信昌電子陶瓷股份有限公司
Prosperity Dielectrics Co., Ltd.

No.220-1, Sec. 2, Nanshan Rd., Lujhu, Taoyuan 33860, Taiwan, R.O.C.
Tel.：886-3-3224471 Fax：886-3-3212216

Messrs.：____

Date：___

APPROVAL SHEET

Product Name ： **Automotive Capacitor Arrays Series Qualified to AEC-Q200**

Part No. ： **MY Series**

Description ： **4x0402, 4x0603, C0G/X7R, 10Vdc to 100Vdc**

PREPARED BY	APPROVED BY

信昌電子陶瓷股份有限公司

PROSPERITY DIELECTRICS CO., LTD.

桃園縣蘆竹鄉南山路二段 220-1 號 http://www.pdc.com.tw

Tel: 03-322-4471 ext: **Fax: 03-322-5231 / 03-321-2215**

Contactor:_____ **Mobile:**_____

PDC

信昌電子陶瓷股份有限公司
Prosperity Dielectrics Co., Ltd.

No.220-1, Sec. 2, Nanshan Rd., Lujhu, Taoyuan 33860, Taiwan, R.O.C.
Tel.：886-3-3224471 Fax：886-3-3212216

SPECIFICATION

FOR

Product Name ： **Automotive Capacitor Arrays Series Qualified to AEC-Q200**

Part No. ： **MY Series**

Description ： **4x0402, 4x0603, C0G/X7R, 10Vdc to 100Vdc**

SPEC. No.	：**MY-000-001-01**
DATE	：

RAWN BY	CHECEKED BY	APPROVED BY
Yvens Chou	**Yvens Chou**	**Ryan Chen**

PDC

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 capacitor arrays are developed to offer designers the opportunity to lower placement costs increase assembly line output through lower component count per board.

PDC's MY series MLCC is made by NP0 & X7R dielectrics and which provides product with high electrical precision, stability and reliability. Besides, MY series MLCC is tighten controlling in quality in line to assure quality performance in automotive applications.

2. FEATURES

a. High density mounting due to mounting space saving.
b. Mounting cost saving.
c. Increased throughput.

3. APPLICATIONS

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

4. HOW TO ORDER

MY	24	N	102	J	500	C	T
PDC Family	Size	Dielectric	Capacitance	Tolerance	Rated Voltage	Termination	Packaging Style
Table 1	Table 2	Table 3	Table 4	Table 5	Table 6	Table 7	Table 8

Table 1	PDC Family
Code	Description
MY	Automotive Capacitor array (with AEC-Q200 qualification)

Table 2	Size				
Code	Description	Code	Description	Code	Description
24	4x0402	34	4x0603		

Table 3	Dielectric Material Characteristics		
Code	Description	Code	Description
N	C0G (NP0)	X	X7R

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
J	±5 %	K	±10 %	M	±20 %

Table 6	Rated Voltage				
Code	Description	Code	Description	Code	Description
100	10Vdc	250	25Vdc	101	100Vdc
160	16Vdc	500	50Vdc		

Table 7	Termination		
Code	Description	Code	Description
C	Cu/Ni/Sn		

Table 8	Packaging Style				
Code	Description	Code	Description	Code	Description
T	7" reeled	G	13" reeled		

*Size/ Inch (mm) : 4x0402=0508 (1220), 4x0603=0612 (1632)

PSA
PASSIVE SYSTEM ALLIANCE

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm) / Symbol
4x0402 0508 (1220)	2.00±0.15	1.25±0.15	0.85±0.10 / T
	S (mm)	BW (mm)	P (mm)
	0.20±0.10	0.25±0.10	0.50±0.10
Size Inch (mm)	L (mm)	W (mm)	T (mm) / Symbol
4x0603 0612 (1632)	3.20±0.15	1.60±0.15	0.80±0.10 / B
	S (mm)	BW (mm)	P (mm)
	0.30±0.20	0.40±0.15	0.80±0.15

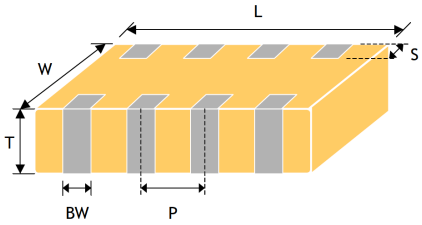


Fig.5-1 The outline of MLCC

6. GENERAL ELECTRICAL DATA

Dielectric	C0G	X7R
Size	4x0402, 4x0603	
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	
Capacitance *	10pF ~ 220pF	180pF ~ 0.1μF
Capacitance tolerance**	J(±5%), K(±10%)	K(±10%), M(±20%)
Insulation resistance at Ur	≥10GΩ or RxC≥500Ω-F, whichever is smaller	
Operating temperature	-55℃ to +125℃	
Capacitance characteristic	±30ppm/℃	±15%
Termination	Ni/Sn (lead-free termination)	

* Measured at 30~70% related humidity.
NP0 : Apply 1.0±0.2Vrms, 1.0MHz±10% at the conditions of 25℃ ambient temperature.
X7R : Apply 1.0±0.2Vrms, 1.0KHz±10%, at the conditions of 25℃ ambient temperature.
** Preconditioning for Class II MLCC : Perform a heat treatment at 150±10℃ for 1 hour, then leave in ambient condition for 24±2 hours before measurement.

PSA
PASSIVE SYSTEM ALLIANCE

7. CAPACITANCE RANGE

SIZE Inch (mm)		4x0402 (MY24)				4x0603 (MY34)					
Dielectric		C0G	X7R			C0G			X7R		
Cap(pF)	code	50V	10V	16V	25V	25V	50V	100V	16V	25V	50V
10	100	T				B	B	B			
15	150	T				B	B	B			
22	220	T				B	B	B			
33	330	T				B	B	B			
47	470	T				B	B	B			
68	680	T				B	B	B			
100	101	T				B	B	B			
120	121	T				B	B	B			
150	151	T				B	B	B			
180	181	T				B	B	B		B	B
220	221	T				B	B	B		B	B
270	271					B	B	B		B	B
330	331					B	B	B		B	B
390	391					B	B	B		B	B
470	471					B	B	B		B	B
680	681									B	B
820	821									B	B
1000	102		T	T	T					B	B
1500	152		T	T	T					B	B
2200	222		T	T	T					B	B
3300	332		T	T	T					B	B
4700	472		T	T	T					B	B
6800	682		T	T	T					B	B
10000	103		T	T	T					B	B
15000	153		T	T	T				B	B	B
22000	223		T	T	T				B	B	B
33000	333		T	T	T				B		
47000	473		T	T	T				B		
68000	683		T	T	T				B		
100000	104		T	T	T				B		

The letter in cell is expressed the symbol of product thickness.

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 ±10.0%.
* Q/D.F. value :
C0G : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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≥6.8μF; 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≥4.7μF</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>I.R.</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≥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>
<tr><td>6.3V ; 4V</td><td></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 : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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≥6.8μF</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≥4.7μF</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>I.R.</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≥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>
<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 : Q≥350 for Cap.>30pF, Q≥275+2.5C for 10pF≤Cap.≤30pF,
Q≥200+10C for Cap.<10pF.
X7R :
<table>
<tr><th>Rated</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≥6.8μF; 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≥4.7μF</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>I.R.</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≥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>
<tr><td>6.3V; 4V</td><td></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±5%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 : Q≥200 for Cap.≥30pF, Q≥100+10/3C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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≥6.8μF; 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≥4.7μF</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>I.R.</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≥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>
<tr><td>6.3V; 4V</td><td></td></tr>
</table>
Class II (X7R) for 1.3~1.5Vdc test
<table>
<tr><th>Rated voltage</th><th>I.R.</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≥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>
<tr><td>6.3V; 4V</td><td></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 : Q≥350 for Cap.>30pF, Q≥275+2.5C for 10pF≤Cap.≤30pF,
Q≥200+10C for Cap.<10pF.
X7R :
<table>
<tr><th>Rated</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≥6.8μF; 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≥4.7μF</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>I.R.</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≥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>
<tr><td>6.3V; 4V</td><td></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 : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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>I.R.</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≥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>
<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 : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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>I.R.</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≥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>
<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 : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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>I.R.</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≥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>
<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 : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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>I.R.</th></tr>
<tr><td>100V : X7R</td><td rowspan="6">≥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≥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>
<tr><td>6.3V; 4V</td><td></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 : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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≥6.8μF; 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≥4.7μF</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>I.R.</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≥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>
<tr><td>6.3V; 4V</td><td></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 : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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>I.R.</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≥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>
<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

<table>
<tr><th>No.</th><th>AEC-Q200 Test Item</th><th>AEC-Q200 Test Condition</th><th>Requirements</th></tr>
<tr><td rowspan="4">17</td><td rowspan="4">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 : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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>* Insulation Resistance.
To apply rated voltage for max. 120 sec.</td><td>* I.R. : ≥10GΩ or RxC≥500Ω-F, whichever is smaller.
Class II (X7R)
<table>
<tr><th>Rated voltage</th><th>I.R.</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≥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>
<tr><td>6.3V; 4V</td></tr>
</table></td></tr>
<tr><td>* Dielectric Strength.
<table>
<tr><th>Rated Vol.(V)</th><th>Condition</th></tr>
<tr><td>≤100</td><td>2.5 times of U_R</td></tr>
<tr><td>100<V≤250</td><td>2.0 times of U_R</td></tr>
<tr><td>250<V≤500</td><td>1.5 times of U_R</td></tr>
<tr><td>=630</td><td>1.2 times of U_R</td></tr>
</table>
* Duration 1~5 sec, charge and discharge current less than 50mA.</td><td>* No evidence of damage or flash over during test.</td></tr>
<tr><td>* Temperature Coefficient (With no electrical load) Operation temperature : -55~125℃ at 25℃.</td><td>* 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 : Q≥1000 for Cap.≥30pF, Q≥400+20C for Cap.<30pF.
X7R :
<table>
<tr><th>Rated</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 Inch (mm)	Thickness (mm) / Symbol	Paper tape		Plastic tape	
		7" reel	13" reel	7" reel	13" reel
4x0402 0508(1220)	0.85±0.10 / T	4k	-	-	-
4x0603 0612(1632)	0.80±0.10 / B	4k	-	-	-

Unit : pcs

9.1. EMBOSSED TAPE DIMENSIONS

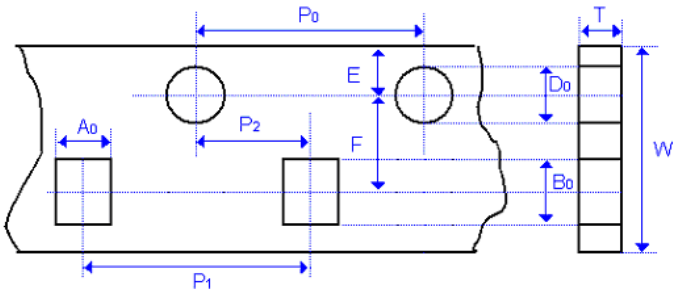


Fig. 9-1 The dimension of paper tape

Size	4x0402 0508 (1220)	4x0603 0612 (1632)
Chip Thickness	T	B
A_0	1.50±0.20	1.90 +/-0.50
B_0	2.30±0.20	3.50 +/-0.50
T	≤1.2	≤1.2
K_0	-	-
W	8.00±0.10	8.00±0.10
P_0	4.00±0.10	4.00±0.10
$10xP_0$	40.00±0.20	40.00±0.20
P_1	4.00±0.10	4.00±0.10
P_2	2.00±0.05	2.00±0.05
D_0	1.55±0.05	1.55±0.05
D_1	-	-
E	1.75±0.05	1.75±0.05
F	3.50±0.05	3.50±0.05
Unit :	mm	mm

9. PACKAGE DIMENSION AND QUANTITY

9.2. REEL DIMENSIONS

Size	4x0402, 4x0603
Reel size	7”
C	13.0 +0.5/-0.2
W_1	8.4 +1.5/-0
A	178.0 ±0.10
N	60.0 +1.0/-0

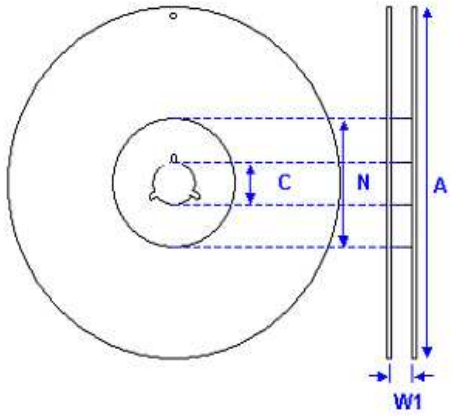


Fig. 9-2 The dimension of reel

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

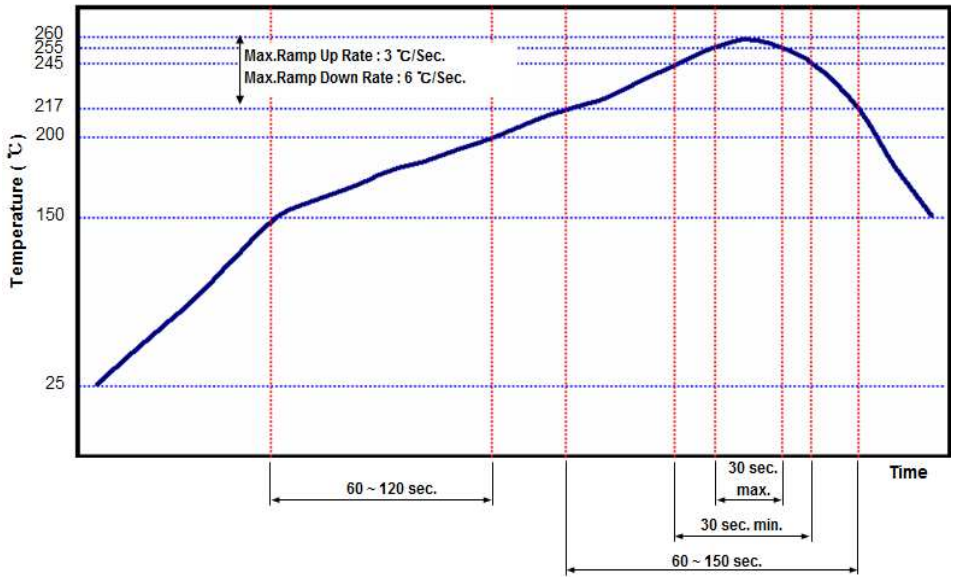
In order to minimize the risk of thermal shock during soldering, a carefully controlled preheat is required. The rate of preheat should not exceed 3℃ per secon d.

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.) Reflow soldering :

Fig. 10-1 Reflow soldering profile



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

10. APPLICATION NOTES

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.