

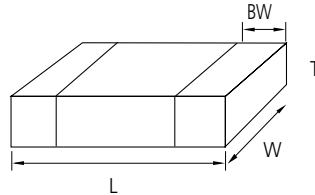
Feature

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

Application

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

Structure and Dimensions



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

Automotive Capacitors Table (COG, X7R)

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

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

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



Product Lineup (Automotive Capacitors_COG)

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

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

Product Lineup (Automotive Capacitors_COG)

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

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Product Lineup (Automotive Capacitors_COG)

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

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Product Lineup (Automotive Capacitors_COG)

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

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Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting



Product Lineup (Automotive Capacitors_X7R)

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

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Product Lineup (Automotive Capacitors_X7R)

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

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

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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 $0.25\mu\text{F}$, (Whichever is larger)
			CLASS II	Within $\pm 10\%$
		Q	CLASS I	Capacitance $\geq 30\mu\text{F}$: $Q \geq 1,000$ $< 30\mu\text{F}$: $Q \geq 400 + 20 \times C$ (C : Capacitance)
		Tan δ	CLASS II	Rated Voltage $\geq 25\text{V}$: 0.03 max $\geq 16\text{V}$: 0.05 max $\geq 10\text{V}$: 0.075 max
IR		More than $10,000\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)		
3	Temperature Cycling	Appearance	No abnormal exterior appearance	
		Capacitance Change	CLASS I	Within $\pm 2.5\%$ or $0.25\mu\text{F}$, (Whichever is larger)
			CLASS II	Within $\pm 10\%$
		Q	CLASS I	Capacitance $\geq 30\mu\text{F}$: $Q \geq 1,000$ $< 30\mu\text{F}$: $Q \geq 400 + 20 \times C$ (C : Capacitance)
		Tan δ	CLASS II	Rated Voltage $\geq 25\text{V}$: 0.03 max $\geq 16\text{V}$: 0.05 max $\geq 10\text{V}$: 0.075 max
IR		More than $10,000\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)		
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 $0.25\mu\text{F}$, (Whichever is larger)
			CLASS II	Within $\pm 12.5\%$
		Q	CLASS I	Capacitance $\geq 30\mu\text{F}$: $Q \geq 350$ $< 10\mu\text{F}$: $Q \geq 275 + (5/2) \times C$ $< 10\mu\text{F}$: $Q \geq 200 + 10 \times C$ (C : Capacitance)
		Tan δ	CLASS II	Rated Voltage $\geq 25\text{V}$: 0.03 max $\geq 16\text{V}$: 0.05 max $\geq 10\text{V}$: 0.075 max
IR		More than $10,000\text{M}\Omega$ or $500\text{M}\Omega \times \mu\text{F}$ (Whichever is smaller)		

Step	Temperature(°C)	Time(min.)
1	Min. operating Temp. ± 2	15 ± 3
2	25 ± 2	1
3	Max. operating Temp. ± 2	15 ± 3
4	25 ± 2	1

1000Cycles
Measurement at 24 ± 2 hrs after test conclusion

Step	Temperature(°C)	Time(min.)
1	Min. operating Temp. ± 2	15 ± 3
2	25 ± 2	1
3	Max. operating Temp. ± 2	15 ± 3
4	25 ± 2	1

10Cycles, $t=24$ hrs/cycle
Heat ($25\text{--}65^\circ\text{C}$) and humidity ($80\text{--}98\%$), Unpowered measurement at 24 ± 2 hrs after test conclusion

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

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

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

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

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

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Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

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Low ESL Capacitors

Reliability Test Condition

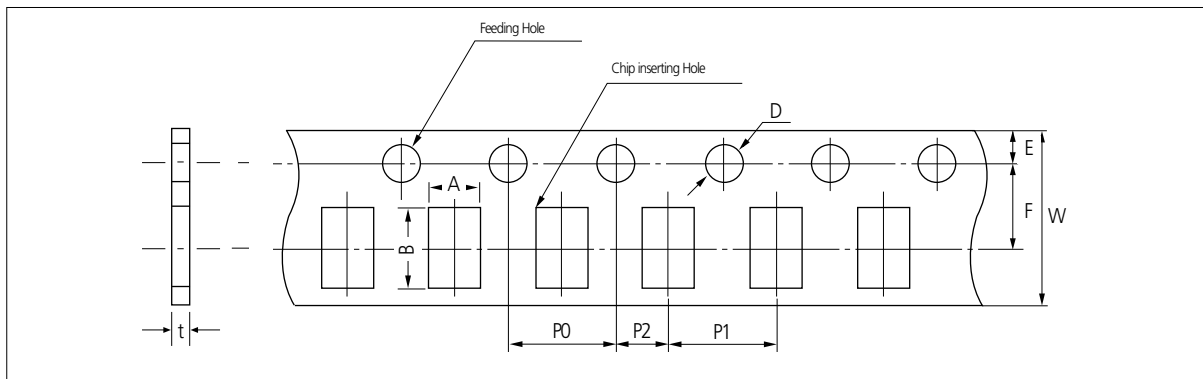
Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting

Packaging Specifications

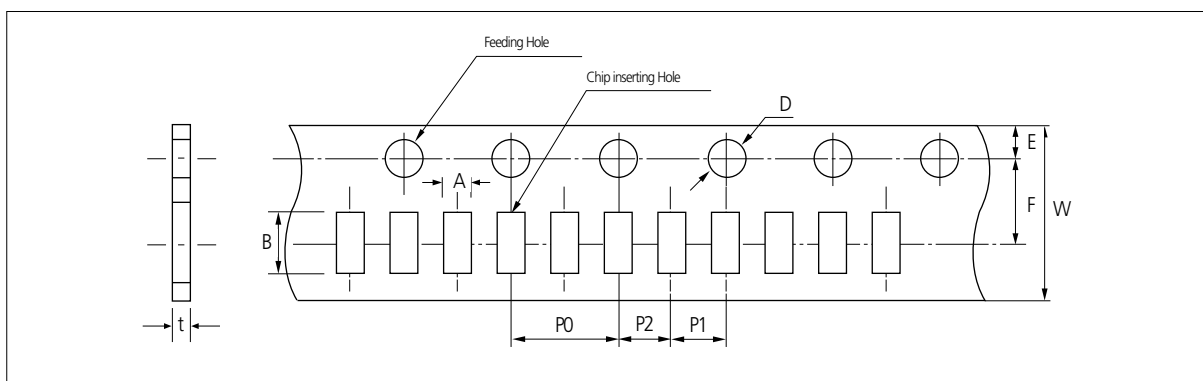
Cardboard Paper Tape(4mm)



Unit: inch(mm)

Symbol		A	B	W	F	E	P1	P2	P0	D	t
Type											
Dimension	0504 (1410)	1.3 ± 0.2	1.7 ± 0.2	8.0 ± 0.3	3.5 ± 0.05	1.75 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	4.0 ± 0.1	$\varnothing 1.5$ $+0.1/-0$	1.1 Below
	0603 0306 (1608) (0816)	1.1 ± 0.2	1.9 ± 0.2								
	0805 0508 (2012) (1220)	1.6 ± 0.2	2.4 ± 0.2								
	1206 0612 (3216) (1632)	2.0 ± 0.2	3.6 ± 0.2								

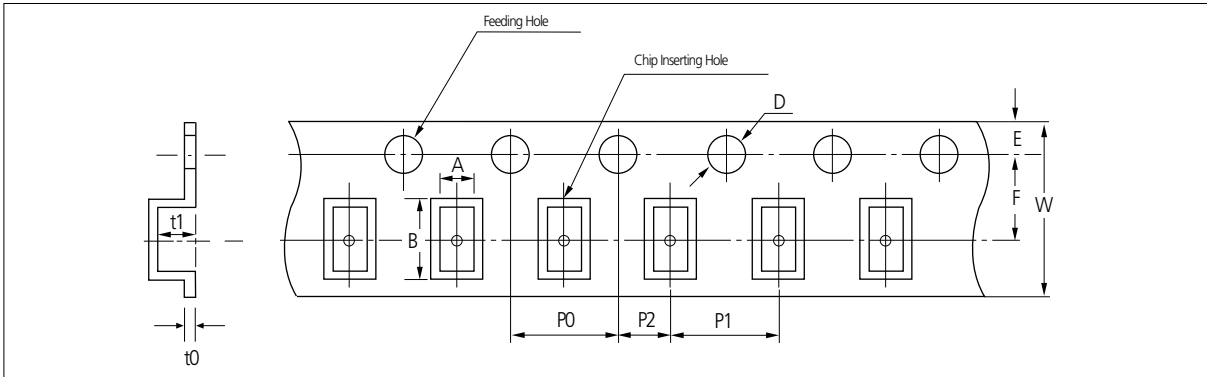
Cardboard Paper Tape(2mm)



Unit: inch(mm)

Symbol		A	B	W	F	E	P1	P2	P0	D	t
Type											
Dimension	01005 (0402)	0.26 ± 0.03	0.46 ± 0.03	8.0 ± 0.3	3.5 ± 0.05	1.75 ± 0.1	2.0 ± 0.05	2.0 ± 0.05	4.0 ± 0.1	$\varnothing 1.550$ ± 0.02	0.26 ± 0.03
	0201 (0603)	0.38 ± 0.03	0.68 ± 0.03								
	0402 (1005)	0.62 ± 0.04	1.12 ± 0.04								
											0.37 ± 0.05

Embossed Plastic Tape



Unit: inch(mm)

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

Part Numbering System

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Reliability Test Condition

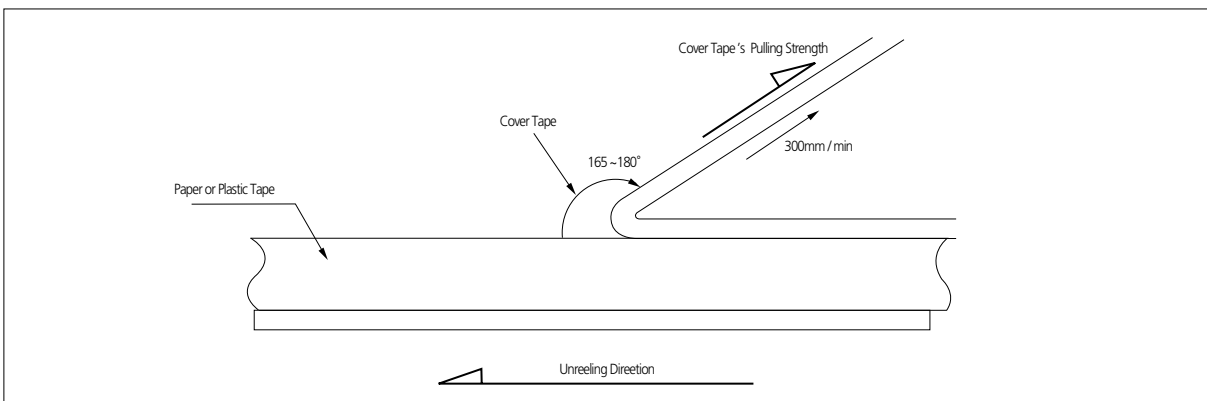
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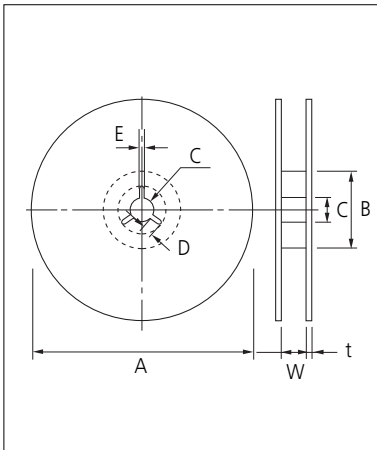
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Peeling off of Cover Tape

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



Reel Dimensions



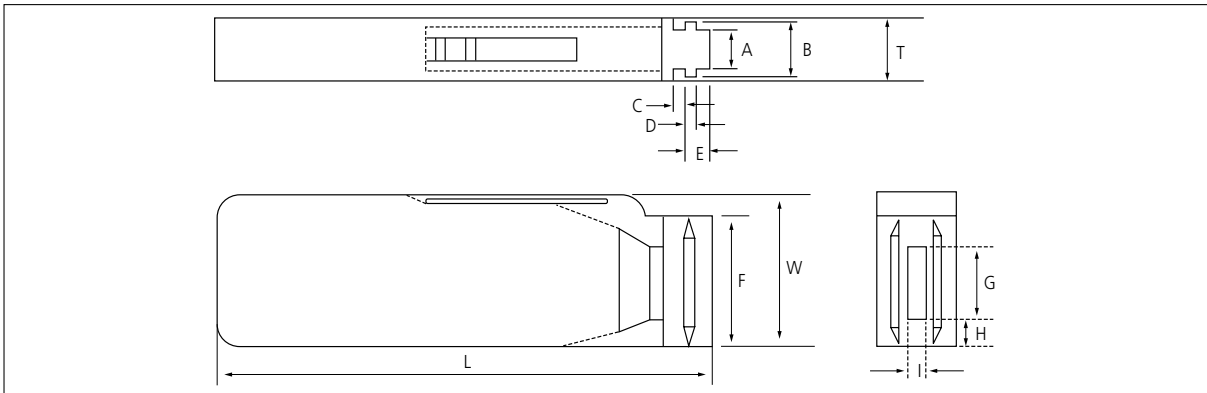
Unit: mm

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

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

Bulk Case Packaging

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



Unit: mm

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

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

• QUANTITY

Unit: inch(mm) and pcs

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

Part Numbering System

General Capacitors

High Capacitance Capacitors

Super Small Size Capacitors

Medium-High Voltage Capacitors

Array Type Capacitors

Low ESL Capacitors

Reliability Test Condition

Premium Capacitors for Automotive Applications

Packaging Specification

Application Manual for Surface Mounting