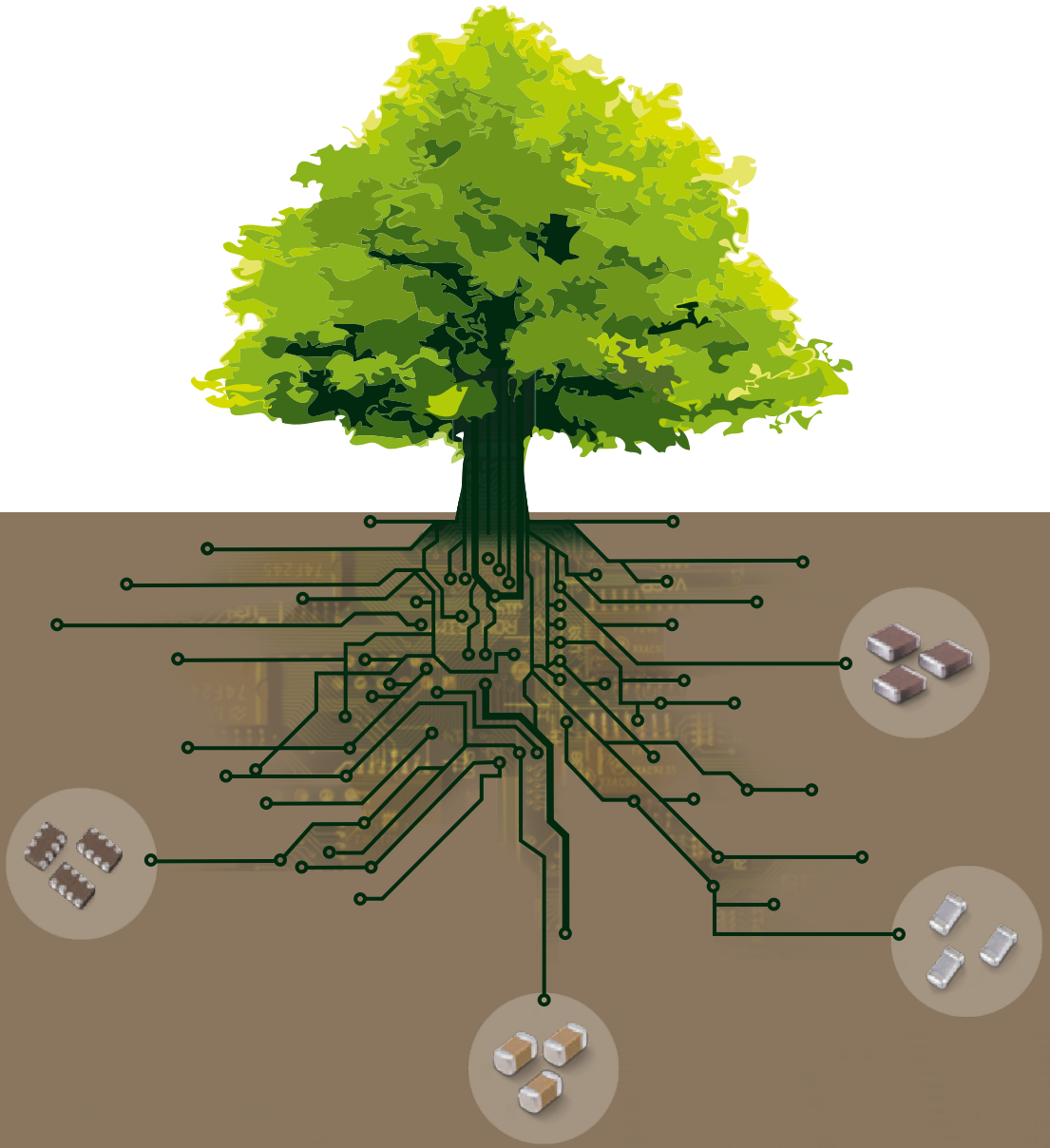
November 2015

Carbon Emission 1.86g CO2
MLCC(02A104M) 1piece

RoHs+Halogen Compliant
ecoparts

MULTILAYER CERAMIC CAPACITORS



SAMSUNG
ELECTRO-MECHANICS

SAMSUNG

We declare that all our MLCCs are produced in accordance with EU ROHS and REACH 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, Cr6+, As, Br and the compounds, PCB, asbestos

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.semlcr.com]

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

CONTENTS

Part Numbering System

CL	10	A	106	M	P	8	N	N	N	C
1	2	3	4	5	6	7	8	9	10	11

1. SERIES CODE

CL = Multi layer Ceramic Capacitors

2. SIZE CODE — inch(㎜)

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

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3. DIELECTRIC CODE

Class I	Class II
C = C0G	A = X5R F = Y5V B = X7R X = X6S Y = X7S Z = X7T

★★

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

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

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

6. RATED VOLTAGE CODE

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

★★★

7. THICKNESS CODE

2 = 0.20㎜ A = 0.65㎜ F = 1.25㎜ L = 3.20㎜ S = 1.35㎜
3 = 0.30㎜ C = 0.85㎜ H = 1.60㎜ M = 1.15㎜ U = 1.80㎜
5 = 0.50㎜ D = 1.00㎜ I = 2.00㎜ P = 1.15㎜ V = 2.50㎜
8 = 0.80㎜ E = 1.10㎜ J = 2.50㎜ Q = 1.25㎜ Y = 1.25㎜
9 = 0.90㎜

8. INNER ELECTRODE / TERMINATION / PLATING CODE

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

9. PRODUCT CODE

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

*Size tolerance

Code \ Size	01005(0402)	0201(0603)	0402(1005)	0603(1608)	0805(2012)	1206(3216)
S	±0.03	±0.05	±0.07	±0.07		±0.30
Q	±0.05	±0.07	±0.10	±0.15	±0.15	
R	±0.07	±0.09	±0.15	±0.20	±0.20	
U	±0.09		±0.20	±0.25	±0.30	
Z			±0.40	±0.30		
9			±0.30			

10. CONTROL CODE

N = Reserved for future use

11. PACKAGING CODE

B = Bulk
P = Bulk Case
C = Cardboard Tape, 7"Reel
H = Cardboard Tape, 7"Reel(15,000ea)
8 = Cardboard Tape, 7"Reel
O = Cardboard Tape, 10"Reel
D = Cardboard Tape, 13"Reel(10,000ea)
L = Cardboard Tape, 13"Reel(15,000ea)
Z = Cardboard Type, 7"Reel(Chip aligned for horizontal SMT)
Y = Cardboard Type, 7"Reel(Chip aligned for vertical SMT)
E = Embossed Type, 7"Reel
G = Embossed Type, 7"Reel(3,000ea)
F = Embossed Type, 13"Reel
S = Embossed Type, 10"Reel

Class I (Temperature Compensation)

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

★ **Class II** (High Dielectric Constant)

Symbol	EIA Code	Operation Temperature Range(℃)	Capacitance Change(△C%)
A	X5R	−55 ~ + 85	±15
B	X7R	−55 ~ +125	±15
X	X6S	−55 ~ +105	±22
F	Y5V	−30 ~ + 85	−82 ~ +22
Y	X7S	−55 ~ +125	±22
Z	X7T	−55 ~ +125	−33 ~ +22

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Series	TC	Capacitance Step											
E-3	Y5V	1.0				2.2				4.7			
E-6	X5R X7R X6S X7S X7T	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

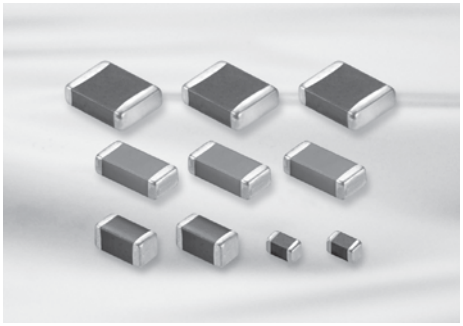
★★★

Size	Code	Thickness(mm)	Spec(mm)	Size	Code	Thickness(mm)	Spec(mm)
01005(0402)	2	0.20	±0.02	1210(3225)	C	0.85	±0.10*
0201(0603)	3	0.30	±0.03		9	0.90	±0.10*
0402(1005)	3	0.30	±0.03*		F	1.25	±0.20
	5	0.50	±0.05		S	1.35	±0.15
0603(1608)	5	0.50	+0.0/−0.1*		H	1.60	±0.20
	8	0.80	±0.10		U	1.80	±0.20*
0805(2012)	A	0.65	±0.10		I	2.00	±0.20
	C	0.85	±0.10		J	2.50	±0.20
	C	0.85	±0.10*		V	2.50	±0.30
	M	1.15	±0.10	1808(4520)	F	1.25	±0.20
	F	1.25	±0.10		H	1.60	±0.20
	Q	1.25	±0.15		I	2.00	±0.20
	Y	1.25	±0.20	1812(4532)	F	1.25	±0.20
1206(3216)	C	0.85	±0.15		H	1.60	±0.20
	C	0.85	±0.10*		I	2.00	±0.20
	E	1.10	±0.15		J	2.50	±0.20
	E	1.10	±0.10*		L	3.20	±0.30
	P	1.15	±0.10*	2220(5750)	H	1.60	±0.20
	M	1.15	±0.15		I	2.00	±0.20
	F	1.25	±0.15		J	2.50	±0.20
	H	1.60	±0.20		L	3.00	±0.30

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

■ Please discuss with sales person with regard to Pd products.

Standard & High Capacitors



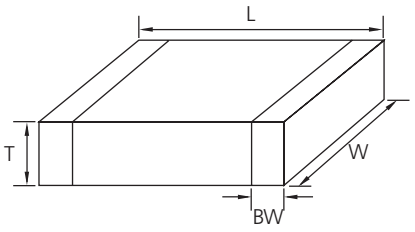
Feature

- Wide selection of size : from 0402 to 2220
- Highly reliable tolerance and high speed automatic chip placement on PCBs
- Wide capacitance range
- Wide temperature compensation and voltage range
  : from C0G to Y5V and from 6.3V to 50V
- Highly reliable performance
- Highly resistant termination metal
- Tape & reel for surface mount assembly

Application

- HHP, DSC, DVC, LCD, TV, Memory Module, PDA, Game Machine
- Desktop PC, Note PC, HHP, DC-DC Converter, DSC
- Tuner (Product code C is suitable.)

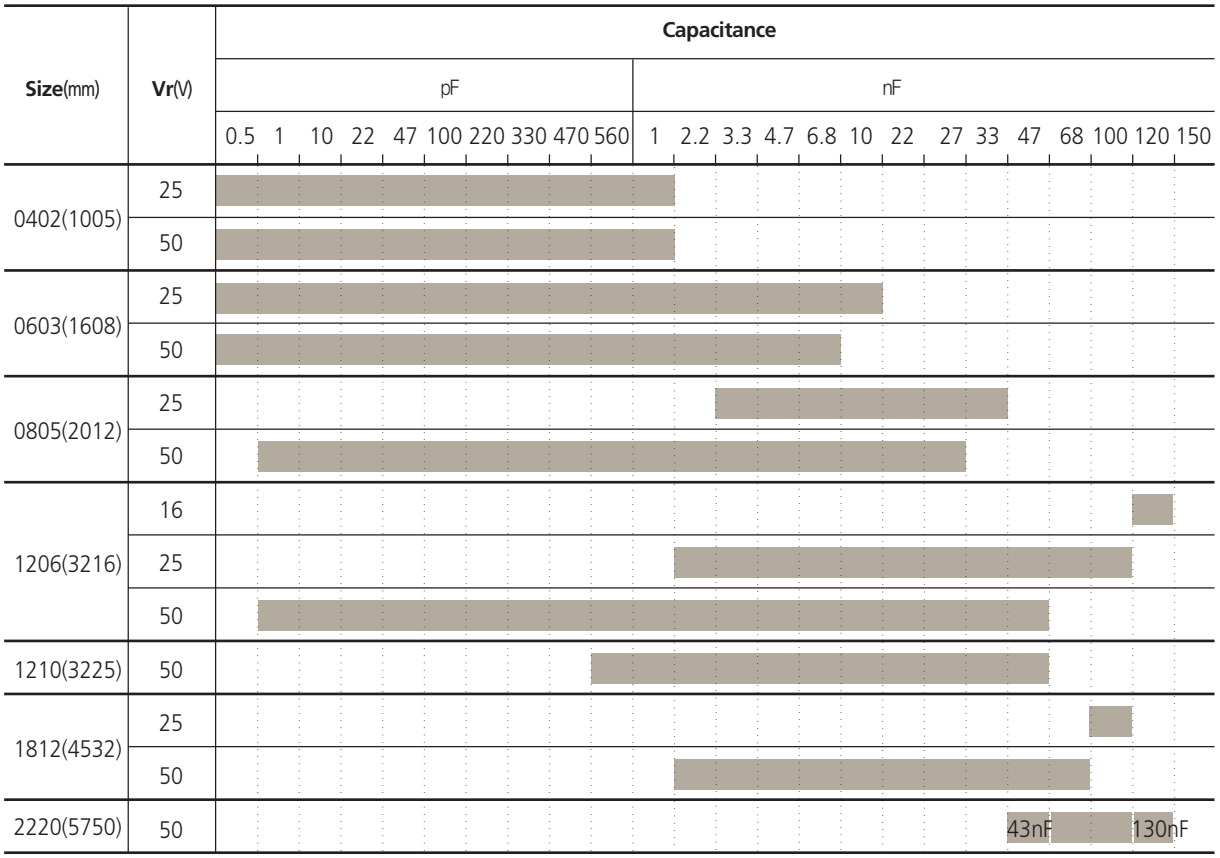
Structure and Dimensions



Size Code	EIA Code	Dimension(㎜)				
		L	W	T	Thickness Code	BW
05	0402	1.00±0.05	0.50±0.05	0.50±0.05	5	0.25±0.10
10	0603	1.60±0.10	0.80±0.10	0.50+0.0/–0.1(*)	5	0.30±0.20
		1.60±0.10	0.80±0.10	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
		2.00±0.10	1.25±0.10	1.15±0.10	M	
		2.00±0.10	1.25±0.10	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
		3.20±0.15	1.60±0.15	0.85±0.15	C	
		3.20±0.20	1.60±0.20	0.85±0.10(*)	C	
		3.20±0.20	1.60±0.20	1.15±0.10(*)	P	
		3.20±0.15	1.60±0.15	1.25±0.15	F	
		3.20±0.20	1.60±0.20	1.60±0.20	H	
32	1210	3.20±0.30	2.50±0.20	0.85±0.10(*)	C	0.60±0.30
		3.20±0.30	2.50±0.20	0.90±0.10(*)	9	
		3.20±0.30	2.50±0.20	1.60±0.20	H	
		3.20±0.30	2.50±0.20	1.80±0.20(*)	U	
		3.20±0.30	2.50±0.20	2.00±0.20	I	
		3.20±0.30	2.50±0.20	2.50±0.20	J	
		3.20±0.40	2.50±0.30	2.50±0.30	V	
42	1808	4.50±0.40	2.00±0.20	1.25±0.20	F	0.80±0.30
		4.50±0.40	2.00±0.20	1.40±0.20	G	
		4.50±0.40	2.00±0.20	2.00±0.20	I	
43	1812	4.50±0.40	3.20±0.30	1.25±0.20	F	0.80±0.30
		4.50±0.40	3.20±0.30	2.50±0.20	J	
		4.50±0.40	3.20±0.30	3.20±0.30	L	
55	2220	5.70±0.40	5.00±0.40	2.50±0.20	J	1.00±0.30
		5.70±0.40	5.00±0.40	3.20±0.30	L	

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

Standard & High Capacitance (C0G)



Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q Capacitors
Medium-High Voltage Capacitors
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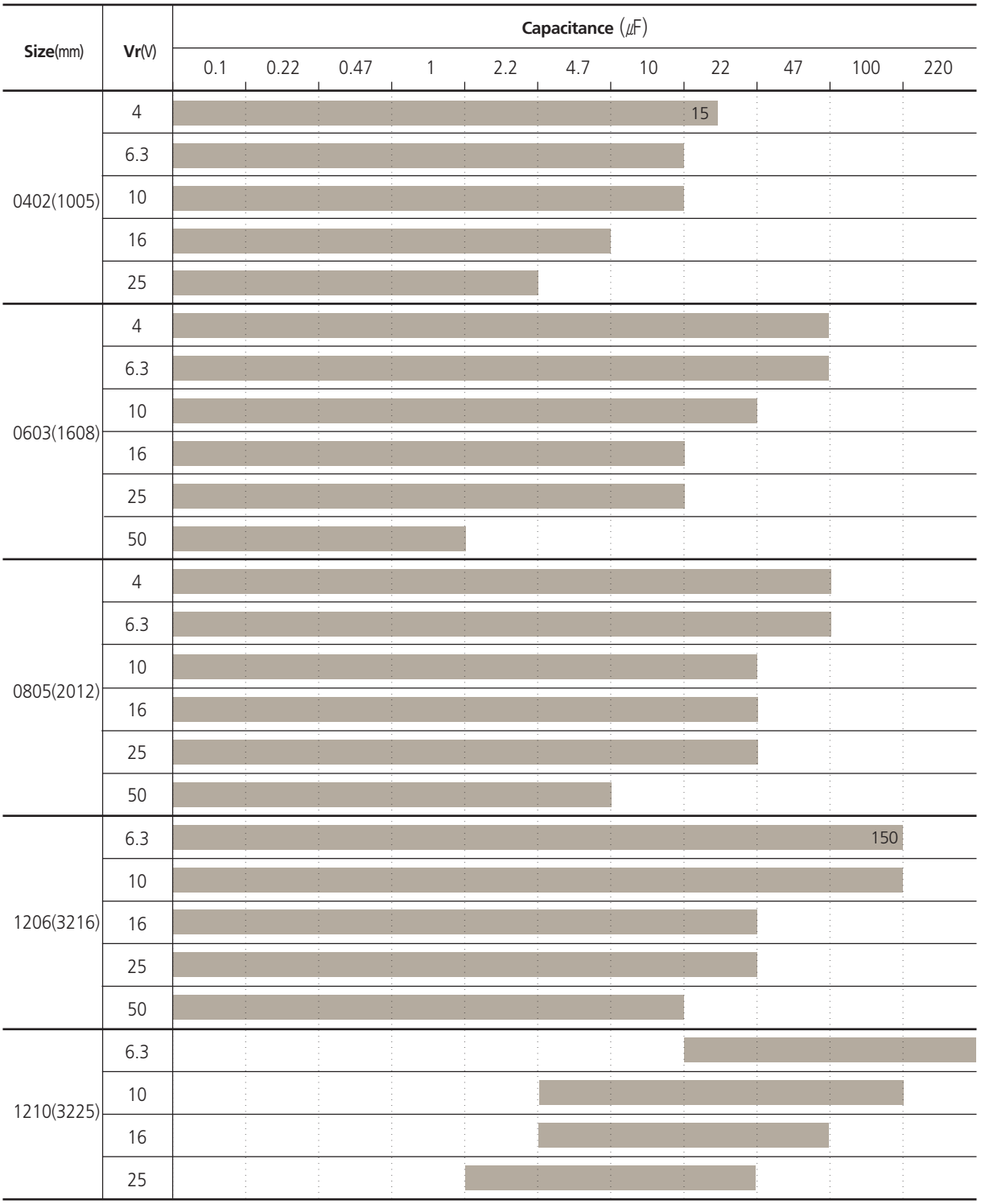
Standard & High Capacitance (X5R)



Standard & High Capacitance-Low Profile (X5R)

Size(mm)	Tmax (mm)	Vr(V)	Capacitance (μF)
			1 / 2.2 / 4.7 / 10 / 22 / 47
0402(1005)	0.33	6.3	X6S (Tmax=0.35)
		10	
		16	
0603(1608)	0.5	6.3	
		10	
		16	
		25	
0805(2012)	0.7	10	
		16	
		25	
	0.85	25	
	0.95	4	(Tmax=1.0)
		6.3	(Tmax=1.0)
		10	
		16	
		25	X6S
1206(3216)	0.7	10	
	0.95	6.3	
		10	
		16	
		25	X6S
		50	(Tmax=1.0) (Tmax=1.0)
		100	(Tmax=1.0)
1210(3225)	0.95	16	
	2.0	25	
		35	
		50	

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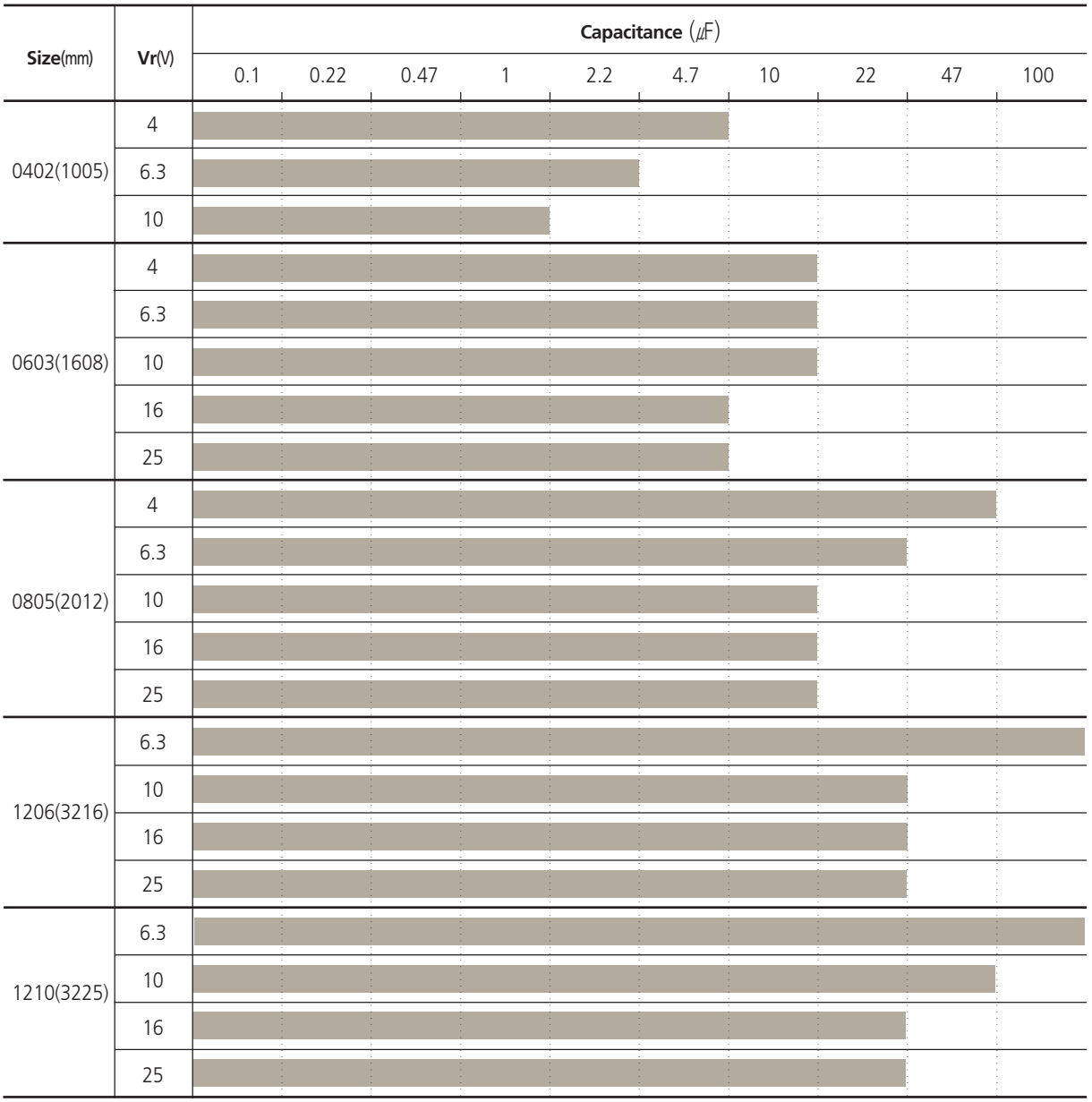
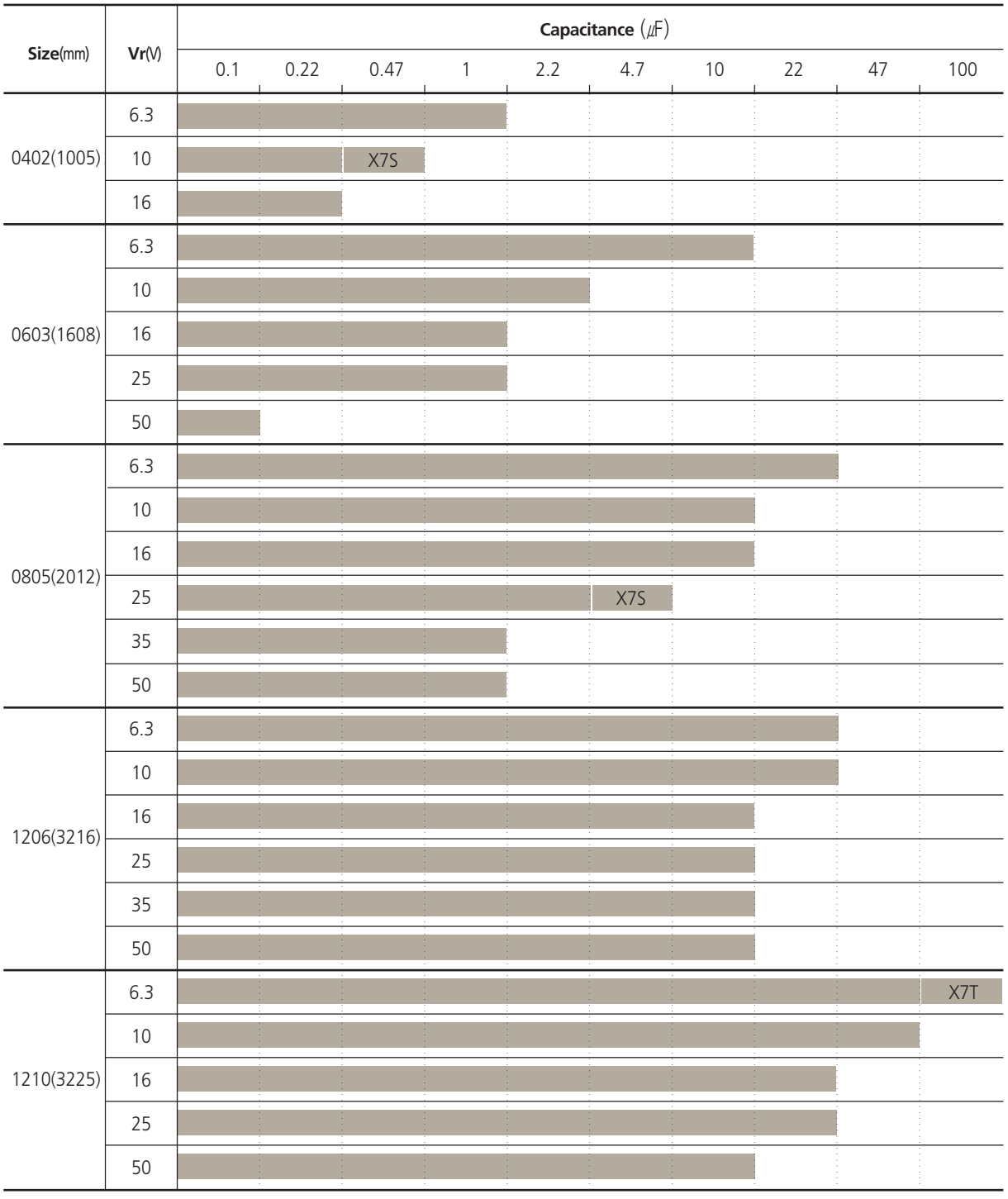
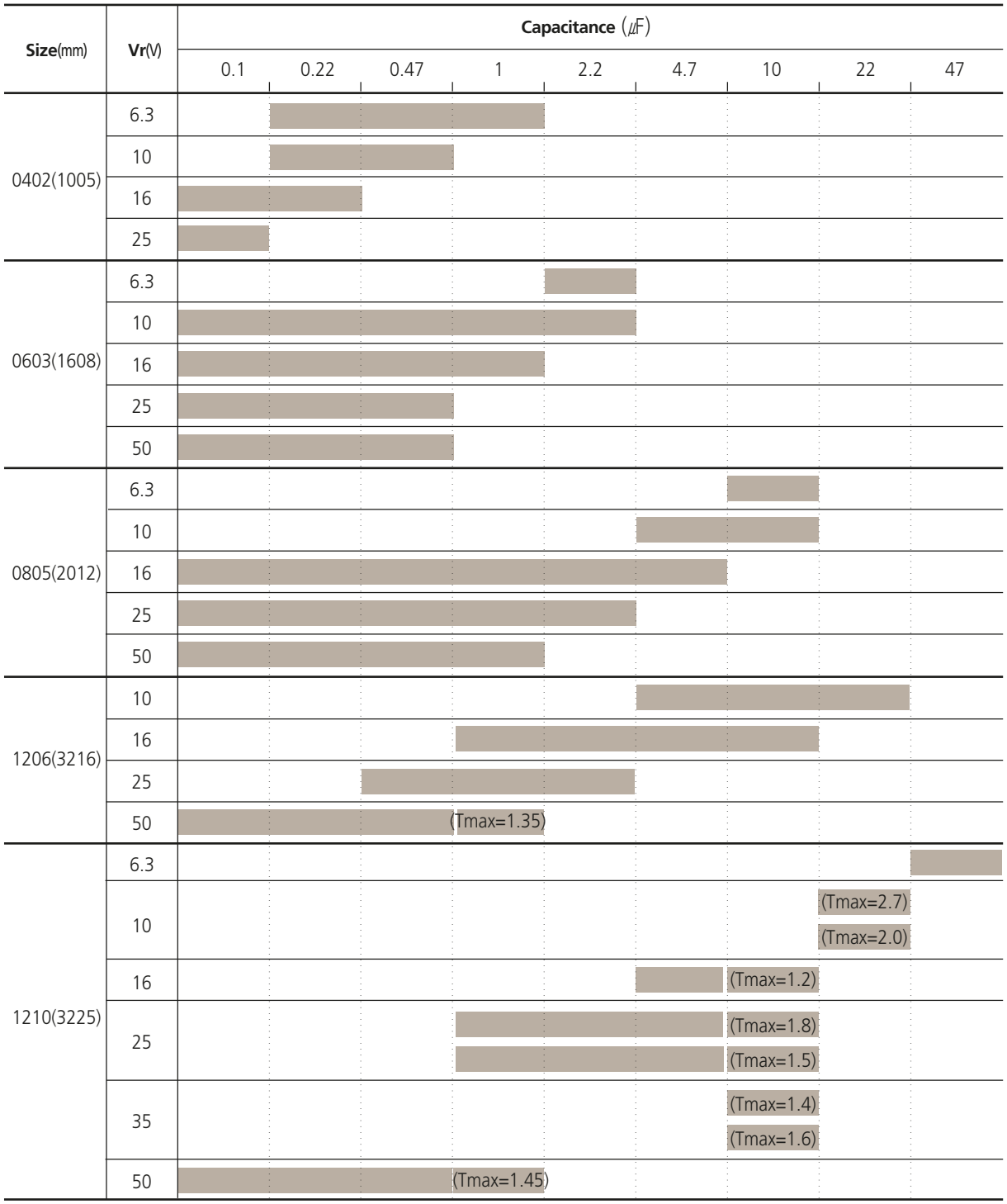
Standard & High Capacitance (X6S)



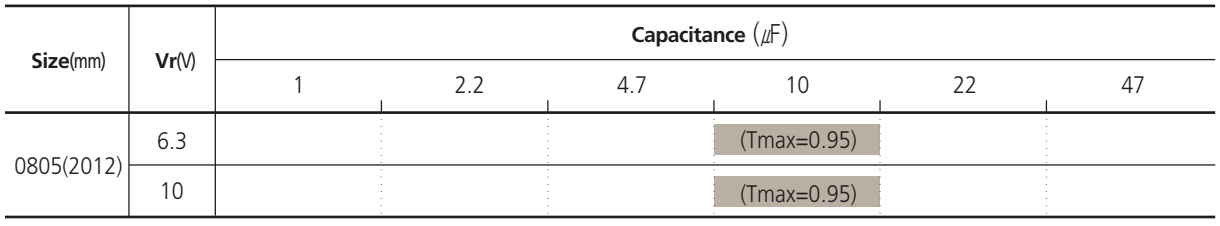
Standard & High Capacitance (X7R)



Standard & High capacitance (Y5V)



Standard & High capacitance - Low Profile (Y5V)



Product Lineup (Standard & High Capacitors-C0G)

	Part Number	Size L x 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 p74.

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Product Lineup (Standard & High Capacitors-C0G)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
51	CL05C620JB5NNN □	1.00×0.50	62pF	50	±5%	0.55
52	CL05C680JB5NNN □		68pF	50	±5%	0.55
53	CL05C750JB5NNN □		75pF	50	±5%	0.55
54	CL05C820JB5NNN □		82pF	50	±5%	0.55
55	CL05C910JB5NNN □		91pF	50	±5%	0.55
56	CL05C101JB5NNN □		100pF	50	±5%	0.55
57	CL05C121JB5NNN □		120pF	50	±5%	0.55
58	CL05C151JB5NNN □		150pF	50	±5%	0.55
59	CL05C181JB5NNN □		180pF	50	±5%	0.55
60	CL05C201JB5NNN □		200pF	50	±5%	0.55
61	CL05C221JB5NNN □		220pF	50	±5%	0.55
62	CL05C271JB5NNN □		270pF	50	±5%	0.55
63	CL05C331JB5NNN □		330pF	50	±5%	0.55
64	CL05C391JB5NNN □		390pF	50	±5%	0.55
65	CL05C471JB5NNN □		470pF	50	±5%	0.55
66	CL05C471JO5NNN □		470pF	16	±5%	0.55
67	CL05C681JB5NNN □		680pF	50	±5%	0.55
68	CL05C821JB5NNN □		820pF	50	±5%	0.55
69	CL05C102JB5NNN □		1nF	50	±5%	0.55
70	CL05C102JA5NNN □		1nF	25	±5%	0.55
71	CL05C102JO5NNN □		1nF	16	±5%	0.55
1	CL10C0R3CB8NNN □	1.60×0.80	0.3pF	50	±0.25pF	0.90
2	CL10C0R5CB8NNN □		0.5pF	50	±0.25pF	0.90
3	CL10CR75CB8NNN □		0.75pF	50	±0.25pF	0.90
4	CL10C010CB8NNN □		1.0pF	50	±0.25pF	0.90
5	CL10C1R2CB8NNN □		1.2pF	50	±0.25pF	0.90
6	CL10C1R5CB8NNN □		1.5pF	50	±0.25pF	0.90
7	CL10C1R8CB8NNN □		1.8pF	50	±0.25pF	0.90
8	CL10C020CB8NNN □		2.0pF	50	±0.25pF	0.90
9	CL10C2R2CB8NNN □		2.2pF	50	±0.25pF	0.90
10	CL10C2R4CB8NNN □		2.4pF	50	±0.25pF	0.90
11	CL10C2R5CB8NNN □		2.5pF	50	±0.25pF	0.90
12	CL10C2R7CB8NNN □		2.7pF	50	±0.25pF	0.90
13	CL10C030CB8NNN □		3.0pF	50	±0.25pF	0.90
14	CL10C3R3CB8NNN □		3.3pF	50	±0.25pF	0.90
15	CL10C3R5CB8NNN □		3.5pF	50	±0.25pF	0.90
16	CL10C3R6CB8NNN □		3.6pF	50	±0.25pF	0.90
17	CL10C3R9CB8NNN □		3.9pF	50	±0.25pF	0.90
18	CL10C040CB8NNN □		4.0pF	50	±0.25pF	0.90
19	CL10C4R3CB8NNN □		4.3pF	50	±0.25pF	0.90
20	CL10C4R7CB8NNN □		4.7pF	50	±0.25pF	0.90
21	CL10C050DB8NNN □		5.0pF	50	±0.5pF	0.90
22	CL10C5R6DB8NNN □		5.6pF	50	±0.5pF	0.90
23	CL10C060DB8NNN □		6.0pF	50	±0.5pF	0.90
24	CL10C6R2DB8NNN □		6.2pF	50	±0.5pF	0.90
25	CL10C6R8DB8NNN □		6.8pF	50	±0.5pF	0.90
26	CL10C070DB8NNN □		7.0pF	50	±0.5pF	0.90
27	CL10C7R5DB8NNN □		7.5pF	50	±0.5pF	0.90
28	CL10C080DB8NNN □		8.0pF	50	±0.5pF	0.90
29	CL10C8R2DB8NNN □		8.2pF	50	±0.5pF	0.90

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Standard & High Capacitors-C0G)

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

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Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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 (Standard & High Capacitors-C0G)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
80	CL10C821JB8NNN □	1.60×0.80	820 pF	50	±5%	0.90
81	CL10C102JB8NNN □		1 nF	50	±5%	0.90
82	CL10C182JB8NNN □		1.8 nF	50	±5%	0.90
83	CL10C222JB8NNN □		2.2 nF	50	±5%	0.90
84	CL10C562JB8NNN □		5.6 nF	50	±5%	0.90
85	CL10C103JA8NNN □		10 nF	25	±5%	0.90
1	CL21CR47CBANNN □	2.00×1.25	0.47pF	50	±0.25pF	0.75
2	CL21C0R5CBANNN □		0.5 pF	50	±0.25pF	0.75
3	CL21C010CBANNN □		1.0 pF	50	±0.25pF	0.75
4	CL21C1R2CBANNN □		1.2 pF	50	±0.25pF	0.75
5	CL21C1R5CBANNN □		1.5 pF	50	±0.25pF	0.75
6	CL21C1R8CBANNN □		1.8 pF	50	±0.25pF	0.75
7	CL21C020CBANNN □		2.0 pF	50	±0.25pF	0.75
8	CL21C2R2CBANNN □		2.2 pF	50	±0.25pF	0.75
9	CL21C2R4CBANNN □		2.4 pF	50	±0.25pF	0.75
10	CL21C2R5CBANNN □		2.5 pF	50	±0.25pF	0.75
11	CL21C2R7CBANNN □		2.7 pF	50	±0.25pF	0.75
12	CL21C030CBANNN □		3.0 pF	50	±0.25pF	0.75
13	CL21C3R2CBANNN □		3.2 pF	50	±0.25pF	0.75
14	CL21C3R3CBANNN □		3.3 pF	50	±0.25pF	0.75
15	CL21C3R6CBANNN □		3.6 pF	50	±0.25pF	0.75
16	CL21C3R9CBANNN □		3.9 pF	50	±0.25pF	0.75
17	CL21C040CBANNN □		4.0 pF	50	±0.25pF	0.75
18	CL21C4R7CBANNN □		4.7 pF	50	±0.25pF	0.75
19	CL21C5R6DBANNN □		5.6 pF	50	±0.5pF	0.75
20	CL21C060DBANNN □		6.0 pF	50	±0.5pF	0.75
21	CL21C6R8DBANNN □		6.8 pF	50	±0.5pF	0.75
22	CL21C070DBANNN □		7.0 pF	50	±0.5pF	0.75
23	CL21C7R5DBANNN □		7.5 pF	50	±0.5pF	0.75
24	CL21C080DBANNN □		8.0 pF	50	±0.5pF	0.75
25	CL21C8R2DBANNN □		8.2 pF	50	±0.5pF	0.75
26	CL21C090DBANNN □		9.0 pF	50	±0.5pF	0.75
27	CL21C100JBANNN □		10 pF	50	±5%	0.75
28	CL21C120JBANNN □		12 pF	50	±5%	0.75
29	CL21C130JBANNN □		13 pF	50	±5%	0.75
30	CL21C140JBANNN □		14 pF	50	±5%	0.75
31	CL21C150JBANNN □		15 pF	50	±5%	0.75
32	CL21C160JBANNN □		16 pF	50	±5%	0.75
33	CL21C180JBANNN □		18 pF	50	±5%	0.75
34	CL21C200JBANNN □		20 pF	50	±5%	0.75
35	CL21C220JBANNN □		22 pF	50	±5%	0.75
36	CL21C240JBANNN □		24 pF	50	±5%	0.75
37	CL21C250JBANNN □		25 pF	50	±5%	0.75
38	CL21C270JBANNN □		27 pF	50	±5%	0.75
39	CL21C300JBANNN □		30 pF	50	±5%	0.75
40	CL21C330JBANNN □		33 pF	50	±5%	0.75
41	CL21C360JBANNN □		36 pF	50	±5%	0.75
42	CL21C390JBANNN □		39 pF	50	±5%	0.75
43	CL21C430JBANNN □		43 pF	50	±5%	0.75
44	CL21C470JBANNN □		47 pF	50	±5%	0.75
45	CL21C510JBANNN □		51 pF	50	±5%	0.75

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Product Lineup (Standard & High Capacitors-C0G)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
46	CL21C560JBANNN □	2.00×1.25	56 pF	50	±5%	0.75
47	CL21C620JBANNN □		62 pF	50	±5%	0.75
48	CL21C680JBANNN □		68 pF	50	±5%	0.75
49	CL21C750JBANNN □		75 pF	50	±5%	0.75
50	CL21C820JBANNN □		82 pF	50	±5%	0.75
51	CL21C910JBANNN □		91 pF	50	±5%	0.75
52	CL21C101JBANNN □		100 pF	50	±5%	0.75
53	CL21C111JBANNN □		110 pF	50	±5%	0.75
54	CL21C121JBANNN □		120 pF	50	±5%	0.75
55	CL21C131JBANNN □		130 pF	50	±5%	0.75
56	CL21C151JBANNN □		150 pF	50	±5%	0.75
57	CL21C161JBANNN □		160 pF	50	±5%	0.75
58	CL21C181JBANNN □		180 pF	50	±5%	0.75
59	CL21C201JBANNN □		200 pF	50	±5%	0.75
60	CL21C221JBANNN □		220 pF	50	±5%	0.75
61	CL21C241JBANNN □		240 pF	50	±5%	0.75
62	CL21C271JBANNN □		270 pF	50	±5%	0.75
63	CL21C301JBANNN □		300 pF	50	±5%	0.75
64	CL21C331JBANNN □		330 pF	50	±5%	0.75
65	CL21C361JBANNN □		360 pF	50	±5%	0.75
66	CL21C391JBANNN □		390 pF	50	±5%	0.75
67	CL21C431JBANNN □		430 pF	50	±5%	0.75
68	CL21C471JBANNN □		470 pF	50	±5%	0.75
69	CL21C511JBANNN □		510 pF	50	±5%	0.75
70	CL21C561JBANNN □		560 pF	50	±5%	0.75
71	CL21C621JBCNNN □		620 pF	50	±5%	0.95
72	CL21C681JBCNNN □		680 pF	50	±5%	0.95
73	CL21C751JBCNNN □		750 pF	50	±5%	0.95
74	CL21C821JBCNNN □		820 pF	50	±5%	0.95
75	CL21C102JBCNNN □		1 nF	50	±5%	0.95
76	CL21C122JBFNNN □		1.2 nF	50	±5%	1.35
77	CL21C152JBFNNN □		1.5 nF	50	±5%	1.35
78	CL21C182JBFNNN □		1.8 nF	50	±5%	1.35
79	CL21C222JBFNNN □		2.2 nF	50	±5%	1.35
80	CL21C332JAFNNN □		3.3 nF	25	±5%	1.35
81	CL21C332JBFNNN □		3.3 nF	50	±5%	1.35
82	CL21C392JAANNN □		3.9 nF	25	±5%	0.75
83	CL21C392JBFNNN □		3.9 nF	50	±5%	1.35
84	CL21C472JBFNNN □		4.7 nF	50	±5%	1.35
85	CL21C562JBFNNN □		5.6 nF	50	±5%	1.35
86	CL21C822JAFNNN □		8.2 nF	25	±5%	1.35
87	CL21C103JBFNNN □		10 nF	50	±5%	1.35
88	CL21C333JAFNNN □		33 nF	25	±5%	1.35
1	CL31C0R5CBCNNN □	3.20×1.60	0.5 pF	50	±0.25 pF	1.00
2	CL31C010CBCNNN □		1.0 pF	50	±0.25 pF	1.00
3	CL31C1R5CBCNNN □		1.5 pF	50	±0.25 pF	1.00
4	CL31C1R8CBCNNN □		1.8 pF	50	±0.25 pF	1.00
5	CL31C020CBCNNN □		2.0 pF	50	±0.25 pF	1.00
6	CL31C2R2CBCNNN □		2.2 pF	50	±0.25 pF	1.00
7	CL31C2R7CBCNNN □		2.7 pF	50	±0.25 pF	1.00

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Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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 (Standard & High Capacitors-C0G)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
8	CL31C030CBCNNN □	3.20×1.60	3.0 pF	50	±0.25 pF	1.00
9	CL31C3R3CBCNNN □		3.3 pF	50	±0.25 pF	1.00
10	CL31C040CBCNNN □		4.0 pF	50	±0.25 pF	1.00
11	CL31C4R7CBCNNN □		4.7 pF	50	±0.25 pF	1.00
12	CL31C100JBCNNN □		10 pF	50	±5%	1.00
13	CL31C120JBCNNN □		12 pF	50	±5%	1.00
14	CL31C150JBCNNN □		15 pF	50	±5%	1.00
15	CL31C180JBCNNN □		18 pF	50	±5%	1.00
16	CL31C200JBCNNN □		20 pF	50	±5%	1.00
17	CL31C220JBCNNN □		22 pF	50	±5%	1.00
18	CL31C270JBCNNN □		27 pF	50	±5%	1.00
19	CL31C300JBCNNN □		30 pF	50	±5%	1.00
20	CL31C330JBCNNN □		33 pF	50	±5%	1.00
21	CL31C390JBCNNN □		39 pF	50	±5%	1.00
22	CL31C470JBCNNN □		47 pF	50	±5%	1.00
23	CL31C510JBCNNN □		51 pF	50	±5%	1.00
24	CL31C560JBCNNN □		56 pF	50	±5%	1.00
25	CL31C680JBCNNN □		68 pF	50	±5%	1.00
26	CL31C750JBCNNN □		75 pF	50	±5%	1.00
27	CL31C820JBCNNN □		82 pF	50	±5%	1.00
28	CL31C101JBCNNN □		100 pF	50	±5%	1.00
29	CL31C121JBCNNN □		120 pF	50	±5%	1.00
30	CL31C151JBCNNN □		150 pF	50	±5%	1.00
31	CL31C181JBCNNN □		180 pF	50	±5%	1.00
32	CL31C221JBCNNN □		220 pF	50	±5%	1.00
33	CL31C271JBCNNN □		270 pF	50	±5%	1.00
34	CL31C331JBCNNN □		330 pF	50	±5%	1.00
35	CL31C391JBCNNN □		390 pF	50	±5%	1.00
36	CL31C471JBCNNN □		470 pF	50	±5%	1.00
37	CL31C561JBCNNN □		560 pF	50	±5%	1.00
38	CL31C681JBCNNN □		680 pF	50	±5%	1.00
39	CL31C821JBCNNN □		820 pF	50	±5%	1.00
40	CL31C102JBCNNN □		1 nF	50	±5%	1.00
41	CL31C122JBCNNN □		1.2 nF	50	±5%	1.00
42	CL31C152JBCNNN □		1.5 nF	50	±5%	1.00
43	CL31C182JBCNNN □		1.8 nF	50	±5%	1.00
44	CL31C222JBCNNN □		2.2 nF	50	±5%	1.00
45	CL31C272JBFNNN □		2.7 nF	50	±5%	1.40
46	CL31C332JBFNNN □		3.3 nF	50	±5%	1.40
47	CL31C472JBFNNN □		4.7 nF	50	±5%	1.40
48	CL31C682JBHNNN □		6.8 nF	50	±5%	1.80
49	CL31C103JAFNNN □		10 nF	25	±5%	1.40
50	CL31C223JBHNNN □		22 nF	50	±5%	1.80
51	CL31C333JBHNNN □		33 nF	50	±5%	1.80
52	CL31C473JBHNNN □		47 nF	50	±5%	1.80
53	CL31C683JAHNNN □		68 nF	25	±5%	1.80
54	CL31C104JAHNNN □		100 nF	25	±5%	1.80
1	CL32C472JBFNNN □	3.20×2.50	4.7 nF	50	±5%	1.45
2	CL32C103JBFNNN □		10 nF	50	±5%	1.45
3	CL32C223JBHNNN □		22 nF	50	±5%	1.80
4	CL32C333JBHNNN □		33 nF	50	±5%	1.80
5	CL32C473JBHNNN □		47 nF	50	±5%	1.80

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Product Lineup (Standard & High Capacitors-X5R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL05A223KO5NNN□	1.00×0.50	22 nF	16	±10%	0.55
2	CL05A104KA5NNN□		0.1 μF	25	±10%	0.55
3	CL05A104KO5NNN□		0.1 μF	16	±10%	0.55
4	CL05A104KP5NNN□		0.1 μF	10	±10%	0.55
5	CL05A224KA5NNN□		0.22 μF	25	±10%	0.55
6	CL05A224KP5NNN□		0.22 μF	10	±10%	0.55
7	CL05A334KA5NNN□		0.33 μF	25	±10%	0.55
8	CL05A334KP5NNN□		0.33 μF	10	±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	CL05A225MA5NUN□		2.2 μF	25	±20%	0.70
24	CL05A225KO5NQN□		2.2 μF	16	±10%	0.60
25	CL05A225MP5NSN□		2.2 μF	10	±20%	0.57
26	CL05A225KP3LRN□		2.2 μF	10	±10%	0.33
27	CL05A225MQ5NNN□		2.2 μF	6.3	±20%	0.55
28	CL05A225KQ3LRN□		2.2 μF	6.3	±10%	0.33
29	CL05A225MR5NNN□		2.2 μF	4	±20%	0.55
30	CL05A225KR3LRN□		2.2 μF	4	±10%	0.33
31	CL05A475MO5NUN□		4.7 μF	16	±20%	0.70
32	CL05A475MP5NRN□		4.7 μF	10	±20%	0.65
33	CL05A475MQ5NRN□		4.7 μF	6.3	±20%	0.65
34	CL05A475MQ3LUN□		4.7 μF	6.3	±20%	0.35
35	CL05A106MP5NUN□		10 μF	10	±20%	0.70
36	CL05A106MQ5NUN□		10 μF	6.3	±20%	0.70
37	CL05A106MR5NRN□		10 μF	4	±20%	0.65
38	CL05A156MR5NUN□		15 μF	4	±20%	0.70
39	CL05A226MR5NZN□		22 μF	4	±20%	0.90
1	CL10A474KB8NNN□	1.60×0.80	0.47μF	50	±10%	0.90
2	CL10A474KA8NNN□		0.47μF	25	±10%	0.90
3	CL10A474KP8NNN□		0.47μF	10	±10%	0.90
4	CL10A474KQ8NNN□		0.47μF	6.3	±10%	0.90
5	CL10A474KR8NNN□		0.47μF	4	±10%	0.90
6	CL10A105KB8NNN□		1 μF	50	±10%	0.90
7	CL10A105KA5LNN□		1 μF	25	±10%	0.50
8	CL10A105KA8NNN□		1 μF	25	±10%	0.90
9	CL10A105KO8NNN□		1 μF	16	±10%	0.90
10	CL10A105KO5LNN□		1 μF	16	±10%	0.50
11	CL10A105KP8NNN□		1 μF	10	±10%	0.90
12	CL10A105KP5LNN□		1 μF	10	±10%	0.50
13	CL10A105KQ8NNN□		1 μF	6.3	±10%	0.90
14	CL10A105KQ5LNN□		1 μF	6.3	±10%	0.50

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Standard & High Capacitors-X5R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
15	CL10A105KR8NNN □	1.60×0.80	1㎌	4	±10%	0.90
16	CL10A105KR5LNN □		1㎌	4	±10%	0.50
17	CL10A105KA5LNN □		1㎌	25	±10%	0.50
18	CL10A225KA8NNN □		2.2㎌	25	±10%	0.90
19	CL10A225KA5LNN □		2.2㎌	25	±10%	0.50
20	CL10A225KO8NNN □		2.2㎌	16	±10%	0.90
21	CL10A225KO5LNN □		2.2㎌	16	±10%	0.50
22	CL10A225KP8NNN □		2.2㎌	10	±10%	0.90
23	CL10A225KP5LNN □		2.2㎌	10	±10%	0.50
24	CL10A225KQ8NNN □		2.2㎌	6.3	±10%	0.90
25	CL10A225KQ5LNN □		2.2㎌	6.3	±10%	0.50
26	CL10A225KR8NNN □		2.2㎌	4	±10%	0.90
27	CL10A225KR5LNN □		2.2㎌	4	±10%	0.50
28	CL10A335KQ8NNN □		3.3㎌	6.3	±10%	0.90
29	CL10A335KR8NNN □		3.3㎌	4	±10%	0.90
30	CL10A475KA8NQN □		4.7㎌	25	±10%	0.95
31	CL10A475KO8NNN □		4.7㎌	16	±10%	0.90
32	CL10A475KP8NNN □		4.7㎌	10	±10%	0.90
33	CL10A475KP5LNN □		4.7㎌	10	±10%	0.50
34	CL10A475KQ5LNN □		4.7㎌	6.3	±10%	0.50
35	CL10A475KQ8NNN □		4.7㎌	6.3	±10%	0.90
36	CL10A475KR5LNN □		4.7㎌	4	±10%	0.50
37	CL10A475KR8NNN □		4.7㎌	4	±10%	0.90
38	CL10A106KR8NNN □		10㎌	4	±10%	0.90
39	CL10A106MR5LRN □		10㎌	4	±20%	0.50
40	CL10A106KQ8NNN □		10㎌	6.3	±10%	0.90
41	CL10A106MQ5LRN □		10㎌	6.3	±20%	0.50
42	CL10A106MP8NNN □		10㎌	10	±20%	0.90
43	CL10A106MO8NQN □		10㎌	16	±20%	0.95
44	CL10A106MA8NRN □		10㎌	25	±20%	1.00
45	CL10A226MR8NRN □		22㎌	4	±20%	1.00
46	CL10A226MQ8NRN □		22㎌	6.3	±20%	1.00
47	CL10A226MP8NRN □		22㎌	10	±20%	1.00
48	CL10A226MP8NUN □		22㎌	10	±20%	1.05
49	CL10A476MR8NZN □		47㎌	4	±20%	1.10
50	CL10A476MQ8CZN □		47㎌	6.3	±20%	1.10
1	CL21A105KBQNNN □	2.00×1.25	1㎌	50	±10%	1.40
2	CL21A105KAFNNN □		1㎌	25	±10%	1.35
3	CL21A105KA6LNN □		1㎌	25	±10%	0.70
4	CL21A105KOFNNN □		1㎌	16	±10%	1.35
5	CL21A105KO6LNN □		1㎌	16	±10%	0.70
6	CL21A105KQFNNN □		1㎌	6.3	±10%	1.35
7	CL21A105KRFNNN □		1㎌	4	±10%	1.35
8	CL21A225KBQNNN □		2.2㎌	50	±10%	1.40
9	CL21A225KAFNNN □		2.2㎌	25	±10%	1.35
10	CL21A225KO6LNN □		2.2㎌	16	±10%	0.70
11	CL21A225KOFNNN □		2.2㎌	16	±10%	1.35
12	CL21A225KPFNNN □		2.2㎌	10	±10%	1.35
13	CL21A225KQFNNN □		2.2㎌	6.3	±10%	1.35
14	CL21A225KRFNNN □		2.2㎌	4	±10%	1.35
15	CL21A475KBQNNN □		4.7㎌	50	±10%	1.40

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Product Lineup (Standard & High Capacitors-X5R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
16	CL21A475KAQNNN□	2.00×1.25	4.7㎌	25	±10%	1.40
17	CL21A475KACLRN□		4.7㎌	25	±10%	0.95
18	CL21A475KOFNNN□		4.7㎌	16	±10%	1.35
19	CL21A475KOCLNN□		4.7㎌	16	±10%	0.95
20	CL21A475KPFNNN□		4.7㎌	10	±10%	1.35
21	CL21A475KPCLNN□		4.7㎌	10	±10%	0.95
22	CL21A475KQFNNN□		4.7㎌	6.3	±10%	1.35
23	CL21A475KQCLNN□		4.7㎌	6.3	±10%	0.95
24	CL21A475KRFNNN□		4.7㎌	4	±10%	1.35
25	CL21A475KRCLNN□		4.7㎌	4	±10%	0.95
26	CL21A106KAYNNN□		10㎌	25	±10%	1.45
27	CL21A106KACLRN□		10㎌	25	±10%	0.95
28	CL21A106KA7LQN□		10㎌	25	±10%	0.80
29	CL21A106KOFNNN□		10㎌	16	±10%	1.35
30	CL21A106KOQNNN□		10㎌	16	±10%	1.40
31	CL21A106KOCLRN□		10㎌	16	±10%	0.95
32	CL21A106KOCL3R□		10㎌	16	±10%	0.95
33	CL21A106KPFNNN□		10㎌	10	±10%	1.35
34	CL21A106KPCLQN□		10㎌	10	±10%	0.95
35	CL21A106KQFNNN□		10㎌	6.3	±10%	1.35
36	CL21A106KQCLNN□		10㎌	6.3	±10%	0.95
37	CL21A106KRFNNN□		10㎌	4	±10%	1.35
38	CL21A106KRCLNN□		10㎌	4	±10%	0.95
39	CL21A226MAQNNN□		22㎌	25	±20%	1.40
40	CL21A226MPQNNN□		22㎌	10	±20%	1.40
41	CL21A226MPCLRN□		22㎌	10	±20%	0.95
42	CL21A226MQQNNN□		22㎌	6.3	±20%	1.40
43	CL21A226MQCLRN□		22㎌	6.3	±20%	0.95
44	CL21A226MRQNNN□		22㎌	4	±20%	1.40
45	CL21A226MRCLRN□		22㎌	4	±20%	0.95
46	CL21A336MQELNN□		33㎌	6.3	±20%	1.20
47	CL21A336MQ9LNN□		33㎌	6.3	±20%	1.00
48	CL21A336MRELNN□		33㎌	4	±20%	1.20
49	CL21A336MR9LNN□		33㎌	4	±20%	1.00
50	CL21A476MQYNNN□		47㎌	6.3	±20%	1.45
51	CL21A476MRYNNN□		47㎌	4	±20%	1.45
52	CL21A476MQ9LRN□		47㎌	6.3	±20%	1.00
1	CL31A225KC9LNN□	3.20×1.60	2.2㎌	100	±10%	1.00
2	CL31A475KBHNNN□		4.7㎌	50	±10%	1.80
3	CL31A475KB9LNN□		4.7㎌	50	±10%	1.00
4	CL31A475KAHNNN□		4.7㎌	25	±10%	1.80
5	CL31A475KACLNN□		4.7㎌	25	±10%	0.95
6	CL31A475KOHNNN□		4.7㎌	16	±10%	1.80
7	CL31A475KOCLNN□		4.7㎌	16	±10%	0.95
8	CL31A475KPHNNN□		4.7㎌	10	±10%	1.80
9	CL31A475KQHNNN□		4.7㎌	6.3	±10%	1.80
10	CL31A475KRHNNN□		4.7㎌	4	±10%	1.80
11	CL31A106KBHNNN□		10㎌	50	±10%	1.80
12	CL31A106KAHNNN□		10㎌	25	±10%	1.80
13	CL31A106KACLNN□		10㎌	25	±10%	0.95
14	CL31A106KOHNNN□		10㎌	16	±10%	1.80

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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 (Standard & High Capacitors-X5R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
15	CL31A106KOCLNN□	3.20×1.60	10㎌	16	±10%	0.95
16	CL31A106KPHNNN□		10㎌	10	±10%	1.80
17	CL31A106KPCLNN□		10㎌	10	±10%	0.95
18	CL31A106KQHNNN□		10㎌	6.3	±10%	1.80
19	CL31A106KRHNNN□		10㎌	4	±10%	1.80
20	CL31A156KQHNNN□		15㎌	6.3	±10%	1.80
21	CL31A156KRHNNN□		15㎌	4	±10%	1.80
22	CL31A226KAHNNN□		22㎌	25	±10%	1.80
23	CL31A226KOHNNN□		22㎌	16	±10%	1.80
24	CL31A226KOCLNN□		22㎌	16	±10%	0.95
25	CL31A226KPHNNN□		22㎌	10	±10%	1.80
26	CL31A226KPCLNN□		22㎌	10	±10%	0.95
27	CL31A226KQHNNN□		22㎌	6.3	±10%	1.80
28	CL31A476KPHNNN□		47㎌	10	±10%	1.80
29	CL31A476MQHNNN□		47㎌	6.3	±20%	1.80
30	CL31A476MRHNNN□		47㎌	4	±20%	1.80
31	CL31A107MQHNNN□		100㎌	6.3	±20%	1.80
32	CL31A107MRHNNN□		100㎌	4	±20%	1.80
33	CL31A107MPHNNN□		100㎌	10	±20%	1.80
1	CL32A106KQCLNN□	3.20×2.50	10㎌	6.3	±10%	0.95
2	CL32A106KRCLNN□		10㎌	4	±10%	0.95
3	CL32A106KBULNN□		10㎌	50	±10%	2.00
4	CL32A106KAJNNN□		10㎌	25	±10%	2.70
5	CL32A106KAULNN□		10㎌	25	±10%	2.00
6	CL32A106KOJNNN□		10㎌	16	±10%	2.70
7	CL32A106KPJNNN□		10㎌	10	±10%	2.70
8	CL32A226KAJNNN□		22㎌	25	±10%	2.70
9	CL32A226KOJNNN□		22㎌	16	±10%	2.70
10	CL32A226KOCLNN□		22㎌	16	±10%	0.95
11	CL32A226KPJNNN□		22㎌	10	±10%	2.70
12	CL32A226KQJNNN□		22㎌	6.3	±10%	2.70
13	CL32A226MQCLNN□		22㎌	6.3	±20%	0.95
14	CL32A226KRJNNN□		22㎌	4	±10%	2.70
15	CL32A226MRCLNN□		22㎌	4	±20%	0.95
16	CL32A476KOJNNN□		47㎌	16	±10%	2.70
17	CL32A476KPJNNN□		47㎌	10	±10%	2.70
18	CL32A476MQJNNN□		47㎌	6.3	±20%	2.70
19	CL32A476MRJNNN□		47㎌	4	±20%	2.70
20	CL32A107MPVNNN□		100㎌	10	±20%	2.80
21	CL32A107MQVNNN□		100㎌	6.3	±20%	2.80
22	CL32A107MRVNNN□		100㎌	4	±20%	2.80
23	CL32A157MQVNNN□		150㎌	6.3	±20%	2.80
24	CL32A227MQVNNN□		220㎌	6.3	±20%	2.80
1	CL43A476MQJNNN□	4.50×3.20	47㎌	6.3	±20%	2.70
2	CL43A476MRJNNN□		47㎌	4	±20%	2.70
3	CL43A107KQLNNN□		100㎌	6.3	±10%	3.50
4	CL43A107KRLNNN□		100㎌	4	±10%	3.50

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Standard & High Capacitors-X6S)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL05X224KP5NNN□	1.00×0.50	0.22㎌	10	±10%	0.55
2	CL05X224KQ5NNN□		0.22㎌	6.3	±10%	0.55
3	CL05X474KP5NNN□		0.47㎌	10	±10%	0.55
4	CL05X474KQ5NNN□		0.47㎌	6.3	±10%	0.55
5	CL05X474MR5NNN□		0.47㎌	4	±20%	0.55
6	CL05X684JQ5NNN□		0.68㎌	6.3	± 5%	0.55
7	CL05X105KA5NQN□		1㎌	25	±10%	0.60
8	CL05X105KP5NNN□		1㎌	10	±10%	0.55
9	CL05X105MQ3LNN□		1㎌	6.3	±20%	0.33
10	CL05X225MP5NUN□		2.2㎌	10	±20%	0.70
11	CL05X475MQ5NUN□		4.7㎌	6.3	±20%	0.70
12	CL05X106MR5NUN□		10㎌	4	±20%	0.70
1	CL10X474KA8NNN□	1.60×0.80	0.47㎌	25	±10%	0.90
2	CL10X474KO8NNN□		0.47㎌	16	±10%	0.90
3	CL10X474KP8NNN□		0.47㎌	10	±10%	0.90
4	CL10X474KQ8NNN□		0.47㎌	6.3	±10%	0.90
5	CL10X474KR8NNN□		0.47㎌	4	±10%	0.90
6	CL10X105KA8NNN□		1㎌	25	±10%	0.90
7	CL10X105KO8NNN□		1㎌	16	±10%	0.90
8	CL10X105KP8NNN□		1㎌	10	±10%	0.90
9	CL10X105KQ8NNN□		1㎌	6.3	±10%	0.90
10	CL10X105KR8NNN□		1㎌	4	±10%	0.90
11	CL10X225KO8NNN□		2.2㎌	16	±10%	0.90
12	CL10X225KP8NNN□		2.2㎌	10	±10%	0.90
13	CL10X225KQ8NNN□		2.2㎌	6.3	±10%	0.90
14	CL10X225KR8NNN□		2.2㎌	4	±10%	0.90
15	CL10X475KA8NQN□		4.7㎌	25	±10%	0.95
16	CL10X475KO8NQN□		4.7㎌	16	±10%	0.95
17	CL10X475KP5NNN□		4.7㎌	10	±10%	0.90
18	CL10X475KQ8NNN□		4.7㎌	6.3	±10%	0.90
19	CL10X475KR8NNN□		4.7㎌	4	±10%	0.90
20	CL10X106MP8NNN□		10㎌	10	±20%	0.90
21	CL10X106KQ8NNN□		10㎌	6.3	±10%	0.90
22	CL10X106KR8NNN□		10㎌	4	±10%	0.90
1	CL21X105KAFNNN□	2.00×1.25	1㎌	25	±10%	1.35
2	CL21X105KOFNNN□		1㎌	16	±10%	1.35
3	CL21X105KPFNNN□		1㎌	10	±10%	1.35
4	CL21X105KQFNNN□		1㎌	6.3	±10%	1.35
5	CL21X105KRFNNN□		1㎌	4	±10%	1.35
6	CL21X225KAFNNN□		2.2㎌	25	±10%	1.35
7	CL21X225KOFNNN□		2.2㎌	16	±10%	1.35
8	CL21X225KPFNNN□		2.2㎌	10	±10%	1.35
9	CL21X225KQFNNN□		2.2㎌	6.3	±10%	1.35
10	CL21X225KRFNNN□		2.2㎌	4	±10%	1.35
11	CL21X475KAQNNN□		4.7㎌	25	±10%	1.40
12	CL21X475KOFNNN□		4.7㎌	16	±10%	1.35
13	CL21X475KPFNNN□		4.7㎌	10	±10%	1.35
14	CL21X475KQFNNN□		4.7㎌	6.3	±10%	1.35

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
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Application Manual for Surface Mounting

Product Lineup (Standard & High Capacitors-X6S)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
15	CL21X475KRFNNN □	2.00×1.25	4.7㎌	4	±10%	1.35
16	CL21X106KACLRN □		10㎌	25	±10%	0.95
17	CL21X106KAYNNN □		10㎌	25	±10%	1.45
18	CL21X106KOYNNN □		10㎌	16	±10%	1.45
19	CL21X106KPCLNN □		10㎌	10	±10%	0.95
20	CL21X106KPYNNN □		10㎌	10	±10%	1.45
21	CL21X106KQQNNN □		10㎌	6.3	±10%	1.40
22	CL21X106KRQNNN □		10㎌	4	±10%	1.40
23	CL21X106KRCLNN □		10㎌	4	±10%	0.95
24	CL21X226MQQNNN □		22㎌	6.3	±20%	1.40
25	CL21X226MRQNNN □		22㎌	4	±20%	1.40
26	CL21X476MRYNNN □		47㎌	4	±20%	1.45
1	CL31X475KAHNNN □	3.20×1.60	4.7㎌	25	±10%	1.80
2	CL31X475KACLNN □		4.7㎌	25	±10%	0.95
3	CL31X475KOHNNN □		4.7㎌	16	±10%	1.80
4	CL31X475KPHNNN □		4.7㎌	10	±10%	1.80
5	CL31X475MQHNNN □		4.7㎌	6.3	±20%	1.80
6	CL31X475KRHNNN □		4.7㎌	4	±10%	1.80
7	CL31X106KACLNN □		10㎌	25	±10%	0.95
8	CL31X106KAHNNN □		10㎌	25	±10%	1.80
9	CL31X106KOHNNN □		10㎌	16	±10%	1.80
10	CL31X106KPHNNN □		10㎌	10	±10%	1.80
11	CL31X106KQHNNN □		10㎌	6.3	±10%	1.80
12	CL31X106KRHNNN □		10㎌	4	±10%	1.80
13	CL31X226KOHNNN □		22㎌	16	±10%	1.80
14	CL31X226KPHNNN □		22㎌	10	±10%	1.80
15	CL31X226KQHNNN □		22㎌	6.3	±10%	1.80
16	CL31X226KRHNNN □		22㎌	4	±10%	1.80
17	CL31X107MQHNNN □		100㎌	6.3	±20%	1.80
18	CL31X107MRHNNN □		100㎌	4	±20%	1.80
1	CL32X106KAUNNN □	3.20×2.50	10㎌	25	±10%	2.00
2	CL32X106KOJNNN □		10㎌	16	±10%	2.70
3	CL32X106KPJNNN □		10㎌	10	±10%	2.70
4	CL32X106KQJNNN □		10㎌	6.3	±10%	2.70
5	CL32X106KRJNNN □		10㎌	4	±10%	2.70
6	CL32X226KAJNNN □		22㎌	25	±10%	2.70
7	CL32X226KOJNNN □		22㎌	16	±10%	2.70
8	CL32X226KPJNNN □		22㎌	10	±10%	2.70
9	CL32X226KQJNNN □		22㎌	6.3	±10%	2.70
10	CL32X226KRJNNN □		22㎌	4	±10%	2.70
11	CL32X476MPJNNN □		47㎌	10	±20%	2.70
12	CL32X476KQJNNN □		47㎌	6.3	±10%	2.70
13	CL32X476KRJNNN □		47㎌	4	±10%	2.70
14	CL32X107MQVNNN □		100㎌	6.3	±20%	2.80
15	CL32X107MRVNNN □		100㎌	4	±20%	2.80

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Standard & High Capacitors-X7R, X7S)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL05B151KB5NNN □	1.00×0.50	150pF	50	±10%	0.55
2	CL05B181KB5NNN □		180pF	50	±10%	0.55
3	CL05B221KB5NNN □		220pF	50	±10%	0.55
4	CL05B271KB5NNN □		270pF	50	±10%	0.55
5	CL05B331KB5NNN □		330pF	50	±10%	0.55
6	CL05B391KB5NNN □		390nF	50	±10%	0.55
7	CL05B471KB5NNN □		470pF	50	±10%	0.55
8	CL05B561KB5NNN □		560pF	50	±10%	0.55
9	CL05B681KB5NNN □		680pF	50	±10%	0.55
10	CL05B102KB5NNN □		1nF	50	±10%	0.55
11	CL05B122KB5NNN □		1.2nF	50	±10%	0.55
12	CL05B152KB5NNN □		1.5nF	50	±10%	0.55
13	CL05B182KB5NNN □		1.8nF	50	±10%	0.55
14	CL05B222KB5NNN □		2.2nF	50	±10%	0.55
15	CL05B272KB5NNN □		2.7nF	50	±10%	0.55
16	CL05B332KB5NNN □		3.3nF	50	±10%	0.55
17	CL05B472KB5NNN □		4.7nF	50	±10%	0.55
18	CL05B562KB5NNN □		5.6nF	50	±10%	0.55
19	CL05B682KB5NNN □		6.8nF	50	±10%	0.55
20	CL05B822KB5NNN □		8.2nF	50	±10%	0.55
21	CL05B103KB5NNN □		10nF	50	±10%	0.55
22	CL05B123KA5NNN □		12nF	25	±10%	0.55
23	CL05B153KA5NNN □		15nF	25	±10%	0.55
24	CL05B223KA5NNN □		22nF	25	±10%	0.55
25	CL05B273KO5NNN □		27nF	16	±10%	0.55
26	CL05B333KO5NNN □		33nF	16	±10%	0.55
27	CL05B393KO5NNN □		39nF	16	±10%	0.55
28	CL05B473KO5NNN □		47nF	16	±10%	0.55
29	CL05B563KO5NNN □		56nF	16	±10%	0.55
30	CL05B683KO5NNN □		68nF	16	±10%	0.55
31	CL05B823KO5NNN □		82nF	16	±10%	0.55
32	CL05B104KO5NNN □		100nF	16	±10%	0.55
33	CL05B224KO5NNN □		220nF	16	±10%	0.55
34	CL05B474KP5NNN □		470nF	10	±10%	0.55
35	CL05B105KQ5NQN □		1㎌	6.3	±10%	0.60
1	CL05Y474KP5NNN □	1.00×0.50	470nF	10	±10%	0.55
37	CL10B101KB8NNN □	1.60×0.80	100pF	50	±10%	0.90
38	CL10B121KB8NNN □		120pF	50	±10%	0.90
39	CL10B151KB8NNN □		150pF	50	±10%	0.90
40	CL10B181KB8NNN □		180pF	50	±10%	0.90
41	CL10B201KB8NNN □		200pF	50	±10%	0.90
42	CL10B221KB8NNN □		220pF	50	±10%	0.90
43	CL10B271KB8NNN □		270pF	50	±10%	0.90
44	CL10B331KB8NNN □		330pF	50	±10%	0.90
45	CL10B391KB8NNN □		390pF	50	±10%	0.90
46	CL10B471KB8NNN □		470pF	50	±10%	0.90
47	CL10B561KB8NNN □		560pF	50	±10%	0.90
48	CL10B681KB8NNN □		680pF	50	±10%	0.90
49	CL10B751KB8NNN □		750pF	50	±10%	0.90
50	CL10B821KB8NNN □		820pF	50	±10%	0.90
51	CL10B102KB8NNN □		1nF	50	±10%	0.90
52	CL10B122KB8NNN □		1.2nF	50	±10%	0.90

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Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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 (Standard & High Capacitors-X7R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
53	CL10B152KB8NNN □	1.60×0.80	1.5nF	50	±10%	0.90
54	CL10B182KB8NNN □		1.8nF	50	±10%	0.90
55	CL10B202KB8NNN □		2nF	50	±10%	0.90
56	CL10B222KB8NNN □		2.2nF	50	±10%	0.90
57	CL10B332KB8NNN □		3.3nF	50	±10%	0.90
58	CL10B392KB8NNN □		3.9nF	50	±10%	0.90
59	CL10B472KB8NNN □		4.7nF	50	±10%	0.90
60	CL10B562KB8NNN □		5.6nF	50	±10%	0.90
61	CL10B682KB8NNN □		6.8nF	50	±10%	0.90
62	CL10B822KB8NNN □		8.2nF	50	±10%	0.90
63	CL10B103JB8NNN □		10nF	50	±5%	0.90
64	CL10B123KB8NNN □		12nF	50	±10%	0.90
65	CL10B153KB8NNN □		15nF	50	±10%	0.90
66	CL10B183KB8NNN □		18nF	50	±10%	0.90
67	CL10B223KB8NNN □		22nF	50	±10%	0.90
68	CL10B273KB8NNN □		27nF	50	±10%	0.90
69	CL10B333JB8NNN □		33nF	50	±5%	0.90
70	CL10B393KB8NNN □		39nF	50	±10%	0.90
71	CL10B473KB8NNN □		47nF	50	±10%	0.90
72	CL10B563KB8NNN □		56nF	50	±10%	0.90
73	CL10B683KB8NNN □		68nF	50	±10%	0.90
74	CL10B823KB8NNN □		82nF	50	±10%	0.90
75	CL10B104KB8NNN □		100nF	50	±10%	0.90
76	CL10B124KO8NNN □		120nF	16	±10%	0.90
77	CL10B154KA8NNN □		150nF	25	±10%	0.90
78	CL10B224KA8NNN □		220nF	25	±10%	0.90
79	CL10B474KA8NNN □		470nF	25	±10%	0.90
80	CL10B684KO8NNN □		680nF	16	±10%	0.90
81	CL10B105KA8NNN □		1㎌	25	±10%	0.90
82	CL10B225KP8NNN □		2.2㎌	10	±10%	0.90
1	CL21B151KBANNN □	2.00×1.25	150pF	50	±10%	0.75
2	CL21B181KBANNN □		180pF	50	±10%	0.75
3	CL21B221KBANNN □		220pF	50	±10%	0.75
4	CL21B331KBANNN □		330pF	50	±10%	0.75
5	CL21B391KBANNN □		390pF	50	±10%	0.75
6	CL21B471KBANNN □		470pF	50	±10%	0.75
7	CL21B511KBANNN □		510pF	50	±10%	0.75
8	CL21B561KBANNN □		560pF	50	±10%	0.75
9	CL21B681KBANNN □		680pF	50	±10%	0.75
10	CL21B821KBANNN □		820pF	50	±10%	0.75
11	CL21B102KBANNN □		1nF	50	±10%	0.75
12	CL21B122KBANNN □		1.2nF	50	±10%	0.75
13	CL21B152KBANNN □		1.5nF	50	±10%	0.75
14	CL21B182KBANNN □		1.8nF	50	±10%	0.75
15	CL21B202KBANNN □		2nF	50	±10%	0.75
16	CL21B222KBANNN □		2.2nF	50	±10%	0.75
17	CL21B272KBANNN □		2.7nF	50	±10%	0.75
18	CL21B332KBANNN □		3.3nF	50	±10%	0.75
19	CL21B472KBANNN □		4.7nF	50	±10%	0.75
20	CL21B562KBANNN □		5.6nF	50	±10%	0.75
21	CL21B682KBANNN □		6.8nF	50	±10%	0.75

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Standard & High Capacitors-X7R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
22	CL21B103KBANNN □	2.00×1.25	10nF	50	±10%	0.75
23	CL21B123KBANNN □		12nF	50	±10%	0.75
24	CL21B153KBANNN □		15nF	50	±10%	0.75
25	CL21B333KBANNN □		33nF	50	±10%	0.75
26	CL21B393KBANNN □		39nF	50	±10%	0.75
27	CL21B473KBANNN □		47nF	50	±10%	0.75
28	CL21B563KBCNNN □		56nF	50	±10%	0.95
29	CL21B683KAANNN □		68nF	25	±10%	0.75
30	CL21B683JBCNNN □		68nF	50	±5%	0.95
31	CL21B683KBFNNN □		68nF	50	±10%	1.35
32	CL21B823KBCNNN □		82nF	50	±10%	0.95
33	CL21B823KBFNNN □		82nF	50	±10%	1.35
34	CL21B104KACNNN □		100nF	25	±10%	0.95
35	CL21B104KBCNNN □		100nF	50	±10%	0.95
36	CL21B104KBFNNN □		100nF	50	±10%	1.35
37	CL21B124KBFNNN □		120nF	50	±10%	1.35
38	CL21B124KACNNN □		120nF	25	±10%	0.95
39	CL21B154KOANNN □		150nF	16	±10%	0.75
40	CL21B154KBFNNN □		150nF	50	±10%	1.35
41	CL21B224KBFNNN □		220nF	50	±10%	1.35
42	CL21B334KAFNNN □		330nF	25	±10%	1.35
43	CL21B474KAFNNN □		470nF	25	±10%	1.35
44	CL21B684KOFNNN □		680nF	16	±10%	1.35
45	CL21B105KBFNNN □		1㎌	50	±10%	1.35
46	CL21B155KAFNNN □		1.5㎌	25	±10%	1.35
47	CL21B225KAFNNN □		2.2㎌	25	±10%	1.35
48	CL21B475KQQNNN □		4.7㎌	6.3	±10%	1.40
49	CL21B475KAFNNN □		4.7㎌	25	±10%	1.35
50	CL21B106KOQNNN □		10㎌	16	±10%	1.40
1	CL31B221KBCNNN □		220pF	50	±10%	1.00
2	CL31B331KBCNNN □	3.20×1.60	330pF	50	±10%	1.00
3	CL31B471KBCNNN □		470pF	50	±10%	1.00
4	CL31B561KBCNNN □		560pF	50	±10%	1.00
5	CL31B152KBCNNN □		1.5nF	50	±10%	1.00
6	CL31B222KBCNNN □		2.2nF	50	±10%	1.00
7	CL31B332KBCNNN □		3.3nF	50	±10%	1.00
8	CL31B472KBCNNN □		4.7nF	50	±10%	1.00
9	CL31B473KBCNNN □		47nF	50	±10%	1.00
10	CL31B562KBCNNN □		5.6nF	50	±10%	1.00
11	CL31B682KBCNNN □		6.8nF	50	±10%	1.00
12	CL31B822KBCNNN □		8.2nF	50	±10%	1.00
13	CL31B103KBCNNN □		10nF	50	±10%	1.00
14	CL31B123KBCNNN □		12nF	50	±10%	1.00
15	CL31B153KBCNNN □		15nF	50	±10%	1.00
16	CL31B223KBCNNN □		22nF	50	±10%	1.00
17	CL31B333KBCNNN □		33nF	50	±10%	1.00
18	CL31B683KBCNNN □		68nF	50	±10%	1.00
19	CL31B104KBCNNN □		100nF	50	±10%	1.00
20	CL31B154KBCNNN □		150nF	50	±10%	1.00
21	CL31B224KBFNNN □		220nF	50	±10%	1.40
22	CL31B334KBFNNN □		330nF	50	±10%	1.40

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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 (Standard & High Capacitors-X7R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
23	CL31B334KACNNN □	3.20×1.60	330nF	25	±10%	1.00
24	CL31B474KBHNNN □		470nF	50	±10%	1.80
25	CL31B474MAFNNN □		470nF	25	±20%	1.40
26	CL31B684KOCNNN □		680nF	16	±10%	1.00
27	CL31B684KBHNNN □		680nF	50	±10%	1.80
28	CL31B105KBHNNN □		1㎌	50	±10%	1.80
29	CL31B225KAHNNN □		2.2㎌	25	±10%	1.80
30	CL31B335KAHNNN □		3.3㎌	25	±10%	1.80
31	CL31B475KBHNNN □		4.7㎌	50	±10%	1.80
32	CL31B106KBHNNN □		10㎌	50	±10%	1.80
33	CL31B226KPHNNN □		22㎌	10	±10%	1.80
1	CL32B104KBFNNN □	3.20×2.50	100nF	50	±10%	1.45
2	CL32B154KBFNNN □		150nF	50	±10%	1.45
3	CL32B224KBFNNN □		220nF	50	±10%	1.45
4	CL32B334KBFNNN □		330nF	50	±10%	1.45
5	CL32B474KBFNNN □		470nF	50	±10%	1.45
6	CL32B105KBHNNN □		1㎌	50	±10%	1.80
7	CL32B225KBJNNN □		2.2㎌	50	±10%	2.70
8	CL32B225KAINNN □		2.2㎌	25	±10%	2.20
9	CL32B475KBJNNN □		4.7㎌	50	±10%	2.70
10	CL32B475KBUYNN □		4.7㎌	50	±10%	2.00
11	CL32B475KOINNN □		4.7㎌	16	±10%	2.20
12	CL32B106KLJNNN □		10㎌	35	±10%	2.70
13	CL32B106KAULNN □		10㎌	25	±10%	2.00
14	CL32B106KPINNN □		10㎌	10	±10%	2.20
15	CL32B226KAJNNN □		22㎌	25	±10%	2.70
16	CL32B476MQJNN □		47㎌	6.3	±20%	2.70

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

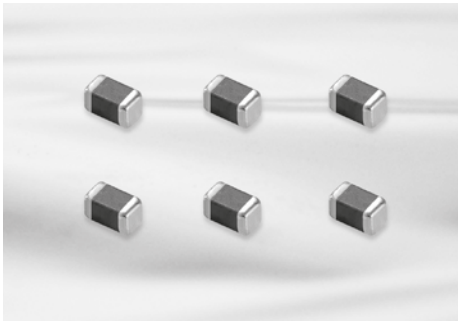
Product Lineup (Standard & High Capacitors-Y5V)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL05F224ZO5NNN □	1.00×0.50	0.22㎌	16	+80/–20%	0.55
2	CL05F224ZP5NNN □		0.22㎌	10	+80/–20%	0.55
3	CL05F224ZQ5NNN □		0.22㎌	6.3	+80/–20%	0.55
4	CL05F474ZP5NNN □		0.47㎌	10	+80/–20%	0.55
5	CL05F474ZQ5NNN □		0.47㎌	6.3	+80/–20%	0.55
6	CL05F105ZQ5NNN □		1㎌	6.3	+80/–20%	0.55
1	CL10F474ZB8NNN □	1.60×0.80	0.47㎌	50	+80/–20%	0.90
2	CL10F474ZA8NNN □		0.47㎌	25	+80/–20%	0.90
3	CL10F474ZO8NNN □		0.47㎌	16	+80/–20%	0.90
4	CL10F474ZP8NNN □		0.47㎌	10	+80/–20%	0.90
5	CL10F105ZO8NNN □		1㎌	16	+80/–20%	0.90
6	CL10F105ZP8NNN □		1㎌	10	+80/–20%	0.90
7	CL10F225ZP8NNN □		2.2㎌	10	+80/–20%	0.90
8	CL10F225ZQ8NNN □		2.2㎌	6.3	+80/–20%	0.90
9	CL10F475ZQ8NNN □		4.7㎌	6.3	+80/–20%	0.90
1	CL21F105ZBFNNN □	2.00×1.25	1㎌	50	+80/–20%	1.35
2	CL21F105ZAFNNN □		1㎌	25	+80/–20%	1.35
3	CL21F105ZOFNNN □		1㎌	16	+80/–20%	1.35
4	CL21F225ZAFNNN □		2.2㎌	25	+80/–20%	1.35
5	CL21F225ZOFNNN □		2.2㎌	16	+80/–20%	1.35
6	CL21F475ZQFNNN □		4.7㎌	6.3	+80/–20%	1.35
7	CL21F475ZOFNNN □		4.7㎌	16	+80/–20%	1.35
8	CL21F475ZPFNNN □		4.7㎌	10	+80/–20%	1.35
9	CL21F106ZPFNNN □		10㎌	10	+80/–20%	1.35
10	CL21F106ZPCLNN □		10㎌	10	+80/–20%	0.95
11	CL21F106ZQFNNN □		10㎌	6.3	+80/–20%	1.35
12	CL21F106ZQCLNN □		10㎌	6.3	+80/–20%	0.95
1	CL31F475ZOFNNN □	3.20×1.60	4.7㎌	16	+80/–20%	1.40
2	CL31F475ZPFNNN □		4.7㎌	10	+80/–20%	1.40
3	CL31F475ZQFNNN □		4.7㎌	6.3	+80/–20%	1.40
4	CL31F106ZOHNNN □		10㎌	16	+80/–20%	1.80
5	CL31F106ZPHNNN □		10㎌	10	+80/–20%	1.80
6	CL31F106ZQHNNN □		10㎌	6.3	+80/–20%	1.80
7	CL31F226ZPHNNN □		22㎌	10	+80/–20%	1.80
8	CL31F226ZQHNNN □		22㎌	6.3	+80/–20%	1.80
1	CL32F106ZAHNNN □	3.20×2.50	10㎌	25	+80/–20%	1.80
2	CL32F106ZOELNN □		10㎌	16	+80/–20%	1.20
3	CL32F226ZPJNNN □		22㎌	10	+80/–20%	2.70
4	CL32F226ZPJLNN □		22㎌	10	+80/–20%	2.70
5	CL32F476ZQINNN □		47㎌	6.3	+80/–20%	2.20
6	CL32F107ZQJNNN □		100㎌	6.3	+80/–20%	2.70

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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 Capacitors



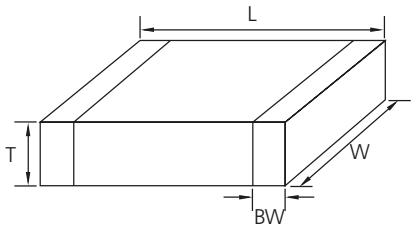
Feature

- Small chip size
- 02 and 03 series (High-Q) 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

Structure and Dimensions



Code	EIA Code	Dimension (㎜)			
		L	W	T	BW
02	01005	0.4±0.02	0.2±0.02	0.2±0.02	0.10±0.03
03	0201	0.6±0.03	0.3±0.03	0.3±0.03	0.15±0.05

Super Small Size Capacitance Table (C0G)

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

Super Small Size Capacitance Table (High-Q)

TC	Size (mm)	Vr(V)	Capacitance (pF) 0.2	1	10	15	27	33	47	100
C0G	01005(0402)	25	■	■	■	■	■			
	0201(0603)	25					■	■	■	
		50	■	■	■	■				

Super Small Size Capacitance Table (X7R,X6S)

TC	Size (mm)	Vr(V)	Capacitance (nF) 0.1	0.22	0.47	1	2.2	3.3	4.7	10
X7R	01005(0402)	10	■	■	■	■				
	0201(0603)	10					■	■	■	■
		16			■	■	■	■	■	■
		25			■	■	■	■	■	■
		50			■	■	■			
X6S	0201(0603)	4	■							

Super Small Size Capacitance Table (X5R, Y5V)

TC	Size (mm)	Vr(V)	Capacitance (μF) 0.01	0.1	0.22	0.47	1	2.2	4.7	10
X5R	01005(0402)	6.3	■	■	■					
		10		■						
		16		■						
	0201(0603)	4		X5R or X6S						
		6.3		■	■	■	■	■	■	
		10		■	■	■	■			
		16		■	■	■	■			
		25		■						
Y5V	0201(0603)	6.3		■						

Product Lineup (Super Small Size Capacitors-C0G)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)	
1	CL02C0R5CO2ANN □	0.40×0.20	0.5pF	16	±0.25pF	0.22	
2	CL02C010CO2ANN □		1.0pF	16	±0.25pF	0.22	
3	CL02C1R2CO2ANN □		1.2pF	16	±0.25pF	0.22	
4	CL02C1R5CO2ANN □		1.5pF	16	±0.25pF	0.22	
5	CL02C1R8CO2ANN □		1.8pF	16	±0.25pF	0.22	
6	CL02C020CO2ANN □		2.0pF	16	±0.25pF	0.22	
7	CL02C2R2CO2ANN □		2.2pF	16	±0.25pF	0.22	
8	CL02C2R7CO2ANN □		2.7pF	16	±0.25pF	0.22	
9	CL02C030CO2ANN □		3.0pF	16	±0.25pF	0.22	
10	CL02C3R3CO2ANN □		3.3pF	16	±0.25pF	0.22	
11	CL02C3R9CO2ANN □		3.9pF	16	±0.25pF	0.22	
12	CL02C4R7CO2ANN □		4.7pF	16	±0.25pF	0.22	
13	CL02C5R6DO2ANN □		5.6pF	16	±0.5pF	0.22	
14	CL02C6R8DO2ANN □		6.8pF	16	±0.5pF	0.22	
15	CL02C8R2DO2ANN □		8.2pF	16	±0.5pF	0.22	
16	CL02C090DO2ANN □		9.0pF	16	±0.5pF	0.22	
17	CL02C100JO2ANN □		10pF	16	±5%	0.22	
18	CL02C150JO2ANN □		15pF	16	±5%	0.22	
19	CL02C180JO2ANN □		18pF	16	±5%	0.22	
20	CL02C220JO2ANN □		22pF	16	±5%	0.22	
21	CL02C270JO2ANN □		27pF	16	±5%	0.22	
22	CL02C330JO2ANN □		33pF	16	±5%	0.22	
23	CL02C390JO2ANN □		39pF	16	±5%	0.22	
24	CL02C470JO2ANN □		47pF	16	±5%	0.22	
25	CL02C560JQ2ANN □		56pF	6.3	±5%	0.22	
26	CL02C680JQ2ANN □		68pF	6.3	±5%	0.22	
27	CL02C820JQ2ANN □		82pF	6.3	±5%	0.22	
28	CL02C101JO2ANN □		100pF	16	±5%	0.22	
29	CL02C101JQ2ANN □		100pF	6.3	±5%	0.22	
1	CL02C0R5BO2GNN □	0.40×0.20	0.5pF	16	±0.25pF	0.22	High-Q
2	CL02C010BO2GNN □		1.0pF	16	±0.25pF	0.22	High-Q
3	CL02C1R2BO2GNN □		1.2pF	16	±0.25pF	0.22	High-Q
4	CL02C1R5BO2GNN □		1.5pF	16	±0.25pF	0.22	High-Q
5	CL02C1R8BO2GNN □		1.8pF	16	±0.25pF	0.22	High-Q
6	CL02C2R2BO2GNN □		2.2pF	16	±0.25pF	0.22	High-Q
7	CL02C2R7BO2GNN □		2.7pF	16	±0.25pF	0.22	High-Q
8	CL02C3R3BO2GNN □		3.3pF	16	±0.25pF	0.22	High-Q
9	CL02C3R9BO2GNN □		3.9pF	16	±0.25pF	0.22	High-Q
10	CL02C4R7BO2GNN □		4.7pF	16	±0.25pF	0.22	High-Q
11	CL02C5R6BO2GNN □		5.6pF	16	±0.25pF	0.22	High-Q
12	CL02C6R8BO2GNN □		6.8pF	16	±0.25pF	0.22	High-Q
13	CL02C8R2BO2GNN □		8.2pF	16	±0.25pF	0.22	High-Q
14	CL02C100JO2GNN □		10pF	16	±5%	0.22	High-Q
15	CL02C120JO2GNN □		12pF	16	±5%	0.22	High-Q
16	CL02C150JO2GNN □		15pF	16	±5%	0.22	High-Q
17	CL02C180JO2GNN □		18pF	16	±5%	0.22	High-Q
18	CL02C220JO2GNN □		22pF	16	±5%	0.22	High-Q
19	CL02C270JO2GNN □		27pF	16	±5%	0.22	High-Q
1	CL03C0R5CA3GNN □	0.60×0.30	0.5pF	25	±0.25pF	0.33	High-Q
2	CL03C010CA3GNN □		1.0pF	25	±0.25pF	0.33	High-Q
3	CL03C1R2CA3GNN □		1.2pF	25	±0.25pF	0.33	High-Q
4	CL03C1R5CA3GNN □		1.5pF	25	±0.25pF	0.33	High-Q

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Super Small Size Capacitors-C0G)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)	
5	CL03C1R8CA3GNN □	0.60×0.30	1.8pF	25	±0.25pF	0.33	High-Q
6	CL03C020CA3GNN □		2.0pF	25	±0.25pF	0.33	High-Q
7	CL03C2R2CA3GNN □		2.2pF	25	±0.25pF	0.33	High-Q
8	CL03C2R7CA3GNN □		2.7pF	25	±0.25pF	0.33	High-Q
9	CL03C030CA3GNN □		3.0pF	25	±0.25pF	0.33	High-Q
10	CL03C3R3CA3GNN □		3.3pF	25	±0.25pF	0.33	High-Q
11	CL03C3R9CA3GNN □		3.9pF	25	±0.25pF	0.33	High-Q
12	CL03C4R7CA3GNN □		4.7pF	25	±0.25pF	0.33	High-Q
13	CL03C5R6DA3GNN □		5.6pF	25	±0.5pF	0.33	High-Q
14	CL03C6R8DA3GNN □		6.8pF	25	±0.5pF	0.33	High-Q
15	CL03C8R2DA3GNN □		8.2pF	25	±0.5pF	0.33	High-Q
16	CL03C090DA3GNN □		9.0pF	25	±0.5pF	0.33	High-Q
17	CL03C100JA3GNN □		10pF	25	±5%	0.33	High-Q
18	CL03C150JA3ANN □		15pF	25	±5%	0.33	
19	CL03C180JA3ANN □		18pF	25	±5%	0.33	
20	CL03C220JA3ANN □		22pF	25	±5%	0.33	
21	CL03C270JA3ANN □		27pF	25	±5%	0.33	
22	CL03C330JA3ANN □		33pF	25	±5%	0.33	
23	CL03C390JA3ANN □		39pF	25	±5%	0.33	
24	CL03C470JA3ANN □		47pF	25	±5%	0.33	
25	CL03C101JB3ANN □		100pF	50	±5%	0.33	
26	CL03C101JA3ANN □		100pF	25	±5%	0.33	

Product Lineup (Super Small Size Capacitors-X7R,X6S)

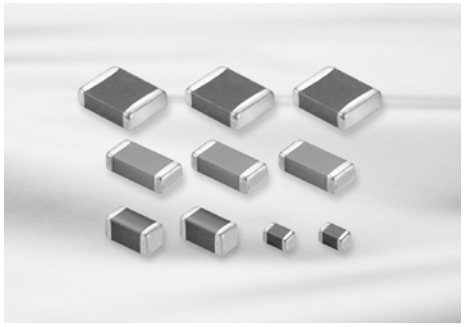
	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL02B101KP2NNN □	0.40×0.20	100pF	10	±10%	0.22
2	CL02B221KP2NNN □		220pF	10	±10%	0.22
3	CL02B271KP2NNN □		270pF	10	±10%	0.22
4	CL02B331KP2NNN □		330pF	10	±10%	0.22
5	CL02B391KP2NNN □		390pF	10	±10%	0.22
6	CL02B471KP2NNN □		470pF	10	±10%	0.22
7	CL02B681KP2NNN □		680pF	10	±10%	0.22
8	CL02B102KP2NNN □		1nF	10	±10%	0.22
1	CL03B151KA3NNN □	0.60×0.30	150pF	25	±10%	0.33
2	CL03B221KA3NNN □		220pF	25	±10%	0.33
3	CL03B271KO3NNN □		270pF	16	±10%	0.33
4	CL03B331KA3NNN □		330pF	25	±10%	0.33
5	CL03B471KA3NNN □		470pF	25	±10%	0.33
6	CL03B561KO3NNN □		560pF	16	±10%	0.33
7	CL03B681KA3NNN □		680pF	25	±10%	0.33
8	CL03B821KO3NNN □		820pF	16	±10%	0.33
9	CL03B102KA3NNN □		1nF	25	±10%	0.33
10	CL03B152KP3NNN □		1.5nF	10	±10%	0.33
11	CL03B332KP3NNN □		3.3nF	10	±10%	0.33
12	CL03B392KP3NNN □		3.9nF	10	±10%	0.33
13	CL03B472KP3NNN □		4.7nF	10	±10%	0.33
14	CL03B682KP3NNN □		6.8nF	10	±10%	0.33
15	CL03B103KP3NNN □		10nF	10	±10%	0.33
1	CL03X104KQ3NNN □		100nF	6.3	±20%	0.33
2	CL03X105MR3CSN □		1μF	4	±20%	0.35
3	CL03X105MR3NRN □		1μF	4	±20%	0.39

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Super Small Size Capacitors-X5R)

	Part Number	Size L x 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
14	CL02A224MR2NNN □		220nF	4	±20%	0.22
15	CL02A224MQ2NNN □		220nF	6.3	±20%	0.22
1	CL03A103KA3NNN □	0.60×0.30	10nF	25	±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 □		220nF	10	±10%	0.33
10	CL03A105MO3NRN □		1nF	16	±20%	0.39
11	CL03A105MQ3CSN □		1μF	6.3	±20%	0.35
12	CL03A105MP3NSN □		1μF	10	±20%	0.35
13	CL03A225MR3CRN □		2.2μF	4	±20%	0.39
14	CL03A225MQ3CRN □		2.2μF	6.3	±20%	0.39

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.



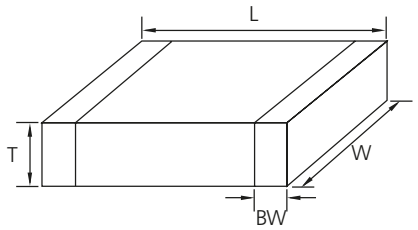
Feature

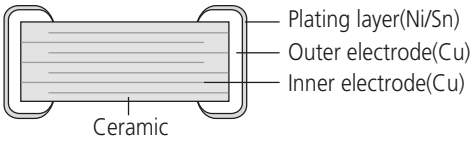
- High Q and low ESR in high frequency range
- Tight tolerance available
- High efficiency and low power consumption in RF circuit
- Can be applied to power amplifier module for base-station and GHz range communications

Application

- Base Station
- Set Top Box
- Wireless Equipment
- GPS, Bluetooth

Structure and Dimensions



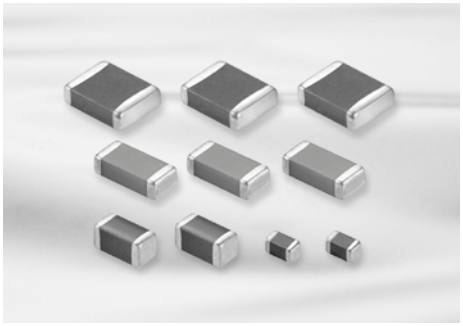


Code	EIA Code	Rated Voltage	Dimension (mm)			
			L	W	T	BW
05	0402	50V	1.00±0.05	0.50±0.05	0.50±0.05	0.25±0.10
10	0603	50/100V	1.60±0.10	0.80±0.10	0.80±0.10	0.30±0.20
		250V	1.60±0.15	0.80±0.15	0.65±0.10	0.30±0.20
21	0805	250V	2.00±0.15	1.25±0.15	0.85±0.15	0.50+0.20/−0.30

Capacitance Table (High-Q capacitor)

TC	Size (mm)	Vr(V)	Capacitance (pF) 0.2 0.5 1 10 15 27 33 47 68 100 150 220
COG	0402(1005)	50	
	0603(1608)	50	
		100	
		250	
	0805(2012)	250	

Medium-High Voltage Capacitors



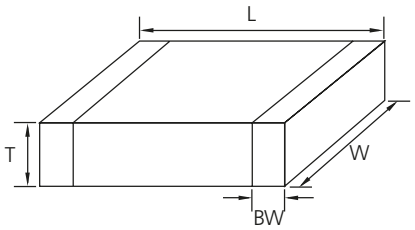
Feature

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

Application

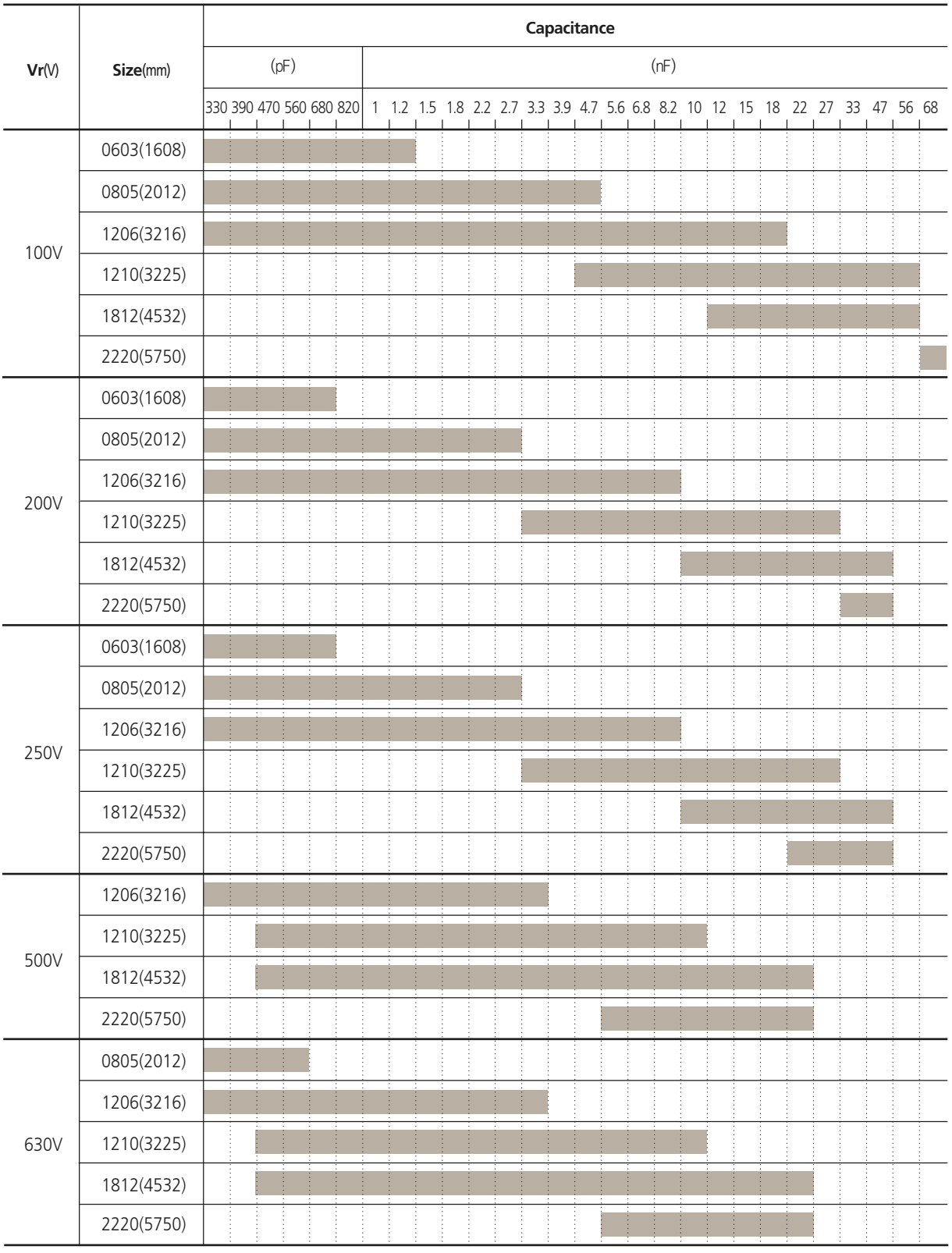
- Switching Power Circuit(SMPS)
- Lighting Ballast, LCD back lighting inverter
- DC-DC converter input filter, snubber circuit
- Phone, Fax, Modem
- Network(IEEE802.3)

Structure and Dimensions

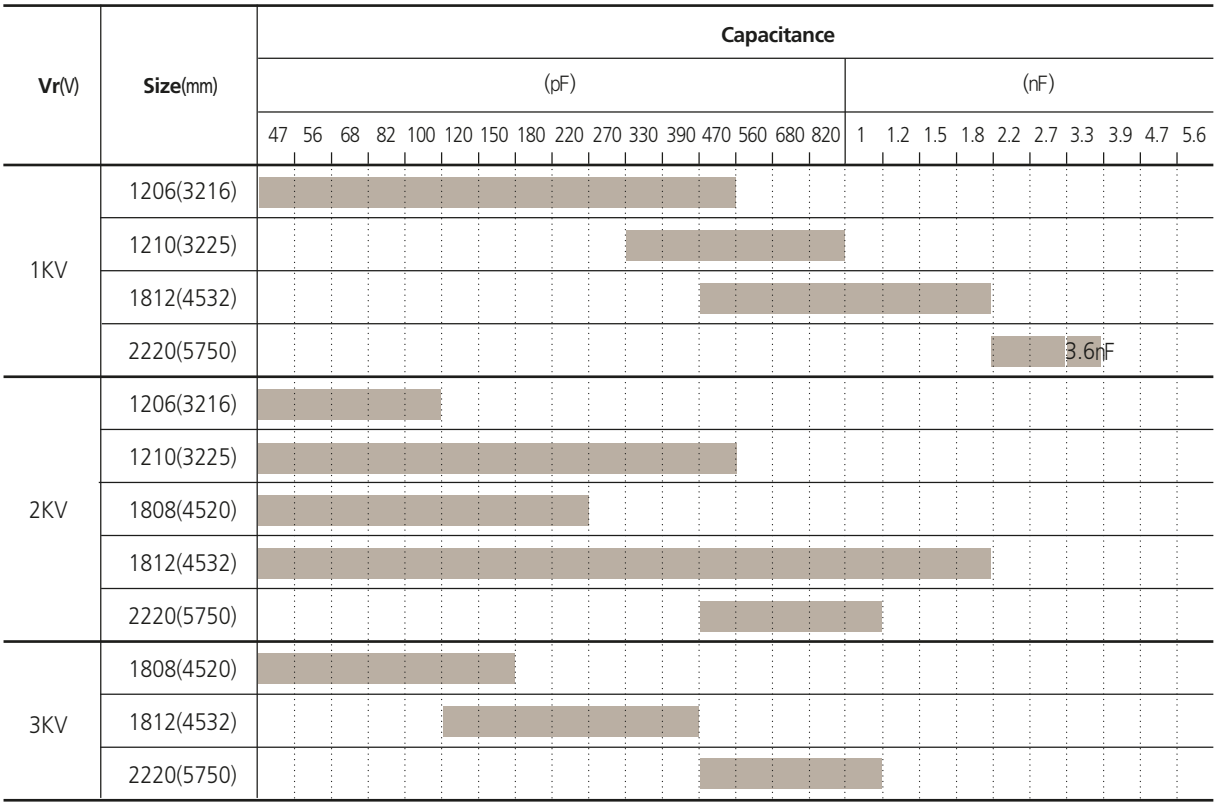


Code	EIA Code	Dimension (mm)				
		L	W	T	Thickness Code	BW
10	0603	1.60±0.10	0.80±0.10	0.80±0.10	8	0.3±0.2
21	0805	2.00±0.10	1.25±0.10	1.25±0.10	F	0.5+0.2/–0.3
		2.00±0.10	1.25±0.10	0.85±0.10	C	
		2.00±0.10	1.25±0.10	0.65±0.10	A	
31	1206	3.20±0.20	1.60±0.20	1.60±0.20	H	0.5±0.3
		3.20±0.15	1.60±0.15	1.25±0.15	F	
		3.20±0.15	1.60±0.15	0.85±0.15	C	
32	1210	3.20±0.30	2.50±0.20	2.50±0.20	J	0.6±0.3
		3.20±0.30	2.50±0.20	1.60±0.20	H	
		3.20±0.30	2.50±0.20	1.25±0.20	F	
42	1808	4.50±0.40	2.00±0.20	2.00±0.20	I	0.8±0.3
		4.50±0.40	2.00±0.20	1.60±0.20	H	
		4.50±0.40	2.00±0.20	1.25±0.20	F	
43	1812	4.50±0.40	3.20±0.30	2.50±0.20	J	0.8±0.3
		4.50±0.40	3.20±0.30	1.60±0.20	H	
		4.50±0.40	3.20±0.30	1.25±0.20	F	
55	2220	5.70±0.40	5.00±0.40	2.50±0.20	J	1.0±0.3
		5.70±0.40	5.00±0.40	1.60±0.20	H	

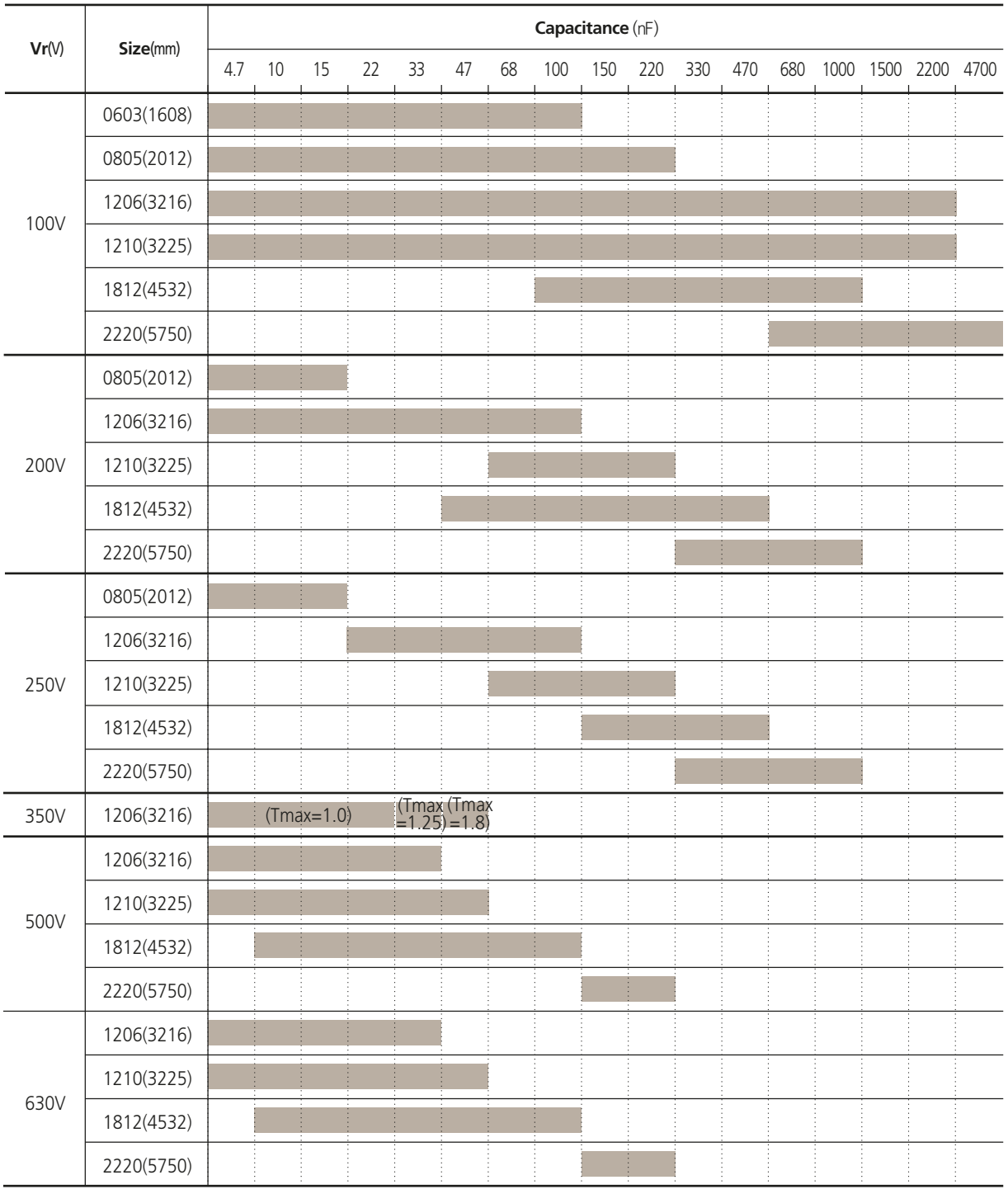
Medium-High Voltage capacitance Table (C0G)



Medium-High Voltage capacitance Table (C0G)



Medium-High Voltage capacitance Table (X7R)



Medium-High Voltage capacitance Table (X7R)

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

Product Lineup (Medium-High Voltage Capacitors-C0G)

	Part Number	Size L x 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 □		56pF	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	CL21C150JCANNN □		15pF	100	±5%	0.75
4	CL21C150JDCNNN □		15pF	200	±5%	0.95
5	CL21C180JCANNN □		18pF	100	±5%	0.75
6	CL21C180JDCNNN □		18pF	200	±5%	0.95
7	CL21C220JCANNN □		22pF	100	±5%	0.75
8	CL21C270JCANNN □		27pF	100	±5%	0.75
9	CL21C270JHFNNN □		27pF	630	±5%	1.35
10	CL21C330JCANNN □		33pF	100	±5%	0.75
11	CL21C330JDCNNN □		33pF	200	±5%	0.95
12	CL21C330JHFNNN □		33pF	630	±5%	1.35
13	CL21C390JDCNNN □		39pF	200	±5%	0.95
14	CL21C470JCANNN □		47pF	100	±5%	0.75
15	CL21C470JDCNNN □		47pF	200	±5%	0.95
16	CL21C470JHFNNN □		47pF	630	±5%	1.35
17	CL21C560JCCNNN □		56pF	100	±5%	0.95
18	CL21C560JDCNNN □		56pF	200	±5%	0.95
19	CL21C680JCANNN □		68pF	100	±5%	0.75
20	CL21C680JDCNNN □		68pF	200	±5%	0.95
21	CL21C680JHFNNN □		68pF	630	±5%	1.35
22	CL21C820JCCNNN □		82pF	100	±5%	0.95
23	CL21C101JCANNN □		100pF	100	±5%	0.75
24	CL21C101JDCNNN □		100pF	200	±5%	0.95
25	CL21C101JECNNN □		100pF	250	±5%	0.95

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Medium-High Voltage Capacitors-C0G)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
26	CL21C121JDCNNN □	2.00×1.25	120pF	200	±5%	0.95
27	CL21C151JCANNN □		150pF	100	±5%	0.75
28	CL21C151JHFNNN □		150pF	630	±5%	1.35
29	CL21C221JCANNN □		220pF	100	±5%	0.75
30	CL21C221JDCNNN □		220pF	200	±5%	0.95
31	CL21C331JCANNN □		330pF	100	±5%	0.75
32	CL21C471JCCNNN □		470pF	100	±5%	0.95
33	CL21C561JCCNNN □		560pF	100	±5%	0.95
34	CL21C561JHFNNN □		560pF	630	±5%	1.35
35	CL21C681JCCNNN □		680pF	100	±5%	0.95
36	CL21C102JCFNNN □		1nF	100	±5%	1.35
37	CL21C102JDFNNN □		1nF	200	±5%	1.35
38	CL21C272JDFNNN □		2.7nF	200	±5%	1.35
39	CL21C272JEFNNN □		2.7nF	250	±5%	1.35
40	CL21C472JCFNNN □		4.7nF	100	±5%	1.35
1	CL31C150JGFNNN □	3.20×1.60	15pF	500	±5%	1.40
2	CL31C180JGFNNN □		18pF	500	±5%	1.40
3	CL31C220JGFNNN □		22pF	500	±5%	1.40
4	CL31C220JJHNNN □		22pF	2000	±5%	1.80
5	CL31C270JGFNNN □		27pF	500	±5%	1.40
6	CL31C330JGFNNN □		33pF	500	±5%	1.40
7	CL31C390JGFNNN □		39pF	500	±5%	1.40
8	CL31C470JGFNNN □		47pF	500	±5%	1.40
9	CL31C470JHFNNN □		47pF	630	±5%	1.40
10	CL31C470JIFNNN □		47㎌	1000	±5%	1.40
11	CL31C470JJHNNN □		47pF	2000	±5%	1.80
12	CL31C560JGFNNN □		56pF	500	±5%	1.40
13	CL31C680JCCNNN □		68pF	100	±5%	1.00
14	CL31C680JGFNNN □		68pF	500	±5%	1.40
15	CL31C680JHFNNN □		68pF	630	±5%	1.40
16	CL31C680JIFNNN □		68pF	1000	±5%	1.40
17	CL31C820JGFNCN □		82pF	500	±5%	1.40
18	CL31C101JGFNNN □		100pF	500	±5%	1.40
19	CL31C101JHFNNN □		100pF	630	±5%	1.40
20	CL31C101JIFNNN □		100pF	1000	±5%	1.40
21	CL31C101JJHNNN □		100pF	2000	±5%	1.80
22	CL31C121JGFNNN □		120pF	500	±5%	1.40
23	CL31C151JGFNNN □		150pF	500	±5%	1.40
24	CL31C181JGFNNN □		180pF	500	±5%	1.40
25	CL31C221JGFNNN □		220pF	500	±5%	1.40
26	CL31C271JGFNNN □		270pF	500	±5%	1.40
27	CL31C271JCCNNN □		270pF	100	±5%	1.00
28	CL31C331JGFNNN □		330pF	500	±5%	1.40
29	CL31C331JIHNNN □		330pF	1000	±5%	1.80
30	CL31C391JCCNNN □		390pF	100	±5%	1.00
31	CL31C471JGFNNN □		470pF	500	±5%	1.40
32	CL31C471JHFNNN □		470pF	630	±5%	1.40
33	CL31C471JIFNNN □		470pF	1000	±5%	1.40
34	CL31C561JCCNNN □		560pF	100	±5%	1.00
35	CL31C561JGFNNN □		560pF	500	±5%	1.40
36	CL31C681JGFNNN □		680pF	500	±5%	1.80
37	CL31C821JHHNNN □		820pF	630	5%	1.80

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Medium-High Voltage Capacitors-C0G)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
36	CL31C102JCCNNN □	3.20×1.60	1nF	100	±5%	1.00
37	CL31C102JGHNNN □		1nF	500	±5%	1.80
38	CL31C152JCCNNN □		1.5nF	100	±5%	1.00
39	CL31C222JCCNNN □		2.2nF	100	±5%	1.00
40	CL31C332JGHNNN □		3.3nF	500	±5%	1.80
41	CL31C332JHHNNN □		3.3nF	630	±5%	1.80
42	CL31C392JCHNNN □		3.9nF	100	±5%	1.80
43	CL31C822JDHNNN □		8.2nF	200	±5%	1.80
44	CL31C822JEHNNN □		8.2nF	250	±5%	1.80
45	CL31C183JCHNNN □		18nF	100	±5%	1.80
1	CL32C101JJFNNN □	3.20×2.50	100pF	2000	±5%	1.45
2	CL32C471JJJNNN □		470pF	2000	±5%	2.70
3	CL32C821JIJNNN □		820pF	1000	±5%	2.70
4	CL32C103JGJNNN □		10nF	500	±5%	2.70
5	CL32C103JHJNNN □		10nF	630	±5%	2.70
6	CL32C273JDJNNN □		27nF	200	±5%	2.70
7	CL32C273JEJNNN □		27nF	250	±5%	2.70
8	CL32C563JCJNNN □		56nF	100	±5%	2.70
1	CL42C100JKFNNN □	4.50×2.00	10pF	3000	±5%	1.45
2	CL42C151JKINNN □		150pF	3000	±5%	2.20
3	CL42C221JJHNNN □		220pF	2000	±5%	1.80
1	CL43C391JKJNNN □	4.50×3.20	390pF	3000	±5%	2.70
2	CL43C102 JIHNNN □		1nF	1000	±5%	1.80
3	CL43C122 JIINNN □		1.2nF	1000	±5%	2.20
4	CL43C182 JIJNNN □		1.8nF	1000	±5%	2.70
5	CL43C182JJJNNN □		1.8nF	2000	±5%	2.70
6	CL43C223JGJNNN □		22nF	500	±5%	2.70
7	CL43C223JHJNNN □		22nF	630	±5%	2.70
8	CL43C473JDJNNN □		47nF	200	±5%	2.70
9	CL43C473JEJNNN □		47nF	250	±5%	2.70
10	CL43C563JCJNNN □		56nF	100	±5%	2.70
1	CL55C102JJJNNN □	5.70×5.00	1nF	2000	±5%	2.70
2	CL55C102JKJNNN □		1nF	3000	±5%	2.70
3	CL55C362JIJNNN □		3.6nF	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

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Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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 x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL10B102KC8NNN □	1.60 x 0.80	1nF	100	±10%	0.90
2	CL10B472KC8NNN □		4.7nF	100	±10%	0.90
3	CL10B103KC8NNN □		10nF	100	±10%	0.90
4	CL10B104KC8NNN □		100nF	100	±10%	0.90
1	CL21B221KDCNNN □	2.00×1.25	220pF	200	±10%	0.95
2	CL21B221KCANNN □		220pF	100	±10%	0.75
3	CL21B331KDCNNN □		330pF	200	±10%	0.95
4	CL21B471KCANNN □		470pF	100	±10%	0.75
5	CL21B102KDCNNN □		1nF	200	±10%	0.95
6	CL21B102KCANNN □		1nF	100	±10%	0.75
7	CL21B222KDCNNN □		2.2nF	200	±10%	0.95
8	CL21B222KCANNN □		2.2nF	100	±10%	0.75
9	CL21B332KCANNN □		3.3nF	100	±10%	0.75
10	CL21B472KDCNNN □		4.7nF	200	±10%	0.95
11	CL21B472KCANNN □		4.7nF	100	±10%	0.75
12	CL21B682KCANNN □		6.8nF	100	±10%	0.75
13	CL21B103KDCNNN □		10nF	200	±10%	0.95
14	CL21B103KCANNN □		10nF	100	±10%	0.75
15	CL21B153KEFNNN □		15nF	250	±10%	1.35
16	CL21B153KDFNNN □		15nF	200	±10%	1.35
17	CL21B153KCCNNN □		15nF	100	±10%	0.95
18	CL21B223KCFNNN □		22nF	100	±10%	1.35
19	CL21B473KCFNNN □		47nF	100	±10%	1.35
20	CL21B683KCFNNN □		68nF	100	±10%	1.35
21	CL21B154KCFNNN □		150nF	100	±10%	1.35
22	CL21B224KCFNNN □		220nF	100	±10%	1.35
1	CL31B221KGFNNN □	3.20×1.60	220pF	500	±10%	1.40
2	CL31B471KGFNNN □		470pF	500	±10%	1.40
3	CL31B471KDCNNN □		470pF	200	±10%	1.00
4	CL31B102KJHNNN □		1nF	2000	±10%	1.80
5	CL31B102KI FNNN □		1nF	1000	±10%	1.40
6	CL31B102KGFNNN □		1nF	500	±10%	1.40
7	CL31B102KHFNNN □		1nF	630	±10%	1.40
8	CL31B152KGFNNN □		1.5nF	500	±10%	1.40
9	CL31B152KJHNNN □		1.5nF	2000	±10%	1.80
10	CL31B222KIFNNN □		2.2nF	1000	±10%	1.40
11	CL31B222KDCNNN □		2.2nF	200	±10%	1.00
12	CL31B222KGFNNN □		2.2nF	500	±10%	1.40
13	CL31B222KJHNNN □		2.2nF	2000	±10%	1.80
14	CL31B332KGFNNN □		3.3nF	500	±10%	1.40
15	CL31B332KIFNNN □		3.3nF	1000	±10%	1.40
16	CL31B472KGFNNN □		4.7nF	500	±10%	1.40

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Medium-High Voltage Capacitors-X7R)

	Part Number	Size L x 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	CL31B223KHHNNN □		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	CL31B333KHHNNN □		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 □		1㎌	100	±10%	1.80
47	CL31B155KCHNNN □		1.5㎌	100	±10%	1.80
48	CL31B225KCHNNN □		2.2㎌	100	±10%	1.80
1	CL32B102KJFNNN □	3.20×2.50	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	CL32B333KHHNNN □		33nF	630	±10%	1.80
9	CL32B333KGHNNN □		33nF	500	±10%	1.80
10	CL32B473KHHNNN □		47nF	630	±10%	1.80

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Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
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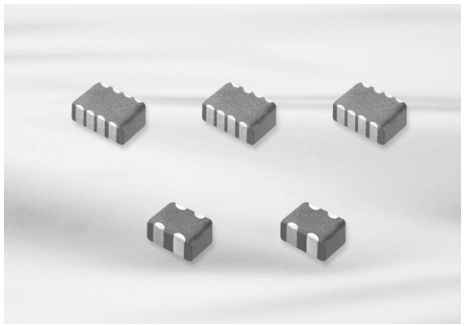
Application Manual for Surface Mounting

Product Lineup (Medium-High Voltage Capacitors-X7R)

	Part Number	Size L x 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	CL32B104KEJNNN □		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 □		1㎌	100	±10%	2.70
25	CL32B155KCHNNN □		1.5㎌	100	±10%	1.80
26	CL32B225KCJNNN □		2.2㎌	100	±10%	2.70
1	CL43B102KJFNNN □	4.50×3.20	1nF	2000	±10%	1.45
2	CL43B152KJFNNN □		1.5nF	2000	±10%	1.45
3	CL43B222KIFNNN □		2.2nF	1000	±10%	1.45
4	CL43B222KJFNNN □		2.2nF	2000	±10%	1.45
5	CL43B332KJFNNN □		3.3nF	2000	±10%	1.45
6	CL43B103KIFNNN □		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	CL43B104KGINNN □		100nF	500	±10%	2.20
11	CL43B104KDFNNN □		100nF	200	±10%	1.45
12	CL43B104KHINNN □		100nF	630	±10%	2.20
13	CL43B224KCFNNN □		220nF	100	±10%	1.45
14	CL43B334KCFNNN □		330nF	100	±10%	1.45
15	CL43B474KEJNNN □		470nF	250	±10%	2.70
16	CL43B474KCHNNN □		470nF	100	±10%	1.80
17	CL43B474KDJNNN □		470nF	200	±10%	2.70
18	CL43B105KCJNNN □		1㎌	100	±10%	2.70
1	CL55B103KJHNNN □	5.70×5.00	10nF	2000	±10%	1.80
2	CL55B473KIINNN □		47nF	1000	±10%	2.20
3	CL55B224KGJNNN □		220nF	500	±10%	2.70
4	CL55B224KHJNNN □		220nF	630	±10%	2.70
5	CL55B105KCHNNN □		1㎌	100	±10%	1.80
6	CL55B105KDJNNN □		1㎌	200	±10%	2.70
7	CL55B105KEJNNN □		1㎌	250	±10%	2.70
8	CL55B475KCJNNN □		4.7㎌	100	±10%	2.70

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.



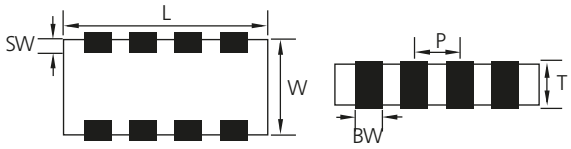
Feature

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

Application

- A bypass for digital and analog signal line noise generated by telecommunication equipment and other common electronic circuits

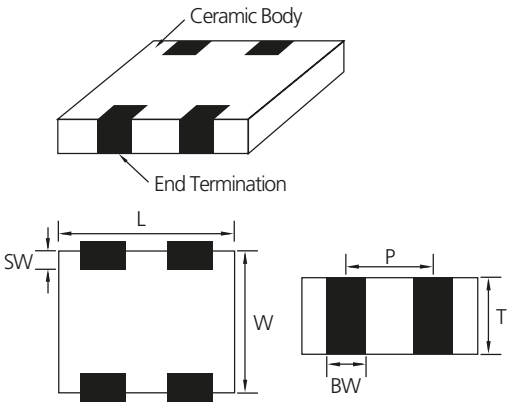
Structure and Dimensions



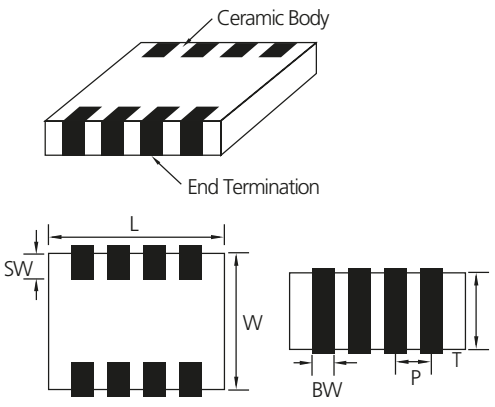
Code	Size (mm)	EIA Code	Dimension(mm)					
			L	W	T	BW	SW	P
A	0906	0302	0.90±0.05	0.60±0.05	0.45±0.05	0.25±0.05	0.15±0.1	0.45±0.05
A	1410	0504	1.37±0.15	1.0±0.15	0.35±0.05 0.50±0.05 0.60±0.06 0.80±0.08	0.36±0.1	0.2±0.1	0.64±0.1
A	2012	0805	2.0±0.15	1.25±0.15	0.85±0.1	0.5±0.2	0.25±0.15	1.0±0.1
B	2012	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	3216	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)



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

Array Type capacitance 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	1.00						

TC	Size(mm)	Type	Vr(V)	Tmax (mm)	Capacitance(nF) 1	2.2	4.7	10	22	47	100	220	470	1000	2200
X5R	0302(0906)	2-element	4	0.50											
			6.3												
			10												
	0504(1410)	2-element	6.3	0.88											
				0.66											
				0.55											
				0.40											
			10	0.88											
				0.66											
				0.55											
				0.40											
			16	0.88											
				0.66											
				0.55											
				0.40											
			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	1.00											
			25												
			50												
Y5V	1206(3216)	4-element	25	1.00											
			50												

Product Lineup (Array Type Capacitors)

	Part Number	Element Type	Size L x 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	CL31C100JBCNBN □	4-Array	3.20×1.60	10pF	50	±5%	1.00
2	CL31C150JBCNBN □			15pF	50	±5%	1.00
3	CL31C220JBCNBN □			22pF	50	±5%	1.00
4	CL31C270JBCNBN □			27pF	50	±5%	1.00
5	CL31C330KBCNBN □			33pF	50	±10%	1.00
6	CL31C390KBCNBN □			39pF	50	±10%	1.00
7	CL31C680JBCNBN □			68pF	50	±5%	1.00
8	CL31C820JBCNBN □			82pF	50	±5%	1.00
9	CL31C101JBCNBN □			100pF	50	±5%	1.00
10	CL31C151KBCNBN □			150pF	50	±10%	1.00
11	CL31C181JBCNBN □			180pF	50	±5%	1.00
12	CL31C331JBCNBN □			330pF	50	±5%	1.00
13	CL31C471JBCNBN □			470pF	50	±5%	1.00
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	CL09A104KP4SAN □	2-Array	0.90×0.60	100nF	10	±10%	0.50
2	CL09A104KQ4SAN □			100nF	6.3	±10%	0.50
3	CL09A105MQ4NAN □			1㎌	6.3	±20%	0.50
4	CL09A105MR4NAN □			1㎌	4	±20%	0.50
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
4	CL14A105MA5NAN □			1㎌	25	±20%	0.55
5	CL14A105KP8NAN □			1㎌	10	±10%	0.88
6	CL14A105MO3NAN □			1㎌	16	±20%	0.40
7	CL14A105MO8NAN □			1㎌	16	±20%	0.88
8	CL14A105MO5NAN □			1㎌	16	±20%	0.55
9	CL14A105MP3NAN □			1㎌	10	±20%	0.40
10	CL14A105MP5NAN □			1㎌	10	±20%	0.55
11	CL14A225KP8NAN □			2.2㎌	10	±10%	0.88
12	CL14A225KQ8NAN □			2.2㎌	6.3	±10%	0.88
1	CL21A105KOCNAN □	2-Array	2.00×1.25	1㎌	16	±10%	0.95
2	CL21A105MPCNAN □			1㎌	10	±20%	0.95
1	CL31F473ZBCNBN □	4-Array	3.20×1.60	47nF	50	+80/–20%	1.00
2	CL31F104ZACNBN □			100nF	25	+80/–20%	1.00

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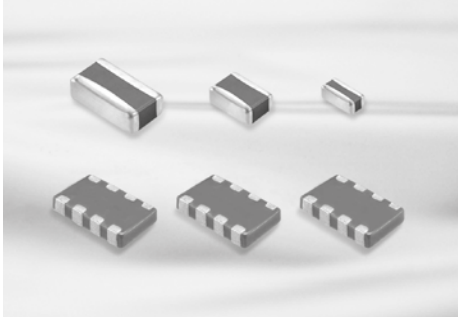
Low ESL Capacitors



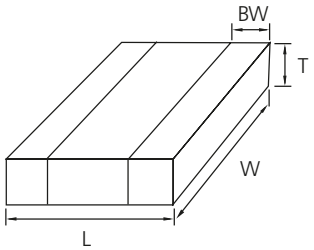
Feature

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

Application

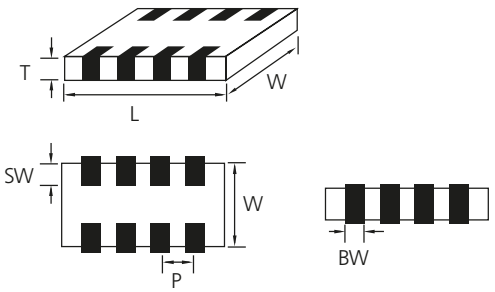
- High Speed Microprocessor
- High Frequency Digital Equipment

LICC(Low Inductance Ceramic Capacitors)



Code	Size (mm)	EIA Code	Dimension(mm)			
			L	W	T	BW
L5	0510	0204	0.52±0.05	1.0±0.05	0.3±0.05	0.18±0.06
01	0816	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	Size (mm)	EIA Code	Dimension(mm)					
			L	W	T	BW	SW	P
10	1608	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	2012	0805	2.0±0.1	1.25±0.1	0.5/+0.05–0.1	0.25+0.15–0.1	0.2+0.15–0.1	0.5±0.1

Low ESL capacitance Table (LICC)

TC	Size(mm)	Tmax(mm)	Vr(V)	Capacitance(μF)
				0.01 0.022 0.047 0.1 0.22 0.47 1 2.2 4.7 10
X6S /X7S /X7T	0204(0510)	0.35	2.5	X7T
			4	X7S X6S
			6.3	X7S
	0306(0816)	0.55	4	X7S

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

Low ESL capacitance Table (SLIC)

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

Product Lineup (Low ESL Capacitors-X7R, X6S, X7S, X7T)

	Part Number	Size L x 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
3	CLL5X105MR3NLN □		1㎌	4	±20%	0.35
1	CLL5Y104MQ3NLN □	0.50×1.00	100nF	6.3	±20%	0.35
1	CL01Y105MR5NLN □	0.80×1.60	1㎌	4	±20%	0.55
2	CL01Y225MR5NLN □		2.2㎌	4	±20%	0.55
1	CL10Y474MR5NJN □	1.60×0.80	470nF	4	±20%	0.55
2	CL10Y105MR5NJN □		1㎌	4	±20%	0.55
3	CL10Y225MR5NJN □		2.2㎌	4	±20%	0.55
1	CL21Y105MR5NJN □	2.00×1.25	1㎌	4	±20%	0.55
2	CL21Y225MR5NJN □		2.2㎌	4	±20%	0.55
1	CLL5Z105MS3NLN □	0.50×1.00	1㎌	2.5	±20%	0.35

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

<table>
<tr><th>No</th><th colspan="2">Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td>1</td><td colspan="2">Appearance</td><td>No abnormal exterior appearance</td><td>Visual Inspection throughMicroscope (x10)</td></tr>
<tr><td>2</td><td colspan="2">Insulation Resistance</td><td>10,000MΩ min. or 500MΩ · μF min.(or*100MΩ · μF) product whichever is smaller
(Rated voltage ≤16V:10,000MΩ min. or 100MΩ · μF min. product whichever is smaller)</td><td>Apply the rated voltage for 60~120 sec.
Rated voltage＞500V: Insulation Resistance shall be measured with 500 ± 50Vdc</td></tr>
<tr><td>3</td><td colspan="2">Withstanding Voltage</td><td>No dielectric breakdown or mechanical breakdown</td><td>Apply the specified voltage* for 1~5 sec.
Charge / Discharge current limit: 50mA max.
*CLASS I (Rated Voltage＜100V) : 300% of the rated Voltage
CLASS II (Rated Voltage＜100V) : 250% of the rated Voltage
In the case of Vr ≥100V products, following condition should be applied.
100V≤Rated Voltage＜500V : 200% of the rated Voltage
500V≤Rated Voltage＜1000V :150% of the rated Voltage
Rated Voltage≥1000V :120% of the rated Voltage</td></tr>
<tr><td rowspan="4">4</td><td rowspan="4">Capacitance</td><td>CLASS I</td><td>Within the specified tolerance</td><td>
<table>
<tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>≤1,000pF</td><td>1MHz±10%</td><td rowspan="2">0.5 ~ 5 Vrms</td></tr>
<tr><td>＞1,000pF</td><td>1KHz±10%</td></tr>
</table>
</td></tr>
<tr><td rowspan="3">CLASS II</td><td rowspan="3">Within the specified tolerance</td><td>
<table>
<tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>≤10μF</td><td>1KHz±10%</td><td>1.0±0.2 Vrms</td></tr>
<tr><td>＞10μF</td><td>120Hz±20%</td><td>0.5±0.1Vrms</td></tr>
<tr><td>*</td><td>1KHz±10%</td><td>0.5±0.1Vrms</td></tr>
</table>
* A capacitor prior to measuring the capacitance is heat treated at 150℃+0/−10℃ and maintained in ambient air for 24±2 hours.
</td></tr>
<tr><td rowspan="2">5</td><td>Q</td><td>CLASS I</td><td>Capacitance ≥ 30pF : Q ≥1,000
＜ 30pF : Q ≥400 +20 × C
(C : Capacitance)</td><td>
<table>
<tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>≤1,000pF</td><td>1MHz±10%</td><td rowspan="2">0.5 ~ 5 Vrms</td></tr>
<tr><td>＞1,000pF</td><td>1KHz±10%</td></tr>
</table>
</td></tr>
<tr><td>Tanδ</td><td>CLASS II</td><td>1. Characteristic : A(X5R)
<table>
<tr><th>Rated Voltage</th><th>Spec</th></tr>
<tr><td>50V / 35V</td><td>0.025 max / 0.05 max*</td></tr>
<tr><td>25V</td><td>0.025 max / 0.05 max* / 0.10 max*</td></tr>
<tr><td>16V</td><td>0.035 max / 0.05 max* / 0.10 max*</td></tr>
<tr><td>≤10V</td><td>0.05 max /0.10 max*</td></tr>
</table>
2. Characteristic : B(X7R), X(X6S), Y(X7S)
<table>
<tr><th>Rated Voltage</th><th>Spec</th></tr>
<tr><td>50V≥ / 35V / 25V</td><td>0.025 max / 0.05 max* / 0.10 max*</td></tr>
<tr><td>16V</td><td>0.035 max / 0.10 max*</td></tr>
<tr><td>≤10V</td><td>0.05 max /0.10 max*</td></tr>
</table>
3. Characteristic : F(Y5V)
<table>
<tr><th>Rated Voltage</th><th>Spec</th></tr>
<tr><td>50V / 35V / 25V</td><td>0.05 max / 0.07 max* / 0.09 max*</td></tr>
<tr><td>16V</td><td>0.07 max / 0.09 max* / 0.125 max*</td></tr>
<tr><td>10V</td><td>0.125 max /0.16 max*</td></tr>
<tr><td>≤6.3V</td><td>0.16 max</td></tr>
</table>
</td><td>
<table>
<tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>≤10μF</td><td>1KHz±10%</td><td>1.0±0.2 Vrms</td></tr>
<tr><td>＞10μF</td><td>120Hz±20%</td><td>0.5±0.1Vrms</td></tr>
<tr><td>*</td><td>1KHz±10%</td><td>0.5±0.1Vrms</td></tr>
</table>
You can check the specification at the web site or contact sales people for each product with mark*
</td></tr>
</table>

※ The conditions of measurement may be altered upon request.

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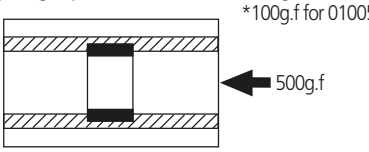
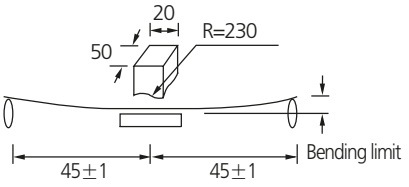
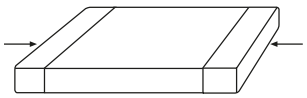
<table>
<tr><th>No</th><th colspan="3">Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td rowspan="2">6</td><td rowspan="2">Temperature Characteristics of Capacitance</td><td>CLASS I</td><td>
<table>
<tr><td>Characteristic</td><td>Temp.Coefficient(PPM/℃)</td></tr>
<tr><td>C</td><td>0±30</td></tr>
</table>
</td><td>Capacitance shall be measured by the steps shown in the following table.
<table>
<tr><td>Step</td><td>Temperature(℃)</td></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
$\text{Temp. Coefficient} = \frac{C2-C1}{C1\times\triangle T}\times 10^6 [\text{ppm/℃}]$
C1: Capacitance at step 3
C2: Capacitance at 125℃
△T: 100℃ (=125℃−25℃)
(2) CLASS II
Capacitance Change shall be calculated from the formula as below
$\triangle C = \frac{C2-C1}{C1}\times 100(\%)$
C1: Capacitance at step 3
C2: Capacitance at step 2 or 4</td></tr>
<tr><td>CLASS II</td><td>
<table>
<tr><td>Characteristic</td><td>Capacitance Change(%) with No bias</td></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>Z(X7T)</td><td>+22%~−33%</td></tr>
<tr><td>F(Y5V)</td><td>+22%~−82%</td></tr>
</table>
</td></tr>
<tr><td>7</td><td colspan="2">Adhesive Strength of Termination</td><td>No indication of peeling shall occur on the terminal electrode</td><td>Apply 500g.f* pressure for 10±1 sec. *200g.f for 0201
*100g.f for 01005
 
</td></tr>
<tr><td rowspan="5">8</td><td rowspan="5">Bending Strength</td><td>Appearance</td><td colspan="3">No indication of peeling shall occur</td><td rowspan="5">• Bending Limit: 1mm • Test Speed: 1.0mm/sec.
• Keep the test board at the limit point in 5 sec.
• Then Measure Capacitance
 
</td></tr>
<tr><td rowspan="4">Capacitance</td><td colspan="2">Characteristic</td><td>Capacitance Change</td></tr>
<tr><td colspan="2">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) Z(X7T)</td><td>±12.5%</td></tr>
<tr><td>F(Y5V)</td><td>±30%</td></tr>
<tr><td>9</td><td colspan="2">Solderability</td><td>More than 75% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve
  </td><td>
<table>
<tr><td>Solder</td><td>Sn−3Ag−0.5Cu</td></tr>
<tr><td>Solder Temp.</td><td>245±5℃</td></tr>
<tr><td>Flux</td><td>RMA Type</td></tr>
<tr><td>Dip time</td><td>3±0.3 sec.</td></tr>
<tr><td>Pre-heating</td><td>at 80~120℃ for 10~30 sec.</td></tr>
</table>
</td></tr>
<tr><td rowspan="6">10</td><td rowspan="6">Resistance to Soldering Heat</td><td>Appearance</td><td colspan="3">No mechanical damage shall occur</td><td rowspan="6">Solder temperature: 270±5℃ DIP TIME:10±1 sec.
Each termination shall be fully immersed and preheated as below:
<table>
<tr><td>Step</td><td>Temperature(℃)</td><td>Time(sec.)</td></tr>
<tr><td>1</td><td>80~100</td><td>60</td></tr>
<tr><td>2</td><td>150~180</td><td>60</td></tr>
</table>
Leave the capacitor in ambient condition for specified time* before measurement
*24 ± 2 hours(CLASS I)
24 ± 2 hours(CLASSII)</td></tr>
<tr><td rowspan="3">Capacitance</td><td colspan="2">Characteristic</td><td>Capacitance Change</td></tr>
<tr><td colspan="2">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), X(X6S), Y(X7S) Z(X7T)</td><td>±7.5%</td></tr>
<tr><td>F(Y5V)</td><td>±20%</td></tr>
<tr><td>Q (CLASS I)</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Tanδ (CLASS II)</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Insulation resistance</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Withstanding voltage</td><td colspan="3">Within the specified initial value</td></tr>
</table>

No	Item		Performance			Test Condition
11	Vibration Test	Appearance	No mechanical damage shall occur			The capacitor shall be subjected to a harmonic motion having a total amplitude of 1.5mm changing frequency from 10Hz to 55Hz and back to 10Hz in about 1 min. Repeat this for 2hours each in 3 mutually perpendicular directions.
		Capacitance	Characteristic		Capacitance Change	
			CLASS I		±2.5% or ± 0.25 pF whichever is larger	
			CLASS II	A(X5R), B(X7R)	±5%	
				X(X6S), Y(X7S) Z(X7T)	±10%	
				F(Y5V)	±20%	
		Q (CLASS I)	Within the specified initial value			
		Tanδ (CLASS II)	Within the specified initial value			
		Insulation resistance	Within the specified initial value			
12	Moisture Resistance	Appearance	No mechanical damage shall occur			Applied Voltage: rated voltage Temperature: 40±2℃ Humidity: 90~95% RH Duration Time: 500+12/–0 Hr. Charge/Discharge Current: 50㎃ max. Perform the initial measurement according to Note1. Perform the final measurement according to Note2. This test is only applied to Vr≤500V products. You can check the specification at the web site or contact sales people for each product with mark*
		Capacitance	Characteristic		Capacitance Change	
			CLASS I		±7.5% or ± 0.75pF whichever is larger	
			CLASS II	A(X5R), B(X7R), X(X6S), Y(X7S) Z(X7T)	±12.5%	
				F(Y5V)	±30%	
		Q (CLASS I)	Capacitance≥30pF : Q≥200 <30pF : Q≥100+10/3×C (C: Capacitance)			
		Tanδ (CLASS II)	1. Capacitance: A(X5R) 0.05 max / 0.075 max* (35V / 50V) 0.05 max / 0.075 max* / 0.125 max*(16V / 25V) 0.075 max / 0.125 max* (≤10V) 2. Capacitance: B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V≥) 0.075 max / 0.125 max* (≤10V) 3. Capacitance: F(Y5V) 0.09 max (50V) 0.09 max / 0.125 max* (25V / 35V) 0.09 max / 0.125 max* / 0.16 max* (16V) 0.16 max / 0.195 max* (10V) 0.195 max (4V / 6.3V)			
		Insulation resistance	500MΩ min. or 25MΩ·㎌ min. product whichever is smaller / 12.5MΩ·㎌ or over*			
13	High Temperature Resistance	Appearance	No mechanical damage shall occur			Temperature : max. operating temperature Duration Time: 1000+48/–0 Hr. Charge/Discharge Current: 50㎃ max. Vr≤200V : 200% of the rated Voltage 250V≤Vr≤500V: 150% of the rated Voltage Vr=630V : 120% of the rated Voltage 1000V≤Vr≤3000V: 100% of the rated Voltage * : 150% or 100% of the rated Voltage Perform the initial measurement according to Note1 for class II Perform the final measurement according to Note2. You can check the specification at the web site or contact sales people for each product with mark*
		Capacitance	Characteristic		Capacitance Change	
			CLASS I		±3% or ± 0.3 pF whichever is larger	
			CLASS II	A(X5R), B(X7R), X(X6S), Y(X7S) Z(X7T)	±12.5%	
				F(Y5V)	±30%	
		Q (CLASS I)	Capacitance≥30pF : Q≥350 10≤Capacitance<30pF : Q≥275+2.5×C Capacitance<10pF : Q≥200+10×C (C: Capacitance)			
		Tanδ (CLASS II)	1. Capacitance : A(X5R) 0.05 max / 0.075 max* (35V / 50V) 0.05 max / 0.075 max* / 0.125 max*(16V / 25V) 0.075 max / 0.125 max* (≤10V) 2. Capacitance : B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V≥) 0.075 max / 0.125 max* (≤10V) 3. Capacitance : F(Y5V) 0.09 max (50V) 0.09 max / 0.125 max* (25V / 35V) 0.09 max / 0.125 max* / 0.16 max* (16V) 0.16 max / 0.195 max* (10V) 0.195 max (4V / 6.3V)			
		Insulation resistance	1,000MΩ min. or 50MΩ·㎌ min. product whichever is smaller / 25MΩ·㎌ or over*			

Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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

<table>
<tr><th>No</th><th colspan="3">Item</th><th colspan="3">Performance</th><th>Test Condition</th></tr>
<tr><td rowspan="7">14</td><td rowspan="7">Temperature Cycle</td><td>Appearance</td><td colspan="3">No mechanical damage shall occur</td><td rowspan="7">Capacitor shall be subjected to 5 cycles.
Condition for 1 cycle:
<table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(min.)</th></tr><tr><td>1</td><td>min. operating temperature +0/–3</td><td>30</td></tr><tr><td>2</td><td>25</td><td>2~3</td></tr><tr><td>3</td><td>max. operating temperature +0/–3</td><td>30</td></tr><tr><td>4</td><td>25</td><td>2~3</td></tr></table>Leave the capacitor in ambient condition for specified time* before measurenment
*24 ±2 hours(CLASS I)
24 ±2 hours(CLASS II)</td></tr>
<tr><td rowspan="4">Capacitance</td><td colspan="2">Characteristic</td><td>Capacitance Change</td></tr>
<tr><td colspan="2">CLASS I</td><td>±2.5% or ±0.25pF whichever is larger</td></tr>
<tr><td rowspan="3">CLASS II</td><td>A(X5R), B(X7R)</td><td>±7.5%</td></tr>
<tr><td>X(X6S), Y(X7S) Z(X7T)</td><td>±15%</td></tr>
<tr><td>F(Y5V)</td><td>±20%</td></tr>
<tr><td>Q (CLASS I)</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Tanδ (CLASS II)</td><td colspan="3">Within the specified initial value</td></tr>
<tr><td>Insulation resistance</td><td colspan="3">Within the specified initial value</td></tr>
</table>

<table>
<tr><th>No</th><th colspan="6">Recommended Soldering Method</th></tr>
<tr><td rowspan="15">15</td><td rowspan="15">Recommended Soldering Method By Size & Capacitance</td><td rowspan="2">Size inch(mm)</td><td rowspan="2">Temperature Characteristic</td><td rowspan="2">Capacitance</td><td colspan="2">Condition</td></tr>
<tr><td>Flow</td><td>Reflow</td></tr>
<tr><td>01005(0402)</td><td rowspan="3">–</td><td rowspan="3">–</td><td rowspan="3">–</td><td rowspan="3">○</td></tr>
<tr><td>0201 (0603)</td></tr>
<tr><td>0402 (1005)</td></tr>
<tr><td rowspan="3">0603(1608)</td><td>Class I</td><td>–</td><td>○</td><td>○</td></tr>
<tr><td rowspan="2">Class II</td><td>C <1㎌</td><td>○</td><td>○</td></tr>
<tr><td>C ≥1㎌</td><td>–</td><td>○</td></tr>
<tr><td rowspan="3">0805 (2012)</td><td>Class I</td><td>–</td><td>○</td><td>○</td></tr>
<tr><td rowspan="2">Class II</td><td>C <4.7㎌</td><td>○</td><td>○</td></tr>
<tr><td>C ≥4.7㎌</td><td>–</td><td>○</td></tr>
<tr><td>Array</td><td>–</td><td>–</td><td>○</td></tr>
<tr><td rowspan="3">1206 (3216)</td><td>Class I</td><td>–</td><td>○</td><td>○</td></tr>
<tr><td rowspan="2">Class II</td><td>C <10㎌</td><td>○</td><td>○</td></tr>
<tr><td>C ≥10㎌</td><td>–</td><td>○</td></tr>
<tr><td>Array</td><td>–</td><td>–</td><td>○</td></tr>
<tr><td>1210 (3225)</td><td rowspan="4">–</td><td rowspan="4">–</td><td rowspan="4">–</td><td>○</td></tr>
<tr><td>1808 (4520)</td><td>○</td></tr>
<tr><td>1812 (4532)</td><td>○</td></tr>
<tr><td>2220 (5750)</td><td>○</td></tr>
</table>

Note 1. Initial Measurement For Class II

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

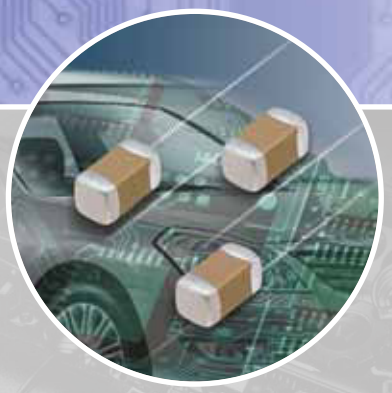
Note 2. Latter Measurement

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

Note 3. All Size in Reliability Test Condition Section is "inch"

Note 4. Camera Strobe Circuit Capacitors Should be Following a Special Reliability Test Condition.
Please check with our sales representatives or product engineers.

Premium Capacitors for Automotive *Applications*



SAMSUNG
ELECTRO-MECHANICS

Part Numbering System (Automotive Capacitors)

CL	10	B	104	K	B	8	W	P	N	C
1	2	3	4	5	6	7	8	9	10	11

1. SERIES CODE
CL = Multi layer Ceramic Capacitors

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

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

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

★★
5. TOLERANCE CODE
C = ±0.25pF D = ±0.5pF F = ±1pF, ±1%* G = ±2%
J = ±5% K = ±10% M = ±20%
*For Values 10pF, F = ±1pF, Values＞10pF, F = ±1%
※This code has only typical specifications. Please refer to individual specifications.

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

★★★
7.THICKNESS CODE
5 = 0.50㎜ 6 = 0.60㎜ 8 = 0.80㎜ C = 0.85㎜
P = 1.15㎜ F,Q = 1.25㎜ H = 1.60㎜ J = 2.50㎜
※This code has only typical specifications. Please refer to individual specifications.

8. DESIGN CODE
1 = Ni / Cu / Ni Barrier / Sn 100% / Standard
V = Ni / Cu+Soft termination / Ni Barrier / Sn 100% / Standard
W= Ni / Cu+Soft termination / Ni Barrier / Sn 100% / Open Mode
※This code has only typical specifications. Please refer to individual specifications.

9. PRODUCT CODE
P = Automotive product meet AEC-Q-200.
※If orders are placed without returned specification, please allow us to judge that specification is accepted by your side.

10. GRADE CODE
N = Standard

11. PACKAGING CODE
B = Bulk
P = Bulk Case
C = Cardboard Tape, 7"Reel
H = Cardboard Tape,7"Reel(15,000ea)
O = Cardboard Tape, 10"Reel
D = Cardboard Tape, 13"Reel(10,000ea)
L = Cardboard Tape, 13"Reel(15,000ea)
E = Embossed Type, 7"Reel
G = Embossed Type, 7"Reel(3,000ea)
F = Embossed Type, 13"Reel
S = Embossed Type, 10"Reel

★
Class I

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

Class II

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

★★
Capacitance Tolerance

Code	Capacitance Tolerance	TC	Capacitance Step	Rated Capacitance
C	±0.25pF	C0G	Under 5pF	E-12 series ★
D	±0.5pF	C0G	6.0 to 9.0pF	E-12 series ★
J	±5%	C0G	Over 10pF	E-12 series
K	±10%	X7R	Under 0.01μF	E-3 series
			Over 0.01μF	E-6 series
M	±20%	X7R	Under 0.01μF	E-3 series
			Over 0.01μF	E-6 series

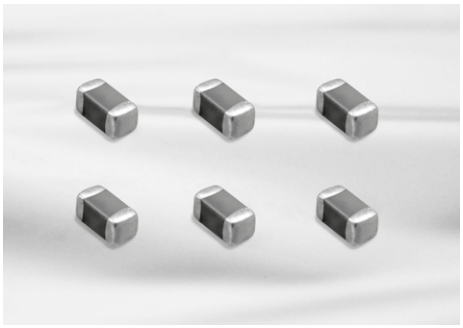
★E-24 series is also available

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
	Q	1.25	±0.15
1206(3216)	C	0.85	±0.15
	P	1.15	±0.10
	H	1.60	±0.20
1210(3225)	I	2.00	±0.20
	J	2.50	±0.20

Premium Capacitors for Automotive Applications



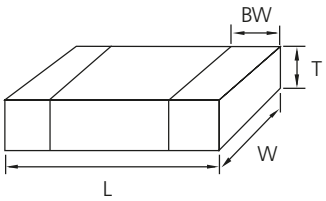
Feature

- Automotive products are manufactured in state of the art facilities recommended for registration to ISO/TS 16949:2002.
- Automotive products meet AEC-Q-200 requirements.
- Automotive products are RoHS compliant.
- Samsung terminations are suitable for all flow and reflow soldering systems. (10/21/31 size type only)
- Automotive products meet JEDEC-020-D requirements.
- C0G dielectric components contain BME and copper terminations with a Ni/Sn plated overcoat.
- X7R dielectric components have BME and soft terminations with a Ni/Sn plated overcoat.

Application

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

Structure and Dimensions



Code	EIA Code	Dimension(mm)			
		L	W	T	BW
05	0402	1.00±0.05	0.50±0.05	0.50(±0.05)	0.25±0.10
10	0603	1.60±0.10	0.80±0.10	0.80(±0.10)	0.30±0.20
21	0805	2.00±0.10	1.25±0.10	0.60(±0.10)	0.5+0.2/–0.3
				0.85(±0.10)	
				1.25(±0.10)	
		2.00±0.15	1.25±0.15	1.25(±0.15)	
31	1206	3.20±0.20	1.60±0.20	0.85(±0.15)	0.50±0.30
				1.15(±0.10)	
				1.60(±0.20)	
32	1210	3.20±0.30	2.50±0.20	2.00(±0.20)	0.60±0.30
				2.50(±0.20)	

Automotive Capacitors Table (C0G, X7R)

TC	Size (mm)	Thickness (mm)	Vr	Capacitance (pF) 100	220	470	Capacitance (nF) 1	2.2	4.7	10	22	47	100
COG	0402(1005)	0.50	50										
			100										
	0603(1608)	0.80	50										
			100		271								
	0805(2012)	0.60 0.85 1.25	50										
			100										

TC	Size (mm)	Thickness (mm)	Vr	Capacitance (nF) 10	22	47	100	220	470	Capacitance (μF) 1	2.2	4.7	10	22
X7R	0402(1005)	0.50	10											
			16											
			25											
			50											
	0603(1608)	0.80	10											
			16											
			25											
			50											
			100											
	0805(2012)	1.25	10											
		0.85 1.25	16											
		0.60 0.85 1.25	25											
		0.60 0.85 1.25	50											
		0.60 0.85 1.25	100											
	1206(3216)	1.60	10											
		1.15 1.60	16											
		0.85 1.15 1.60	25											
		0.85 1.15 1.60	50											
	3225(1210)	2.70	16											

Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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 x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL05C4R7CB51PN □	1.00×0.50	4.7pF	50	±0.25pF	0.55
2	CL05C4R7CC51PN □		4.7pF	100	±0.25pF	0.55
3	CL05C6R8DB51PN □		6.8pF	50	±0.5pF	0.55
4	CL05C6R8DC51PN □		6.8pF	100	±0.5pF	0.55
5	CL05C100JB51PN □		10pF	50	±5%	0.55
6	CL05C100JC51PN □		10pF	100	±5%	0.55
7	CL05C120JB51PN □		12pF	50	±5%	0.55
8	CL05C120JC51PN □		12pF	100	±5%	0.55
9	CL05C150JB51PN □		15pF	50	±5%	0.55
10	CL05C150JC51PN □		15pF	100	±5%	0.55
11	CL05C180JB51PN □		18pF	50	±5%	0.55
12	CL05C180JC51PN □		18pF	100	±5%	0.55
13	CL05C220JB51PN □		22pF	50	±5%	0.55
14	CL05C220JC51PN □		22pF	100	±5%	0.55
15	CL05C270JB51PN □		27pF	50	±5%	0.55
16	CL05C270JC51PN □		27pF	100	±5%	0.55
17	CL05C330JB51PN □		33pF	50	±5%	0.55
18	CL05C330JC51PN □		33pF	100	±5%	0.55
19	CL05C390JB51PN □		39pF	50	±5%	0.55
20	CL05C390JC51PN □		39pF	100	±5%	0.55
21	CL05C470JB51PN □		47pF	50	±5%	0.55
22	CL05C470JC51PN □		47pF	100	±5%	0.55
23	CL05C560JB51PN □		56pF	50	±5%	0.55
24	CL05C560JC51PN □		56pF	100	±5%	0.55
25	CL05C680JB51PN □		68pF	50	±5%	0.55
26	CL05C680JC51PN □		68pF	100	±5%	0.55
27	CL05C820JB51PN □		82pF	50	±5%	0.55
28	CL05C820JC51PN □		82pF	100	±5%	0.55
29	CL05C101JB51PN □		100pF	50	±5%	0.55
30	CL05C101JC51PN □		100pF	100	±5%	0.55
31	CL05C121JB51PN □		120pF	50	±5%	0.55
32	CL05C151JB51PN □		150pF	50	±5%	0.55
33	CL05C221JB51PN □		220pF	50	±5%	0.55
1	CL10C4R7CB81PN □	1.60×0.80	4.7pF	50	±0.25pF	0.90
2	CL10C4R7CC81PN □		4.7pF	100	±0.25pF	0.90
3	CL10C6R8DB81PN □		6.8pF	50	±0.5pF	0.90
4	CL10C6R8DC81PN □		6.8pF	100	±0.5pF	0.90
5	CL10C100JB81PN □		10pF	50	±5%	0.90
6	CL10C100JC81PN □		10pF	100	±5%	0.90
7	CL10C120JB81PN □		12pF	50	±5%	0.90
8	CL10C120JC81PN □		12pF	100	±5%	0.90
9	CL10C150JB81PN □		15pF	50	±5%	0.90
10	CL10C150JC81PN □		15pF	100	±5%	0.90
11	CL10C180JB81PN □		18pF	50	±5%	0.90
12	CL10C180JC81PN □		18pF	100	±5%	0.90
13	CL10C220JB81PN □		22pF	50	±5%	0.90
14	CL10C220JC81PN □		22pF	100	±5%	0.90
15	CL10C270JB81PN □		27pF	50	±5%	0.90
16	CL10C270JC81PN □		27pF	100	±5%	0.90
17	CL10C330JB81PN □		33pF	50	±5%	0.90

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Automotive Capacitors-COG)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
18	CL10C330JC81PN ☐	1.60×0.80	33pF	100	±5%	0.90
19	CL10C390JB81PN ☐		39pF	50	±5%	0.90
20	CL10C390JC81PN ☐		39pF	100	±5%	0.90
21	CL10C470JB81PN ☐		47pF	50	±5%	0.90
22	CL10C470JC81PN ☐		47pF	100	±5%	0.90
23	CL10C560JB81PN ☐		56pF	50	±5%	0.90
24	CL10C560JC81PN ☐		56pF	100	±5%	0.90
25	CL10C680JB81PN ☐		68pF	50	±5%	0.90
26	CL10C680JC81PN ☐		68pF	100	±5%	0.90
27	CL10C820JB81PN ☐		82pF	50	±5%	0.90
28	CL10C820JC81PN ☐		82pF	100	±5%	0.90
29	CL10C101JB81PN ☐		100pF	50	±5%	0.90
30	CL10C101JC81PN ☐		100pF	100	±5%	0.90
31	CL10C121JB81PN ☐		120pF	50	±5%	0.90
32	CL10C151JB81PN ☐		150pF	50	±5%	0.90
33	CL10C221JB81PN ☐		220pF	50	±5%	0.90
34	CL10C221JC81PN ☐		220pF	100	±5%	0.90
35	CL10C271JB81PN ☐		270pF	50	±5%	0.90
36	CL10C331JB81PN ☐		330pF	50	±5%	0.90
37	CL10C391JB81PN ☐		390pF	50	±5%	0.90
38	CL10C471JB81PN ☐		470pF	50	±5%	0.90
39	CL10C561JB81PN ☐		560pF	50	±5%	0.90
40	CL10C681JB81PN ☐		680pF	50	±5%	0.90
41	CL10C821JB81PN ☐		820pF	50	±5%	0.90
42	CL10C102JB81PN ☐		1.0nF	50	±5%	0.90
1	CL21C100JB61PN ☐	2.00×1.25	10pF	50	±5%	0.70
2	CL21C100JC61PN ☐		10pF	100	±5%	0.70
3	CL21C120JB61PN ☐		12pF	50	±5%	0.70
4	CL21C120JC61PN ☐		12pF	100	±5%	0.70
5	CL21C150JB61PN ☐		15pF	50	±5%	0.70
6	CL21C150JC61PN ☐		15pF	100	±5%	0.70
7	CL21C180JB61PN ☐		18pF	50	±5%	0.70
8	CL21C180JC61PN ☐		18pF	100	±5%	0.70
9	CL21C220JB61PN ☐		22pF	50	±5%	0.70
10	CL21C220JC61PN ☐		22pF	100	±5%	0.70
11	CL21C270JC61PN ☐		27pF	100	±5%	0.70
12	CL21C330JB61PN ☐		33pF	50	±5%	0.70
13	CL21C330JC61PN ☐		33pF	100	±5%	0.70
14	CL21C390JB61PN ☐		39pF	50	±5%	0.70
15	CL21C390JC61PN ☐		39pF	100	±5%	0.70
16	CL21C470JB61PN ☐		47pF	50	±5%	0.70
17	CL21C470JC61PN ☐		47pF	100	±5%	0.70
18	CL21C560JB61PN ☐		56pF	50	±5%	0.70
19	CL21C560JC61PN ☐		56pF	100	±5%	0.70
20	CL21C680JB61PN ☐		68pF	50	±5%	0.70
21	CL21C680JC61PN ☐		68pF	100	±5%	0.70
22	CL21C820JB61PN ☐		82pF	50	±5%	0.70
23	CL21C820JC61PN ☐		82pF	100	±5%	0.70
24	CL21C101JB61PN ☐		100pF	50	±5%	0.70
25	CL21C101JC61PN ☐		100pF	100	±5%	0.70

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Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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 x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
26	CL21C121JB61PN □	2.00×1.25	120pF	50	±5%	0.70
27	CL21C121JC61PN □		120pF	100	±5%	0.70
28	CL21C151JB61PN □		150pF	50	±5%	0.70
29	CL21C151JC61PN □		150pF	100	±5%	0.70
30	CL21C221JB61PN □		220pF	50	±5%	0.70
31	CL21C221JC61PN □		220pF	100	±5%	0.70
32	CL21C271JB61PN □		270pF	50	±5%	0.70
33	CL21C271JC61PN □		270pF	100	±5%	0.70
34	CL21C331JB61PN □		330pF	50	±5%	0.70
35	CL21C331JC61PN □		330pF	100	±5%	0.70
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	CL21C102JBF1PN □		1.0nF	50	±5%	1.35
45	CL21C102JBC1PN □		1.0nF	50	±5%	0.95
46	CL21C102JCF1PN □		1.0nF	100	±5%	1.35
47	CL21C102JCC1PN □		1.0nF	100	±5%	0.95
48	CL21C122JBF1PN □		1.2nF	50	±5%	1.35
49	CL21C122JBC1PN □		1.2nF	50	±5%	0.95
50	CL21C152JBF1PN □		1.5nF	50	±5%	1.35
51	CL21C152JBC1PN □		1.5nF	50	±5%	0.95
52	CL21C182JBF1PN □		1.8nF	50	±5%	1.35
53	CL21C182JBC1PN □		1.8nF	50	±5%	0.95
54	CL21C222JBF1PN □		2.2nF	50	±5%	1.35
55	CL21C222JBC1PN □		2.2nF	50	±5%	0.95
56	CL21C272JBF1PN □		2.7nF	50	±5%	1.35
57	CL21C272JBC1PN □		2.7nF	50	±5%	0.95
58	CL21C332JBF1PN □		3.3nF	50	±5%	1.35
59	CL21C332JBC1PN □		3.3nF	50	±5%	0.95
60	CL21C392JBF1PN □		3.9nF	50	±5%	1.35
61	CL21C392JBC1PN □		3.9nF	50	±5%	0.95
62	CL21C472JBF1PN □		4.7nF	50	±5%	1.35
63	CL21C472JBC1PN □		4.7nF	50	±5%	0.95
64	CL21C562JBF1PN □		5.6nF	50	±5%	1.35
65	CL21C562JBC1PN □		5.6nF	50	±5%	0.95
66	CL21C682JBF1PN □		6.8nF	50	±5%	1.35
67	CL21C822JBF1PN □		8.2nF	50	±5%	1.35
68	CL21C103JBF1PN □		10nF	50	±5%	1.35

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Automotive Capacitors-X7R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL05B331KB5VPN □	1.00×0.50	330pF	50	±10%	0.55
2	CL05B471KB5VPN □		470pF	50	±10%	0.55
3	CL05B681KB5VPN □		680pF	50	±10%	0.55
4	CL05B102KA5VPN □		1.0nF	25	±10%	0.55
5	CL05B102KB5VPN □		1.0nF	50	±10%	0.55
6	CL05B152KA5VPN □		1.5nF	25	±10%	0.55
7	CL05B152KB5VPN □		1.5nF	50	±10%	0.55
8	CL05B222KA5VPN □		2.2nF	25	±10%	0.55
9	CL05B222KB5VPN □		2.2nF	50	±10%	0.55
10	CL05B332KA5VPN □		3.3nF	25	±10%	0.55
11	CL05B332KB5VPN □		3.3nF	50	±10%	0.55
12	CL05B472KA5VPN □		4.7nF	25	±10%	0.55
13	CL05B472KB5VPN □		4.7nF	50	±10%	0.55
14	CL05B682KA5VPN □		6.8nF	25	±10%	0.55
15	CL05B682KB5VPN □		6.8nF	50	±10%	0.55
16	CL05B103KA5VPN □		10nF	25	±10%	0.55
17	CL05B103KB5VPN □		10nF	50	±10%	0.55
18	CL05B153KA5VPN □		15nF	25	±10%	0.55
19	CL05B153KB5VPN □		15nF	50	±10%	0.55
20	CL05B223KA5VPN □		22nF	25	±10%	0.55
21	CL05B223KB5VPN □		22nF	50	±10%	0.55
22	CL05B333KO5VPN □		33nF	16	±10%	0.55
23	CL05B473KO5VPN □		47nF	16	±10%	0.55
24	CL05B683KO5VPN □		68nF	16	±10%	0.55
25	CL05B104KO5VPN □		100nF	16	±10%	0.55

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Product Lineup (Automotive Capacitors-X7R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL10B221KC8WPN □	1.60×0.80	220pF	100	±10%	0.90
2	CL10B331KC8WPN □		330pF	100	±10%	0.90
3	CL10B471KC8WPN □		470pF	100	±10%	0.90
4	CL10B681KC8WPN □		680pF	100	±10%	0.90
5	CL10B102KB8WPN □		1.0nF	50	±10%	0.90
6	CL10B102KC8WPN □		1.0nF	100	±10%	0.90
7	CL10B152KB8WPN □		1.5nF	50	±10%	0.90
8	CL10B152KC8WPN □		1.5nF	100	±10%	0.90
9	CL10B222KB8WPN □		2.2nF	50	±10%	0.90
10	CL10B222KC8WPN □		2.2nF	100	±10%	0.90
11	CL10B332KB8WPN □		3.3nF	50	±10%	0.90
12	CL10B332KC8WPN □		3.3nF	100	±10%	0.90
13	CL10B472KB8WPN □		4.7nF	50	±10%	0.90
14	CL10B472KC8WPN □		4.7nF	100	±10%	0.90
15	CL10B682KB8WPN □		6.8nF	50	±10%	0.90
16	CL10B682KC8WPN □		6.8nF	100	±10%	0.90
17	CL10B103KB8WPN □		10nF	50	±10%	0.90
18	CL10B103KC8WPN □		10nF	100	±10%	0.90
19	CL10B153KB8WPN □		15nF	50	±10%	0.90
20	CL10B223KB8WPN □		22nF	50	±10%	0.90
21	CL10B333KA8WPN □		33nF	25	±10%	0.90
22	CL10B333KB8WPN □		33nF	50	±10%	0.90
23	CL10B473KA8WPN □		47nF	25	±10%	0.90
24	CL10B473KB8WPN □		47nF	50	±10%	0.90
25	CL10B683KA8WPN □		68nF	25	±10%	0.90
26	CL10B683KB8WPN □		68nF	50	±10%	0.90
27	CL10B104KA8WPN □		100nF	25	±10%	0.90
28	CL10B104KB8WPN □		100nF	50	±10%	0.90
29	CL10B154KO8VPN □		150nF	16	±10%	0.90
30	CL10B154KA8VPN □		150nF	25	±10%	0.90
31	CL10B224KO8VPN □		220nF	16	±10%	0.90
32	CL10B224KA8VPN □		220nF	25	±10%	0.90
33	CL10B334KO8VPN □		330nF	16	±10%	0.90
34	CL10B334KA8VPN □		330nF	25	±10%	0.90
35	CL10B474KO8VPN □		470nF	16	±10%	0.90
36	CL10B474KA8VPN □		470nF	25	±10%	0.90
37	CL10B684KO8VPN □		680nF	16	±10%	0.90
38	CL10B105KO8VPN □		1.0μF	16	±10%	0.90

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

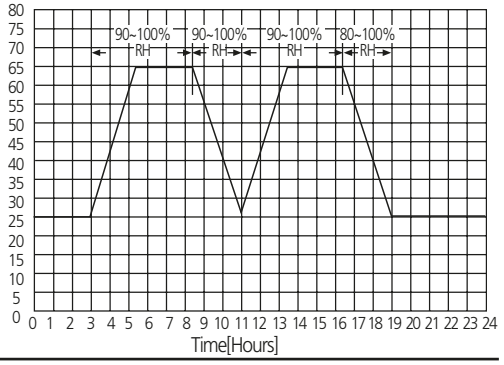
Product Lineup (Automotive Capacitors-X7R)

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
1	CL21B102KC6WPN □	2.00×1.25	1.0㎋	100	±10%	0.70
2	CL21B152KC6WPN □		1.5㎋	100	±10%	0.70
3	CL21B222KC6WPN □		2.2㎋	100	±10%	0.70
4	CL21B332KC6WPN □		3.3㎋	100	±10%	0.70
5	CL21B472KC6WPN □		4.7㎋	100	±10%	0.70
6	CL21B682KC6WPN □		6.8㎋	100	±10%	0.70
7	CL21B103KC6WPN □		10㎋	100	±10%	0.70
8	CL21B153KC6WPN □		15㎋	100	±10%	0.70
9	CL21B223KC6WPN □		22㎋	100	±10%	0.70
10	CL21B333KCCWPN □		33㎋	100	±10%	0.95
11	CL21B473KCCWPN □		47㎋	100	±10%	0.95
12	CL21B683KCCWPN □		68㎋	100	±10%	0.95
13	CL21B104KBFWPN □		100㎋	50	±10%	1.35
14	CL21B104KBCWPN □		100㎋	50	±10%	0.95
15	CL21B104KCFWPN □		100㎋	100	±10%	1.35
16	CL21B104KCCWPN □		100㎋	100	±10%	0.95
17	CL21B154KAFVPN □		150㎋	25	±10%	1.35
18	CL21B154KBFVPN □		150㎋	50	±10%	1.35
19	CL21B224KAFVPN □		220㎋	25	±10%	1.35
20	CL21B224KBFVPN □		220㎋	50	±10%	1.35
21	CL21B334KAFVPN □		330㎋	25	±10%	1.35
22	CL21B334KBFVPN □		330㎋	50	±10%	1.35
23	CL21B474KOFVPN □		470㎋	16	±10%	1.35
24	CL21B474KAFVPN □		470㎋	25	±10%	1.35
25	CL21B474KBFVPN □		470㎋	50	±10%	1.35
26	CL21B684KOFVPN □		680㎋	16	±10%	1.35
27	CL21B684KAFVPN □		680㎋	25	±10%	1.35
28	CL21B105KOFVPN □		1.0㎌	16	±10%	1.35
29	CL21B105KAFVPN □		1.0㎌	25	±10%	1.35
30	CL21B225KPFVPN □		2.2㎌	10	±10%	1.35
31	CL21B225KOFVPN □		2.2㎌	16	±10%	1.35
32	CL21B335KPQVPN □		3.3㎌	10	±10%	1.40
33	CL21B475KPQVPN □		4.7㎌	10	±10%	1.40
1	CL31B104KBPWPN □	3.20×1.60	100㎋	50	±10%	1.25
2	CL31B104KBCVPN □		100㎋	50	±10%	1.00
3	CL31B154KBPWPN □		150㎋	50	±10%	1.25
4	CL31B224KBPWPN □		220㎋	50	±10%	1.25
5	CL31B334KBHWPN □		330㎋	50	±10%	1.80
6	CL31B474KBHWPN □		470㎋	50	±10%	1.80
7	CL31B684KBHWPN □		680㎋	50	±10%	1.80
8	CL31B105KAPWPN □		1.0㎌	25	±10%	1.25
9	CL31B105KBHWPN □		1.0㎌	50	±10%	1.80
10	CL31B155KAHVPN □		1.5㎌	25	±10%	1.80
11	CL31B155KBHVPN □		1.5㎌	50	±10%	1.80
12	CL31B225KOHVPN □		2.2㎌	16	±10%	1.80
13	CL31B225KAHVPN □		2.2㎌	25	±10%	1.80
14	CL31B225KBHVPN □		2.2㎌	50	±10%	1.80
15	CL31B335KOHVPN □		3.3㎌	16	±10%	1.80
16	CL31B335KAHVPN □		3.3㎌	25	±10%	1.80
17	CL31B475KOHVPN □		4.7㎌	16	±10%	1.80
18	CL31B475KAHVPN □		4.7㎌	25	±10%	1.80
19	CL31B685KOHVPN □		6.8㎌	16	±10%	1.80
20	CL31B106KOHVPN □		10.0㎌	16	±10%	1.80
1	CL32B226KOJVPN □	3.20×2.50	22㎌	16	±10%	2.70

※ □ mark means packaging code. If you want to learn the code or quantity in detail, please see p74.

Reliability Test Condition (Automotive Capacitors)

<table>
<tr><th>No</th><th colspan="3">Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td>1</td><td colspan="3">Pre-and Post-Stress
Electrical Test</td><td>–</td><td></td></tr>
<tr><td rowspan="5">2</td><td rowspan="5">High Temperature
Exposure</td><td>Appearance</td><td></td><td>No abnormal exterior appearance</td><td rowspan="5">Unpowered, 1000hrs@T=125℃
Measurement at 24±2hrs after test conclusion

Initial Measurement
Perform a heat treatment at 150+0/–10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement.
Final Measurement
Let sit for 24±2hrs at room temperature after test conclusion, then measure.</td></tr>
<tr><td rowspan="2">Capacitance
Change</td><td>CLASS I</td><td>Within ±2.5% or 0.25pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS II</td><td>Within ±10%</td></tr>
<tr><td>Q</td><td>CLASS I</td><td>Capacitance ≥ 30pF : Q ≥ 1,000
< 30pF : Q ≥ 400+20×C
(C : Capacitance)</td></tr>
<tr><td>Tanδ</td><td>CLASS II</td><td>Rated Voltage ≥ 25V : 0.03 max
≥ 16V : 0.05 max
≥ 10V : 0.075 max *1)</td></tr>
<tr><td colspan="2">IR</td><td>More than 10,000MΩ or 500MΩ×μF
(Whichever is smaller) *1)</td></tr>
<tr><td rowspan="5">3</td><td rowspan="5">Temperature
Cycling</td><td>Appearance</td><td></td><td>No abnormal exterior appearance</td><td rowspan="5">1000Cycles
Initial Measurement
Perform a heat treatment at 150+0/–10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement.
Final Measurement
Let sit for 24±2hrs at room temperature after test conclusion, then measure.
Measurement at 24±2hrs after test conclusion
<table><tr><th>Step</th><th>Temperature(℃)</th><th>Time(min.)</th></tr><tr><td>1</td><td>Min. operating
Temp.±2</td><td>15±3</td></tr><tr><td>2</td><td>25±2</td><td>1</td></tr><tr><td>3</td><td>Max. operating
Temp.±2</td><td>15±3</td></tr><tr><td>4</td><td>25±2</td><td>1</td></tr></table></td></tr>
<tr><td rowspan="2">Capacitance
Change</td><td>CLASS I</td><td>Within ±2.5% or 0.25pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS II</td><td>Within ±10%</td></tr>
<tr><td>Q</td><td>CLASS I</td><td>Capacitance ≥ 30pF : Q ≥ 1,000
< 30pF : Q ≥ 400+20×C
(C : Capacitance)</td></tr>
<tr><td>Tanδ</td><td>CLASS II</td><td>Rated Voltage ≥ 25V : 0.03 max
≥ 16V : 0.05 max
≥ 10V : 0.075max *1)</td></tr>
<tr><td colspan="2">IR</td><td>More than 10,000MΩ or 500MΩ×μF
(Whichever is smaller) *1)</td></tr>
<tr><td>4</td><td colspan="3">Destructive Physical
Analysis</td><td>No defects or abnormalities</td><td>Per EIA 469</td></tr>
<tr><td rowspan="5">5</td><td rowspan="5">Moisture Resistance</td><td>Appearance</td><td></td><td>No abnormal exterior appearance</td><td rowspan="5">10Cycles, t=24hrs/cycle
Heat (25~65℃) and humidity (80~98%), Unpowered
measurement at 24±2hrs after test conclusion
 
</td></tr>
<tr><td rowspan="2">Capacitance
Change</td><td>CLASS I</td><td>Within±2.5% or 0.25pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS II</td><td>Within ±12.5%</td></tr>
<tr><td>Q</td><td>CLASS I</td><td>Capacitance ≥ 30pF : Q ≥350
10≤Capacitance<30pF : Q≥275+(5/2)×C
Capacitance<10pF : Q ≥200+10×C
(C : Capacitance)</td></tr>
<tr><td>Tanδ</td><td>CLASS II</td><td>Rated Voltage ≥ 25V : 0.03 max
≥ 16V : 0.05 max
≥ 10V : 0.075max *1)</td></tr>
<tr><td colspan="2">IR</td><td>More than 10,000MΩ or 500MΩ×μF
(Whichever is smaller) *1)</td></tr>
</table>

※*1) : Indicates typical specification. Please refer to individual specifications.

No	Item			Performance	Test Condition
6	Biased Humidity	Appearance		No abnormal exterior appearance	1000hrs 85℃/85%RH, Rated Voltate and 1.3~1.5V, (add 100kohm resistor) Initial Measurement Perform a heat treatment at 150+0/−10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement. Final measurement Perform a heat treatment at 150+0/−10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement. Perform the initial measurement. 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 *1)	
		IR		More than 500MΩ or 25MΩ×μF (Whichever is Smaller) *1)	
7	High Temperature Operating Life	Appearance		No abnormal exterior appearance	1000hrs @ TA=125℃ , 200% Rated Voltage, *2) Initial Measurement Perform a heat treatment at 150+0/−10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement. Final measurement Perform a heat treatment at 150+0/−10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement. Perform the initial measurement. 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 *1)	
		IR		More than 1,000MΩ or 50MΩ×μF (Whichever is smaller) *1)	
8	External Visual			No abnormal exterior appearance	Microscope (x10)
9	Physical Dimensions			Within the specified dimensions	Using the calipers
10	Mechanical Shock	Appearance		No abnormal exterior appearance	Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks) Peakvalue: 1,500G / Duration: 0.5ms / Wave: Half sine Initial Measurement Perform a heat treatment at 150+0/−10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement. Final measurement Let measure within 24hrs at room temperature 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 : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05 max *1)	
		IR		More than 10,000MΩ or 500MΩ×μF (Whichever is smaller) *1)	

※ *1) : Indicates typical specification. Please refer to individual specifications.
*2) : Some of the parts are applicable in rated voltagex150%, Please refer to individual specifications.

Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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"×5" PCB 0.031" Thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10~2000㎐. Initial Measurement Perform a heat treatment at 150+0/–10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement. Final measurement Let measure within 24hrs at room temperature 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 : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05max *1)	
		IR		More than 10,000㏁ or 500㏁ ×㎌ (Whichever is smaller) *1)	
12	Resistance to Solder Heat	Appearance		No abnormal exterior appearance	Solder pot : 260±5℃ , 10±1sec. Initial Measurement Perform a heat treatment at 150+0/–10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement. Final Measurement Let sit for 24±2hrs at room temperature after test conclusion, then measure.
		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 *1)	
		IR		More than 10,000㏁ or 500㏁ ×㎌ (Whichever is smaller) *1)	
13	Thermal Shock	Appearance		No abnormal exterior appearance	–55℃/+125℃ Note: Number of cycles required–300, Maximum transfer time–20 sec, Dwell time–15min. Air–Air
		Capacitance Change	CLASS I	Within ±2.5% or 0.25pF, (Whichever is larger)	
			CLASS II	Within ±10%	
		Q	CLASS I	Capacitance ≥ 30pF : Q ≥1,000 < 30pF : Q ≥400+20×C (C : Capacitance)	
		Tanδ	CLASS II	Rated Voltage ≥ 25V : 0.025 max ≥ 16V : 0.035 max ≥ 10V : 0.05max *1)	
		IR		More than 10,000㏁ or 500㏁ ×㎌ (Whichever is smaller) *1)	
14	ESD	Appearance		No abnormal exterior appearance	AEC-Q200-002 Initial Measurement Perform a heat treatment at 150+0/–10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement. Final measurement Perform a heat treatment at 150+0/–10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement. Perform the initial measurement.
		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 *1)	
		IR		More than 10,000㏁ or 500㏁ ×㎌ (Whichever is smaller) *1)	

※ *1) : Indicates typical specification. Please refer to individual specifications.

<table>
<tr><th>No</th><th colspan="3">Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td>15</td><td colspan="3">Solderability</td><td>95% of the terminations is to be soldered evenly and continuously</td><td>a) Preheat at 155℃ for 4 hrs, Immerse in solder for 5s at 235±5℃
b) Steam aging for 8 hrs, Immerse in solder for 5s at 235±5℃
c) Steam aging for 8 hrs, Immerse in solder for 120s at 260±5℃
solder : a solution ethanol and rosin</td></tr>
<tr><td rowspan="8">16</td><td rowspan="8">Electrical Characterization</td><td colspan="2">Capacitance</td><td>Within specified tolerance</td><td rowspan="8">The Capacitance /D.F. should be measured at 25℃,
*A capacitor prior to measuring the capacitance is heat treated at 150+0/−10℃ and maintained in ambient air for 24±2hrs.
<table><tr><th>Class</th><th>Capacitance</th><th>Frequency</th><th>Vrms</th></tr><tr><td rowspan="2">Class I</td><td>1000pF ↓</td><td>1㎒±10%</td><td>0.5∼5Vrms</td></tr><tr><td>1000pF ↑</td><td>1㎑±10%</td><td>1.0±0.2Vrms</td></tr><tr><td rowspan="2">Class II</td><td>10㎌ ↓</td><td>1㎑±10%</td><td>1.0±0.2Vrms</td></tr><tr><td>10㎌ ↑</td><td>120Hz±20%</td><td>0.5±0.1Vrms</td></tr></table>Initial measurement
Perform a heat treatment at 150+0/−10℃ for one hour after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement.

I.R. should be measured with a DC voltage not exceeding Rated Voltage @25℃ , @125℃ for 60∼120 sec.

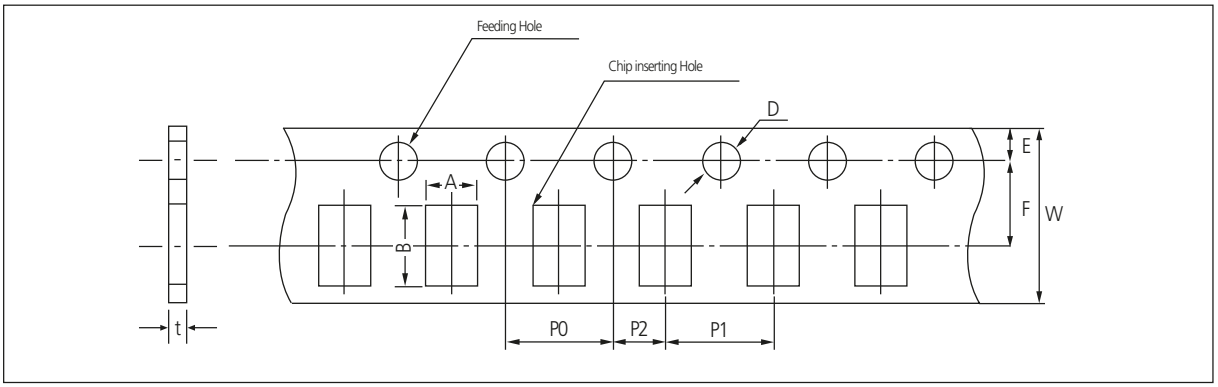
Dielectric Strength : 250% of the rated voltage for 1∼5 seconds
The charge/discharge current is less than 50mA.</td></tr>
<tr><td rowspan="2">Q</td><td rowspan="2">CLASS I</td><td rowspan="2">Capacitance≥30pF : Q≥1,000
＜30pF : Q≥400+20×C
(C: Capacitance)</td></tr>
<tr></tr>
<tr><td rowspan="2">Tanδ</td><td rowspan="2">CLASS II</td><td rowspan="2">Rated Voltage ≥ 25V : 0.025 max
≥ 16V : 0.035 max
≥ 10V : 0.05max *1)</td></tr>
<tr></tr>
<tr><td rowspan="2">IR@25℃</td><td>CLASS I</td><td>More than 100,000㏁ or 1,000 ㏁×㎌
(Whichever is smaller)</td></tr>
<tr><td>CLASS II</td><td>More than 10,000㏁ or 500㏁×㎌
(Whichever is smaller)</td></tr>
<tr><td rowspan="2">IR@125℃</td><td>CLASS I</td><td>More than 10,000㏁ or 100 ㏁×㎌
(Whichever is smaller)</td></tr>
<tr><td>CLASS II</td><td>More than 1,000㏁ or 10㏁×㎌
(Whichever is smaller)</td></tr>
<tr><td colspan="2">Dielectric Strength</td><td>No dielectric breakdown or mechanical breakdown</td></tr>
<tr><td rowspan="3">17</td><td rowspan="3">Board Flex</td><td colspan="2">Appearance</td><td>No abnormal exterior appearance</td><td rowspan="3">Bending to the limit for 60 seconds
Limit : Class I −3mm
Class II − 3mm
The figure indicates typical specification.
Please refer to individual specifications
Initial Measurement
Perform a heat treatment at 150+0/−10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement.
Final measurement
Let measure within 24hrs at room temperature after test conclusion.</td></tr>
<tr><td rowspan="2">Capacitance Change</td><td>CLASS I</td><td>Within ±5.0% or 0.5pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS II</td><td>Within ±10%</td></tr>
<tr><td rowspan="3">18</td><td rowspan="3">Terminal Strength(SMD)</td><td colspan="2">Appearance</td><td>No abnormal exterior appearance</td><td rowspan="3">18N, for 60±1 sec.
* 0603(1608) −10N,
0402(1005) −2N
Initial Measurement
Perform a heat treatment at 150+0/−10℃ for 1hr after soldering process. And then let sit for 24±2hrs at room temperature. Perform the initial measurement.
Final measurement
Let measure within 24hrs at room temperature after test conclusion.</td></tr>
<tr><td rowspan="2">Capacitance Change</td><td>CLASS I</td><td>Within ±2.5% or 0.25pF,
(Whichever is larger)</td></tr>
<tr><td>CLASS II</td><td>Within ±10%</td></tr>
<tr><td>19</td><td colspan="3">Beam Load</td><td>Destruction value should be exceed
Chip Length ≤ 2.5㎜
a) Chip Thickness ＞0.5㎜ : 20N
b) Chip Thickness≤ 0.5㎜ : 8N
Chip Length ≥ 3.2㎜
a) Chip Thickness ≥1.25㎜ : 54.5N
b) Chip Thickness＜1.25㎜ : 15N</td><td>Beam speed
Chip Length ≤ 2.5㎜, 0.5±0.05㎜/sec
Chip Length ≥ 3.2㎜, 2.5±0.25㎜/sec</td></tr>
<tr><td rowspan="4">20</td><td rowspan="4">Capacitance Temperature Characteristics</td><td rowspan="2">Capacitance Change</td><td>CLASS I</td><td>0±30 ppm/℃</td><td rowspan="4"><table><tr><th>Step</th><th>Temperature(℃)</th></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></td></tr>
<tr><td>CLASS II</td><td>Within ±15%</td></tr>
<tr><td>Temperature Coefficient</td><td>CLASS I</td><td>0±30 ppm/℃</td></tr>
<tr><td>Capacitance Drift</td><td>CLASS I</td><td>Within ±0.2% or 0.05pF,
(Whichever is larger)</td></tr>
</table>

※ *1) : Indicates typical specification. Please refer to individual specifications.

*If you want more detaiedl imformation, Please Visit Samsung Electro-mechanics website (www.semlcr.com)

Packaging Specifications

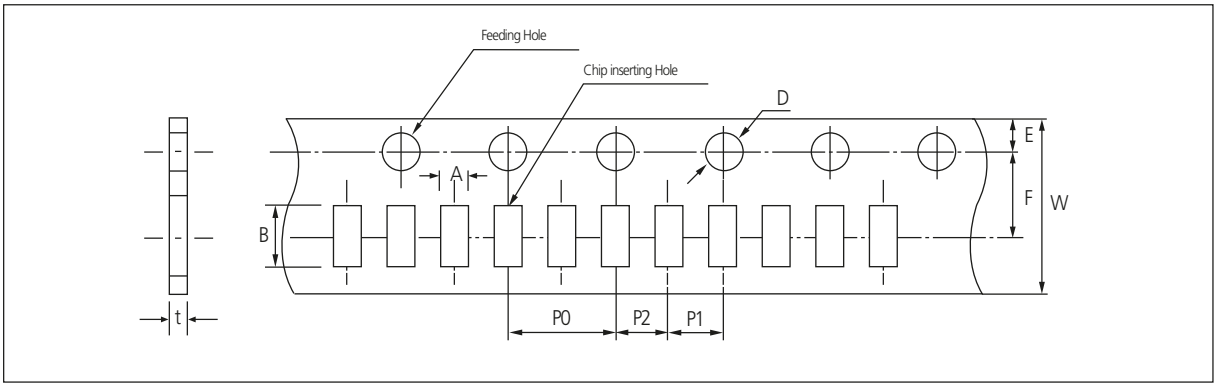
Cardboard Paper Tape(4mm)



Unit: inch(mm)

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

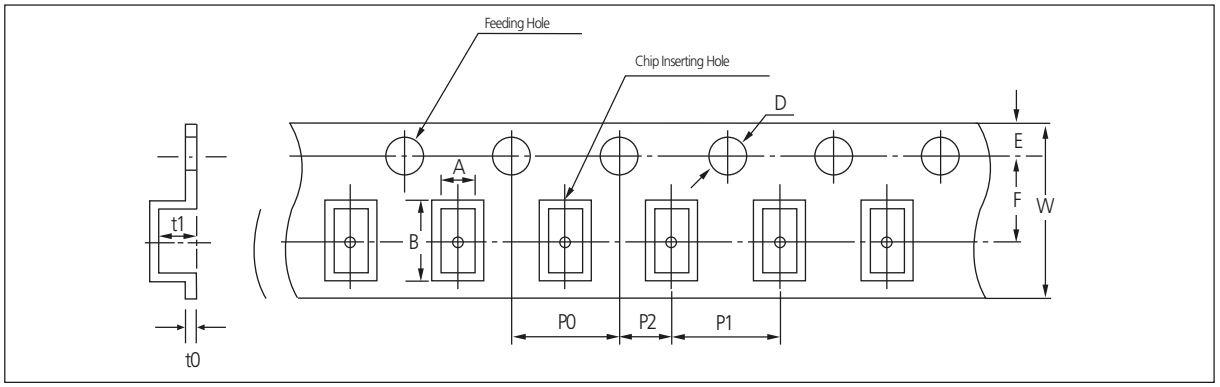
Cardboard Paper Tape(2mm)



Unit: inch(mm)

Symbol / Type		A	B	W	F	E	P1	P2	P0	D	t
Dimension	01005 (0402)	0.25 ±0.02	0.45 ±0.02	8.0 ±0.3	3.5 ±0.05	1.75 ±0.1	2.0 ±0.05	2.0 ±0.05	4.0 ±0.1	Ø1.5 +0.1 /−0.03	0.25 ±0.02
	0201 (0603)	0.38 ±0.03	0.68 ±0.03								0.37 ±0.03
	0402 (1005)	0.62 ±0.05	1.12 ±0.05								0.37 ±0.05
											0.60 ±0.05
	0204 (0510)	0.62 +0.05 /−0.10	1.12 +0.05 /−0.10								0.37 ±0.03

Embossed Plastic Tape

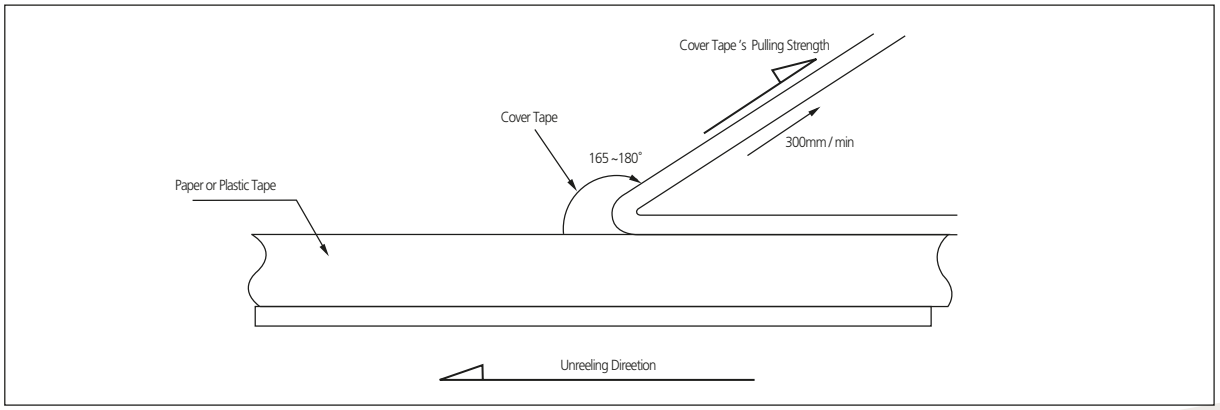


Unit: inch(mm)

Symbol / Type		A	B	W	F	E	P1	P2	P0	D	t1	t0
Dimension	01005 (0402)	0.25 ±0.02	0.45 ±0.02	4.0 ±0.05	1.8 ±0.02	0.9 ±0.05	1.0 ±0.02	1.0 ±0.02	2.0 ±0.04	Ø0.8 ±0.04	0.25 ±0.02	0.5 max
	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/ −0.03	2.9 max	0.6 Below
	0805 (2012)	1.45 ±0.2	2.3 ±0.2									
	1206 (3216)	1.9 ±0.2	3.5 ±0.2									
	1210 (3225)	2.8 ±0.2	3.6 ±0.2									
	1808 (4520)	2.3 ±0.2	4.9 ±0.2	12.0 ±0.3	5.60 ±0.05		8.0 ±0.1				3.8 max	
	1812 (4532)	3.6 ±0.2	4.9 ±0.2									
	2220 (5750)	5.5 ±0.2	6.2 ±0.2									
	0204 (5010)	0.62 +0.05 /−0.10	1.12 +0.05 −/0.10	0.8 ±0.3	3.5 ±0.05		4.0 ±0.1				2.5 max	
	0306 (0816)	1.1 ±0.2	1.9 ±0.2									
	0508 (1220)	1.45 ±0.2	2.3 ±0.2									
	0612 (1632)	2.0 ±0.2	3.6 ±0.2									

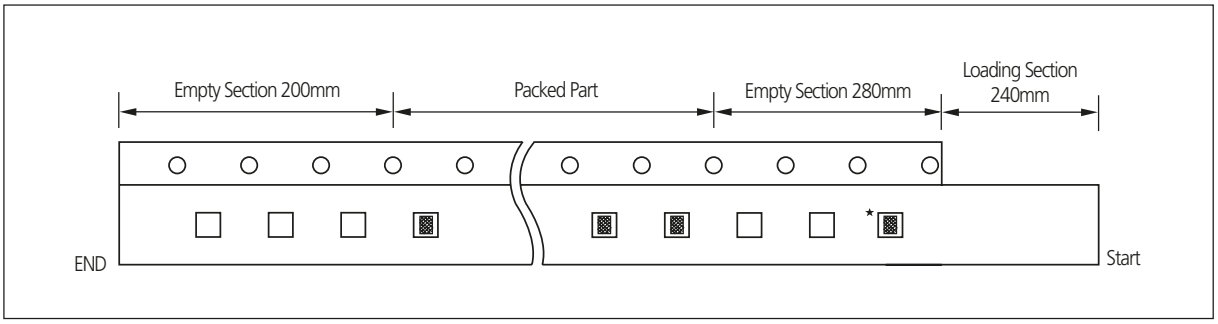
Peeling off of Cover Tape

- 10 g.f ≤ Peel off force ≤70 g.f



Part Numbering System
Standard & High Capacitors
Super Small Size Capacitors
High-Q 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

Taping Size

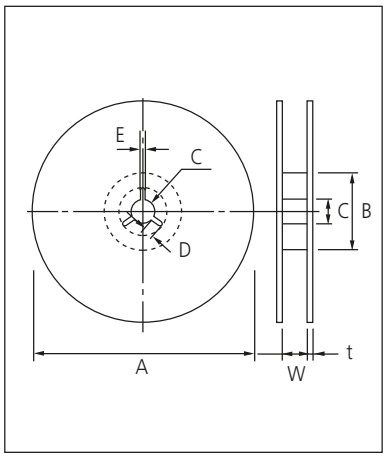


• The chip is only use for identifying the label and packaged products.
Please don't use the chip.

Unit: kpcs

Size	T code	Quantity & Packing Code									
		Cardboard Paper Type						Embossed Plastic Type			
		C (7″reel)	8 (7″reel)	H (7″reel)	O (10″reel)	D (13″reel)	L (13″reel)	E (7″reel)	G (7″reel)	F (13″reel)	S (10″reel)
01005(0402)	2	20	–	–	–	100	50	50	–	–	–
0201(0603)	3	10	–	15	30	50	–	–	–	–	–
0402(1005)	3	10	–	15	30	50	–	–	–	–	–
	5	10	8	15	30	50	40	–	–	–	–
0504(1410)	8	4	–	–	10	10	15	–	–	–	–
0603(1608)	5	4	–	–	10	10	–	–	–	–	–
	8	4	–	–	10	10	15	3	–	–	–
0604(1610)	D	–	–	–	–	–	–	3	–	10	6
0805(2012)	A, C	4	–	–	10	10	15	–	–	–	–
	E, F, Q	–	–	–	–	–	–	2	3	10	6
1206(3216)	C	4	–	–	10	10	15	–	–	–	–
	E, F, P	–	–	–	–	–	–	2	3	10	6
	H	–	–	–	–	–	–	2	–	8	4
1210(3225)	9, D, C, O	–	–	–	–	–	–	2	–	10	–
	E, F, M	–	–	–	–	–	–	2	–	10	–
	H, T	–	–	–	–	–	–	2	–	8	4
	I, U	–	–	–	–	–	–	2	–	4	–
	J, V	–	–	–	–	–	–	1	–	4	–
	S	–	–	–	–	–	–	2	–	8	–
1808(4520)	F	–	–	–	–	–	–	2	–	–	–
1812(4532)	F, H, I	–	–	–	–	–	–	1	–	4	–
	L, J	–	–	–	–	–	–	–	–	2	–
2220(5750)	H, I, J	–	–	–	–	–	–	–	–	2	–

Reel Dimensions



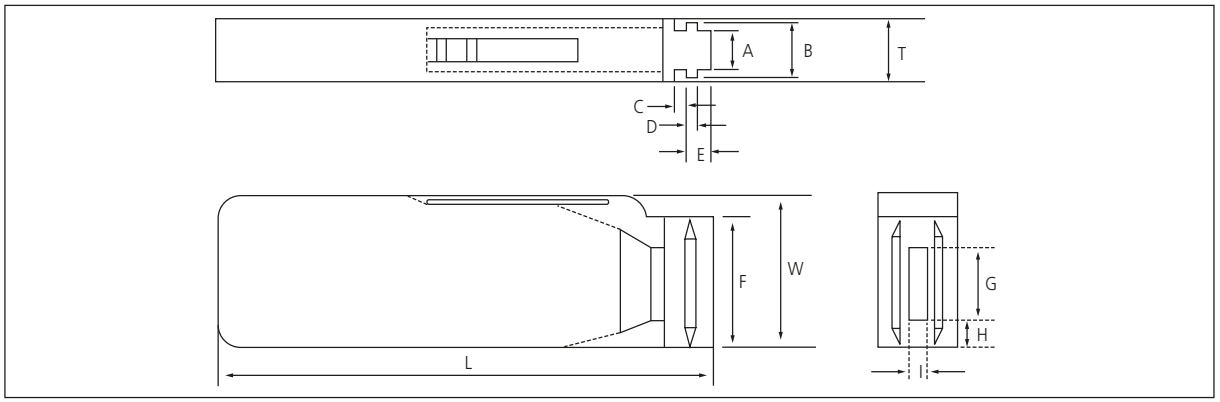
Unit: mm

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

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

Bulk Case Packaging

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



Unit: mm

Symbol	A	B	T	C	D	E
Dimension	6.8±0.1	8.8±0.1	12±0.1	1.5+0.1/–0	2+0/–0.1	3.0+0.2/–0

Symbol	F	W	G	H	L	I
Dimension	31.5+0.2/–0	36+0/–0.2	19±0.35	7±0.35	110±0.7	5±0.35

• **QUANTITY**

Unit: inch(mm) and pcs

Size	0402(1005)	0603(1608)	0805(2012)	
			T≤0.85mm	T≥1.0mm
Quantity	50,000	10,000 or 15,000	10,000	5,000

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.

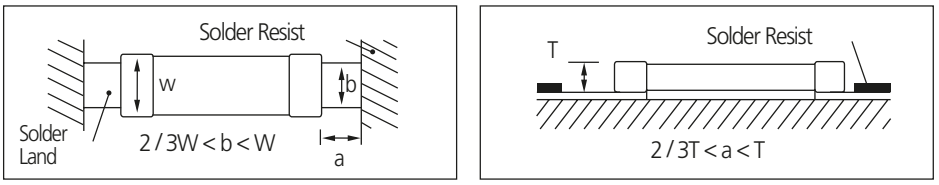
1-2. Corrosive Gases
Since sulfur and chlorine may degrade the solderability of the end termination, it is important to store the capacitors in an environment free of these gases

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

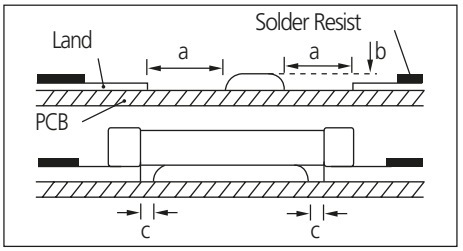


3.Adhesives

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 theconductor pattern, thereby causing defective soldering. The following illustrations show the proper quantity of adhesive.



Unit: mm

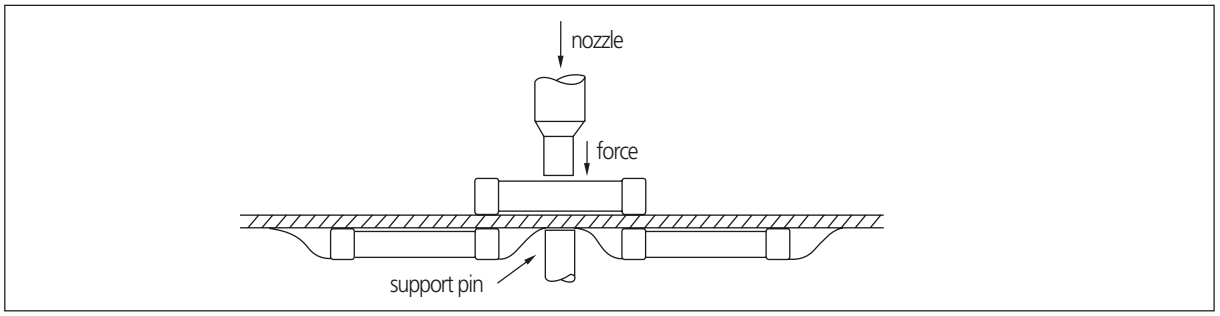
Type	21	31
a	0.2min	0.2min
b	70~100 μm	70~100 μm
c	>0	>0

3-3. Adhesive hardening Characteristics
To prevent oxidation of the terminations, the adhesive must harden at 160℃ or less, within 2 minutes or less.

4. Mounting

4-1. Mounting Head Pressure
Excessive pressure will cause chip capacitors to crack. The pressure between nozzle and chip capacitor will be 300g maximum during mounting.

4-2. Bending Stress
Bending of printed circuit board by mounting head when double-sided circuit boards are used, chip capacitors first are mounted and soldered onto one side of the board. When the capacitors are mounted onto the other side, it is important to support the board as shown in the illustration. If the circuit board is not supported, it may bend, causing the already-installed capacitors to crack.



5. Flux

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

6. Soldering

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

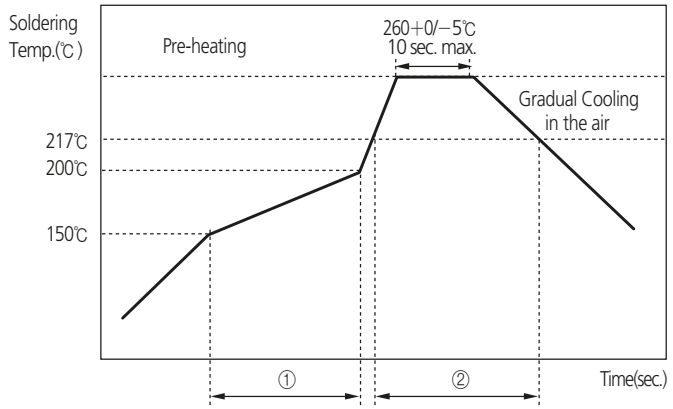
6-1. Soldering Methods

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

6-2. Soldering Profile
To avoid the crack problem by sudden temperature change, follow the temperature profile in the adjacent graph.

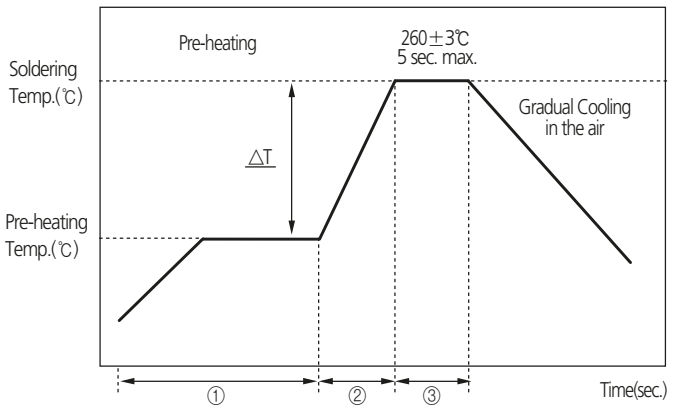
6-2-1 Pb-Free (Sn 100%) Plating

▪ REFLOW SOLDERING



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

▪ FLOW SOLDERING



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

▪ SOLDER IRON(Hand Soldering)

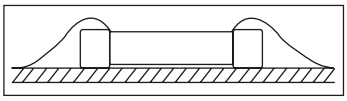
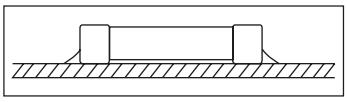
Variation of Temp.(℃)	Soldering Temp(℃)	Pre-heating Time(sec.)	Soldering Time(sec.)	Cooling Time(sec.)	Condition of Iron Facilities		
					Wattage	Tip Diameter	Soldering Time
△T≤130	300±10℃ max.	≥ 60 sec.	≤ 4 sec.	–	20W max.	3mm max.	4 sec max.

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

6-3. Manual Soldering

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

6-4. Amount of Solder

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

6-5. Cooling

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

6-6. Cleaning

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

7. Notes for Separating Multiple, Shared PC Boards

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

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OHSAS18001

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Date Validity	2013-10-25 ~2016-10-24	2013-08-08 ~2016-08-07	2012-08-03 ~2015-08-02	2011-11-29 ~2014-11-28	2011-11-29 ~2014-11-28
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QC 080000	***UL KR-HSPM-1011***	***UL KR-HSPM-1012***	***UL PI-HSPM-1001***	***UL PRC-HSPM-1767***	***UL PRC-HSPM-1767-2***
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