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EYANG TECHNOLOGY DEVELOPMENT CO.,LTD

Multilayer Ceramic Chip Capacitors for Automotive Model selection reference book

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Multilayer Ceramic Chip Capacitors for Automotive

1.Scope

This specification is applicable to the Multilayer Ceramic Chip Capacitors (MLCC) for Automotive Infortainment & Confort.

1.1 Temperature Characteristics:

Class1 (Temperature Compensating Type): C0G

Class2 (High dielectric constant type): X7R\X7S\X7T\X6S\X5R

1.2 Size Code: 0201\0402\0603\0805\1206\1210

1.3 Capacitance : 0.1pF~47μF

2.Part Number System

A	0402	C0G	120	J	500	N	T	B
① Series Code	② Size Code	③Temperature Characteristics	④Nominal Capacitance	⑤Capacitance Tolerance	⑥Rated Voltage	⑦Termination Type	⑧Packaging Code	⑨Thickness Code

① Series Code A-Multilayer Ceramic Chip Capacitors for Automotive

② Size Code (Unit:mm)

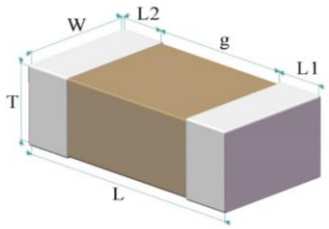


Fig.1 Structure & Dimension

Size Code	L	W	L1,L2	g	T	Thickness Code
0201	0.60±0.03	0.30±0.03	0.10~0.20	0.20min.	0.30±0.03	A
0201	0.60+0.05/-0.03	0.30+0.05/-0.03	0.10~0.20	0.20min.	0.30+0.05/-0.03	J
0201	0.60±0.09	0.30±0.09	0.10~0.20	0.20min.	0.30±0.09	F
0201	0.60+0.10/-0.03	0.30+0.10/-0.03	0.10~0.20	0.20min.	0.30+0.10/-0.03	X
0402	1.00±0.05	0.50±0.05	0.15~0.35	0.30min.	0.50±0.05	B
0402	1.00+0.15/-0.05	0.50+0.15/-0.05	0.15~0.35	0.30min.	0.50+0.15/-0.05	N
0402	1.00+0.20/-0.05	0.50+0.20/-0.05	0.15~0.35	0.30min.	0.50+0.20/-0.05	C
0603	1.60±0.10	0.80±0.10	0.20~0.50	0.50min.	0.80±0.10	D
0603	1.60+0.20/-0.10	0.80+0.20/-0.10	0.20~0.50	0.50min.	0.80+0.20/-0.10	K
0805	2.00±0.10	1.25±0.10	0.20~0.70	0.70min.	0.60±0.10	C
0805	2.00±0.20	1.25±0.20	0.20~0.70	0.70min.	0.85±0.15	K
0805	2.00±0.20	1.25±0.20	0.20~0.70	0.70min.	0.85+0.15/-0.35	Y
0805	2.00±0.10	1.25±0.10	0.20~0.70	0.70min.	1.25±0.10	G
0805	2.00±0.20	1.25±0.20	0.20~0.70	0.70min.	1.25±0.20	H
1206	3.20±0.15	1.60±0.15	0.30~0.80	1.50 min.	0.85±0.10	E
1206	3.20±0.20	1.60±0.20	0.30~0.80	1.50 min.	1.15±0.15	O
1206	3.20±0.20	1.60±0.20	0.30~0.80	1.50 min.	1.60±0.20	L
1210	3.20±0.20	2.50±0.20	0.30~0.90	1.50 min.	2.00±0.20	Q
1210	3.20±0.30	2.50±0.20	0.30~0.90	1.50 min.	2.50±0.20	R
1210	3.20±0.40	2.50±0.30	0.30~0.90	1.50 min.	2.50±0.30	3

③ Temperature Characteristics

Temperature Characteristics	Operating Temp. Range	Temperature Characteristics		
		Temp. coeff. or Cap. Change	Temp. Range	Ref. Temp.
C0G	-55℃~ 125℃	0±30ppm/℃	25℃~125℃	25℃
X7R	-55℃~125℃	±15%	-55℃~125℃	25℃
X7S	-55℃~125℃	±22%	-55℃~125℃	25℃
X7T	-55℃~125℃	+22%/-33%	-55℃~125℃	25℃
X6S	-55℃~105℃	±22%	-55℃~105℃	25℃
X5R	-55℃~85℃	±15%	-55℃~85℃	25℃

④ Nominal Capacitance (Unit: pF) 1pF=10^{-3}nF =10^{-6}μF

Example :R47=0.47 pF ,2R2=2.2 pF ,120=12×10^{0}=12pF, 104=10×10^{4}=100000 pF=100nF,

Class1(C0G) Capacitance Step in E24 series. Capacitance: See Table3-1

Class2(X7R\X7S\X7T\X6S\X5R) Capacitance Step in E12 series,Capacitance: See Table3-2

⑤ Capacitance Tolerance

Code	Capacitance Tolerance	Code	Capacitance Tolerance
A	±0.05 pF	G	±2%
B	±0.1pF	J	±5%
C	±0.25pF	K	±10%
D	±0.5pF	L	±15%
F	±1%	M	±20%

⑥ Rated Voltage

Code	Voltage Values	Code	Voltage Values
2R5	2.5V	101	100V
4R0	4.0V	201	200V
6R3	6.3V	251	250V
100	10V	501	500V
160	16V	631	630V
250	25V	102	1000V
350	35V	202	2000V
500	50V	-	-

⑦ Termination Type

Code	Terminal Electrodes	Plating Material
N	Cu	Ni/Sn
P	Cu+AgPd or Cu+AgPdCu	-
C	Cu	Cu
K	Cu	Ni/Au
R	Cu/Ag (Resin)	Ni/Sn

⑧ Packaging Code See Table 4.

⑨ Thickness Code See ② Size Code

Table 3-1 Capacitance Table (Class1-C0G)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
1	A	C0G	0201	100V	A	0.1pF～100pF
2	A	C0G	0201	50V	A	0.1pF~1nF
3	A	C0G	0201	25V	A	0.1pF~1nF
4	A	C0G	0201	16V	A	0.1pF~1nF
5	A	C0G	0402	100V	B	0.1pF～1nF
6	A	C0G	0402	50V	B	0.1pF～2.2nF
7	A	C0G	0402	25V	B	0.1pF～2.2nF
8	A	C0G	0402	16V	B	0.1pF～2.2nF
9	A	C0G	0603	250V	D	10pF~2.2nF
10	A	C0G	0603	100V	D	10pF~10nF
11	A	C0G	0603	50V	D	1pF~10nF
12	A	C0G	0603	35V	D	1pF~10nF
13	A	C0G	0603	25V	D	1pF~10nF
14	A	C0G	0603	16V	D	1pF~10nF
15	A	C0G	0805	630V	K	10pF~560pF
16	A	C0G	0805	630V	H	680pF~2.2nF
17	A	C0G	0805	500V	K	10pF~560pF
18	A	C0G	0805	500V	H	680pF~2.2nF
19	A	C0G	0805	250V	K	10pF~3.9nF
20	A	C0G	0805	250V	H	4.7nF~10nF
21	A	C0G	0805	200V	K	10pF~3.9nF
22	A	C0G	0805	200V	H	4.7nF~10nF
23	A	C0G	0805	100V	C	10pF~3.9nF
24	A	C0G	0805	100V	K	4.7nF~15nF
25	A	C0G	0805	100V	G	18nF~33nF
26	A	C0G	0805	50V	C	10pF~3.9nF
27	A	C0G	0805	50V	K	4.7nF~15nF
28	A	C0G	0805	50V	G	18nF~47nF
29	A	C0G	1206	2000V	O	10pF~100pF
30	A	C0G	1206	1000V	E	10pF~470pF
31	A	C0G	1206	1000V	O	10pF~750pF
32	A	C0G	1206	1000V	L	820pF~1.0nF
33	A	C0G	1206	630V	E	10pF~1.8nF
34	A	C0G	1206	630V	O	2.2nF~3.3nF
35	A	C0G	1206	630V	L	3.6nF~10nF
36	A	C0G	1206	250V	O	6.8nF~12nF
37	A	C0G	1206	250V	L	15nF~22nF
38	A	C0G	1206	100V	E	10pF~39nF
39	A	C0G	1206	100V	O	47nF
40	A	C0G	1206	100V	L	56nF~100nF
41	A	C0G	1206	50V	E	10pF-39nF
42	A	C0G	1206	50V	O	47nF
43	A	C0G	1206	50V	L	56nF~100nF
44	A	C0G	1206	25V	E	10pF~39nF
45	A	C0G	1206	25V	O	47nF
46	A	C0G	1206	25V	L	56nF~220nF
47	A	C0G	1210	1000V	Q	1.0nF~8.2nF
48	A	C0G	1210	1000V	R	10nF~22nF
49	A	C0G	1210	630V	Q	6.8nF~18nF
50	A	C0G	1210	630V	R	22nF~33nF
51	A	C0G	1210	630V	3	33nF

Table 3-2 Capacitance Table (Class 2-X7R\X7S\X7T\X6S\X5R)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
1	A	X7R	0201	50V	A	120pF~1.5nF
2	A	X7R	0201	25V	A	120pF~10nF
3	A	X7R	0201	16V	A	120pF~10nF
4	A	X7R	0201	10V	A	120pF~10nF
5	A	X7R	0201	6.3V	A	120pF~10nF
6	A	X7R	0402	100V	B	120pF~10nF
7	A	X7R	0402	50V	B	120pF～100nF
8	A	X7R	0402	50V	N	56nF~100nF
9	A	X7R	0402	35V	B	120pF~100nF
10	A	X7R	0402	35V	N	56nF~100nF
11	A	X7R	0402	25V	B	120pF~100nF
12	A	X7R	0402	25V	N	150nF~330nF
13	A	X7R	0402	16V	B	120pF~220nF
14	A	X7R	0402	16V	N	150nF~470nF
15	A	X7R	0402	10V	B	120pF~220nF
16	A	X7R	0402	10V	N	150nF~470nF
17	A	X7R	0402	6.3V	B	120pF~220nF
18	A	X7R	0402	6.3V	N	150nF~470nF
19	A	X7R	0603	100V	D	100pF～100nF
20	A	X7R	0603	100V	K	47nF~100nF
21	A	X7R	0603	50V	D	1nF~330nF
22	A	X7R	0603	50V	K	330nF~470nF
23	A	X7R	0603	35V	D	1nF~330nF
24	A	X7R	0603	35V	K	330nF~470nF
25	A	X7R	0603	25V	D	1nF～1μF
26	A	X7R	0603	25V	K	330nF~1μF
27	A	X7R	0603	16V	D	1nF～1μF
28	A	X7R	0603	16V	K	330nF~1μF
29	A	X7R	0603	10V	D	1nF～1μF
30	A	X7R	0603	10V	K	330nF~1μF
31	A	X7R	0603	6.3V	D	1nF～1μF
32	A	X7R	0603	6.3V	K	330nF~1μF
33	A	X7R	0805	250V	Y	1nF~22nF
34	A	X7R	0805	100V	Y	1nF~100nF
35	A	X7R	0805	100V	H	220nF~470nF
36	A	X7R	0805	50V	Y	1nF~100nF
37	A	X7R	0805	50V	H	150nF～1μF
38	A	X7R	0805	25V	H	150nF~4.7μF
39	A	X7R	0805	16V	H	150nF~4.7μF
40	A	X7R	0805	10V	H	150nF~4.7μF
41	A	X7R	1206	2000V	O	150pF~2.2nF
42	A	X7R	1206	1000V	O	150pF~4.7nF
43	A	X7R	1206	1000V	L	5.6nF~10nF
44	A	X7R	1206	630V	O	1nF~10nF
45	A	X7R	1206	630V	L	33nF
46	A	X7R	1206	500V	O	1nF~10nF
47	A	X7R	1206	500V	L	33nF
48	A	X7R	1206	250V	O	15nF~22nF
49	A	X7R	1206	250V	L	33nF~100nF

Table 3-2 Capacitance Table (Class 2-X7R\X7S\X7T\X6S\X5R)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
50	A	X7R	1206	200V	O	15nF~22nF
51	A	X7R	1206	200V	L	33nF~100nF
52	A	X7R	1206	100V	O	100nF~220nF
53	A	X7R	1206	100V	L	330nF~1μF
54	A	X7R	1206	50V	L	1.5μF~2.2μF
55	A	X7R	1206	25V	L	4.7μF
56	A	X7R	1206	16V	L	4.7μF~10μF
57	A	X7R	1210	50V	R	4.7μF
58	A	X7R	1210	25V	R	10μF
59	A	X7R	1210	16V	R	22μF
60	A	X7R	1210	10V	R	22μF
61	A	X7R	1210	6.3V	R	47μF
62	A	X7S	0201	16V	X	100nF
63	A	X7S	0201	10V	A	15nF~100nF
64	A	X7S	0201	10V	J	100nF
65	A	X7S	0201	6.3V	A	15nF~100nF
66	A	X7S	0201	6.3V	J	100nF
67	A	X7S	0402	16V	N	330nF~470nF
68	A	X7S	0402	10V	N	330nF~470nF
69	A	X7S	0402	10V	C	680nF~1μF
70	A	X7S	0402	6.3V	N	1μF
71	A	X7S	0603	25V	D	330nF~1μF
72	A	X7S	0603	25V	K	2.2μF
73	A	X7S	0603	16V	D	330nF~1μF
74	A	X7S	0603	16V	K	2.2μF
75	A	X7S	0603	10V	D	330nF~2.2μF
76	A	X7S	0603	10V	K	2.2μF
77	A	X7S	0603	6.3V	D	330nF~2.2μF
78	A	X7S	0603	6.3V	K	2.2μF
79	A	X7S	0805	100V	H	1μF
80	A	X7S	0805	35V	H	4.7μF
81	A	X7S	0805	25V	H	4.7μF
82	A	X7S	0805	16V	H	4.7μF
83	A	X7S	0805	10V	H	4.7μF~10μF
84	A	X7S	0805	6.3V	H	4.7μF~10μF
85	A	X7S	1206	100V	L	2.2μF
86	A	X7S	1206	50V	L	4.7μF
87	A	X7S	1206	25V	L	10μF
88	A	X7S	1206	10V	L	22μF
89	A	X7T	0201	6.3V	F	220nF~470nF
90	A	X7T	0201	4V	F	330nF~1μF
91	A	X7T	0201	2.5V	J	1μF
92	A	X7T	0201	2.5V	F	330nF~1μF
93	A	X7T	0402	16V	B	330nF~470nF
94	A	X7T	0402	10V	B	330nF~1μF
95	A	X7T	0402	6.3V	B	330nF~1μF
96	A	X7T	0402	6.3V	C	2.2μF~4.7μF
97	A	X7T	0402	4V	B	330nF~1μF
98	A	X7T	0402	4V	C	2.2μF~4.7μF

Table 3-2 Capacitance Table (Class 2-X7R\X7S\X7T\X6S\X5R)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
99	A	X7T	0603	25V	K	2.2μF
100	A	X7T	0603	16V	K	4.7μF
101	A	X7T	0603	10V	K	4.7μF~10μF
102	A	X7T	0603	6.3V	K	4.7μF~10μF
103	A	X7T	0805	50V	H	2.2μF
104	A	X7T	0805	16V	H	10μF
105	A	X7T	0805	10V	H	22μF
106	A	X7T	0805	6.3V	H	22μF
107	A	X6S	0201	16V	A	10nF~56nF
108	A	X6S	0201	16V	J	68nF~100nF
109	A	X6S	0201	16V	F	220nF~470nF
110	A	X6S	0201	10V	A	10nF~100nF
111	A	X6S	0201	10V	J	220nF
112	A	X6S	0201	10V	F	330nF~470nF
113	A	X6S	0201	6.3V	A	10nF~100nF
114	A	X6S	0201	6.3V	J	220nF
115	A	X6S	0201	6.3V	F	330nF~1μF
116	A	X6S	0201	4V	A	68nF~220nF
117	A	X6S	0402	35V	B	220nF
118	A	X6S	0402	25V	B	220nF
119	A	X6S	0402	25V	N	220nF~1μF
120	A	X6S	0402	16V	B	220nF~1μF
121	A	X6S	0402	16V	N	220nF~1μF
122	A	X6S	0402	16V	C	2.2μF
123	A	X6S	0402	10V	B	1μF
124	A	X6S	0402	10V	C	2.2μF~4.7μF
125	A	X6S	0402	6.3V	B	220nF~2.2μF
126	A	X6S	0402	6.3V	C	2.2μF~4.7μF
127	A	X6S	0402	4V	B	220nF~2.2μF
128	A	X6S	0402	4V	N	2.2μF~4.7μF
129	A	X6S	0603	35V	D	1μF
130	A	X6S	0603	35V	K	2.2μF
131	A	X6S	0603	25V	D	1μF
132	A	X6S	0603	25V	K	2.2μF~4.7μF
133	A	X6S	0603	16V	D	1μF~2.2μF
134	A	X6S	0603	16V	K	4.7μF~10μF
135	A	X6S	0603	10V	D	1μF
136	A	X6S	0603	10V	K	10μF
137	A	X6S	0603	6.3V	D	4.7μF
138	A	X6S	0603	6.3V	K	10μF~22μF
139	A	X6S	0603	4V	D	1μF~10μF
140	A	X6S	0603	4V	K	22μF
141	A	X6S	0805	25V	H	2.2μF
142	A	X6S	0805	16V	H	10μF
143	A	X6S	0805	10V	H	22μF
144	A	X6S	0805	6.3V	H	22μF
145	A	X5R	0201	25V	A	150pF~100nF
146	A	X5R	0201	25V	F	220nF~470nF
147	A	X5R	0201	16V	A	150pF~100nF

Table 3-2 Capacitance Table (Class 2-X7R\X7S\X7T\X6S\X5R)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
148	A	X5R	0201	16V	J	100nF~220nF
149	A	X5R	0201	16V	F	330nF~470nF
150	A	X5R	0201	10V	A	10nF~100nF
151	A	X5R	0201	10V	J	220nF
152	A	X5R	0201	10V	F	470nF~1μF
153	A	X5R	0201	6.3V	A	10nF~220nF
154	A	X5R	0201	6.3V	J	220nF~470nF
155	A	X5R	0201	6.3V	F	1μF
156	A	X5R	0201	4V	F	1μF
157	A	X5R	0402	50V	N	100nF
158	A	X5R	0402	35V	N	100nF
159	A	X5R	0402	25V	B	33nF~1μF
160	A	X5R	0402	25V	N	220nF~1μF
161	A	X5R	0402	16V	B	220nF~1μF
162	A	X5R	0402	16V	C	2.2μF
163	A	X5R	0402	10V	B	1μF
164	A	X5R	0402	10V	N	2.2μF
165	A	X5R	0402	10V	C	4.7μF
166	A	X5R	0402	6.3V	B	1μF~2.2μF
167	A	X5R	0402	6.3V	N	4.7μF
168	A	X5R	0402	4V	N	4.7μF
169	A	X5R	0603	50V	D	1μF
170	A	X5R	0603	35V	K	2.2μF
171	A	X5R	0603	25V	K	2.2μF~4.7μF
172	A	X5R	0603	16V	K	2.2μF~10μF
173	A	X5R	0603	10V	K	2.2μF~10μF
174	A	X5R	0603	6.3V	K	2.2μF~22μF
175	A	X5R	0805	25V	G	1μF~4.7μF
176	A	X5R	0805	25V	H	10μF
177	A	X5R	0805	16V	G	1μF~4.7μF
178	A	X5R	0805	16V	H	10μF
179	A	X5R	0805	10V	G	3.3μF~10μF
180	A	X5R	0805	10V	H	22μF
181	A	X5R	0805	6.3V	G	3.3μF~10μF
182	A	X5R	0805	6.3V	H	22μF

Table 4 Packaging (Minimum Quantity)

NO.	Size Code	Thickness Code	Square hole spacing	Disc Size	Carrier Tape Type	QTY (Kpcs)	Packaging Code
1	0201	A	2mm	7〃	Paper	15	T
2	0201	A	2mm	13〃	Paper	50	J
3	0201	A	1mm	13〃	Paper	100	D
4	0201	A	2mm	7〃	Paper	10	H
5	0201	A	1mm	7〃	Paper	30	L
6	0201	J	2mm	7〃	Paper	15	T
7	0201	J	2mm	13〃	Paper	50	J
8	0201	J	1mm	13〃	Paper	100	D
9	0201	J	2mm	7〃	Paper	10	H
10	0201	J	1mm	7〃	Paper	30	L
11	0201	X	2mm	7〃	Paper	15	T
12	0201	X	2mm	13〃	Paper	50	J
13	0201	X	2mm	7〃	Paper	10	H
14	0201	F	2mm	7〃	Paper	15	T
15	0402	B	2mm	7〃	Paper	10	T
16	0402	B	2mm	13〃	Paper	50	J
17	0402	N	2mm	7〃	Paper	10	T
18	0402	N	2mm	13〃	Paper	50	J
19	0402	C	2mm	7〃	Paper	10	T
20	0402	C	2mm	13〃	Paper	50	J
21	0603	D	4mm	7〃	Paper	4	T
22	0603	D	4mm	13〃	Paper	15	A
23	0603	D	4mm	13〃	Plastic	10	O
24	0603	D	4mm	7〃	Paper	3	W
25	0603	K	4mm	7〃	Paper	4	T
26	0603	K	4mm	13〃	Paper	15	A
27	0603	K	4mm	13〃	Plastic	10	O
28	0603	K	4mm	7〃	Paper	3	W
29	0603	K	4mm	7〃	Plastic	4	Q
30	0603	K	4mm	7〃	Plastic	3	R
31	0805	C	4mm	7〃	Paper	4	T
32	0805	C	4mm	7〃	Plastic	3	R
33	0805	K	4mm	7〃	Paper	4	T
34	0805	K	4mm	7〃	Plastic	3	R
35	0805	K	4mm	13〃	Plastic	15	E
36	0805	Y	4mm	7〃	Paper	4	T
37	0805	Y	4mm	13〃	Plastic	15	E
38	0805	Y	4mm	7〃	Plastic	2	P
39	0805	Y	4mm	7〃	Plastic	3	R
40	0805	G	4mm	7〃	Plastic	3	R
41	0805	G	4mm	7〃	Plastic	2	P
42	0805	G	4mm	13〃	Plastic	10	O
43	0805	H	4mm	7〃	Plastic	3	R
44	0805	H	4mm	7〃	Plastic	2	P
45	0805	H	4mm	13〃	Plastic	10	O
46	1206	E	4mm	7〃	Plastic	3	R
47	1206	E	4mm	7〃	Plastic	2	P
48	1206	O	4mm	7〃	Plastic	3	R
49	1206	O	4mm	7〃	Plastic	2	P
50	1206	L	4mm	7〃	Plastic	2	P
51	1206	L	4mm	7〃	Plastic	3	R
52	1206	L	4mm	13〃	Plastic	8	E
53	1210	Q	4mm	7〃	Plastic	1.5	F
54	1210	Q	4mm	7〃	Plastic	0.5	S
55	1210	Q	4mm	7〃	Plastic	1	Z
56	1210	R	4mm	7〃	Plastic	1	Z
57	1210	R	4mm	7〃	Plastic	0.5	S

First packaging: Each multi-disc material is packed into a box.

The second packaging: the first packaged packaging box is loaded into the paper packaging box,and the remaining space in the box is filled with light auxiliary materials.

The above packaging forms can also be packaged according to user needs.

3. Technical Specifications and Test Methods

3.1 Operating Environment

Temp. Characteristics	Temp. Range	Relative Humidity	Atmospheric Pressure
C0G/X7R/X7S/X7T	-55℃~125℃	≤95% (25℃)	86 KPa~106KPa
X6S	-55℃~105℃	≤95% (25℃)	86 KPa~106KPa
X5R	-55℃~85℃	≤95% (25℃)	86 KPa~106KPa

3.2 Reliablility Test Specifications and Methods

Table 5: Specifications and Test Methods

No.	Item		Specification		Test Method
	AEC-Q200 Test Item		Class1 (Temperature Compensating Type) C0G	Class 2 (High dielectric constant type) X7R\X7S\X7T\X6S\X5R	
1	Pre-and Post-Stress Electrical Test		—	—	—
2	High Temperature Exposure (Storage)	Appearance	No defects or abnormalities.		Pre-treatment: Class 2: Perform a heat treatment at 150℃+0/-10℃ for 1hour and then sit for 24±2 hours at room temperature. then measure. Perform heat treament 3 times according to Lead-free reflow soldering profiles, the peak temperature is 260℃, and the time gap between each heat treament is more than 30 minutes. Test temperature: θ2±3℃ [C0G/X7R/X7S/X7T:θ2=125℃, X6S: θ2=105℃, X5R：θ2=85℃] Test time: 1000±12h Post-treatment: Set for 24±2 hours at room temperature, then measure.
		Cap. Change	ΔC/C≤±2.5% or ±0.25pF (Whichever is larger)	ΔC/C≤ ±12.5%	
		I.R. (Room Temp.)	≥10000MΩ or 500Ω•F (Whichever is smaller)	≥500MΩ or 25Ω•F (Whichever is smaller)	
		D.F. or Q	C≥30pF: Q≥1000 C < 30pF: Q≥400+20C C: Nominal Capacitance (pF)	0.2max	
3	Temperature Cycling	Appearance	No defects or abnormalities.		Pre-treatment: Class 2: Perform a heat treatment at 150℃+0/-10℃ for 1hour and then sit for 24±2 hours at room temperature. then measure. Perform heat treament 3 times according to Lead-free reflow soldering profiles, the peak temperature is 260℃, and the time gap between each heat treament is more than 30 minutes. Cycles: 1000cycles Temperature Step. Step. / Temp.(℃) / Time (min) 1 / θ1 / 30±3 2 / Room Temp. / 1 3 / θ2 / 30±3 4 / Room Temp. / 1 C0G/X7R/X7S/X7T: θ1=-55℃,θ2=125℃ X6S: θ1=-55℃,θ2=105℃ X5R: θ1=-55℃,θ2=85℃ Post-treatment: Set for 24±2 hours at room temperature, then measure.
		Cap. Change	ΔC/C≤±2.5% or ±0.25pF (Whichever is larger)	ΔC/C≤ ±10%	
		I.R. (Room Temp.)	≥10000MΩ or 500Ω•F (Whichever is smaller)	≥1000MΩ or 50Ω•F (Whichever is smaller)	
		D.F. or Q	C≥30pF: Q≥1000 C < 30pF: Q≥400+20C C: Nominal Capacitance (pF)	0.2max	
4	Destructive PhysicalAnalysis（DPA）		No defects or abnormalities.		EIA-469
5	Biased Humidity (85/85)	Appearance	No defects or abnormalities.		Pre-treatment: Class 2: Perform a heat treatment at 150℃+0/-10℃ for 1hour and then sit for 24±2 hours at room temperature. then measure. Perform heat treament 3 times according to Lead-free reflow soldering profiles, the peak temperature is 260℃, and the time gap between each heat treament is more than 30 minutes. Test temperature: 85±3℃ Test humidity: 85±3%RH Test time: 1000±12h Test voltage: Rated voltage(U_R < 500V) and1.3Vdc to 1.5Vdc（Add 100kΩ resister) 500±50V (U_R=500V/630V/1KV/2KV) and1.3Vdc to 1.5Vdc（Add 100kΩ resister) The charge/discharge current: 50mA or lower Post-treatment: Class 2: Perform a heat treatment at 150℃+0/-10℃ for 1hour and then sit for 24±2 hours at room temperature. then measure. Class 1: Set for 24±2 hours at room temperature, then measure.
		Cap. Change	ΔC/C ≤±3% or ±0.3pF (Whichever is larger)	ΔC/C≤ ±12.5%	
		I.R. (Room Temp.)	≥1000MΩ or 50Ω•F (Whichever is smaller)	≥100MΩ or 5Ω•F (Whichever is smaller)	
		D.F. or Q	C≥30pF: Q≥200 C < 30pF: Q≥100+10C/3 C: Nominal Capacitance (pF)	0.2max	
6	Operational Life	Appearance	No defects or abnormalities.		Pre-treatment: Class 2: Perform a heat treatment at 150℃+0/-10℃ for 1hour and then sit for 24±2 hours at room temperature. then measure. Perform heat treament 3 times according to Lead-free reflow soldering profiles, the peak temperature is 260℃, and the time gap between each heat treament is more than 30 minutes. Test temperature: θ2±3℃ [C0G/X7R/X7S/X7T:θ2=125℃, X6S: θ2=105℃, X5R：θ2=85℃] Test time: 1000±12h Test voltage: 1.0× U_R The charge/discharge current: 50mA or lower Post-treatment: Class 2: Perform a heat treatment at 150 ℃ for 1hour and then sit for 24±2 hours at room temperature. Perform the initial measurement. Class 1: Set for 24±2 hours at room temperature, then measure.
		Cap. Change	ΔC/C ≤±3% or ±0.3pF (Whichever is larger)	ΔC/C≤ ±12.5%	
		I.R. (Room Temp.)	≥1000MΩ or 50Ω•F (Whichever is smaller)	≥100MΩ or 5Ω•F (Whichever is smaller)	
		D.F. or Q	C≥30pF: Q≥350 10pF≤C < 30pF: Q≥275+5C/2 C < 10pF: Q≥200+10C C: Nominal Capacitance (pF)	0.2max	
7	Appearance		No defects or abnormalities.		Visual inspection under 10x microscope
8	Physical Dimension		See Fig.1		Using Measuring instrument of dimension
9	Mechanical Shock	Appearance	No defects or abnormalities.		Perform heat treament 3 times according to Lead-free reflow soldering profiles, the peak temperature is 260℃, and the time gap between each heat treament is more than 30 minutes. Solder the capacitor on the test substrate(glass epoxy board). Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks). Waveform: Half-sine Holding Time: 0.5ms Peak value: 1500g Velocity change: 4.7m/s
		Cap. Change	Within the specified initial value.	Within the specified initial value.	
		I.R. (Room Temp.)	≥10000MΩ or 100Ω•F (Whichever is smaller)	≥1000MΩ or 50Ω•F (Whichever is smaller)	
		D.F. or Q	Within the specified initial value.	Within the specified initial value.	
10	Vibration	Appearance	No defects or abnormalities.		Perform heat treament 3 times according to Lead-free reflow soldering profiles, the peak temperature is 260℃, and the time gap between each heat treament is more than 30 minutes. Mounting method: Solder the capacitor on the test substrate(glass epoxy board). Kind of Vibration: 10Hz to 2000Hz and return to 10Hz, Total amplitude: 1.5mm Vibration Time: 20min. Vibration directions and time: This motion should be applied for 12 cycles in each 3 mutually perpendicular directions (total of 36 times).
		Cap. Change	Within the specified initial value.	Within the specified initial value.	
		I.R. (Room Temp.)	Within the specified initial value.	≥1000MΩ or 50Ω•F (Whichever is smaller)	
		D.F. or Q	Within the specified initial value.	Within the specified initial value.	
11	Resistance to Soldering Heat	Appearance	No defects or abnormalities.		Pre-treatment: Class 2: Perform a heat treatment at 150℃+0/-10℃ for 1hour and then sit for 24±2 hours at room temperature. then measure. Pre-heating: Temp.:120℃~150℃/Time:60s Test Method: Solder bath method Solder alloy: Sn-Ag-Cu(Lead Free Solder) Solder temp.: 260℃±5℃ Duration of immersion: 10±1s Depth of immersion: 10±1mm Post-treatment: Set for 24±2 hours at room temperature, then measure.
		Cap. Change	Within the specified initial value.	X7R:ΔC/C≤±7.5% X7S/X7T/X6S/X5R:ΔC/C≤±15%	
		I.R. (Room Temp.)	≥10000MΩ or 500Ω•F (Whichever is smaller)	≥1000MΩ or 50Ω•F (Whichever is smaller)	
		D.F. or Q	Within the specified initial value.	Within the specified initial value.	
12	ESD	Appearance	No defects or abnormalities.		Per AEC-Q200-002 Pre-treatment: Class 2: Perform a heat treatment at 150℃+0/-10℃ for 1hour and then sit for 24±2 hours at room temperature. then measure.
		Cap. Change	Within the specified initial value.	Within the specified initial value.	
		I.R. (Room Temp.)	≥10000MΩ or 500Ω•F (Whichever is smaller)	≥1000MΩ or 50Ω•F (Whichever is smaller)	
		D.F. or Q	Within the specified initial value.	Within the specified initial value.	

Table 5: Specifications and Test Methods

No.	Item		Specification		Test Method
	AEC-Q200 Test Item		Class1 (Temperature Compensating Type) C0G	Class 2 (High dielectric constant type) X7R\X7S\X7T\X6S\X5R	
13	Solderability	Appearance	95% of the terminations is to be soldered evenly and continuously		(a) Preheat at 155℃ for 4 hours. After preheating,immerse the capacitor in a solution of rosin ethanol 25(mass)%. Immerse in Sn-3.0Ag-0.5Cu solder solution at 245±5℃ or an eutectic solder solution at 235±5℃ for 5±0.5 seconds. (b) should be placed into steam aging for 8 hours±15 minutes. After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%. Immerse in Sn-3.0Ag-0.5Cu solder solution at 245±5℃ or an eutectic solder solution at 235±5℃ for 5±0.5 seconds. (c) should be placed into steam aging for 8 hours±15minutes. After preheating, immerse the capacitor in a solution of rosin ethanol 25(mass)%. Immerse in Sn-3.0Ag-0.5Cu solder solution or an eutectic solder solution for 120±5 seconds at 260±5℃.
14	Electrical Characterization	Capacitance	Within the specified tolerance		Measurement Temperature 18～28℃ Relative Humidity ≤RH 80% Measurement Frequency Class 1: C≤1nF, f=1.0±0.1MHz ; C>1nF, f=1.0±0.1KHz Class 2: C≤10μF, f=1.0±0.1KHz; C>10μF, f=120±24Hz Measurement Voltage Class 1: 1.0±0.2Vrms Class 2: C≤10μF,U=1.0±0.2Vrms;C>10μF,U=0.5±0.1Vrms
15		D.F. or Q	C≥30pF: Q≥1000 C＜30pF: Q≥400+20C C: Nominal Capacitance (pF)	0.125max	Measurement Temperature 18～28℃ Relative Humidity ≤RH 80% Measurement Frequency Class 1: C≤1nF, f=1.0±0.1MHz ; C>1nF, f=1.0±0.1KHz Class 2: C≤10μF, f=1.0±0.1KHz; C>10μF, f=120±24Hz Measurement Voltage Class 1: 1.0±0.2Vrms Class 2: C≤10μF,U=1.0±0.2Vrms;C>10μF,U=0.5±0.1Vrms
16		I.R. (Room Temp.)	≥100000MΩ or 1000Ω•F (Whichever is smaller)	≥1000MΩ or 50Ω•F (Whichever is smaller)	Measurement Temperature 25℃ Measurement Voltage U_R<500V: U_R U_R≥500V: 500±50V Charging Time 1min. The charge/discharge current 50mA or lower
17		I.R. (High Temp.)	≥10000MΩ or100Ω•F (Whichever is smaller)	≥100MΩ or 5Ω•F (Whichever is smaller)	Measurement Temperature C0G/X7R/X7S/X7T: 125℃ X6S: 105℃ X5R: 85℃ Measurement Voltage U_R<500V: U_R U_R≥500V: 500±50V Charging Time 1min. The charge/discharge current 50mA or lower
18		Voltage proof	No defects or abnormalities.		Test Voltage **Class 1** **Class 2**

Class 1

Size Code	U_R	Capacitance	Test Voltage
0201	＜250V	-	≥2.5×U_R
0402	250V	-	≥2.0×U_R
0603	630V	-	≥1.5×U_R
0805	1000V	-	≥1.3×U_R
1206	2000V	-	≥1.2×U_R
1210	630V	-	≥1.5×U_R
	1000V	≤2.2nF	≥1.3×U_R
		2.2nF＜C≤15nF	≥1.2×U_R
		＞15nF	≥1.1×U_R

Class 2

U_R	Test Voltage
≤100V	≥2.5×U_R
250V/200V	≥2.0×U_R
500V/630V	≥1.5×U_R
1000V/2000V	≥1.2×U_R

Applied Time t=1s～5s

The charge/discharge current 50mA or lower

19	Board Flex	Appearance	No defects or abnormalities.		Solder the capacitor on the test substrate See Fig.2 Pressurization Method : See Fig.3. Speed 1.0mm/sec Flexure 2mm Holding Time 60s then measure the capacitance.
		Cap. Change	ΔC/C≤±5% or ±0.5pF (Whichever is larger)	ΔC/C≤ ±10%	
		I.R. (Room Temp.)	≥10000MΩ or 500Ω•F (Whichever is smaller)	≥1000MΩ or 50Ω•F (Whichever is smaller)	
		D.F. or Q	Within the specified initial value.	Within the specified initial value.	
20	Terminal Strength	Appearance	No defects or abnormalities.		Perform heat treament 3 times according to Lead-free reflow soldering profiles, the peak temperature is 260℃, and the time gap between each heat treament is more than 30 minutes. Mounting method Solder the capacitor on the test substrate(glass epoxy board) shown in Fig4. Applied Force 0201/0402:F=2N 0603/0805/1206/1210:F=18N
		Cap. Change	Within the specified initial value.	Within the specified initial value.	
		I.R. (Room Temp.)	≥10000MΩ or 500Ω•F, (Whichever is smaller)	≥1000MΩ or 50Ω•F (Whichever is smaller)	
		D.F. or Q	Within the specified initial value.	Within the specified initial value.	
21	Beam Load Test	Destruction value	Destruction value should be exceed following one: Size Code Destruction value 0201 ≥ 5N 0402 ≥ 8N 0603/0805 ≥20N 1206/1210 ≥15 N (T＜1.25mm) 1206/1210 ≥54.5N (T≥1.25mm)		Mounting method Place the capacitor in the beam load fixture as Fig 5/6 Speed supplied the Stress Load 0402min. : 0.5mm/s, 0201: 0.1mm/s <Size Code:0805 max. > <Size Code:1206 min.>
22	Capacitance Temperature Characteristics		C0G: αc≤±30ppm/℃ (125℃); -72≤αc≤+30ppm/℃ (-55℃)	X7R/X5R: ΔC/C ≤±15% X7S/X6S: ΔC/C:≤±22% X7T: -33%≤ΔC/C≤22%	Pre-treatment Class 2: Perform a heat treatment at 150℃+0/-10℃ for 1hour and then sit for 24±2 hours at room temperature. then measure. Pre-drying Class 1: 16-24 hours Measure the capacitance separately in 25℃、θ1、25℃、θ2、25℃, should satisfied relatived capacitance change characteristics. C0G/X7R/X7S/X7T: θ1=-55℃,θ2=125℃ X6S: θ1=-55℃,θ2=105℃ X5R: θ1=-55℃,θ2=85℃ T.C Measurement Voltage: Class 1: 1.0±0.2Vrms Class 2: ≤1.0±0.2Vrms ※ [※ Please contact our technical support staff for more information.]

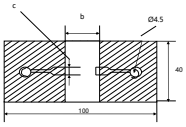


Fig 2

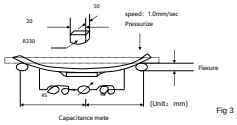


Fig 3

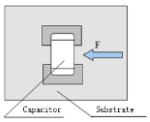


Fig 4

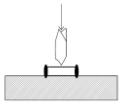


Fig 5

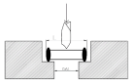


Fig 6

4. Packaging,Shipment and storage

4.1 Packaging

4.1.1 packaging type

Reel Packaging (standard carrier tape disc packaging),single disc smallest package See Table 4.

4.1.2 Carrier Tape size

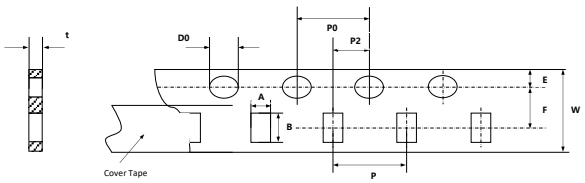


Fig. 7-1: 0603,0805,1206,1210 (Paper tape)

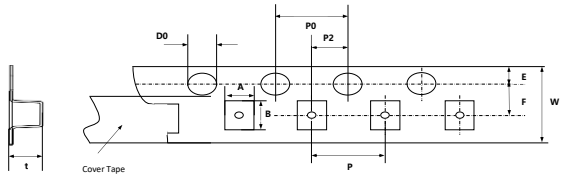


Fig. 7-2:0603,0805,1206,1210 (Plastic tape)

Table 6-1 Carrier size (Size Code:0603,0805,1206,1210) (Unit:mm)

Size Code	Thickness code	Carrier Tape Type	Packaging Code	A	B	F	P	E	D0	P2	K	W	P0	t
0603	D	Paper	T	1.00±0.10	1.80±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0603	D	Paper	A	1.00±0.10	1.80±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0603	D	Plastic	O	1.00±0.10	1.80±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0603	D	Paper	W	1.00±0.10	1.80±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0603	K	Paper	T	1.10±0.10	1.90±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0603	K	Paper	A	1.10±0.10	1.90±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0603	K	Plastic	O	1.10±0.10	1.90±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0603	K	Paper	W	1.10±0.10	1.90±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0603	K	Plastic	Q	1.10±0.10	1.90±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0603	K	Plastic	R	1.10±0.10	1.90±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0805	C	Paper	T	1.45±0.10	2.20±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	0.9max
0805	C	Plastic	R	1.45±0.10	2.20±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	0.9max
0805	K	Paper	T	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0805	K	Plastic	R	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0805	K	Plastic	E	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0805	Y	Paper	T	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0805	Y	Plastic	E	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0805	Y	Plastic	P	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0805	Y	Plastic	R	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
0805	G	Plastic	R	1.45±0.10	2.20±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.75max
0805	G	Plastic	P	1.45±0.10	2.20±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.75max
0805	G	Plastic	O	1.45±0.10	2.20±0.10	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.75max
0805	H	Plastic	R	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	2.00max
0805	H	Plastic	P	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	2.00max
0805	H	Plastic	O	1.45±0.20	2.20±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	2.00max
1206	E	Plastic	R	1.80±0.20	3.40±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
1206	E	Plastic	P	1.80±0.20	3.40±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.15max
1206	O	Plastic	R	1.80±0.20	3.40±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.45max
1206	O	Plastic	P	1.80±0.20	3.40±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	1.45max
1206	L	Plastic	P	1.80±0.20	3.40±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	2.50max
1206	L	Plastic	R	1.80±0.20	3.40±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	2.50max
1206	L	Plastic	E	1.80±0.20	3.40±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	2.50max
1210	Q	Plastic	F	2.70±0.20	3.50±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	2.50max
1210	Q	Plastic	S	2.70±0.20	3.50±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	2.50max
1210	Q	Plastic	Z	2.70±0.20	3.50±0.20	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	2.50max
1210	R	Plastic	Z	2.70±0.20	3.50±0.30	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	3.00max
1210	R	Plastic	S	2.70±0.20	3.50±0.30	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	3.00max
1210	3	Plastic	Z	2.70±0.30	3.50±0.40	3.50±0.05	4.00±0.10	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.20	4.00±0.10	3.10max

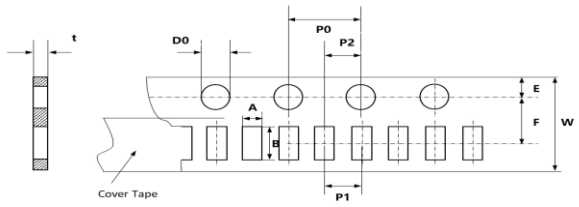


Fig. 7-3:0402 (Paper tape/ 2mm pitch)

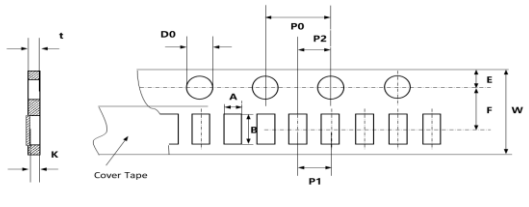


Fig. 7-4:0201 (Paper tape/ 2mm pitch)

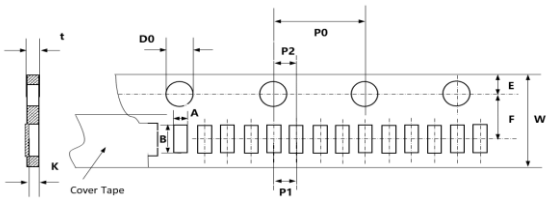


Fig. 7-5:0201 (Paper tape/ 1mm pitch)

Table 6-2 Carrier size (Size Code:0201,0402) (Unit:mm)

Size Code	Thickness code	Carrier Tape Type	Packaging Code	A	B	F	P1	E	D0	P2	K	W	P0	t
0201	A	Paper	T	0.38±0.02	0.68±0.03	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.36±0.02	8.00±0.10	4.00±0.10	0.5max
0201	A	Paper	J	0.38±0.02	0.68±0.03	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.36±0.02	8.00±0.10	4.00±0.10	0.5max
0201	A	Paper	H	0.38±0.02	0.68±0.03	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.36±0.02	8.00±0.10	4.00±0.10	0.5max
0201	A	Paper	D	0.38±0.02	0.68±0.03	3.50±0.05	1.00±0.05	1.75±0.10	1.55±0.05	1.00±0.05	0.36±0.02	8.00±0.10	4.00±0.10	0.5max
0201	A	Paper	L	0.38±0.02	0.68±0.03	3.50±0.05	1.00±0.05	1.75±0.10	1.55±0.05	1.00±0.05	0.36±0.02	8.00±0.10	4.00±0.10	0.5max
0201	J	Paper	T	0.40±0.04	0.70±0.04	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.38±0.04	8.00±0.10	4.00±0.10	0.5max
0201	J	Paper	J	0.40±0.04	0.70±0.04	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.38±0.04	8.00±0.10	4.00±0.10	0.5max
0201	J	Paper	D	0.40±0.04	0.70±0.04	3.50±0.05	1.00±0.05	1.75±0.10	1.55±0.05	1.00±0.05	0.38±0.04	8.00±0.10	4.00±0.10	0.5max
0201	J	Paper	H	0.40±0.04	0.70±0.04	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.38±0.04	8.00±0.10	4.00±0.10	0.5max
0201	J	Paper	L	0.40±0.04	0.70±0.04	3.50±0.05	1.00±0.05	1.75±0.10	1.55±0.05	1.00±0.05	0.38±0.04	8.00±0.10	4.00±0.10	0.5max
0201	X	Paper	T	0.44±0.06	0.74±0.06	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.40±0.05	8.00±0.10	4.00±0.10	0.6max
0201	X	Paper	J	0.44±0.06	0.74±0.06	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.40±0.05	8.00±0.10	4.00±0.10	0.6max
0201	X	Paper	H	0.44±0.06	0.74±0.06	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.40±0.05	8.00±0.10	4.00±0.10	0.6max
0201	F	Paper	T	0.44±0.06	0.74±0.06	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	0.40±0.05	8.00±0.10	4.00±0.10	0.6max
0402	B	Paper	T	0.63±0.05	1.13±0.05	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.10	4.00±0.10	0.8max
0402	B	Paper	J	0.63±0.05	1.13±0.05	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.10	4.00±0.10	0.8max
0402	N	Paper	T	0.70±0.10	1.20±0.10	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.10	4.00±0.10	0.8max
0402	N	Paper	J	0.70±0.10	1.20±0.10	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.10	4.00±0.10	0.8max
0402	C	Paper	T	0.75±0.10	1.30±0.10	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.10	4.00±0.10	0.8max
0402	C	Paper	J	0.75±0.10	1.30±0.10	3.50±0.05	2.00±0.05	1.75±0.10	1.55±0.05	2.00±0.05	/	8.00±0.10	4.00±0.10	0.8max

4.1.3 Disc size

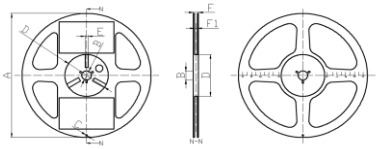


Fig. 8: disc (Width of carrier-8mm)

Table7: Disc size (Unit:mm)

Disc size	Width of carrier	A	B	C	D	E	F	F1	Size Code
7"	8.00±0.10	Φ178±2.0	Φ13±1.0	Φ4.0±0.5	Φ60±2.0	4±1.0	11.5±1.0	10±2	All
13"	8.00±0.10	Φ330±2.0	Φ13±1.0	Φ4.0±0.5	Φ108±2.0	4±1.0	13.5±2.0	10±2	All

4.1.4 Carrier Tape specifications

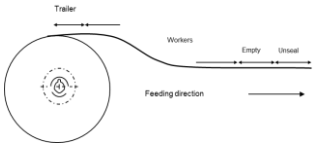


Fig 9 Carrier

Packaging	The minimum length of the reserved spaces		
Carrier	Trailer	Empty	Unseal
	60 mm	200 mm	160 mm

4.1.5 Performance of Carrier Taping

4.1.5.1 Strength of Carrier Tape and Top Cover Tape

a. Carrier Tape

When a tensile force 1.02kgf is applied in the direction to unreel the tape,the tape shall withstand this force.

b. Top cover Tape

When a tensile force 1.02kgf is applied to the tape,the tape shall withstand this force.

4.1.5.2 Peeling Strength of Top Cover Tape

Unless otherwise specified,the peeling strength of top cover tape shall be within 10.2 to 71.4 gf when the top cover tape is pulled at a speed of 300mm/min with the angle of 0 to 15°(see Fig.10).

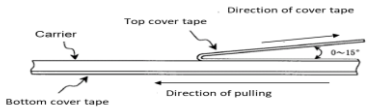


Fig. 10 Cover tape peel-off force

4.2 Shipment

Transport packaging products to adapt to the modern means of transport,but the product in the process of transport to prevent rain and acid and alkali corrosion,shall not be whipped extrusion casting and gravity.

4.3 Storage

4.3.1 Storage conditions:

The recommended temperature is less than 30℃.

A temperature is +5℃ to +40℃ and a relative humidity is 20% to 70% as a standard condition.(MSL Level 1)

MLCC may be affected by the storage conditions. Please use them promptly after delivery.

High temperature and humidity conditions and/or prolonged storage may cause deterioration of the packaging materials.

If more than six months have elapsed since delivery,check packaging,mounting,etc. before use.

4.3.2 Corrosive gas can react with the termination (external) electrodes or lead wires of capacitors,and result in poor solderability.

Do not store the capacitors in an atmosphere consisting of corrosive gas (e.g.,hydrogen sulfide,sulfur dioxide,chlorine,ammonia gas etc.)

5. MLCC Application of Technical Requirements

5.1 Circuit Design

5.1.1 Operating Temperature

a. Do not use capacitor above the maximum allowable operating temperature.

b. Surface temperature including self-heating should be below maximum operating temperature.

5.1.2Operating Voltage

The operating voltage for capacitors must always be lower than their rated voltage.

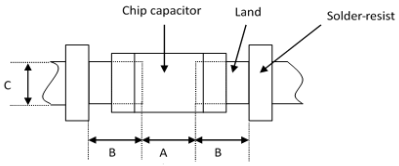
5.2 PCB Design

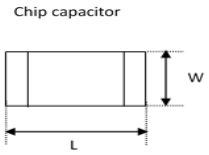
5.2.1 Design of Land-patterns

When the capacitors are mounted on a PCB, the amount of solder at the terminations has a direct effect on the performance of the capacitors.

The greater the amount of solder, the higher the stress on the capacitor. Therefore, when designing land-patterns, it is necessary to consider the appropriate size and configuration of the solder pads.

Size and recommended land dimensions are shown in the following figure and table:



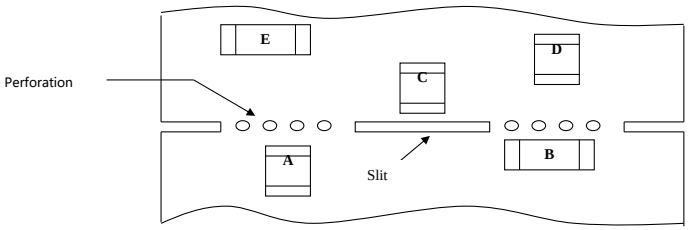


Recommended land dimensions for reflow-soldering (unit: mm)

Size Code	Length	Width	Tolerance	A	B	C
0201	0.6	0.3	±0.03	0.20~0.25	0.20~0.30	0.20~0.35
0201	0.6	0.3	±0.05	0.20~0.25	0.25~0.35	0.30~0.40
0201	0.6	0.3	±0.09/±0.1	0.23~0.30	0.25~0.35	0.30~0.40
0402	1	0.5	±0.05	0.30~0.50	0.35~0.45	0.40~0.60
0402	1	0.5	±0.15 or ±0.20	0.40~0.60	0.40~0.50	0.50~0.70
0603	1.6	0.8	±0.10	0.60~0.80	0.60~0.70	0.60~0.80
0603	1.6	0.8	±0.20	0.70~0.90	0.70~0.80	0.80~1.00
0805	2.0	1.25	±0.10 or ±0.20	1.00~1.40	0.60~0.80	1.20~1.40
1206	3.2	1.6	±0.20	1.80~2.00	1.00~1.20	1.50~1.70
1210	3.2	2.5	±0.20	2.00~2.40	1.00~1.20	1.80~2.30

5.2.2 Capacitor Layout on PC Board

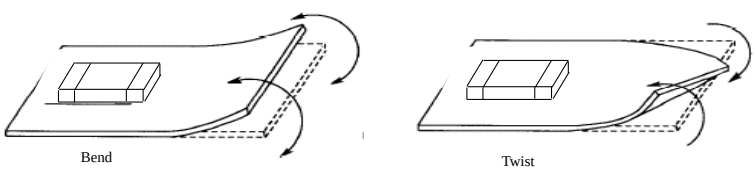
Mechanical stress varies according to the location of capacitors on PC board. The recommendation for better design is as follows



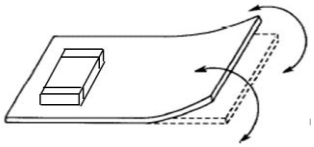
The stress in capacitors is in the following order: A>B=C>D>E

Pay attention not to bend or distort the PC board otherwise the capacitor may crack. Please refer to the following examples of good and bad capacitor layout.

a. Not recommended

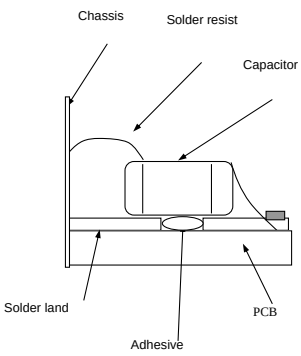


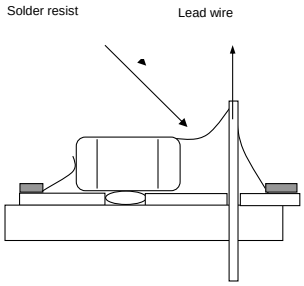
b.Recommended

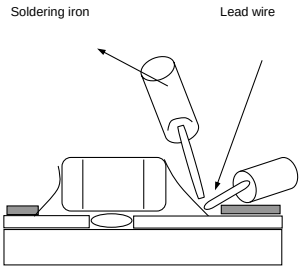


5.2.3Solder Buildup and Soldering

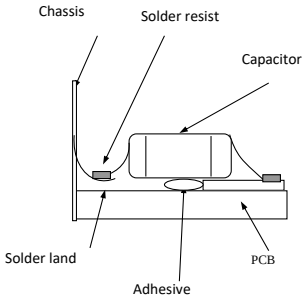
a.Examples of soldering method not recommended

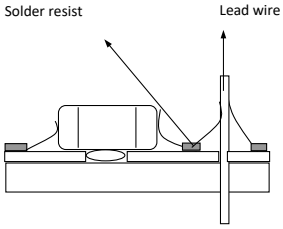


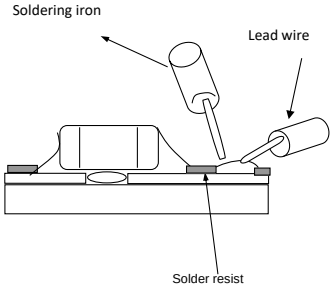




b.Examples of soldering method recommended







5.3 Consideration for Automatic Placement

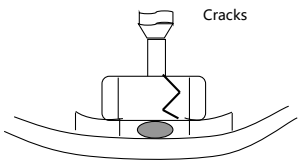
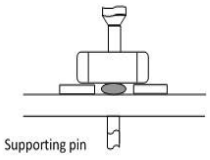
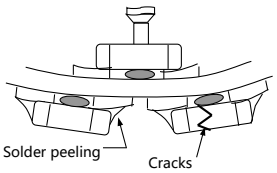
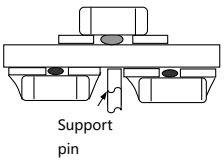
If the mounting head is adjusted too low, it may induce excessive stress in the chip capacitor to result in cracking. Please take following precautions

a.Adjust the bottom dead center of the mounting head to reach on the PC board surface and not press it;

b.Adjust the mounting head pressure to be 1N to 3N of static weight;

c.To minimize the impact energy from mounting head, it is important to provide support from the bottom side of the PC board.

Please refer to the following samples:

Mounting	Not recommended	Recommended
Singel-sided Mounting		
Double-sided Mounting		

5.4 Soldering

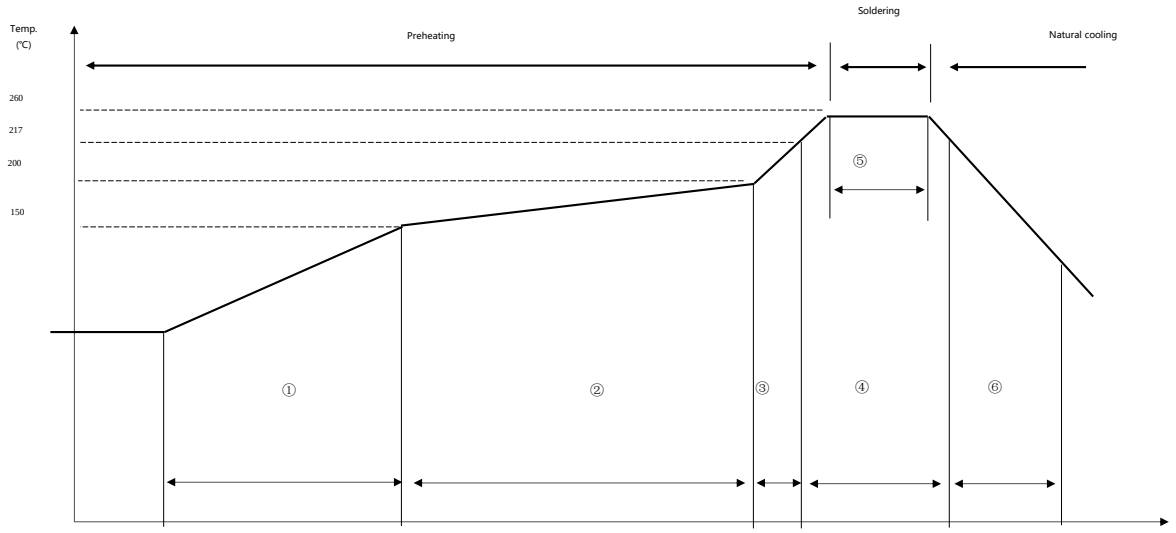
5.4.1 Flux Selection

a.It is recommended to use a mildly activated rosin flux (less than 0.1wt% chlorine). Strong flux is not recommended.

b.Please provide proper amount of flux. Excessive flux must be avoided.

c.When water-soluble flux is used, enough washing is necessary.

5.4.2 Recommended Soldering Profile



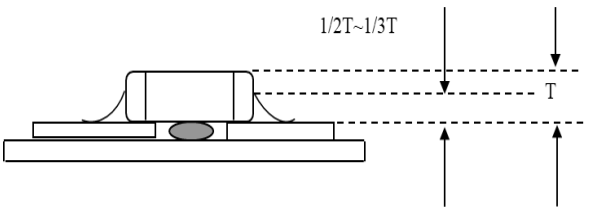
5.4.2.1 Reflow Soldering Condition

NO.	Reflow Soldering zone	Reflow Soldering Condition
①	Preheating 1	≤3℃/s;≥60s
②	Constant temperature	150 ~ 200℃;60~120s;≤1℃/s
③	Preheating 1	1~5℃/s
④	Soldering 1	Above 217℃, 60~150s
⑤	Soldering 1	Above 260℃,over 10s
⑥	Natural cooling	≤6℃/s

Caution

a.Excessive solder will induce higher tensile force in chip capacitor when temperature changes and result in cracking. Insufficient solder may detach the capacitor from the PC board.

The ideal condition is to have solder mass controlled to 1/2 to 1/3 of the thickness of the capacitor



b.Soldering duration should be kept as close to recommended times as possible, because excessive duration can detrimentally affect solderability.

c.The peak temperature of reflow soldering is 245±15℃。

6. All products in this specification comply with the EU RoHS directive

The EU RoHS Directive refers to the "Directive 2011/65/EU on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment" stipulated by the European Union.