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Messrs. : 一般共用

Date : 2023/07/26

APPROVAL SHEET

Product Name : AUTOMOTIVE Multilayer Ceramic Chip Capacitors without AEC-Q200 certification

Part No. : MG Series

Description : Size 0201 to 1812, C0G/X7R/X5R, 6.3Vdc to 3000Vdc

PREPARED BY	APPROVED BY

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SPECIFICATION

FOR

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Part No. : MG Series

Description : Size 0201 to 1812, C0G/X7R/X5R, 6.3Vdc to 3000Vdc

SPEC. No. : MG-000-001-06

DATE : 2023/07/26

DRAWN BY	CHECEKED BY	APPROVED BY
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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 MG series MLCC is made by NP0, X7R & X5R dielectrics and which provides product with high electrical precision, stability and reliability. Besides, MG series MLCC is tighten controlling in quality in line to assure quality performance in automotive applications.

2. FEATURES

- A wide selection of sizes is available (0402 to 1812).
- High capacitance in given case size.
- Capacitor with lead-free termination (pure Tin).
- RoHS Compliant.
- HALOGEN compliant.

3. APPLICATIONS

- For Navigation & Information equipments.
- For entertainment equipments.
- For comfortable equipments.
- For Automotive electronic equipment.

4. HOW TO ORDER

<u>MG</u>	<u>31</u>	<u>X</u>	<u>471</u>	<u>K</u>	<u>251</u>	<u>P</u>	<u>X</u>	<u>G</u>
PDC Family	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Packaging	Thickness	Control Code
Table 1	Table 2	Table 3	Table 4	Table 5	Table 6	Table 7	Table 8	Table 9

Table 1	PDC Family
Code	Description
MG	Automotive Caps without AEC-Q200 certification

Table 2		Size			
Code	Description	Code	Description	Code	Description
03	0201 (0603)	31	1206 (3216)	46	1825 (4563)
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)

Table 3		Dielectric Material Characteristics	
Code	Description	Code	Description
N	C0G	X	X7R
B	X5R		

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

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 %	X	+10%~+20%
D	±0.50 pF	L	0% ~ +10%		
F	±1 %	M	±20 %		
G	±2 %	N	-5% ~ +10%		
H	±3 %	P	±0.02 pF		

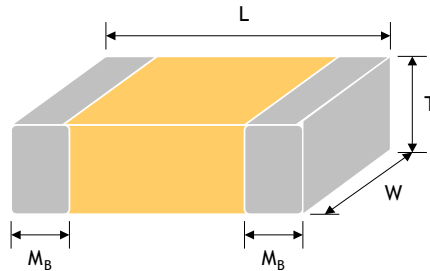
Table 6		Rated Voltage			
Code	Description	Code	Description	Code	Description
6R3	6.3Vdc	201	200Vdc	152	1500Vdc
100	10Vdc	251	250Vdc	202	2000Vdc
160	16Vdc	401	400Vdc	302	3000Vdc
250	25Vdc	501	500Vdc	402	4000Vdc
500	50Vdc	631	630Vdc	502	5000Vdc
101	100Vdc	102	1000Vdc	602	6000Vdc

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)

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	Code / T (mm)	M _B (mm)	Outline
0201 (0603)	0.6±0.03	0.3±0.03	See No.4 Reference Table 8	0.15±0.05	
	0.6±0.05 ^{#2}	0.3±0.05 ^{#2}		0.15±0.1/-	
	0.6±0.09 ^{#3}	0.3±0.09 ^{#3}			
0402 (1005)	1.00±0.05	0.50±0.05		0.25 +0.05/-0.10	
	1.00±0.20	0.50±0.20			
0603 (1608)	1.60±0.10	0.80±0.10		0.40±0.15	
	1.60+0.15/-0.10	0.80+0.15/- 0.10			
	1.60±0.20 ^{#1}	0.80±0.20 ^{#1}			
0805 (2012)	2.00±0.15	1.25±0.10		0.50±0.20	
	2.00±0.20	1.25±0.20			
1206 (3216)	3.20±0.15	1.60±0.15		0.60±0.20 (0.5±0.25) ^{***}	
	3.20±0.20	1.60±0.20			
	3.20+0.30/-0.10	1.60+0.30/-			
1210 (3225)	3.20±0.30	2.50±0.20		0.75±0.25	
	3.20±0.40	2.50±0.30			
	3.20±0.60 ^{#4}	2.50±0.50 ^{#4}			
1808 (4520)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	2.03±0.25		0.75±0.25 (0.5±0.25) ^{***}	
1812 (4532)	4.50±0.40 (4.5+0.5/-0.3) ^{**}	3.20±0.30		0.75±0.25 (0.5±0.25) ^{***}	
		3.20±0.40			Fig. 5.1 The outline of MLCC

* R = Reflow soldering process ; W = Wave soldering process.

** For 1808/1812/1825_200V~4000V and safety certificated products.

*** For 1206_≥1000V, 1808/1812_200V~4000V and safety certificated products.

#1: For 0603/Cap ≥ 10μF or 0603(≤6.3V)/Cap ≥ 4.7μF For 0603(>10V)/Cap > 1μF products.

#2: For 0201/ 0.1μF < Cap < 0.68μF products.

#3: For 0201/Cap ≥ 0.68μF products.

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6. GENERAL ELECTRICAL DATA

Dielectric	NP0	X7R	X5R
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812		
Capacitance range*	0.1pF to 0.047μF	100pF to 2.2μF	0.068μF to 10μF
Capacitance tolerance**	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)	J (±5%), K (±10%), M (±20%)	
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V, 1000V		6.3V, 10V, 16V, 25V
Tan δ*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1	
Operating temperature	-55 to +125°C		-55 to +85°C
Capacitance characteristic	±30ppm/°C		±15%
Termination	Ni/Sn (lead-free termination)		

* Measured at the condition of 30~70% related humidity.

NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature

Measured at 1.0±0.2Vrms, 1.0kHz±10% for C≤10μF; 0.5±0.2Vrms, 120Hz±20% for C>10μF, 30~70% related humidity, 25°C ambient temperature for X7R, X5R.

** Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour, then leave in ambient condition for 24±2 hours before measurement.

Note 1: X7R/X5R

Rated vol.	D.F.≤	Exception of D.F. ≤	
≥100V	≤2.5%	≤3.5%	1206≥0.47μF
		≤5%	0805>0.1μF;0603≥0.068μF;1206>1μF;1210≥2.2μF
		≤10%	0805>0.22μF;1210≥3.3μF
50V	≤2.5%	≤3.5%	0201(50V);0603≥0.047μF;0805≥0.18μF;1206≥0.47μF
		≤5%	0201≥0.01μF;1210≥3.3μF
		≤10%	0402≥0.012μF; 0603>0.1μF; 0805≥1μF(0805/X7R>0.47μF); 1206≥2.2μF; 1210≥10μF
		≤12.5%	1206≥10μF
35V	≤3.5%	≤10%	0603≥1μF;0805≥2.2μF;1206≥2.2μF;1210≥10μF
25V	≤3.5%	≤5%	0201≥0.01μF;0805≥1μF;1210≥10μF
		≤7%	0603≥0.33μF
		≤10%	0201≥0.1μF;0402≥0.10μF&(0402/X7R≥0.056μF); 0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF(1210/X5R≥10uF)
		≤12.5%	0402≥0.47μF;0805/X5R=10uF
16V	≤3.5%	≤5%	0201≥0.01μF;0402≥0.033μF;0603≥0.15μF; 0805≥0.68μF;1206≥2.2μF;1210≥4.7μF
		≤10%	0201≥0.1μF(0201/X7R≥0.022μF);0402≥0.22uF 0603≥0.47μF;0805≥2.2μF;1206≥4.7μF;1210≥22μF
10V	≤5%	≤10%	0201≥0.012μF;0402≥0.22μF 0603≥0.33μF;0805≥2.2μF;1206≥2.2μF;1210≥22μF;01R5
		≤15%	0201≥0.1μF(0201/X5R>0.1uF); 0402≥1μFV;0603/X5R≥10μF;
6.3V	≤10%	≤15%	0201≥0.1μF(0201/X5R>0.1uF);0402≥1μF;0603≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF
		≤20%	0402≥2.2μF
4V	≤15%	---	---

7. CAPACITANCE RANGE

7-1 C0G

DIELECTRIC		NP0																
SIZE		0201					0402					0603						
RATED VOLTAGE		10	16	25	50	100	10	16	25	50	100	10	16	25	50	100	200	250
Capacitance	0.1pF (0R1)	L	L	L	L	L	N	N	N	N	N							
	0.2pF (0R2)	L	L	L	L	L	N	N	N	N	N							
	0.3pF (0R3)	L	L	L	L	L	N	N	N	N	N							
	0.4pF (0R4)	L	L	L	L	L	N	N	N	N	N							
	0.5pF (0R5)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.6pF (0R6)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.7pF (0R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.8pF (0R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	0.9pF (0R9)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.0pF (1R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.2pF (1R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.5pF (1R5)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	1.8pF (1R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.0pF (2R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.2pF (2R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	2.7pF (2R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.0pF (3R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.3pF (3R3)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	3.9pF (3R9)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	4.0pF (4R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	4.7pF (4R7)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	5.0pF (5R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	5.6pF (5R6)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	6.0pF (6R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	6.8pF (6R8)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	7.0pF (7R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	8.0pF (8R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	8.2pF (8R2)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	9.0pF (9R0)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	10pF (100)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	12pF (120)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	15pF (150)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	18pF (180)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	22pF (220)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	27pF (270)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	33pF (330)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	39pF (390)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	47pF (470)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	56pF (560)	L	L	L	L	L	N	N	N	N	N	S	S	S	S	S	S	S
	68pF (680)	L	L	L	L		N	N	N	N	N	S	S	S	S	S	S	S
	82pF (820)	L	L	L	L		N	N	N	N	N	S	S	S	S	S	S	S
	100pF (101)	L	L	L	L		N	N	N	N	N	S	S	S	S	S	S	S
	120pF (121)	L	L	L	L		N	N	N	N	N	S	S	S	S	S	S	S
	150pF (151)						N	N	N	N	N	S	S	S	S	S	S	S
	180pF (181)						N	N	N	N	N	S	S	S	S	S	S	S
	220pF (221)						N	N	N	N	N	S	S	S	S	S	S	S
270pF (271)						N	N	N	N		S	S	S	S	S	B	B	
330pF (331)						N	N	N	N		S	S	S	S	S	B	B	
390pF (391)						N	N	N	N		S	S	S	S	S	B	B	
470pF (471)						N	N	N	N		S	S	S	S	S	B	B	
560pF (561)						N	N	N	N		S	S	S	S	S	B	B	
680pF (681)						N	N	N	N		S	S	S	S	S	B	B	
820pF (821)						N	N	N	N		S	S	S	S	S	B	B	
1,000pF (102)						N	N	N	N		S	S	S	S	S			
1,200pF (122)											B	B	B	B	B			
1,500pF (152)											B	B	B	B	B			
1,800pF (182)											B	B	B	B	B			
2,200pF (222)											B	B	B	B				
2,700pF (272)											B	B	B	B				
3,300pF (332)											B	B	B	B				
3,900pF (392)																		
4,700pF (472)																		
5,600pF (562)																		
6,800pF (682)																		
8,200pF (822)																		
0.01uF (103)																		

7. CAPACITANCE RANGE

7-1 C0G

DIELECTRIC		NP0								
SIZE		0805								
RATED VOLTAGE		10	16	25	50	100	200	250	500	630
Capacitance	0.5pF (0R5)	A	A	A	A	A	A	A	A	A
	0.6pF (0R6)	A	A	A	A	A	A	A	A	A
	0.7pF (0R7)	A	A	A	A	A	A	A	A	A
	0.8pF (0R8)	A	A	A	A	A	A	A	A	A
	0.9pF (0R9)	A	A	A	A	A	A	A	A	A
	1.0pF (1R0)	A	A	A	A	A	A	A	A	A
	1.2pF (1R2)	A	A	A	A	A	A	A	A	A
	1.5pF (1R5)	A	A	A	A	A	A	A	A	A
	1.8pF (1R8)	A	A	A	A	A	A	A	A	A
	2.2pF (2R2)	A	A	A	A	A	A	A	A	A
	2.7pF (2R7)	A	A	A	A	A	A	A	A	A
	3.3pF (3R3)	A	A	A	A	A	A	A	A	A
	3.9pF (3R9)	A	A	A	A	A	A	A	A	A
	4.7pF (4R7)	A	A	A	A	A	A	A	A	A
	5.6pF (5R6)	A	A	A	A	A	A	A	A	A
	6.8pF (6R8)	A	A	A	A	A	A	A	A	A
	8.2pF (8R2)	A	A	A	A	A	A	A	A	A
	10pF (100)	A	A	A	A	A	A	A	A	A
	12pF (120)	A	A	A	A	A	A	A	A	A
	15pF (150)	A	A	A	A	A	A	A	A	A
	18pF (180)	A	A	A	A	A	A	A	A	A
	22pF (220)	A	A	A	A	A	A	A	A	A
	27pF (270)	A	A	A	A	A	A	A	A	A
	33pF (330)	A	A	A	A	A	A	A	A	A
	39pF (390)	A	A	A	A	A	A	A	A	A
	47pF (470)	A	A	A	A	A	A	A	A	A
	56pF (560)	A	A	A	A	A	A	A	A	A
	68pF (680)	A	A	A	A	A	A	A	A	A
	82pF (820)	A	A	A	A	A	A	A	X	X
	100pF (101)	A	A	A	A	A	X	X	X	X
	120pF (121)	A	A	A	A	A	X	X	C	C
	150pF (151)	A	A	A	A	A	C	C	C	C
	180pF (181)	A	A	A	A	A	C	C	C	C
	220pF (221)	A	A	A	A	A	C	C	C	C
	270pF (271)	A	A	A	A	A	C	C	C	C
	330pF (331)	A	A	A	A	A	C	C	C	C
	390pF (391)	X	X	X	X	X	C	C	C	C
	470pF (471)	X	X	X	X	X	C	C	I	I
	560pF (561)	X	X	X	X	X	C	C	I	I
	680pF (681)	X	X	X	X	X	C	C	I	I
	820pF (821)	X	X	X	X	X	C	C	I	I
	1,000pF (102)	X	X	X	X	X	C	C	I	I
	1,200pF (122)	X	X	X	X	X	C	C	I	I
	1,500pF (152)	X	X	X	X	X	C	C	I	I
	1,800pF (182)	X	X	X	X	X	C	C	I	I
	2,200pF (222)	X	X	X	X	X	C	C	I	I
	2,700pF (272)	C	C	C	C	C	I	I		
	3,300pF (332)	C	C	C	C	C	I	I		
	3,900pF (392)	C	C	C	C	C	I	I		
	4,700pF (472)	C	C	C	C	C	I	I		
	5,600pF (562)	C	C	C	C	C				
	6,800pF (682)	C	C	C	C	C				
	8,200pF (822)	C	C	C	C	C				
	0.01μF (103)	C	C	C	C	C				
	0.012μF (123)	C	C	C	C	C				
	0.015μF (153)	C	C	C	C	C				
	0.018μF (183)	C	C	C	C	C				
	0.022μF (223)	C	C	C	C	C				

7. CAPACITANCE RANGE

7-1 C0G

DIELECTRIC		NP0									
SIZE		1206									
RATED VOLTAGE		10	16	25	50	100	200	250	500	630	1000
Capacitance	1.0pF (1R0)										
	1.2pF (1R2)	X	X	X	X	X	X	X	X	X	
	1.5pF (1R5)	X	X	X	X	X	X	X	X	X	X
	1.8pF (1R8)	X	X	X	X	X	X	X	X	X	X
	2.2pF (2R2)	X	X	X	X	X	X	X	X	X	X
	2.7pF (2R7)	X	X	X	X	X	X	X	X	X	X
	3.3pF (3R3)	X	X	X	X	X	X	X	X	X	X
	3.9pF (3R9)	X	X	X	X	X	X	X	X	X	X
	4.7pF (4R7)	X	X	X	X	X	X	X	X	X	X
	5.6pF (5R6)	X	X	X	X	X	X	X	X	X	X
	6.8pF (6R8)	X	X	X	X	X	X	X	X	X	X
	8.2pF (8R2)	X	X	X	X	X	X	X	X	X	X
	10pF (100)	X	X	X	X	X	X	X	X	X	X
	12pF (120)	X	X	X	X	X	X	X	X	X	X
	15pF (150)	X	X	X	X	X	X	X	X	X	X
	18pF (180)	X	X	X	X	X	X	X	X	X	X
	22pF (220)	X	X	X	X	X	X	X	X	X	C
	27pF (270)	X	X	X	X	X	X	X	X	X	C
	33pF (330)	X	X	X	X	X	X	X	X	X	C
	39pF (390)	X	X	X	X	X	X	X	X	X	C
	47pF (470)	X	X	X	X	X	X	X	X	X	C
	56pF (560)	X	X	X	X	X	X	X	X	X	C
	68pF (680)	X	X	X	X	X	X	X	X	X	C
	82pF (820)	X	X	X	X	X	X	X	X	X	C
	100pF (101)	X	X	X	X	X	X	X	X	X	C
	120pF (121)	X	X	X	X	X	X	X	X	X	C
	150pF (151)	X	X	X	X	X	X	X	X	X	C
	180pF (181)	X	X	X	X	X	X	X	X	X	E
	220pF (221)	X	X	X	X	X	X	X	X	X	E
	270pF (271)	X	X	X	X	X	X	M	M	M	E
	330pF (331)	X	X	X	X	X	X	M	M	M	E
	390pF (391)	X	X	X	X	X	X	M	M	M	E
	470pF (471)	X	X	X	X	X	M	M	M	M	E
	560pF (561)	X	X	X	X	X	M	C	C	C	E
	680pF (681)	X	X	X	X	X	M	C	C	C	E
	820pF (821)	X	X	X	X	X	M	E	E	E	E
	1,000pF (102)	X	X	X	X	X	M	E	E	E	E
	1,200pF (122)	X	X	X	X	X	M	E	E	E	
	1,500pF (152)	X	X	X	X	X	C	E	E	E	
	1,800pF (182)	X	X	X	X	X	C	E	E	E	
	2,200pF (222)	X	X	X	X	X	C	E	E	E	
	2,700pF (272)	X	X	X	X	X	C	E	E	E	
	3,300pF (332)	X	X	X	X	X	C	E	E	E	
	3,900pF (392)	X	X	X	X	X	C	E	E	E	
	4,700pF (472)	X	X	X	X	X	C	E	E	E	
	5,600pF (562)	X	X	X	X	X	E	E			
	6,800pF (682)	M	M	M	M	M	E	E			
	8,200pF (822)	C	C	C	C	C	E	E			
	0.01uF (103)	C	C	C	C	C	E	E			

7. CAPACITANCE RANGE

7-1 C0G

DIELECTRIC		NP0									
SIZE		1210									
RATED VOLTAGE (VDC)		10	16	25	50	100	200	250	500	630	1000
Capacitance	10pF (100)	M	M	M	M	M	M	M	M	M	M
	12pF (120)	M	M	M	M	M	M	M	M	M	M
	15pF (150)	M	M	M	M	M	M	M	M	M	M
	18pF (180)	M	M	M	M	M	M	M	M	M	M
	22pF (220)	M	M	M	M	M	M	M	M	M	M
	27pF (270)	M	M	M	M	M	M	M	M	M	M
	33pF (330)	M	M	M	M	M	M	M	M	M	M
	39pF (390)	M	M	M	M	M	M	M	M	M	M
	47pF (470)	M	M	M	M	M	M	M	M	M	M
	56pF (560)	M	M	M	M	M	M	M	M	M	M
	68pF (680)	M	M	M	M	M	M	M	M	M	M
	82pF (820)	M	M	M	M	M	M	M	M	M	M
	100pF (101)	M	M	M	M	M	M	M	M	M	C
	120pF (121)	M	M	M	M	M	M	M	M	M	C
	150pF (151)	M	M	M	M	M	M	M	M	M	C
	180pF (181)	M	M	M	M	M	M	M	M	M	C
	220pF (221)	M	M	M	M	M	M	M	M	M	E
	270pF (271)	M	M	M	M	M	M	M	M	M	E
	330pF (331)	M	M	M	M	M	M	M	M	M	E
	390pF (391)	M	M	M	M	M	M	M	M	M	E
	470pF (471)	M	M	M	M	M	M	M	M	M	E
	560pF (561)	M	M	M	M	M	M	M	M	M	E
	680pF (681)	M	M	M	M	M	M	M	M	M	E
	820pF (821)	M	M	M	M	M	M	M	M	M	E
	1,000pF (102)	M	M	M	M	M	C	C	C	C	E
	1,200pF (122)	M	M	M	M	M	C	C	C	C	F
	1,500pF (152)	M	M	M	M	M	C	C	C	C	F
	1,800pF (182)	M	M	M	M	M	C	C	C	C	F
	2,200pF (222)	M	M	M	M	M	C	C	C	C	F
	2,700pF (272)	M	M	M	M	M	C	C	C	C	F
	3,300pF (332)	M	M	M	M	M	C	C	C	C	F
	3,900pF (392)	M	M	M	M	M	C	C	C	C	F
	4,700pF (472)	M	M	M	M	M	E	E	E	E	F
	5,600pF (562)	M	M	M	M	M	E	E	E	E	F
	6,800pF (682)	M	M	M	M	M	E	E	E	E	F
	8,200pF (822)	M	M	M	M	M	E	E	E	E	F
	0.010μF (103)	M	M	M	M	M	E	E	F	F	G
	0.012μF (123)	C	C	C	C	C	F	F	G	G	G
	0.015μF (153)	C	C	C	C	C	F	F	G	G	G
	0.018μF (183)	F	F	F	F	F	F	F			
	0.022μF (223)	F	F	F	F	F	F	F			
	0.027μF (273)	F	F	F	F	F	F	F			
	0.033μF (333)	F	F	F	F	F	F	F			
	0.039μF (393)	F	F	F	F	F	F	F			
	0.047μF (473)	F	F	F	F	F	F	F			

7. CAPACITANCE RANGE

7-1 C0G

DIELECTRIC SIZE		NP0 1812				
RATED VOLTAGE		10	16	25	50	100
Capacitance	10pF (100)					C
	12pF (120)					C
	15pF (150)					C
	18pF (180)					C
	22pF (220)					C
	27pF (270)					C
	33pF (330)					C
	39pF (390)					C
	47pF (470)					C
	56pF (560)					C
	68pF (680)					C
	82pF (820)					C
	100pF (101)					C
	120pF (121)					C
	150pF (151)					C
	180pF (181)					C
	220pF (221)					C
	270pF (271)					C
	330pF (331)					C
	390pF (391)					C
	470pF (471)					C
	560pF (561)					C
	680pF (681)					C
	820pF (821)					C
	1,000pF (102)	C	C	C	C	C
	1,200pF (122)	C	C	C	C	C
	1,500pF (152)	C	C	C	C	C
	1,800pF (182)	C	C	C	C	C
	2,200pF (222)	C	C	C	C	C
	2,700pF (272)	C	C	C	C	C
	3,300pF (332)	C	C	C	C	C
	3,900pF (392)	C	C	C	C	C
	4,700pF (472)	C	C	C	C	C
	5,600pF (562)	C	C	C	C	C
	6,800pF (682)	C	C	C	C	C
	8,200pF (822)	C	C	C	C	C
	0.010μF (103)	C	C	C	C	C
	0.012μF (123)	C	C	C	C	C
	0.015μF (153)	C	C	C	C	C
	0.018μF (183)	C	C	C	C	C
	0.022μF (223)	C	C	C	C	C
	0.027μF (273)	C	C	C	C	C
	0.033μF (333)	C	C	C	C	C
	0.039μF (393)					

7. CAPACITANCE RANGE

7-2 X7R

DIELECTRIC		X7R														
SIZE		0201				0402					0603					
RATED VOLTAGE		10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	100
Capacitance	100pF (101)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	120pF (121)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	150pF (151)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	180pF (181)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	220pF (221)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	270pF (271)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	330pF (331)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	390pF (391)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	470pF (471)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	560pF (561)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	680pF (681)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	820pF (821)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	1,000pF (102)	L	L	L	L		N	N	N	N	S	S	S	S	S	S
	1,200pF (122)	L	L	L			N	N	N	N	S	S	S	S	S	S
	1,500pF (152)	L	L	L			N	N	N	N	S	S	S	S	S	S
	1,800pF (182)	L	L	L			N	N	N	N	S	S	S	S	S	S
	2,200pF (222)	L	L	L			N	N	N	N	S	S	S	S	S	S
	2,700pF (272)	L	L	L			N	N	N	N	S	S	S	S	S	S
	3,300pF (332)	L	L	L			N	N	N	N	S	S	S	S	S	S
	3,900pF (392)	L	L	L			N	N	N	N	S	S	S	S	S	S
	4,700pF (472)	L	L	L			N	N	N	N	S	S	S	S	S	S
	5,600pF (562)	L	L	L			N	N	N	N	S	S	S	S	S	S
	6,800pF (682)	L					N	N	N	N	S	S	S	S	S	S
	8,200pF (822)	L					N	N	N	N	S	S	S	S	S	S
	0.010μF (103)	L					N	N	N	N	S	S	S	S	S	S
	0.012μF (123)						N	N	N		S	S	S	S	S	B
	0.015μF (153)						N	N	N		S	S	S	S	S	B
	0.018μF (183)						N	N	N		S	S	S	S	S	B
	0.022μF (223)						N	N	N		S	S	S	S	S	B
	0.027μF (273)						N	N	N		S	S	S	S	S	B
	0.033μF (333)						N	N	N		S	S	S	S	B	B
	0.039μF (393)						N	N	N		S	S	S	S	B	B
	0.047μF (473)						N	N	N		S	S	S	S	B	B
	0.056μF (563)						N	N	N		S	S	S	S	B	
	0.068μF (683)						N	N	N		S	S	S	S	B	
	0.082μF (823)						N	N	N		S	S	S	S	B	
0.10μF (104)					N	N	N	N		S	S	S	S	B		
0.12μF (124)										S	S	S	B			
0.15μF (154)										S	S	S	B	B		
0.18μF (184)										S	S	S	B			
0.22μF (224)										S	S	S	B	B		
0.27μF (274)										B	B	B	B			
0.33μF (334)										B	B	B	B	B		
0.39μF (394)										B	B	B	B			
0.47μF (474)										B	B	B	B			

7. CAPACITANCE RANGE

7-2 X7R

DIELECTRIC		X7R																			
SIZE		0805										1206									
RATED VOLTAGE		6.3	10	16	25	50	100	200	250	500	630	10	16	25	50	100	200	250	500	630	
Capacitance	100pF (101)	X	X	X	X	X	X	X	X	X	X						C	C	C	C	
	120pF (121)	X	X	X	X	X	X	X	X	X	X						C	C	C	C	
	150pF (151)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	180pF (181)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	220pF (221)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	270pF (271)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	330pF (331)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	390pF (391)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	470pF (471)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	560pF (561)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	680pF (681)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	820pF (821)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	1,000pF (102)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	1,200pF (122)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	1,500pF (152)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	1,800pF (182)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	2,200pF (222)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	2,700pF (272)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	3,300pF (332)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	3,900pF (392)	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	C	C	C	C	
	4,700pF (472)	X	X	X	X	X	X	X	X	C	C	C	X	X	X	X	X	C	C	C	C
	5,600pF (562)	X	X	X	X	X	X	X	X	C	C	C	X	X	X	X	X	C	C	C	C
	6,800pF (682)	X	X	X	X	X	X	X	X	C	C	C	X	X	X	X	X	C	C	C	C
	8,200pF (822)	X	X	X	X	X	X	X	X	C	C	C	X	X	X	X	X	C	C	C	C
	0.010μF (103)	X	X	X	X	X	X	C	C	C	C	C	X	X	X	X	X	C	C	C	C
	0.012μF (123)	X	X	X	X	X	X	C	C				X	X	X	X	X	C	C		
	0.015μF (153)	X	X	X	X	X	X	C	C				X	X	X	X	X	C	C		
	0.018μF (183)	X	X	X	X	X	X	C	C				X	X	X	X	X	C	C		
	0.022μF (223)	X	X	X	X	X	X	C	C				X	X	X	X	X	C	C		
	0.027μF (273)		X	X	X	X	C						X	X	X	X	X	C	C		
	0.033μF (333)		X	X	X	X	C						X	X	X	X	X	E	E		
	0.039μF (393)		X	X	X	X	C						X	X	X	X	X	E	E		
	0.047μF (473)		X	X	X	X	C						X	X	X	X	X	E	E		
	0.056μF (563)		X	X	X	X	C						X	X	X	X	X	E	E		
	0.068μF (683)		X	X	X	X	C						X	X	X	X	X	E	E		
	0.082μF (823)		X	X	X	X	C						X	X	X	X	C	E	E		
	0.10μF (104)		X	X	X	X	C						X	X	X	X	C	E	E		
	0.12μF (124)		X	X	X	C							X	X	X	X	C				
	0.15μF (154)		C	C	C	C							M	M	M	M	E				
	0.18μF (184)		C	C	C	C							M	M	M	M	E				
0.22μF (224)		C	C	C	C							M	M	M	M	E					
0.27μF (274)		C	C	C	I							M	M	M	C						
0.33μF (334)		C	C	C	I							M	M	M	C						
0.39μF (394)		C	C	C	I							M	M	J	P						
0.47μF (474)		C	C	C	I							J	J	J	P						
0.56μF (564)		C	C	C								J	J	J	P						
0.68μF (684)		C	C	C	I							J	J	J	P						
0.82μF (824)		C	C	C								J	J	J	P						
1.0μF (105)		C	C	C	I							J	J	J	P						
1.5μF (155)												J	J	P							
2.2μF (225)												J	J	P							
4.7μF (475)																					
10μF (106)																					

7. CAPACITANCE RANGE

7-2 X7R

DIELECTRIC		X7R																	
SIZE		1210								1812									
RATED VOLTAGE		10	16	25	50	100	200	250	500	1000	10	16	25	50	100	200	250	3000	
Capacitance	100pF (101)							C	C	C									
	120pF (121)							C	C	C									
	150pF (151)							C	C	C									
	180pF (181)							C	C	C									
	220pF (221)							C	C	C									
	270pF (271)							C	C	C								F	
	330pF (331)							C	C	C								F	
	390pF (391)							C	C	C								F	
	470pF (471)							C	C	C								F	
	560pF (561)							C	C	C								F	
	680pF (681)							M	C	C								F	
	820pF (821)							M	C	C								F	
	1,000pF (102)	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	F
	1,200pF (122)	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	F
	1,500pF (152)	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	F
	1,800pF (182)	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	G
	2,200pF (222)	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	G
	2,700pF (272)	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	G
	3,300pF (332)	M	M	M	M	M	M	M	C	C	C	C	C	C	C	C	C	C	G
	3,900pF (392)	M	M	M	M	M	M	M	C	G	C	C	C	C	C	C	C	C	G
	4,700pF (472)	M	M	M	M	M	M	M	C	E	C	C	C	C	C	C	C	C	G
	5,600pF (562)	M	M	M	M	M	M	M	C	E	C	C	C	C	C	C	C	C	
	6,800pF (682)	M	M	M	M	M	M	M	C	E	C	C	C	C	C	C	C	C	
	8,200pF (822)	M	M	M	M	M	M	M	C	E	C	C	C	C	C	C	C	C	
	0.010μF (103)	M	M	M	M	M	M	M	C	E	C	C	C	C	C	C	C	C	
	0.012μF (123)	M	M	M	M	M	M	M	C		C	C	C	C	C	C	C	C	
	0.015μF (153)	M	M	M	M	M	M	M	C		C	C	C	C	C	C	C	C	
	0.018μF (183)	M	M	M	M	M	M	M	C		C	C	C	C	C	C	C	C	
	0.022μF (223)	M	M	M	M	M	M	M	C		C	C	C	C	C	C	C	C	
	0.027μF (273)	M	M	M	M	M	M	M			C	C	C	C	C	C	C	C	
	0.033μF (333)	M	M	M	M	M	M	M			C	C	C	C	C	C	C	C	
	0.039μF (393)	M	M	M	M	M	M	M			C	C	C	C	C	C	C	C	
	0.047μF (473)	M	M	M	M	M	C	C			C	C	C	C	C	C	C	C	
	0.056μF (563)	M	M	M	M	M	C	C			C	C	C	C	C	C	C	C	
	0.068μF (683)	M	M	M	M	M	E	E			C	C	C	C	C	C	C	C	
	0.082μF (823)	M	M	M	M	M	E	E			C	C	C	C	C	C	C	C	
0.10μF (104)	M	M	M	M	M	E	E			C	C	C	C	C	C	C	C		
0.12μF (124)	M	M	M	M	M	E	E			C	C	C	C	C	C	C	C		
0.15μF (154)	C	C	C	C	C	G	G			C	C	C	C	C	C	F	F		
0.18μF (184)	C	C	C	C	C	G	G			C	C	C	C	C	C	F	F		
0.22μF (224)	C	C	C	C	C	G	G			C	C	C	C	C	C	F	F		
0.27μF (274)	C	C	C	C	E	G	G			C	C	C	C	C	C	F	F		
0.33μF (334)	C	C	C	C	E	G	G			C	C	C	C	C	C	F	F		
0.39μF (394)	C	C	C	C	G	G	G			C	C	C	C	C	C	F	F		
0.47μF (474)	C	C	C	C	G	G	G			C	C	C	C	C	F	F	F		
0.56μF (564)	C	C	C	C	G					C	C	C	C	C	F				
0.68μF (684)	C	C	C	C	F					C	C	C	F	F					
0.82μF (824)	C	C	C	C	F					C	C	C	F	F					
1.00μF (105)	C	C	C	C	F					C	C	C	F	F					
1.50μF (155)	F	F	E												F				
2.20μF (225)	F	F	E												G				

7. CAPACITANCE RANGE

7-3 X5R

DIELECTRIC		X5R																
SIZE		0402			0603				0805				1206				1210	
RATED VOLTAGE(VDC)		6.3	10	16	6.3	10	16	25	6.3	10	16	25	6.3	10	16	25	10	16
Capacitance	0.027μF (273)																	
	0.033μF (333)																	
	0.039μF (393)																	
	0.047μF (473)																	
	0.056μF (563)																	
	0.068μF (683)		N															
	0.082μF (823)																	
	0.10μF (104)		N	N														
	0.15μF (154)																	
	0.22μF (224)	N	N	N														
	0.27μF (274)																	
	0.33μF (334)	N	N			B	B	B										
	0.39μF (394)																	
	0.47μF (474)	N				B	B	B										
	0.68μF (684)	N				B												
	0.82μF (824)																	
	1.0μF (105)				B	B												
	1.5μF (155)								I	I				J	J	P	F	F
	2.2μF (225)								I	I	I	I		J	J	P	F	F
	3.3μF (335)										I	I	P	P	P	P	F	F
	4.7μF (475)										I		P	P	P	P	F	F
	6.8μF (685)												P					
	10μF (106)																	
	22μF (226)																	

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																																																								
1.	Visual and Mechanical	---	* No remarkable defect. * Dimensions to conform to individual specification sheet.																																																								
2.	Capacitance	* Class I : (C0G) Cap.≤1000pF, 1.0±0.2Vrms, 1MHz±10%. Cap.>1000pF, 1.0±0.2Vrms, 1KHz±10%. * Class II : (X7R, X5R) Cap.≤10μF, 1.0±0.2Vrms, 1KHz±10%. Cap.>10μF, 0.5±0.2Vrms, 120Hz±20%. ** Test condition: 0.5±0.2Vrms, 1KHz±10% X7R: 0805=106(6.3V), 0603/475(6.3V) X5R: 0201≥224 (6.3V,10V,16V)#1, 0402≥475 (6.3V,16V), 0402≥225(10V), 0603=106 (6.3V) #1 Excluding X5R/0201/105(6.3V);225(10V) , 0402X475M6R3 *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	* Shall not exceed the limits given in the detailed spec. * C0G : Cap.≥30pF, Q≥1000; Cap.<30pF, Q≥400+20C. * X7R, X5R : <table><tr><th>Rated</th><th>D.F.≤</th><th colspan="2">Exception of D.F.≤</th></tr><tr><td rowspan="3">≥100V</td><td rowspan="3">≤2.5%</td><td>≤3.5%</td><td>1206≥0.47μF</td></tr><tr><td>≤5%</td><td>0805>0.1μF, 0603≥0.068μF, 1206>1μF, 1210≥2.2μF</td></tr><tr><td>≤10%</td><td>0805>0.22μF, 1210≥3.3μF</td></tr><tr><td rowspan="3">50V</td><td rowspan="3">≤2.5%</td><td>≤3.5%</td><td>0201(50V), 0603≥0.047μF, 0805≥0.18μF, 1206≥0.47μF</td></tr><tr><td>≤5%</td><td>0201≥0.01uF, 1210≥3.3μF</td></tr><tr><td>≤10%</td><td>0402≥0.012μF, 0603>0.1μF, 0805≥1uF(0805/X7R>0.47uF); 1206≥2.2μF, 1210≥10μF</td></tr><tr><td>35V</td><td>≤3.5%</td><td>≤10%</td><td>0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF</td></tr><tr><td rowspan="4">25V</td><td rowspan="4">≤3.5%</td><td>≤5%</td><td>0201≥0.01uF(0201/X5R=0.01uF); 0805≥1uF;1210≥10μF*</td></tr><tr><td>≤7%</td><td>0603≥0.33μF</td></tr><tr><td>≤10%</td><td>0201≥0.1uF(0201/X5R>0.01uF; 0201/X7R≥0.022uF);0402≥0.22uF; 0603>0.47uF;0805≥2.2uF;1206≥4.7uF ;1210≥22uF</td></tr><tr><td>≤12.5%</td><td>0402≥0.47μF;0805/X5R/X6S=10uF</td></tr><tr><td rowspan="3">16V</td><td rowspan="3">≤3.5%</td><td>≤5%</td><td>0201≥0.01μF(0201/X5R=0.01uF, 0402≥0.033μF, 0603≥0.15μF, 0805≥0.68μF, 1206≥2.2μF, 1210≥4.7μF</td></tr><tr><td>≤10%</td><td>0201≥0.1uF(0201/X5R≥0.01μF; 0201/X7R≥0.022μF), 0402≥0.22uF, 0603≥0.68μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥22μF</td></tr><tr><td>≤12.5%</td><td>0402/X5R≥1μF;0402/X6S=1uF; 0805/X5R/X6R=10uF</td></tr><tr><td rowspan="3">10V</td><td rowspan="3">≤5%</td><td>≤10%</td><td>0201≥0.012μF, 0402≥0.22μF, 0603≥0.33μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥22μF</td></tr><tr><td>≤15%</td><td>0201≥0.1μF(0201/X5R>0.1uF), 0402≥1μF;0603/X5R≥10μF</td></tr><tr><td>≤12.5%</td><td>0805/X5R/X6S=10μF</td></tr><tr><td rowspan="2">6.3V</td><td rowspan="2">≤10%</td><td>≤15%</td><td>0201≥0.1μF(0201/X5R>0.1uF), 0402≥1μF(0402/X6S≥0.47μF;0603≥10uF; 0805≥4.7μF, 1206≥47μF, 1210≥100μF</td></tr><tr><td>≤20%</td><td>0402≥2.2μF</td></tr></table>	Rated	D.F.≤	Exception of D.F.≤		≥100V	≤2.5%	≤3.5%	1206≥0.47μF	≤5%	0805>0.1μF, 0603≥0.068μF, 1206>1μF, 1210≥2.2μF	≤10%	0805>0.22μF, 1210≥3.3μF	50V	≤2.5%	≤3.5%	0201(50V), 0603≥0.047μF, 0805≥0.18μF, 1206≥0.47μF	≤5%	0201≥0.01uF, 1210≥3.3μF	≤10%	0402≥0.012μF, 0603>0.1μF, 0805≥1uF(0805/X7R>0.47uF); 1206≥2.2μF, 1210≥10μF	35V	≤3.5%	≤10%	0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF	25V	≤3.5%	≤5%	0201≥0.01uF(0201/X5R=0.01uF); 0805≥1uF;1210≥10μF*	≤7%	0603≥0.33μF	≤10%	0201≥0.1uF(0201/X5R>0.01uF; 0201/X7R≥0.022uF);0402≥0.22uF; 0603>0.47uF;0805≥2.2uF;1206≥4.7uF ;1210≥22uF	≤12.5%	0402≥0.47μF;0805/X5R/X6S=10uF	16V	≤3.5%	≤5%	0201≥0.01μF(0201/X5R=0.01uF, 0402≥0.033μF, 0603≥0.15μF, 0805≥0.68μF, 1206≥2.2μF, 1210≥4.7μF	≤10%	0201≥0.1uF(0201/X5R≥0.01μF; 0201/X7R≥0.022μF), 0402≥0.22uF, 0603≥0.68μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥22μF	≤12.5%	0402/X5R≥1μF;0402/X6S=1uF; 0805/X5R/X6R=10uF	10V	≤5%	≤10%	0201≥0.012μF, 0402≥0.22μF, 0603≥0.33μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥22μF	≤15%	0201≥0.1μF(0201/X5R>0.1uF), 0402≥1μF;0603/X5R≥10μF	≤12.5%	0805/X5R/X6S=10μF	6.3V	≤10%	≤15%	0201≥0.1μF(0201/X5R>0.1uF), 0402≥1μF(0402/X6S≥0.47μF;0603≥10uF; 0805≥4.7μF, 1206≥47μF, 1210≥100μF	≤20%	0402≥2.2μF
Rated	D.F.≤		Exception of D.F.≤																																																								
≥100V	≤2.5%		≤3.5%	1206≥0.47μF																																																							
			≤5%	0805>0.1μF, 0603≥0.068μF, 1206>1μF, 1210≥2.2μF																																																							
			≤10%	0805>0.22μF, 1210≥3.3μF																																																							
50V	≤2.5%		≤3.5%	0201(50V), 0603≥0.047μF, 0805≥0.18μF, 1206≥0.47μF																																																							
			≤5%	0201≥0.01uF, 1210≥3.3μF																																																							
			≤10%	0402≥0.012μF, 0603>0.1μF, 0805≥1uF(0805/X7R>0.47uF); 1206≥2.2μF, 1210≥10μF																																																							
35V	≤3.5%		≤10%	0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF																																																							
25V	≤3.5%		≤5%	0201≥0.01uF(0201/X5R=0.01uF); 0805≥1uF;1210≥10μF*																																																							
		≤7%	0603≥0.33μF																																																								
		≤10%	0201≥0.1uF(0201/X5R>0.01uF; 0201/X7R≥0.022uF);0402≥0.22uF; 0603>0.47uF;0805≥2.2uF;1206≥4.7uF ;1210≥22uF																																																								
		≤12.5%	0402≥0.47μF;0805/X5R/X6S=10uF																																																								
16V	≤3.5%	≤5%	0201≥0.01μF(0201/X5R=0.01uF, 0402≥0.033μF, 0603≥0.15μF, 0805≥0.68μF, 1206≥2.2μF, 1210≥4.7μF																																																								
		≤10%	0201≥0.1uF(0201/X5R≥0.01μF; 0201/X7R≥0.022μF), 0402≥0.22uF, 0603≥0.68μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥22μF																																																								
		≤12.5%	0402/X5R≥1μF;0402/X6S=1uF; 0805/X5R/X6R=10uF																																																								
10V	≤5%	≤10%	0201≥0.012μF, 0402≥0.22μF, 0603≥0.33μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥22μF																																																								
		≤15%	0201≥0.1μF(0201/X5R>0.1uF), 0402≥1μF;0603/X5R≥10μF																																																								
		≤12.5%	0805/X5R/X6S=10μF																																																								
6.3V	≤10%	≤15%	0201≥0.1μF(0201/X5R>0.1uF), 0402≥1μF(0402/X6S≥0.47μF;0603≥10uF; 0805≥4.7μF, 1206≥47μF, 1210≥100μF																																																								
		≤20%	0402≥2.2μF																																																								
3.	Q/ D.F. (Dissipation Factor)																																																										
4.	Dielectric Strength	<table><tr><th>Rated Vol.(V)</th><th>Condition</th></tr><tr><td>≤100</td><td>2.5 times of UR</td></tr><tr><td>200<V≤300</td><td>2.0 times of UR</td></tr><tr><td>400<V≤450</td><td>1.2 times of UR</td></tr><tr><td>500<V≤630V</td><td>1.5 times of UR</td></tr><tr><td>1000<V≤3000V</td><td>1.2 times of UR</td></tr></table> * Duration : 1 to 5 sec. * Charge and discharge current less than 50mA.	Rated Vol.(V)	Condition	≤100	2.5 times of UR	200<V≤300	2.0 times of UR	400<V≤450	1.2 times of UR	500<V≤630V	1.5 times of UR	1000<V≤3000V	1.2 times of UR	* No evidence of damage or flash over during test.																																												
Rated Vol.(V)	Condition																																																										
≤100	2.5 times of UR																																																										
200<V≤300	2.0 times of UR																																																										
400<V≤450	1.2 times of UR																																																										
500<V≤630V	1.5 times of UR																																																										
1000<V≤3000V	1.2 times of UR																																																										

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements																
5.	Insulation Resistance		* $\geq 10\text{G}\Omega$ or $\text{RxC} \geq 500\Omega\text{-F}$, whichever is smaller. * Class II (X7R, X5R) :																
			<table><tr><th>Rated voltage</th><th>I.R.</th></tr><tr><td>100V : All X7R</td><td rowspan="5">$\geq 10\text{G}\Omega$ or $\text{RxC} \geq 100\Omega\text{-F}$, whichever is smaller</td></tr><tr><td>50V : 0402$\geq 0.01\mu\text{F}$, 0603$\geq 1\mu\text{F}$, 0805$\geq 1\mu\text{F}$, 1206$\geq 4.7\mu\text{F}$, 1210$\geq 4.7\mu\text{F}$, 1812$\geq 10\mu\text{F}$, 2220$\geq 22\mu\text{F}$</td></tr><tr><td>35V : 0805$\geq 2.2\mu\text{F}$, 1206$\geq 2.2\mu\text{F}$, 1210$\geq 10\mu\text{F}$</td></tr><tr><td>25V : 0402$\geq 1\mu\text{F}$, 0603$\geq 2.2\mu\text{F}$, 0805$\geq 2.2\mu\text{F}$, 1206$\geq 10\mu\text{F}$, 1210$\geq 10\mu\text{F}$</td></tr><tr><td>16V : 0201$\geq 0.1\mu\text{F}$, 0402$\geq 0.22\mu\text{F}$, 0603$\geq 1\mu\text{F}$, 0805$\geq 2.2\mu\text{F}$, 1206$\geq 10\mu\text{F}$, 1210$\geq 47\mu\text{F}$</td></tr><tr><td>10V : 0201$\geq 47\text{nF}$, 0402$\geq 0.47\mu\text{F}$, 0603$\geq 0.47\mu\text{F}$, 0805$\geq 2.2\mu\text{F}$, 1206$\geq 4.7\mu\text{F}$, 1210$\geq 47\mu\text{F}$</td></tr></table>	Rated voltage	I.R.	100V : All X7R	$\geq 10\text{G}\Omega$ or $\text{RxC} \geq 100\Omega\text{-F}$, whichever is smaller	50V : 0402 $\geq 0.01\mu\text{F}$, 0603 $\geq 1\mu\text{F}$, 0805 $\geq 1\mu\text{F}$, 1206 $\geq 4.7\mu\text{F}$, 1210 $\geq 4.7\mu\text{F}$, 1812 $\geq 10\mu\text{F}$, 2220 $\geq 22\mu\text{F}$	35V : 0805 $\geq 2.2\mu\text{F}$, 1206 $\geq 2.2\mu\text{F}$, 1210 $\geq 10\mu\text{F}$	25V : 0402 $\geq 1\mu\text{F}$, 0603 $\geq 2.2\mu\text{F}$, 0805 $\geq 2.2\mu\text{F}$, 1206 $\geq 10\mu\text{F}$, 1210 $\geq 10\mu\text{F}$	16V : 0201 $\geq 0.1\mu\text{F}$, 0402 $\geq 0.22\mu\text{F}$, 0603 $\geq 1\mu\text{F}$, 0805 $\geq 2.2\mu\text{F}$, 1206 $\geq 10\mu\text{F}$, 1210 $\geq 47\mu\text{F}$	10V : 0201 $\geq 47\text{nF}$, 0402 $\geq 0.47\mu\text{F}$, 0603 $\geq 0.47\mu\text{F}$, 0805 $\geq 2.2\mu\text{F}$, 1206 $\geq 4.7\mu\text{F}$, 1210 $\geq 47\mu\text{F}$							
		Rated voltage	I.R.																
		100V : All X7R	$\geq 10\text{G}\Omega$ or $\text{RxC} \geq 100\Omega\text{-F}$, whichever is smaller																
		50V : 0402 $\geq 0.01\mu\text{F}$, 0603 $\geq 1\mu\text{F}$, 0805 $\geq 1\mu\text{F}$, 1206 $\geq 4.7\mu\text{F}$, 1210 $\geq 4.7\mu\text{F}$, 1812 $\geq 10\mu\text{F}$, 2220 $\geq 22\mu\text{F}$																	
35V : 0805 $\geq 2.2\mu\text{F}$, 1206 $\geq 2.2\mu\text{F}$, 1210 $\geq 10\mu\text{F}$																			
25V : 0402 $\geq 1\mu\text{F}$, 0603 $\geq 2.2\mu\text{F}$, 0805 $\geq 2.2\mu\text{F}$, 1206 $\geq 10\mu\text{F}$, 1210 $\geq 10\mu\text{F}$																			
16V : 0201 $\geq 0.1\mu\text{F}$, 0402 $\geq 0.22\mu\text{F}$, 0603 $\geq 1\mu\text{F}$, 0805 $\geq 2.2\mu\text{F}$, 1206 $\geq 10\mu\text{F}$, 1210 $\geq 47\mu\text{F}$																			
10V : 0201 $\geq 47\text{nF}$, 0402 $\geq 0.47\mu\text{F}$, 0603 $\geq 0.47\mu\text{F}$, 0805 $\geq 2.2\mu\text{F}$, 1206 $\geq 4.7\mu\text{F}$, 1210 $\geq 47\mu\text{F}$																			
<table><tr><th>Rated Vol.(V)</th><th>Apply Voltage</th><th>Test Condition</th></tr><tr><td>≤ 100</td><td>1 times of U_R</td><td>Max. 120 sec.</td></tr><tr><td>$630 < V \leq 500$</td><td>500Vdc max</td><td>60 sec.</td></tr><tr><td>> 630</td><td>500Vdc</td><td>60 sec.</td></tr></table>	Rated Vol.(V)	Apply Voltage	Test Condition	≤ 100	1 times of U_R	Max. 120 sec.	$630 < V \leq 500$	500Vdc max	60 sec.	> 630	500Vdc	60 sec.							
Rated Vol.(V)	Apply Voltage	Test Condition																	
≤ 100	1 times of U_R	Max. 120 sec.																	
$630 < V \leq 500$	500Vdc max	60 sec.																	
> 630	500Vdc	60 sec.																	
6.	Temperature Coefficient	* With no electrical load.																	
		<table><tr><th>T.C.</th><th>Operating Temp.</th></tr><tr><td>C0G</td><td>-55 ~ 125°C at 25°C</td></tr><tr><td>X7R</td><td>-55 ~ 125°C at 25°C</td></tr><tr><td>X5R</td><td>-55 ~ 85°C at 25°C</td></tr></table>	T.C.	Operating Temp.	C0G	-55 ~ 125°C at 25°C	X7R	-55 ~ 125°C at 25°C	X5R	-55 ~ 85°C at 25°C	<table><tr><th>T.C.</th><th>Capacitance Change</th></tr><tr><td>C0G</td><td>Within $\pm 30\text{ppm}/^\circ\text{C}$</td></tr><tr><td>X7R</td><td>Within $\pm 15\%$</td></tr><tr><td>X5R</td><td>Within $\pm 15\%$</td></tr></table>	T.C.	Capacitance Change	C0G	Within $\pm 30\text{ppm}/^\circ\text{C}$	X7R	Within $\pm 15\%$	X5R	Within $\pm 15\%$
		T.C.	Operating Temp.																
		C0G	-55 ~ 125°C at 25°C																
		X7R	-55 ~ 125°C at 25°C																
X5R	-55 ~ 85°C at 25°C																		
T.C.	Capacitance Change																		
C0G	Within $\pm 30\text{ppm}/^\circ\text{C}$																		
X7R	Within $\pm 15\%$																		
X5R	Within $\pm 15\%$																		
7.	Adhesive Strength of Termination	* Pressurizing force : 2N (0201) and 5N (≤ 0603) and 10N (> 0603) * Test time : 10 ± 1 sec.	* No remarkable damage or removal of the terminations.																
8.	Vibration Resistance	* Vibration frequency : 10~55 Hz/min.																	
		* Total amplitude : 1.5mm.																	
		* Test time : 6 hrs. (Two hrs each in three mutually perpendicular directions)																	
		* Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24 $\pm$ 2 hrs at room temp.	* No remarkable damage.																
		* Cap./DF(Q) Measurement to be made after de-aging at 150°C for 1hr then set for 24 $\pm$ 2 hrs at room temp.	* Cap. change and Q/D.F. : To meet initial spec.																
9.	Solderability	* Solder temperature : 235 $\pm$ 5°C. * Dipping time : 2 $\pm$ 0.5 sec.	* 95% min. coverage of all metalized area.																
10.	Bending Test	* 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 1 mm and then the pressure shall be maintained for 5 $\pm$ 1 sec.	* No remarkable damage.																
		* Measurement to be made after keeping at room temp. for 24 $\pm$ 2 hrs.	* Cap. change : C0G : Within $\pm 5\%$ or $\pm 0.5\text{pF}$, whichever is larger. X7R, X5R : Within $\pm 12.5\%$.																
			(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test)																
11.	Resistance to Soldering Heat	* Solder temperature : 260 $\pm$ 5°C.	* No remarkable damage.																
		* Dipping time : 10 $\pm$ 1 sec.	* Cap. change : C0G : Within $\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever is larger. X7R, X5R : Within $\pm 7.5\%$.																
		* Preheating : 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder.	* Q/D.F., I.R. and dielectric strength : To meet initial requirements.																
		* Before initial measurement (Class II only) : Perform 150+0/-10°C for 1 hr and then set for 24 $\pm$ 2 hrs at room temp.	* 25% max. leaching on each edge.																
		* Measurement to be made after keeping at room temp. for 24 $\pm$ 2 hrs.																	

8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Condition	Requirements															
12.	Temperature Cycle	* Conduct the five cycles according to the temperatures and time. <table><tr><th>Step</th><th>Temp.(°C)</th><th>Time(min.)</th></tr><tr><td>1</td><td>Min. operating temp. +0/-3</td><td>30±3</td></tr><tr><td>2</td><td>Room temp.</td><td>2~3</td></tr><tr><td>3</td><td>Max. operating temp. +3/-0</td><td>30±3</td></tr><tr><td>4</td><td>Room temp.</td><td>2~3</td></tr></table> * Before initial measurement (Class II only) : Perform 150+0/-10°C 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.	Step	Temp.(°C)	Time(min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	* No remarkable damage. * Cap. change : C0G : Within ±2.5% or ±0.25pF, whichever is larger. X7R, X5R : Within ±7.5%. * Q/D.F., I.R. and dielectric strength : To meet initial requirements.
		Step	Temp.(°C)	Time(min.)														
1	Min. operating temp. +0/-3	30±3																
2	Room temp.	2~3																
3	Max. operating temp. +3/-0	30±3																
4	Room temp.	2~3																
13.	Humidity (Damp Heat) Steady State	* Test temp. : 40±2°C. * Humidity : 90~95% RH. * Test time : 500 +24/-0 hrs. * Before initial measurement (Class II only) : Perform 150+0/-10°C 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.	* No remarkable damage. * Cap. change :C0G : Within ±5% or ±0.5pF, whichever is larger. X7R, X5R : ≥10V**, within ±12.5%; 6.3V within ±25%; Cap.≥1μF, within ±25%. **10V : 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25%. * Q/D.F. value : C0G : Q≥350 for Cap.>30pF, Q≥275+2.5C for 10pF≤Cap.≤30pF, Q≥200+10C for Cap.<10pF. X7R, X5R : ≤200% of initial requirement. * I.R. : ≥10V, ≥1GΩ or RxC≥50Ω-F, whichever is smaller. Class II (X7R, X5R) <table><tr><th>Rated voltage</th><th>I.R.</th></tr><tr><td>100V : All X7R; 1210≥3.3μF</td><td rowspan="7">≥1GΩ or RxC≥10Ω-F, whichever is smaller</td></tr><tr><td>50V : 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF</td></tr><tr><td>35V : 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF</td></tr><tr><td>25V : 0201≥0.1μF, 0402≥0.22μF, 0603≥2.2μF, 0805≥2.2μF, 1206≥10μF, 1210≥10μF</td></tr><tr><td>16V : 0201≥0.1μF, 0402≥0.22μF, 0603≥1μF, 0805≥2.2μF, 1206≥10μF, 1210≥47μF</td></tr><tr><td>10V : 0201≥47nF, 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥47μF</td></tr><tr><td>6.3V : All X6S/X7S items; Size≥1812</td></tr></table>	Rated voltage	I.R.	100V : All X7R; 1210≥3.3μF	≥1GΩ or RxC≥10Ω-F, whichever is smaller	50V : 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF	35V : 0603≥1μF, 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF	25V : 0201≥0.1μF, 0402≥0.22μF, 0603≥2.2μF, 0805≥2.2μF, 1206≥10μF, 1210≥10μF	16V : 0201≥0.1μF, 0402≥0.22μF, 0603≥1μF, 0805≥2.2μF, 1206≥10μF, 1210≥47μF	10V : 0201≥47nF, 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥47μF	6.3V : All X6S/X7S items; Size≥1812					
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14.	Humidity (Damp Heat) Load	* Test temp. : 40±2°C. * Humidity : 90~95%RH * Test time : 500 +24/-0 hrs. * To apply voltage : Rated voltage (Max. 500V). * Before initial measurement (Class II only) : To apply test voltage for 1hr at 40°C and then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs.	* No remarkable damage. * Cap. change :C0G : Within ±7.5% or ±0.75pF, whichever is larger. X7R, X5R : ≥10V**, within ±12.5%; 6.3V within ±25%; Cap.≥1μF, within ±25%. **10V : 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25%. * Q/D.F. value : C0G : Q≥200 for Cap. ≥30pF, Q≥100+10/3C for Cap.<30pF. X7R, X5R : ≤200% of initial requirement. * I.R. : ≥10V, ≥500MΩ or RxC≥25Ω-F, whichever is smaller. Class II (X7R, X5R) <table><tr><th>Rated voltage</th><th>I.R.</th></tr><tr><td>100V : All X7R</td><td rowspan="6">≥500MΩ or RxC≥5Ω-F, whichever is smaller</td></tr><tr><td>50V : 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF</td></tr><tr><td>35V : 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF</td></tr><tr><td>25V : 0402≥1μF, 0603≥2.2μF, 0805≥2.2μF, 1206≥10μF, 1210≥10μF</td></tr><tr><td>16V : 0402≥0.22μF, 0603≥1μF, 0805≥2.2μF, 1206≥10μF, 1210≥47μF</td></tr><tr><td>10V : 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥47μF</td></tr></table>	Rated voltage	I.R.	100V : All X7R	≥500MΩ or RxC≥5Ω-F, whichever is smaller	50V : 0402>0.01μF, 0603≥1μF, 0805≥1μF, 1206≥4.7μF, 1210≥4.7μF	35V : 0805≥2.2μF, 1206≥2.2μF, 1210≥10μF	25V : 0402≥1μF, 0603≥2.2μF, 0805≥2.2μF, 1206≥10μF, 1210≥10μF	16V : 0402≥0.22μF, 0603≥1μF, 0805≥2.2μF, 1206≥10μF, 1210≥47μF	10V : 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥47μF						
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8. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

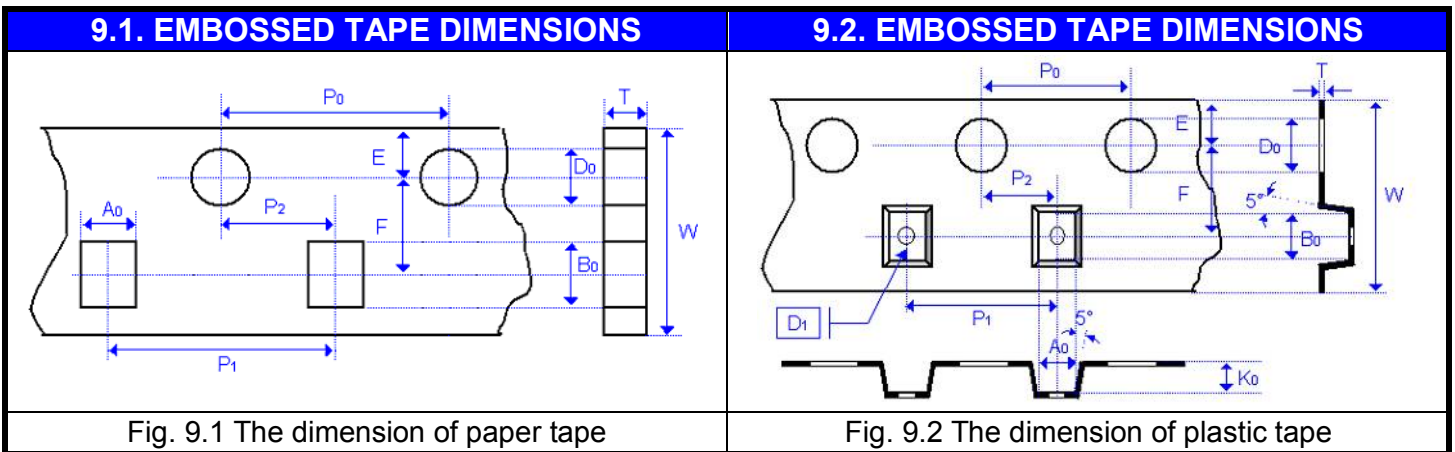
No.	Item	Test Condition	Requirements																																				
15.	High Temperature Load (Endurance)	* Test temp. : C0G, X7R : 125±3°C. X5R : 85±3°C. * Test time : 1000 +24/-0 hrs. * To apply voltage : (1) 6.3V or C≥10μF : 150% of rated voltage. (2) 10V≤Ur<500V : 200% of rated voltage. (3) 500V : 150% of rated voltage. (4) Ur≥630V : 120% of rated voltage. (5) 100% of rated voltage for below range.	* No remarkable damage. * Cap. change : C0G : Within ±3% or ±0.3pF, whichever is larger. X7R, X5R : ≥10V**, within ±12.5%; 6.3V within ±25%; Cap.≥1μF, within ±25%. **10V : 0603≥4.7μF; 0402≥1μF; 0201≥0.1μF, within ±25%. * Q/D.F. value : C0G : Q≥350 for Cap.>30pF, Q≥275+2.5C for 10pF≤Cap.≤30pF, Q≥200+10C for Cap.<10pF. X7R, X5R : ≤200% of initial requirement. * I.R. : ≥10V, ≥1GΩ or RxC≥50Ω-F, whichever is smaller. Class II (X7R, X5R).																																				
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9. PACKAGE DIMENSION AND QUANTITY

Size	Thickness (mm)	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
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



Size	0402	0603		0805	
Chip Thickness	0.50±0.10	0.80±0.07	0.80 +0.15/-0.10	0.80±0.10	1.25±0.10 1.25±0.20
A ₀	0.70±0.20	1.00 +0.05/-0.10	1.02 +0.05/-0.10	1.50±0.10	<1.65
B ₀	1.20±0.20	1.80±0.10	1.80±0.10	2.30±0.10	<2.40
T	≤0.80	0.95±0.05	0.97±0.05	0.95±0.05	0.23±0.05
K ₀	-	-	-	-	<2.50
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10
P ₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
10xP ₀	40.00±0.10	40.00±0.20	40.00±0.20	40.00±0.20	40.00±0.20
P ₁	2.00±0.05	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10
P ₂	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05	2.00±0.05
D ₀	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±0.10
F	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05
Unit :	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	12.0±0.20	12.0±0.20
P ₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	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	40.00±0.20	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±0.10
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	0402, 0603, 0805, 1206, 1210		1808, 1812, 1825, 2220, 2225
Reel size	7"	13"	7"
C	13.0 +0.5/-0.2	13.0 +0.7/-0.3	13.0 +0.5/-0.2
W ₁	8.4 +1.5/-0	8.4 +2.0/-0	8.4 +1.5/-0
W	14.4 max	14.4 max	shall accommodate tape width without interference
A	178.0 ±0.10	330.0 ±1.0	178.0 ±0.10
N	60.0 +1.0/-0	100 ±1.0	60.0 +1.0/-0

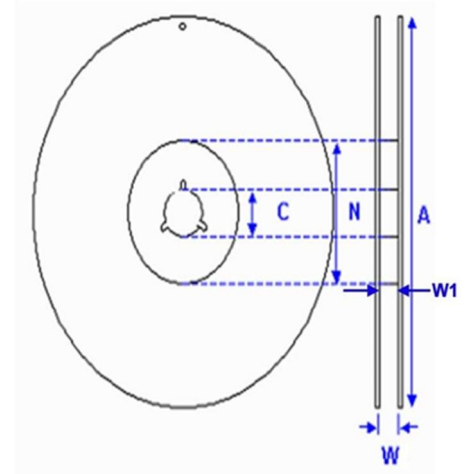


Fig. 9.3 The dimension of reel

10. APPLICATION NOTES

STORAGE

To prevent the damage of solderability of terminations, the following storage conditions are recommended:
 Indoors under 5 ~ 40°C 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.

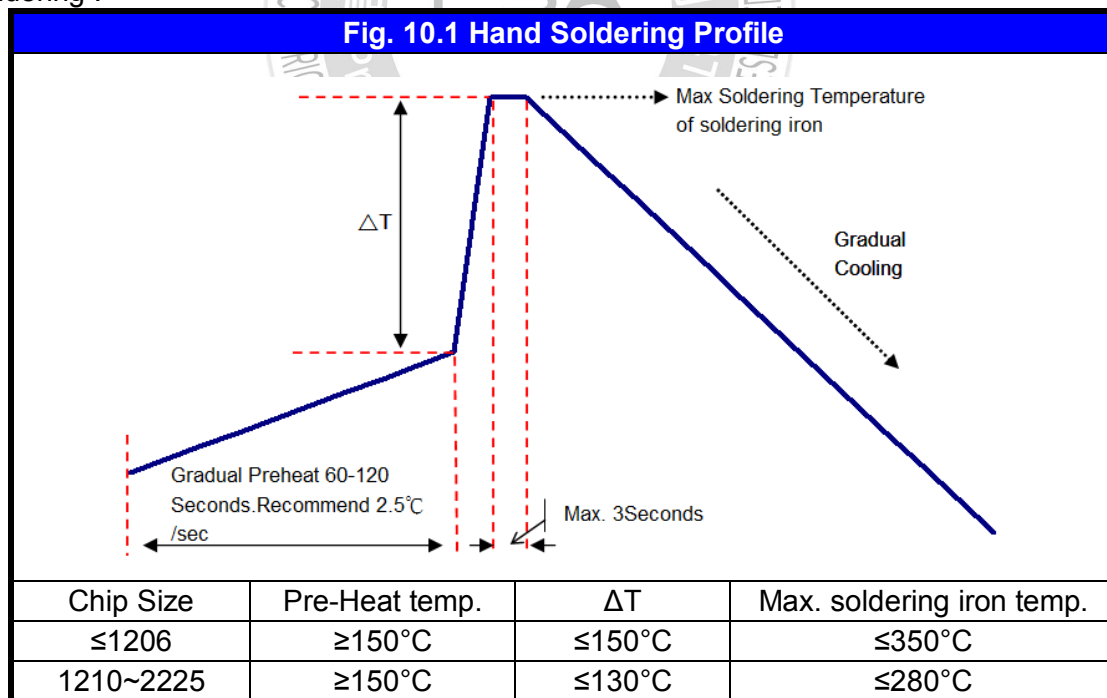
PREHEAT

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°C per second.

SOLDERING

Use mildly activated rosin 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 :



* 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.

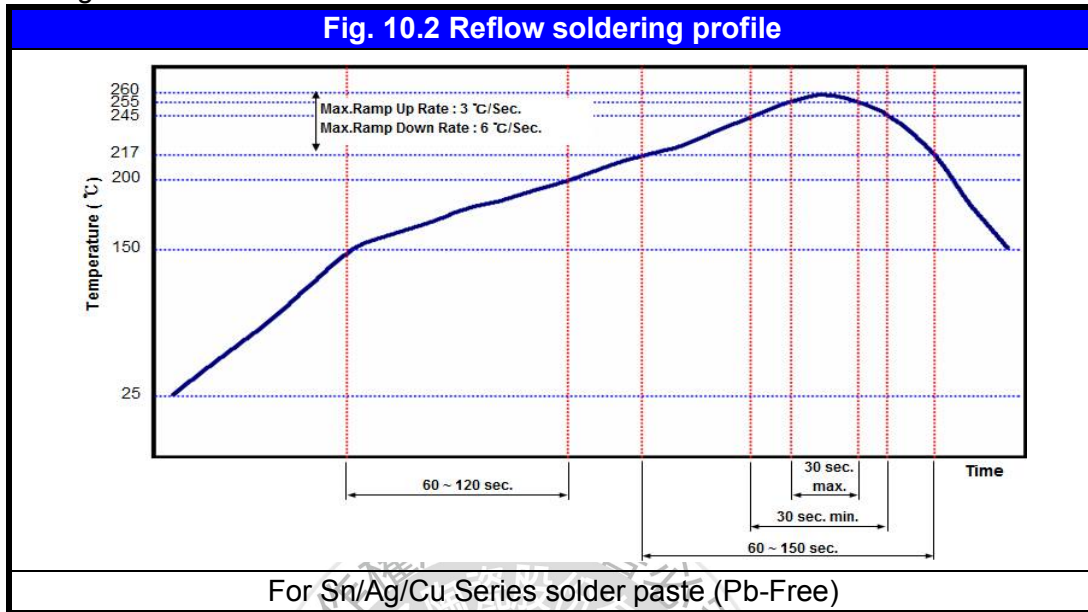
* The tip of iron should not contact the ceramic body directly.

* The Capacitors shall be cooled gradually at room temperature after soldering.

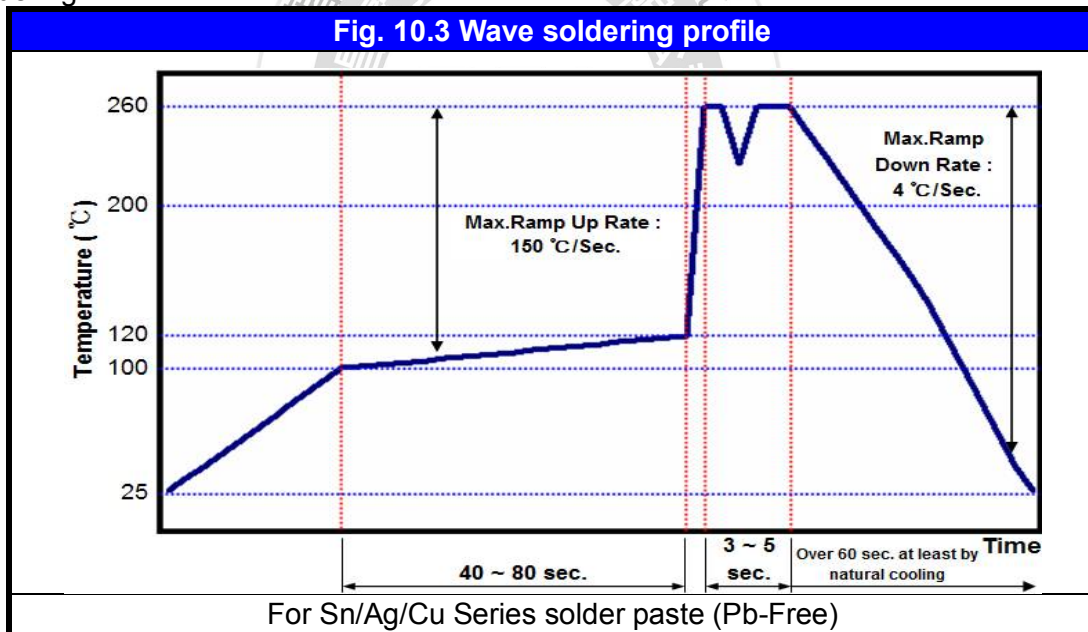
* Forced air cooling is not allowed.

10. APPLICATION NOTES

b.) Reflow soldering :



c.) Wave soldering :



Soldering conditions :

Class I :

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
≤0402 (1005)	Class I	All	X	O
0603 (1608)	Class I	All	O	O
0805 (2012)	Class I	All	O	O
1206 (3216)	Class I	All	O	O
		Thickness >0.95mm	X	O
1210 (3225)	Class I	All	X	O
Coating Products	All	All	X	O

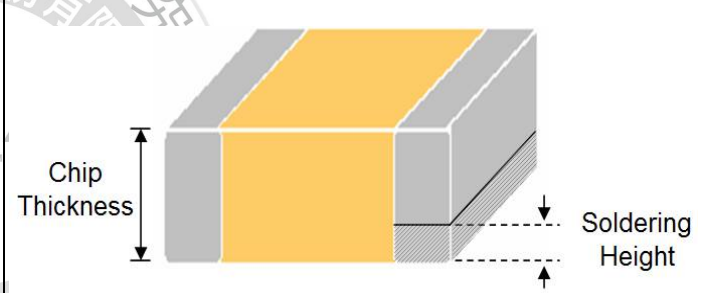
10. APPLICATION NOTES

Soldering conditions :

Class II :

Size Inch (mm)	Temper. Cher.	Capacitance	Condition	
			Wave	Reflow
≤0402 (1005)	Class II	All	X	O
0603 (1608)	Class II	Cap. <2.2μF	O	O
		Cap. ≥2.2μF	X	O
0805 (2012)	Class II	Thickness ≤ 0.95mm	O	O
		Thickness > 0.95mm	X	O
1206 (3216)	Class II	Thickness ≤ 0.95mm	O	O
		Thickness > 0.95mm	X	O
≥1210 (3225)	Class II	All	X	O
Coating Products	All	All	X	O

Soldering height :

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

The AUTOMOTIVE 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.