± 0.20	I	
				2.00 ± 0.20	J	
42	1808	3.20 ± 0.40	2.50 ± 0.30	2.50 ± 0.30	v	0.80 ± 0.30
				2.50 ± 0.30	L	
				2.50 ± 0.30	L	
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												nF											
		0.5	1	10	22	47	100	220	330	470	560	1	2.2	3.3	4.7	6.8	10	22	27	33	47	68	100	120	150
0402(1005)	25																								
	50																								
0603(1608)	25																								
	50																								
0805(2012)	25																								
	50																								
1206(3216)	16																								
	25																								
	50																								
1210(3225)	50																								
1812(4532)	25																								
	50																								
2220(5750)	50																								

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SystemGeneral
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General Capacitors Table (X5R)

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

General Capacitors Table_Low Profile (X5R)

Size(mm)	Tmax (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							
1206(3216)	0.95	25				X6S			
		10							
		6.3							
		16							
		50							
	0.7	10							
1210(3225)	2.0	25							
		35							
		50							
	0.95	16							

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

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General Capacitors Table (X6S)

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

General Capacitors Table (X7R)

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

Part Numbering
System

General
Capacitors

High Capacitance
Capacitors

Super Small Size
Capacitors

Medium-High
Voltage Capacitors

Array Type
Capacitors

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General Capacitors Table (Y5V)

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

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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SystemGeneral
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Voltage CapacitorsArray Type
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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	CL10C0R75CB8NNN □		0.75pF	50	±0.25pF	0.90
4	CL10C010CB8NNN □		1.0pF	50	±0.25pF	0.90
5	CL10C1R2CB8NNN □		1.2pF	50	±0.25pF	0.90
6	CL10C1R5CB8NNN □		1.5pF	50	±0.25pF	0.90
7	CL10C1R8CB8NNN □		1.8pF	50	±0.25pF	0.90
8	CL10C020CB8NNN □		2.0pF	50	±0.25pF	0.90
9	CL10C2R2CB8NNN □		2.2pF	50	±0.25pF	0.90
10	CL10C2R4CB8NNN □		2.4pF	50	±0.25pF	0.90
11	CL10C2R5CB8NNN □		2.5pF	50	±0.25pF	0.90
12	CL10C2R7CB8NNN □		2.7pF	50	±0.25pF	0.90
13	CL10C030CB8NNN □		3.0pF	50	±0.25pF	0.90
14	CL10C3R3CB8NNN □		3.3pF	50	±0.25pF	0.90
15	CL10C3R5CB8NNN □		3.5pF	50	±0.25pF	0.90
16	CL10C3R6CB8NNN □		3.6pF	50	±0.25pF	0.90
17	CL10C3R9CB8NNN □		3.9pF	50	±0.25pF	0.90
18	CL10C040CB8NNN □		4.0pF	50	±0.25pF	0.90
19	CL10C4R3CB8NNN □		4.3pF	50	±0.25pF	0.90
20	CL10C4R7CB8NNN □		4.7pF	50	±0.25pF	0.90
21	CL10C050DB8NNN □		5.0pF	50	±0.5pF	0.90
22	CL10C5R6DB8NNN □		5.6pF	50	±0.5pF	0.90
23	CL10C060DB8NNN □		6.0pF	50	±0.5pF	0.90
24	CL10C6R2DB8NNN □		6.2pF	50	±0.5pF	0.90
25	CL10C6R8DB8NNN □		6.8pF	50	±0.5pF	0.90
26	CL10C070DB8NNN □		7.0pF	50	±0.5pF	0.90
27	CL10C7R5DB8NNN □		7.5pF	50	±0.5pF	0.90
28	CL10C080DB8NNN □		8.0pF	50	±0.5pF	0.90
29	CL10C8R2DB8NNN □		8.2pF	50	±0.5pF	0.90

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

Product Lineup (General Capacitors-C0G)

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

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

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

Product Lineup (General Capacitors-C0G)

	Part Number	Size L×W (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

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

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

Product Lineup (General Capacitors-C0G)

	Part Number	Size L×W (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 Capacitance' subcategory.

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

Product Lineup (General Capacitors-X7R)

	Part Number	Size L×W (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 Capacitance' subcategory.

Product Lineup (General Capacitors-X7R)

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

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

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Product Lineup (General Capacitors-X5R)

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

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

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

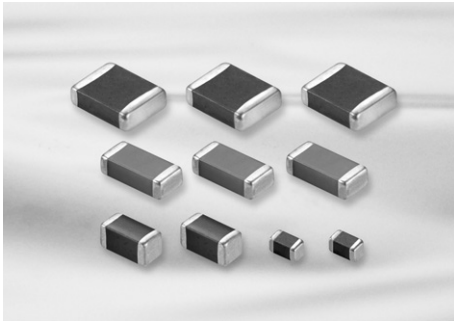
Product Lineup (General Capacitors-Y5V)

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

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

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

High Capacitance Capacitors



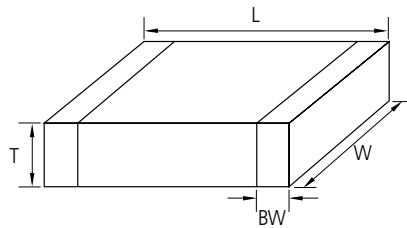
Feature

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

Application

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

Structure and Dimensions



Size Code	EIA Code	Dimension(mm)				
		L	W	T	Thickness Code	BW
05	0402	1.00 ± 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	
32	1210	3.20 ± 0.20	1.60 ± 0.20	1.60 ± 0.20	H	0.60 ± 0.30
				0.85 ± 0.10	C	
				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	
42	1808	3.20 ± 0.40	2.50 ± 0.30	2.50 ± 0.30	v	0.80 ± 0.30
				4.50 ± 0.40	I	
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

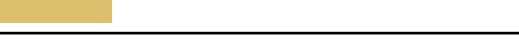
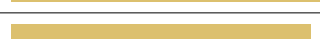
Reliability Test Condition

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)

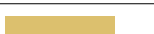
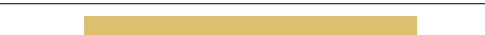
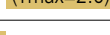
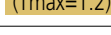
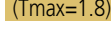
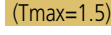
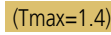
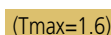
Size(mm)	Vr(V)	Capacitance (uF)									
		0.1	0.22	0.47	1	2.2	4.7	10	22	47	100
0402(1005)	4										
	6.3										
	10										
0603(1608)	4										
	6.3										
	10										
	16										
	25										
0805(2012)	4										
	6.3										
	10										
	16										
	25										
1206(3216)	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	0.22 μF	6.3	±10%	0.55
2	CL05A224KR5NNN □		0.22 μF	4	±10%	0.55
3	CL05A224KA5NNN □		0.22 μF	25	±10%	0.55
4	CL05A224KO5NNN □		0.22 μF	16	±10%	0.55
5	CL05A224KP5NNN □		0.22 μF	10	±10%	0.55
6	CL05A334KA5NNN □		0.33 μF	25	±10%	0.55
7	CL05A334KQ5NNN □		0.33 μF	6.3	±10%	0.55
8	CL05A334KR5NNN □		0.33 μF	4	±10%	0.55
9	CL05A474KA5NNN □		0.47 μF	25	±10%	0.55
10	CL05A474KO5NNN □		0.47 μF	16	±10%	0.55
11	CL05A474KP5NNN □		0.47 μF	10	±10%	0.55
12	CL05A474KQ5NNN □		0.47 μF	6.3	±10%	0.55
13	CL05A474KR5NNN □		0.47 μF	4	±10%	0.55
14	CL05A105KA5NQN □		1 μF	25	±10%	0.60
15	CL05A105KO5NNN □		1 μF	16	±10%	0.55
16	CL05A105KO3LQN □		1 μF	16	±10%	0.33
17	CL05A105KP5NNN □		1 μF	10	±10%	0.55
18	CL05A105KP3LNN □		1 μF	10	±10%	0.33
19	CL05A105KQ5NNN □		1 μF	6.3	±10%	0.55
20	CL05A105KQ3LNN □		1 μF	6.3	±10%	0.33
21	CL05A105KR5NNN □		1 μF	4	±10%	0.55
22	CL05A105KR3LNN □		1 μF	4	±10%	0.33
23	CL05A225KO5NQN □		2.2 μF	16	±10%	0.60
24	CL05A225MP5NSN □		2.2 μF	10	±20%	0.57
25	CL05A225KP3LRN □		2.2 μF	10	±10%	0.33
26	CL05A225MQ5NNN □		2.2 μF	6.3	±20%	0.55
27	CL05A225KQ3LRN □		2.2 μF	6.3	±10%	0.33
28	CL05A225MR5NNN □		2.2 μF	4	±20%	0.55
29	CL05A225KR3LRN □		2.2 μF	4	±10%	0.33
30	CL05A475MP5NRN □		4.7 μF	10	±20%	0.65
31	CL05A475MQ5NRN □		4.7 μF	6.3	±20%	0.65
32	CL05A475MR5NRN □		4.7 μF	4	±20%	0.65
33	CL05A106MQ5NUN □		10 μF	6.3	±20%	0.70
34	CL05A106MR5NRN □		10 μF	4	±20%	0.65
1	CL10A474KB8NNN □	1.60 × 0.80	0.47 μF	50	±10%	0.90
2	CL10A474KA8NNN □		0.47 μF	25	±10%	0.90
3	CL10A474KP8NNN □		0.47 μF	10	±10%	0.90
4	CL10A474KQ8NNN □		0.47 μF	6.3	±10%	0.90
5	CL10A474KR8NNN □		0.47 μF	4	±10%	0.90
6	CL10A105KB8NNN □		1 μF	50	±10%	0.90
7	CL10A105KA85NN □		1 μF	25	±10%	0.55
8	CL10A105KA8NNN □		1 μF	25	±10%	0.90
9	CL10A105KO8NNN □		1 μF	16	±10%	0.90
10	CL10A105KO5LNN □		1 μF	16	±10%	0.55
11	CL10A105KP8NNN □		1 μF	10	±10%	0.90
12	CL10A105KP5LNN □		1 μF	10	±10%	0.55
13	CL10A105KQ8NNN □		1 μF	6.3	±10%	0.90
14	CL10A105KQ5LNN □		1 μF	6.3	±10%	0.55

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

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

Product Lineup (High Capacitance-X5R)

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

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

Product Lineup (High Capacitance-X5R)

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

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

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

Product Lineup (High Capacitance-X5R)

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

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

Product Lineup (High Capacitance-X6S)

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

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

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

Product Lineup (High Capacitance -X7R)

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

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

Product Lineup (High Capacitance -X7R)

	Part Number	Size L × W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max. (mm)
1	CL05B224KO5NNN □	1.00 × 0.50	0.22 μ F	16	±10%	0.55
2	CL05B224KP5NNN □		0.22 μ F	10	±10%	0.55
3	CL05B224KQ5NNN □		0.22 μ F	6.3	±10%	0.55
1	CL10B474KA8NNN □	1.60 × 0.80	0.47 μ F	25	±10%	0.90
2	CL10B474KO8NNN □		0.47 μ F	16	±10%	0.90
3	CL10B474KP8NNN □		0.47 μ F	10	±10%	0.90
4	CL10B474KQ8NNN □		0.47 μ F	6.3	±10%	0.90
5	CL10B105KA8NNN □		1 μ F	25	±10%	0.90
6	CL10B105KO8NNN □		1 μ F	16	±10%	0.90
7	CL10B105KP8NNN □		1 μ F	10	±10%	0.90
8	CL10B105KQ8NNN □		1 μ F	6.3	±10%	0.90
9	CL10B225KP8NNN □		2.2 μ F	10	±10%	0.90
10	CL10B225KQ8NNN □		2.2 μ F	6.3	±10%	0.90
1	CL21B105KBNNN □	2.00 × 1.25	1 μ F	50	±10%	1.35
2	CL21B105KLNNN □		1 μ F	35	±10%	1.35
3	CL21B105KAFNNN □		1 μ F	25	±10%	1.35
4	CL21B105KOFNNN □		1 μ F	16	±10%	1.35
5	CL21B105KPFNNN □		1 μ F	10	±10%	1.35
6	CL21B105KQFNNN □		1 μ F	6.3	±10%	1.35
7	CL21B225KAFNNN □		2.2 μ F	25	±10%	1.35
8	CL21B225KOFNNN □		2.2 μ F	16	±10%	1.35
9	CL21B225KPFNNN □		2.2 μ F	10	±10%	1.35
10	CL21B225KQFNNN □		2.2 μ F	6.3	±10%	1.35
11	CL21B475KOFNNN □		4.7 μ F	16	±10%	1.35
12	CL21B475KPFNNN □		4.7 μ F	10	±10%	1.35
13	CL21B475KQNNN □		4.7 μ F	6.3	±10%	1.35
14	CL21B106KOQNNN □		10 μ F	16	±10%	1.40
15	CL21B106KPQNNN □		10 μ F	10	±10%	1.35
16	CL21B106KQQNNN □		10 μ F	6.3	±10%	1.35
1	CL31B475KBHNNN □	3.20 × 1.60	4.7 μ F	50	±10%	1.80
2	CL31B475KLHNNN □		4.7 μ F	35	±10%	1.80
3	CL31B475KAHNNN □		4.7 μ F	25	±10%	1.80
4	CL31B475KOHNNN □		4.7 μ F	16	±10%	1.80
5	CL31B475KPHNNN □		4.7 μ F	10	±10%	1.80
6	CL31B475KQHNNN □		4.7 μ F	6.3	±10%	1.80
7	CL31B106KLHNNN □		10 μ F	35	±10%	1.80
8	CL31B106KAHNNN □		10 μ F	25	±10%	1.80
9	CL31B106KOHNNN □		10 μ F	16	±10%	1.80
10	CL31B106KPHNNN □		10 μ F	10	±10%	1.80
11	CL31B106KQHNNN □		10 μ F	6.3	±10%	1.80
1	CL32B106KBNNN □	3.20 × 2.50	10 μ F	50	±10%	2.70
2	CL32B106KAJNNN □		10 μ F	25	±10%	2.70
3	CL32B106KOJNNN □		10 μ F	16	±10%	2.70
4	CL32B106KPINNN □		10 μ F	10	±10%	2.70
5	CL32B106KQJNNN □		10 μ F	6.3	±10%	2.70
6	CL32B226KAJNNN □		22 μ F	25	±10%	2.70
7	CL32B226KOJNNN □		22 μ F	16	±10%	2.70
8	CL32B226KPJNNN □		22 μ F	10	±10%	2.70
9	CL32B226KQJNNN □		22 μ F	6.3	±10%	2.70
10	CL32B476MQJNNN □		47 μ F	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

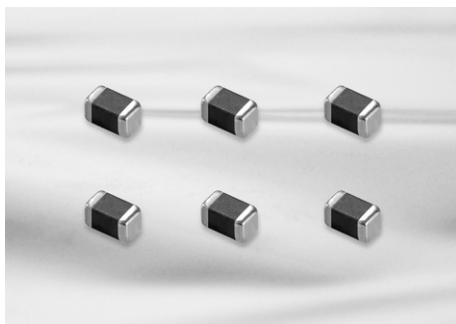
Application Manual for Surface Mounting

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



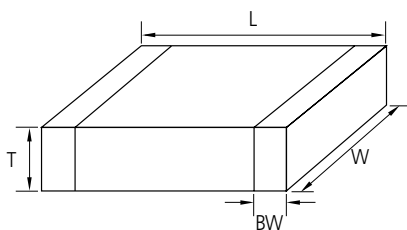
Feature

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

Application

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

Structure and Dimensions



Code	EIA Code	Dimension(mm)			
		L	W	T	BW
02	01005	0.4 ± 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

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

Super Small Size Capacitance Table (C0G)

Size(mm)	Tmax (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								
		6.3								
		10								
		16								
		25								
X7R	01005(0402)	10								
	0201(0603)	10								
		16								
Y5V	0201(0603)	6.3								

Product Lineup (Super Small Size Capacitors -C0G)

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

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

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

Product Lineup (Super Small Size Capacitors -X7R)

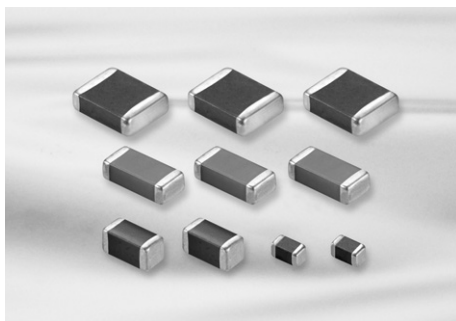
	Part Number	Size L×W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max. (mm)
1	CL02B101KP2NNN □	0.40×0.20	100pF	10	±10%	0.22
2	CL02B151KP2NNN □		150pF	10	±10%	0.22
3	CL02B221KP2NNN □		220pF	10	±10%	0.22
4	CL02B331KP2NNN □		330pF	10	±10%	0.22
5	CL02B471KP2NNN □		470pF	10	±10%	0.22
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 □		1nF	6.3	±10%	0.22
7	CL02A152KQ2NNN □		1.5nF	6.3	±10%	0.22
8	CL02A222KQ2NNN □		2.2nF	6.3	±10%	0.22
9	CL02A332KQ2NNN □		3.2nF	6.3	±10%	0.22
10	CL02A472KQ2NNN □		4.7nF	6.3	±10%	0.22
11	CL02A682KQ2NNN □		6.8nF	6.3	±10%	0.22
12	CL02A103KQ2NNN □		10nF	6.3	±10%	0.22
13	CL02A104KQ2NNN □		100nF	6.3	±10%	0.22
1	CL03A103KP3NNN □	0.60×0.30	10nF	10	±10%	0.33
2	CL03A223KQ3NNN □		22nF	6.3	±10%	0.33
3	CL03A473KQ3NNN □		47nF	6.3	±10%	0.33
4	CL03A104MA3NNN □		100nF	25	±20%	0.33
5	CL03A104KO3NNN □		100nF	16	±10%	0.33
6	CL03A104KP3NNN □		100nF	10	±10%	0.33
7	CL03A104KQ3NNN □		100nF	6.3	±10%	0.33
8	CL03A224KQ3NNN □		220nF	6.3	±10%	0.33
9	CL03A224KP3NNN □		200nF	10	±10%	0.33
10	CL03A105MQ3CSN □		1μF	6.3	±20%	0.35

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

Medium-High Voltage Capacitors



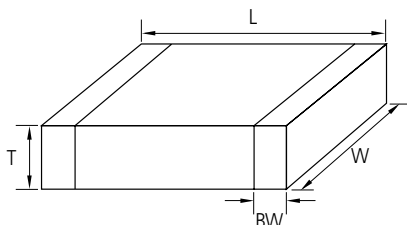
Feature

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

Application

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

Structure and Dimensions



Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

Code	EIA Code	Dimension(mm)			
		L	W	T	BW
10	0603	1.6 ± 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

Medium-High Voltage Capacitors Table (C0G)

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

Medium-High Voltage Capacitors Table (C0G)

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

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

Medium-High Voltage Capacitors Table (X7R)

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

Part Numbering
System

General
Capacitors

High Capacitance
Capacitors

Super Small Size
Capacitors

Medium-High
Voltage Capacitors

Array Type
Capacitors

Low ESL
Capacitors

Reliability Test
Condition

Premium Capacitors
for Automotive
Applications

Packaging
Specification

Application Manual
for Surface Mounting

Product Lineup (Medium-High Voltage Capacitors-C0G)

	Part Number	Size L×W (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	CL21C331JCANN □	2.00 × 1.25	330pF	100	±5%	0.75
27	CL21C471JCCNN □		470pF	100	±5%	0.95
28	CL21C561JCCNN □		560pF	100	±5%	0.95
29	CL21C681JCCNN □		680pF	100	±5%	0.95
30	CL21C102JCFNN □		1nF	100	±5%	1.35
31	CL21C102JDFNN □		1nF	200	±5%	1.35
32	CL21C272JDFNN □		2.7nF	200	±5%	1.35
33	CL21C272JEFNN □		2.7nF	250	±5%	1.35
34	CL21C472JCFNN □		4.7nF	100	±5%	1.35
1	CL31C150JGFNN □	3.20 × 1.60	15pF	500	±5%	1.40
2	CL31C180JGFNN □		18pF	500	±5%	1.40
3	CL31C220JGFNN □		22pF	500	±5%	1.40
4	CL31C220JHNN □		22pF	2000	±5%	1.80
5	CL31C270JGFNN □		27pF	500	±5%	1.40
6	CL31C330JGFNN □		33pF	500	±5%	1.40
7	CL31C390JGFNN □		39pF	500	±5%	1.40
8	CL31C470JHFNN □		47pF	630	±5%	1.40
9	CL31C470JGFNN □		47pF	500	±5%	1.40
10	CL31C470JHNN □		47pF	2000	±5%	1.80
11	CL31C560JGFNN □		56pF	500	±5%	1.40
12	CL31C680JCCNN □		68pF	100	±5%	1.00
13	CL31C680JHFNN □		68pF	630	±5%	1.40
14	CL31C680JGFNN □		68pF	500	±5%	1.40
15	CL31C680JIFNN □		68pF	1000	±5%	1.40
16	CL31C820JGFNCN □		82pF	500	±5%	1.40
17	CL31C101JGFNN □		100pF	500	±5%	1.40
18	CL31C101JHFNN □		100pF	630	±5%	1.40
19	CL31C101JIFNN □		100pF	1000	±5%	1.40
20	CL31C101JHNN □		100pF	2000	±5%	1.80
21	CL31C121JGFNN □		120pF	500	±5%	1.40
22	CL31C151JGFNN □		150pF	500	±5%	1.40
23	CL31C181JGFNN □		180pF	500	±5%	1.40
24	CL31C221JGFNN □		220pF	500	±5%	1.40
25	CL31C271JGFNN □		270pF	500	±5%	1.40
26	CL31C271JCCNN □		270pF	100	±5%	1.00
27	CL31C331JGFNN □		330pF	500	±5%	1.40
28	CL31C331JHNN □		330pF	1000	±5%	1.80
29	CL31C391JCCNN □		390pF	100	±5%	1.00
30	CL31C471JGFNN □		470pF	500	±5%	1.40
31	CL31C561JCCNN □		560pF	100	±5%	1.00
32	CL31C561JGFNN □		560pF	500	±5%	1.40
33	CL31C681JGFNN □		680pF	500	±5%	1.80
34	CL31C102JCCNN □		1nF	100	±5%	1.00
35	CL31C102JHNN □		1nF	500	±5%	1.80
36	CL31C152JCCNN □		1.5nF	100	±5%	1.00
37	CL31C222JCCNN □		2.2nF	100	±5%	1.00
38	CL31C332JHNN □		3.3nF	500	±5%	1.80
39	CL31C332JHNN □		3.3nF	630	±5%	1.80
40	CL31C392JCHNN □		3.9nF	100	±5%	1.80
41	CL31C822JDHNN □		8.2nF	200	±5%	1.80

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

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

Product Lineup (Medium-High Voltage Capacitors-C0G)

	Part Number	Size L×W (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	CL32C821JJJNNN □		820pF	1000	±5%	2.70
4	CL32C103JGJNNN □		10nF	500	±5%	2.70
5	CL32C103JHJNNN □		10nF	630	±5%	2.70
6	CL32C273JDJNNN □		27nF	200	±5%	2.70
7	CL32C273JEJNNN □		27nF	250	±5%	2.70
8	CL32C563JCJNNN □		56nF	100	±5%	2.70
1	CL42C100JFNNN □	4.50×2.00	10pF	3000	±5%	1.45
2	CL42C151JKJNNN □		150pF	3000	±5%	2.20
3	CL42C221JJHNNN □		220pF	2000	±5%	1.80
1	CL43C391JKJNNN □	4.50×3.20	390pF	2000	±5%	2.70
2	CL43C102JHNNN □		1.0nF	1000	±5%	1.80
3	CL43C122JHNNN □		1.2nF	1000	±5%	2.20
4	CL43C182JHNNN □		1.8nF	1000	±5%	2.70
5	CL43C182JJJNNN □		1.8nF	2000	±5%	2.70
6	CL43C223JGJNNN □		22nF	500	±5%	2.70
7	CL43C223JHJNNN □		22nF	630	±5%	2.70
8	CL43C473JDJNNN □		47nF	200	±5%	2.70
9	CL43C473JEJNNN □		47nF	250	±5%	2.70
10	CL43C563JCJNNN □		56nF	100	±5%	2.70
1	CL55C102JJJNNN □	5.70×5.00	1nF	2000	±5%	2.70
2	CL55C102JKJNNN □		1nF	3000	±5%	2.70
3	CL55C362JJJNNN □		3.3nF	1000	±5%	2.70
4	CL55C223JGJNNN □		22nF	500	±5%	2.70
5	CL55C223JHJNNN □		22nF	630	±5%	2.70
6	CL55C473JDJNNN □		47nF	200	±5%	2.70
7	CL55C473JEJNNN □		47nF	250	±5%	2.70
8	CL55C683JCJNNN □		68nF	100	±5%	2.70

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

Product Lineup (Medium-High Voltage Capacitors-X7R)

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

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

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

Product Lineup (Medium-High Voltage Capacitors-X7R)

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

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

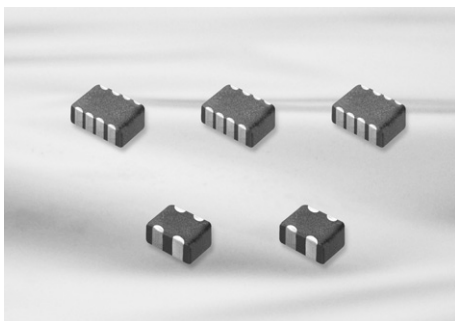
Product Lineup (Medium-High Voltage Capacitors-X7R)

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

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

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

Array Type Capacitors



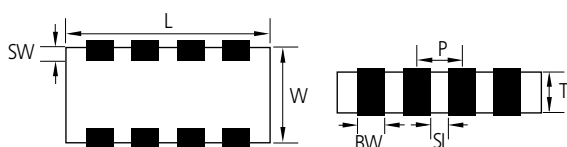
Feature

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

Application

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

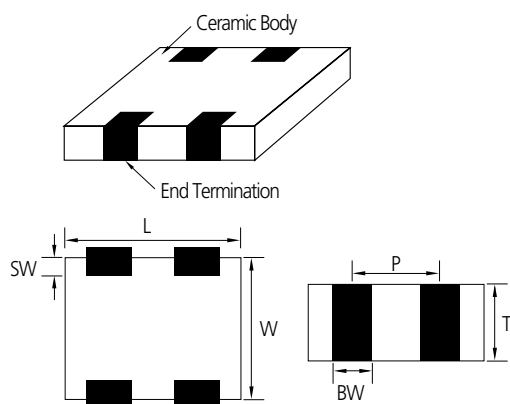
Structure and Dimensions



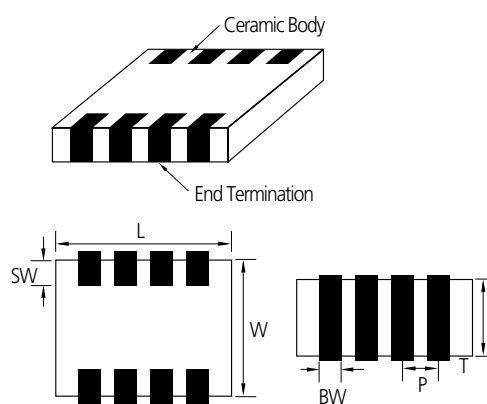
Code	EIA Code	Dimension(mm)					
		L	W	T	BW	SW	P
A	0906	0.90 ± 0.05	0.60 ± 0.05	0.45 ± 0.05	0.25 ± 0.05	0.15 ± 0.1	0.45 ± 0.05
A	0504	1.37 ± 0.15	1.0 ± 0.15	0.35 ± 0.05 0.50 ± 0.05 0.60 ± 0.06 0.80 ± 0.08	0.36 ± 0.1	0.2 ± 0.1	0.64 ± 0.1
A	0805	2.0 ± 0.15	1.25 ± 0.15	0.85 ± 0.1	0.5 ± 0.2	0.25 ± 0.15	1.0 ± 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)

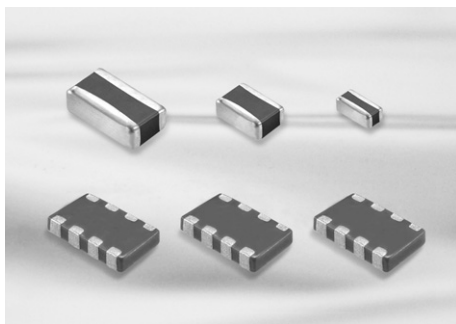
TC	Size(mm)	Type	Vr(V)	Tmax (mm)	Capacitance (pF)									
					10	22	27	47	100	470				
C0G	0504(1410)	2-element	25	0.88										
	1206(3216)	4-element	50	1.0										
TC	Size(mm)	Type	Vr(V)	Tmax (mm)	Capacitance (nF)									
					1	2.2	4.7	10	22	47	100	220	470	1000
X5R	0302(0906)	2-element	6.3	0.5										
			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
SystemGeneral
CapacitorsHigh Capacitance
CapacitorsSuper Small Size
CapacitorsMedium-High
Voltage CapacitorsArray Type
CapacitorsLow ESL
CapacitorsReliability Test
ConditionPremium Capacitors
for Automotive
ApplicationsPackaging
SpecificationApplication Manual
for Surface Mounting

Product Lineup (Array Type Capacitors)

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

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



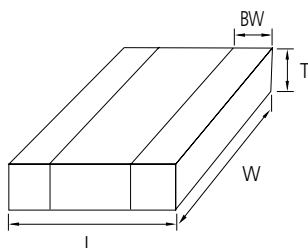
Feature

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

Application

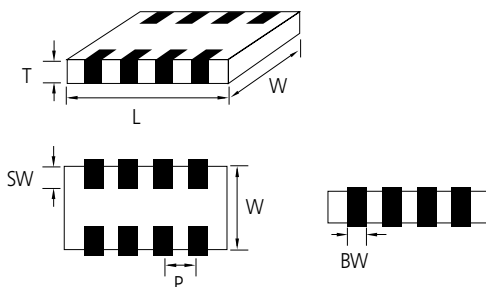
- High Speed Microprocessor
- High Frequency Digital Equipment
- ※ For using special purpose like Military, Medical, Aviation, Automobile device should be following a special specification.

LICC(Low Inductance chip capacitors)



Code	EIA Code	Dimension(mm)			
		L	W	T	BW
L5	0204	0.52 ± 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
SystemGeneral
CapacitorsHigh Capacitance
CapacitorsSuper Small Size
CapacitorsMedium-High
Voltage CapacitorsArray Type
CapacitorsLow ESL
CapacitorsReliability Test
ConditionPremium Capacitors
for Automotive
ApplicationsPackaging
SpecificationApplication Manual
for Surface Mounting

Low ESL Capacitors Table (LICC)

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

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

Low ESL Capacitors Table (SLIC)

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

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

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

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

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

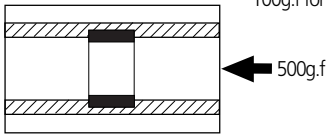
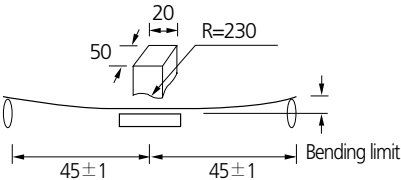
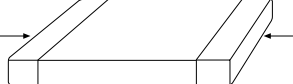
Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

Reliability Test Condition

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

No	Item		Performance	Test Condition																
6	Temperature Characteristics of Capacitance	CLASS I	<table><tr><th>Characteristic</th><th>Temp.Coefficient(PPM/°C)</th></tr><tr><td>C</td><td>0 ± 30</td></tr></table>	Characteristic	Temp.Coefficient(PPM/°C)	C	0 ± 30	Capacitance shall be measured by the steps shown in the following table <table><tr><th>Step</th><th>Temperature(°C)</th></tr><tr><td>1</td><td>25 ± 2</td></tr><tr><td>2</td><td>Min. Operating Temp. ± 2</td></tr><tr><td>3</td><td>25 ± 2</td></tr><tr><td>4</td><td>Max. Operating Temp. ± 2</td></tr><tr><td>5</td><td>25 ± 2</td></tr></table> (1) CLASS I Temperature Coefficient shall be calculated from the formula as below Temp. Coefficient= $\frac{C2 - C1}{C1 \times \Delta T} \times 10^6$ [ppm/°C] C1: Capacitance at step 3 C2: Capacitance at 125°C ΔT: 100°C(=125°C-25°C) (2) CLASS II Capacitance Change shall be calculated from the formula as below $\Delta C = \frac{C2 - C1}{C1} \times 100(\%)$ C1: Capacitance at step 3 C2: Capacitance at step 2 or 4	Step	Temperature(°C)	1	25 ± 2	2	Min. Operating Temp. ± 2	3	25 ± 2	4	Max. Operating Temp. ± 2	5	25 ± 2
		Characteristic	Temp.Coefficient(PPM/°C)																	
C	0 ± 30																			
Step	Temperature(°C)																			
1	25 ± 2																			
2	Min. Operating Temp. ± 2																			
3	25 ± 2																			
4	Max. Operating Temp. ± 2																			
5	25 ± 2																			
CLASS II	<table><tr><th>Characteristic</th><th>Capacitance Change(%) with No bias</th></tr><tr><td>A(X5R) / B(X7R)</td><td>± 15%</td></tr><tr><td>X(X6S), Y(X7S)</td><td>± 22%</td></tr><tr><td>F(Y5V)</td><td>+22%~-82%</td></tr></table>	Characteristic	Capacitance Change(%) with No bias	A(X5R) / B(X7R)	± 15%	X(X6S), Y(X7S)	± 22%	F(Y5V)	+22%~-82%											
Characteristic	Capacitance Change(%) with No bias																			
A(X5R) / B(X7R)	± 15%																			
X(X6S), Y(X7S)	± 22%																			
F(Y5V)	+22%~-82%																			
7	Adhesive Strength of Termination		No indication of peeling shall occur on the terminal electrode	Apply 500g.f* pressure for 10 ± 1 sec. *200g.f for 0201 *100g.f for 01005 																
8	Appearance	No indication of peeling shall occur		• Bending Limit: 1mm • Test Speed: 1.0mm/sec. • Keep the test board at the limit point in 5 sec. • Then Measure Capacitance 																
	Bending Strength Capacitance	<table><tr><th>Characteristic</th><th>Capacitance Change</th></tr><tr><td>CLASS I</td><td>± 5% or ± 0.5 pF whichever is larger</td></tr><tr><td rowspan="2">CLASS II</td><td>A(X5R), B(X7R), X(X6S), Y(X7S)</td><td>± 12.5%</td></tr><tr><td>F(Y5V)</td><td>± 30%</td></tr></table>			Characteristic	Capacitance Change	CLASS I	± 5% or ± 0.5 pF whichever is larger	CLASS II	A(X5R), B(X7R), X(X6S), Y(X7S)	± 12.5%	F(Y5V)	± 30%							
Characteristic		Capacitance Change																		
CLASS I		± 5% or ± 0.5 pF whichever is larger																		
CLASS II	A(X5R), B(X7R), X(X6S), Y(X7S)	± 12.5%																		
	F(Y5V)	± 30%																		
9	Solderability		More than 75% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve 	<table><tr><td>Solder</td><td>Sn-3Ag-0.5Cu</td></tr><tr><td>Solder Temp.</td><td>245 ± 5°C</td></tr><tr><td>Flux</td><td>RMA Type</td></tr><tr><td>Dip time</td><td>3 ± 0.3 sec.</td></tr><tr><td>Pre-heating</td><td>at 80~120°C for 10~30 sec.</td></tr></table>	Solder	Sn-3Ag-0.5Cu	Solder Temp.	245 ± 5°C	Flux	RMA Type	Dip time	3 ± 0.3 sec.	Pre-heating	at 80~120°C for 10~30 sec.						
Solder	Sn-3Ag-0.5Cu																			
Solder Temp.	245 ± 5°C																			
Flux	RMA Type																			
Dip time	3 ± 0.3 sec.																			
Pre-heating	at 80~120°C for 10~30 sec.																			
10	Appearance	No mechanical damage shall occur		Solder temperature: 270 ± 5°C DIP TIME: 10 ± 1 sec. Each termination shall be fully immersed and preheated as below: <table><tr><th>Step</th><th>Temperature(°C)</th><th>Time (sec.)</th></tr><tr><td>1</td><td>80~100</td><td>60</td></tr><tr><td>2</td><td>150~180</td><td>60</td></tr></table>	Step	Temperature(°C)	Time (sec.)	1	80~100	60	2	150~180	60							
	Step	Temperature(°C)	Time (sec.)																	
	1	80~100	60																	
	2	150~180	60																	
	Capacitance	<table><tr><th>Characteristic</th><th>Capacitance Change</th></tr><tr><td>CLASS I</td><td>± 2.5% or ± 0.25 pF whichever is larger</td></tr><tr><td rowspan="2">CLASS II</td><td>A(X5R), B(X7R)</td><td>± 7.5%</td></tr><tr><td>X(X6S), Y(X7S)</td><td></td></tr><tr><td>F(Y5V)</td><td>± 20%</td></tr></table>		Characteristic	Capacitance Change	CLASS I	± 2.5% or ± 0.25 pF whichever is larger	CLASS II	A(X5R), B(X7R)	± 7.5%	X(X6S), Y(X7S)		F(Y5V)	± 20%						
		Characteristic	Capacitance Change																	
		CLASS I	± 2.5% or ± 0.25 pF whichever is larger																	
	CLASS II	A(X5R), B(X7R)	± 7.5%																	
X(X6S), Y(X7S)																				
F(Y5V)	± 20%																			
Q (CLASS I)	Within the specified initial value		Leave the capacitor in ambient condition for specified time* before measurement *24 ± 2 hours(CLASS I) 24 ± 2 hours(CLASS II)																	
Tanδ (CLASS II)	Within the specified initial value																			
Insulation resistance	Within the specified initial value																			
Withstanding voltage	Within the specified initial value																			

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

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

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

Note1. Initial Measurement For Class II

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

Note2. Latter Measurement

1. CLASS I

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

2. CLASS II

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

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

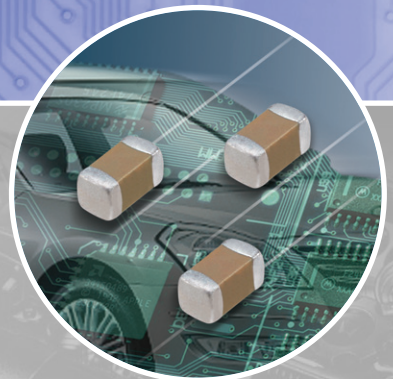
Note4. Camera Strobe Circuit Capacitors Should be Following a Special Reliability Test Condition.
Please check with our sales representatives or product engineers.

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

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



Premium Capacitors for Automotive Applications



SAMSUNG
ELECTRO-MECHANICS



Premium Capacitors for Automotive Applications

Part Numbering System (Automotive Capacitors)

	CL	10	B	104	K	B	8	5	P	N	C
	1	2	3	4	5	6	7	8	9	10	11
1. SERIES CODE _____ CL=Multi layer Ceramic Capacitors											
2. SIZE CODE — inch (mm) _____ 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 = 0.50mm 6= 0.60mm 8 = 0.80mm C = 0.85mm P = 1.15mm F = 1.25mm H = 1.60mm J = 2.50mm ※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 O = Cardboard Tape, 10" Reel E = Embossed Type, 7" Reel P = Bulk Case D = Cardboard Tape, 13" Reel(10,000ea) F = Embossed Type, 13" Reel C = Cardboard Tape, 7" Reel L = Cardboard Tape, 13" Reel(15,000ea) S = Embossed Type, 10" Reel											

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

★
Class I

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

Class II

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

★★
Capacitance Tolerance

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

★E-24 series is also available

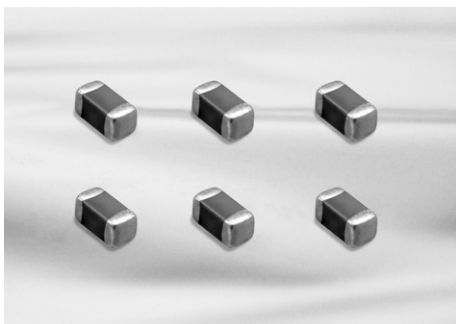
Series	Capacitance Step											
E-3	1.0				2.2				4.7			
E-6	1.0		1.5		2.2		3.3		4.7		6.8	
E-12	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6	6.8	8.2
E-24	1.0	1.1	1.2	1.3	2.2	2.4	2.7	3.0	4.7	5.1	5.6	6.2
	1.5	1.6	1.8	2.0	3.3	3.6	3.9	4.3	6.8	7.5	8.2	9.1

★★★

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

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

Part Numbering
SystemGeneral
CapacitorsHigh Capacitance
CapacitorsSuper Small Size
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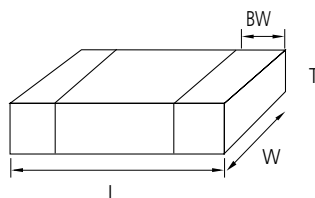
Feature

- 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.
- COG dielectric components contain BME and copper terminations with a Ni/Sn plated overcoat.
- X7R dielectric components have BME and soft terminations with a Ni/Sn plated overcoat.

Application

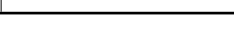
- Automotive Electronic Equipment
(Powertrain, Safety, Body & Chassis, Convenience, Infotainment)

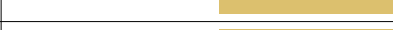
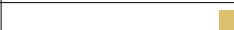
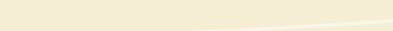
Structure and Dimensions



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

Automotive Capacitors Table (C0G, X7R)

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

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

Part Numbering
System

General
Capacitors

High Capacitance
Capacitors

Super Small Size
Capacitors

Medium-High
Voltage Capacitors

Array Type
Capacitors

Low ESL
Capacitors

Reliability Test
Condition

Premium Capacitors
for Automotive
Applications

Packaging
Specification

Application Manual
for Surface Mounting

Product Lineup (Automotive Capacitors_COG)

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

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Part Numbering System

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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

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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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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

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Product Lineup (Automotive Capacitors_X7R)

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

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

Part Numbering 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 (Automotive Capacitors)

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

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

No	Item		Performance		Test Condition									
6	Biased Humidity	Appearance		No abnormal exterior appearance		1000hrs 85 °C/85%RH, Rated Voltate and 1.3~1.5V, (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 MΩ or 25 MΩ × μF (Whichever is Smaller)											
7	High Temperature Operating Life	Appearance		No abnormal exterior appearance		1000hrs @ TA=125 °C, 200% Rated Voltage, 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 MΩ or 50 MΩ × μF (Whichever is smaller)											
8	External Visual		No abnormal exterior appearance		Microscope (x10)									
9	Physical Dimensions		Within the specified dimensions		Using the calipers									
10	Mechanical Shock	Appearance		No abnormal exterior appearance		Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks) <table><tr><td>Peakvalue</td><td>Duration</td><td>Wave</td></tr><tr><td>1,500G</td><td>0.5ms</td><td>Half sine</td></tr></table>			Peakvalue	Duration	Wave	1,500G	0.5ms	Half sine
		Peakvalue	Duration	Wave										
		1,500G	0.5ms	Half sine										
		Capacitance Change	CLASS I	Within ± 2.5% or 0.25pF, (Whichever is larger)										
			CLASS II	Within ± 10%										
Q	CLASS I	Capacitance ≥ 30pF : Q ≥ 1,000 < 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 MΩ or 500 MΩ × μF (Whichever is smaller)											

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

Part Numbering
System

General
Capacitors

High Capacitance
Capacitors

Super Small Size
Capacitors

Medium-High
Voltage Capacitors

Array Type
Capacitors

Low ESL
Capacitors

Reliability Test
Condition

Premium Capacitors
for Automotive
Applications

Packaging
Specification

Application Manual
for Surface Mounting

No	Item		Performance	Test Condition
11	Vibration	Appearance	No abnormal exterior appearance	5g's for 20min., 12cycles each of 3 orientations, Use 8" x5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2000 Hz.
		Capacitance Change	CLASS I Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)	
			CLASS II Within $\pm 10\%$	
		Q	CLASS I Capacitance $\geq 30\text{pF}$: $Q \geq 1,000$ $< 30\text{pF}$: $Q \geq 400 + 20 \times C$ (C : Capacitance)	
		Tan δ	CLASS II Rated Voltage $\geq 25\text{V}$: 0.025 max $\geq 16\text{V}$: 0.035 max $\geq 10\text{V}$: 0.05max	
12	Resistance to Solder Heat	IR	More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)	Solder pot : $260 \pm 5^\circ\text{C}$, $10 \pm 1\text{sec}$.
		Appearance	No abnormal exterior appearance	
		Capacitance Change	CLASS I Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)	
			CLASS II Within $\pm 10\%$	
		Q	CLASS I Capacitance $\geq 30\text{pF}$: $Q \geq 1,000$ $< 30\text{pF}$: $Q \geq 400 + 20 \times C$ (C : Capacitance)	
13	Thermal Shock	Tan δ	CLASS II Rated Voltage $\geq 25\text{V}$: 0.025 max $\geq 16\text{V}$: 0.035 max $\geq 10\text{V}$: 0.05max	$-55^\circ\text{C}/+125^\circ\text{C}$ Note: Number of cycles required - 300, Maximum transfer time-20 sec, Dwell time-15min. Air-Air
		IR	More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)	
		Appearance	No abnormal exterior appearance	
		Capacitance Change	CLASS I Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)	
			CLASS II Within $\pm 10\%$	
14	ESD	Q	CLASS I Capacitance $\geq 30\text{pF}$: $Q \geq 1,000$ $< 30\text{pF}$: $Q \geq 400 + 20 \times C$ (C : Capacitance)	AEC-Q200-002
		Tan δ	CLASS II Rated Voltage $\geq 25\text{V}$: 0.025 max $\geq 16\text{V}$: 0.035 max $\geq 10\text{V}$: 0.05max	
		IR	More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)	
		Capacitance Change	CLASS I Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)	
			CLASS II Within $\pm 10\%$	
15	Humidity	Appearance	No abnormal exterior appearance	85%RH for 20min., 12cycles each of 3 orientations, Use 8" x5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2000 Hz.
		Capacitance Change	CLASS I Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)	
			CLASS II Within $\pm 10\%$	
		Q	CLASS I Capacitance $\geq 30\text{pF}$: $Q \geq 1,000$ $< 30\text{pF}$: $Q \geq 400 + 20 \times C$ (C : Capacitance)	
		Tan δ	CLASS II Rated Voltage $\geq 25\text{V}$: 0.025 max $\geq 16\text{V}$: 0.035 max $\geq 10\text{V}$: 0.05max	
16	Mechanical Shock	IR	More than 10,000 $\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)	Mechanical Shock : 150g, 11ms, 3cycles each of 3 orientations, Use 8" x5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2000 Hz.
		Appearance	No abnormal exterior appearance	
		Capacitance Change	CLASS I Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)	
			CLASS II Within $\pm 10\%$	
		Q	CLASS I Capacitance $\geq 30\text{pF}$: $Q \geq 1,000$ $< 30\text{pF}$: $Q \geq 400 + 20 \times C$ (C : Capacitance)	

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

No	Item			Performance	Test Condition																		
15	Solderability			95% of the terminations is to be soldered evenly and continuously	a) Preheat at 155℃ for 4 hours, Immerse in solder for 5s at 235±5℃ 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																		
16	Electrical Characterization	Capacitance		Within specified tolerance	The Capacitance /D.F. should be measured at 25℃, <table><tr><td>Class</td><td>Capacitance</td><td>Frequency</td><td>Vrms</td></tr><tr><td rowspan="2">Class I</td><td>1000pF ↓</td><td>1 MHz ±10%</td><td>0.5~5Vrms</td></tr><tr><td>1000pF ↑</td><td>1 kHz ±10%</td><td>1.0±0.2Vrms</td></tr><tr><td rowspan="2">Class II</td><td>10 μF ↓</td><td>1 kHz ±10%</td><td>1.0±0.2Vrms</td></tr><tr><td>10 μF ↑</td><td>120 Hz ±20%</td><td>0.5±0.1Vrms</td></tr></table>	Class	Capacitance	Frequency	Vrms	Class I	1000pF ↓	1 MHz ±10%	0.5~5Vrms	1000pF ↑	1 kHz ±10%	1.0±0.2Vrms	Class II	10 μF ↓	1 kHz ±10%	1.0±0.2Vrms	10 μF ↑	120 Hz ±20%	0.5±0.1Vrms
		Class	Capacitance	Frequency		Vrms																	
		Class I	1000pF ↓	1 MHz ±10%		0.5~5Vrms																	
			1000pF ↑	1 kHz ±10%		1.0±0.2Vrms																	
		Class II	10 μF ↓	1 kHz ±10%	1.0±0.2Vrms																		
			10 μF ↑	120 Hz ±20%	0.5±0.1Vrms																		
		Q	CLASS I	Capacitance ≥ 30pF : Q ≥ 1,000 < 30pF : Q ≥ 400 +20×C (C: Capacitance)	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.																		
						Tanδ	CLASS II	Rated Voltage ≥ 25V : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05max															
		IR@25℃	CLASS I	More than 100,000 μΩ or 1,000 μΩ × μF (Whichever is smaller)																			
			CLASS II	More than 10,000 μΩ or 500 μΩ × μF (Whichever is smaller)																			
IR@125℃	CLASS I	More than 10,000 μΩ or 100 μΩ × μF (Whichever is smaller)																					
	CLASS II	More than 1,000 μΩ or 10 μΩ × μF (Whichever is smaller)																					
Dielectric Strength		No dielectric breakdown or mechanical breakdown																					
17	Board Flex	Appearance		Bending to the limit for 5 seconds Limit : Class I - 3mm Class II - 2mm																			
		Capacitance Change	CLASS I			Within ±5.0% or 0.5pF, (Whichever is larger)																	
			CLASS II			Within ±10%																	
18	Terminal Strength(SMD)	Appearance		18N, for 60±1 sec. * 0603(1608) –10N, 0402(1005) –2N																			
		Capacitance Change	CLASS I		Within ±2.5% or 0.25pF, (Whichever is larger)																		
			CLASS II		Within ±10%																		
19	Beam Load			Destruction value should be exceed Chip Length ≤2.5mm a) Chip Thickness > 0.5mm : 20N b) Chip Thickness ≤0.5mm : 8N Chip Length ≥ 3.2mm a) Chip Thickness ≥ 1.25mm : 54.5N b) Chip Thickness < 1.25mm : 15N	Beam speed Chip Length ≤2.5mm, 0.5±0.05mm/sec Chip Length ≥3.2mm, 2.5±0.25mm/sec																		
20	Capacitance Temperature Characteristics	Capacitance Change	CLASS I	0±30 ppm/℃	<table><tr><td>Step</td><td>Temperature(℃)</td><td>Time(min)</td></tr><tr><td>1</td><td>25 ± 2</td><td>1</td></tr><tr><td>2</td><td>Min. Operating Temp. ±2</td><td>15±3</td></tr><tr><td>3</td><td>25 ± 2</td><td>1</td></tr><tr><td>4</td><td>Max. Operating Temp. ±2</td><td>15±3</td></tr><tr><td>5</td><td>25 ± 2</td><td>1</td></tr></table>	Step	Temperature(℃)	Time(min)	1	25 ± 2	1	2	Min. Operating Temp. ±2	15±3	3	25 ± 2	1	4	Max. Operating Temp. ±2	15±3	5	25 ± 2	1
			Step	Temperature(℃)		Time(min)																	
		1	25 ± 2	1																			
		2	Min. Operating Temp. ±2	15±3																			
		3	25 ± 2	1																			
		4	Max. Operating Temp. ±2	15±3																			
5	25 ± 2	1																					
CLASS II	Within ±15%																						
Temperature Coefficient	CLASS I	0±30 ppm/℃																					
	Capacitance Drift	CLASS I	Within ±0.2% or 0.05pF, (Whichever is larger)																				

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

Part Numbering
System

General
Capacitors

High Capacitance
Capacitors

Super Small Size
Capacitors

Medium-High
Voltage Capacitors

Array Type
Capacitors

Low ESL
Capacitors

Reliability Test
Condition

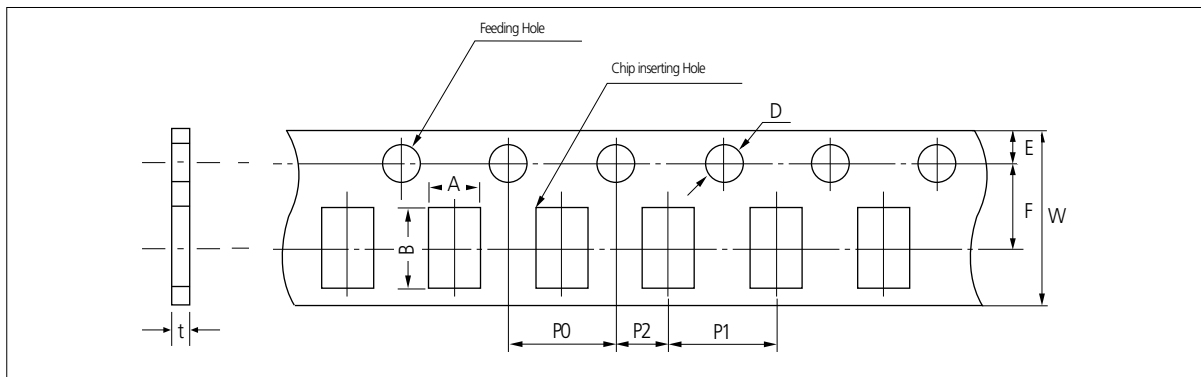
Premium Capacitors
for Automotive
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Packaging
Specification

Application Manual
for Surface Mounting

Packaging Specifications

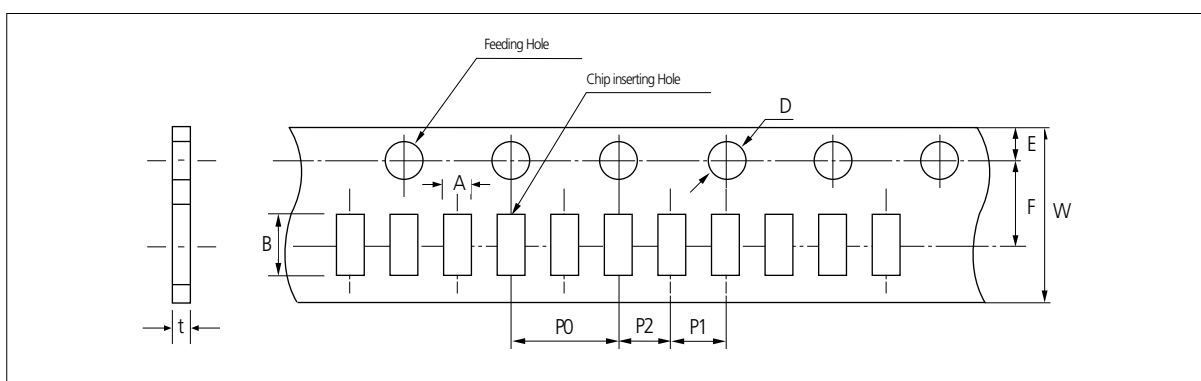
Cardboard Paper Tape(4mm)



Unit: inch(mm)

Symbol		A	B	W	F	E	P1	P2	P0	D	t
Type											
Dimension	0504 (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								

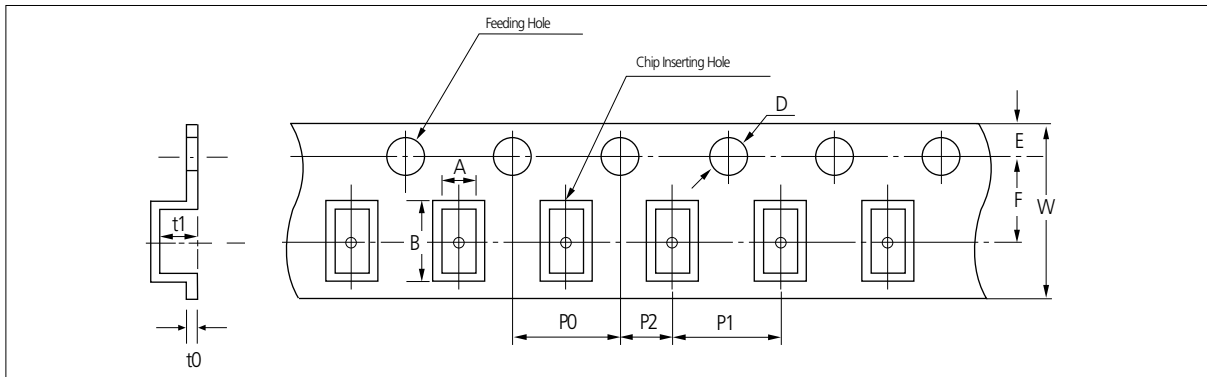
Cardboard Paper Tape(2mm)



Unit: inch(mm)

Symbol		A	B	W	F	E	P1	P2	P0	D	t
Type											
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		A	B	W	F	E	P1	P2	P0	D	t1	t0
Type												
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	12.0 ±0.3	5.60 ±0.05	8.0 ±0.1						
	1808 (4520)	2.3 ±0.2	4.9 ±0.2									
	1812 (4532)	3.6 ±0.2	4.9 ±0.2									
	2220 (5750)	5.5 ±0.2	6.2 ±0.2									

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

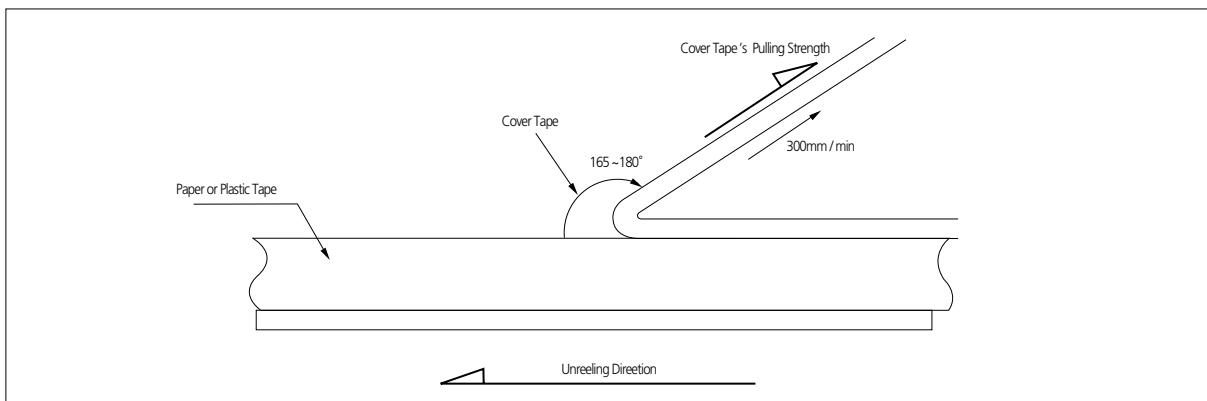
Premium Capacitors
for Automotive
Applications

Packaging
Specification

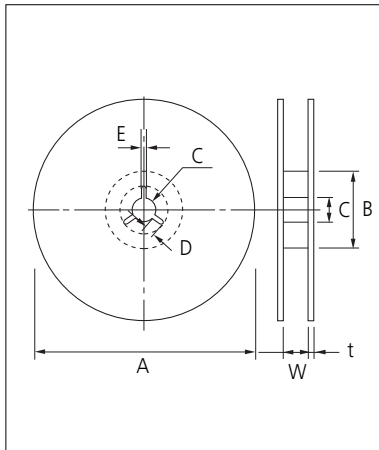
Application Manual
for Surface Mounting

Peeling off of Cover Tape

- $5 \text{ g.f} \leq \text{Peel off force} \leq 70 \text{ g.f}$



Reel Dimensions



Unit: mm

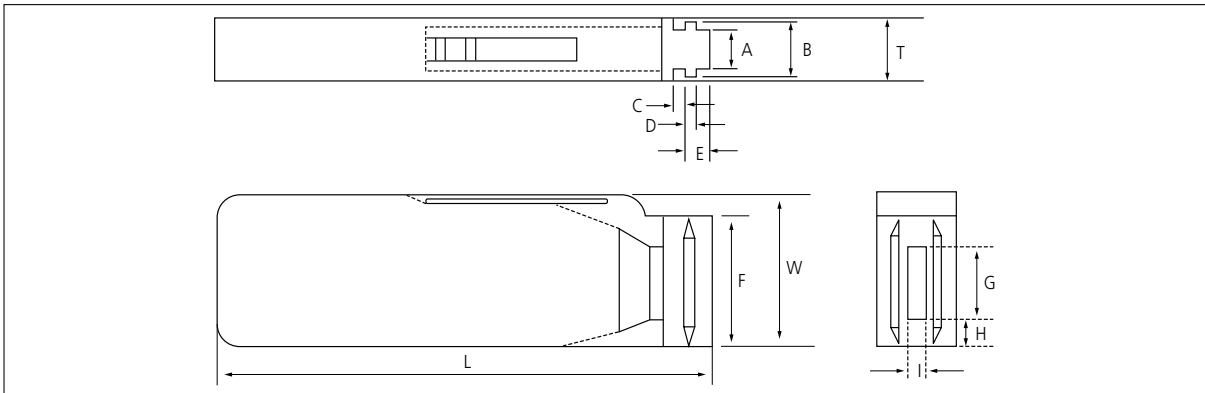
Symbol	Tape Width	A	B	C	D
7" Reel	8mm	$\varnothing 180+0/-3$	$\varnothing 60+1/-0$	$\varnothing 13\pm 0.3$	4 ± 0.2
	12mm	$\varnothing 180+0/-3$	$\varnothing 60+1/-0$	$\varnothing 13\pm 0.3$	4 ± 0.2
10" Reel	8mm	$\varnothing 258+0/-3$	$\varnothing 80+1/-0$	$\varnothing 13\pm 0.3$	4 ± 0.2
	12mm	$\varnothing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

Part Numbering
SystemGeneral
CapacitorsHigh Capacitance
CapacitorsSuper Small Size
CapacitorsMedium-High
Voltage CapacitorsArray Type
CapacitorsLow ESL
CapacitorsReliability Test
ConditionPremium Capacitors
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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

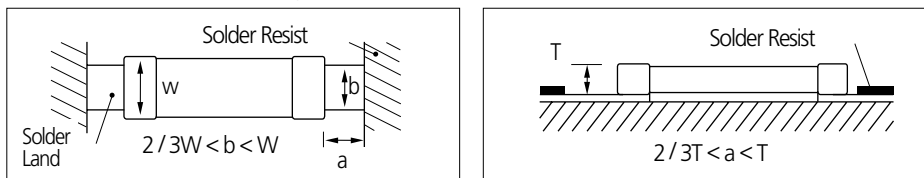
1-3. Temperature Fluctuations

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.

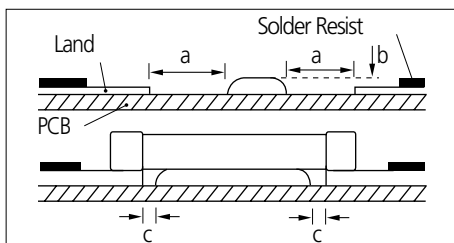
They should not corrode the circuit board or chip material.

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	70~100μm	70~100μm
c	>0	>0

3-3. Adhesive hardening Characteristics

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

4. Mounting

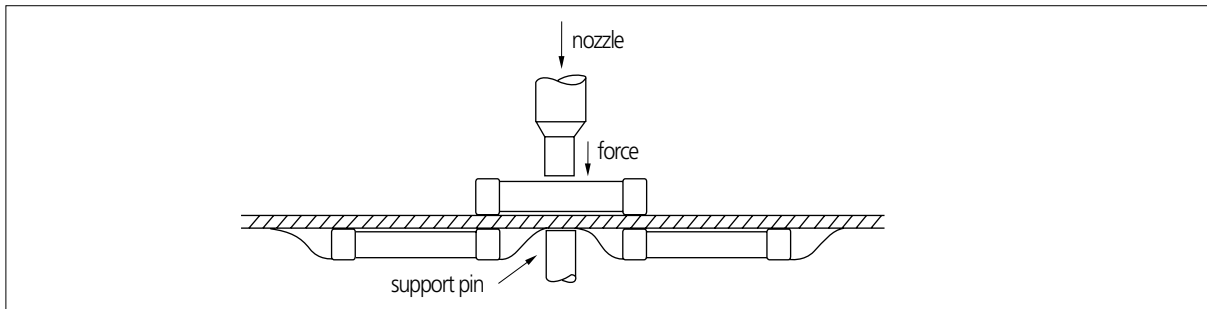
4-1. Mounting Head Pressure

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

4-2. Bending Stress

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

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



Part Numbering
System

General
Capacitors

High Capacitance
Capacitors

Super Small Size
Capacitors

Medium-High
Voltage Capacitors

Array Type
Capacitors

Low ESL
Capacitors

Reliability Test
Condition

Premium Capacitors
for Automotive
Applications

Packaging
Specification

Application Manual
for Surface Mounting

5. Flux

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

6. Soldering

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

6-1. Soldering Methods

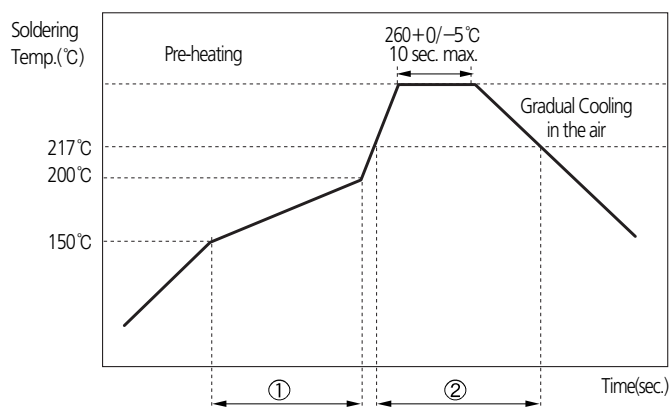
Method	Classification	
Reflow soldering	· Overall heating	· Infrared rays · Hot plate · VPS (Vapor phase)
	· Local heating	· Air heater · Laser · Light beam
Flow Soldering	· Single wave · Double wave	

6-2. Soldering Profile

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

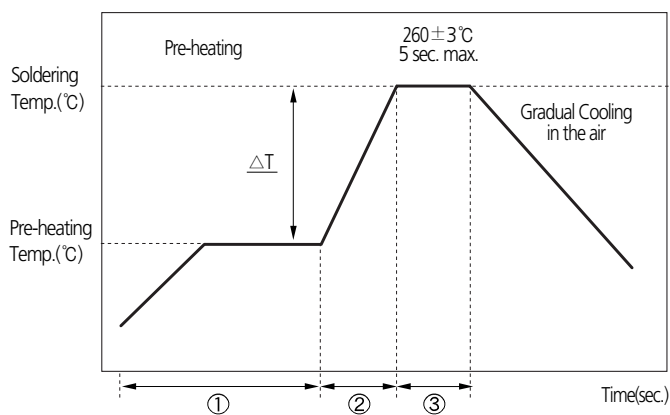
6-2-1 Pb-Free (Sn 100%) Plating

▪ REFLOW SOLDERING



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

▪ FLOW SOLDERING



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

▪ SOLDER IRON(Hand Soldering)

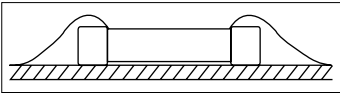
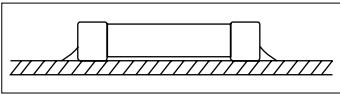
Variation of Temp.(°C)	Soldering Temp(°C)	Pre-heating Time(sec.)	Soldering Time(sec.)	Cooling Time(sec.)	Condition of Iron Facilities		
					Wattage	Tip Diameter	Soldering Time
ΔT≤130	300±10°Cmax.	≥ 60 sec.	≤ 4 sec.	-	20W max.	3mm max.	4 sec max.

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

6-3. Manual Soldering

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

6-4. Amount of Solder

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

6-5. Cooling

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

6-6. Cleaning

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

7. Notes for Separating Multiple, Shared PC Boards

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

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For and on behalf of BSI
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Expiry Date: 2013/05/01
Page 1 of 2

BSI
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Systems

ISO 14001

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Array), (SR)Image Sensor Module and PFCM/Fabric Printed circuit Board.
The design of printed circuit board.

For and on behalf of BSI
Certification Manager, Systems Assessment
Original registered: 22 May 2009
Latest issue: 18 Jun 2009
Expiry date: 05 Jun 2010
Page: 1 of 2

BSI

Quality System Certification status for each factory site

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

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