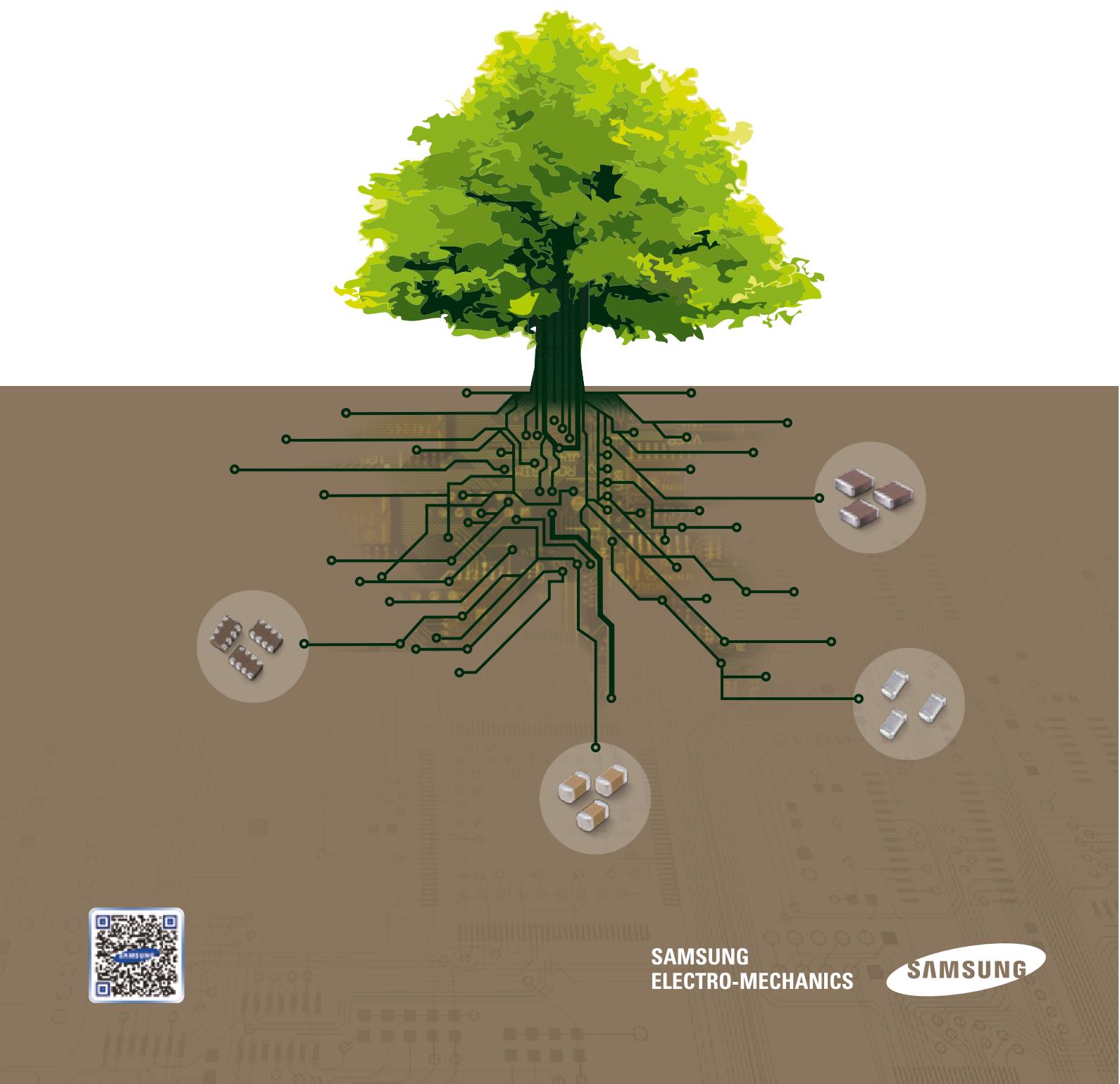


November 2015



# 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, CCl<sub>4</sub>, HCFC

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

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

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# 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(mm)

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

## 3. DIELECTRIC CODE

Class I	Class II
C = COG	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 =  $10 \times 10^6 = 10000000$ pF

For Values < 10pF, Letter R denotes decimal point  
example) 1R5 = 1.5pF

## 5. TOLERANCE CODE

B = $\pm 0.1\text{pF}$	F = $\pm 1\text{pF}, \pm 1\%$ *	K = $\pm 10\%$
C = $\pm 0.25\text{pF}$	G = $\pm 2\%$	M = $\pm 20\%$
D = $\pm 0.5\text{pF}$	J = $\pm 5\%$	Z = $+80/-20\%$

\*For Values  $\leq 10\text{pF}$ , F =  $\pm 1\text{pF}$

Values  $> 10\text{pF}$ , F =  $\pm 1\%$

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

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

## 10. CONTROL CODE

N = Reserved for future use

## 11. PACKAGING CODE

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

**Class I** (Temperature Compensation)

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

**Class II** (High Dielectric Constant)

Symbol	EIA Code	Operation Temperature Range(°C)	Capacitance Change( $\Delta\%/\Delta C$ )
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

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

Series	TC	Capacitance Step									
		1.0		2.2		4.7		6.8		8.2	
E-3	Y5V	1.0		2.2		4.7		6.8		8.2	
E-6	X5R	1.0	1.5	2.2	3.3	4.7	6.8				
	X7R										
	X6S										
	X7S										
	X7T										
E-12	COG	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6

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*
02021(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		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
1206(3216)	Y	1.25	±0.20		F	1.25	±0.20
	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*		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, 12<sup>th</sup> code in part number.

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

# Standard & High Capacitors



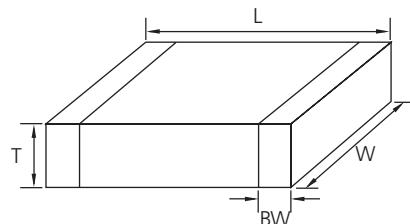
## Feature

- 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(mm)				
		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	
		3.20±0.20	1.60±0.20	0.60±0.10(*)	6	
31	1206	3.20±0.15	1.60±0.15	0.85±0.15	C	0.50±0.30
		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	
		3.20±0.30	2.50±0.20	0.85±0.10(*)	C	
32	1210	3.20±0.30	2.50±0.20	0.90±0.10(*)	9	0.60±0.30
		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	
		4.50±0.40	2.00±0.20	1.25±0.20	F	
42	1808	4.50±0.40	2.00±0.20	1.40±0.20	G	0.80±0.30
		4.50±0.40	2.00±0.20	2.00±0.20	I	
		4.50±0.40	3.20±0.30	1.25±0.20	F	
43	1812	4.50±0.40	3.20±0.30	2.50±0.20	J	0.80±0.30
		4.50±0.40	3.20±0.30	3.20±0.30	L	
		5.70±0.40	5.00±0.40	2.50±0.20	J	
55	2220	5.70±0.40	5.00±0.40	3.20±0.30	L	1.00±0.30

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

### Standard & High Capacitance (C0G)

Size(mm)	Vr(V)	Capacitance																							
		pF										nF													
		0.5	1	10	22	47	100	220	330	470	560	1	2.2	3.3	4.7	6.8	10	22	27	33	47	68	100	120	150
0402(1005)	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0603(1608)	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
0805(2012)	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1206(3216)	16	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1210(3225)	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
1812(4532)	25	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
2220(5750)	50	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	43nF	.	.	130nF	.	.	.	.	.

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

**Standard & High Capacitance (X5R)**

Size(mm)	Vr(V)	Capacitance ( $\mu F$ )										
		0.1	0.22	0.47	1	2.2	4.7	10	22	47	100	220
0402(1005)	4	.	.	.	.	.	.	15	.	.	.	.
	6.3	.	.	.	.	.	.	.	.	.	.	.
	10	.	.	.	.	.	.	.	.	.	.	.
	16	.	.	.	.	9.5	.	.	.	.	.	.
	25	.	.	.	2.2	.	.	.	.	.	.	.
0603(1608)	4	.	.	.	.	.	.	.	.	.	.	.
	6.3	.	.	.	.	.	.	.	.	.	.	.
	10	.	.	.	.	.	.	.	27	.	.	.
	16	.	.	.	.	.	.	.	10.5	.	.	.
	25	.	.	.	.	.	.	.	10.5	.	.	.
0805(2012)	50	.	.	.	1.1	.	.	.	.	.	.	.
	4	.	.	.	.	.	.	.	.	.	.	.
	6.3	.	.	.	.	.	.	.	.	.	.	.
	10	.	.	.	.	.	.	.	27	.	.	.
	16	.	.	.	.	.	.	.	27	.	.	.
1206(3216)	25	.	.	.	.	.	.	.	27	.	.	.
	50	.	.	.	.	.	.	9.5	.	.	.	.
	6.3	.	.	.	.	.	.	.	.	150	.	.
	10	.	.	.	.	.	.	.	.	10.5	.	.
	16	.	.	.	.	.	.	.	27	.	.	.
1210(3225)	25	.	.	.	.	.	.	.	.	.	.	.
	6.3	.	.	.	.	.	.	.	.	.	.	.
	10	.	.	.	.	.	.	.	.	.	.	.
	16	.	.	.	2.2	.	.	.	.	47	.	.
25	6.3	.	.	.	.	.	.	2.2	.	.	.	.
	10	.	.	.	.	.	.	2.2	.	.	.	.

### Standard & High Capacitance-Low Profile (X5R)

Size(mm)	Tmax (mm)	Vr(V)	Capacitance ( $\mu F$ )					
			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				X6S		
	0.95	4						(Tmax=1.0)
		6.3						(Tmax=1.0)
		10						
		16						
		25						
1206(3216)	0.7	10						
	0.95	6.3						
		10						
		16						
		25						
		50		(Tmax=1.0)	(Tmax=1.0)			
		100		(Tmax=1.0)				
1210(3225)	0.95	16						
	2.0	25						
		35						
		50						

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



### Standard & High Capacitance (X7R)

Size(mm)	Vr(V)	Capacitance ( $\mu\text{F}$ )									
		0.1	0.22	0.47	1	2.2	4.7	10	22	47	100
0402(1005)	6.3				1						
	10			X7S							
	16										
0603(1608)	6.3										
	10										
	16										
	25										
	50										
0805(2012)	6.3										
	10										
	16										
	25					X7S					
	35										
	50										
1206(3216)	6.3										
	10										
	16										
	25										
	35										
	50										
1210(3225)	6.3									X7T	
	10										
	16										
	25										
	50										

Part Numbering System

Standard & High Capacitors

Super Small Size Capacitors

High-Q Capacitors

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Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

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Packaging Specification

Application Manual for Surface Mounting

**Standard & High capacitance (Y5V)**

Size(mm)	Vr(V)	Capacitance ( $\mu\text{F}$ )								
		0.1	0.22	0.47	1	2.2	4.7	10	22	47
0402(1005)	6.3									
	10									
	16									
	25									
0603(1608)	6.3									
	10									
	16									
	25									
	50									
0805(2012)	6.3									
	10									
	16									
	25									
	50									
1206(3216)	10									
	16									
	25									
	50				(Tmax=1.35)					
1210(3225)	6.3									
	10								(Tmax=2.7)	
	16								(Tmax=2.0)	
	25								(Tmax=1.2)	
	35								(Tmax=1.8)	
	50								(Tmax=1.5)	
									(Tmax=1.4)	
									(Tmax=1.6)	
									(Tmax=1.45)	

**Standard & High capacitance - Low Profile (Y5V)**

Size(mm)	Vr(V)	Capacitance ( $\mu\text{F}$ )					
		1	2.2	4.7	10	22	47
0805(2012)	6.3					(Tmax=0.95)	
	10					(Tmax=0.95)	

### Product Lineup (Standard & High Capacitors-COG)

	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.

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)
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

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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)
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	CL21CR47CBANNNN □	2.00×1.25	0.47 pF	50	±0.25 pF	0.75
2	CL21C0R5CBANNNN □		0.5 pF	50	±0.25 pF	0.75
3	CL21C010CBANNNN □		1.0 pF	50	±0.25 pF	0.75
4	CL21C1R2CBANNNN □		1.2 pF	50	±0.25 pF	0.75
5	CL21C1R5CBANNNN □		1.5 pF	50	±0.25 pF	0.75
6	CL21C1R8CBANNNN □		1.8 pF	50	±0.25 pF	0.75
7	CL21C020CBANNNN □		2.0 pF	50	±0.25 pF	0.75
8	CL21C2R2CBANNNN □		2.2 pF	50	±0.25 pF	0.75
9	CL21C2R4CBANNNN □		2.4 pF	50	±0.25 pF	0.75
10	CL21C2R5CBANNNN □		2.5 pF	50	±0.25 pF	0.75
11	CL21C2R7CBANNNN □		2.7 pF	50	±0.25 pF	0.75
12	CL21C030CBANNNN □		3.0 pF	50	±0.25 pF	0.75
13	CL21C3R2CBANNNN □		3.2 pF	50	±0.25 pF	0.75
14	CL21C3R3CBANNNN □		3.3 pF	50	±0.25 pF	0.75
15	CL21C3R6CBANNNN □		3.6 pF	50	±0.25 pF	0.75
16	CL21C3R9CBANNNN □		3.9 pF	50	±0.25 pF	0.75
17	CL21C040CBANNNN □		4.0 pF	50	±0.25 pF	0.75
18	CL21C4R7CBANNNN □		4.7 pF	50	±0.25 pF	0.75
19	CL21C5R6DBANNNN □		5.6 pF	50	±0.5 pF	0.75
20	CL21C060DBANNNN □		6.0 pF	50	±0.5 pF	0.75
21	CL21C6R8DBANNNN □		6.8 pF	50	±0.5 pF	0.75
22	CL21C070DBANNNN □		7.0 pF	50	±0.5 pF	0.75
23	CL21C7R5DBANNNN □		7.5 pF	50	±0.5 pF	0.75
24	CL21C080DBANNNN □		8.0 pF	50	±0.5 pF	0.75
25	CL21C8R2DBANNNN □		8.2 pF	50	±0.5 pF	0.75
26	CL21C090DBANNNN □		9.0 pF	50	±0.5 pF	0.75
27	CL21C100JBANNNN □		10 pF	50	±5%	0.75
28	CL21C120JBANNNN □		12 pF	50	±5%	0.75
29	CL21C130JBANNNN □		13 pF	50	±5%	0.75
30	CL21C140JBANNNN □		14 pF	50	±5%	0.75
31	CL21C150JBANNNN □		15 pF	50	±5%	0.75
32	CL21C160JBANNNN □		16 pF	50	±5%	0.75
33	CL21C180JBANNNN □		18 pF	50	±5%	0.75
34	CL21C200JBANNNN □		20 pF	50	±5%	0.75
35	CL21C220JBANNNN □		22 pF	50	±5%	0.75
36	CL21C240JBANNNN □		24 pF	50	±5%	0.75
37	CL21C250JBANNNN □		25 pF	50	±5%	0.75
38	CL21C270JBANNNN □		27 pF	50	±5%	0.75
39	CL21C300JBANNNN □		30 pF	50	±5%	0.75
40	CL21C330JBANNNN □		33 pF	50	±5%	0.75
41	CL21C360JBANNNN □		36 pF	50	±5%	0.75
42	CL21C390JBANNNN □		39 pF	50	±5%	0.75
43	CL21C430JBANNNN □		43 pF	50	±5%	0.75
44	CL21C470JBANNNN □		47 pF	50	±5%	0.75
45	CL21C510JBANNNN □		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 □	3.20×1.60	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 □		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

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Packaging Specification

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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)
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	CL31C683JAHHNNN □		68 nF	25	±5%	1.80
54	CL31C104JAHHNNN □		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

※ □ 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)
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	0.47 μF	50	±10%	0.90
2	CL10A474KA8NNN□		0.47 μF	25	±10%	0.90
3	CL10A474KP8NNN□		0.47 μF	10	±10%	0.90
4	CL10A474KQ8NNN□		0.47 μF	6.3	±10%	0.90
5	CL10A474KR8NNN□		0.47 μF	4	±10%	0.90
6	CL10A105KB8NNN□		1 μF	50	±10%	0.90
7	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.

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	CL10A105KR8NNN □	1.60×0.80	1 $\mu$ F	4	$\pm 10\%$	0.90
16	CL10A105KR5LNN □		1 $\mu$ F	4	$\pm 10\%$	0.50
17	CL10A105KA5LNN □		1 $\mu$ F	25	$\pm 10\%$	0.50
18	CL10A225KA8NNN □		2.2 $\mu$ F	25	$\pm 10\%$	0.90
19	CL10A225KA5LNN □		2.2 $\mu$ F	25	$\pm 10\%$	0.50
20	CL10A225KO8NNN □		2.2 $\mu$ F	16	$\pm 10\%$	0.90
21	CL10A225KO5LNN □		2.2 $\mu$ F	16	$\pm 10\%$	0.50
22	CL10A225KP8NNN □		2.2 $\mu$ F	10	$\pm 10\%$	0.90
23	CL10A225KP5LNN □		2.2 $\mu$ F	10	$\pm 10\%$	0.50
24	CL10A225KQ8NNN □		2.2 $\mu$ F	6.3	$\pm 10\%$	0.90
25	CL10A225KQ5LNN □		2.2 $\mu$ F	6.3	$\pm 10\%$	0.50
26	CL10A225KR8NNN □		2.2 $\mu$ F	4	$\pm 10\%$	0.90
27	CL10A225KR5LNN □		2.2 $\mu$ F	4	$\pm 10\%$	0.50
28	CL10A335KQ8NNN □		3.3 $\mu$ F	6.3	$\pm 10\%$	0.90
29	CL10A335KR8NNN □		3.3 $\mu$ F	4	$\pm 10\%$	0.90
30	CL10A475KA8NQN □		4.7 $\mu$ F	25	$\pm 10\%$	0.95
31	CL10A475KO8NNN □		4.7 $\mu$ F	16	$\pm 10\%$	0.90
32	CL10A475KP8NNN □		4.7 $\mu$ F	10	$\pm 10\%$	0.90
33	CL10A475KP5LNN □		4.7 $\mu$ F	10	$\pm 10\%$	0.50
34	CL10A475KQ5LNN □		4.7 $\mu$ F	6.3	$\pm 10\%$	0.50
35	CL10A475KQ8NNN □		4.7 $\mu$ F	6.3	$\pm 10\%$	0.90
36	CL10A475KR5LNN □		4.7 $\mu$ F	4	$\pm 10\%$	0.50
37	CL10A475KR8NNN □		4.7 $\mu$ F	4	$\pm 10\%$	0.90
38	CL10A106KR8NNN □		10 $\mu$ F	4	$\pm 10\%$	0.90
39	CL10A106MR5LRN □		10 $\mu$ F	4	$\pm 20\%$	0.50
40	CL10A106KQ8NNN □		10 $\mu$ F	6.3	$\pm 10\%$	0.90
41	CL10A106MQ5LRN □		10 $\mu$ F	6.3	$\pm 20\%$	0.50
42	CL10A106MP8NNN □		10 $\mu$ F	10	$\pm 20\%$	0.90
43	CL10A106MO8NQN □		10 $\mu$ F	16	$\pm 20\%$	0.95
44	CL10A106MA8NRN □		10 $\mu$ F	25	$\pm 20\%$	1.00
45	CL10A226MR8NRN □		22 $\mu$ F	4	$\pm 20\%$	1.00
46	CL10A226MQ8NRN □		22 $\mu$ F	6.3	$\pm 20\%$	1.00
47	CL10A226MP8NRN □		22 $\mu$ F	10	$\pm 20\%$	1.00
48	CL10A226MP8NUN □		22 $\mu$ F	10	$\pm 20\%$	1.05
49	CL10A476MR8NZN □		47 $\mu$ F	4	$\pm 20\%$	1.10
50	CL10A476MQ8CZN □		47 $\mu$ F	6.3	$\pm 20\%$	1.10
1	CL21A105KBQNNN □	2.00×1.25	1 $\mu$ F	50	$\pm 10\%$	1.40
2	CL21A105KAFNNN □		1 $\mu$ F	25	$\pm 10\%$	1.35
3	CL21A105KA6LNN □		1 $\mu$ F	25	$\pm 10\%$	0.70
4	CL21A105KOFNNN □		1 $\mu$ F	16	$\pm 10\%$	1.35
5	CL21A105KO6LNN □		1 $\mu$ F	16	$\pm 10\%$	0.70
6	CL21A105KQFNNN □		1 $\mu$ F	6.3	$\pm 10\%$	1.35
7	CL21A105KRFNNN □		1 $\mu$ F	4	$\pm 10\%$	1.35
8	CL21A225KBQNNN □		2.2 $\mu$ F	50	$\pm 10\%$	1.40
9	CL21A225KAFNNN □		2.2 $\mu$ F	25	$\pm 10\%$	1.35
10	CL21A225KO6LNN □		2.2 $\mu$ F	16	$\pm 10\%$	0.70
11	CL21A225KOFNNN □		2.2 $\mu$ F	16	$\pm 10\%$	1.35
12	CL21A225KPFFNNN □		2.2 $\mu$ F	10	$\pm 10\%$	1.35
13	CL21A225KQFNNN □		2.2 $\mu$ F	6.3	$\pm 10\%$	1.35
14	CL21A225KRFNNN □		2.2 $\mu$ F	4	$\pm 10\%$	1.35
15	CL21A475KBQNNN □		4.7 $\mu$ F	50	$\pm 10\%$	1.40

※ □ 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)
16	CL21A475KAQNNN□	2.00×1.25	4.7μF	25	±10%	1.40
17	CL21A475KACLRN□		4.7μF	25	±10%	0.95
18	CL21A475KOFNNN□		4.7μF	16	±10%	1.35
19	CL21A475KOCLNN□		4.7μF	16	±10%	0.95
20	CL21A475KPFNNN□		4.7μF	10	±10%	1.35
21	CL21A475KPCLNN□		4.7μF	10	±10%	0.95
22	CL21A475KQFNNN□		4.7μF	6.3	±10%	1.35
23	CL21A475KQCLNN□		4.7μF	6.3	±10%	0.95
24	CL21A475KRFNNN□		4.7μF	4	±10%	1.35
25	CL21A475KRCLNN□		4.7μF	4	±10%	0.95
26	CL21A106KAYNNN□		10μF	25	±10%	1.45
27	CL21A106KACLRN□		10μF	25	±10%	0.95
28	CL21A106KA7LQN□		10μF	25	±10%	0.80
29	CL21A106KOFNNN□		10μF	16	±10%	1.35
30	CL21A106KOQNNN□		10μF	16	±10%	1.40
31	CL21A106KOCLR□		10μF	16	±10%	0.95
32	CL21A106KOCL3R□		10μF	16	±10%	0.95
33	CL21A106KPFNNN□		10μF	10	±10%	1.35
34	CL21A106KPCLQN□		10μF	10	±10%	0.95
35	CL21A106KQFNNN□		10μF	6.3	±10%	1.35
36	CL21A106KQCLNN□		10μF	6.3	±10%	0.95
37	CL21A106KRFNNN□		10μF	4	±10%	1.35
38	CL21A106KRCNN□		10μF	4	±10%	0.95
39	CL21A226MAQNNN□		22μF	25	±20%	1.40
40	CL21A226MPQNNN□		22μF	10	±20%	1.40
41	CL21A226MPCLRN□		22μF	10	±20%	0.95
42	CL21A226MQQNNN□		22μF	6.3	±20%	1.40
43	CL21A226MQCLRN□		22μF	6.3	±20%	0.95
44	CL21A226MRQNNN□		22μF	4	±20%	1.40
45	CL21A226MRCLRN□		22μF	4	±20%	0.95
46	CL21A336MQELNN□		33μF	6.3	±20%	1.20
47	CL21A336MQ9LNN□		33μF	6.3	±20%	1.00
48	CL21A336MRELNN□		33μF	4	±20%	1.20
49	CL21A336MR9LNN□		33μF	4	±20%	1.00
50	CL21A476MQYNNN□		47μF	6.3	±20%	1.45
51	CL21A476MRYNNN□		47μF	4	±20%	1.45
52	CL21A476MQ9LRN□		47μF	6.3	±20%	1.00
1	CL31A225KC9LNN□	3.20×1.60	2.2μF	100	±10%	1.00
2	CL31A475KBHNNN□		4.7μF	50	±10%	1.80
3	CL31A475KB9LNN□		4.7μF	50	±10%	1.00
4	CL31A475KAHNNN□		4.7μF	25	±10%	1.80
5	CL31A475KACLN□		4.7μF	25	±10%	0.95
6	CL31A475KOHNNN□		4.7μF	16	±10%	1.80
7	CL31A475KOCLNN□		4.7μF	16	±10%	0.95
8	CL31A475KPHNNN□		4.7μF	10	±10%	1.80
9	CL31A475KQHNNN□		4.7μF	6.3	±10%	1.80
10	CL31A475KRHNNN□		4.7μF	4	±10%	1.80
11	CL31A106KBHNNN□		10μF	50	±10%	1.80
12	CL31A106KAHNNN□		10μF	25	±10%	1.80
13	CL31A106KACLN□		10μF	25	±10%	0.95
14	CL31A106KOHNNN□		10μF	16	±10%	1.80

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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-X5R)**

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
15	CL31A106KOCLNN □	3.20×1.60	10 $\mu$ F	16	$\pm 10\%$	0.95
16	CL31A106KPHNNN □		10 $\mu$ F	10	$\pm 10\%$	1.80
17	CL31A106KPC LNN □		10 $\mu$ F	10	$\pm 10\%$	0.95
18	CL31A106QHNNN □		10 $\mu$ F	6.3	$\pm 10\%$	1.80
19	CL31A106KRHNNN □		10 $\mu$ F	4	$\pm 10\%$	1.80
20	CL31A156KQHNNN □		15 $\mu$ F	6.3	$\pm 10\%$	1.80
21	CL31A156KRHNNN □		15 $\mu$ F	4	$\pm 10\%$	1.80
22	CL31A226KAHNNN □		22 $\mu$ F	25	$\pm 10\%$	1.80
23	CL31A226KOHNNN □		22 $\mu$ F	16	$\pm 10\%$	1.80
24	CL31A226KOCLNN □		22 $\mu$ F	16	$\pm 10\%$	0.95
25	CL31A226KPHNNN □		22 $\mu$ F	10	$\pm 10\%$	1.80
26	CL31A226KPC LNN □		22 $\mu$ F	10	$\pm 10\%$	0.95
27	CL31A226QHNNN □		22 $\mu$ F	6.3	$\pm 10\%$	1.80
28	CL31A476KPHNNN □		47 $\mu$ F	10	$\pm 10\%$	1.80
29	CL31A476MQHNNN □		47 $\mu$ F	6.3	$\pm 20\%$	1.80
30	CL31A476MRHNNN □		47 $\mu$ F	4	$\pm 20\%$	1.80
31	CL31A107MQHNNN □		100 $\mu$ F	6.3	$\pm 20\%$	1.80
32	CL31A107MRHNNN □		100 $\mu$ F	4	$\pm 20\%$	1.80
33	CL31A107MPHNNN □		100 $\mu$ F	10	$\pm 20\%$	1.80
1	CL32A106KQCLNN □	3.20×2.50	10 $\mu$ F	6.3	$\pm 10\%$	0.95
2	CL32A106KRC LNN □		10 $\mu$ F	4	$\pm 10\%$	0.95
3	CL32A106KBULNN □		10 $\mu$ F	50	$\pm 10\%$	2.00
4	CL32A106KAJNNN □		10 $\mu$ F	25	$\pm 10\%$	2.70
5	CL32A106KAULNN □		10 $\mu$ F	25	$\pm 10\%$	2.00
6	CL32A106KOJNNN □		10 $\mu$ F	16	$\pm 10\%$	2.70
7	CL32A106KPJNNN □		10 $\mu$ F	10	$\pm 10\%$	2.70
8	CL32A226KAJNNN □		22 $\mu$ F	25	$\pm 10\%$	2.70
9	CL32A226KOJNNN □		22 $\mu$ F	16	$\pm 10\%$	2.70
10	CL32A226KOCLNN □		22 $\mu$ F	16	$\pm 10\%$	0.95
11	CL32A226KPJNNN □		22 $\mu$ F	10	$\pm 10\%$	2.70
12	CL32A226KQJNNN □		22 $\mu$ F	6.3	$\pm 10\%$	2.70
13	CL32A226MQCLNN □		22 $\mu$ F	6.3	$\pm 20\%$	0.95
14	CL32A226KRJNNN □		22 $\mu$ F	4	$\pm 10\%$	2.70
15	CL32A226MRCLNN □		22 $\mu$ F	4	$\pm 20\%$	0.95
16	CL32A476KOJNNN □		47 $\mu$ F	16	$\pm 10\%$	2.70
17	CL32A476KPJNNN □		47 $\mu$ F	10	$\pm 10\%$	2.70
18	CL32A476MQJNNN □		47 $\mu$ F	6.3	$\pm 20\%$	2.70
19	CL32A476MRJNNN □		47 $\mu$ F	4	$\pm 20\%$	2.70
20	CL32A107MPVNNN □		100 $\mu$ F	10	$\pm 20\%$	2.80
21	CL32A107MQVNNN □		100 $\mu$ F	6.3	$\pm 20\%$	2.80
22	CL32A107MRVNNN □		100 $\mu$ F	4	$\pm 20\%$	2.80
23	CL32A157MQVNNN □		150 $\mu$ F	6.3	$\pm 20\%$	2.80
24	CL32A227MQVNNN □		220 $\mu$ F	6.3	$\pm 20\%$	2.80
1	CL43A476MQJNNN □	4.50×3.20	47 $\mu$ F	6.3	$\pm 20\%$	2.70
2	CL43A476MRJNNN □		47 $\mu$ F	4	$\pm 20\%$	2.70
3	CL43A107KQLNNN □		100 $\mu$ F	6.3	$\pm 10\%$	3.50
4	CL43A107KRLNNN □		100 $\mu$ F	4	$\pm 10\%$	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 $\mu$ F	10	$\pm 10\%$	0.55
2	CL05X224KQ5NNN □		0.22 $\mu$ F	6.3	$\pm 10\%$	0.55
3	CL05X474KP5NNN □		0.47 $\mu$ F	10	$\pm 10\%$	0.55
4	CL05X474KQ5NNN □		0.47 $\mu$ F	6.3	$\pm 10\%$	0.55
5	CL05X474MR5NNN □		0.47 $\mu$ F	4	$\pm 20\%$	0.55
6	CL05X684JQ5NNN □		0.68 $\mu$ F	6.3	$\pm 5\%$	0.55
7	CL05X105KA5NQN □		1 $\mu$ F	25	$\pm 10\%$	0.60
8	CL05X105KP5NNN □		1 $\mu$ F	10	$\pm 10\%$	0.55
9	CL05X105MQ3LNN □		1 $\mu$ F	6.3	$\pm 20\%$	0.33
10	CL05X225MP5NUN □		2.2 $\mu$ F	10	$\pm 20\%$	0.70
11	CL05X475MQ5NUN □		4.7 $\mu$ F	6.3	$\pm 20\%$	0.70
12	CL05X106MR5NUN □		10 $\mu$ F	4	$\pm 20\%$	0.70
1	CL10X474KA8NNN □	1.60×0.80	0.47 $\mu$ F	25	$\pm 10\%$	0.90
2	CL10X474KO8NNN □		0.47 $\mu$ F	16	$\pm 10\%$	0.90
3	CL10X474KP8NNN □		0.47 $\mu$ F	10	$\pm 10\%$	0.90
4	CL10X474KQ8NNN □		0.47 $\mu$ F	6.3	$\pm 10\%$	0.90
5	CL10X474KR8NNN □		0.47 $\mu$ F	4	$\pm 10\%$	0.90
6	CL10X105KA8NNN □		1 $\mu$ F	25	$\pm 10\%$	0.90
7	CL10X105KO8NNN □		1 $\mu$ F	16	$\pm 10\%$	0.90
8	CL10X105KP8NNN □		1 $\mu$ F	10	$\pm 10\%$	0.90
9	CL10X105KQ8NNN □		1 $\mu$ F	6.3	$\pm 10\%$	0.90
10	CL10X105KR8NNN □		1 $\mu$ F	4	$\pm 10\%$	0.90
11	CL10X225KO8NNN □		2.2 $\mu$ F	16	$\pm 10\%$	0.90
12	CL10X225KP8NNN □		2.2 $\mu$ F	10	$\pm 10\%$	0.90
13	CL10X225KQ8NNN □		2.2 $\mu$ F	6.3	$\pm 10\%$	0.90
14	CL10X225KR8NNN □		2.2 $\mu$ F	4	$\pm 10\%$	0.90
15	CL10X475KA8NQN □	2.00×1.25	4.7 $\mu$ F	25	$\pm 10\%$	0.95
16	CL10X475KO8NQN □		4.7 $\mu$ F	16	$\pm 10\%$	0.95
17	CL10X475KP5NNN □		4.7 $\mu$ F	10	$\pm 10\%$	0.90
18	CL10X475KQ8NNN □		4.7 $\mu$ F	6.3	$\pm 10\%$	0.90
19	CL10X475KR8NNN □		4.7 $\mu$ F	4	$\pm 10\%$	0.90
20	CL10X106MP8NNNN □		10 $\mu$ F	10	$\pm 20\%$	0.90
21	CL10X106KQ8NNN □		10 $\mu$ F	6.3	$\pm 10\%$	0.90
22	CL10X106KR8NNN □		10 $\mu$ F	4	$\pm 10\%$	0.90
1	CL21X105KAFNNN □		1 $\mu$ F	25	$\pm 10\%$	1.35
2	CL21X105KOFNNN □		1 $\mu$ F	16	$\pm 10\%$	1.35
3	CL21X105KPFNNN □		1 $\mu$ F	10	$\pm 10\%$	1.35
4	CL21X105KQFNNN □		1 $\mu$ F	6.3	$\pm 10\%$	1.35
5	CL21X105KRFNNN □		1 $\mu$ F	4	$\pm 10\%$	1.35
6	CL21X225KAFNNN □		2.2 $\mu$ F	25	$\pm 10\%$	1.35
7	CL21X225KOFNNN □		2.2 $\mu$ F	16	$\pm 10\%$	1.35
8	CL21X225KPFNNN □		2.2 $\mu$ F	10	$\pm 10\%$	1.35
9	CL21X225KQFNNN □		2.2 $\mu$ F	6.3	$\pm 10\%$	1.35
10	CL21X225KRFNNN □		2.2 $\mu$ F	4	$\pm 10\%$	1.35
11	CL21X475KAQNNN □		4.7 $\mu$ F	25	$\pm 10\%$	1.40
12	CL21X475KOFNNN □		4.7 $\mu$ F	16	$\pm 10\%$	1.35
13	CL21X475KPFNNN □		4.7 $\mu$ F	10	$\pm 10\%$	1.35
14	CL21X475KQFNNN □		4.7 $\mu$ F	6.3	$\pm 10\%$	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

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-X6S)**

	Part Number	Size L x W (mm)	Capacitance	Rated Voltage (Vdc)	Capacitance Tolerance	Thickness Max.(mm)
15	CL21X475KRFNNN □	2.00×1.25	4.7μF	4	±10%	1.35
16	CL21X106KACLRN □		10μF	25	±10%	0.95
17	CL21X106KAYNNN □		10μF	25	±10%	1.45
18	CL21X106KOYNNN □		10μF	16	±10%	1.45
19	CL21X106KPCLNN □		10μF	10	±10%	0.95
20	CL21X106KPYNNN □		10μF	10	±10%	1.45
21	CL21X106KQQNNN □		10μF	6.3	±10%	1.40
22	CL21X106KRQNNN □		10μF	4	±10%	1.40
23	CL21X106KRCLNN □		10μF	4	±10%	0.95
24	CL21X226MQQNNN □		22μF	6.3	±20%	1.40
25	CL21X226MRQNNN □		22μF	4	±20%	1.40
26	CL21X476MRYNNN □		47μF	4	±20%	1.45
1	CL31X475KAHN NN □	3.20×1.60	4.7μF	25	±10%	1.80
2	CL31X475KACLNN □		4.7μF	25	±10%	0.95
3	CL31X475KOHNNN □		4.7μF	16	±10%	1.80
4	CL31X475KPHNNN □		4.7μF	10	±10%	1.80
5	CL31X475MQHNNN □		4.7μF	6.3	±20%	1.80
6	CL31X475KRHNNN □		4.7μF	4	±10%	1.80
7	CL31X106KACLNN □		10μF	25	±10%	0.95
8	CL31X106KAHN NN □		10μF	25	±10%	1.80
9	CL31X106KOHNNN □		10μF	16	±10%	1.80
10	CL31X106KPHNNN □		10μF	10	±10%	1.80
11	CL31X106KQHNNN □		10μF	6.3	±10%	1.80
12	CL31X106KRHNNN □		10μF	4	±10%	1.80
13	CL31X226KOHNNN □		22μF	16	±10%	1.80
14	CL31X226KPHNNN □		22μF	10	±10%	1.80
15	CL31X226KQHNNN □		22μF	6.3	±10%	1.80
16	CL31X226KRHNNN □		22μF	4	±10%	1.80
17	CL31X107MQHNNN □		100μF	6.3	±20%	1.80
18	CL31X107MRHNNN □		100μF	4	±20%	1.80
1	CL32X106KAUNNN □	3.20×2.50	10μF	25	±10%	2.00
2	CL32X106KOJNNN □		10μF	16	±10%	2.70
3	CL32X106KPJNNN □		10μF	10	±10%	2.70
4	CL32X106KQJNNN □		10μF	6.3	±10%	2.70
5	CL32X106KRJNNN □		10μF	4	±10%	2.70
6	CL32X226KAJNNN □		22μF	25	±10%	2.70
7	CL32X226KOJNNN □		22μF	16	±10%	2.70
8	CL32X226KPJNNN □		22μF	10	±10%	2.70
9	CL32X226KQJNNN □		22μF	6.3	±10%	2.70
10	CL32X226KRJNNN □		22μF	4	±10%	2.70
11	CL32X476MPJNNN □		47μF	10	±20%	2.70
12	CL32X476KQJNNN □		47μF	6.3	±10%	2.70
13	CL32X476KRJNNN □		47μF	4	±10%	2.70
14	CL32X107MQVN NN □		100μF	6.3	±20%	2.80
15	CL32X107MRVN NN □		100μF	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 □		1μF	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

※ □ 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)
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 □		1μF	25	± 10%	0.90
82	CL10B225KP8NNN □		2.2μF	10	± 10%	0.90
1	CL21B151KBANN □	2.00×1.25	150pF	50	± 10%	0.75
2	CL21B181KBANN □		180pF	50	± 10%	0.75
3	CL21B221KBANN □		220pF	50	± 10%	0.75
4	CL21B331KBANN □		330pF	50	± 10%	0.75
5	CL21B391KBANN □		390pF	50	± 10%	0.75
6	CL21B471KBANN □		470pF	50	± 10%	0.75
7	CL21B511KBANN □		510pF	50	± 10%	0.75
8	CL21B561KBANN □		560pF	50	± 10%	0.75
9	CL21B681KBANN □		680pF	50	± 10%	0.75
10	CL21B821KBANN □		820pF	50	± 10%	0.75
11	CL21B102KBANN □		1nF	50	± 10%	0.75
12	CL21B122KBANN □		1.2nF	50	± 10%	0.75
13	CL21B152KBANN □		1.5nF	50	± 10%	0.75
14	CL21B182KBANN □		1.8nF	50	± 10%	0.75
15	CL21B202KBANN □		2nF	50	± 10%	0.75
16	CL21B222KBANN □		2.2nF	50	± 10%	0.75
17	CL21B272KBANN □		2.7nF	50	± 10%	0.75
18	CL21B332KBANN □		3.3nF	50	± 10%	0.75
19	CL21B472KBANN □		4.7nF	50	± 10%	0.75
20	CL21B562KBANN □		5.6nF	50	± 10%	0.75
21	CL21B682KBANN □		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 □	3.20×1.60	1 $\mu$ F	50	±10%	1.35
46	CL21B155KAFNNN □		1.5 $\mu$ F	25	±10%	1.35
47	CL21B225KAFNNN □		2.2 $\mu$ F	25	±10%	1.35
48	CL21B475KQQNNN □		4.7 $\mu$ F	6.3	±10%	1.40
49	CL21B475KAFNNN □		4.7 $\mu$ F	25	±10%	1.35
50	CL21B106KOQNNN □		10 $\mu$ F	16	±10%	1.40
1	CL31B221KBCNNN □		220pF	50	±10%	1.00
2	CL31B331KBCNNN □		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 □		1µF	50	±10%	1.80
29	CL31B225KAHNNN □		2.2µF	25	±10%	1.80
30	CL31B335KAHNNN □		3.3µF	25	±10%	1.80
31	CL31B475KBHNNN □		4.7µF	50	±10%	1.80
32	CL31B106KBHNNN □		10µF	50	±10%	1.80
33	CL31B226KPHNNN □		22µF	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 □		1µF	50	±10%	1.80
7	CL32B225KBJNNN □		2.2µF	50	±10%	2.70
8	CL32B225KAINNN □		2.2µF	25	±10%	2.20
9	CL32B475KBJNNN □		4.7µF	50	±10%	2.70
10	CL32B475KBUYNN □		4.7µF	50	±10%	2.00
11	CL32B475KOINNN □		4.7µF	16	±10%	2.20
12	CL32B106KLJNNN □		10µF	35	±10%	2.70
13	CL32B106KAULNN □		10µF	25	±10%	2.00
14	CL32B106KPINNN □		10µF	10	±10%	2.20
15	CL32B226KAJNNN □		22µF	25	±10%	2.70
16	CL32B476MQJNN □		47µF	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	CL05F224Z05NNN □	1.00×0.50	0.22 $\mu$ F	16	+80/-20%	0.55
2	CL05F224ZP5NNN □		0.22 $\mu$ F	10	+80/-20%	0.55
3	CL05F224ZQ5NNN □		0.22 $\mu$ F	6.3	+80/-20%	0.55
4	CL05F474ZP5NNN □		0.47 $\mu$ F	10	+80/-20%	0.55
5	CL05F474ZQ5NNN □		0.47 $\mu$ F	6.3	+80/-20%	0.55
6	CL05F105ZQ5NNN □		1 $\mu$ F	6.3	+80/-20%	0.55
1	CL10F474ZB8NNN □	1.60×0.80	0.47 $\mu$ F	50	+80/-20%	0.90
2	CL10F474ZA8NNN □		0.47 $\mu$ F	25	+80/-20%	0.90
3	CL10F474ZO8NNN □		0.47 $\mu$ F	16	+80/-20%	0.90
4	CL10F474ZP8NNN □		0.47 $\mu$ F	10	+80/-20%	0.90
5	CL10F105ZO8NNN □		1 $\mu$ F	16	+80/-20%	0.90
6	CL10F105ZP8NNN □		1 $\mu$ F	10	+80/-20%	0.90
7	CL10F225ZP8NNN □		2.2 $\mu$ F	10	+80/-20%	0.90
8	CL10F225ZQ8NNN □		2.2 $\mu$ F	6.3	+80/-20%	0.90
9	CL10F475ZQ8NNN □		4.7 $\mu$ F	6.3	+80/-20%	0.90
1	CL21F105ZBFNNN □	2.00×1.25	1 $\mu$ F	50	+80/-20%	1.35
2	CL21F105ZAFNNN □		1 $\mu$ F	25	+80/-20%	1.35
3	CL21F105ZOFNNN □		1 $\mu$ F	16	+80/-20%	1.35
4	CL21F225ZAFNNN □		2.2 $\mu$ F	25	+80/-20%	1.35
5	CL21F225ZOFNNN □		2.2 $\mu$ F	16	+80/-20%	1.35
6	CL21F475ZQFNNN □		4.7 $\mu$ F	6.3	+80/-20%	1.35
7	CL21F475ZOFNNN □		4.7 $\mu$ F	16	+80/-20%	1.35
8	CL21F475ZPFNNN □		4.7 $\mu$ F	10	+80/-20%	1.35
9	CL21F106ZPFNNN □		10 $\mu$ F	10	+80/-20%	1.35
10	CL21F106ZPCLNN □		10 $\mu$ F	10	+80/-20%	0.95
11	CL21F106ZQFNNN □		10 $\mu$ F	6.3	+80/-20%	1.35
12	CL21F106ZQCLNN □		10 $\mu$ F	6.3	+80/-20%	0.95
1	CL31F475ZOFNNN □	3.20×1.60	4.7 $\mu$ F	16	+80/-20%	1.40
2	CL31F475ZPFNNN □		4.7 $\mu$ F	10	+80/-20%	1.40
3	CL31F475ZQFNNN □		4.7 $\mu$ F	6.3	+80/-20%	1.40
4	CL31F106ZOHNNN □		10 $\mu$ F	16	+80/-20%	1.80
5	CL31F106ZPHNNN □		10 $\mu$ F	10	+80/-20%	1.80
6	CL31F106ZQHNNN □		10 $\mu$ F	6.3	+80/-20%	1.80
7	CL31F226ZPHNNN □		22 $\mu$ F	10	+80/-20%	1.80
8	CL31F226ZQHNNN □		22 $\mu$ F	6.3	+80/-20%	1.80
1	CL32F106ZAHNNN □	3.20×2.50	10 $\mu$ F	25	+80/-20%	1.80
2	CL32F106ZOEJNN □		10 $\mu$ F	16	+80/-20%	1.20
3	CL32F226ZPJNNN □		22 $\mu$ F	10	+80/-20%	2.70
4	CL32F226ZPJLNN □		22 $\mu$ F	10	+80/-20%	2.70
5	CL32F476ZQINNN □		47 $\mu$ F	6.3	+80/-20%	2.20
6	CL32F107ZQJNNN □		100 $\mu$ F	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

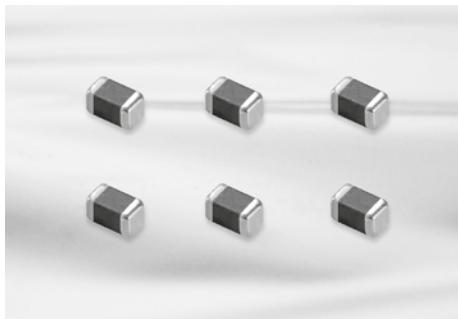
Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

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# Super Small Size Capacitors



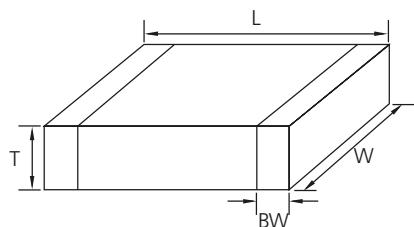
## Feature

- 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 (mm)			
		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	0201(0603)	10								
		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								
	0201(0603)	10								
		16								
		25								
Y5V	0201(0603)	6.3								

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

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Packaging Specification

Application Manual for Surface Mounting



**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	0.5 pF	16	±0.25 pF	0.22	
2	CL02C010CO2ANN □		1.0 pF	16	±0.25 pF	0.22	
3	CL02C1R2CO2ANN □		1.2 pF	16	±0.25 pF	0.22	
4	CL02C1R5CO2ANN □		1.5 pF	16	±0.25 pF	0.22	
5	CL02C1R8CO2ANN □		1.8 pF	16	±0.25 pF	0.22	
6	CL02C20CO2ANN □		2.0 pF	16	±0.25 pF	0.22	
7	CL02C2R2CO2ANN □		2.2 pF	16	±0.25 pF	0.22	
8	CL02C2R7CO2ANN □		2.7 pF	16	±0.25 pF	0.22	
9	CL02C30CO2ANN □		3.0 pF	16	±0.25 pF	0.22	
10	CL02C3R3CO2ANN □		3.3 pF	16	±0.25 pF	0.22	
11	CL02C3R9CO2ANN □		3.9 pF	16	±0.25 pF	0.22	
12	CL02C4R7CO2ANN □		4.7 pF	16	±0.25 pF	0.22	
13	CL02C5R6DO2ANN □		5.6 pF	16	±0.5 pF	0.22	
14	CL02C6R8DO2ANN □		6.8 pF	16	±0.5 pF	0.22	
15	CL02C8R2DO2ANN □		8.2 pF	16	±0.5 pF	0.22	
16	CL02C090DO2ANN □		9.0 pF	16	±0.5 pF	0.22	
17	CL02C100J02ANN □		10 pF	16	±5%	0.22	
18	CL02C150J02ANN □		15 pF	16	±5%	0.22	
19	CL02C180J02ANN □		18 pF	16	±5%	0.22	
20	CL02C220J02ANN □		22 pF	16	±5%	0.22	
21	CL02C270J02ANN □		27 pF	16	±5%	0.22	
22	CL02C330J02ANN □		33 pF	16	±5%	0.22	
23	CL02C390J02ANN □		39 pF	16	±5%	0.22	
24	CL02C470J02ANN □		47 pF	16	±5%	0.22	
25	CL02C560JQ2ANN □		56 pF	6.3	±5%	0.22	
26	CL02C680JQ2ANN □		68 pF	6.3	±5%	0.22	
27	CL02C820JQ2ANN □		82 pF	6.3	±5%	0.22	
28	CL02C101J02ANN □		100 pF	16	±5%	0.22	
29	CL02C101JQ2ANN □		100 pF	6.3	±5%	0.22	
1	CL02C0R5BO2GNN □	0.40×0.20	0.5 pF	16	±0.25 pF	0.22	High-Q
2	CL02C010BO2GNN □		1.0 pF	16	±0.25 pF	0.22	High-Q
3	CL02C1R2BO2GNN □		1.2 pF	16	±0.25 pF	0.22	High-Q
4	CL02C1R5BO2GNN □		1.5 pF	16	±0.25 pF	0.22	High-Q
5	CL02C1R8BO2GNN □		1.8 pF	16	±0.25 pF	0.22	High-Q
6	CL02C2R2BO2GNN □		2.2 pF	16	±0.25 pF	0.22	High-Q
7	CL02C2R7BO2GNN □		2.7 pF	16	±0.25 pF	0.22	High-Q
8	CL02C3R3BO2GNN □		3.3 pF	16	±0.25 pF	0.22	High-Q
9	CL02C3R9BO2GNN □		3.9 pF	16	±0.25 pF	0.22	High-Q
10	CL02C4R7BO2GNN □		4.7 pF	16	±0.25 pF	0.22	High-Q
11	CL02C5R6BO2GNN □		5.6 pF	16	±0.25 pF	0.22	High-Q
12	CL02C6R8BO2GNN □		6.8 pF	16	±0.25 pF	0.22	High-Q
13	CL02C8R2BO2GNN □		8.2 pF	16	±0.25 pF	0.22	High-Q
14	CL02C100JO2GNN □		10 pF	16	±5%	0.22	High-Q
15	CL02C120JO2GNN □		12 pF	16	±5%	0.22	High-Q
16	CL02C150JO2GNN □		15 pF	16	±5%	0.22	High-Q
17	CL02C180JO2GNN □		18 pF	16	±5%	0.22	High-Q
18	CL02C220JO2GNN □		22 pF	16	±5%	0.22	High-Q
19	CL02C270JO2GNN □		27 pF	16	±5%	0.22	High-Q
1	CL03C0R5CA3GNN □	0.60×0.30	0.5 pF	25	±0.25 pF	0.33	High-Q
2	CL03C010CA3GNN □		1.0 pF	25	±0.25 pF	0.33	High-Q
3	CL03C1R2CA3GNN □		1.2 pF	25	±0.25 pF	0.33	High-Q
4	CL03C1R5CA3GNN □		1.5 pF	25	±0.25 pF	0.33	High-Q

※ □ 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	1.8 pF	25	±0.25 pF	0.33	High-Q
6	CL03C020CA3GNN □		2.0 pF	25	±0.25 pF	0.33	High-Q
7	CL03C2R2CA3GNN □		2.2 pF	25	±0.25 pF	0.33	High-Q
8	CL03C2R7CA3GNN □		2.7 pF	25	±0.25 pF	0.33	High-Q
9	CL03C030CA3GNN □		3.0 pF	25	±0.25 pF	0.33	High-Q
10	CL03C3R3CA3GNN □		3.3 pF	25	±0.25 pF	0.33	High-Q
11	CL03C3R9CA3GNN □		3.9 pF	25	±0.25 pF	0.33	High-Q
12	CL03C4R7CA3GNN □		4.7 pF	25	±0.25 pF	0.33	High-Q
13	CL03C5R6DA3GNN □		5.6 pF	25	±0.5 pF	0.33	High-Q
14	CL03C6R8DA3GNN □		6.8 pF	25	±0.5 pF	0.33	High-Q
15	CL03C8R2DA3GNN □		8.2 pF	25	±0.5 pF	0.33	High-Q
16	CL03C090DA3GNN □		9.0 pF	25	±0.5 pF	0.33	High-Q
17	CL03C100JA3GNN □		10 pF	25	±5%	0.33	High-Q
18	CL03C150JA3ANN □		15 pF	25	±5%	0.33	
19	CL03C180JA3ANN □		18 pF	25	±5%	0.33	
20	CL03C220JA3ANN □		22 pF	25	±5%	0.33	
21	CL03C270JA3ANN □		27 pF	25	±5%	0.33	
22	CL03C330JA3ANN □		33 pF	25	±5%	0.33	
23	CL03C390JA3ANN □		39 pF	25	±5%	0.33	
24	CL03C470JA3ANN □		47 pF	25	±5%	0.33	
25	CL03C101JB3ANN □		100 pF	50	±5%	0.33	
26	CL03C101JA3ANN □		100 pF	25	±5%	0.33	

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

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### 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	100 pF	10	±10%	0.22	
2	CL02B221KP2NNN □		220 pF	10	±10%	0.22	
3	CL02B271KP2NNN □		270 pF	10	±10%	0.22	
4	CL02B331KP2NNN □		330 pF	10	±10%	0.22	
5	CL02B391KP2NNN □		390 pF	10	±10%	0.22	
6	CL02B471KP2NNN □		470 pF	10	±10%	0.22	
7	CL02B681KP2NNN □		680 pF	10	±10%	0.22	
8	CL02B102KP2NNN □		1nF	10	±10%	0.22	
1	CL03B151KA3NNN □	0.60×0.30	150 pF	25	±10%	0.33	
2	CL03B221KA3NNN □		220 pF	25	±10%	0.33	
3	CL03B271KO3NNN □		270 pF	16	±10%	0.33	
4	CL03B331KA3NNN □		330 pF	25	±10%	0.33	
5	CL03B471KA3NNN □		470 pF	25	±10%	0.33	
6	CL03B561KO3NNN □		560 pF	16	±10%	0.33	
7	CL03B681KA3NNN □		680 pF	25	±10%	0.33	
8	CL03B821KO3NNN □		820 pF	16	±10%	0.33	
9	CL03B102KA3NNN □		1nF	25	±10%	0.33	
10	CL03B152KP3NNN □		1.5 nF	10	±10%	0.33	
11	CL03B332KP3NNN □		3.3 nF	10	±10%	0.33	
12	CL03B392KP3NNN □		3.9 nF	10	±10%	0.33	
13	CL03B472KP3NNN □		4.7 nF	10	±10%	0.33	
14	CL03B682KP3NNN □		6.8 nF	10	±10%	0.33	
15	CL03B103KP3NNN □		10 nF	10	±10%	0.33	
1	CL03X104KQ3NNN □		100 nF	6.3	±20%	0.33	
2	CL03X105MR3CSN □		1 μF	4	±20%	0.35	
3	CL03X105MR3NRN □		1 μF	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	150 pF	6.3	±10%	0.22
2	CL02A221KQ2NNN □		220 pF	6.3	±10%	0.22
3	CL02A331KQ2NNN □		330 pF	6.3	±10%	0.22
4	CL02A471KQ2NNN □		470 pF	6.3	±10%	0.22
5	CL02A681KQ2NNN □		680 pF	6.3	±10%	0.22
6	CL02A102KQ2NNN □		1 nF	6.3	±10%	0.22
7	CL02A152KQ2NNN □		1.5 nF	6.3	±10%	0.22
8	CL02A222KQ2NNN □		2.2 nF	6.3	±10%	0.22
9	CL02A332KQ2NNN □		3.2 nF	6.3	±10%	0.22
10	CL02A472KQ2NNN □		4.7 nF	6.3	±10%	0.22
11	CL02A682KQ2NNN □		6.8 nF	6.3	±10%	0.22
12	CL02A103KQ2NNN □		10 nF	6.3	±10%	0.22
13	CL02A104KQ2NNN □		100 nF	6.3	±10%	0.22
14	CL02A224MR2NNN □		220 nF	4	±20%	0.22
15	CL02A224MQ2NNN □		220 nF	6.3	±20%	0.22
1	CL03A103KA3NNN □	0.60×0.30	10 nF	25	±10%	0.33
2	CL03A223KQ3NNN □		22 nF	6.3	±10%	0.33
3	CL03A473KQ3NNN □		47 nF	6.3	±10%	0.33
4	CL03A104MA3NNN □		100 nF	25	±20%	0.33
5	CL03A104KO3NNN □		100 nF	16	±10%	0.33
6	CL03A104KP3NNN □		100 nF	10	±10%	0.33
7	CL03A104KQ3NNN □		100 nF	6.3	±10%	0.33
8	CL03A224KQ3NNN □		220 nF	6.3	±10%	0.33
9	CL03A224KP3NNN □		220 nF	10	±10%	0.33
10	CL03A105MO3NRN □		1 nF	16	±20%	0.39
11	CL03A105MQ3CSN □		1 μF	6.3	±20%	0.35
12	CL03A105MP3NSN □		1 μF	10	±20%	0.35
13	CL03A225MR3CRN □		2.2 μF	4	±20%	0.39
14	CL03A225MQ3CRN □		2.2 μF	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

Part Numbering System

Standard & High Capacitors

Super Small Size Capacitors

High-Q Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

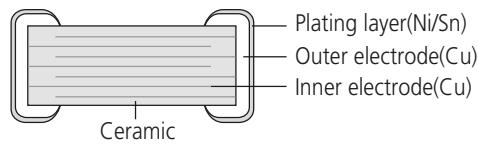
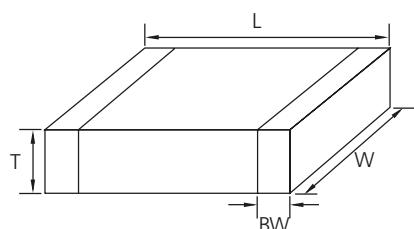
Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

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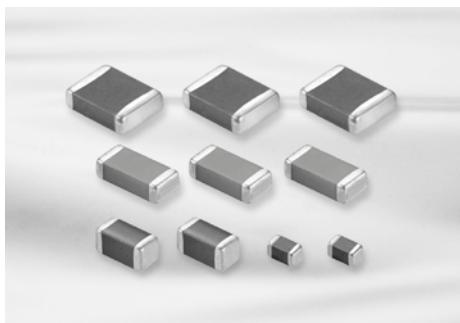


Code	EIA Code	Rated Voltage	Dimension (mm)			
			L	W	T	BW
05	0402	50V	1.00±0.05	0.50±0.05	0.50±0.05	0.25±0.10
10	0603	50/100V	1.60±0.10	0.80±0.10	0.80±0.10	0.30±0.20
		250V	1.60±0.15	0.80±0.15	0.65±0.10	0.30±0.20
21	0805	250V	2.00±0.15	1.25±0.15	0.85±0.15	0.50+0.20/-0.30

## Capacitance Table (High-Q capacitor)

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

# Medium-High Voltage Capacitors



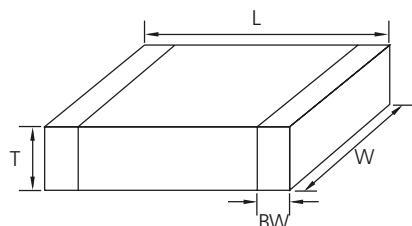
## Feature

- Highly reliable performance
- Operating at high voltage level
- Wide voltage level: from 100V to 3000V
- High withstand 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	
		3.20±0.20	1.60±0.20	1.60±0.20	H	
31	1206	3.20±0.15	1.60±0.15	1.25±0.15	F	0.5±0.3
		3.20±0.15	1.60±0.15	0.85±0.15	C	
		3.20±0.30	2.50±0.20	2.50±0.20	J	
32	1210	3.20±0.30	2.50±0.20	1.60±0.20	H	0.6±0.3
		3.20±0.30	2.50±0.20	1.25±0.20	F	
		4.50±0.40	2.00±0.20	2.00±0.20	I	
42	1808	4.50±0.40	2.00±0.20	1.60±0.20	H	0.8±0.3
		4.50±0.40	2.00±0.20	1.25±0.20	F	
		4.50±0.40	3.20±0.30	2.50±0.20	J	
43	1812	4.50±0.40	3.20±0.30	1.60±0.20	H	0.8±0.3
		4.50±0.40	3.20±0.30	1.25±0.20	F	
		5.70±0.40	5.00±0.40	2.50±0.20	J	
55	2220	5.70±0.40	5.00±0.40	1.60±0.20	H	1.0±0.3

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

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

- Part Numbering System
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- High-Q Capacitors
- Medium-High Voltage Capacitors
- Array Type Capacitors
- Low ESL Capacitors
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- Premium Capacitors for Automotive Applications
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## Medium-High Voltage capacitance Table (C0G)

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

Vr(V)	Size(mm)	Capacitance (nF)															
		4.7	10	15	22	33	47	68	100	150	220	330	470	680	1000	1500	2200
100V	0603(1608)																
	0805(2012)																
	1206(3216)																
	1210(3225)																
	1812(4532)																
	2220(5750)																
200V	0805(2012)																
	1206(3216)																
	1210(3225)																
	1812(4532)																
	2220(5750)																
250V	0805(2012)																
	1206(3216)																
	1210(3225)																
	1812(4532)																
	2220(5750)																
350V	1206(3216)	(Tmax=1.0)	(Tmax=1.25)=1.8)														
500V	1206(3216)																
	1210(3225)																
	1812(4532)																
	2220(5750)																
630V	1206(3216)																
	1210(3225)																
	1812(4532)																
	2220(5750)																

Part Numbering System

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## Medium-High Voltage capacitance Table (X7R)

### 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	10 pF	100	±5%	0.90
2	CL10C150JC8NNN □		15 pF	100	±5%	0.90
3	CL10C330JC8NNN □		33 pF	100	±5%	0.90
4	CL10C390JC8NNN □		39 pF	100	±5%	0.90
5	CL10C470JC8NNN □		47 pF	100	±5%	0.90
6	CL10C560JC8NNN □		56 pF	100	±5%	0.90
7	CL10C101JC8NNN □		100 pF	100	±5%	0.90
8	CL10C121JC8NNN □		120 pF	100	±5%	0.90
9	CL10C151JC8NNN □		150 pF	100	±5%	0.90
10	CL10C331JC8NNN □		330 pF	100	±5%	0.90
11	CL10C331JD8NNN □		330 pF	200	±5%	0.90
12	CL10C331JE8NNN □		330 pF	250	±5%	0.90
13	CL10C391JD8NNN □		390 pF	200	±5%	0.90
14	CL10C391JE8NNN □		390 pF	250	±5%	0.90
15	CL10C471JC8NNN □		470 pF	100	±5%	0.90
16	CL10C471JD8NNN □		470 pF	200	±5%	0.90
17	CL10C471JE8NNN □		470 pF	250	±5%	0.90
18	CL10C561JD8NNN □		560 pF	200	±5%	0.90
19	CL10C561JE8NNN □		560 pF	250	±5%	0.90
20	CL10C681JC8NNN □		680 pF	100	±5%	0.90
21	CL10C681JD8NNN □		680 pF	200	±5%	0.90
22	CL10C681JE8NNN □		680 pF	250	±5%	0.90
23	CL10C821JC8NNN □		820 pF	100	±5%	0.90
24	CL10C102JC8NNN □		1 nF	100	±5%	0.90
25	CL10C122JC8NNN □		1.2 nF	100	±5%	0.90
1	CL21C100JCANNN □	2.00×1.25	10 pF	100	±5%	0.75
2	CL21C120JCANNN □		12 pF	100	±5%	0.75
3	CL21C150JCANNN □		15 pF	100	±5%	0.75
4	CL21C150JDCANNN □		15 pF	200	±5%	0.95
5	CL21C180JCANNN □		18 pF	100	±5%	0.75
6	CL21C180JDCANNN □		18 pF	200	±5%	0.95
7	CL21C220JCANNN □		22 pF	100	±5%	0.75
8	CL21C270JCANNN □		27 pF	100	±5%	0.75
9	CL21C270JHFNNN □		27 pF	630	±5%	1.35
10	CL21C330JCANNN □		33 pF	100	±5%	0.75
11	CL21C330JDCANNN □		33 pF	200	±5%	0.95
12	CL21C330JHFNNN □		33 pF	630	±5%	1.35
13	CL21C390JDCANNN □		39 pF	200	±5%	0.95
14	CL21C470JCANNN □		47 pF	100	±5%	0.75
15	CL21C470JDCANNN □		47 pF	200	±5%	0.95
16	CL21C470JHFNNN □		47 pF	630	±5%	1.35
17	CL21C560JCCANNN □		56 pF	100	±5%	0.95
18	CL21C560JDCANNN □		56 pF	200	±5%	0.95
19	CL21C680JCANNN □		68 pF	100	±5%	0.75
20	CL21C680JDCANNN □		68 pF	200	±5%	0.95
21	CL21C680JHFNNN □		68 pF	630	±5%	1.35
22	CL21C820JCCANNN □		82 pF	100	±5%	0.95
23	CL21C101JCANNN □		100 pF	100	±5%	0.75
24	CL21C101JDCANNN □		100 pF	200	±5%	0.95
25	CL21C101JECANNN □		100 pF	250	±5%	0.95

\* □ 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

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**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 □		47μF	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	CL32C821JJJNNN □		820pF	1000	±5%	2.70
4	CL32C103JGJNNN □		10nF	500	±5%	2.70
5	CL32C103JHJNNN □		10nF	630	±5%	2.70
6	CL32C273JDJNNN □		27nF	200	±5%	2.70
7	CL32C273JEJNNN □		27nF	250	±5%	2.70
8	CL32C563JCJNNN □		56nF	100	±5%	2.70
1	CL42C100JKFNNN □	4.50×2.00	10pF	3000	±5%	1.45
2	CL42C151JKINNN □		150pF	3000	±5%	2.20
3	CL42C221JJHJNNN □		220pF	2000	±5%	1.80
1	CL43C391JKJNNN □	4.50×3.20	390pF	3000	±5%	2.70
2	CL43C102 JI HJNNN □		1nF	1000	±5%	1.80
3	CL43C122 JII JNNN □		1.2nF	1000	±5%	2.20
4	CL43C182 JIJ JNNN □		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

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

Part Numbering System

Standard & High Capacitors

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Array Type Capacitors

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**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 x 1.25	220pF	200	±10%	0.95
2	CL21B221KCANNNN □		220pF	100	±10%	0.75
3	CL21B331KDCNNN □		330pF	200	±10%	0.95
4	CL21B471KCANNNN □		470pF	100	±10%	0.75
5	CL21B102KDCNNN □		1nF	200	±10%	0.95
6	CL21B102KCANNNN □		1nF	100	±10%	0.75
7	CL21B222KDCNNN □		2.2nF	200	±10%	0.95
8	CL21B222KCANNNN □		2.2nF	100	±10%	0.75
9	CL21B332KCANNNN □		3.3nF	100	±10%	0.75
10	CL21B472KDCNNN □		4.7nF	200	±10%	0.95
11	CL21B472KCANNNN □		4.7nF	100	±10%	0.75
12	CL21B682KCANNNN □		6.8nF	100	±10%	0.75
13	CL21B103KDCNNN □		10nF	200	±10%	0.95
14	CL21B103KCANNNN □		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	CL31B221KGFFNNN □	3.20 x 1.60	220pF	500	±10%	1.40
2	CL31B471KGFFNNN □		470pF	500	±10%	1.40
3	CL31B471KDCNNN □		470pF	200	±10%	1.00
4	CL31B102KJHNNN □		1nF	2000	±10%	1.80
5	CL31B102KJFNNN □		1nF	1000	±10%	1.40
6	CL31B102KGFFNNN □		1nF	500	±10%	1.40
7	CL31B102KHFFNNN □		1nF	630	±10%	1.40
8	CL31B152KGFFNNN □		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	CL31B222KGFFNNN □		2.2nF	500	±10%	1.40
13	CL31B222KJHNNN □		2.2nF	2000	±10%	1.80
14	CL31B332KGFFNNN □		3.3nF	500	±10%	1.40
15	CL31B332KIFNNN □		3.3nF	1000	±10%	1.40
16	CL31B472KGFFNNN □		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	CL31B103KFCSSN □		10nF	350	±10%	1.00
22	CL31B153KDCNNN □		15nF	200	±10%	1.00
23	CL31B153KFCSSN □		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	CL31B223KFCSSN □		22nF	350	±10%	1.00
30	CL31B223KGHN NN □		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	CL31B333KGHN NN □		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 □		1μF	100	±10%	1.80
47	CL31B155KCHNNN □		1.5μF	100	±10%	1.80
48	CL31B225KCHNNN □		2.2μF	100	±10%	1.80
1	CL32B102KJFNNN □	3.20×2.50	1nF	2000	±10%	1.45
2	CL32B472KHFNNN □		4.7nF	630	±10%	1.45
3	CL32B472KIFNNN □		4.7nF	1000	±10%	1.45
4	CL32B682KIFNNN □		6.8nF	1000	±10%	1.45
5	CL32B103KCFNNN □		10nF	100	±10%	1.45
6	CL32B153KGFNNN □		15nF	500	±10%	1.45
7	CL32B223KGFNNN □		22nF	500	±10%	1.45
8	CL32B333KHHNNN □		33nF	630	±10%	1.80
9	CL32B333KGHN NN □		33nF	500	±10%	1.80
10	CL32B473KHHNNN □		47nF	630	±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

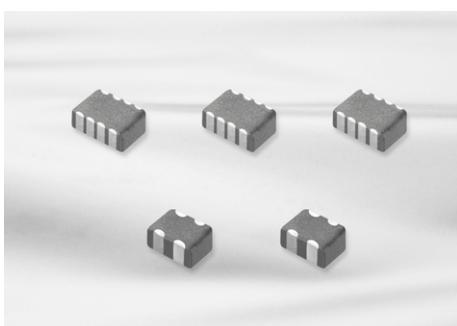
Application Manual for Surface Mounting

**Product Lineup (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 □		1μF	100	±10%	2.70
25	CL32B155KCHNNN □		1.5μF	100	±10%	1.80
26	CL32B225KCJNNN □		2.2μF	100	±10%	2.70
1	CL43B102KJFNNN □	4.50×3.20	1nF	2000	±10%	1.45
2	CL43B152KJFNNN □		1.5nF	2000	±10%	1.45
3	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	CL43B473KGFFNNN □		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 □		1μF	100	±10%	2.70
1	CL55B103KJHNNN □	5.70×5.00	10nF	2000	±10%	1.80
2	CL55B473KIINNN □		47nF	1000	±10%	2.20
3	CL55B224KGJNNN □		220nF	500	±10%	2.70
4	CL55B224KHJNNN □		220nF	630	±10%	2.70
5	CL55B105KCHNNN □		1μF	100	±10%	1.80
6	CL55B105KDJNNN □		1μF	200	±10%	2.70
7	CL55B105KEJNNN □		1μF	250	±10%	2.70
8	CL55B475KCJNNN □		4.7μF	100	±10%	2.70

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

# Array Type Capacitors



## Feature

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

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

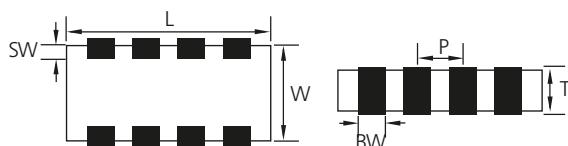
Packaging Specification

Application Manual for Surface Mounting

## Application

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

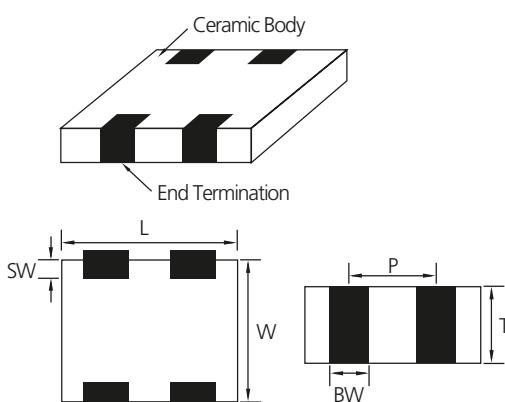
## Structure and Dimensions



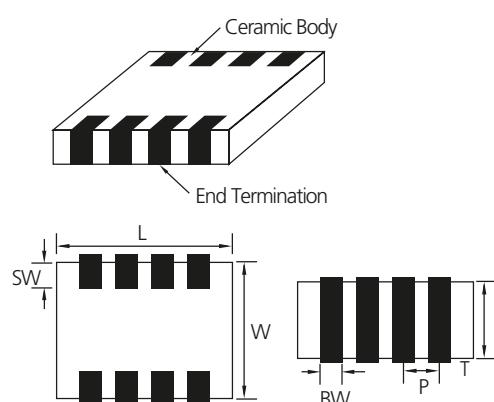
Code	Size (mm)	EIA Code	Dimension(mm)					
			L	W	T	BW	SW	P
A	0906	0302	0.90±0.05	0.60±0.05	0.45±0.05	0.25±0.05	0.15±0.1	0.45±0.05
A	1410	0504	1.37±0.15	1.0±0.15	0.35±0.05 0.50±0.05 0.60±0.06 0.80±0.08	0.36±0.1	0.2±0.1	0.64±0.1
A	2012	0805	2.0±0.15	1.25±0.15	0.85±0.1	0.5±0.2	0.25±0.15	1.0±0.1
B	2012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





## 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						
X5R	0504(1410)	2-element	6.3	0.50	Capacitance(nF)					
					1	2.2	4.7	10	22	47
										100
			10	0.88						220
										470
										1000
										2200
			16	0.66						
			25	0.55						
X7R	0805(2012)	2-element	6.3	0.95						
			10	0.95						
Y5V	1206(3216)	4-element	16	0.95						
			25	1.00						
			50	1.00						

### 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 □			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	3.20×1.60	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 □			1μF	6.3	±20%	0.50
4	CL09A105MR4NAN □			1μF	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 □			1μF	25	±20%	0.55
5	CL14A105KP8NAN □			1μF	10	±10%	0.88
6	CL14A105MO3NAN □			1μF	16	±20%	0.40
7	CL14A105MO8NAN □			1μF	16	±20%	0.88
8	CL14A105MO5NAN □			1μF	16	±20%	0.55
9	CL14A105MP3NAN □			1μF	10	±20%	0.40
10	CL14A105MP5NAN □			1μF	10	±20%	0.55
11	CL14A225KP8NAN □			2.2μF	10	±10%	0.88
12	CL14A225KQ8NAN □			2.2μF	6.3	±10%	0.88
1	CL21A105KOCNAN □	2-Array	2.00×1.25	1μF	16	±10%	0.95
2	CL21A105MPCNAN □			1μF	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

\* □ 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

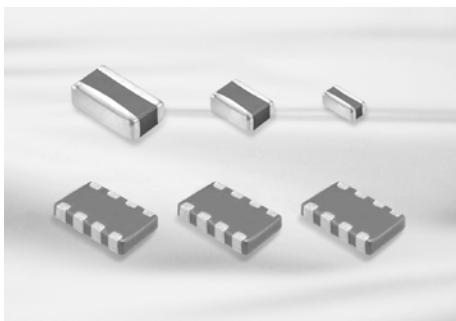
Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

# Low ESL Capacitors



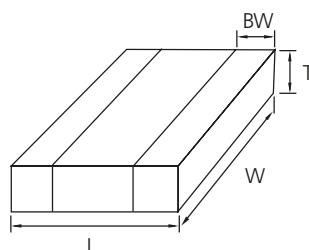
## Feature

- 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

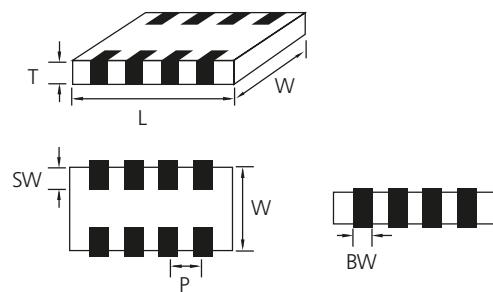
- High Speed Microprocessor
- High Frequency Digital Equipment

## 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			

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

### 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					
			4		X7R			X7S			
			6.3		X7R						
	0805(2012)	0.55	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	CL21B104M05NJP □	2.00×1.25	100nF	16	± 20%	0.55
2	CL21B684M05NJP □		680nF	16	± 20%	0.55
3	CL21B684MQ5NJP □		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 □		1μF	4	± 20%	0.35
1	CLL5Y104MQ3NLN □	0.50×1.00	100nF	6.3	± 20%	0.35
1	CL01Y105MR5NLN □	0.80×1.60	1μF	4	± 20%	0.55
2	CL01Y225MR5NLN □		2.2μF	4	± 20%	0.55
1	CL10Y474MR5NJP □	1.60×0.80	470nF	4	± 20%	0.55
2	CL10Y105MR5NJP □		1μF	4	± 20%	0.55
3	CL10Y225MR5NJP □		2.2μF	4	± 20%	0.55
1	CL21Y105MR5NJP □	2.00×1.25	1μF	4	± 20%	0.55
2	CL21Y225MR5NJP □		2.2μF	4	± 20%	0.55
1	CLL5Z105MS3NLN □	0.50×1.00	1μF	2.5	± 20%	0.35

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

# Reliability Test Capacitors

No	Item	Performance	Test Condition																																																																							
1	Appearance	No abnormal exterior appearance	Visual Inspection through Microscope (x10)																																																																							
2	Insulation Resistance	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)	Apply the rated voltage for 60~120 sec. Rated voltage > 500V: Insulation Resistance shall be measured with 500 ± 50Vdc																																																																							
3	Withstanding Voltage	No dielectric breakdown or mechanical breakdown	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																																																																							
4	Capacitance	CLASS I Within the specified tolerance	<table border="1"> <thead> <tr> <th>Capacitance</th> <th>Frequency</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>≤1,000 pF</td> <td>1MHz ± 10%</td> <td rowspan="2">0.5 ~ 5 Vrms</td> </tr> <tr> <td>&gt;1,000 pF</td> <td>1KHz ± 10%</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Capacitance</th> <th>Frequency</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>≤10 μF</td> <td>1KHz ± 10%</td> <td>1.0 ± 0.2 Vrms</td> </tr> <tr> <td>&gt;10 μF</td> <td>120Hz ± 20%</td> <td>0.5 ± 0.1 Vrms</td> </tr> <tr> <td>*</td> <td>1KHz ± 10%</td> <td>0.5 ± 0.1 Vrms</td> </tr> </tbody> </table> <p>* A capacitor prior to measuring the capacitance is heat treated at 150°C +0/-10°C and maintained in ambient air for 24±2 hours.</p>	Capacitance	Frequency	Voltage	≤1,000 pF	1MHz ± 10%	0.5 ~ 5 Vrms	>1,000 pF	1KHz ± 10%	Capacitance	Frequency	Voltage	≤10 μF	1KHz ± 10%	1.0 ± 0.2 Vrms	>10 μF	120Hz ± 20%	0.5 ± 0.1 Vrms	*	1KHz ± 10%	0.5 ± 0.1 Vrms																																																			
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※ The conditions of measurement may be altered upon request.

You can check the specification at the web site or contact sales people for each product with mark\*

Part Numbering System

Standard & High Capacitors

Super Small Size Capacitors

High-Q Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

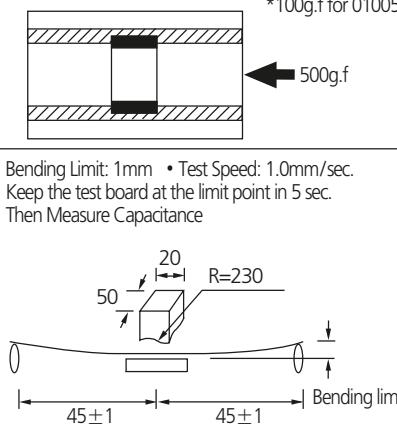
Low ESL Capacitors

Reliability Test Condition

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Packaging Specification

Application Manual for Surface Mounting

No	Item		Performance	Test Condition																
6	Temperature Characteristics of Capacitance	CLASS I	<table border="1"> <tr> <td>Characteristic</td><td>Temp.Coefficient(PPM/°C)</td></tr> <tr> <td>C</td><td>0±30</td></tr> </table>	Characteristic	Temp.Coefficient(PPM/°C)	C	0±30	<p>Capacitance shall be measured by the steps shown in the following table.</p> <table border="1"> <tr> <td>Step</td><td>Temperature (°C)</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> <p>(1) CLASS I Temperature Coefficient shall be calculated from the formula as below  <math display="block">\text{Temp. Coefficient} = \frac{C_2 - C_1}{C_1 \times \Delta T} \times 10^6 [\text{ppm}/\text{°C}]</math></p> <p>C1: Capacitance at step 3 C2: Capacitance at 125°C <math>\Delta T</math>: 100°C (=125°C - 25°C)</p> <p>(2) CLASS II Capacitance Change shall be calculated from the formula as below  <math display="block">\Delta C = \frac{C_2 - C_1}{C_1} \times 100(%)</math></p> <p>C1: Capacitance at step 3 C2: Capacitance at step 2 or 4</p>	Step	Temperature (°C)	1	25±2	2	Min. Operating Temp. ±2	3	25±2	4	Max. Operating Temp. ±2	5	25±2
Characteristic	Temp.Coefficient(PPM/°C)																			
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Z(X7T)	+22%~ -33%																			
F(Y5V)	+22%~ -82%																			
CLASS II																				
7	Adhesive Strength of Termination	No indication of peeling shall occur on the terminal electrode		Apply 500g.f* pressure for 10±1 sec. *200g.f for 0201 *100g.f for 01005																
8	Bending Strength	Appearance	No indication of peeling shall occur	<ul style="list-style-type: none"> <li>Bending Limit: 1mm • Test Speed: 1.0mm/sec.</li> <li>Keep the test board at the limit point in 5 sec.</li> <li>Then Measure Capacitance</li> </ul> 																
		Capacitance	Characteristic	Capacitance Change																
			CLASS I	±5% or ± 0.5 pF whichever is larger																
			CLASS II	A(X5R), B(X7R), X(X6S), Y(X7S) Z(X7T)	±12.5%															
				F(Y5V)	±30%															
9	Solderability	More than 75% of the terminal surface is to be soldered newly, so metal part does not come out or dissolve		<table border="1"> <tr> <td>Solder</td><td>Sn-3Ag-0.5Cu</td></tr> <tr> <td>Solder Temp.</td><td>245±5°C</td></tr> <tr> <td>Flux</td><td>RMA Type</td></tr> <tr> <td>Dip time</td><td>3±0.3 sec.</td></tr> <tr> <td>Pre-heating</td><td>at 80~120°C for 10~30 sec.</td></tr> </table>	Solder	Sn-3Ag-0.5Cu	Solder Temp.	245±5°C	Flux	RMA Type	Dip time	3±0.3 sec.	Pre-heating	at 80~120°C for 10~30 sec.						
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10	Resistance to Soldering Heat	Appearance	No mechanical damage shall occur	<p>Solder temperature: 270±5°C DIP TIME:10±1 sec. Each termination shall be fully immersed and preheated as below:</p> <table border="1"> <tr> <td>Step</td><td>Temperature (°C)</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> <p>Leave the capacitor in ambient condition for specified time* before measurement  *24 ± 2 hours(CLASS I )  24 ± 2 hours(CLASSII )</p>	Step	Temperature (°C)	Time (sec.)	1	80~100	60	2	150~180	60							
Step	Temperature (°C)	Time (sec.)																		
1	80~100	60																		
2	150~180	60																		
Capacitance	Characteristic	Capacitance Change																		
	CLASS I	±2.5% or ± 0.25 pF whichever is larger																		
	CLASS II	A(X5R), B(X7R), X(X6S), Y(X7S) Z(X7T)	±7.5%																	
		F(Y5V)	±20%																	
Q (CLASS I )	Within the specified initial value																			
Tanδ (CLASS II )	Within the specified initial value																			
Insulation resistance	Within the specified initial value																			
Withstanding voltage	Within the specified initial value																			

No	Item	Performance			Test Condition	
11	Vibration Test	Appearance	No mechanical damage shall occur			
			Characteristic		Capacitance Change	
			CLASS I		$\pm 2.5\%$ or $\pm 0.25 \mu F$ whichever is larger	
		Capacitance	CLASS II	A(X5R), B(X7R)	$\pm 5\%$	
				X(X6S), Y(X7S) Z(X7T)	$\pm 10\%$	
				F(Y5V)	$\pm 20\%$	
		$Q$ (CLASS I)		Within the specified initial value		
		$\tan\delta$ (CLASS II)		Within the specified initial value		
		Insulation resistance	Within the specified initial value			
12	Moisture Resistance	Appearance	No mechanical damage shall occur			
			Characteristic		Capacitance Change	
			CLASS I		$\pm 7.5\%$ or $\pm 0.75 \mu F$ whichever is larger	
		Capacitance	CLASS II	A(X5R), B(X7R), X(X6S), Y(X7S) Z(X7T)	$\pm 12.5\%$	
				F(Y5V)	$\pm 30\%$	
				$Q$ (CLASS I)		
		Capacitance $\geq 30 \mu F$ : $Q \geq 200$ $< 30 \mu F$ : $Q \geq 100 + 10/3 \times C$ (C: Capacitance)				
		$\tan\delta$ (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* ( $\leq 10V$ ) 2. Capacitance: B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V $\geq$ ) 0.075 max / 0.125 max* ( $\leq 10V$ ) 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)		Perform the initial measurement according to Note1. Perform the final measurement according to Note2.
		Insulation resistance	500M $\Omega$ min. or 25M $\Omega \cdot \mu F$ min. product whichever is smaller / 12.5M $\Omega \cdot \mu F$ or over*			
13	High Temperature Resistance	Appearance	No mechanical damage shall occur			
			Characteristic		Capacitance Change	
			CLASS I		$\pm 3\%$ or $\pm 0.3 \mu F$ whichever is larger	
		Capacitance	CLASS II	A(X5R), B(X7R), X(X6S), Y(X7S) Z(X7T)	$\pm 12.5\%$	
				F(Y5V)	$\pm 30\%$	
				$Q$ (CLASS I)		
		Capacitance $\geq 30 \mu F$ : $Q \geq 350$ $10 \leq \text{Capacitance} < 30 \mu F$ : $Q \geq 275 + 2.5 \times C$ Capacitance $< 10 \mu F$ : $Q \geq 200 + 10 \times C$ (C: Capacitance)				
		$\tan\delta$ (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* ( $\leq 10V$ ) 2. Capacitance : B(X7R), X(X6S) 0.05 max / 0.125 max* (16V / 25V / 35V / 50V $\geq$ ) 0.075 max / 0.125 max* ( $\leq 10V$ ) 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)		Perform the initial measurement according to Note1 for class II Perform the final measurement according to Note2.
		Insulation resistance	1,000M $\Omega$ min. or 50M $\Omega \cdot \mu F$ min. product whichever is smaller / 25M $\Omega \cdot \mu F$ or over*			

Part Numbering System

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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		
14	Temperature Cycle	Appearance	No mechanical damage shall occur		Capacitor shall be subjected to 5 cycles. Condition for 1 cycle:	
		Capacitance	Characteristic	Capacitance Change		
			CLASS I	$\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger		
		CLASS II	A(X5R), B(X7R)	$\pm 7.5\%$		
			X(X6S), Y(X7S) Z(X7T)	$\pm 15\%$		
			F(Y5V)	$\pm 20\%$		
		Q (CLASS I)	Within the specified initial value		Leave the capacitor in ambient condition for specified time* before measurement	
		Tan $\delta$ (CLASS II)	Within the specified initial value		* $24 \pm 2$ hours(CLASS I) $24 \pm 2$ hours(CLASS II)	
		Insulation resistance	Within the specified initial value			

No	Recommended Soldering Method				
	Size inch(mm)	Temperature Characteristic	Capacitance	Condition	
				Flow	Reflow
15	01005(0402)	—	—	—	○
	0201 (0603)				
	0402 (1005)				
	0603(1608)	Class I	—	○	○
		Class II	$C < 1\mu\text{F}$	○	○
			$C \geq 1\mu\text{F}$	—	○
	0805 (2012)	Class I	—	○	○
		Class II	$C < 4.7\mu\text{F}$	○	○
			$C \geq 4.7\mu\text{F}$	—	○
	1206 (3216)	Array	—	—	○
		Class I	—	○	○
			$C < 10\mu\text{F}$	○	○
		Class II	$C \geq 10\mu\text{F}$	—	○
			Array	—	○
	1210 (3225)	—	—	—	○
	1808 (4520)				○
	1812 (4532)				○
	2220 (5750)				○

#### Note 1. Initial Measurement For Class II

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

#### Note 2. Latter Measurement

##### 1. CLASS I

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

##### 2. CLASS II

Perform the heat treatment at  $150^\circ\text{C} +0/-10^\circ\text{C}$  for 1 hour. Then Leave the capacitor in ambient condition for  $24 \pm 2$  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.



SAMSUNG  
ELECTRO-MECHANICS





**Class I**

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

**Class II**

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

**\*\* Capacitance Tolerance**

Code	Capacitance Tolerance	TC	Capacitance Step	Rated Capacitance
C	±0.25pF	COG	Under 5pF	E-12 series *
D	±0.5pF	COG	6.0 to 9.0pF	E-12 series *
J	±5%	COG	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	
E-12	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6
E-24	1.0	1.1	1.2	1.3	2.2	2.4	2.7	3.0	4.7	5.1
	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

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High-Q Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

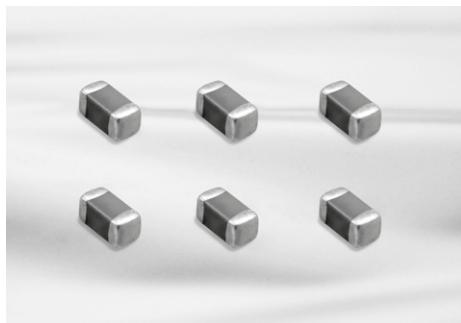
Reliability Test Condition

Premium Capacitors for Automotive Applications

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# Premium Capacitors for Automotive Applications



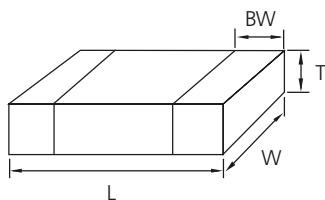
## Feature

- 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, Infotainment)

## Structure and Dimensions



Code	EIA Code	Dimension(mm)			
		L	W	T	BW
05	0402	1.00±0.05	0.50±0.05	0.50(± 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)			Capacitance (nF)						
				100	220	470	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	50										
			0.85										
		1.25	100										
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	16										
			1.25										
		0.60	25										
		0.85	50										
		1.25	100										
		0.60	100										
		0.85	1206(3216)										
		1.25	1.60	10									
		1.15	16										
			1.60										
			0.85	25									
		1.15	50										
		1.60	1.60	10									
		0.85	1206(3216)	16									
		1.15	1.15	25									
		1.60	1.60	50									
		0.85	1.60	100									
		1.15	1.15	1225(1210)	16								
		1.60	1.60	2.70									

Part Numbering System

Standard & High Capacitors

Super Small Size Capacitors

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Medium-High Voltage Capacitors

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**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

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

Part Numbering System

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High-Q Capacitors

Medium-High Voltage Capacitors

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## 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	330 pF	50	±10%	0.55
2	CL05B471KB5VPN □		470 pF	50	±10%	0.55
3	CL05B681KB5VPN □		680 pF	50	±10%	0.55
4	CL05B102KA5VPN □		1.0 nF	25	±10%	0.55
5	CL05B102KB5VPN □		1.0 nF	50	±10%	0.55
6	CL05B152KA5VPN □		1.5 nF	25	±10%	0.55
7	CL05B152KB5VPN □		1.5 nF	50	±10%	0.55
8	CL05B222KA5VPN □		2.2 nF	25	±10%	0.55
9	CL05B222KB5VPN □		2.2 nF	50	±10%	0.55
10	CL05B332KA5VPN □		3.3 nF	25	±10%	0.55
11	CL05B332KB5VPN □		3.3 nF	50	±10%	0.55
12	CL05B472KA5VPN □		4.7 nF	25	±10%	0.55
13	CL05B472KB5VPN □		4.7 nF	50	±10%	0.55
14	CL05B682KA5VPN □		6.8 nF	25	±10%	0.55
15	CL05B682KB5VPN □		6.8 nF	50	±10%	0.55
16	CL05B103KA5VPN □		10 nF	25	±10%	0.55
17	CL05B103KB5VPN □		10 nF	50	±10%	0.55
18	CL05B153KA5VPN □		15 nF	25	±10%	0.55
19	CL05B153KB5VPN □		15 nF	50	±10%	0.55
20	CL05B223KA5VPN □		22 nF	25	±10%	0.55
21	CL05B223KB5VPN □		22 nF	50	±10%	0.55
22	CL05B333KO5VPN □		33 nF	16	±10%	0.55
23	CL05B473KO5VPN □		47 nF	16	±10%	0.55
24	CL05B683KO5VPN □		68 nF	16	±10%	0.55
25	CL05B104KO5VPN □		100 nF	16	±10%	0.55

\* □ 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

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## 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 nF	100	±10%	0.70
2	CL21B152KC6WPN □		1.5 nF	100	±10%	0.70
3	CL21B222KC6WPN □		2.2 nF	100	±10%	0.70
4	CL21B332KC6WPN □		3.3 nF	100	±10%	0.70
5	CL21B472KC6WPN □		4.7 nF	100	±10%	0.70
6	CL21B682KC6WPN □		6.8 nF	100	±10%	0.70
7	CL21B103KC6WPN □		10 nF	100	±10%	0.70
8	CL21B153KC6WPN □		15 nF	100	±10%	0.70
9	CL21B223KC6WPN □		22 nF	100	±10%	0.70
10	CL21B333KCCWPN □		33 nF	100	±10%	0.95
11	CL21B473KCCWPN □		47 nF	100	±10%	0.95
12	CL21B683KCCWPN □		68 nF	100	±10%	0.95
13	CL21B104KBFVPN □		100 nF	50	±10%	1.35
14	CL21B104KBCWPN □		100 nF	50	±10%	0.95
15	CL21B104KCFVPN □		100 nF	100	±10%	1.35
16	CL21B104KCCWPN □		100 nF	100	±10%	0.95
17	CL21B154KAFVPN □		150 nF	25	±10%	1.35
18	CL21B154KBFVPN □		150 nF	50	±10%	1.35
19	CL21B224KAFVPN □		220 nF	25	±10%	1.35
20	CL21B224KBFVPN □		220 nF	50	±10%	1.35
21	CL21B334KAFVPN □		330 nF	25	±10%	1.35
22	CL21B334KBFVPN □		330 nF	50	±10%	1.35
23	CL21B474KOFVPN □		470 nF	16	±10%	1.35
24	CL21B474KAFVPN □		470 nF	25	±10%	1.35
25	CL21B474KBFVPN □		470 nF	50	±10%	1.35
26	CL21B684KOFVPN □		680 nF	16	±10%	1.35
27	CL21B684KAFVPN □		680 nF	25	±10%	1.35
28	CL21B105KOFVPN □		1.0 μF	16	±10%	1.35
29	CL21B105KAFVPN □		1.0 μF	25	±10%	1.35
30	CL21B225KPFVPN □		2.2 μF	10	±10%	1.35
31	CL21B225KOFVPN □		2.2 μF	16	±10%	1.35
32	CL21B335KPQVPN □		3.3 μF	10	±10%	1.40
33	CL21B475KPQVPN □		4.7 μF	10	±10%	1.40
1	CL31B104KBPWPN □	3.20×1.60	100 nF	50	±10%	1.25
2	CL31B104KBCVPN □		100 nF	50	±10%	1.00
3	CL31B154KBPWPN □		150 nF	50	±10%	1.25
4	CL31B224KBPWPN □		220 nF	50	±10%	1.25
5	CL31B334KBHVPN □		330 nF	50	±10%	1.80
6	CL31B474KBHVPN □		470 nF	50	±10%	1.80
7	CL31B684KBHVPN □		680 nF	50	±10%	1.80
8	CL31B105KAPWPN □		1.0 μF	25	±10%	1.25
9	CL31B105KBHVPN □		1.0 μF	50	±10%	1.80
10	CL31B155KAHVPN □		1.5 μF	25	±10%	1.80
11	CL31B155KBHVPN □		1.5 μF	50	±10%	1.80
12	CL31B225KOHVPN □		2.2 μF	16	±10%	1.80
13	CL31B225KAHVPN □		2.2 μF	25	±10%	1.80
14	CL31B225KBHVPN □		2.2 μF	50	±10%	1.80
15	CL31B335KOHVPN □		3.3 μF	16	±10%	1.80
16	CL31B335KAHVPN □		3.3 μF	25	±10%	1.80
17	CL31B475KOHVPN □		4.7 μF	16	±10%	1.80
18	CL31B475KAHVPN □		4.7 μF	25	±10%	1.80
19	CL31B685KOHVPN □		6.8 μF	16	±10%	1.80
20	CL31B106KOHVPN □		10.0 μF	16	±10%	1.80
1	CL32B226KOJVPN □	3.20×2.50	22 μF	16	±10%	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

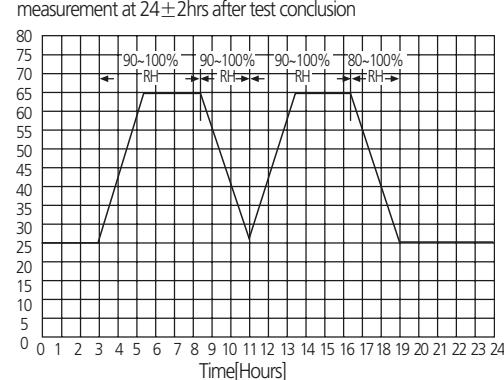
Packaging Specification

Application Manual for Surface Mounting

**Reliability Test Condition (Automotive Capacitors)**

No	Item		Performance	Test Condition
1	Pre-and Post-Stress Electrical Test		—	
2	High Temperature Exposure	Appearance		No abnormal exterior appearance
		Capacitance Change	CLASS I	Within $\pm 2.5\%$ or 0.25 pF, (Whichever is larger)
			CLASS II	Within $\pm 10\%$
		Q	CLASS I	Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$ $< 30\text{pF}$ : $Q \geq 400 + 20 \times C$ (C : Capacitance)
		Tan $\delta$	CLASS II	Rated Voltage $\geq 25V$ : 0.03 max $\geq 16V$ : 0.05 max $\geq 10V$ : 0.075 max *1)
		IR		More than $10,000\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) *1)
3	Temperature Cycling	Appearance		No abnormal exterior appearance
		Capacitance Change	CLASS I	Within $\pm 2.5\%$ or 0.25 pF, (Whichever is larger)
			CLASS II	Within $\pm 10\%$
		Q	CLASS I	Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$ $< 30\text{pF}$ : $Q \geq 400 + 20 \times C$ (C : Capacitance)
		Tan $\delta$	CLASS II	Rated Voltage $\geq 25V$ : 0.03 max $\geq 16V$ : 0.05 max $\geq 10V$ : 0.075 max *1)
		IR		More than $10,000\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) *1)
4	Destructive Physical Analysis		No defects or abnormalities	Per EIA 469
5	Moisture Resistance	Appearance		No abnormal exterior appearance
		Capacitance Change	CLASS I	Within $\pm 2.5\%$ or 0.25 pF, (Whichever is larger)
			CLASS II	Within $\pm 12.5\%$
		Q	CLASS I	Capacitance $\geq 30\text{pF}$ : $Q \geq 350$ $10 \leq \text{Capacitance} < 30\text{pF}$ : $Q \geq 275 + (5/2) \times C$ Capacitance $< 10\text{pF}$ : $Q \geq 200 + 10 \times C$ (C : Capacitance)
		Tan $\delta$	CLASS II	Rated Voltage $\geq 25V$ : 0.03 max $\geq 16V$ : 0.05 max $\geq 10V$ : 0.075 max *1)
		IR		More than $10,000\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) *1)

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



No	Item		Performance	Test Condition	
6	Biased Humidity	Appearance		No abnormal exterior appearance	
		Capacitance Change	CLASS I	Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)	
			CLASS II	Within $\pm 12.5\%$	
		Q	CLASS I	Capacitance $\geq 30\text{pF}$ : $Q \geq 200$ $< 30\text{pF}$ : $Q \geq 100 + (10/3) \times C$ (C : Capacitance)	
			Tan $\delta$	Rated Voltage $\geq 25V$ : 0.035 max $\geq 16V$ : 0.05 max $\geq 10V$ : 0.075max *1)	
			IR	More than $500\text{M}\Omega$ or $25\text{M}\Omega \times \mu\text{F}$ (Whichever is Smaller) *1)	
7	High Temperature Operating Life	Appearance		No abnormal exterior appearance	
		Capacitance Change	CLASS I	Within $\pm 3.0\%$ or 0.3pF, (Whichever is larger)	
			CLASS II	Within $\pm 12.5\%$	
		Q	CLASS I	Capacitance $\geq 30\text{pF}$ : $Q \geq 350$ $\geq 10\text{pF}$ : $Q \geq 275 + (5/2) \times C$ $< 10\text{pF}$ : $Q \geq 200 + 10 \times C$ (C : Capacitance)	
			Tan $\delta$	Rated Voltage $\geq 25V$ : 0.035 max $\geq 16V$ : 0.05 max $\geq 10V$ : 0.075max *1)	
			IR	More than $1,000\text{M}\Omega$ or $50\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) *1)	
8	External Visual		No abnormal exterior appearance		
9	Physical Dimensions		Within the specified dimensions		
10	Mechanical Shock	Appearance		No abnormal exterior appearance	
		Capacitance Change	CLASS I	Within $\pm 2.5\%$ or 0.25pF, (Whichever is larger)	
			CLASS II	Within $\pm 10\%$	
		Q	CLASS I	Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$ $< 30\text{pF}$ : $Q \geq 400 + 20 \times C$ (C : Capacitance)	
			Tan $\delta$	Rated Voltage $\geq 25V$ : 0.025 max $\geq 16V$ : 0.035 max $\geq 10V$ : 0.05 max *1)	
			IR	More than $10,000\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller) *1)	

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

\*2) : Some of the parts are applicable in rated voltage x 150%, Please refer to individual specifications.

Part Numbering System

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Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting



No	Item			Performance	Test Condition
11	Vibration	Appearance		No abnormal exterior appearance	<p>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 Hz.            Initial Measurement            Perform a heat treatment at 150+0/-10°C 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.</p>
		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 10,000MΩ or 500MΩ × μF (Whichever is smaller) *1)	
12	Resistance to Solder Heat	Appearance		No abnormal exterior appearance	<p>Solder pot : 260±5°C , 10±1sec.            Initial Measurement            Perform a heat treatment at 150+0/-10°C 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.</p>
		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 10,000MΩ or 500MΩ × μF (Whichever is smaller) *1)	
13	Thermal Shock	Appearance		No abnormal exterior appearance	<p>-55°C/+125°C            Note: Number of cycles required -300,            Maximum transfer time -20 sec,            Dwell time -15min. Air-Air</p>
		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 10,000MΩ or 500MΩ × μF (Whichever is smaller) *1)	
14	ESD	Appearance		No abnormal exterior appearance	<p>AEC-Q200-002            Initial Measurement            Perform a heat treatment at 150+0/-10°C 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°C for 1hr after            soldering process. And then let sit for 24±2hrs at room            temperature. Perform the initial measurement.            Perform the initial measurement.</p>
		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 10,000MΩ or 500MΩ × μF (Whichever is smaller) *1)	

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

No	Item		Performance	Test Condition
15	Solderability		95% of the terminations is to be soldered evenly and continuously	a) Preheat at 155°C for 4 hrs, Immerse in solder for 5s at 235±5°C b) Steam aging for 8 hrs, Immerse in solder for 5s at 235±5°C c) Steam aging for 8 hrs, Immerse in solder for 120s at 260±5°C solder : a solution ethanol and rosin
16	Electrical Characterization	Capacitance		Within specified tolerance
		Q	CLASS I	Capacitance $\geq 30\text{pF}$ : $Q \geq 1,000$ $< 30\text{pF}$ : $Q \geq 400 + 20 \times C$ ( C: Capacitance)
		Tanδ	CLASS II	Rated Voltage $\geq 25V$ : 0.025 max $\geq 16V$ : 0.035 max $\geq 10V$ : 0.05max *1)
		IR@25°C	CLASS I	More than 100,000MΩ or $1,000\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)
			CLASS II	More than 10,000MΩ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)
		IR@125°C	CLASS I	More than 10,000MΩ or $100\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)
			CLASS II	More than 1,000MΩ or $10\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)
		Dielectric Strength		No dielectric breakdown or mechanical breakdown
17	Board Flex	Appearance		No abnormal exterior appearance
		Capacitance Change	CLASS I	Within ± 5.0% or $0.5\text{pF}$ , (Whichever is larger)
			CLASS II	Within ± 10%
18	Terminal Strength(SMD)	Appearance		No abnormal exterior appearance
		Capacitance Change	CLASS I	Within ± 2.5% or $0.25\text{pF}$ , (Whichever is larger)
			CLASS II	Within ± 10%
19	Beam Load		Destruction value should be exceed Chip Length $\leq 2.5\text{mm}$ a) Chip Thickness $> 0.5\text{ mm}$ : 20N b) Chip Thickness $\leq 0.5\text{ mm}$ : 8N Chip Length $\geq 3.2\text{mm}$ a) Chip Thickness $\geq 1.25\text{ mm}$ : 54.5N b) Chip Thickness $< 1.25\text{ mm}$ : 15N	Beam speed Chip Length $\leq 2.5\text{mm}$ , $0.5 \pm 0.05\text{mm/sec}$ Chip Length $\geq 3.2\text{mm}$ , $2.5 \pm 0.25\text{mm/sec}$
20	Capacitance Temperature Characteristics	Capacitance Change	CLASS I	0±30 ppm/°C
			CLASS II	Within ± 15%
		Temperature Coefficient	CLASS I	0±30 ppm/°C
		Capacitance Drift	CLASS I	Within ± 0.2% or $0.05\text{pF}$ , (Whichever is larger)

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

\*If you want more detailed information, Please Visit Samsung Electro-mechanics website ( [www.semiconductor.samsung.com](http://www.semiconductor.samsung.com) )

Part Numbering System

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Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

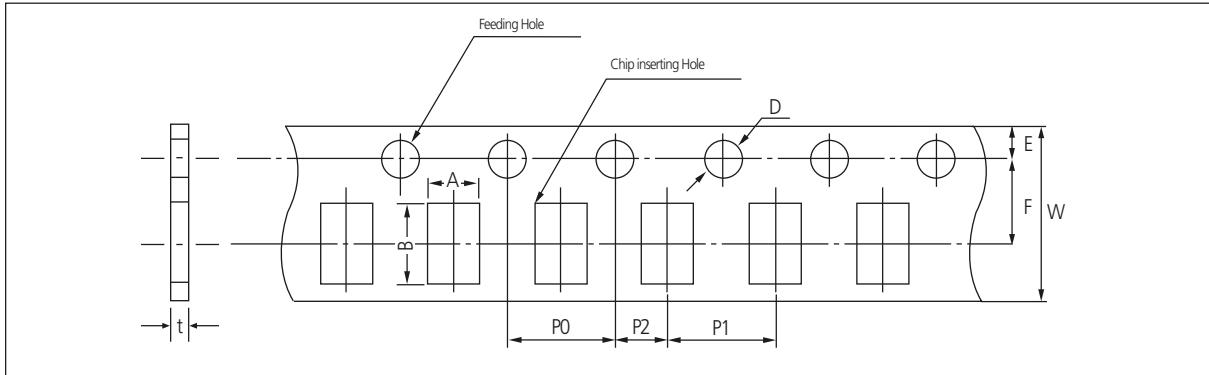
Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

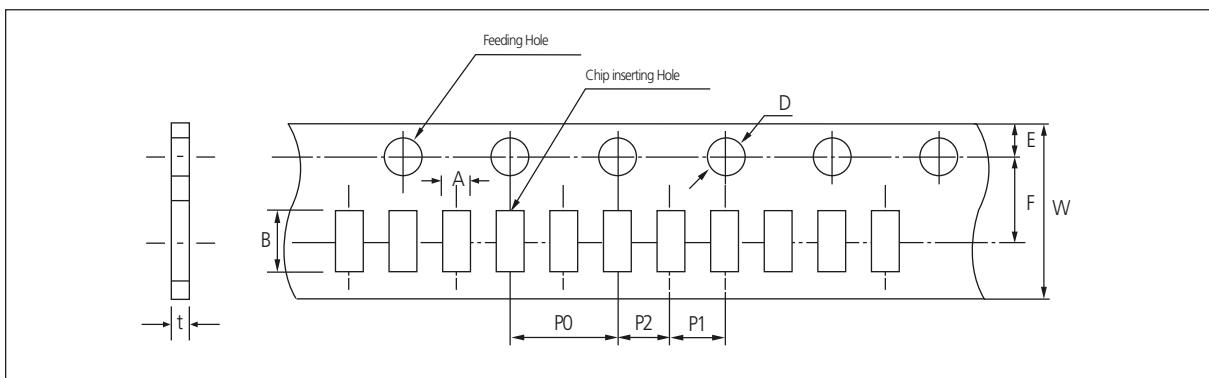
# Packaging Specifications

## Cardboard Paper Tape(4mm)



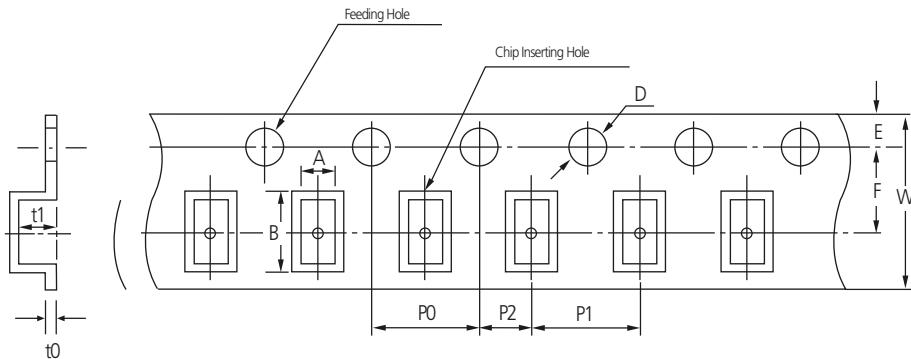
Unit: inch(mm)

## Cardboard Paper Tape(2mm)



Unit: inch(mm)

## Embossed Plastic Tape



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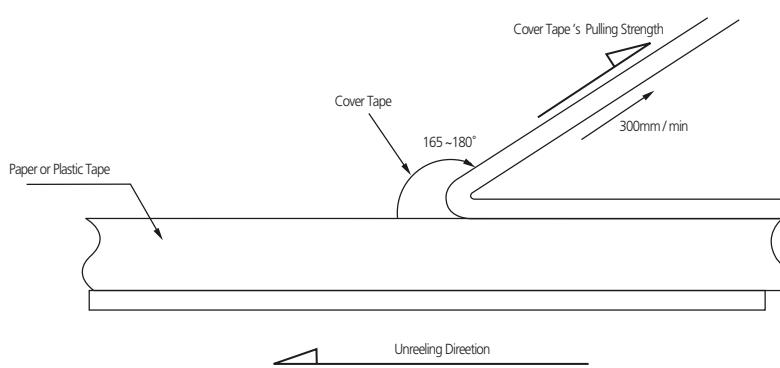
Packaging Specification

Application Manual for Surface Mounting

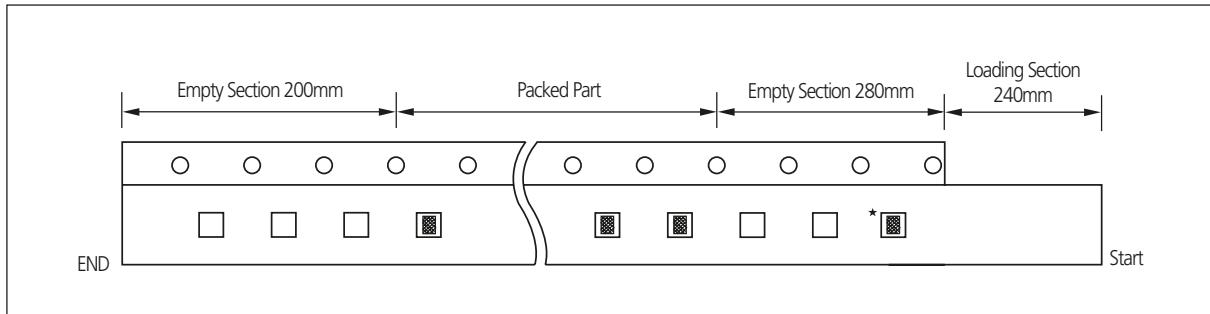
Symbol	A	B	W	F	E	P1	P2	P0	D	t1	t0
Type											
Dimension	01005 (0402)	0.25 ±0.02	0.45 ±0.02	4.0 ±0.05	1.8 ±0.02	0.9 ±0.05	1.0 ±0.02	1.0 ±0.02	2.0 ±0.04	Ø0.8 ±0.04	0.25 ±0.02
	0603 (1608)	1.05 ±0.15	1.9 ±0.15								
	0805 (2012)	1.45 ±0.2	2.3 ±0.2								
	1206 (3216)	1.9 ±0.2	3.5 ±0.2								
	1210 (3225)	2.8 ±0.2	3.6 ±0.2								
	1808 (4520)	2.3 ±0.2	4.9 ±0.2								
	1812 (4532)	3.6 ±0.2	4.9 ±0.2	8.0 ±0.3	3.5 ±0.05		4.0 ±0.1				2.9 max
	2220 (5750)	5.5 ±0.2	6.2 ±0.2								
	0204 (5010)	0.62 +0.05 /-0.10	1.12 +0.05 /-0.10								
	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



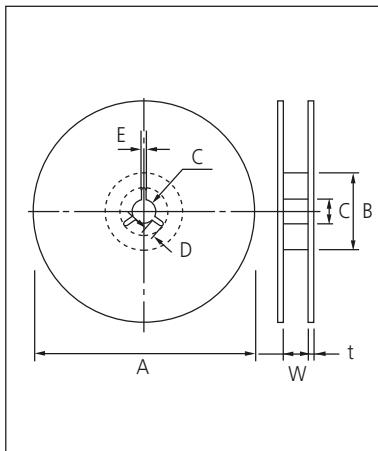
## Taping Size



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

Unit: kpc

## Reel Dimensions



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

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

Part Numbering System

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Reliability Test Condition

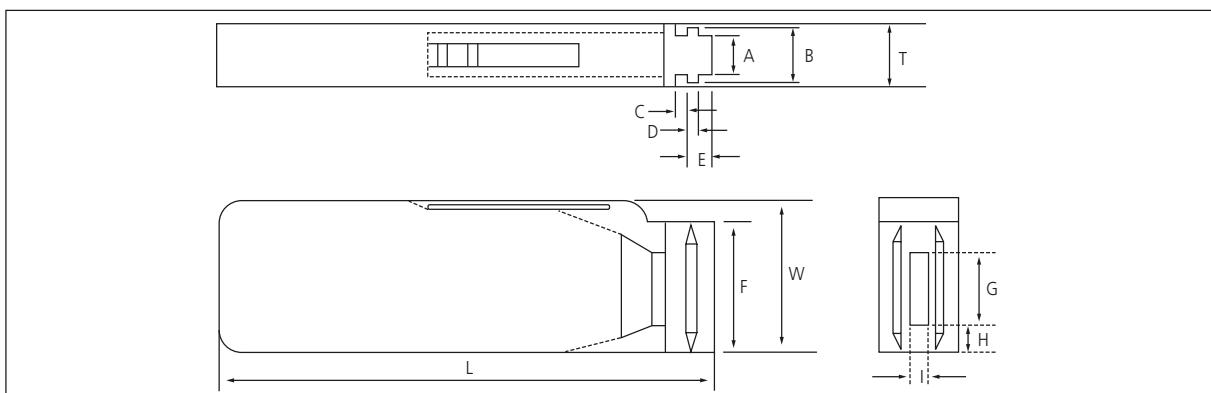
Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

## Bulk Case Packaging

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



Unit: mm

Symbol	A	B	T	C	D	E
Dimension	$6.8\pm 0.1$	$8.8\pm 0.1$	$12\pm 0.1$	$1.5+0.1/-0$	$2+0/-0.1$	$3.0+0.2/-0$
Symbol	F	W	G	H	L	I
Dimension	$31.5+0.2/-0$	$36+0/-0.2$	$19\pm 0.35$	$7\pm 0.35$	$110\pm 0.7$	$5\pm 0.35$

## • QUANTITY

Unit: inch(mm) and pcs

Size	0402(1005)	0603(1608)	0805(2012)	
			$T\leq 0.85\text{mm}$	$T\geq 1.0\text{mm}$
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°C with a relative humidity of 20~70%. Allowable storage period is within 6 months from the outgoing date of delivery.

### 1-2. Corrosive Gases

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

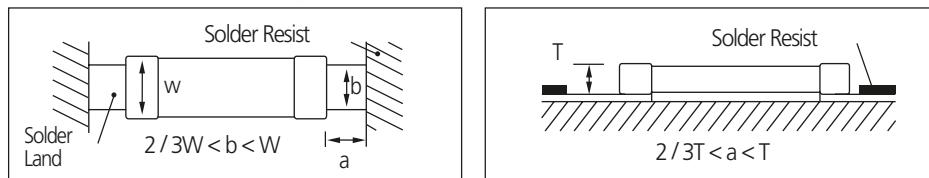
### 1-3. Temperature Fluctuations

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

## 2. Design of Solder Land Pattern

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

Recommendation of solder Land Shape and Size



## 3. Adhesives

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

### 3-1. Requirements for Adhesives

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

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

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

They should have a long pot life.

They should harden quickly.

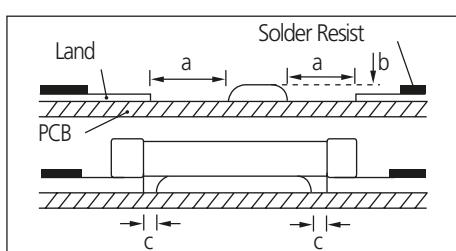
They should not corrode the circuit board or chip material.

They should be a good insulator.

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

### 3-2. Application Method

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



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°C or less, within 2 minutes or less.

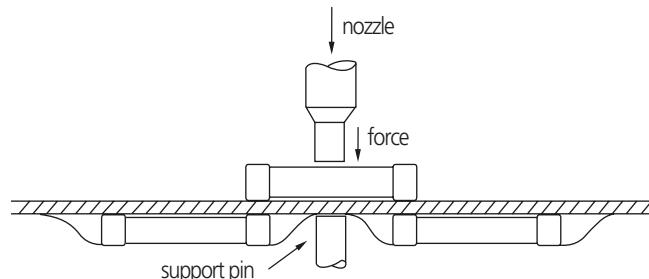
## 4. Mounting

### 4-1. Mounting Head Pressure

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

### 4-2. Bending Stress

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



Part Numbering System

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

## 5. Flux

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

## 6. Soldering

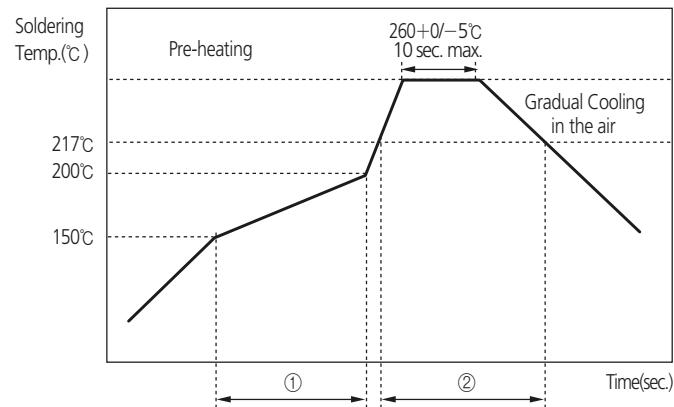
Since a multilayer ceramic chip capacitor comes into direct contact with melted solder during soldering, it is exposed to potentially mechanical stress caused by the sudden temperature change. The capacitor may also be subject to silver migration, and to contamination by the flux. Because of these factors,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

### 6-1. Soldering Methods

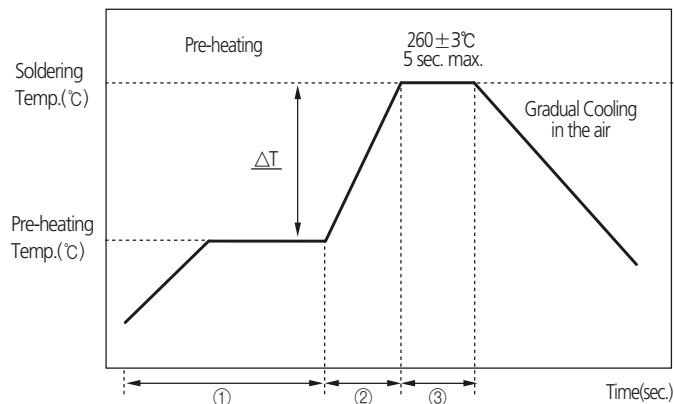
Method	Classification	
Reflow soldering	· Overall heating	<ul style="list-style-type: none"> <li>· Infrared rays</li> <li>· Hot plate</li> <li>· VPS (Vapor phase)</li> </ul>
	· Local heating	<ul style="list-style-type: none"> <li>· Air heater</li> <li>· Laser</li> <li>· Light beam</li> </ul>
Flow soldering	<ul style="list-style-type: none"> <li>· Single wave</li> <li>· Double wave</li> </ul>	

### 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**

Soldering Temp. (°C)	Pre-heating Time (①, sec.)	Soldering Time (②, sec.)
$260 \pm 5^\circ\text{C}$	60~120	60~150

**■ FLOW SOLDERING**

$\Delta T$ (°C)	Soldering Temp. (°C)	Pre-heating Time (①+②, sec.)	Soldering Time (③, sec.)
$\leq 150$ (1206 and below size)	$260 \pm 3$	$\geq 120$	$\leq 5$

**■ SOLDER IRON(Hand Soldering)**

Variation of Temp.(°C)	Soldering Temp.(°C)	Pre-heating Time(sec.)	Soldering Time(sec.)	Cooling Time(sec.)	Condition of Iron Facilities		
					Wattage	Tip Diameter	Soldering Time
$\Delta T \leq 130$	$300 \pm 10^\circ\text{C}$ max.	$\geq 60$ sec.	$\leq 4$ sec.	—	20W max.	3mm max.	4 sec max.

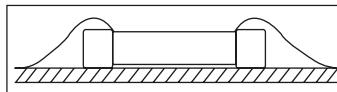
※ Caution - Iron tip should not contact with ceramic body directly

### 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.

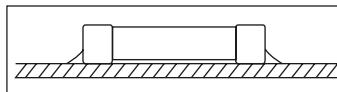
### 6-4. Amount of Solder

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

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### 6-5. Cooling

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

### 6-6. Cleaning

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

## 7. Notes for Separating Multiple, Shared PC Boards

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

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