Issued No.:SPEC-CGA20240822
Date:2024-12-02

EYANG TECHNOLOGY DEVELOPMENT CO.,LTD

Soft Termination Multilayer Ceramic Chip Capacitors for Automotive Powertrain & Safety Model selection reference book

ADD：EYANG Buiding,No.13Gaoxin North 4th Rd,Songpingshan Community,
Xili Subdistrict,Nanshan District,shenzhen,Guangdong province,China
Postcode：518057 TEL：86-755-86252187 FAX：86-755-86252237
Mark：The Model selection reference book is for design reference only.

Soft Termination Multilayer Ceramic Chip Capacitors for Automotive Powertrain & Safety

1.Scope

This specification is applicable to the Soft Termination Multilayer Ceramic Chip Capacitors (MLCC) for Automotive Powertrain & Safety .

1.1 Temperature Characteristics:

Class1 (Temperature Compensating Type): C0G/X8G

Class2 (High dielectric constant type): X8R\X8L\X7R\X7S\X7T

1.2 Size Code: 0402\0603\0805\1206\1210\2220

1.3 Capacitance : 0.1pF~220μF

2.Part Number System

E	0402	X7S	105	K	100	R	T	C
① Series Code	② Size Code	③Temperature Characteristics	④Nominal Capacitance	⑤Capacitance Tolerance	⑥Rated Voltage	⑦Termination Type	⑧Packaging Code	⑨Thickness Code

① Series Code E-Multilayer Ceramic Chip Capacitors for Automotive Powertrain & Safety

② Size Code (Unit:mm)

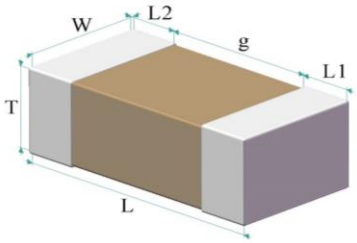


Fig.1 Structure & Dimension

Size Code	L	W	L1,L2	g	T	Thickness Code
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.	1.30±0.20	H
1206	3.20±0.20	1.60±0.20	0.30~0.80	1.50 min.	1.60±0.20	L
1206	3.20±0.30	1.60±0.30	0.30~0.80	1.50 min.	1.60±0.30	P
1210	3.20±0.20	2.50±0.20	0.30~0.90	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
2220	5.70±0.40	5.00±0.40	0.30min.	2.0 min.	2.50±0.20	R
2220	5.70±0.40	5.00±0.40	0.30min.	2.0 min.	3.20±0.40	I

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℃
X8G	-55℃~150℃	0±30ppm/℃	25℃~150℃	25℃
X8R	-55℃~ 150℃	±15%	-55℃~ 150℃	25℃
X8L	-55℃~ 150℃	+15%/-40%	-55℃~ 150℃	25℃
X7R	-55℃~125℃	±15%	-55℃~125℃	25℃
X7S	-55℃～125℃	±22%	-55℃~125℃	25℃
X7T	-55℃~125℃	+22%/-33%	-55℃~125℃	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=100 nF,

Class1(C0G\X8G) Capacitance Step in E24 series. Capacitance: See Table3-1

Class2(X8R\X8L\X7R\X7S\X7T) 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	800	80V
4R0	4.0V	101	100V
6R3	6.3V	201	200V
100	10V	251	250V
160	16V	501	500V
250	25V	631	630V
350	35V	102	1000V
500	50V	202	2000V

⑦ Termination Type

Code	Terminal Electrodes	Plating Material
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\X8G)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
1	E	C0G	0402	100V	B	0.1pF~1nF
2	E	C0G	0402	50V	B	0.1pF~1nF
3	E	C0G	0402	25V	B	0.1pF~1nF
4	E	C0G	0603	100V	D	0.1pF~6.8nF
5	E	C0G	0603	50V	D	0.1pF~10nF
6	E	C0G	0603	25V	D	0.1pF~10nF
7	E	C0G	0805	630V	K	10pF~560pF
8	E	C0G	0805	630V	H	680pF~2.2nF
9	E	C0G	0805	500V	K	10pF~560pF
10	E	C0G	0805	500V	H	680pF~2.2nF
11	E	C0G	0805	250V	K	10pF~3.9nF
12	E	C0G	0805	250V	H	4.7nF~10nF
13	E	C0G	0805	200V	K	10pF~3.9nF
14	E	C0G	0805	200V	H	4.7nF~10nF
15	E	C0G	0805	100V	C	10pF~3.9nF
16	E	C0G	0805	100V	K	100pF~15nF
17	E	C0G	0805	100V	G	18nF~22nF
18	E	C0G	0805	80V	C	10pF~3.9nF
19	E	C0G	0805	80V	K	100pF~15nF
20	E	C0G	0805	80V	G	18nF~22nF
21	E	C0G	0805	50V	C	10pF~3.9nF
22	E	C0G	0805	50V	K	100pF~15nF
23	E	C0G	0805	50V	G	18nF~22nF
24	E	C0G	1206	1000V	E	10pF~470pF
25	E	C0G	1206	1000V	O	10pF~750pF
26	E	C0G	1206	1000V	L	820pF~1.0nF
27	E	C0G	1206	630V	E	10pF~1.8nF
28	E	C0G	1206	630V	O	10pF~3.3nF
29	E	C0G	1206	630V	L	3.6nF~10nF
30	E	C0G	1206	500V	E	10pF~1.8nF

Table 3-1 Capacitance Table (Class1-C0G\X8G)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
31	E	C0G	1206	500V	O	10pF~3.3nF
32	E	C0G	1206	500V	L	3.6nF~10nF
33	E	C0G	1206	250V	E	10pF~1.8nF
34	E	C0G	1206	250V	O	10pF~12nF
35	E	C0G	1206	250V	L	15nF~22nF
36	E	C0G	1206	100V	E	10pF~39nF
37	E	C0G	1206	100V	O	47nF
38	E	C0G	1206	100V	L	56nF~100nF
39	E	C0G	1206	50V	E	10pF~39nF
40	E	C0G	1206	50V	O	47nF
41	E	C0G	1206	50V	L	56nF~100nF
42	E	C0G	1210	1000V	Q	1.0nF~8.2nF
43	E	C0G	1210	1000V	R	10nF~22nF
44	E	C0G	1210	630V	Q	6.8nF~18nF
45	E	C0G	1210	630V	R	22nF~27nF
46	E	C0G	1210	630V	3	33nF
47	E	C0G	1210	500V	Q	6.8nF~18nF
48	E	C0G	1210	500V	R	22nF~27nF
49	E	C0G	1210	500V	3	33nF
50	E	X8G	0402	50V	B	0.1pF~1nF
51	E	X8G	0603	100V	D	1pF~1nF
52	E	X8G	0603	50V	D	1pF~2.7nF
53	E	X8G	0805	100V	C	100pF~1nF
54	E	X8G	0805	100V	K	1.2nF~1.5nF
55	E	X8G	0805	50V	C	100pF~3.9nF
56	E	X8G	0805	50V	K	4.7nF~10nF
57	E	X8G	1206	100V	E	1nF~5.6nF
58	E	X8G	1206	50V	E	1nF~22nF

Table 3-2 Capacitance Table (Class 2-X8R\X8L\X7R\X7S\X7T)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
1	E	X7R	0402	100V	B	120pF~4.7nF
2	E	X7R	0402	50V	B	120pF~22nF
3	E	X7R	0402	50V	B	33nF~100nF
4	E	X7R	0402	25V	B	220pF~27nF
5	E	X7R	0402	25V	B	33nF~47nF
6	E	X7R	0402	25V	B	100nF
7	E	X7R	0402	16V	B	220pF~22nF
8	E	X7R	0402	16V	B	27nF~100nF
9	E	X7R	0402	16V	B	120nF~220nF
10	E	X7R	0402	10V	B	100nF
11	E	X7R	0402	10V	B	120nF~220nF
12	E	X7R	0603	100V	D	100pF~47nF
13	E	X7R	0603	100V	D	68nF~100nF
14	E	X7R	0603	50V	D	100pF~100nF
15	E	X7R	0603	50V	D	120nF~220nF
16	E	X7R	0603	35V	D	100pF~100nF
17	E	X7R	0603	35V	D	120nF~470nF
18	E	X7R	0603	25V	D	100pF~100nF
19	E	X7R	0603	25V	D	120nF~330nF
20	E	X7R	0603	25V	D	470nF~1μF
21	E	X7R	0603	16V	D	100pF~100nF
22	E	X7R	0603	16V	D	120nF~470nF
23	E	X7R	0603	16V	D	680nF~1μF
24	E	X7R	0603	6.3V	D	1.5μF~2.2μF
25	E	X7R	0805	250V	Y	1nF~10nF
26	E	X7R	0805	100V	Y	1nF~100nF
27	E	X7R	0805	100V	H	100nF~470nF
28	E	X7R	0805	100V	H	680nF~1μF
29	E	X7R	0805	50V	Y	1nF~100nF
30	E	X7R	0805	50V	H	100nF~470nF
31	E	X7R	0805	50V	H	680nF~1μF
32	E	X7R	0805	25V	Y	1nF~100nF

Table 3-2 Capacitance Table (Class 2-X8R\X8L\X7R\X7S\X7T)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
33	E	X7R	0805	25V	H	220nF~1μF
34	E	X7R	0805	25V	H	2.2μF
35	E	X7R	0805	16V	H	1μF~1.5μF
36	E	X7R	0805	16V	H	2.2μF
37	E	X7R	0805	16V	H	3.3μF
38	E	X7R	0805	16V	H	4.7μF
39	E	X7R	0805	10V	H	1μF~1.5μF
40	E	X7R	0805	10V	H	2.2μF
41	E	X7R	0805	10V	H	3.3μF
42	E	X7R	0805	10V	H	4.7μF
43	E	X7R	0805	10V	H	10μF
44	E	X7R	0805	6.3V	H	10μF
45	E	X7R	1206	630V	O	150pF~10nF
46	E	X7R	1206	630V	L	15nF~33nF
47	E	X7R	1206	500V	O	150pF~10nF
48	E	X7R	1206	500V	L	15nF~33nF
49	E	X7R	1206	250V	O	10nF
50	E	X7R	1206	250V	L	15nF~47nF
51	E	X7R	1206	200V	O	10nF
52	E	X7R	1206	200V	L	15nF~47nF
53	E	X7R	1206	100V	O	47nF~220nF
54	E	X7R	1206	100V	H	100nF~330nF
55	E	X7R	1206	100V	L	100nF~470nF
56	E	X7R	1206	100V	L	1μF~1.5μF
57	E	X7R	1206	100V	L	2.2μF
58	E	X7R	1206	50V	L	100nF~1.5μF
59	E	X7R	1206	50V	L	2.2μF
60	E	X7R	1206	50V	L	3.3μF~4.7μF
61	E	X7R	1206	25V	L	1.0μF~4.7μF
62	E	X7R	1206	16V	L	1.0μF~4.7μF
63	E	X7R	1206	16V	L	10μF
64	E	X7R	1206	10V	L	10μF

Table 3-2 Capacitance Table (Class 2-X8R\X8L\X7R\X7S\X7T)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
65	E	X7R	1206	10V	L	22μF
66	E	X7R	1206	6.3V	L	22μF
67	E	X7R	1210	50V	R	3.3μF~4.7μF
68	E	X7R	1210	25V	R	3.3μF~4.7μF
69	E	X7R	1210	25V	R	10μF
70	E	X7R	1210	25V	3	22μF
71	E	X7R	1210	16V	R	10μF
72	E	X7R	1210	16V	R	22μF
73	E	X7R	1210	10V	R	22μF
74	E	X7R	1210	6.3V	R	47μF
75	E	X7R	2220	100V	R	10μF
76	E	X7R	2220	16V	I	22μF
77	E	X7S	0402	16V	N	330nF~470nF
78	E	X7S	0402	10V	B	470nF
79	E	X7S	0402	10V	N	330nF~470nF
80	E	X7S	0402	10V	C	680nF~1μF
81	E	X7S	0402	6.3V	N	470nF
82	E	X7S	0402	6.3V	C	680nF~1μF
83	E	X7S	0603	16V	K	2.2μF
84	E	X7S	0603	10V	D	2.2μF
85	E	X7S	0603	6.3V	D	2.2μF
86	E	X7S	0805	100V	H	1.0μF
87	E	X7S	0805	35V	H	2.2μF
88	E	X7S	0805	25V	H	4.7μF
89	E	X7S	0805	25V	H	10μF
90	E	X7S	0805	16V	H	4.7μF
91	E	X7S	0805	16V	H	10μF
92	E	X7S	0805	10V	G	4.7μF
93	E	X7S	0805	10V	H	4.7μF
94	E	X7S	0805	10V	H	10μF
95	E	X7S	1206	100V	L	2.2μF
96	E	X7S	1206	50V	L	2.2μF

Table 3-2 Capacitance Table (Class 2-X8R\X8L\X7R\X7S\X7T)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
97	E	X7S	1206	50V	L	4.7μF
98	E	X7S	1206	25V	L	2.2μF
99	E	X7S	1206	25V	L	4.7μF
100	E	X7S	1206	25V	P	10μF
101	E	X7S	1206	16V	P	10μF
102	E	X7S	1206	16V	P	22μF
103	E	X7S	1206	10V	L	22μF
104	E	X7S	1206	6.3V	L	22μF
105	E	X7S	1210	100V	R	4.7μF
106	E	X7S	1210	50V	R	10μF
107	E	X7S	1210	25V	R	10μF
108	E	X7S	1210	25V	3	22μF
109	E	X7S	1210	10V	R	47μF
110	E	X7S	1210	6.3V	R	47μF
111	E	X7T	0402	4V	B	1μF
112	E	X7T	0402	4V	C	2.2μF~4.7μF
113	E	X7T	0402	2.5V	C	10μF
114	E	X7T	0603	6.3V	K	4.7μF
115	E	X7T	0603	6.3V	K	10μF
116	E	X7T	0603	4V	K	10μF
117	E	X7T	0603	2.5V	K	22μF
118	E	X7T	0805	50V	H	2.2μF
119	E	X7T	0805	25V	H	4.7μF
120	E	X7T	0805	16V	H	10μF
121	E	X7T	0805	10V	H	10μF
122	E	X7T	0805	6.3V	H	10μF
123	E	X7T	0805	6.3V	H	22μF
124	E	X7T	0805	4V	H	22μF
125	E	X7T	1206	50V	P	10μF
126	E	X7T	1206	6.3V	L	22μF
127	E	X7T	1206	4V	L	47μF
128	E	X7T	1210	6.3V	R	22μF

Table 3-2 Capacitance Table (Class 2-X8R\X8L\X7R\X7S\X7T)

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage	Thickness code	Capacitance
129	E	X7T	1210	6.3V	R	47μF
130	E	X7T	1210	2.5V	3	100μF
131	E	X7T	1210	2.5V	3	220μF
132	E	X8R	0402	50V	B	220pF~1nF
133	E	X8R	0603	100V	D	1nF~10nF
134	E	X8R	0603	50V	D	1nF~6.8nF
135	E	X8R	0603	50V	D	10nF~47nF
136	E	X8R	0603	25V	D	68nF~100nF
137	E	X8R	0805	100V	K	10nF~33nF
138	E	X8R	0805	100V	H	33nF~47nF
139	E	X8R	0805	50V	K	10nF~33nF
140	E	X8R	0805	50V	G	33nF~100nF
141	E	X8R	0805	50V	H	33nF~100nF
142	E	X8R	0805	25V	H	150nF~330nF
143	E	X8R	1206	100V	O	68nF~100nF
144	E	X8R	1206	100V	L	150nF~330nF
145	E	X8R	1206	50V	O	150nF~330nF
146	E	X8R	1206	50V	L	470nF
147	E	X8R	1206	25V	O	470nF
148	E	X8R	1206	25V	L	680nF~1μF
149	E	X8L	0402	50V	B	220pF~4.7nF
150	E	X8L	0402	25V	B	5.6nF~10nF
151	E	X8L	0402	16V	B	15nF~47nF
152	E	X8L	0603	50V	D	150pF~100nF
153	E	X8L	0603	25V	D	15nF~220nF
154	E	X8L	0603	16V	D	15nF~220nF
155	E	X8L	0805	50V	H	47nF~330nF
156	E	X8L	0805	25V	H	150nF~470nF
157	E	X8L	0805	16V	H	220nF~1μF

Table 4 Packaging (Minimum Quantity)

NO.	Size Code	Thickness Code	Square hole spacing	Disc Size	Carrier Tape Type	QTY (Kpcs)	Packaging Code
1	0402	B	2mm	7〃	Paper	10	T
2	0402	B	2mm	13〃	Paper	50	J
3	0402	N	2mm	7〃	Paper	10	T
4	0402	N	2mm	13〃	Paper	50	J
5	0402	C	2mm	7〃	Paper	10	T
6	0402	C	2mm	13〃	Paper	50	J
7	0603	D	4mm	7〃	Paper	4	T
8	0603	D	4mm	13〃	Paper	15	A
9	0603	D	4mm	13〃	Plastic	10	O
10	0603	D	4mm	7〃	Paper	3	W
11	0603	K	4mm	7〃	Paper	4	T
12	0603	K	4mm	13〃	Paper	15	A
13	0603	K	4mm	13〃	Plastic	10	O
14	0603	K	4mm	7〃	Paper	3	W
15	0603	K	4mm	7〃	Plastic	4	Q
16	0603	K	4mm	7〃	Plastic	3	R
17	0805	C	4mm	7〃	Paper	4	T
18	0805	C	4mm	7〃	Plastic	3	R
19	0805	K	4mm	7〃	Paper	4	T
20	0805	K	4mm	7〃	Plastic	3	R
21	0805	K	4mm	13〃	Plastic	15	E
22	0805	Y	4mm	7〃	Paper	4	T
23	0805	Y	4mm	13〃	Plastic	15	E
24	0805	Y	4mm	7〃	Plastic	2	P
25	0805	Y	4mm	7〃	Plastic	3	R
26	0805	G	4mm	7〃	Plastic	3	R
27	0805	G	4mm	7〃	Plastic	2	P
28	0805	G	4mm	13〃	Plastic	10	O
29	0805	H	4mm	7〃	Plastic	3	R
30	0805	H	4mm	7〃	Plastic	2	P
31	0805	H	4mm	13〃	Plastic	10	O
32	1206	E	4mm	7〃	Plastic	3	R
33	1206	E	4mm	7〃	Plastic	2	P
34	1206	O	4mm	7〃	Plastic	3	R
35	1206	O	4mm	7〃	Plastic	2	P
36	1206	H	4mm	7〃	Plastic	3	R
37	1206	H	4mm	7〃	Plastic	2	P
38	1206	L	4mm	7〃	Plastic	3	R
39	1206	L	4mm	7〃	Plastic	2	P
40	1206	L	4mm	13〃	Plastic	8	E

Table 4 Packaging (Minimum Quantity)

NO.	Size Code	Thickness Code	Square hole spacing	Disc Size	Carrier Tape Type	QTY (Kpcs)	Packaging Code
41	1206	P	4mm	7〃	Plastic	2	P
42	1210	L	4mm	7〃	Plastic	2	P
43	1210	Q	4mm	7〃	Plastic	1.5	F
44	1210	Q	4mm	7〃	Plastic	0.5	S
45	1210	Q	4mm	7〃	Plastic	1	Z
46	1210	R	4mm	7〃	Plastic	1	Z
47	1210	R	4mm	7〃	Plastic	0.5	S
48	1210	3	4mm	7〃	Plastic	1	Z
49	2220	R	8mm	13〃	Plastic	2	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	Relative Humidity
C0G/X7R/X7S/X7T	-55℃~125℃	≤95% (25℃)	86 KPa~106KPa
X8G/X8R/X8L	-55℃~150℃	≤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/X8G	Class 2 (High dielectric constant type) X8R\X8L\X7R\X7S\X7T	
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: 150±3℃ 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)	See Table5-1	
		I.R. (Room Temp.)	≥10000MΩ or 100Ω•F, (Whichever is smaller)	See Table5-1	
		D.F. or Q	C≥30pF: Q≥1000 C < 30pF: Q≥400+20C C: Nominal Capacitance (pF)	See Table5-1	
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:
		Cap. Change	ΔC/C≤±2.5% or ±0.25pF, (Whichever is larger)	See Table5-1	
		I.R. (Room Temp.)	≥10000MΩ or 100Ω•F, (Whichever is smaller)	See Table5-1	
		D.F. or Q	C≥30pF: Q≥1000 C < 30pF: Q≥400+20C C: Nominal Capacitance (pF)	See Table5-1	

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℃
X8G/X8R/X8L : θ1=-55℃,θ2=150℃

Post-treatment: Set for 24±2 hours at room temperature, then measure.

4	Destructive Physical Analysis (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)	See Table5-1	
		I.R. (Room Temp.)	≥1000MΩ or 25Ω•F, (Whichever is smaller)	See Table5-1	
		D.F. or Q	C≥30pF: Q≥200 C < 30pF: Q≥100+10C/3 C: Nominal Capacitance (pF)	See Table5-1	
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℃, X8R/X8L/X8G:θ2=150℃] Test time: 1000±12h Test voltage **Class1:** **Class 2:** See Table5-1 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)	See Table5-1	
		I.R. (Room Temp.)	I.R.≥1000MΩ or 50Ω•F, (Whichever is smaller)	See Table5-1	
		D.F. or Q	C≥30pF: Q≥350 10pF≤C < 30pF: Q≥275+5C/2 C < 10pF: Q≥200+10C C: Nominal Capacitance (pF)	See Table5-1	

Size Code	U_R	Capacitance	Test voltage
0402	-	-	$2\times U_R$
0603	≤50V	-	$2\times U_R$
	=100V	≤1.5nF	$2\times U_R$
	=100V	> 1.5nF	$1.5\times U_R$
0805	≤100V	-	$2\times U_R$
	=250V	-	$1.5\times U_R$
	=630V	-	$1.2\times U_R$

Size Code	U_R	Capacitance	Test voltage
1206	=50V	-	$2\times U_R$
	=100V	≤56nF	$2\times U_R$
	=100V	> 56nF	$1.5\times U_R$
	=250V	-	$1.5\times U_R$
	=630V	-	$1.2\times U_R$
	=1000V	-	$1.2\times U_R$
1210	=630V	-	$1.2\times U_R$
	=1000V	≤2.2nF	$1.2\times U_R$
	=1000V	> 2.2nF	$1\times U_R$

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)	Within the specified initial value.	
		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/X8G	Class 2 (High dielectric constant type) X8R\X8L\X7R\X7S\X7T	
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.
		Cap. Change	Within the specified initial value.	Within the specified initial value.	Mounting method: Solder the capacitor on the test substrate(glass epoxy board).
		I.R. (Room Temp.)	Within the specified initial value.	Within the specified initial value.	Kind of Vibration: 10Hz to 2000Hz and return to 10Hz,
		D.F. or Q	Within the specified initial value.	Within the specified initial value.	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).
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.
		Cap. Change	Within the specified initial value.	Within the specified initial value.	Pre-heating: Temp.:120℃~150℃/Time:60s
		I.R. (Room Temp.)	≥10000MΩ or 500Ω•F, (Whichever is smaller)	Within the specified initial value.	Test Method: Solder bath method
		D.F. or Q	Within the specified initial value.	Within the specified initial value.	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.
12	ESD	Appearance	No defects or abnormalities.		Per AEC-Q200-002
		Cap. Change	Within the specified initial value.	Within the specified initial value.	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.
		I.R. (Room Temp.)	≥10000MΩ or100Ω•F, (Whichever is smaller)	Within the specified initial value.	
		D.F. or Q	Within the specified initial value.	Within the specified initial value.	
13	Solderability	Appearance	95% of the terminations is to be soldered evenly and continuously		Pre-heating: Temp. : 155℃/Time: 4h Flux: Solution of rosin ethanol Test Method: Solder bath method Solder alloy: Sn-Ag-Cu(Lead Free Solder) Solder temp.: 245℃±5℃ Duration of immersion: 5.0±0.5s Depth of immersion: 10±1mm
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)	See Table5-1	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.)	I.R.≥100000MΩ or 500Ω•F, (Whichever is smaller)	See Table5-1	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 or10Ω•F, (Whichever is smaller)	See Table5-1	Measurement Temperature: X8R/X8L/X8G: 150℃ C0G/X7R/X7S/X7T: 125℃ 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
0402 0603 0805 1206	＜250V	-	≥2.5×U_R
	250V	-	≥2.0×U_R
	500V/630V	-	≥1.5×U_R
	1000V	-	≥1.3×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
200V/250V	≥2.0×U_R
500V/630V	≥1.5×U_R

Applied Time: t=1s~5s
The charge/discharge current: 50mA or lower

Table 5: Specifications and Test Methods

<table>
<tr><th rowspan="2">No.</th><th colspan="2">Item</th><th colspan="2">Specification</th><th rowspan="2">Test Method</th></tr>
<tr><th colspan="2">AEC-Q200 Test Item</th><th>Class1 (Temperature Compensating Type)
C0G/X8G</th><th>Class 2 (High dielectric constant type)
X8R\X8L\X7R\X7S\X7T</th></tr>
<tr><td rowspan="4">19</td><td rowspan="4">Board Flex</td><td>Appearance</td><td colspan="2">No defects or abnormalities.</td><td rowspan="4">Solder the capacitor on the test substrate See Fig.2
Pressurization Method : See Fig.3.
Speed 1.0mm/sec
Flexure
Holding Time 60s
then measure the capacitance.</td></tr>
<tr><td>Cap. Change</td><td>ΔC/C≤±5% or ±0.5pF (Whichever is larger)</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R. (Room Temp.)</td><td>I.R.≥10000MΩ or 500Ω•F, (Whichever is smaller)</td><td>See Table5-1</td></tr>
<tr><td>D.F. or Q</td><td>Within the specified initial value.</td><td>Within the specified initial value.</td></tr>
<tr><td rowspan="4">20</td><td rowspan="4">Terminal Strength</td><td>Appearance</td><td colspan="2">No defects or abnormalities.</td><td rowspan="4">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 0402:F=2N
0603/0805/1206/1210/2220:F=18N</td></tr>
<tr><td>Cap. Change</td><td>Within the specified initial value.</td><td>Within the specified initial value.</td></tr>
<tr><td>I.R. (Room Temp.)</td><td>I.R.≥10000MΩ or 500Ω•F, (Whichever is smaller)</td><td>See Table5-1</td></tr>
<tr><td>D.F. or Q</td><td>Within the specified initial value.</td><td>Within the specified initial value.</td></tr>
<tr><td>21</td><td>Beam Load Test</td><td>Destruction value</td><td colspan="2">Destruction value should be exceed following one:
Size Code Destruction value
0402 ≥ 8N
0603/0805 ≥20N
1206/1210/2220 ≥15 N (T＜1.25mm)
1206/1210/2220 ≥54.5N (T≥1.25mm)</td><td>Mounting method Place the capacitor in the beam load fixture as Fig 5/6
Speed supplied the Stress Load 0.5mm/s
<Size Code:0805 max. >
<Size Code:1206 min.></td></tr>
<tr><td>22</td><td colspan="2">Capacitance Temperature Characteristics</td><td>C0G: αc≤±30ppm/℃ (125℃);
-72≤αc≤+30ppm/℃ (-55℃)
X8G: αc≤±30ppm/℃ (150℃);
-72≤αc≤+30ppm/℃ (-55℃)</td><td>X8R/X7R: ΔC/C≤±15%
X7S: ΔC/C≤±22%
X7T: -33%≤ΔC/C≤22%
X8L: -40%≤ΔC/C≤15%</td><td>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℃
X8R/X8L/X8G θ1=-55℃, θ2=150℃
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.]</td></tr>
</table>

Size Code	Capacitance	Flexure
0402	all	5mm
0603	all	5mm
0805	all	5mm
1206	≥100nF	5mm
	＜100nF	3mm
1210/2220	≥1.0μF	5mm
	＜1.0μF	3mm

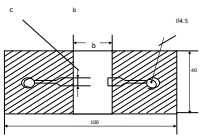


Fig: 2

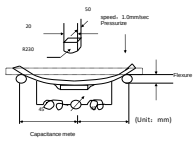


Fig: 3

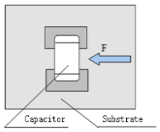


Fig : 4

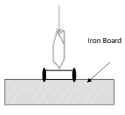


Fig: 5

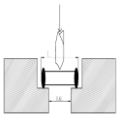


Fig: 6

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

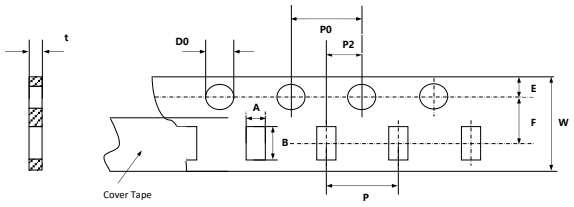


Fig. 7-1: 0603,0805 (Paper tape)

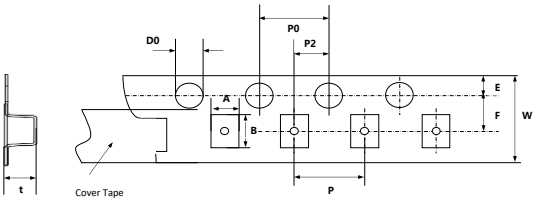


Fig. 7-2:0603,0805,1206,1210 (Plastic tape)

Table: 6-1 Carrier size (Size Code:0603,0805,1206,1210,1210) (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	H	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	2.00max
1206	H	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	2.00max
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	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	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
1206	P	Plastic	P	1.90±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	L	Plastic	P	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	2.00max
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
2220	R	Plastic	S	5.50±0.20	6.20±0.20	7.50±0.10	8.00±0.10	1.75±0.10	1.50±0.10	2.00±0.10	/	16.00±0.30	4.00±0.10	3.50max

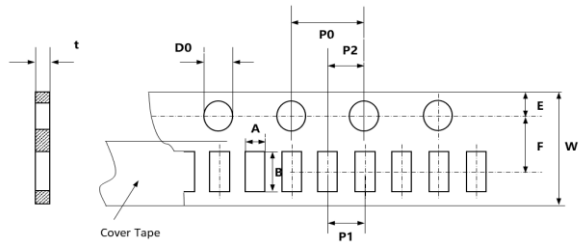


Fig. 7-3:0402 (Paper tape/ 2mm pitch)

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

Size Code	Thickness code	Carrier Tape Type	Packaging Code	A	B	F	P1	E	D0	P2	K	W	P0	t
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

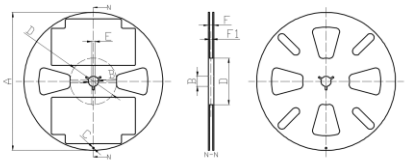


Fig. 8-1: disc (Width of carrier-4mm)

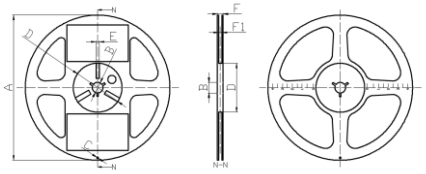


Fig. 8-2: disc (Width of carrier-8mm)

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
13"	16.00±0.30	Φ330±2.0	Φ13±1.0	/	Φ100±2.0	5±1.0	16.0±2.0	19±2	2220

4.1.4 Carrier Tape specifications

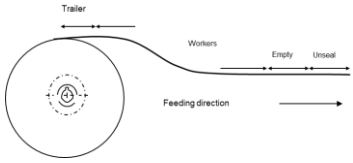


Fig 9 Carrier

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).

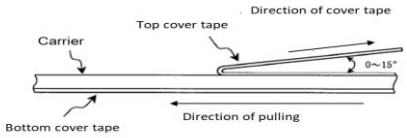


Fig. 10 Cover tape peel-off force

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 mounths 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.

5.1.2 Operating Voltage

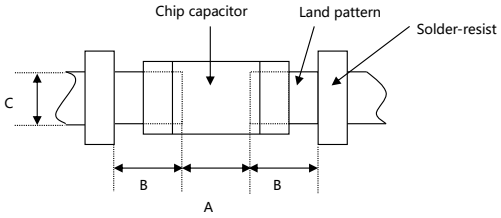
The operating voltage for capacitors must always be lower than their rated voltage.

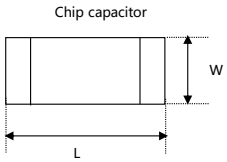
5.2 PCB Design

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.



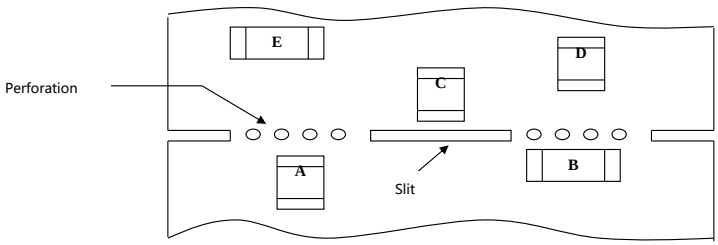


Recommended land dimensions for reflow-soldering (unit: mm)

Size Code	Length	Width	Tolerance	A	B	C
0402	1.0	0.5	±0.05	0.30~0.50	0.35~0.45	0.40~0.60
0402	1.0	0.5	±0.15, ±0.20	0.40~0.60	0.40~0.50	0.50~0.70
0402	1.0	0.5	±0.30	0.40~0.60	0.40~0.50	0.50~0.80
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
0603	1.6	0.8	±0.25,±0.30	0.70~0.90	0.70~0.90	0.80~1.10
0805	2.0	1.25	±0.10,±0.15, ±0.20	1.00~1.40	0.60~0.80	1.20~1.40
0805	2.0	1.25	±0.25	1.00~1.40	0.70~0.90	1.35~1.55
1206	3.2	1.6	±0.10,±0.15, ±0.20	1.80~2.00	0.90~1.20	1.50~1.70
1206	3.2	1.6	±0.30	1.90~2.10	1.00~1.30	1.60~1.90
1210	3.2	2.5	±0.20	2.00~2.40	1.00~1.20	2.50~2.70
1210	3.2	2.5	±0.30	2.00~2.40	1.10~1.30	2.50~2.80
2220	5.7	2.5	±0.20	4.10~4.80	1.20~1.40	2.50~2.70
2220	5.7	5.0	±0.40	4.10~4.80	1.20~1.40	4.00~5.00

5.2.2 Capacitor Layout on PC Board

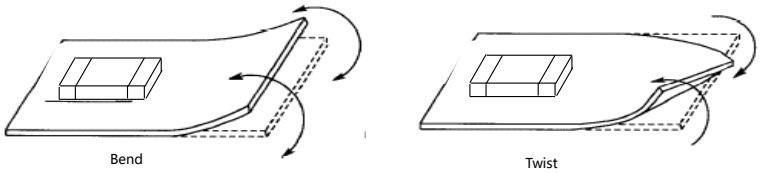
Mechanical stress varies according to the location of capacitors on PC board. The recommendation for better design is as follows



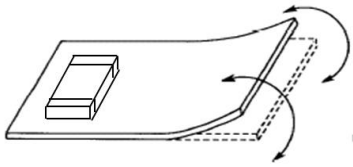
The stress in capacitors is in the following order: A>B=C>D>E

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

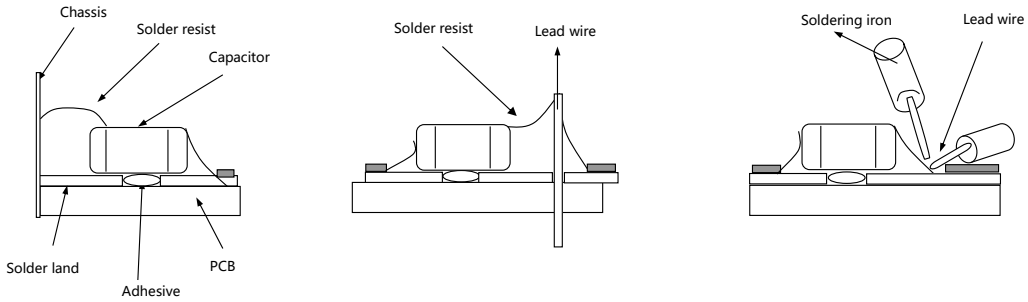


b.Recommended

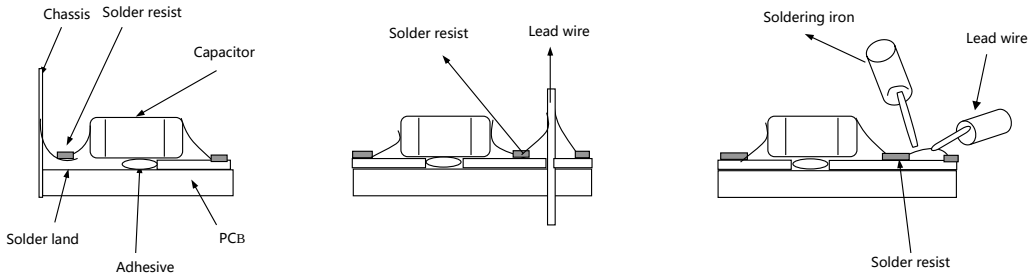


5.2.3Solder Buildup and Soldering

a.Examples of soldering method not recommended



b.Examples of soldering method recommended



5.3 Consideration for Automatic Placement

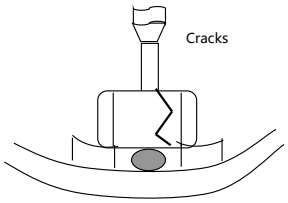
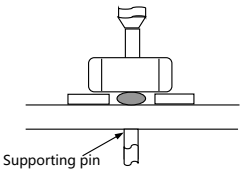
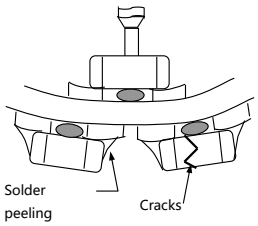
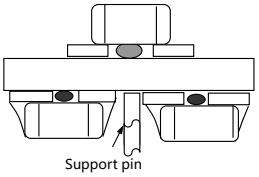
If the mounting head is adjusted too low, it may induce excessive stress in the chip capacitor to result in cracking. Please take following precautions.

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

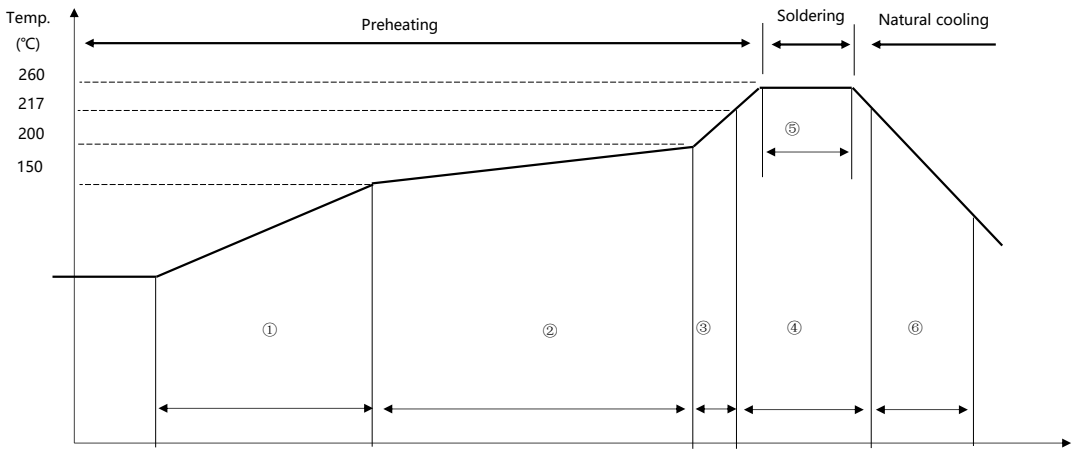
5.4.1 Flux Selection

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



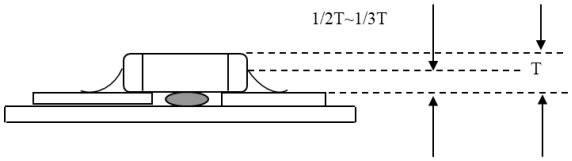
5.4.2.1 Reflow Soldering Condition

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.

Table 5-1 Cap., D.F, I.R. changes after test

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage (DC)	Thickness code	Capacitance	High Temperature Exposure (Storage)			Temperature Cycling			Biased Humidity (85/85)			Operational Life				Electrical Characterization					Board Flex	Terminal Strength
							Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Test voltage [Vrms]	D.F. [max.]	I.R. (Room Temp.) [min.]	I.R. (High Temp.) [min.]	Measurement Voltage [Vrms]	Measurement Frequency	I.R. (Room Temp.) [min.]	I.R. (Room Temp.) [min.]
1	E	X7R	0402	100V	B	120pF~4.7nF	10	10000MΩ	0.03	10	10000MΩ	0.03	12.5	1000MΩ	0.035	12.5	1000MΩ	0.035	2.0×U_R	0.025	10000MΩ	1000MΩ	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
2	E	X7R	0402	50V	B	120pF~22nF	10	10000MΩ	0.03	10	10000MΩ	0.03	12.5	1000MΩ	0.035	12.5	1000MΩ	0.035	2.0×U_R	0.025	10000MΩ	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
3	E	X7R	0402	50V	B	33nF~100nF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
4	E	X7R	0402	25V	B	220pF~27nF	10	10000MΩ	0.03	10	10000MΩ	0.03	12.5	1000MΩ	0.05	12.5	1000MΩ	0.05	2.0×U_R	0.025	10000MΩ	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
5	E	X7R	0402	25V	B	33nF~47nF	10	10000MΩ	0.05	10	10000MΩ	0.05	12.5	1000MΩ	0.05	12.5	1000MΩ	0.05	2.0×U_R	0.035	10000MΩ	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
6	E	X7R	0402	25V	B	100nF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
7	E	X7R	0402	16V	B	220pF~22nF	10	10000MΩ	0.03	10	10000MΩ	0.03	12.5	1000MΩ	0.05	12.5	1000MΩ	0.05	2.0×U_R	0.025	10000MΩ	1000MΩ	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
8	E	X7R	0402	16V	B	27nF~100nF	10	10000MΩ or 500Ω.F	0.05	10	10000MΩ or 500Ω.F	0.05	12.5	1000MΩ or 50Ω.F	0.05	12.5	1000MΩ or 50Ω.F	0.05	2.0×U_R	0.035	10000MΩ or 500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
9	E	X7R	0402	16V	B	120nF~220nF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
10	E	X7R	0402	10V	B	100nF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
11	E	X7R	0402	10V	B	120nF~220nF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
12	E	X7R	0603	100V	D	100pF~47nF	10	10000MΩ	0.03	10	10000MΩ	0.03	12.5	1000MΩ	0.035	12.5	1000MΩ	0.035	2.0×U_R	0.025	10000MΩ	1000MΩ	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
13	E	X7R	0603	100V	D	68nF~100nF	10	10000MΩ or 500Ω.F	0.03	10	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	1.5×UR	0.025	10000MΩ or 500Ω.F	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
14	E	X7R	0603	50V	D	100pF~100nF	10	10000MΩ or 500Ω.F	0.03	10	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	2.0×U_R	0.025	10000MΩ or 500Ω.F	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
15	E	X7R	0603	50V	D	120nF~220nF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
16	E	X7R	0603	35V	D	100pF~100nF	10	10000MΩ or 500Ω.F	0.03	10	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	2.0×U_R	0.025	10000MΩ or 500Ω.F	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
17	E	X7R	0603	35V	D	120nF~470nF	12.5	50Ω.F	0.1	10	50Ω.F	0.1	12.5	5Ω.F	0.2	12.5	50Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
18	E	X7R	0603	25V	D	100pF~100nF	10	10000MΩ or 500Ω.F	0.03	10	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	2.0×U_R	0.025	10000MΩ or 500Ω.F	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
19	E	X7R	0603	25V	D	120nF~330nF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
20	E	X7R	0603	25V	D	470nF~1μF	12.5	50Ω.F	0.1	10	50Ω.F	0.1	12.5	5Ω.F	0.2	12.5	5Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
21	E	X7R	0603	16V	D	100pF~100nF	10	10000MΩ or 500Ω.F	0.03	10	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	2.0×U_R	0.025	10000MΩ or 500Ω.F	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
22	E	X7R	0603	16V	D	120nF~470nF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
23	E	X7R	0603	16V	D	680nF~1μF	10	500Ω.F	0.1	10	500Ω.F	0.1	12.5	50Ω.F	0.1	12.5	50Ω.F	0.1	1.5×U_R	0.1	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
24	E	X7R	0603	6.3V	D	1.5μF~2.2μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
25	E	X7R	0805	250V	Y	1nF~10nF	10	10000MΩ or 500Ω.F	0.03	7.5	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	1.5×U_R	0.025	10000MΩ or 500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
26	E	X7R	0805	100V	Y	1nF~100nF	10	10000MΩ or 500Ω.F	0.03	10	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	2.0×U_R	0.025	10000MΩ or 500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
27	E	X7R	0805	100V	H	100nF~470nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
28	E	X7R	0805	100V	H	680nF~1μF	10	50Ω.F	0.2	10	50Ω.F	0.2	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
29	E	X7R	0805	50V	Y	1nF~100nF	10	10000MΩ or 500Ω.F	0.03	10	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	2.0×U_R	0.025	10000MΩ or 500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
30	E	X7R	0805	50V	H	100nF~470nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
31	E	X7R	0805	50V	H	680nF~1μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.5×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
32	E	X7R	0805	25V	Y	1nF~100nF	10	10000MΩ or 500Ω.F	0.03	10	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	2.0×U_R	0.025	10000MΩ or 500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
33	E	X7R	0805	25V	H	220nF~1μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
34	E	X7R	0805	25V	H	2.2μF	12.5	50Ω.F	0.1	10	50Ω.F	0.1	12.5	5Ω.F	0.2	12.5	5Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
35	E	X7R	0805	16V	H	1μF~1.5μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
36	E	X7R	0805	16V	H	2.2μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
37	E	X7R	0805	16V	H	3.3μF	12.5	50Ω.F	0.1	10	50Ω.F	0.1	12.5	5Ω.F	0.2	12.5	5Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
38	E	X7R	0805	16V	H	4.7μF	10	50Ω.F	0.2	7.5	50Ω.F	0.2	12.5	5Ω.F	0.2	12.5	5Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
39	E	X7R	0805	10V	H	1μF~1.5μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
40	E	X7R	0805	10V	H	2.2μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
41	E	X7R	0805	10V	H	3.3μF	12.5	50Ω.F	0.1	10	50Ω.F	0.1	12.5	5Ω.F	0.2	12.5	5Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
42	E	X7R	0805	10V	H	4.7μF	10	50Ω.F	0.2	7.5	50Ω.F	0.2	12.5	5Ω.F	0.2	12.5	5Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
43	E	X7R	0805	10V	H	10μF	10	50Ω.F	0.2	7.5	50Ω.F	0.125	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.125	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
44	E	X7R	0805	6.3V	H	10μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
45	E	X7R	1206	630V	O	150pF~10nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.2×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F

Table 5-1 Cap., D.F, I.R. changes after test

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage (DC)	Thickness code	Capacitance	High Temperature Exposure (Storage)			Temperature Cycling			Biased Humidity (85℃/85%)			Operational Life				Electrical Characterization					Board Flex	Terminal Strength
							Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Test voltage [Vrms]	D.F. [max.]	I.R. (Room Temp.) [min.]	I.R. (High Temp.) [min.]	Measurement Voltage [Vrms]	Measurement Frequency	I.R. (Room Temp.) [min.]	I.R. (Room Temp.) [min.]
46	E	X7R	1206	630V	L	15nF~33nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.2×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
47	E	X7R	1206	500V	O	150pF~10nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.2×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
48	E	X7R	1206	500V	L	15nF~33nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.2×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
49	E	X7R	1206	250V	O	10nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.2×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
50	E	X7R	1206	250V	L	15nF~47nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.2×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
51	E	X7R	1206	200V	O	10nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.2×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
52	E	X7R	1206	200V	L	15nF~47nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.2×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
53	E	X7R	1206	100V	O	47nF~220nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
54	E	X7R	1206	100V	H	100nF~330nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
55	E	X7R	1206	100V	L	100nF~470nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
56	E	X7R	1206	100V	L	1μF~1.5μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×UR	0.05	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
57	E	X7R	1206	100V	L	2.2μF	10	50Ω.F	0.2	10	50Ω.F	0.2	12.5	25Ω.F	0.2	12.5	25Ω.F	0.2	1.5×UR	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
58	E	X7R	1206	50V	L	100nF~1.5μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×UR	0.05	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
59	E	X7R	1206	50V	L	2.2μF	10	500Ω.F	0.2	10	500Ω.F	0.1	12.5	50Ω.F	0.2	12.5	50Ω.F	0.2	2.0×UR	0.1	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
60	E	X7R	1206	50V	L	3.3μF~4.7μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×UR	0.05	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
61	E	X7R	1206	25V	L	1.0μF~4.7μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×UR	0.05	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
62	E	X7R	1206	16V	L	1.0μF~4.7μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×UR	0.05	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
63	E	X7R	1206	16V	L	10μF	12.5	50Ω.F	0.1	10	50Ω.F	0.1	12.5	5Ω.F	0.2	12.5	5Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
64	E	X7R	1206	10V	L	10μF	12.5	50Ω.F	0.1	10	50Ω.F	0.1	12.5	5Ω.F	0.2	12.5	5Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
65	E	X7R	1206	10V	L	22μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
66	E	X7R	1206	6.3V	L	22μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
67	E	X7R	1210	50V	R	3.3μF~4.7μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
68	E	X7R	1210	25V	R	3.3μF~4.7μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
69	E	X7R	1210	25V	R	10μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	25Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
70	E	X7R	1210	25V	3	22μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
71	E	X7R	1210	16V	R	10μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	25Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
72	E	X7R	1210	16V	R	22μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
73	E	X7R	1210	10V	R	22μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
74	E	X7R	1210	6.3V	R	47μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
75	E	X7R	2220	100V	R	10μF	10	500Ω.F	0.2	10	500Ω.F	0.1	12.5	50Ω.F	0.2	12.5	50Ω.F	0.2	1.5×U_R	0.1	500Ω.F	50Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
76	E	X7R	2220	16V	I	22μF	10	50Ω.F	0.2	10	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
77	E	X7S	0402	16V	N	330nF~470nF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
78	E	X7S	0402	10V	B	470nF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
79	E	X7S	0402	10V	N	330nF~470nF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
80	E	X7S	0402	10V	C	680nF~1μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
81	E	X7S	0402	6.3V	N	470nF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
82	E	X7S	0402	6.3V	C	680nF~1μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
83	E	X7S	0603	16V	K	2.2μF	10	50Ω.F	0.2	10	50Ω.F	0.15	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.15	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
84	E	X7S	0603	10V	D	2.2μF	10	50Ω.F	0.2	10	50Ω.F	0.15	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.15	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
85	E	X7S	0603	6.3V	D	2.2μF	10	50Ω.F	0.2	10	50Ω.F	0.15	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.15	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
86	E	X7S	0805	100V	H	1.0μF	10	50Ω.F	0.2	10	50Ω.F	0.2	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
87	E	X7S	0805	35V	H	2.2μF	12.5	50Ω.F	0.2	10	50Ω.F	0.2	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
88	E	X7S	0805	25V	H	4.7μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
89	E	X7S	0805	25V	H	10μF	20	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	20	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
90	E	X7S	0805	16V	H	4.7μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	1.5×U_R	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F

Table 5-1 Cap., D.F, I.R. changes after test

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage (DC)	Thickness code	Capacitance	High Temperature Exposure (Storage)			Temperature Cycling			Biased Humidity (85℃/85%RH)			Operational Life				Electrical Characterization					Board Flex	Terminal Strength
							Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Test voltage [Vrms]	D.F. [max.]	I.R. (Room Temp.) [min.]	I.R. (High Temp.) [min.]	Measurement Voltage [Vrms]	Measurement Frequency	I.R. (Room Temp.) [min.]	I.R. (Room Temp.) [min.]
91	E	X7S	0805	16V	H	10μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
92	E	X7S	0805	10V	G	4.7μF	12.5	50Ω.F	0.1	10	50Ω.F	0.1	12.5	5Ω.F	0.2	12.5	5Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
93	E	X7S	0805	10V	H	4.7μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
94	E	X7S	0805	10V	H	10μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
95	E	X7S	1206	100V	L	2.2μF	10	50Ω.F	0.2	10	50Ω.F	0.2	12.5	25Ω.F	0.2	12.5	25Ω.F	0.2	1.5×UR	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
96	E	X7S	1206	50V	L	2.2μF	10	500Ω.F	0.2	10	500Ω.F	0.1	12.5	50Ω.F	0.2	12.5	50Ω.F	0.2	1.5×UR	0.1	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
97	E	X7S	1206	50V	L	4.7μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×UR	0.05	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
98	E	X7S	1206	25V	L	2.2μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×UR	0.05	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
99	E	X7S	1206	25V	L	4.7μF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×UR	0.05	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
100	E	X7S	1206	25V	P	10μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×UR	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
101	E	X7S	1206	16V	P	10μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	1.5×UR	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
102	E	X7S	1206	16V	P	22μF	15	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
103	E	X7S	1206	10V	L	22μF	15	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
104	E	X7S	1206	6.3V	L	22μF	15	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
105	E	X7S	1210	100V	R	4.7μF	10	50Ω.F	0.2	10	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
106	E	X7S	1210	50V	R	10μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.5×UR	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
107	E	X7S	1210	25V	R	10μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	1.5×UR	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
108	E	X7S	1210	25V	3	22μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
109	E	X7S	1210	10V	R	47μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
110	E	X7S	1210	6.3V	R	47μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
111	E	X7T	0402	4V	B	1μF	15	100Ω.F	0.2	7.5	100Ω.F	0.1	12.5	12.5Ω.F	0.2	15	25Ω.F	0.2	$1.5\times U_R$	0.1	100Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	100Ω.F	100Ω.F
112	E	X7T	0402	4V	C	2.2μF~4.7μF	15	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	15	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
113	E	X7T	0402	2.5V	C	10μF	15	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	15	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
114	E	X7T	0603	6.3V	K	4.7μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
115	E	X7T	0603	6.3V	K	10μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
116	E	X7T	0603	4V	K	10μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
117	E	X7T	0603	2.5V	K	22μF	15	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	15	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
118	E	X7T	0805	50V	H	2.2μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
119	E	X7T	0805	25V	H	4.7μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
120	E	X7T	0805	16V	H	10μF	12.5	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
121	E	X7T	0805	10V	H	10μF	12.5	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
122	E	X7T	0805	6.3V	H	10μF	12.5	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
123	E	X7T	0805	6.3V	H	22μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
124	E	X7T	0805	4V	H	22μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
125	E	X7T	1206	50V	P	10μF	10	50Ω.F	0.2	7.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	1.0±0.2	1.0±0.1KHz	50Ω.F	50Ω.F
126	E	X7T	1206	6.3V	L	22μF	12.5	50Ω.F	0.2	12.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
127	E	X7T	1206	4V	L	47μF	15	50Ω.F	0.2	30	50Ω.F	0.1	12.5	12.5Ω.F	0.2	15	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
128	E	X7T	1210	6.3V	R	22μF	12.5	50Ω.F	0.2	12.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
129	E	X7T	1210	6.3V	R	47μF	12.5	50Ω.F	0.2	12.5	50Ω.F	0.1	12.5	12.5Ω.F	0.2	12.5	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
130	E	X7T	1210	2.5V	3	220μF	15	50Ω.F	0.2	30	50Ω.F	0.1	12.5	12.5Ω.F	0.2	15	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
131	E	X7T	1210	2.5V	3	100μF	15	50Ω.F	0.2	30	50Ω.F	0.1	12.5	12.5Ω.F	0.2	15	25Ω.F	0.2	$1.5\times U_R$	0.1	50Ω.F	5Ω.F	0.5±0.1	120±24Hz	50Ω.F	50Ω.F
132	E	X8R	0402	50V	B	220pF~1nF	10	10000MΩ or 500Ω.F	0.06	10	10000MΩ or 500Ω.F	0.06	12.5	500MΩ or 25Ω.F	0.06	12.5	1000MΩ or 50Ω.F	0.06	$2.0\times U_R$	0.03	10000MΩ or 500Ω.F	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
133	E	X8R	0603	100V	D	1nF~10nF	10	3000MΩ	0.075	10	10000MΩ	0.075	12.5	1000MΩ	0.075	12.5	1000MΩ	0.075	$2.0\times U_R$	0.05	10000MΩ	100MΩ	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
134	E	X8R	0603	50V	D	1nF~6.8nF	10	3000MΩ	0.075	10	10000MΩ	0.075	12.5	1000MΩ	0.075	12.5	1000MΩ	0.075	$2.0\times U_R$	0.05	10000MΩ	100MΩ	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
135	E	X8R	0603	50V	D	10nF~47nF	10	3000MΩ	0.075	10	10000MΩ	0.075	12.5	1000MΩ	0.075	12.5	1000MΩ	0.075	$2.0\times U_R$	0.05	10000MΩ	1Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ

Table 5-1 Cap., D.F, I.R. changes after test

NO.	Series Code	Temperature Characteristics	Size Code	Rated Voltage (DC)	Thickness code	Capacitance	High Temperature Exposure (Storage)			Temperature Cycling			Biased Humidity (85℃/85%RH)			Operational Life				Electrical Characterization					Board Flex	Terminal Strength
							Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Cap. Change [ΔC/C≤%]	I.R. (Room Temp.) [min.]	D.F. [max.]	Test voltage [Vrms]	D.F. [max.]	I.R. (Room Temp.) [min.]	I.R. (High Temp.) [min.]	Measurement Voltage [Vrms]	Measurement Frequency	I.R. (Room Temp.) [min.]	I.R. (Room Temp.) [min.]
136	E	X8R	0603	25V	D	68nF~100nF	10	3000MΩ	0.075	10	10000MΩ	0.075	12.5	1000MΩ	0.075	12.5	1000MΩ	0.075	2.0×U_R	0.05	10000MΩ	1Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
137	E	X8R	0805	100V	K	10nF~33nF	10	3000MΩ	0.075	10	10000MΩ	0.075	12.5	1000MΩ	0.075	12.5	1000MΩ	0.075	2.0×U_R	0.05	10000MΩ	1Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
138	E	X8R	0805	100V	H	33nF~47nF	10	3000MΩ	0.075	10	10000MΩ	0.075	12.5	1000MΩ	0.075	12.5	1000MΩ	0.075	2.0×U_R	0.05	10000MΩ	1Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
139	E	X8R	0805	50V	K	10nF~33nF	10	3000MΩ	0.075	10	10000MΩ	0.075	12.5	1000MΩ	0.075	12.5	1000MΩ	0.075	2.0×U_R	0.05	10000MΩ	1Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
140	E	X8R	0805	50V	G	33nF~100nF	10	150Ω.F	0.075	10	500Ω.F	0.075	12.5	50Ω.F	0.075	12.5	50Ω.F	0.075	2.0×U_R	0.05	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
141	E	X8R	0805	50V	H	33nF~100nF	10	150Ω.F	0.075	10	500Ω.F	0.075	12.5	50Ω.F	0.075	12.5	50Ω.F	0.075	2.0×U_R	0.05	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
142	E	X8R	0805	25V	H	150nF~330nF	10	150Ω.F	0.075	10	500Ω.F	0.075	12.5	50Ω.F	0.075	12.5	50Ω.F	0.075	2.0×U_R	0.05	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
143	E	X8R	1206	100V	O	68nF~100nF	10	150Ω.F	0.075	10	500Ω.F	0.075	12.5	50Ω.F	0.075	12.5	50Ω.F	0.075	2.0×U_R	0.05	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
144	E	X8R	1206	100V	L	150nF~330nF	10	150Ω.F	0.075	10	500Ω.F	0.075	12.5	50Ω.F	0.075	12.5	50Ω.F	0.075	2.0×U_R	0.05	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
145	E	X8R	1206	50V	O	150nF~330nF	10	150Ω.F	0.075	10	500Ω.F	0.075	12.5	50Ω.F	0.075	12.5	50Ω.F	0.075	2.0×U_R	0.05	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
146	E	X8R	1206	50V	L	470nF	10	150Ω.F	0.075	10	500Ω.F	0.075	12.5	50Ω.F	0.075	12.5	50Ω.F	0.075	2.0×U_R	0.05	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
147	E	X8R	1206	25V	O	470nF	10	150Ω.F	0.075	10	500Ω.F	0.075	12.5	50Ω.F	0.075	12.5	50Ω.F	0.075	2.0×U_R	0.05	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
148	E	X8R	1206	25V	L	680nF~1μF	10	150Ω.F	0.075	10	500Ω.F	0.075	12.5	50Ω.F	0.075	12.5	50Ω.F	0.075	2.0×U_R	0.05	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
149	E	X8L	0402	50V	B	220pF~4.7nF	10	10000MΩ	0.03	10	10000MΩ	0.03	12.5	1000MΩ	0.035	12.5	1000MΩ	0.035	2.0×U_R	0.025	10000MΩ	100MΩ	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
150	E	X8L	0402	25V	B	5.6nF~10nF	10	10000MΩ	0.03	10	10000MΩ	0.03	12.5	1000MΩ	0.035	12.5	1000MΩ	0.035	2.0×U_R	0.025	10000MΩ	100MΩ	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
151	E	X8L	0402	16V	B	15nF~47nF	10	10000MΩ	0.03	10	10000MΩ	0.03	12.5	1000MΩ	0.035	12.5	1000MΩ	0.035	2.0×U_R	0.025	10000MΩ	100MΩ	1.0±0.2	1.0±0.1KHz	10000MΩ	10000MΩ
152	E	X8L	0603	50V	D	150pF~100nF	10	10000MΩ or 500Ω.F	0.03	10	10000MΩ or 500Ω.F	0.03	12.5	1000MΩ or 50Ω.F	0.035	12.5	1000MΩ or 50Ω.F	0.035	2.0×U_R	0.025	10000MΩ or 500Ω.F	1000MΩor 10Ω.F	1.0±0.2	1.0±0.1KHz	10000MΩ or 500Ω.F	10000MΩ or 500Ω.F
153	E	X8L	0603	25V	D	15nF~220nF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
154	E	X8L	0603	16V	D	15nF~220nF	10	500Ω.F	0.05	10	500Ω.F	0.05	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.035	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
155	E	X8L	0805	50V	H	47nF~330nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.035	12.5	50Ω.F	0.035	2.0×U_R	0.025	500Ω.F	1Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
156	E	X8L	0805	25V	H	150nF~470nF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F
157	E	X8L	0805	16V	H	220nF~1μF	10	500Ω.F	0.03	10	500Ω.F	0.03	12.5	50Ω.F	0.05	12.5	50Ω.F	0.05	2.0×U_R	0.025	500Ω.F	10Ω.F	1.0±0.2	1.0±0.1KHz	500Ω.F	500Ω.F