




<b>SPECIFICATION SHEET NO.</b>	R1206- MT06B224K101GB	
<b>ORIGINAL MFG/PART NO.</b>	Aillen Capacitors/MT1206B224K101GB	
<b>NEXTGEN PART CODE</b>	MT06B224K101GB	Indicate This Code For <a href="#">RFQ/Order</a>
<b>DATE</b>	Dec. 6, 2024	
<b>REVISION</b>	A5	Updated With Most Recent Data
<b>DESCRIPTION AND MAIN PARAMETRICS</b>	<p>Automotive Multilayer Ceramic Chip Capacitors (MLCC), MT Series</p> <p>Case 1206 Metric 3216, Dimension L3.20*W1.60*H1.60mm, Thickness 1.80mm Max. Dielectric X7R, Capacitance 0.22μF, Tolerance ±10%, Rated Voltage 100V</p> <p>Operating Temp. Range -55°C ~+125°C</p> <p>Package in Tape/Reel, 2,000pcs/Reel</p> <p>REACH/RoHS/RoHS III Compliant</p>	
<b>CUSTOMER</b>		
<b>CUSTOMER PART NUMBER</b>		
<b>CROSS REF. PART NUMBER</b>		
<b>MEMO</b>		

<b>VENDOR APPROVE</b>		
Issued/Checked/Approved		
		
Effective Date: Dec. 6, 2024		

<b>CUSTOMER APPROVE</b>
DATE:

## DESCRIPTION

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. MLCC is made by NP0, X7R, dielectric material and which provides product with high electrical precision, stability and reliability. Besides, MT series MLCC is tighten controlling in quality in line to assure quality performance in Automotive Applications.



*Image shown is a representation only.*

*Exact specifications should be obtained from the product dimension.*

## MAIN FEATURE

- A Wide Selection Of Sizes Is Available
- Wide Rated Voltage Range
- High Capacitance In Given Case Size.
- Temperature Coefficient: NP0 (COG) And X7R
- Capacitor With Lead-free Termination (Pure Tin)
- The MT Series Meet AEC-Q200 Requirement
- REACH/RoHS/RoHS III Compliant



## APPLICATION

- Navigation & Information Equipment.
- Entertainment Equipment.
- Comfortable Equipment.
- Automotive Electronic Equipment.

## ELECTRICAL CHARACTERISTICS

- See Page 4 For Different Part Code And Rated Voltage.
- All Products Parameters are Subject To NextGen Components' Final Confirmation.

**HOW TO ORDER**

- Please Follow Up Part Code Guide And Indicate NextGen Part Code MT06B224K101GB For RFQ and Order.

**RFQ**  
Request For Quotation

**PART CODE GUIDE**

CODE	NAME	KEY SPECIFICATION OPTION
MT	Product Code	Automotive Multilayer Ceramic Chip Capacitors (MLCC), MT Series
06	Size Code	01: 0201 (0603 Metric) L0.60*W0.30mm; 02: 0402 (1005 Metric) L1.00*W0.50mm 03: 0603 (1608 Metric) L1.60*W0.80mm; 05: 0805 (2012 Metric) L2.00*W1.25mm 06: 1206 (3216 Metric) L3.20*W1.60mm; 10: 1210 (3225 Metric ) L3.20*W2.50mm
B	Temperature Coefficient	N: NP0 (COG); B: X7R
224	Capacitance	Two significant digits followed by number of Zero, The 3rd digit signifies the multiplying factor, and letter R is decimal point. 0R2: 0.2pF; 5R6: 5.6pF; 470: 47pF; 224: 0.22μF
K	Tolerance	B: ±0.1pF; C: ±0.25pF; D: ±0.5pF; F: ±1%; G: ±2%; J: ±5%; K: ±10% ; M: ±20%
101	Rated Voltage	100: 10 VDC; 160: 16 VDC; 250: 25 VDC; 500: 50 VDC; 101: 100 VDC; 201: 200 VDC; 251: 250 VDC; 501: 500 VDC; 631: 630 VDC; 102: 1000 VDC
G	Thickness	G: 1.60 ± 0.20mm, See Page 5 ~ Page 6 (T's Symbol) for Different part code
B	Package	A: 1Kpcs/Reel; B: 2Kpcs/Reel; C: 3Kpcs/Reel; D: 4Kpcs/Reel; I: 10Kpcs/Reel
( )	Internal Control	Blank: N/A; XX: Letter A~Z, a~z or digits (0~9) for Special/Custom Parameters

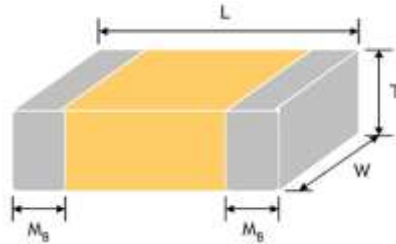
**ELECTRICAL CHARACTERISTICS –50V FOR DIFFERENT PART CODE**

NEXTGEN PART CODE	TEMP. COEFFICIENT	CAPACITANCE	TOLERANCE	VOLTAGE	THICKNESS (MAX.)	OPERATING TEMP. RANGE	CAPACITANCE CHARACTERISTIC
	-	-	-	V	mm	°C	-
MT02B152K500NI	X7R	1500pF	±10%	50	0.55	-55 ~+125	±15%
MT02N3R3C500NI	NPO (COG)	3.3pF	±0.25pF	50	0.55	-55 ~+125	±30ppm/°C
MT02N3R9C500NI	NPO (COG)	3.9pF	±0.25pF	50	0.55	-55 ~+125	±30ppm/°C
MT03B103K500SD	X7R	0.01 μF	±10%	50	0.87	-55 ~+125	±15%
MT03N3R3C500SD	NPO (COG)	3.3pF	±0.25pF	50	0.87	-55 ~+125	±30ppm/°C
MT03N470J500SD	NPO (COG)	47pF	±5%	50	0.87	-55 ~+125	±30ppm/°C
MT03N5R6B500SD	NPO (COG)	5.6pF	±0.1pF	50	0.87	-55 ~+125	±30ppm/°C
MT05B104M500BD	X7R	0.10 μF	±20%	50	0.90	-55 ~+125	±15%

**ELECTRICAL CHARACTERISTICS – 100V FOR DIFFERENT PART CODE**

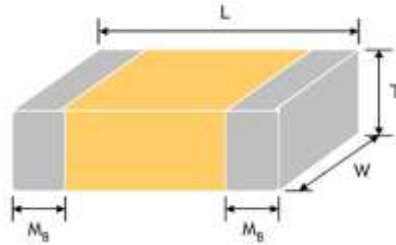
NEXTGEN PART CODE	TEMP. COEFFICIENT	CAPACITANCE	TOLERANCE	VOLTAGE	THICKNESS (MAX.)	OPERATING TEMP. RANGE	CAPACITANCE CHARACTERISTIC
	-	-	-	V	mm	°C	-
MT03B103K101SD	X7R	0.01 μF	±10%	100	0.87	-55 ~+125	±15%
MT05B103K101DC	X7R	0.01 μF	±10%	100	1.35	-55 ~+125	±15%
MT05B104K101DC	X7R	0.10 μF	±10%	100	1.35	-55 ~+125	±15%
MT05B473K101DC	X7R	0.047 μF	±10%	100	1.35	-55 ~+125	±15%
<b>MT06B224K101GB</b>	X7R	0.22 μF	±10%	100	1.8	-55 ~+125	±15%

**DIMENSION** (Unit: mm)



SIZE CODE	METRIC CODE	L	W	T (SYMBOL)		SOLDERING METHOD	Mb	
0201	0603	0.60±0.03	0.30±0.03	0.3±0.03	L	#	0.15+0.05	
0402	1005	1.00±0.05	0.50±0.05	0.50±0.05	N	#	0.25 +0.05/-0.10	
0603	1608	1.60±0.10	0.80±0.10	0.80±0.07	S		0.40±0.15	
		1.60 +0.15/-0.10	0.80 +0.15/-0.10	0.80 +0.15/-0.10	X			
0805	2012	2.00±0.15	1.25±0.10	0.60 ± 0.10	A		0.50±0.20	
				0.80±0.10	B			
				1.25 ± 0.10	D			#
		2.00±0.20	1.25±0.20	1.25 ± 0.20	I	#		
1206	3216	3.20 ± 0.15	1.60±0.15	0.80±0.10	B		0.60 ± 0.20	
				0.95±0.10	C			#
				1.25 ± 0.10	D			#
		3.20 ± 0.20	1.60 ± 0.15	1.15 ± 0.15	J			
		3.20 ± 0.20	1.60±0.20	1.60 ± 0.20	G		#	
		3.20 +0.30/-0.10	1.60 +0.30/-0.10	1.60 +0.30/-0.10	P		#	

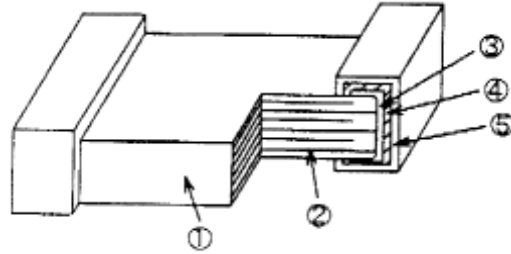
**DIMENSION** (Unit: mm)



SIZE CODE	METRIC CODE	L	W	T (SYMBOL )		SOLDERING METHOD	Mb
1210	3225	3.20±0.30	2.50±0.20	0.95±0.10	C	#	0.75±0.25
				1.25±0.10	D		
		3.20±0.40	2.50±0.30	1.60±0.20	G	#	
				2.00±0.20	K		
				2.50±0.30	M		

# Reflow soldering only is recommended.

**CONSTRUCTIONS**



SYMBOL	NAME		NPO (COG), X7R
①	Ceramic Material		BaTiO
②	Inner Electrode		Ni
③	Termination	Inner layer	Cu
④		Middle Layer	Ni
⑤		Outer Layer	Sn

**GENERAL ELECTRICAL CHARACTERISTICS**

DIELECTRIC	NPO (COG)	X7R
Size	0201, 0402, 0603, 0805, 1206, 1210	0402, 0603, 0805, 1206
Capacitance Range*	0.1pF to 0.047uF	100pF to 2.2uF
Capacitance Tolerance	5pF<Cap<10pF: B ( $\pm 0.1\text{pF}$ ), C ( $\pm 0.25\text{pF}$ ), D ( $\pm 0.5\text{pF}$ )	J ( $\pm 5\%$ ), K ( $\pm 10\%$ ), M ( $\pm 20\%$ )
Rated Voltage	10V, 16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V, 1000V	
Operating Temperature	-55 ~+125°C	
Capacitance Characteristic	$\pm 30\text{ppm}/^\circ\text{C}$	$\pm 15\%$
Termination	Ni/Sn (lead-free termination)	

**Note:**

- #1: NPO, 0.1pF product only provide B tolerance;
- \* Measured at the condition of 30~70% related humidity.
- NPO: Apply  $1.0 \pm 0.2\text{Vrms}$ ,  $1.0\text{MHz} \pm 10\%$  for  $\text{Cap} \leq 1000\text{pF}$  and  $1.0 \pm 0.2\text{Vrms}$ ,  $1.0\text{kHz} \pm 10\%$  for  $\text{Cap} > 1000\text{pF}$ , 25°C at ambient temperature.
- X7R: Measured at  $1.0 \pm 0.2\text{Vrms}$ ,  $1.0\text{kHz} \pm 10\%$  for  $\text{C} \leq 10\mu\text{F}$ ;  $0.5 \pm 0.2\text{Vrms}$ ,  $120\text{Hz} \pm 20\%$  for  $\text{C} > 10\mu\text{F}$ , 30~70% related humidity, 25° C ambient temperature for X7R.
- \*\* Preconditioning for Class II MLCC: Perform a heat treatment at  $150 \pm 10^\circ\text{C}$  for 1 hour and then leave in ambient condition for  $24 \pm 2$  hours before measurement.



**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 0201, 0402**

Table 1-A

SIZE	0201					0402				
	VDC (V)	10	16	25	50	100	10	16	25	50
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
0.6pF (0R6)	L	L	L	L	L	N	N	N	N	N
0.7pF (0R7)	L	L	L	L	L	N	N	N	N	N
0.8pF (0R8)	L	L	L	L	L	N	N	N	N	N
0.9pF (0R9)	L	L	L	L	L	N	N	N	N	N
1.0pF (1R0)	L	L	L	L	L	N	N	N	N	N
1.2pF (1R2)	L	L	L	L	L	N	N	N	N	N
1.5pF (1R5)	L	L	L	L	L	N	N	N	N	N
1.8pF (1R8)	L	L	L	L	L	N	N	N	N	N
2.0pF (2R0)	L	L	L	L	L	N	N	N	N	N
2.2pF (2R2)	L	L	L	L	L	N	N	N	N	N
2.7pF (2R7)	L	L	L	L	L	N	N	N	N	N
3.0pF (3R0)	L	L	L	L	L	N	N	N	N	N
3.3pF (3R3)	L	L	L	L	L	N	N	N	N	N
3.9pF (3R9)	L	L	L	L	L	N	N	N	N	N
4.0pF (4R0)	L	L	L	L	L	N	N	N	N	N
4.7pF (4R7)	L	L	L	L	L	N	N	N	N	N
5.0pF (5R0)	L	L	L	L	L	N	N	N	N	N
5.6pF (5R6)	L	L	L	L	L	N	N	N	N	N
6.0pF (6R0)	L	L	L	L	L	N	N	N	N	N
6.8pF (6R8)	L	L	L	L	L	N	N	N	N	N
7.0pF (7R0)	L	L	L	L	L	N	N	N	N	N
8.0pF (8R0)	L	L	L	L	L	N	N	N	N	N
8.2pF (8R2)	L	L	L	L	L	N	N	N	N	N
9.0pF (9R0)	L	L	L	L	L	N	N	N	N	N
10pF (100)	L	L	L	L	L	N	N	N	N	N
12pF (120)	L	L	L	L	L	N	N	N	N	N
15pF (150)	L	L	L	L	L	N	N	N	N	N
18pF (180)	L	L	L	L	L	N	N	N	N	N
22pF (220)	L	L	L	L	L	N	N	N	N	N
27pF (270)	L	L	L	L	L	N	N	N	N	N

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 0201, 0402**

Table 1-B

SIZE	0201					0402				
	VDC (V)	10	16	25	50	100	10	16	25	50
33pF (330)	L	L	L	L	L	N	N	N	N	N
39pF (390)	L	L	L	L	L	N	N	N	N	N
47pF (470)	L	L	L	L	L	N	N	N	N	N
56pF (560)	L	L	L	L	L	N	N	N	N	N
68pF (680)	L	L	L	L	L	N	N	N	N	N
82pF (820)	L	L	L	L	L	N	N	N	N	N
100pF (101)	L	L	L	L	L	N	N	N	N	N
120pF (121)	L	L	L	L	L	N	N	N	N	N
150pF (151)						N	N	N	N	N
180pF (181)						N	N	N	N	N
220pF (221)						N	N	N	N	N
270pF (271)						N	N	N	N	
330pF (331)						N	N	N	N	
390pF (391)						N	N	N	N	
470pF (471)						N	N	N	N	
560pF (561)						N	N	N	N	
680pF (681)						N	N	N	N	
820pF (821)						N	N	N	N	
1,000pF (102)						N	N	N	N	

**CAPACITANCE RANGE - NP0(COG) DIELECTRIC SIZE 0603**

Table 1-C

SIZE	0603							
	VDC (V)	10	16	25	50	100	200	250
0.5pF (0R5)	S	S	S	S	S	S	S	S
0.6pF (0R6)	S	S	S	S	S	S	S	S
0.7pF (0R7)	S	S	S	S	S	S	S	S
0.8pF (0R8)	S	S	S	S	S	S	S	S
0.9pF (0R9)	S	S	S	S	S	S	S	S
1.0pF (1R0)	S	S	S	S	S	S	S	S
1.2pF (1R2)	S	S	S	S	S	S	S	S
1.5pF (1R5)	S	S	S	S	S	S	S	S
1.8pF (1R8)	S	S	S	S	S	S	S	S
2.0pF (2R0)	S	S	S	S	S	S	S	S

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 0603**

Table 1-D

SIZE	0603						
	10	16	25	50	100	200	250
VDC (V)	10	16	25	50	100	200	250
2.2pF (2R2)	S	S	S	S	S	S	S
2.7pF (2R7)	S	S	S	S	S	S	S
3.0pF (3R0)	S	S	S	S	S	S	S
3.3pF (3R3)	S	S	S	S	S	S	S
3.9pF (3R9)	S	S	S	S	S	S	S
4.0pF (4R0)	S	S	S	S	S	S	S
4.7pF (4R7)	S	S	S	S	S	S	S
5.0pF (5R0)	S	S	S	S	S	S	S
5.6pF (5R6)	S	S	S	S	S	S	S
6.0pF (6R0)	S	S	S	S	S	S	S
6.8pF (6R8)	S	S	S	S	S	S	S
7.0pF (7R0)	S	S	S	S	S	S	S
8.0pF (8R0)	S	S	S	S	S	S	S
8.2pF (8R2)	S	S	S	S	S	S	S
9.0pF (9R0)	S	S	S	S	S	S	S
10pF (100)	S	S	S	S	S	S	S
12pF (120)	S	S	S	S	S	S	S
15pF (150)	S	S	S	S	S	S	S
18pF (180)	S	S	S	S	S	S	S
22pF (220)	S	S	S	S	S	S	S
27pF (270)	S	S	S	S	S	S	S
33pF (330)	S	S	S	S	S	S	S
39pF (390)	S	S	S	S	S	S	S
47pF (470)	S	S	S	S	S	S	S
56pF (560)	S	S	S	S	S	S	S
68pF (680)	S	S	S	S	S	S	S
82pF (820)	S	S	S	S	S	S	S
100pF (101)	S	S	S	S	S	S	S
120pF (121)	S	S	S	S	S	S	S
150pF (151)	S	S	S	S	S	S	S
180pF (181)	S	S	S	S	S	S	S
220pF (221)	S	S	S	S	S	S	S
270pF (271)	S	S	S	S	S	X	X
330pF (331)	S	S	S	S	S	X	X
390pF (391)	S	S	S	S	S	X	X

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 0603**

Table 1-E

SIZE	0603						
VDC (V)	10	16	25	50	100	200	250
470pF (471)	S	S	S	S	S	X	X
560pF (561)	S	S	S	S	S		
680pF (681)	S	S	S	S	S		
820pF (821)	S	S	S	S	S		
1,000pF (102)	S	S	S	S	S		
1,200pF (122)	X	X	X	X			
1,500pF (152)	X	X	X	X			
1,800pF (182)	X	X	X	X			
2,200pF (222)	X	X	X	X			
2,700pF (272)	X	X	X	X			
3,300pF (332)	X	X	X	X			

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 0805**

Table 1-F

SIZE	0805								
VDC (V)	10	16	25	50	100	200	250	500	630
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

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 0805**

Table 1-G

SIZE	0805								
VDC (V)	10	16	25	50	100	200	250	500	630
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	B	B
100pF (101)	A	A	A	A	A	B	B	B	B
120pF (121)	A	A	A	A	A	B	B	D	D
150pF (151)	A	A	A	A	A	D	D	D	D
180pF (181)	A	A	A	A	A	D	D	D	D
220pF (221)	A	A	A	A	A	D	D	D	D
270pF (271)	A	A	A	A	A	D	D	D	D
330pF (331)	A	A	A	A	A	D	D	D	D
390pF (391)	B	B	A	A	A	D	D	D	D
470pF (471)	B	B	B	B	B	D	D	I	I
560pF (561)	B	B	B	B	B	D	D	I	I
680pF (681)	B	B	B	B	B	D	D	I	I
820pF (821)	B	B	B	B	B	D	D	I	I
1,000pF (102)	B	B	B	B	B	D	D	I	I
1,200pF (122)	B	B	B	B	B	D	D		
1,500pF (152)	B	B	B	B	B	D	D		
1,800pF (182)	B	B	B	B	B	D	D		
2,200pF (222)	B	B	B	B	B	D	D		
2,700pF (272)	D	D	D	D	D				
3,300pF (332)	D	D	D	D	D				
3,900pF (392)	D	D	D	D	D				
4,700pF (472)	D	D	D	D	D				
5,600pF (562)	D	D	D	D	D				
6,800pF (682)	D	D	D	D	D				
8,200pF (822)	D	D	D	D					
0.01μF (103)	D	D	D	D					

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 1206**

Table 1-H

Size	1206									
VDC (V)	10	16	25	50	100	200	250	500	630	1000
1.2pF (1R2)	B	B	B	B	B	B	B	B	B	
1.5pF (1R5)	B	B	B	B	B	B	B	B	B	B
1.8pF (1R8)	B	B	B	B	B	B	B	B	B	B
2.2pF (2R2)	B	B	B	B	B	B	B	B	B	B
2.7pF (2R7)	B	B	B	B	B	B	B	B	B	B
3.3pF (3R3)	B	B	B	B	B	B	B	B	B	B
3.9pF (3R9)	B	B	B	B	B	B	B	B	B	B
4.7pF (4R7)	B	B	B	B	B	B	B	B	B	B
5.6pF (5R6)	B	B	B	B	B	B	B	B	B	B
6.8pF (6R8)	B	B	B	B	B	B	B	B	B	B
8.2pF (8R2)	B	B	B	B	B	B	B	B	B	B
10pF (100)	B	B	B	B	B	B	B	B	B	B
12pF (120)	B	B	B	B	B	B	B	B	B	B
15pF (150)	B	B	B	B	B	B	B	B	B	B
18pF (180)	B	B	B	B	B	B	B	B	B	B
22pF (220)	B	B	B	B	B	B	B	B	B	D
27pF (270)	B	B	B	B	B	B	B	B	B	D
33pF (330)	B	B	B	B	B	B	B	B	B	D
39pF (390)	B	B	B	B	B	B	B	B	B	D
47pF (470)	B	B	B	B	B	B	B	B	B	D
56pF (560)	B	B	B	B	B	B	B	B	B	D
68pF (680)	B	B	B	B	B	B	B	B	B	D
82pF (820)	B	B	B	B	B	B	B	B	B	D
100pF (101)	B	B	B	B	B	B	B	B	B	D
120pF (121)	B	B	B	B	B	B	B	B	B	D
150pF (151)	B	B	B	B	B	B	B	B	B	D
180pF (181)	B	B	B	B	B	B	B	B	B	G
220pF (221)	B	B	B	B	B	B	B	B	B	G
270pF (271)	B	B	B	B	B	B	C	C	C	G
330pF (331)	B	B	B	B	B	B	C	C	C	G
390pF (391)	B	B	B	B	B	B	C	C	C	G
470pF (471)	B	B	B	B	B	C	C	C	C	G
560pF (561)	B	B	B	B	B	C	D	D	D	G
680pF (681)	B	B	B	B	B	C	D	D	D	G
820pF (821)	B	B	B	B	B	C	G	G	G	G

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 1206**

Table 1-I

SIZE	1206									
VDC (V)	10	16	25	50	100	200	250	500	630	1000
1,000pF (102)	B	B	B	B	B	C	G	G	G	G
1,200pF (122)	B	B	B	B	B	C	G	G	G	
1,500pF (152)	B	B	B	B	B	D	G	G	G	
1,800pF (182)	B	B	B	B	B	D	G	G	G	
2,200pF (222)	B	B	B	B	B	D	G	G	G	
2,700pF (272)	B	B	B	B	B	D	G	G	G	
3,300pF (332)	B	B	B	B	B	D	G	G	G	
3,900pF (392)	B	B	B	B	B	D	G	G	G	
4,700pF (472)	B	B	B	B	B	D	G	G	G	
5,600pF (562)	B	B	B	B	B					
6,800pF (682)	C	C	C	C	C					
8,200pF (822)	D	D	D	D	D					
0.01µF (103)	D	D	D	D	D					

**CAPACITANCE RANGE - NP0(COG) DIELECTRIC SIZE 1210**

Table 1-J

SIZE	1210									
VDC (V)	10	16	25	50	100	200	250	500	630	1000
10pF (100)	C	C	C	C	C	C	C	C	C	C
12pF (120)	C	C	C	C	C	C	C	C	C	C
15pF (150)	C	C	C	C	C	C	C	C	C	C
18pF (180)	C	C	C	C	C	C	C	C	C	C
22pF (220)	C	C	C	C	C	C	C	C	C	C
27pF (270)	C	C	C	C	C	C	C	C	C	C
33pF (330)	C	C	C	C	C	C	C	C	C	C
39pF (390)	C	C	C	C	C	C	C	C	C	C
47pF (470)	C	C	C	C	C	C	C	C	C	C
56pF (560)	C	C	C	C	C	C	C	C	C	C
68pF (680)	C	C	C	C	C	C	C	C	C	C
82pF (820)	C	C	C	C	C	C	C	C	C	C
100pF (101)	C	C	C	C	C	C	C	C	C	D
120pF (121)	C	C	C	C	C	C	C	C	C	D
150pF (151)	C	C	C	C	C	C	C	C	C	D
180pF (181)	C	C	C	C	C	C	C	C	C	D
220pF (221)	C	C	C	C	C	C	C	C	C	G

**CAPACITANCE RANGE - NP0 (COG) DIELECTRIC SIZE 1210**

Table 1-K

SIZE	1210									
VDC (V)	10	16	25	50	100	200	250	500	630	1000
270pF (271)	C	C	C	C	C	C	C	C	C	G
330pF (331)	C	C	C	C	C	C	C	C	C	G
390pF (391)	C	C	C	C	C	C	C	C	C	G
470pF (471)	C	C	C	C	C	C	C	C	C	G
560pF (561)	C	C	C	C	C	C	C	C	C	G
680pF (681)	C	C	C	C	C	C	C	C	C	G
820pF (821)	C	C	C	C	C	C	C	C	C	G
1,000pF (102)	C	C	C	C	C	D	D	D	D	G
1,200pF (122)	C	C	C	C	C	D	D	D	D	
1,500pF (152)	C	C	C	C	C	D	D	D	D	
1,800pF (182)	C	C	C	C	C	D	D	D	D	
2,200pF (222)	C	C	C	C	C	D	D	D	D	
2,700pF (272)	C	C	C	C	C	D	D	D	D	
3,300pF (332)	C	C	C	C	C	D	D	D	D	
3,900pF (392)	C	C	C	C	C	D	D	D	D	
4,700pF (472)	C	C	C	C	C	G	G			
5,600pF (562)	C	C	C	C	C	G	G			
6,800pF (682)	C	C	C	C	C	G	G			
8,200pF (822)	C	C	C	C	C	G	G			
0.010μF (103)	C	C	C	C	C	G	G			
0.012μF (123)	D	D	D	D	D					
0.015μF (153)	D	D	D	D	D					
0.018μF (183)	K	K	K	K	K					
0.022μF (223)	K	K	K	K	K					
0.027μF (273)	K	K	K	K	K					
0.033μF (333)	K	K	K	K	K					
0.039μF (393)	K	K	K	K	K					
0.047μF (473)	K	K	K	K	K					



**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 0201, 0402**

Table 2-A

SIZE	0201				0402			
	10	16	25	50	10	16	25	50
VDC (V)								
100pF (101)	L	L	L	L	N	N	N	N
120pF (121)	L	L	L	L	N	N	N	N
150pF (151)	L	L	L	L	N	N	N	N
180pF (181)	L	L	L	L	N	N	N	N
220pF (221)	L	L	L	L	N	N	N	N
270pF (271)	L	L	L	L	N	N	N	N
330pF (331)	L	L	L	L	N	N	N	N
390pF (391)	L	L	L	L	N	N	N	N
470pF (471)	L	L	L	L	N	N	N	N
560pF (561)	L	L	L	L	N	N	N	N
680pF (681)	L	L	L	L	N	N	N	N
820pF (821)	L	L	L	L	N	N	N	N
1,000pF (102)	L	L	L	L	N	N	N	N
1,200pF (122)	L	L	L	L	N	N	N	N
1,500pF (152)	L	L	L	L	N	N	N	N
1,800pF (182)	L	L	L	L	N	N	N	N
2,200pF (222)	L	L	L	L	N	N	N	N
2,700pF (272)	L	L	L	L	N	N	N	N
3,300pF (332)	L	L	L	L	N	N	N	N
3,900pF (392)	L	L	L	L	N	N	N	N
4,700pF (472)	L	L	L	L	N	N	N	N
5,600pF (562)	L	L	L	L	N	N	N	N
6,800pF (682)	L				N	N	N	N
8,200pF (822)	L				N	N	N	N
0.010μF (103)	L				N	N	N	N
0.012μF (123)					N	N	N	
0.015μF (153)					N	N	N	
0.018μF (183)					N	N	N	
0.022μF (223)					N	N	N	
0.027μF (273)					N	N	N	
0.033μF (333)					N	N	N	
0.039μF (393)					N	N	N	
0.047μF (473)					N	N	N	
0.056μF (563)					N	N	N	
0.068μF (683)					N	N	N	
0.082μF (823)					N	N	N	
0.10μF (104)					N	N	N	

**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 0603**

Table 2-B

Size	0603				
	10	16	25	50	100
VDC (V)					
100pF (101)	S	S	S	S	S
120pF (121)	S	S	S	S	S
150pF (151)	S	S	S	S	S
180pF (181)	S	S	S	S	S
220pF (221)	S	S	S	S	S
270pF (271)	S	S	S	S	S
330pF (331)	S	S	S	S	S
390pF (391)	S	S	S	S	S
470pF (471)	S	S	S	S	S
560pF (561)	S	S	S	S	S
680pF (681)	S	S	S	S	S
820pF (821)	S	S	S	S	S
1,000pF (102)	S	S	S	S	S
1,200pF (122)	S	S	S	S	S
1,500pF (152)	S	S	S	S	S
1,800pF (182)	S	S	S	S	S
2,200pF (222)	S	S	S	S	S
2,700pF (272)	S	S	S	S	S
3,300pF (332)	S	S	S	S	S
3,900pF (392)	S	S	S	S	S
4,700pF (472)	S	S	S	S	S
5,600pF (562)	S	S	S	S	S
6,800pF (682)	S	S	S	S	S
8,200pF (822)	S	S	S	S	S
0.010μF (103)	S	S	S	S	S
0.012μF (123)	S	S	S	S	X
0.015μF (153)	S	S	S	S	X
0.018μF (183)	S	S	S	S	X
0.022μF (223)	S	S	S	S	X
0.027μF (273)	S	S	S	S	X
0.033μF (333)	S	S	S	X	X
0.039μF (393)	S	S	S	X	X
0.047μF (473)	S	S	S	X	X
0.056μF (563)	S	S	S	X	
0.068μF (683)	S	S	S	X	

**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 0603**

Table 2-C

SIZE	0603				
VDC (V)	10	16	25	50	100
0.082µF (823)	S	S	S	X	
0.10µF (104)	S	S	S	X	
0.12µF (124)	X	X	X		
0.15µF (154)	X	X	X	X	
0.18µF (184)	X	X	X		
0.22µF (224)	X	X	X	X	
0.33µF (334)	X	X	X	X	

**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 0805**

Table 2-D

SIZE	0805								
VDC (V)	10	16	25	50	100	200	250	500	630
100pF (101)	B	B	B	B	B	B	B	B	B
120pF (121)	B	B	B	B	B	B	B	B	B
150pF (151)	B	B	B	B	B	B	B	B	B
180pF (181)	B	B	B	B	B	B	B	B	B
220pF (221)	B	B	B	B	B	B	B	B	B
270pF (271)	B	B	B	B	B	B	B	B	B
330pF (331)	B	B	B	B	B	B	B	B	B
390pF (391)	B	B	B	B	B	B	B	B	B
470pF (471)	B	B	B	B	B	B	B	B	B
560pF (561)	B	B	B	B	B	B	B	B	B
680pF (681)	B	B	B	B	B	B	B	B	B
820pF (821)	B	B	B	B	B	B	B	B	B
1,000pF (102)	B	B	B	B	B	B	B	B	B
1,200pF (122)	B	B	B	B	B	B	B	B	B
1,500pF (152)	B	B	B	B	B	B	B	B	B
1,800pF (182)	B	B	B	B	B	B	B	B	B
2,200pF (222)	B	B	B	B	B	B	B	B	B
2,700pF (272)	B	B	B	B	B	B	B	B	B
3,300pF (332)	B	B	B	B	B	B	B	B	B
3,900pF (392)	B	B	B	B	B	B	B	B	B
4,700pF (472)	B	B	B	B	B	B	B	D	D

**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 0805**

Table 2-E

SIZE	0805								
VDC (V)	10	16	25	50	100	200	250	500	630
5,600pF (562)	B	B	B	B	B	B	B	D	D
6,800pF (682)	B	B	B	B	B	B	B	D	D
8,200pF (822)	B	B	B	B	B	B	B	D	D
0.010µF (103)	B	B	B	B	B	D	D	D	D
0.012µF (123)	B	B	B	B	B	D	D		
0.015µF (153)	B	B	B	B	B	D	D		
0.018µF (183)	B	B	B	B	B	D	D		
0.022µF (223)	B	B	B	B	B	D	D		
0.027µF (273)	B	B	B	B	B				
0.033µF (333)	B	B	B	B	B				
0.039µF (393)	B	B	B	B	B				
0.047µF (473)	B	B	B	B	B				
0.056µF (563)	B	B	B	B	B				
0.068µF (683)	B	B	B	B	D				
0.082µF (823)	B	B	B	B	D				
0.10µF (104)	B	B	B	B	D				
0.12µF (124)	B	B	B	D					
0.15µF (154)	D	D	D	D					
0.18µF (184)	D	D	D	D					
0.22µF (224)	D	D	D	D					
0.27µF (274)	D	D	D	I					
0.33µF (334)	D	D	D	I					
0.39µF (394)	D	D	D	I					
0.47µF (474)	D	D	D	I					
0.56µF (564)	D	D	D						
0.68µF (684)	D	D	D	I					
0.82µF (824)	D	D	D						
1.0µF (105)	D	D	D	I					

**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 1206**

Table 2-F

SIZE	1206								
VDC (V)	10	16	25	50	100	200	250	500	630
100pF (101)						D	D	D	D
120pF (121)						D	D	D	D
150pF (151)	B	B	B	B	B	D	D	D	D
180pF (181)	B	B	B	B	B	D	D	D	D

**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 1206**

Table 2-G

SIZE	1206									
	VDC (V)	10	16	25	50	100	200	250	500	630
220pF (221)	B	B	B	B	B	B	D	D	D	D
270pF (271)	B	B	B	B	B	B	D	D	D	D
330pF (331)	B	B	B	B	B	B	D	D	D	D
390pF (391)	B	B	B	B	B	B	D	D	D	D
470pF (471)	B	B	B	B	B	B	D	D	D	D
560pF (561)	B	B	B	B	B	B	D	D	D	D
680pF (681)	B	B	B	B	B	B	D	D	D	D
820pF (821)	B	B	B	B	B	B	D	D	D	D
1,000pF (102)	B	B	B	B	B	B	D	D	D	D
1,200pF (122)	B	B	B	B	B	B	D	D	D	D
1,500pF (152)	B	B	B	B	B	B	D	D	D	D
1,800pF (182)	B	B	B	B	B	B	D	D	D	D
2,200pF (222)	B	B	B	B	B	B	D	D	D	D
2,700pF (272)	B	B	B	B	B	B	D	D	D	D
3,300pF (332)	B	B	B	B	B	B	D	D	D	D
3,900pF (392)	B	B	B	B	B	B	D	D	D	D
4,700pF (472)	B	B	B	B	B	B	D	D	D	D
5,600pF (562)	B	B	B	B	B	B	D	D	D	D
6,800pF (682)	B	B	B	B	B	B	D	D	D	D
8,200pF (822)	B	B	B	B	B	B	D	D	D	D
0.010μF (103)	B	B	B	B	B	B	D	D	D	D
0.012μF (123)	B	B	B	B	B	B	D	D		
0.015μF (153)	B	B	B	B	B	B	D	D		
0.018μF (183)	B	B	B	B	B	B	D	D		
0.022μF (223)	B	B	B	B	B	B	D	D		
0.027μF (273)	B	B	B	B	B	B				
0.033μF (333)	B	B	B	B	B	B				
0.039μF (393)	B	B	B	B	B	B				
0.047μF (473)	B	B	B	B	B	B				
0.056μF (563)	B	B	B	B	B	B				
0.068μF (683)	B	B	B	B	B	B				
0.082μF (823)	B	B	B	B	B	D				
0.10μF (104)	B	B	B	B	B	D				
0.12μF (124)	B	B	B	B	B	D				
0.15μF (154)	C	C	C	C	C	G				
0.18μF (184)	C	C	C	C	C	G				

**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 1206**

Table 2-H

SIZE	1206								
VDC (V)	10	16	25	50	100	200	250	500	630
0.22 $\mu$ F (224)	C	C	C	C	G				
0.27 $\mu$ F (274)	C	C	C	D					
0.33 $\mu$ F (334)	C	C	C	D					
0.39 $\mu$ F (394)	C	C	J	P					
0.47 $\mu$ F (474)	J	J	J	P					
0.56 $\mu$ F (564)	J	J	J	P					
0.68 $\mu$ F (684)	J	J	J	P					
0.82 $\mu$ F (824)	J	J	J	P					
1.0 $\mu$ F (105)	J	J	J	P					

**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 1210**

Table 2-I

SIZE	1210								
VDC (V)	10	16	25	50	100	250	500	1000	
100pF (101)						D	D	D	
120pF (121)						D	D	D	
150pF (151)						D	D	D	
180pF (181)						D	D	D	
220pF (221)						D	D	D	
270pF (271)						D	D	D	
330pF (331)						D	D	D	
390pF (391)						D	D	D	
470pF (471)						D	D	D	
560pF (561)						D	D	D	
680pF (681)						C	D	D	
820pF (821)						C	D	D	
1,000pF (102)	C	C	C	C	C	C	D	D	
1,200pF (122)	C	C	C	C	C	C	D	D	
1,500pF (152)	C	C	C	C	C	C	D	D	
1,800pF (182)	C	C	C	C	C	C	D	D	
2,200pF (222)	C	C	C	C	C	C	D	D	
2,700pF (272)	C	C	C	C	C	C	D	D	
3,300pF (332)	C	C	C	C	C	C	D	D	
3,900pF (392)	C	C	C	C	C	C	D	G	
4,700pF (472)	C	C	C	C	C	C	D	G	
5,600pF (562)	C	C	C	C	C	C	D	G	

**CAPACITANCE RANGE – X7R DIELECTRIC SIZE 1210**

Table 2-J

SIZE	1210								
	VDC (V)	10	16	25	50	100	250	500	1000
6,800pF (682)	C	C	C	C	C	C	C	D	G
8,200pF (822)	C	C	C	C	C	C	C	D	G
0.010μF (103)	C	C	C	C	C	C	C	D	G
0.012μF (123)	C	C	C	C	C	C	C	D	
0.015μF (153)	C	C	C	C	C	C	C	D	
0.018μF (183)	C	C	C	C	C	C	C	D	
0.022μF (223)	C	C	C	C	C	C	C	D	
0.027μF (273)	C	C	C	C	C	C	C		
0.033μF (333)	C	C	C	C	C	C	C		
0.039μF (393)	C	C	C	C	C	C	C		
0.047μF (473)	C	C	C	C	C	C	D		
0.056μF (563)	C	C	C	C	C	C			
0.068μF (683)	C	C	C	C	C	C			
0.082μF (823)	C	C	C	C	C	C			
0.10μF (104)	C	C	C	C	C	C			
0.12μF (124)	C	C	C	C	C				
0.15μF (154)	C	C	C	C	C				
0.18μF (184)	C	C	C	C	C				
0.22μF (224)	C	C	C	C	C				
0.27μF (274)	C	C	C	C	C				
0.33μF (334)	C	C	C	C	D				
0.39μF (394)	C	C	C	C	D				
0.47μF (474)	C	C	C	C	D				
0.56μF (564)	D	D	D	D	D				
0.68μF (684)	D	D	D	D	D				
0.82μF (824)	D	D	D	D	D				
1.0μF (105)	D	D	D	D	D				
1.5μF (155)		K							
2.2μF (225)		K							

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

ITEM	AEC-Q200 TEST CONDITION	REQUIREMENTS
Pre-and Post-Stress Electrical Test	-	
High Temperature Exposure (Storage) MIL-STD-202 Method 108	* Test temp.: $150 \pm 3^{\circ} \text{C}$ * Unpowered. * Test time: $1000+24/-0$ hrs. * Measurement to be made after keeping at room temp. for $24 \pm 2$ hrs.	*No remarkable damage. *Cap change: NPO: within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger. X7R: within $\pm 10.00\%$ . * Q/D.F. value: NPO: $\text{Cap} \geq 30\text{pF}$ , $\text{Q} \geq 1000$ ; $\text{Cap} < 30\text{pF}$ , $\text{Q} \geq 400+20\text{C}$ . X7R, See <Table 3> Class II (X7R) , See <Table 4>
Temperature : Cycling JESD22 Method JA-104	*Conduct 1000 cycles according to the temperatures and time. Step 1: $-55^{\circ} \text{C} +0/-3^{\circ} \text{C}$ @ $5 \pm 1$ min. Step 2: $+125^{\circ} \text{C} +3/-0^{\circ} \text{C}$ @ $5 \pm 1$ min. Before initial measurement (X7R only): Perform $150+0/-10^{\circ} \text{C}$ for 1 hr and then set for $24 \pm 2$ hrs at room temp. *Measurement to be made after keeping at room temp. for $24 \pm 2$ hrs.	* No remarkable damage. *Cap change: NPO: within $\pm 2.5\%$ or $\pm 0.25\text{pF}$ whichever is larger. X7R: within $\pm 10.00\%$ . *Q/D.F. value: NPO: $\text{Cap} \geq 30\text{pF}$ , $\text{Q} \geq 1000$ ; $\text{Cap} < 30\text{pF}$ , $\text{Q} \geq 400+20\text{C}$ X7R, See <Table 5> Class II (X7R) , See <Table 6>



**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

ITEM	AEC-Q200 TEST CONDITION	REQUIREMENTS
Destructive Physical Analysis EIA-469	Per EIA-469	No defects or abnormalities
Moisture Resistance MIL- STD-202 Method 106	Test temp.: 25~65° C Humidity: 80~100% RH Test time: 10 cycles, t=24hrs/cycle. Measurement to be made after keeping at room temp. for 24 ± 2 hrs.	* No remarkable damage. * Cap change: NPO: within ± 3.0% or ± 0.30pF whichever is larger. X7R: within ± 12.5%. *Q/D.F. value: NPO: More than 30pF Q≥350 ; 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10. X7R, See <Table 7> Class II (X7R) , See <Table 8>
Biased Humidity MIL-STD-202 Method 103	Test temp.: 85 ± 3° C Humidity: 85%RH Test time: 1000+24/-0 hrs. To apply voltage: rated voltage 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 ± 2hrs.	* No remarkable damage. * Cap change: NPO: within ± 3.0% or ± 0.30pF whichever is larger. X7R: within ± 12.5%. *Q/D.F. value: NPO: C≥30pF Q≥200 ; C≤30pF, Q≥100+10/3C X7R, See <Table 9> Class II (X7R) , See <Table 10> <Table 11>

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

ITEM	AEC-Q200 TEST CONDITION	REQUIREMENTS
Operational Life MIL-STD-202 Method 108	Test temp.: $125 \pm 3^\circ \text{C}$  To apply voltage: full rated voltage.  * Test time: 1000+24/-0 hrs. Before initial measurement (X7R only): Apply rated voltage for 1 hr at $125^\circ\text{C}$ . Remove and let set for $24 \pm 2$ hrs at room temp.  Measurement to be made after keeping at room temp. for $24 \pm 2$ hrs.	* No remarkable damage.  * Cap change: NPO: within $\pm 3.0\%$ or $\pm 0.30\text{pF}$ whichever is larger. X7R: within $\pm 12.5\%$ .  *Q/D.F. value: NPO: More than $30\text{pF}$ $Q \geq 350$ ; $10\text{pF} \leq C \leq 30\text{pF}$ , $Q \geq 275 + 2.5C$ Less than $10\text{pF}$ $Q \geq 200 + 10$ . X7R, See <Table 12> Class II (X7R) , See <Table 13>
External Visual MIL-STD-883 Method 2009	Visual inspection	No remarkable defect.
Physical Dimension JESD22 Method JB-100	Using by calipers	Within the specified dimensions
Moisture Resistance II MIL-STD-202 Method 106	* Temperature: $25 \pm 5^\circ \text{C}$  * Time: 3+0.5/-0 min.  *Solvent: Iso - propyl alcohol.	* No remarkable damage.  * Cap change: within the specified tolerance.  *Q/D.F. value: NPO: $\text{Cap} \geq 30\text{pF}$ , $Q \geq 1000$ ; $\text{Cap} < 30\text{pF}$ , $Q \geq 400 + 20C$ X7R, See <Table 14> Class II (X7R) , See <Table 18>

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

ITEM	AEC-Q200 TEST CONDITION	REQUIREMENTS
Mechanical Shock IL-STD-202 Method 213	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)	* No remarkable damage. * Cap change: within the specified tolerance. *Q/D.F. value: NPO: Cap $\geq$ 30pF, Q $\geq$ 1000 ; Cap $<$ 30pF, Q $\geq$ 400+20C X7R, See <Table 14> Class II (X7R) , See <Table 16>
Vibration MIL-STD-202 Method 204	Vibration frequency:10~2000Hz/min. (5g's for 20 min) Total amplitude: 1.5mm 12 cycles each of 3 orientations (36 times)	* No remarkable damage. * Cap change: within the specified tolerance. *Q/D.F. value: NPO: Cap $\geq$ 30pF, Q $\geq$ 1000 ; Cap $<$ 30pF, Q $\geq$ 400+20C X7R, See <Table 14> Class II (X7R) , See <Table 16>
Resistance to Soldering Heat MIL-STD-202 Method 210	*Solder temperature: 270 $\pm$ 5 $^{\circ}$ C *Dipping time: 10 $\pm$ 1 sec *Before initial measurement (X7R only): Perform 150+0/-10 $^{\circ}$ C for 1 hr and then set for 24 $\pm$ 2 hrs at room temp. * Measurement to be made after keeping X7R: at room temp. for 24 $\pm$ 2 hrs.	* No remarkable damage. * Cap change: NPO: within $\pm$ 2.5% or 0.25pF whichever is larger X7R: within $\pm$ 7.5% *Q/D.F. value: NPO: Cap $\geq$ 30pF, Q $\geq$ 1000 ; Cap $<$ 30pF, Q $\geq$ 400+20C X7R, See <Table 14> Class II (X7R) , See <Table 18>

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

ITEM	TEST CONDITION	REQUIREMENTS
Thermal Shock IL-STD-202 Method 107	<p>*Conduct 300 cycles according to the temperatures and time. transfer time: 20 sec.</p> <p>Step 1: -55° C +0/-3° C @ 15±3 min.</p> <p>Step 2: +125° C +3/-0° C @ 15±3 min.</p> <p>*Max. transfer time:20 sec</p> <p>*Before initial measurement (X7R only): Perform 150+0/-10° C for 1 hr and then set for 24±2 hrs at room temp.</p> <p>*Measurement to be made after keeping at room temp. for 24±2 hrs</p>	<p>* No remarkable damage.</p> <p>* Cap change: NPO: within ±2.5% or 0.25pF whichever is larger X7R: within ±10.0%</p> <p>*Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap&lt;30pF, Q≥400+20C X7R, See &lt;Table 14&gt; Class II (X7R) , See &lt;Table 19&gt;</p>
ESD AEC-Q200-002	<p>Per AEC-Q200-002</p>	<p>* No remarkable damage.</p> <p>* Cap change: within the specified tolerance.</p> <p>*Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap&lt;30pF, Q≥400+20C X7R, See &lt;Table 15&gt; Class II (X7R) , See &lt;Table 20&gt;</p>
Solderability J-STD-002 JESD22-B102E	<p>*Condition A Un-mounted chips 4hrs / 155° C</p> <p>*dry then completely immersed for 5±0.5 sec in solder bath at 245±5° C.</p> <p>*Condition B Un-mounted chips steam 8 hrs then completely immersed for 10±1sec in solder bath at 220+5/-0° C.</p> <p>*Condition C Un-mounted chips steam 8 hrs then completely immersed for 10±1 sec. in solder bath at 260+0/-5° C.</p>	<p>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.</p>

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

ITEM	TEST CONDITION	REQUIREMENTS
<p>Electrical Characterization</p>	<p>*Capacitance            *Q/ D.F. (Dissipation Factor) Cap≤1000pF            1.0±0.2Vrms, 1MHz±10%            Cap&gt;1000pF 1.0±0.2Vrms, 1KHz±10%</p> <p>*Insulation Resistance To apply rated voltage(500V max.) for max. 120 sec.</p> <p>*Dielectric Strength            To apply voltage:            ≤100                    ≥2.5 times VDC            200V~300V            ≥2 times VDC            400V~450V            ≥1.2 times            VDC 500V~999V      ≥1.5 times            VDC 1000V~3000V ≥1.2 times VDC , duration 1~5 sec,            charge and discharge current less than 50mA.            *Temperature Coefficient (with no electrical load)            Operation temperature: -55~125° C at 25° C</p>	<p>* Cap change: within the specified tolerance.            *Q/D.F. value:            NPO: Cap≥30pF, Q≥1000 ;            Cap&lt;30pF, Q≥400+20C            X7R, See &lt;Table 14&gt;            Class II (X7R) , See &lt;Table 19&gt;</p> <p>*Dielectric strength No evidence of damage or flash over during test.            *Temperature Coefficient            Capacitance Change:            NPO: Within ±30ppm/° C            X7R: Within ±15%</p>
<p>Board Flex AEC-Q200-005</p>	<p>* 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.</p>	<p>* No remarkable damage.            *Cap change: NPO: within ±5.0% 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.)</p>

**RELIABILITY TEST CONDITIONS AND REQUIREMENTS**

ITEM	TEST CONDITION	REQUIREMENTS
Terminal Strength AEC-Q200-006	* Pressurizing force: 2N (0402), 10N(0603) 18N(0805). * Test time: 60 ± 1 sec.	* No remarkable damage or removal of the terminations. * Capacitance within the specified tolerance * Q/D.F. value: NPO: Cap ≥ 30pF, Q ≥ 1000 ; Cap < 30pF, Q ≥ 400 + 20C X7R, See <Table 17>
Beam Load Test AEC-Q200-003	* Break strength test * Beam speed: 2.5 ± 0.25 mm/se	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)

**HIGH TEMPERATURE EXPOSURE -REQUIREMENTS – X7R**

Table 3

Rated vol.	DF $\leq$	Exception of DF $\leq$	
$\geq 50V$	$\leq 3\%$	$\leq 6\%$	0201(50V); 0603 $\geq 0.047\mu F$ ; 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$ ;
		$\leq 10\%$	1210 $\geq 4.7\mu F$ ;
		$\leq 20\%$	0402 $\geq 0.1\mu F$ ;0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ;1206 $\geq 2.2\mu F$ ;
35V	$\leq 5\%$	$\leq 20\%$	0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$ ;
25V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ ; 1210 $\geq 10\mu F$
		$\leq 15\%$	0603 $\geq 0.33\mu F$ ;1206 $\geq 4.7\mu F$ ; 0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ ;1210 $\geq 22\mu F$ ;
16V	$\leq 5\%$	$\leq 10\%$	0603 $\geq 0.15\mu F$ ;0805 $\geq 0.68\mu F$ ;1206 $\geq 2.2\mu F$ ;1210 $\geq 4.7\mu F$
		$\leq 15\%$	0201 $\geq 0.01\mu F$ ;0402 $\geq 0.033\mu F$ ; 0603 $\geq 0.68\mu F$ ;0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$ ;
10V	$\leq 7.5\%$	$\leq 15\%$	0201 $\geq 0.012\mu F$ ;0402 $\geq 0.33\mu F$ ; 0603 $\geq 0.33\mu F$ ;0805 $\geq 2.2\mu F$ 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$
		$\leq 20\%$	0201 $\geq 0.1\mu F$ ;0402 $\geq 1\mu F$ ;
6.3V	$\leq 15\%$	$\leq 30\%$	0201 $\geq 0.1\mu F$ ;0402 $\geq 1\mu F$ ;0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ ;1206 $\geq 47\mu F$ ;1210 $\geq 100\mu F$ ;
4V	$\leq 20\%$	---	---

IR.:  $\geq 10G\Omega$  or  $RxC \geq 500\Omega-F$  whichever is smaller

**HIGH TEMPERATURE EXPOSURE – REQUIREMENTS – Class II-X7R**

Table 4

Rated voltage	Insulation Resistance
$\geq 100V$ : X7R	1G $\Omega$ or $RxC \geq 10\Omega-F$ whichever is smaller
50V:0603 $\geq 1\mu F$ ;0805 $\geq 1\mu F$ ; 1206 $\geq 4.7\mu F$ ;1210 $\geq 4.7\mu F$	
35V:0805 $\geq 2.2\mu F$ ;1210 $\geq 10\mu F$	
25V:0402 $\geq 1\mu F$ ;0603 $\geq 2.2\mu F$ ;0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ;1210 $\geq 10\mu F$	
16V: 0201 $\geq 0.1\mu F$ ;0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ;0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ;1210 $\geq 47\mu F$	
10V:0201 $\geq 47nF$ ;0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ ;0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ;1210 $\geq 47\mu F$	

**TEMPERATURE CYCLING- REQUIREMENTS – X7R**

Table 5

Rated vol.	DF ≤	Exception of DF ≤	
≥50V	≤ 3%	≤ 6%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF;
		≤ 10%	1210≥4.7μF;
		≤ 20%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;
35V	≤ 5%	≤20%	0603≥1μF; 0805≥2.2μF; 1210≥10μF;
25V	≤ 5%	≤10%	0201≥0.01μF; 0805≥1μF; 1210≥10μF
		≤14%	0603≥0.33μF;1206≥4.7μF
		≤15%	0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF;
16V	≤5%	≤10%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF
		≤15%	0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF;
10V	≤ 7.5%	≤15%	0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF
		≤20%	0201≥0.1μF ;0402≥1μF;
6.3V	≤ 15%	≤30%	0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;
4V	≤20%	---	---

IR.: ≥10GΩ or RxC≥500Ω-F whichever is smaller

**TEMPERATURE CYCLING – REQUIREMENTS – Class II-X7R**

Table 6

Rated voltage	Insulation Resistance
≥100V: X7R	1GΩ or RxC≥10Ω-F whichever is smaller
50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	
35V:0805≥2.2μF;1210≥10μF	
25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V: 0201≥0.1uF;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; 4V;	



**MOISTURE RESISTANCE– REQUIREMENTS – X7R**

Table 7

Rated vol.	DF $\leq$	Exception of DF $\leq$	
$\geq 50V$	$\leq 3\%$	$\leq 6\%$	0201(50V); 0603 $\geq 0.047\mu F$ ; 0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$ ;
		$\leq 10\%$	1210 $\geq 4.7\mu F$ ;
		$\leq 20\%$	0402 $\geq 0.1\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$ ; TT series
35V	$\leq 5\%$	$\leq 20\%$	0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$ ;
25V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ ; 1210 $\geq 10\mu F$
		$\leq 14\%$	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$
		$\leq 15\%$	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ ; 1210 $\geq 22\mu F$ ; TT series
16V	$\leq 5\%$	$\leq 10\%$	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$
		$\leq 15\%$	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ ; 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$ ; TT series
10V	$\leq 7.5\%$	$\leq 15\%$	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ ; 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$
		$\leq 20\%$	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ ; TT series
6.3V	$\leq 15\%$	$\leq 30\%$	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$ ; 0603 $\geq 10\mu F$ ; 0805 $\geq 4.7\mu F$ ; 1206 $\geq 47\mu F$ ; 1210 $\geq 100\mu F$ ;
4V	$\leq 20\%$	---	---

 IR.:  $\geq 10G\Omega$  or  $RxC \geq 500\Omega \cdot F$  whichever is smaller

**MOISTURE RESISTANCE– REQUIREMENTS –Class II-X7R**

Table 8

Rated voltage	Insulation Resistance
$\geq 100V$ : X7R	1G $\Omega$ or $RxC \geq 10\Omega \cdot F$ whichever is smaller
50V: 0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 4.7\mu F$	
35V: 0805 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$	
25V: 0402 $\geq 1\mu F$ ; 0603 $\geq 2.2\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 10\mu F$	
16V: 0201 $\geq 0.1\mu F$ ; 0402 $\geq 0.22\mu F$ ; 0603 $\geq 1\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 47\mu F$	
10V: 0201 $\geq 47nF$ ; 0402 $\geq 0.47\mu F$ ; 0603 $\geq 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 47\mu F$	
6.3V; 4V;	

**BIASED HUMIDITY – REQUIREMENTS – X7R**

Table 9

Rated vol.	DF ≤	Exception of DF ≤	
≥50V	≤ 3%	≤ 6%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF;
		≤ 10%	1210≥4.7μF;
		≤ 20%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;
35V	≤ 5%	≤20%	0603≥1μF; 0805≥2.2μF; 1210≥10μF;
25V	≤ 5%	≤10%	0201≥0.01μF; 0805≥1μF; 1210≥10μF
		≤14%	0603≥0.33μF;1206≥4.7μF
		≤15%	0402≥0.10μF;0603≥0.47μF;0 805≥2.2μF;1206≥6.8μF; 1210≥22μF;
16V	≤5%	≤10%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF
		≤15%	0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF;
10V	≤ 7.5%	≤15%	0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF
		≤20%	0201≥0.1μF ;0402≥1μF;
6.3V	≤ 15%	≤30%	0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;
4V	≤20%	---	---

IR.: ≥10GΩ or RxC≥500Ω-F whichever is smaller

**BIASED HUMIDITY – REQUIREMENTS –Class II-X7R**

Table 10

Rated voltage	Insulation Resistance
≥100V: X7R	500MΩ or R x C ≥5 Ω-F whichever is smaller
50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	
35V:0805≥2.2μF;1210≥10μF	
25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V: 0201≥0.1uF;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; 4V;	

**BIASED HUMIDITY – REQUIREMENTS** – Class II-X7R for 1.3V~1.5V

Table 11

Rated voltage	Insulation Resistance
≥100V: X7R	1GΩ or R x C ≥10 Ω-F whichever is smaller.
50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	
35V:0805≥2.2μF;1210≥10μF	
25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V: 0201≥0.1uF;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; 4V;	

**OPERATIONAL LIFE-REQUIREMENTS** –X7R

Table 12

Rated vol.	DF ≤	Exception of DF ≤	
		DF ≤	Exception of DF ≤
≥50V	≤ 3%	≤ 6%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF;
		≤ 10%	1210≥4.7μF;
		≤ 20%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;
35V	≤ 5%	≤20%	0603≥1μF; 0805≥2.2μF; 1210≥10μF;
25V	≤ 5%	≤10%	0201≥0.01μF; 0805≥1μF; 1210≥10μF
		≤14%	0603≥0.33μF;1206≥4.7μF
		≤15%	0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF;
16V	≤5%	≤10%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF
		≤15%	0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF;
10V	≤ 7.5%	≤15%	0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF
		≤20%	0201≥0.1μF ;0402≥1μF;
6.3V	≤ 15%	≤30%	0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;
4V	≤20%	---	---

IR.: ≥10GΩ or RxC≥50Ω-F whichever is smaller

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**OPERATIONAL LIFE-REQUIREMENTS – X7R-Class II**

Table 13

Rated voltage	Insulation Resistance
≥100V: X7R	1GΩ or $RxC \geq 100\Omega\cdot F$ whichever is smaller
50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	
35V:0805≥2.2μF;1210≥10μF	
25V:0402≥1μF;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; 4V;	

**MOISTURE RESISTANCE II, MECHANICAL SHOCK, VIBRATION, RESISTANCE TO SOLDERING HEAT , THERMAL SHOCK, ELECTRICAL CHARACTERIZATION- REQUIREMENTS –X7R**

Table 14

Rated vol.	DF ≤	Exception of DF ≤	
≥50V	≤2.5%	≤ 3%	0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF
		≤ 5%	1210≥4.7μF;
		≤ 10%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;
35V	≤ 3.5%	≤10%	0603≥1μF; 0805≥2.2μF; 1210≥10μF;
25V	≤ 3.5%	≤5%	0201≥0.01μF; 0805≥1μF; 1210≥10μF
		≤7%	0603≥0.33μF;1206≥4.7μF
		≤10%	0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF;
16V	≤3.5%	≤5%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF
		≤10%	0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF;
10V	≤ 5%	≤10%	0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF
		≤15%	0201≥0.1μF ;0402≥1μF;
6.3V	≤ 10%	≤15%	0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;
		≤20%	0402≥2.2μF;
4V	≤15%	---	---

 IR.: ≥10GΩ or  $RxC \geq 500\Omega\cdot F$  whichever is smaller

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**ESD - REQUIREMENTS – X7R**

Table 15

Rated vol.	DF ≤	Exception of DF ≤	
≥50V	≤2.5%	≤ 3%	0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF
		≤ 5%	1210≥4.7μF;
		≤ 10%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;
35V	≤ 3.5%	≤10%	0603≥1μF; 0805≥2.2μF; 1210≥10μF;
25V	≤ 3.5%	≤5%	0201≥0.01μF; 0805≥1μF; 1210≥10μF
		≤7%	0603≥0.33μF;1206≥4.7μF
		≤10%	0402≥0.10μF;0603≥0.47μF;0805≥2.2μF;1206≥6.8μF; 1210≥22μF;
16V	≤3.5%	≤5%	0603≥0.15μF;0805≥0.68μF;1206≥2.2μF;1210≥4.7μF
		≤10%	0201≥0.01μF;0402≥0.033μF; 0603≥0.68μF;0805≥2.2μF 1206≥4.7μF; 1210≥22μF;
10V	≤ 5%	≤10%	0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF
		≤15%	0201≥0.1μF ;0402≥1μF;
6.3V	≤ 10%	≤15%	0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;
		≤20%	0402≥2.2μF;
4V	≤15%	---	---

IR.: ≥10GΩ or RxC≥50Ω-F whichever is smaller

**MECHANICAL SHOCK, VIBRATION – REQUIREMENTS –X7R-Class II**

Table 16

Rated voltage	Insulation Resistance
≥100V: X7R	10GΩ or R x C ≥100 Ω-F whichever is smaller.
50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	
35V:0805≥2.2μF;1210≥10μF	
25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V: 0201≥0.1uF;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; 4V;	
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**TERMINAL STRENGTH -REQUIREMENTS – X7R**

Table 17

Rated vol.	DF ≤	Exception of DF ≤	
≥50V	≤2.5%	≤ 3%	0201(50V);0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF
		≤ 5%	1210≥4.7μF;
		≤ 10%	0402≥0.1μF;0603≥1μF; 0805≥1μF;1206≥2.2μF; 1210≥10μF;
35V	≤ 3.5%	≤10%	0603≥1μF; 0805≥2.2μF; 1210≥10μF;
25V	≤ 3.5%	≤5%	0201≥0.01μF; 0805≥1μF; 1210≥10μF
16V	≤3.5%	≤5%	0201≥0.01μF;0402≥0.033μF;0603 ≥0.15μF;0805≥0.68μF; 1206≥2.2μF;1210≥4.7μF
		≤10%	0201≥0.1uF; 0402≥ 0.22uF; 0603≥0.68μF;0805≥2.2μF; 1206≥4.7μF; 1210≥22μF;
10V	≤ 5%	≤10%	0201≥0.012μF;0402≥0.33μF; 0603≥0.33μF;0805≥2.2μF 1206≥2.2μF; 1210≥22μF
		≤15%	0201≥0.1μF ;0402≥1μF;
6.3V	≤ 10%	≤15%	0201≥0.1μF;0402≥1μF;0603 ≥10μF; 0805≥4.7μF;1206≥47μF;1210≥100μF;
		≤20%	0402≥2.2μF;
4V	≤15%	---	---

**MOISTURE RESISTANCE II, RESISTANCE TO SOLDERING HEAT- REQUIREMENTS – X7R Class II**

Table 18

Rated voltage	Insulation Resistance
≥100V: X7R	10GΩ or R x C ≥10 Ω-F whichever is smaller.
50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	
35V:0805≥2.2μF;1210≥10μF	
25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V: 0201≥0.1uF;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; 4V;	

**THERMAL SHOCK - REQUIREMENTS – X7R-Class II**

Table 19

Rated voltage	Insulation Resistance
≥100V: X7R	1GΩ or R x C ≥10 Ω-F whichever is smaller.
50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	
35V:0805≥2.2μF;1210≥10μF	
25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V: 0201≥0.1uF;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; 4V; TT series	

**ESD –REQUIREMENTS –X7R-Class II**

Table 20

Rated voltage	Insulation Resistance
≥100V: X7R	1GΩ or R x C ≥100 Ω-F whichever is smaller.
50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	
35V:0805≥2.2μF;1210≥10μF	
25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V: 0201≥0.1uF;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; 4V;	

**ELECTRICAL CHARACTERIZATION –REQUIREMENTS –X7R-Class II**

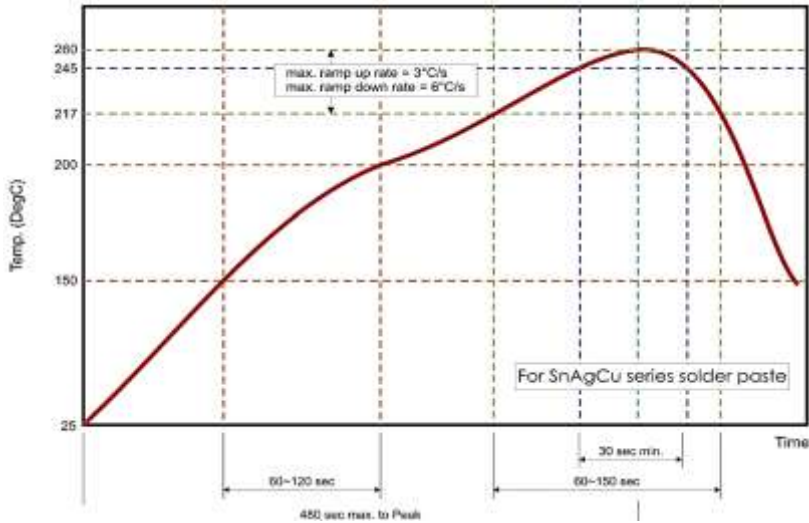
Table 21

Rated voltage	Insulation Resistance
≥100V: X7R	10GΩ or R x C ≥100 Ω-F whichever is smaller.
50V:0603≥1μF;0805≥1μF; 1206≥4.7μF;1210≥4.7μF	
35V:0805≥2.2μF;1210≥10μF	
25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF; 1206≥10μF;1210≥10μF	
16V: 0201≥0.1uF;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; 4V; TT series	

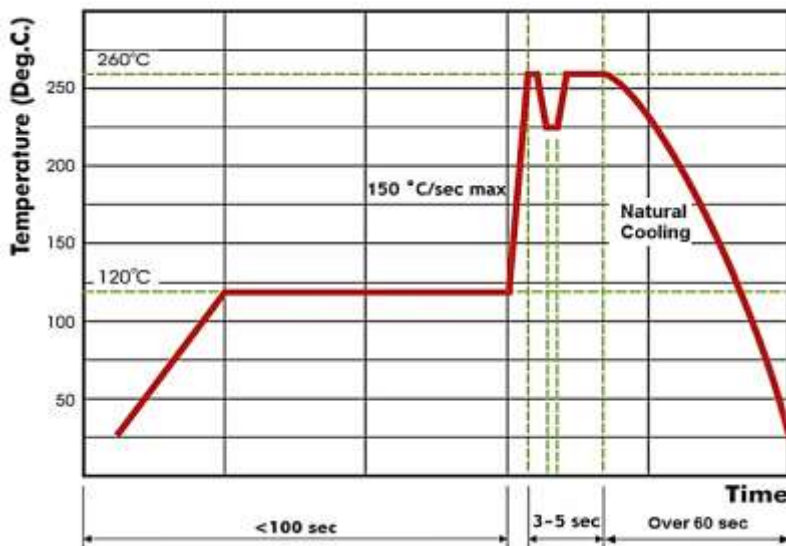
**RECOMMENDED PROFILE CONDITIONS**

The lead-free termination MLCCs are not only to be used on SMT against lead-free solder paste, but also suitable against lead-containing solder paste.

If the optimized solder joint is requested, increasing soldering time, temperature and concentration of N2 within oven are recommended.



Reflow Soldering Profile For SMT Process with SnAgCu series Solder Paste



Wave Soldering Profile For SMT Process with SnAgCu series Solder Paste



## **STORAGE AND HANDLING CONDITIONS**

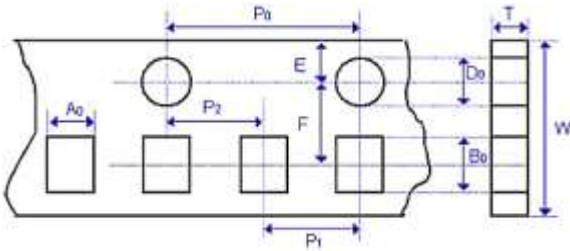
- To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- The product is recommended to be used within one year after shipment. Check solder ability in case of shelf life extension is needed.

## **CAUTIONS**

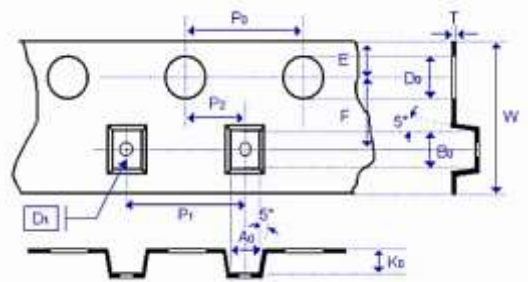
- The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solder ability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- In corrosive atmosphere, solder ability might be degraded, and silver migration might occur to cause low reliability.
- Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sun light, the solder ability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or dewing condition. To store products on the shelf and avoid exposure to moisture.

**TAPE DIMENSION** (Unit: mm)

Paper Tape



Plastic Tape

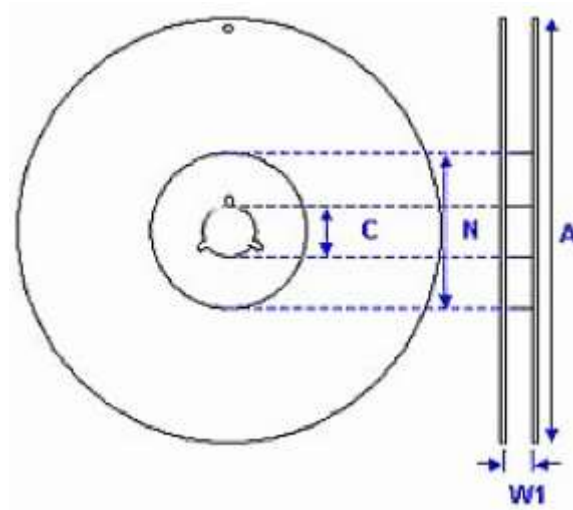


SIZE	0201	0402	0603	0805		
Thickness	L	N, E	S, H, X	A, H	B, T	D, I
A0	0.39+/-0.07	0.70+/-0.2	1.05+/-0.30	1.50+/-0.20	1.50+/-0.20	< 1.80
B0	0.69+/-0.07	1.20+/-0.2	1.80+/-0.30	2.30+/-0.20	2.30+/-0.20	< 2.70
T	≤0.50	≤0.80	≤1.20	≤1.15	≤1.30	0.23+/-0.1
W	8.00+/-0.10	8.00+/-0.10	8.00+/-0.10	8.00+/-0.10	8.00+/-0.10	8.00+/-0.20
P0	4.00+/-0.10	4.00+/-0.10	4.00+/-0.10	4.00+/-0.10	4.00+/-0.10	4.00+/-0.10
10xP0	40.00+/-0.10	40.00+/-0.10	40.00+/-0.20	40.00+/-0.20	40.00+/-0.20	40.00+/-0.20
P1	2.00+/-0.05	2.00+/-0.05	4.00+/-0.10	4.00+/-0.10	4.00+/-0.10	4.00+/-0.10
P2	2.00+/-0.05	2.00+/-0.05	2.00+/-0.05	2.00+/-0.05	2.00+/-0.05	2.00+/-0.05
D0	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05	1.50+0.1/-0
D1						1.00+/-0.10
E	1.75+/-0.05	1.75+/-0.05	1.75+/-0.05	1.75+/-0.05	1.75+/-0.05	1.75+/-0.10
F	3.50+/-0.05	3.50+/-0.05	3.50+/-0.05	3.50+/-0.05	3.50+/-0.05	3.50+/-0.05

**TAPE DIMENSION** (Unit: mm)

SIZE	1206			1210		
	B, T	C, J, D	G, P	T	C, D, G, K	M
A0	1.90 +/-0.50	< 2.00	< 2.30	< 3.05	< 3.05	< 3.20
B0	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	< 3.80	< 3.95
T	≤1.30	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1
W	8.00 +/-0.10	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20	8.00 +/-0.20
P0	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
10xP0	40.0 +/-0.20	40.0 +/-0.20	40.0 +/-0.20	40.0 +/-0.20	40.0 +/-0.20	40.0 +/-0.20
P1	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
P2	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05
D0	1.50 +/-0.05	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0	1.50 +0.1/-0
D1	-	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10
E	1.75 +/-0.05	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	3.50 +/-0.05

**REEL DIMENSION** (Unit: mm)



SIZE CODE	0201, 0402, 0603, 0805, 1206, 1210		
Reel Size	7"	10"	13"
C	13.0+0.5/-0.2	13.0+0.5/-0.2	13.0+0.5/-0.2
W 1	8.4+1.5/-0	8.4+1.5/-0	8.4+1.5/-0
A	178.0±1.00	250.0±1.0	330.0±1.0
N	60.0+1.0/-0	100.0±1.0	100.0±1.0

**PACKAGING STYLE AND QUANTITY PER REEL**

SIZE	THICKNESS (SYMBOL)		PAPER TAPE		PLASTIC TAPE	
			7" REEL	13" REEL	7" REEL	13" REEL
0201 (0603)	0.30±0.03	L	15,000	70,000	-	-
0402 (1005)	0.50±0.05	N	10,000	50,000		
0603 (1608)	0.80±0.07	S	4,000	15,000		
	0.80+0.15/-0.10	X	4,000	15,000		
0805 (2012)	0.60±0.10	A	4,000	15,000		
	0.85±0.10	B	4,000	15,000		
	1.25±0.10	D			3,000	10,000
	1.25±0.20	I			3,000	10,000
1206 (3216)	0.80±0.10	B	4,000	15,000		
	0.95±0.10	C			3,000	10,000
	1.15±0.15	J			3,000	10,000
	1.25±0.10	D			3,000	10,000
	1.60±0.20	G			2,000	10,000
	1.60+0.30/-0.10	P			2,000	9,000
1210 (3225)	0.95±0.10	C			3,000	10,000
	1.25±0.10	D			3,000	10,000
	1.60±0.20	G			2,000	
	2.00±0.20	K			1,000	6,000
	2.50±0.30	M			1,000	6,000

## **IMPORTANT NOTES AND DISCLAIMER**

1. **ROHS COMPLIANCE:** The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU RoHS Directive (EU) 2015/863 EC (RoHS3). RoHS Test Report for this product can be obtained at Download Center.
2. **REACH COMPLIANCE:** REACH substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, REACH Test Report for this product can be obtained at Download Center.
3. All Product parametric performance is indicated in the Electrical Characteristics for the listed herein test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.
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