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Prosperity Dielectrics Co., Ltd.

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Messrs.：____

Date：___

APPROVAL SHEET

Product Name ：AUTOMOTIVE Multilayer Ceramic Chip Capacitors

Part No. ：MT Series

Description ：Size 0201 to 1812, C0G/X7R, 10Vdc to 630Vdc, RoHS Compliant

PREPARED BY	APPROVED BY

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PDC

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SPECIFICATION

FOR

Product Name ： **AUTOMOTIVE Multilayer Ceramic Chip Capacitors**

Part No. ： **MT Series**

Description ： **Size 0201 to 1812, C0G/X7R, 10Vdc to 630Vdc, RoHS Compliant**

SPEC. No.	：**MT-000-002-01**
DATE	：

RAWN BY	CHECEKED BY	APPROVED BY
Angel Liu	Yvens Chou	Ryan Chen

PSA
PASSIVE SYSTEM ALLIANCE

1. INTRODUCTION

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

PDC's MT Soft termination series MLCC is made by X7R dielectrics and which provides product with high electrical precision, stability and reliability. Besides, MT Soft termination series MLCC is tighten controlling in quality in line to assure quality performance in automotive applications and qualified to AEC-Q200.

2. FEATURES

a. A wide selection of sizes is available (0603 to 1812).
b. High capacitance in given case size.
c. Capacitor with lead-free termination (pure Tin).
d. The MT series meet AEC-Q200 requirement.

3. APPLICATIONS

a. For Navigation & Information equipments.
b. For entertainment equipments
c. For comfortable equipments.
d. For Automotive electronic equipment.

4.HOW TO ORDER

MT	31	X	471	K	251	P	X	G
PDC Family	Size	Dielectric	Capacitance	Tolerance	Rated voltage	Packaging	Thickness	Control Code
Table1.	Table2	Table3	Table4	Table5	Table6	Table7	Table8	Table9

Table 1 PDC family

Code	Description
MT	Automotive Capacitor Qualified to AEC-Q200

Table 2 Size

Code	Description	Code	Description	Code	Description
15	0402 (1005)	32	1210 (3225)	52	2211 (5728)
18	0603 (1608)	42	1808 (4520)	55	2220 (5750)
21	0805 (2012)	43	1812 (4532)	56	2225 (5763)
31	1206 (3216)	46	1825 (4563)		

Table 3 Dielectric Material Characteristics

Code	Description	Code	Description
N	C0G	X	X7R
B	X5R	F	Y5V

Table 4 Table 4 Capacitance Rule Code

Code	Description	Code	Description
R47	0.47pF	102	$102=10x10^{2}=1000pF$
0R5	0.5pF	104	$104=10x10^{4}=100nF$
100	$100=10x10^{0}=10pF$	106	$106=10x10^{6}=10\mu F$

Table 5 Tolerance

Code	Description	Code	Description	Code	Description
A	±0.05 pF	I	-10% ~ 0%	Q	±0.03 pF
B	±0.10 pF	J	±5 %	Z	-20% ~ +80%
C	±0.25 pF	K	±10 %		
D	±0.50 pF	L	0% ~ +10%		
F	±1 %	M	±20 %		
G	±2 %	N	-5% ~ +10%		
H	±3 %	P	±0.02 pF		

Table 6 Rated voltage

Code	Description	Code	Description	Code	Description
6R3	6.3VDC	201	200VDC	152	1500VDC
100	10VDC	251	250VDC	202	2000VDC
160	16VDC	401	400VDC	302	3000VDC
250	25VDC	501	500VDC	402	4000VDC
500	50VDC	631	630VDC	502	5000VDC
101	100VDC	102	1000VDC	602	6000VDC

Table 7 Packaging Type

Code	Description	Code	Description
B	Bulk	T	Tray package
E	Tape and 7" Reel, Embossed Tape	P	Tape and 7" Reel, Paper Tape
K	Tape and 10" Reel, Embossed Tape	D	Tape and 10" Reel, Paper Tape
L	Tape and 13" Reel, Embossed Tape	G	Tape and 13" Reel, Paper Tape

Table 8 Thickness Description

Code	Description	Code	Description	Code	Description
A	0.60 ± 0.10 mm	I	1.25 ± 0.20 mm	Q	0.50 + 0.02/-0.05 mm
B	0.8 + 0.15/-0.10 mm	J	1.15 ± 0.15 mm	R	3.10 ± 0.30 mm
C	1.25 ± 0.10 mm	K	0.50 ± 0.20 mm	S	0.80 ± 0.07 mm
D	1.40 ± 0.15 mm	L	0.30 ± 0.03 mm	T	0.85 ± 0.10 mm
E	1.60 ± 0.20 mm	M	0.95 ± 0.10 mm	U	0.50 ± 0.10 mm
F	2.00 ± 0.20 mm	N	0.50 ± 0.05 mm	V	0.20 ± 0.02 mm
G	2.50 ± 0.30 mm	O	3.50 ± 0.20 mm	X	0.80 ± 0.10 mm
H	2.80 ± 0.30 mm	P	1.60 +0.3/-0.10 mm	Z	0.25 ± 0.03 mm

Table 9 Special Control Code

Code	Description
G	RoHS Compliant
Q	Surface Coating (size 1206~2225)

PASSIVE SYSTEM ALLIANCE

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M_B (mm)
0201 (0603)	0.60±0.03	0.30±0.03	See No.4 Reference Table 8	0.15±0.05
0402 (1005)	1.00±0.10	0.50±0.10		0.25 +0.05/0.10
0603 (1608)	1.60±0.15	0.80±0.15		0.40±0.15
0805 (2012)	2.00±0.20	1.25±0.20		0.50±0.20
1206 (3216)	3.20±0.20	1.60±0.20		0.60±0.20
1210 (3225)	3.20±0.30	2.50±0.30		0.75±0.35
1808 (4520)	4.50±0.40	2.00±0.25		0.75±0.35
1812 (4532)	4.50±0.40	3.20±0.30		0.75±0.35

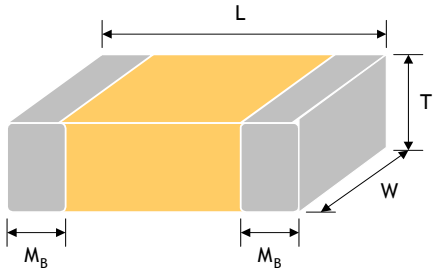

Fig.5-1 The outline of MLCC

6.GENERAL ELECTRICAL DATA

Dielectric	C0G	X7R
Size	0201, 0402, 0603, 0805, 1206, 1210,	0402, 0603, 0805, 1206, 1210, 1808, 1812,
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V, 200V,250V, 500V, 630V	
Capacitance range*	0.1pF ~ 33nF	100pF ~ 1.8μF
Capacitance tolerance	Reference to Table5	
Tan δ	Cap. Rang / Q Spec. Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	≤ 2.5%
Capacitance & Tan δ Test Condition	Measured at the condition of 30~70% related humidity	
	For 25℃. at ambient temperature	Preconditioning for Class II MLCC: Perform a heat treatment at 150±10℃ for 1 hour, then leave in amb ient condition for 24±2 hours before measurement.
	Cap. Rang / Test Condition Cap≤1000pF: 1.0±0.2Vrms, 1.0MHz±10% Cap>1000pF,: 1.0±0.2Vrms, 1.0kHz±10%	1.0±0.2Vrms, 1.0kHz±10%, at 25℃ ambient temperature.
Insulation resistance at Ur	≥100GΩ or R•C≥ 500Ω-F whichever is smaller	
Operating temperature	-55 to +125℃	
Capacitance characteristic	±30ppm / ℃	±15%
Termination	Cu / Ni / Sn (lead-free termination)	

PASSIVE SYSTEM ALLIANCE

7.CAPACITANCE RANGE

7-1 COG

DIELECTRIC		C0G																						
SIZE	EIA CAP	0201				0402				0603							0805							
VDCW	CODE	10V	16V	25V	50V	10V	16V	25V	50V	10V	16V	25V	50V	100V	200V	250V	10V	16V	25V	50V	100V	200V	250V	500V	630V
0.1pF	0R1	L	L	L	L	N	N	N	N																
0.2pF	0R2	L	L	L	L	N	N	N	N																
0.3pF	0R3	L	L	L	L	N	N	N	N																
0.4pF	0R4	L	L	L	L	N	N	N	N																
0.5pF	0R5	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
0.6	0R6	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
0.7	0R7	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
0.8	0R8	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
0.9	0R9	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
1.0	1R0	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
1.2	1R2	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
1.5	1R5	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
1.8	1R8	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
2.2	2R2	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
2.7	2R7	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
3.3	3R3	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
3.9	3R9	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
4.7	4R7	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
5.6	5R6	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
6.8	6R8	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
8.2	8R2	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
10pF	100	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
12	120	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
15	150	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
18	180	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
22	220	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
27	270	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
33	330	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
39	390	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
47	470	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
56	560	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
68	680	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	A	A
82	820	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	A	A	X	X
100pF	101	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	X	X	X	X
120	121	L	L	L	L	N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	X	X	C	C
150	151					N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	C	C	C	C
180	181					N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	C	C	C	C
220	221					N	N	N	N	S	S	S	S	S	S	S	A	A	A	A	A	C	C	C	C
270	271					N	N	N	N	S	S	S	S	S	B	B	A	A	A	A	A	C	C	C	C
330	331					N	N	N	N	S	S	S	S	S	B	B	A	A	A	A	A	C	C	C	C
390	391					N	N	N	N	S	S	S	S	S	B	B	X	X	X	X	X	C	C	C	C
470	471					N	N	N	N	S	S	S	S	S	B	B	X	X	X	X	X	C	C		
560	561					N	N	N	N	S	S	S	S	S			X	X	X	X	X	C	C		
680	681					N	N	N	N	S	S	S	S	S			X	X	X	X	X	C	C		
820	821					N	N	N	N	S	S	S	S	S			X	X	X	X	X	C	C		
1000pF	102					N	N	N	N	S	S	S	S	S			X	X	X	X	X	C	C		
1200	122									B	B	B	B				X	X	X	X	X	C	C		
1500	152									B	B	B	B				X	X	X	X	X	C	C		
1800	182									B	B	B	B				X	X	X	X	X	C	C		
2200	222									B	B	B	B				X	X	X	X	X	C	C		
2700	272									B	B	B	B				C	C	C	C	C				
3300	332									B	B	B	B				C	C	C	C	C				
3900	392																C	C	C	C	C				
4700	472																C	C	C	C	C				
5600	562																C	C	C	C	C				
6800	682																C	C	C	C	C				
8200	822																C	C	C	C					
0.01μF	103																C	C	C	C					

PASSIVE SYSTEM ALLIANCE

7.CAPACITANCE RANGE

7-1 COG

DIELECTRIC		C0G																		
SIZE	EIA CAP	1206										1210								
VDCW	CODE	10V	16V	25V	50V	100V	200V	250V	500V	630V	1000V	10V	16V	25V	50V	100V	200V	250V	500V	630V
1.2	1R2	X	X	X	X	X	X	X	X	X										
1.5	1R5	X	X	X	X	X	X	X	X	X	X									
1.8	1R8	X	X	X	X	X	X	X	X	X	X									
2.2	2R2	X	X	X	X	X	X	X	X	X	X									
2.7	2R7	X	X	X	X	X	X	X	X	X	X									
3.3	3R3	X	X	X	X	X	X	X	X	X	X									
3.9	3R9	X	X	X	X	X	X	X	X	X	X									
4.7	4R7	X	X	X	X	X	X	X	X	X	X									
5.6	5R6	X	X	X	X	X	X	X	X	X	X									
6.8	6R8	X	X	X	X	X	X	X	X	X	X									
8.2	8R2	X	X	X	X	X	X	X	X	X	X									
10pF	100	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M
12	120	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M
15	150	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M
18	180	X	X	X	X	X	X	X	X	X	X	M	M	M	M	M	M	M	M	M
22	220	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
27	270	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
33	330	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
39	390	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
47	470	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
56	560	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
68	680	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
82	820	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
100pF	101	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
120	121	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
150	151	X	X	X	X	X	X	X	X	X	C	M	M	M	M	M	M	M	M	M
180	181	X	X	X	X	X	X	X	X	X	E	M	M	M	M	M	M	M	M	M
220	221	X	X	X	X	X	X	X	X	X	E	M	M	M	M	M	M	M	M	M
270	271	X	X	X	X	X	X	M	M	M	E	M	M	M	M	M	M	M	M	M
330	331	X	X	X	X	X	X	M	M	M	E	M	M	M	M	M	M	M	M	M
390	391	X	X	X	X	X	X	M	M	M	E	M	M	M	M	M	M	M	M	M
470	471	X	X	X	X	X	M	M	M	M	E	M	M	M	M	M	M	M	M	M
560	561	X	X	X	X	X	M	C	C	C	E	M	M	M	M	M	M	M	M	M
680	681	X	X	X	X	X	M	C	C	C	E	M	M	M	M	M	M	M	M	M
820	821	X	X	X	X	X	M	E	E	E	E	M	M	M	M	M	M	M	M	M
1000pF	102	X	X	X	X	X	M	E	E	E	E	M	M	M	M	M	C	C	C	C
1200	122	X	X	X	X	X	M	E	E	E		M	M	M	M	M	C	C	C	C
1500	152	X	X	X	X	X	C	E	E	E		M	M	M	M	M	C	C	C	C
1800	182	X	X	X	X	X	C	E	E	E		M	M	M	M	M	C	C	C	C
2200	222	X	X	X	X	X	C	E	E	E		M	M	M	M	M	C	C	C	C
2700	272	X	X	X	X	X	C	E				M	M	M	M	M	C	C	C	C
3300	332	X	X	X	X	X	C	E				M	M	M	M	M	C	C	C	C
3900	392	X	X	X	X	X	C	E				M	M	M	M	M	C	C	C	C
4700	472	X	X	X	X	X	C	E				M	M	M	M	M	E	E		
5600	562	X	X	X	X	X						M	M	M	M	M	E	E		
6800	682	M	M	M	M	M						M	M	M	M	M	E	E		
8200	822	C	C	C	C	C						M	M	M	M	M	E	E		
0.01μF	103	C	C	C	C	C						M	M	M	M	M	E	E		
0.012	123											C	C	C	C	C				
0.015	153											C	C	C	C	C				
0.018	183											F	F	F	F	F				
0.022	223											F	F	F	F	F				
0.027	273											F	F	F	F	F				
0.033	333											F	F	F	F	F				

PSA
PASSIVE SYSTEM ALLIANCE

7.CAPACITANCE RANGE

7-2 X7R

DIELECTRIC		X7R																	
SIZE	EIA CAP	0402				0603					0805								
VDCW	CODE	10V	16V	25V	50V	10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	200V	250V	500V	630V
100pF	101	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
120	121	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
150	151	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
180	181	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
220	221	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
270	271	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
330	331	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
390	391	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
470	471	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
560	561	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
680	681	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
820	821	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
1000pF	102	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
1200	122	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
1500	152	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
1800	182	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
2200	222	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
2700	272	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
3300	332	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
3900	392	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	X	X
4700	472	N	N	N	N	S	S	S	S	S	X	X	X	X	X	X	X	C	C
5600	562	N	N	N	N	S	S	S	S	S	X	X	X	X	X	C	C	C	C
6800	682	N	N	N	N	S	S	S	S	S	X	X	X	X	X	C	C	C	C
8200	822	N	N	N	N	S	S	S	S	S	X	X	X	X	X	C	C	C	C
0.01μF	103	N	N	N	N	S	S	S	S	S	X	X	X	X	X	C	C	C	C
0.012	123					S	S	S	S		X	X	X	X	X	C	C		
0.015	153					S	S	S	S		X	X	X	X	X	C	C		
0.018	183					S	S	S	S		X	X	X	X	X	C	C		
0.022	223					S	S	S	S		X	X	X	X	X	C	C		
0.027	273					S	S	S	S		X	X	X	X	C				
0.033	333					S	S	S	B		X	X	X	X	C				
0.039	393					S	S	S	B		X	X	X	X	C				
0.047	473					S	S	S	B		X	X	X	X	C				
0.056	563					S	S	S	B		X	X	X	X	C				
0.068	683					S	S	S	B		X	X	X	X	C				
0.082	823					S	S	S	B		X	X	X	C	C				
0.1μF	104					S	S	S	B		X	X	X	C	C				
0.12	124										X	X	X	C					
0.15	154										C	C	C	C					
0.18	184										C	C	C	C					
0.22	224										C	C	C	I					
0.27	274										C	C	C						
0.33	334										C	C	C						
0.39	394										C	C	C						
0.47	474										C	C	C						
0.50	564										C	C	C						
0.68	684										C	C	C						
0.82	824										C	C	C						
1μF	105										C	C							

PSA
PASSIVE SYSTEM ALLIANCE

7.CAPACITANCE RANGE

7-2 X7R

DIELECTRIC		X7R																								
SIZE	EIA CAP	1206									1210							1808				1812			
VDCW	CODE	10V	16V	25V	50V	100V	200V	250V	500V	630V	10V	16V	25V	50V	100V	250V	500V	50V	100V	200V	250V	50V	100V	200V	250V
100pF	101						C	C	C	C						C	C								
120	121						C	C	C	C						C	C								
150	151	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C				
180	181	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C				
220	221	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C				
270	271	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C	C	C	C	C
330	331	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C	C	C	C	C
390	391	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C	C	C	C	C
470	471	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C	C	C	C	C
560	561	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C	C	C	C	C
680	681	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C	C	C	C	C
820	821	X	X	X	X	X	C	C	C	C						C	C	C	C	C	C	C	C	C	C
1000pF	102	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
1200	122	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
1500	152	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
1800	182	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
2200	222	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
2700	272	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
3300	332	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
3900	392	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
4700	472	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
5600	562	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
6800	682	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
8200	822	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
0.01μF	103	X	X	X	X	X	C	C	C	C	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C
0.012	123	X	X	X	X	X	C	C			M	M	M	M	M	M	C	E	E	E	E	C	C	C	C
0.015	153	X	X	X	X	X	C	C			M	M	M	M	M	M	C	E	E	E	E	C	C	C	C
0.018	183	X	X	X	X	X	C	C			M	M	M	M	M	M	C	E	E	E	E	C	C	C	C
0.022	223	X	X	X	X	X	C	C			M	M	M	M	M	M	C	E	E	E	E	C	C	C	C
0.027	273	X	X	X	X	X					M	M	M	M	M	M		E	E	E	E	C	C	C	C
0.033	333	X	X	X	X	X					M	M	M	M	M	M		E	E	E	E	C	C	C	C
0.039	393	X	X	X	X	X					M	M	M	M	M	M		E	E	E	E	C	C	C	C
0.047	473	X	X	X	X	X					M	M	M	M	M	C		E	E	E	E	C	C	C	C
0.056	563	X	X	X	X	X					M	M	M	M	M			E	E	E	E	C	C	C	C
0.068	683	X	X	X	X	X					M	M	M	M	M			E	E	E	E	C	C	C	C
0.082	823	X	X	X	X	C					M	M	M	M	M			E	E	E	E	C	C	C	C
0.1μF	104	X	X	X	X	C					M	M	M	M	M			E	E	E	E	C	C	C	C
0.12	124	X	X	X	X	C					M	M	M	M				E	E	E	E	C	C	C	C
0.15	154	M	M	M	M	E					M	M	M	M				E	E	E	E	C	C	C	C
0.18	184	M	M	M	M	E					M	M	M	M				E	E			C	C	C	C
0.22	224	M	M	M	M	E					M	M	M	M				E	E			C	C	C	C
0.27	274	M	M	M	C																	C	C	E	E
0.33	334	M	M	M	C																	C	C	E	E
0.39	394	M	M	J	P																	C	C	F	F
0.47	474	J	J	J	P																	C	C		
0.50	564	J	J	J	P																	C	C		
0.68	684	J	J	J	P																	C	C		
0.82	824	J	J	J	P																	C	C		
1μF	105	J	J	J	P																	C	C		
1.2	125																					C	C		
1.5	155																					C	C		
1.8	185																					E	E		

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>1.</td><td>Pre-and Post-Stress Electrical Test</td><td>---</td><td></td></tr>
<tr><td>2.</td><td>High Temperature Exposure (Storage)
MIL-STD-202
Method 108</td><td>* Test temp.: 150±3℃
* Unpowered.
* Test time: 1000+24/-0 hrs.
* Measurement to be made after keeping at room temp.
for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change：C0G: within ±2.5% or ±0.25pF whichever is larger.
X7R: within ±10.00%.
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th>Exception of D.F. ≦</th><th></th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 3%</td><td>≦ 6%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF; 1206≧ 0.47μF</td></tr>
<tr><td>≦ 10%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 20%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 5%</td><td>≦ 20%</td><td>0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 5%</td><td>≦ 10%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 14%</td><td>0603≧ 0.33μF;1206≧ 4.7μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.10μF;0603≧ 0.47μF;0805≧ 2.2μF;1206≧ 6
1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0603≧ 0.15μF;0805≧ 0.68μF;1206≧ 2.2μF;1210≧ 4</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.033μF;0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 7.5%</td><td>≦ 15%</td><td>0402≧ 0.33μF; 0603≧ 0.33μF;0805≧ 2.2μF;
1206≧ 2.2μF; 1210≧ 22μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 1μF</td></tr>
<tr><td>6.3V</td><td>≦ 15%</td><td>≦ 30%</td><td>0402≧ 1μF;0603≧ 10μF;
0805≧ 4.7μF;1206≧ 47μF;1210≧ 100μF</td></tr>
<tr><td>4V</td><td>≦ 20%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">1GΩ or RxC≧ 10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V: 0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V ;</td></tr>
</table></td></tr>
<tr><td>3.</td><td>Destructive Physical Analysis
EIA-469</td><td>Per EIA-469</td><td>No defects or abnormalities</td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>4</td><td>Temperature Cycling
JESD22
Method JA-104</td><td>* Conduct 1000 cycles according to the temperatures and time.
<table>
<tr><th>Step</th><th>Temp. (℃)</th><th>Time (min.)</th></tr>
<tr><td>1</td><td>-55℃ +0/-3</td><td>30±1</td></tr>
<tr><td>2</td><td>+125℃ +3/-0</td><td>30±1</td></tr>
</table>
* Before initial measurement (X7R only):
Perform 150+0/-10℃ for 1 hr and then set for 24±2 hrs at room temp.
*Measurement to be made after keeping at room temp.
for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change：C0G: within ±2.5% or 0.25pF whichever is larger.
X7R: within ±10.0%.
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 3%</td><td>≦ 6%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF; 1206≧ 0.47μF</td></tr>
<tr><td>≦ 10%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 20%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 5%</td><td>≦ 20%</td><td>0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 5%</td><td>≦ 10%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 14%</td><td>0603≧ 0.33μF;1206≧ 4.7μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.10μF;0603≧ 0.47μF;0805≧ 2.2μF;1206≧ 6
1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0603≧ 0.15μF;0805≧ 0.68μF;1206≧ 2.2μF;1210≧ 4</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.033μF;0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 7.5%</td><td>≦ 15%</td><td>0402≧ 0.33μF; 0603≧ 0.33μF;0805≧ 2.2μF;
1206≧ 2.2μF; 1210≧ 22μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 1μF</td></tr>
<tr><td>6.3V</td><td>≦ 15%</td><td>≦ 30%</td><td>0402≧ 1μF;0603≧ 10μF;
0805≧ 4.7μF;1206≧ 47μF;1210≧ 100μF</td></tr>
<tr><td>4V</td><td>≦ 20%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">1GΩ or RxC≧ 10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V: 0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table></td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>5.</td><td>Moisture Resistance
MIL-STD-202
Method 106</td><td>* Test temp.: 25~65℃
* Humidity: 80~100% RH
* Test time: 10 cycles, t=24hrs/cycle.
* Measurement to be made after keeping at room temp.
for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change : C0G: within ±3.0% or 0.30pF whichever is larger
X7R: within 12.5%.
* Q/D.F. value:
C0G: More than 30pF Q≥350 ; 10pF≤C≤30pF, Q≥275+2.5C
Less than 10pF Q≥200+10C
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 3%</td><td>≦ 6%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF; 1206≧ 0.47μF</td></tr>
<tr><td>≦ 10%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 20%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 5%</td><td>≦ 20%</td><td>0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 5%</td><td>≦ 10%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 14%</td><td>0603≧ 0.33μF;1206≧ 4.7μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.10μF;0603≧ 0.47μF;0805≧ 2.2μF;1206≧ 6
1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0603≧ 0.15μF;0805≧ 0.68μF;1206≧ 2.2μF;1210≧ 4</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.033μF;0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 7.5%</td><td>≦ 15%</td><td>0402≧ 0.33μF; 0603≧ 0.33μF;0805≧ 2.2μF;
1206≧ 2.2μF; 1210≧ 22μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 1μF</td></tr>
<tr><td>6.3V</td><td>≦ 15%</td><td>≦ 30%</td><td>0402≧ 1μF;0603≧ 10μF;
0805≧ 4.7μF;1206≧ 47μF;1210≧ 100μF</td></tr>
<tr><td>4V</td><td>≦ 20%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">1GΩ or RxC≧ 10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table></td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>6.</td><td>Biased Humidity
MIL-STD-202
Method 103</td><td>* Test temp.: 85±3℃
* Humidity: 85%RH
* Test time: 1000+24/-0 hrs.
* To apply voltage：rated voltage (max. 100Vdc)
and 1.3~1.5Vdc.
(add 100k ohm resistor)
* Before initial measurement (Class II only) :
To apply test voltage for 1hr at test temp.
and then set for 24±2 hrs at room temp.
* Measurement to be made after keeping at room temp.
for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change: C0G: within ±3.0% or 0.30pF whichever is larger.
X7R: within ±12.5%
* Q/D.F. value:
C0G: C≥30pF , Q≥200 ; C<30pF , Q≥100+10/3C
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 3%</td><td>≦ 6%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF; 1206≧ 0.47μF</td></tr>
<tr><td>≦ 10%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 20%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 5%</td><td>≦ 20%</td><td>0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 5%</td><td>≦ 10%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 14%</td><td>0603≧ 0.33μF;1206≧ 4.7μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.10μF;0603≧ 0.47μF;0805≧ 2.2μF;1206≧ 6
1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0603≧ 0.15μF;0805≧ 0.68μF;1206≧ 2.2μF;1210≧ 4</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.033μF;0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 7.5%</td><td>≦ 15%</td><td>0402≧ 0.33μF; 0603≧ 0.33μF;0805≧ 2.2μF;
1206≧ 2.2μF; 1210≧ 22μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 1μF</td></tr>
<tr><td>6.3V</td><td>≦ 15%</td><td>≦ 30%</td><td>0402≧ 1μF;0603≧ 10μF;
0805≧ 4.7μF;1206≧ 47μF;1210≧ 100μF</td></tr>
<tr><td>4V</td><td>≦ 20%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.
Class II (X7R) for rated voltage test
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="6">500MΩ or RxC≧ 5 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table>
Class II (X7R) for 1.3~1.5Vdc
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="6">1GΩ or RxC≧ 10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table></td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>7.</td><td>Operational Life
MIL-STD-202
Method 108</td><td>* Test temp.: 125±3℃
* To apply voltage: full rated voltage.
* Test time: 1000+24/-0 hrs.
* Before initial measurement (X7R only):
Apply rated voltage for 1 hr at 125℃.
Remove and let set for 24±2 hrs at room temp.
* Measurement to be made after keeping at room temp.
for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change: C0G: within ±3.0% or ±0.3pF whichever is larger
X7R: within 12.5%.
* Q/D.F. value:
C0G: More than 30pF, Q≥350 ; 10pF≤C<30pF, Q≥275+2.5C
Less than 10pF, Q≥200+10C
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 3%</td><td>≦ 6%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF; 1206≧ 0.47μF</td></tr>
<tr><td>≦ 10%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 20%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 5%</td><td>≦ 20%</td><td>0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 5%</td><td>≦ 10%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 14%</td><td>0603≧ 0.33μF;1206≧ 4.7μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.10μF;0603≧ 0.47μF;0805≧ 2.2μF;1206≧ 6
1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0603≧ 0.15μF;0805≧ 0.68μF;1206≧ 2.2μF;1210≧ 4</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.033μF;0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 7.5%</td><td>≦ 15%</td><td>0402≧ 0.33μF; 0603≧ 0.33μF;0805≧ 2.2μF;
1206≧ 2.2μF; 1210≧ 22μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 1μF</td></tr>
<tr><td>6.3V</td><td>≦ 15%</td><td>≦ 30%</td><td>0402≧ 1μF;0603≧ 10μF;
0805≧ 4.7μF;1206≧ 47μF;1210≧ 100μF</td></tr>
<tr><td>4V</td><td>≦ 20%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">1GΩ or RxC≧ 10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table></td></tr>
<tr><td>8.</td><td>External Visual
MIL-STD-883
Method 2009</td><td>Visual inspection</td><td>No remarkable defect.</td></tr>
<tr><td>9.</td><td>Physical Dimension
JESD22
Method JB-100</td><td>Using by calipers</td><td>Within the specified dimensions</td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>10.</td><td>Resistance to Solvents
MIL-STD-202
Method 215</td><td>* Temperature: 25±5℃
* Time: 3+0.5/-0 min.
* Solvent: Iso-propyl alcohol.</td><td>* No remarkable damage.
* Cap.: within the specified tolerance.
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 2.5%</td><td>≦ 3%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF;1206≧ 0.47μF</td></tr>
<tr><td>≦ 5%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 3.5%</td><td>≦ 10%</td><td>0805≥2.2μF; 1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 3.5%</td><td>≦ 5%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 7%</td><td>0603≧ 0.33μF; 1206≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.10μF;0603≧ 0.47μF; 0805≧ 2.2μF;
1206≧ 6.8μF ; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 3.5%</td><td>≦ 5%</td><td>0402≧ 0.033μF; 0603≧ 0.15μF; 0805≧ 0.68μF;
1206≧ 2.2μF;1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.22uF; 0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="3">10V</td><td rowspan="3">≦ 5%</td><td>≦ 10%</td><td>0402≧ 0.33μF;0603≧ 0.33μF; 0805≧ 2.2μF;
1206≧ 2.2μF;1210≧ 22μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≦ 10%</td><td>≦ 15%</td><td>0402≧ 1μF;0603≧ 10μF; 0805≧ 4.7μF;
1206≧ 47μF :1210≧ 100μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 2.2μF</td></tr>
<tr><td>4V</td><td>≦ 15%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="8">10GΩ or RxC≧ 100 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table></td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>11.</td><td>Mechanical Shock
MIL-STD-202
Method 213</td><td>* Peak value: 1500g's.
* Wave: 1/2 sine.
* Velocity: 15.4 ft/sec
* Three shocks in each direction should be applied along
3 mutually perpendicular axes of the test specimen
(18 shocks)</td><td>* No remarkable damage.
* Cap.: within the specified tolerance.
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 2.5%</td><td>≦ 3%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF;1206≧ 0.47μF</td></tr>
<tr><td>≦ 5%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 3.5%</td><td>≦ 10%</td><td>0805≥2.2μF; 1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 3.5%</td><td>≦ 5%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 7%</td><td>0603≧ 0.33μF; 1206≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.10μF;0603≧ 0.47μF; 0805≧ 2.2μF; 1206≧ 6.8μF ; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 3.5%</td><td>≦ 5%</td><td>0402≧ 0.033μF; 0603≧ 0.15μF; 0805≧ 0.68μF; 1206≧ 2.2μF;1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.22uF; 0603≧ 0.68μF;0805≧ 2.2μF; 1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0402≧ 0.33μF;0603≧ 0.33μF; 0805≧ 2.2μF; 1206≧ 2.2μF;1210≧ 22μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≦ 10%</td><td>≦ 15%</td><td>0402≧ 1μF;0603≧ 10μF; 0805≧ 4.7μF; 1206≧ 47μF :1210≧ 100μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 2.2μF</td></tr>
<tr><td>4V</td><td>≦ 15%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">10GΩ or RxC≧ 100 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table></td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>12.</td><td>Vibration
MIL-STD-202
Method 204</td><td>* Vibration frequency: 10~2000 Hz/min.
(5g's for 20 min)
* Total amplitude: 1.5mm
* 12 cycles each of 3 orientations (36 times)</td><td>* No remarkable damage.
* Cap.: within the specified tolerance.
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 2.5%</td><td>≦ 3%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF;1206≧ 0.47μF</td></tr>
<tr><td>≦ 5%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 3.5%</td><td>≦ 10%</td><td>0805≥2.2μF; 1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 3.5%</td><td>≦ 5%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 7%</td><td>0603≧ 0.33μF; 1206≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.10μF;0603≧ 0.47μF; 0805≧ 2.2μF;
1206≧ 6.8μF ; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 3.5%</td><td>≦ 5%</td><td>0402≧ 0.033μF; 0603≧ 0.15μF; 0805≧ 0.68μF;
1206≧ 2.2μF;1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.22uF; 0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0402≧ 0.33μF;0603≧ 0.33μF; 0805≧ 2.2μF;
1206≧ 2.2μF;1210≧ 22μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≦ 10%</td><td>≦ 15%</td><td>0402≧ 1μF;0603≧ 10μF; 0805≧ 4.7μF;
1206≧ 47μF :1210≧ 100μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 2.2μF</td></tr>
<tr><td>4V</td><td>≦ 15%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">10GΩ or RxC≧ 100 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table></td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>13.</td><td>Resistance to Soldering Heat
MIL-STD-202
Method 210</td><td>* Solder temperature: 270±5℃
* Dipping time: 10±1 sec
* Before initial measurement (X7R only): Perform 150+0/-10℃ for 1 hr and then set for 24±2 hrs
at room temp.
* Measurement to be made after keeping at room temp.
for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change: C0G: within ±2.5% or 0.25pF whichever is larger
X7R: within 7.5%
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 2.5%</td><td>≦ 3%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF;1206≧ 0.47μF</td></tr>
<tr><td>≦ 5%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 3.5%</td><td>≦ 10%</td><td>0805≥2.2μF; 1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 3.5%</td><td>≦ 5%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 7%</td><td>0603≧ 0.33μF; 1206≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.10μF;0603≧ 0.47μF; 0805≧ 2.2μF; 1206≧ 6.8μF ; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 3.5%</td><td>≦ 5%</td><td>0402≧ 0.033μF; 0603≧ 0.15μF; 0805≧ 0.68μF; 1206≧ 2.2μF;1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.22uF; 0603≧ 0.68μF;0805≧ 2.2μF; 1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0402≧ 0.33μF;0603≧ 0.33μF; 0805≧ 2.2μF; 1206≧ 2.2μF;1210≧ 22μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≦ 10%</td><td>≦ 15%</td><td>0402≧ 1μF;0603≧ 10μF; 0805≧ 4.7μF; 1206≧ 47μF :1210≧ 100μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 2.2μF</td></tr>
<tr><td>4V</td><td>≦ 15%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">10GΩ or RxC≧ 100 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table></td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>14</td><td>Thermal Shock
MIL-STD-202
Method 107</td><td>* Conduct 300 cycles according to the temperatures and time.
<table>
<tr><th>Step</th><th>Temp. (℃)</th><th>Time (min.)</th></tr>
<tr><td>1</td><td>-55℃ +0/-3</td><td>15±3</td></tr>
<tr><td>2</td><td>+125℃ +3/-0</td><td>15±3</td></tr>
</table>
* Max. transfer time: 20 sec.
* Before initial measurement (X7R only): Perform 150+0/-10℃ for 1 hr and then set for 24±2 hrs
at room temp.
* Measurement to be made after keeping at room temp.
for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change：C0G: within ±2.5% or 0.25pF whichever is larger
X7R: within 10.0%
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 3%</td><td>≦ 6%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF; 1206≧ 0.47μF</td></tr>
<tr><td>≦ 10%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 20%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 5%</td><td>≦ 20%</td><td>0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 5%</td><td>≦ 10%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 14%</td><td>0603≧ 0.33μF;1206≧ 4.7μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.10μF;0603≧ 0.47μF;0805≧ 2.2μF;1206≧ 6
1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0603≧ 0.15μF;0805≧ 0.68μF;1206≧ 2.2μF;1210≧ 4</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 0.033μF;0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 7.5%</td><td>≦ 15%</td><td>0402≧ 0.33μF; 0603≧ 0.33μF;0805≧ 2.2μF;
1206≧ 2.2μF; 1210≧ 22μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 1μF</td></tr>
<tr><td>6.3V</td><td>≦ 15%</td><td>≦ 30%</td><td>0402≧ 1μF;0603≧ 10μF;
0805≧ 4.7μF;1206≧ 47μF;1210≧ 100μF</td></tr>
<tr><td>4V</td><td>≦ 20%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="8">1GΩ or RxC≧ 10 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table></td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>15.</td><td>ESD
AEC-Q200-002</td><td>Per AEC-Q200-002</td><td>
* No remarkable damage.
* Cap.: within the specified tolerance.
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 2.5%</td><td>≦ 3%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF;1206≧ 0.47μF</td></tr>
<tr><td>≦ 5%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 3.5%</td><td>≦ 10%</td><td>0805≥2.2μF; 1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 3.5%</td><td>≦ 5%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 7%</td><td>0603≧ 0.33μF; 1206≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.10μF;0603≧ 0.47μF; 0805≧ 2.2μF;
1206≧ 6.8μF ; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 3.5%</td><td>≦ 5%</td><td>0402≧ 0.033μF; 0603≧ 0.15μF; 0805≧ 0.68μF;
1206≧ 2.2μF;1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.22uF; 0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0402≧ 0.33μF;0603≧ 0.33μF; 0805≧ 2.2μF;
1206≧ 2.2μF;1210≧ 22μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≦ 10%</td><td>≦ 15%</td><td>0402≧ 1μF;0603≧ 10μF; 0805≧ 4.7μF;
1206≧ 47μF :1210≧ 100μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 2.2μF</td></tr>
<tr><td>4V</td><td>≦ 15%</td><td>---</td><td>---</td></tr>
</table>
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="7">10GΩ or RxC≧ 100 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table>
</td></tr>
<tr><td>16.</td><td>Solderability
J-STD-002
JESD22-B102E</td><td>
* Condition A
Un-mounted chips 4hrs / 155°C*dry then completely immersed for 5±0.5 sec in solder bath at 245±5°C.
* Condition B
Un-mounted chips steam 8 hrs then completely immersed for 10±1sec in solder bath at 220+5/-0°C.
* Condition C
Un-mounted chips steam 8 hrs then completely immersed for 10±1 sec. in solder bath at 260+0/-5°C.
</td><td>All terminations shall exhibit a continuous solder coating free from defects from a minimum of 95% of the critical surface area of any individual termination.</td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

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<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>17.</td><td>Electrical Characterization</td><td>* Capacitance
* Q/ D.F. (Dissipation Factor)
C0G:
Cap≤1000pF 1.0±0.2Vrms, 1MHz±10%
Cap>1000pF 1.0±0.2Vrms, 1KHz±10%

X7R:
Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25℃ ambient temperature.</td><td>* Capacitance within the specified tolerance.
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 2.5%</td><td>≦ 3%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF;1206≧ 0.47μF</td></tr>
<tr><td>≦ 5%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 3.5%</td><td>≦ 10%</td><td>0805≥2.2μF; 1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 3.5%</td><td>≦ 5%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 7%</td><td>0603≧ 0.33μF; 1206≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.10μF;0603≧ 0.47μF; 0805≧ 2.2μF;
1206≧ 6.8μF ; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 3.5%</td><td>≦ 5%</td><td>0402≧ 0.033μF; 0603≧ 0.15μF; 0805≧ 0.68μF;
1206≧ 2.2μF;1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.22uF; 0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0402≧ 0.33μF;0603≧ 0.33μF; 0805≧ 2.2μF;
1206≧ 2.2μF;1210≧ 22μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≦ 10%</td><td>≦ 15%</td><td>0402≧ 1μF;0603≧ 10μF; 0805≧ 4.7μF;
1206≧ 47μF :1210≧ 100μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 2.2μF</td></tr>
<tr><td>4V</td><td>≦ 15%</td><td>---</td><td>---</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td>* Insulation Resistance
To apply rated voltage for max. 120 sec.</td><td>* IR. ≥10GΩ or RxC≥500Ω-F whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>Insulation Resistance</th></tr>
<tr><td>100V: X7R</td><td rowspan="8">10GΩ or RxC≧ 100 Ω-F whichever is smaller.</td></tr>
<tr><td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td></tr>
<tr><td>35V:0805≥2.2μF;1210≧ 10μF</td></tr>
<tr><td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥</td></tr>
<tr><td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210</td></tr>
<tr><td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF;
1206≥4.7μF;1210≥47μF</td></tr>
<tr><td>6.3V ; 4V</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td>* Dielectric Strength
To apply 250% of rated voltage, duration 1~5 sec,
charge and discharge current less than 50mA.</td><td>* Dielectric strength
No evidence of damage or flash over during test.</td></tr>
<tr><td></td><td></td><td>* Temperature Coefficient (with no electrical load)
Operation temperature: -55~125℃ at 25℃</td><td>* Temperature Coefficient
Capacitance Change: C0G: Within ±30ppm/℃
X7R: Within ±15%</td></tr>
</table>

8.RELIABILITY TEST CONDITIONS AND REQUIREMENTS

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td>18.</td><td>Board Flex
AEC-Q200-005</td><td>* The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 3mm (2mm for X7R) and then the pressure shall be maintained for 5±1 sec.
* Measurement to be made after keeping at room temp. for 24±2 hrs.</td><td>* No remarkable damage.
* Cap change： C0G: within ±5% or 0.5pF whichever is larger
X7R: within ±12.5%
(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</td></tr>
<tr><td>19.</td><td>Terminal Strength
AEC-Q200-006</td><td>* Pressurizing force：2N (0402), 5N(0603), 10N(0805), 17.7N(≥1206).
* Test time: 60±1 sec.</td><td>* No remarkable damage or removal of the terminations.
* Capacitance within the specified tolerance.
* Q/D.F. value:
C0G: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.
X7R:
<table>
<tr><th>Rated vol.</th><th>D.F.≦</th><th colspan="2">Exception of D.F. ≦</th></tr>
<tr><td rowspan="3">≧ 50V</td><td rowspan="3">≦ 2.5%</td><td>≦ 3%</td><td>0603≧ 0.047μF; 0805≧ 0.18μF;1206≧ 0.47μF</td></tr>
<tr><td>≦ 5%</td><td>1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0603≧ 1μF; 0805≧ 1μF;1206≧ 4.7μF; 1210≧ 10μF</td></tr>
<tr><td>35V</td><td>≦ 3.5%</td><td>≦ 10%</td><td>0805≥2.2μF; 1210≧ 10μF</td></tr>
<tr><td rowspan="3">25V</td><td rowspan="3">≦ 3.5%</td><td>≦ 5%</td><td>0805≧ 1μF; 1210≧ 10μF</td></tr>
<tr><td>≦ 7%</td><td>0603≧ 0.33μF; 1206≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.10μF;0603≧ 0.47μF; 0805≧ 2.2μF;
1206≧ 6.8μF ; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">16V</td><td rowspan="2">≦ 3.5%</td><td>≦ 5%</td><td>0402≧ 0.033μF; 0603≧ 0.15μF; 0805≧ 0.68μF;
1206≧ 2.2μF;1210≧ 4.7μF</td></tr>
<tr><td>≦ 10%</td><td>0402≧ 0.22uF; 0603≧ 0.68μF;0805≧ 2.2μF;
1206≧ 4.7μF; 1210≧ 22μF</td></tr>
<tr><td rowspan="2">10V</td><td rowspan="2">≦ 5%</td><td>≦ 10%</td><td>0402≧ 0.33μF;0603≧ 0.33μF; 0805≧ 2.2μF;
1206≧ 2.2μF;1210≧ 22μF</td></tr>
<tr><td>≦ 15%</td><td>0402≧ 1μF</td></tr>
<tr><td rowspan="2">6.3V</td><td rowspan="2">≦ 10%</td><td>≦ 15%</td><td>0402≧ 1μF;0603≧ 10μF; 0805≧ 4.7μF;
1206≧ 47μF :1210≧ 100μF</td></tr>
<tr><td>≦ 20%</td><td>0402≧ 2.2μF</td></tr>
<tr><td>4V</td><td>≦ 15%</td><td>---</td><td>---</td></tr>
</table></td></tr>
<tr><td>20</td><td>Beam Load Test
AEC-Q200-003</td><td>* Break strength test
* Beam speed: 2.5±0.25 mm/sec</td><td>The chip endure following force
* Chip length ≤2.5mm: Thickness >0.5mm (20N), ≤0.5mm (8N)
* Chip length ≥3.2mm: Thickness ≥1.25mm (54.5N), <1.25mm (15N)</td></tr>
</table>

9.PACKAGE DIMENSION AND QUANTITY

Size	Thickness (mm)	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
0201 (0603)	0.30±0.03	15k	70K	-	-
0402 (1005)	0.50±0.05	10k	50K	-	-
	0.50+0.02/-0.05	10k	50K		
	0.50±0.20	10k			
0603 (1608)	0.80±0.07	4k	15k	-	-
	0.80+0.15/-0.10	4k	15k		
0805 (2012)	0.60±0.10	4k	15k	-	-
	0.80±0.10	4k	15k	-	-
	1.25±0.10	-	-	3k	10k
	1.25±0.20	-	-	3k	-
1206 (3216)	0.80±0.10	4k	15k	-	-
	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
1210 (3225)	0.95±0.10	-	-	3k	10k
	1.25±0.10	-	-	3k	10k
	1.60±0.20	-	-	2k	-
	2.50±0.30	-	-	1k	-
1808 (4520)	1.25±0.10	-	-	2k	-
	1.60±0.20	-	-	2k	-
	2.00±0.20	-	-	1k	-
1812 (4532)	1.25±0.10	-	-	1k	-
	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
1825 (4563)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	-
	2.80±0.30	-	-	0.5k	-
2220 (5750)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	
	2.80±0.30	-	-	0.5k	-
2225 (5763)	1.60±0.20	-	-	1k	-
	2.00±0.20	-	-	1k	-
	2.50±0.30	-	-	0.5k	
	2.80±0.30	-	-	0.5k	-

Unit: pcs

9.PACKAGE DIMENSION AND QUANTITY

9.1. EMBOSSED TAPE DIMENSIONS

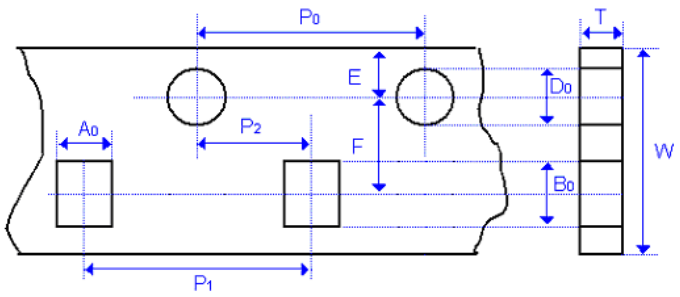


Fig. 9.1 The dimension of paper tape

9.2. EMBOSSED TAPE DIMENSIONS

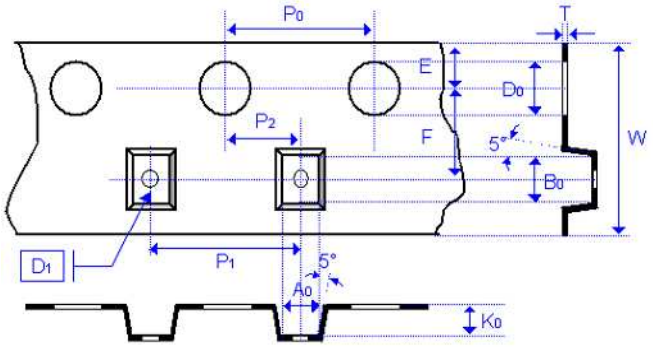


Fig. 9.2 The dimension of plastic tape

Size	0201	0402	0603		0805	
Chip Thickness	0.30±0.03	0.50±0.10	0.80±0.07	0.80+0.15/-0.1	0.80±0.10	1.25±0.10 1.25±0.20
A_0	0.39 +/-0.07	0.70 +/-0.2	1.00+0.05/-0.1	1.02+0.05/-0.1	1.50±0.10	<1.65
B_0	0.69 +/-0.07	1.20 +/-0.2	1.80±0.10	1.80±0.10	2.30±0.10	<2.40
T	≦0.50	≦0.80	0.95±0.05	0.97±0.05	0.95±0.05	0.23±0.05
K_0	-	-	-	-	-	<2.50
W	8+/-0.10	8+/-0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P_0	4+/-0.10	4+/-0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
$10xP_0$	40+/-0.10	40+/-0.10	40.00±0.2	40.00±0.2	40.00±0.2	40.00±0.20
P_1	2+/-0.05	2+/-0.05	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
P_2	2+/-0.05	2+/-0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D_0	1.55+/-0.05	1.55+/-0.05	1.55±0.05	1.55±0.05	1.55±0. 05	1.50±0.10/-0
D_1	-	-	-	-	-	1.00±0.10
E	1.75+/-0.05	1.75+/-0.05	1.75±0.05	1.75±0.05	1.75±0. 05	1.75±0.10
F	3.5+/-0.05	3.5+/-0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05
Unit:	mm	mm	mm	mm	mm	mm

Size	1206			1210		1812	
Chip Thickness	**0.80±0.10**	**0.95±0.10 1.25±0.10**	**1.60±0.20 1.60+0.3/-0/1**	**0.95±0.10 1.25±0.10 1.60±0.20**	**2.50±0.30**	**1.25±0.10 1.60±0.20 2.00±0.20**	**2.50±0.30**
A_0	2.00±0.10	<2.00	<2.00	<3.05	<3.10	<3.90	<3.90
B_0	3.50±0.10	<3.60	<3.70	<3.80	<4.00	<5.30	<5.30
T	0.95±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0.23±0.05	0 .25±0.05	0.25±0.05
K_0	-	<2.50	<2.50	<2.50	<3.50	<2.50	<3.00
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	1 2.0±0.20	12.0±0.20
P_0	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.100	4.00±0.10	4.00±0.10	4.00±0.10
$10xP_0$	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20	40.0±0.10	40.00±0. 20	40.00±0.20
P_1	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	8 .00±0.10	8.00±0.10
P_2	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2 .00±0.05	2.00±0.05
D_0	1.55±0.05	1.50±0.10/-0	1.50±0.10/-0	1.50±0.10/-0	1.50±0.10/-0	1.50+0.10/-0	1.50+0.10/-0
D_1	-	1.00±0.10	1.00±0.10	1.00±0.10	1.00±0.10	1.50±0.10	1.50+/-0.10
E	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1 .75±0.10	1.75+/-0.1
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	5 .50±0.05	5.50+/-0.05
Unit:	mm	mm	mm	mm	mm	mm	mm

9.PACKAGE DIMENSION AND QUANTITY

9.3. REEL DIMENSIONS

Size	0201. 0402. 0603, 0805,1206, 1210			1808,1812, 1825, 2220, 2225
Reel size	7”	7”	13”	7”
C	13.0 +0.5/-0.2	13.0 +0.5/-0.2	13.0 +0.5/-0.2	13.0 +0.5/-0.2
W_1	8.4 +1.5/-0	12.4 +2.0/-0	8.4 +1.5/-0	8.4 +1.5/-0
A	178.0 ±0.10	178.0 ±0.10	330.0 ±1.0	178.0 ±0.10
N	60.0 +1.0/-0	80.0 ±1.0	100 ±1.0	60.0 +1.0/-0

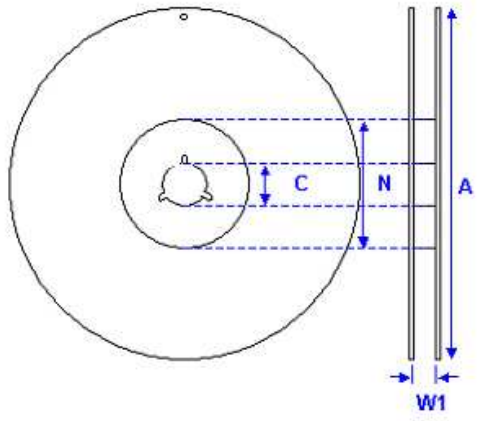


Fig. 4 The dimension of reel

10.APPLICATION NOTES

STORAGE

To prevent the damage of solderability of terminations, the following storage conditions are recommended: Indoors under 5 ~ 40℃ and 20% ~ 70% RH.

No harmful gases containing sulfuric acid, ammonia, hydrogen sulfide or chlorine.

Packaging should not be opened until the capacitors are required for use. If opened, the pack should be re-sealed as soon as is practicable. Taped product should be stored out of direct sunlight, which might promote deterioration in tape or adhesion performance. The product is recommended to be used within 12 months after shipment and checked the solderability before use.

HANDLING

Chip capacitors are dense, hard, brittle, and abrasive materials. They are liable to suffer mechanical damage, in the form of cracks or chips. Chip Capacitors should be handled with care to avoid contamination or damage. To use vacuum or plastic tweezers to pick up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

PREHEAT

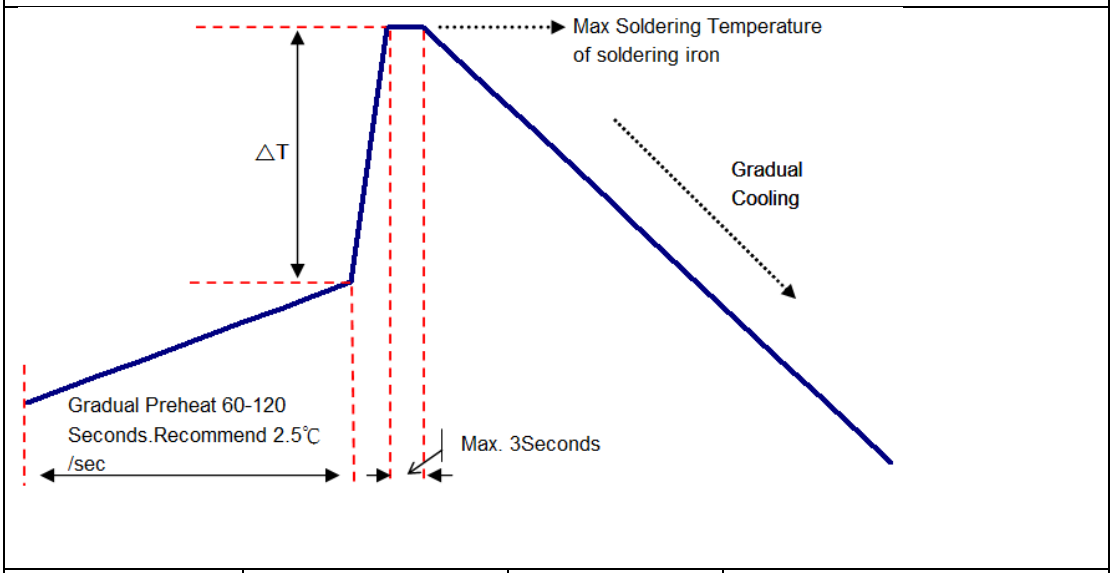
In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 3℃ per second.

SOLDERING

Use middy activated rosin RA and RMA fluxes do not use activated flux. The amount of solder in each solder joint should be controlled to prevent the damage of chip capacitors caused by the stress between solder, chips, and substrate.

a.) Hand soldering:

Hand Soldering Profile



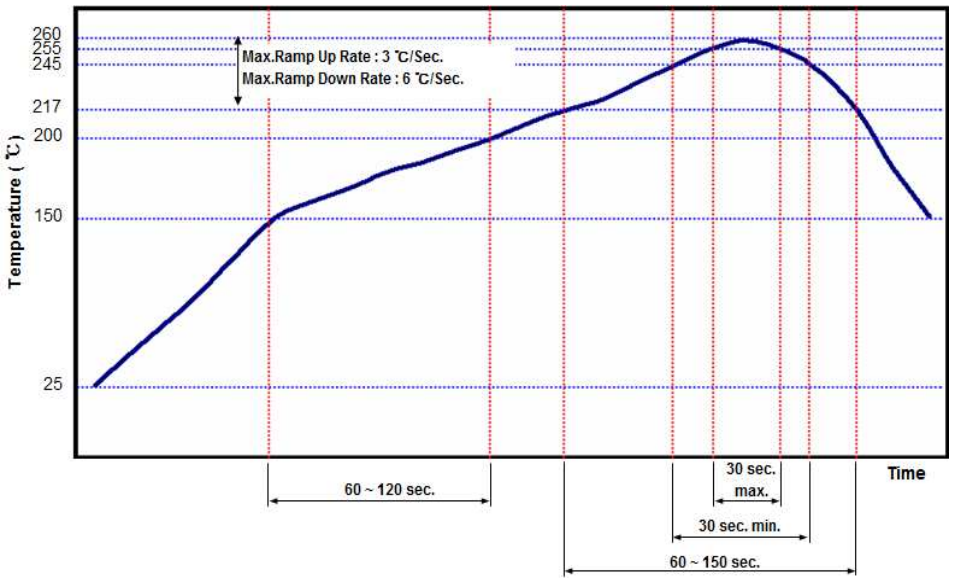
Chip Size	Pre-Heat temp.	△T	Max soldering iron temp.
≦1206	≧150 ℃	≦150 ℃	≦350 ℃
1210~2225	≧150 ℃	≦130 ℃	≦280 ℃

*Soldering iron tip diameter ≦ 1.0 mm and wattage max. 20W.
*The Capacitors shall be pre-heated and that the temperature gradient between the devices and the tip of the soldering iron.
*The required amount of solder shall be melted on the soldering tip.
*The tip of iron should not contact the ceramic body directly.
*The Capacitors shall be cooled gradually at room temperature after soldering.
*Forced air cooling is not allowed.

10.APPLICATION NOTES

b.) Reflow soldering:

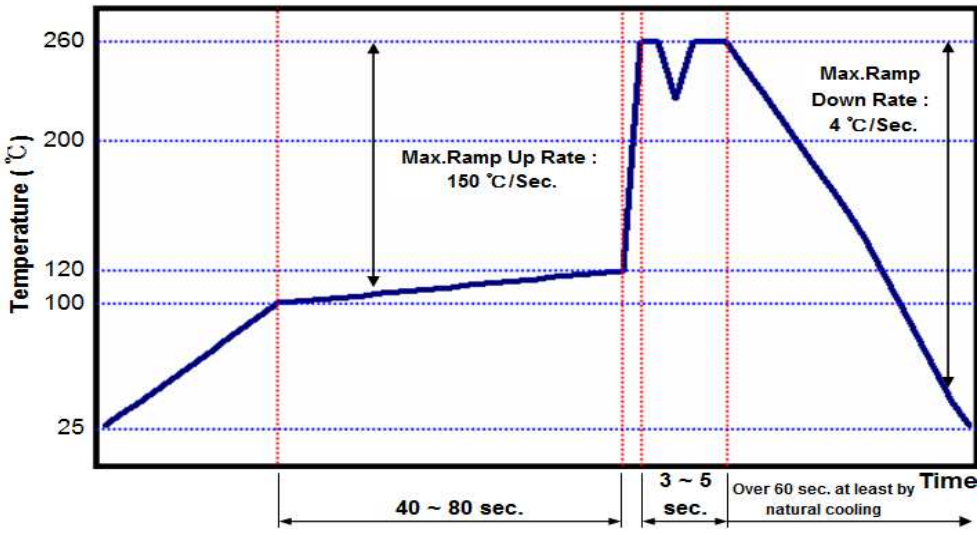
Fig.9.1 Reflow soldering profile



For Sn / Ag / Cu Series solder paste (Pb-Free)

c.) Wave soldering:

Fig.9.2 Wave soldering profile



For Sn / Ag / Cu Series solder paste (Pb-Free)

Soldering conditions:

Class I:

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
0402 (1005)	Class I – C0G	All	X	○
0603 (1608)	Class I - C0G	All	○	○
0805 (2012)	Class I - C0G	All	○	○
1206 (3216)	Class I - C0G	All	○	○
≧1210 (3225)	Class I - C0G	All	X	○

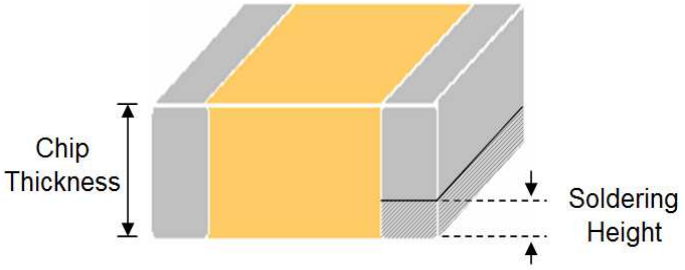
10.APPLICATION NOTES

Soldering conditions:

Class II:

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
0402 (1005)	Class II - X7R	All	X	○
0603 (1608)	Class II - X7R	Cap.＜2.2μF	○	○
		Cap.≧2.2μF	X	○
0805 (2012)	Class II - X7R	Cap.＜4.7μF	○	○
		Cap.≧4.7μF	X	○
1206 (3216)	Class II - X7R	Cap.＜4.7μF	○	○
		Cap.≧4.7μF	X	○
≧1210 (3225)	Class II - X7R	All	X	○

Soldering height:

The solder climbing minimum height is suggesting to 25% of chip thickness or 500um whichever is less. (Reference from IPC-610E)	

COOLING

After soldering, cool the chips and the substrate gradually to room temperature. Natural cooling in air is recommended to minimize stress in the solder joint.

CLEANING

All flux residues must be removed by using suitable electronic-grade vapor-cleaning solvents to eliminate contamination that could cause electrolytic surface corrosion. Good results can be obtained by using ultrasonic cleaning of the solvent. The choice of the proper system is depends upon many factors such as component mix, flux, and solder paste and assembly method. The ability of the cleaning system to remove flux residues and contamination from under the chips is very important.

Notice of MT Series

The standard AEC-Q200 series capacitors are mainly used on general automotive equipment without safety considerations. Please select SAFETY concern type or contact our company in advanced if you intend to use capacitor for designing the equipment which may damage itself and the safety of third party. If necessary, please consider to add the protect circuit in devising process and obtaining fully safety evaluation. The contents of the acknowledgments only used for our parent company, marketing subsidiaries and official marketing agents who purchase our products. Not applicable for the other nonofficial channels.