

APPROVAL SHEET

MULTILAYER CERAMIC CAPACITORS

Automotive Capacitors Series (SMT)

Qualified to AEC_Q200

0201 to 1210 Sizes (10V to 1000V)

NP0, X7R Dielectrics

Halogen Free & RoHS Compliance

*Contents in this sheet are subject to change without prior notice.

1. 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.

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

2. FEATURES

- A wide selection of sizes is available (0201 to 0805).
- High capacitance in given case size.
- Capacitor with lead-free termination (pure Tin).
- The SMT series meet AEC-Q200 requirement.

3. APPLICATIONS

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

4. HOW TO ORDER

<u>SMT</u>	<u>18</u>	<u>N</u>	<u>102</u>	<u>J</u>	<u>500</u>	<u>C</u>	<u>I</u>
<u>Series</u>	<u>Size</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Termination</u>	<u>Packaging style</u>
SMT= Automotive safe concern (with AEC-Q200 qualification)	03=0201 (0603) 15=0402 (1005) 18=0603 (1608) 21=0805 (2012) 31=1206 (3216) 32=1210 (3225)	N=NP0 (COG) B=X7R	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: 0R5=0.5pF 1R0=1.0pF 102=10x10 ² =1000pF	A=±0.05pF B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5% K=±10% M=±20%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 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	C=Cu/Ni/Sn	T=7" reeled G=13" reeled

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M _B (mm)
0201 (0603)	0.60±0.03	0.30±0.03	0.30±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 #			
	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±0.20	1.60±0.20	G #	
	3.20±0.3/-0.1	1.60±0.3/-0.1	1.60±0.30/-0.10	P #	
	3.20±0.30	2.50±0.20	0.95±0.10	C #	
3.20±0.40	2.50±0.30	1.25±0.10	D #		
		1.60±0.20	G #		
		2.00±0.20	K #		
		2.50±0.30	M #		

Reflow soldering only is recommended.

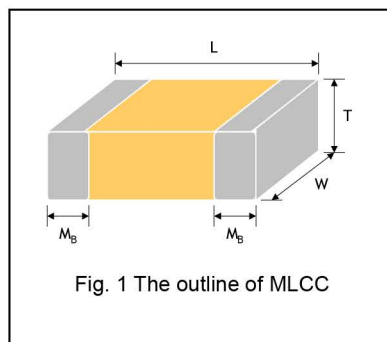


Fig. 1 The outline of MLCC

6. GENERAL ELECTRICAL DATA

Dielectric	NP0	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**	Cap≤5pF ^{#1} : A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: B (±0.1pF), C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)	J (±5%), K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V, 200V, 250, 500, 630, 1000	
Operating temperature	-55 to +125°C	
Capacitance characteristic	±30ppm/°C	±15%
Termination	Ni/Sn (lead-free termination)	

#1: NP0, 0.1pF product only provide B tolerance.

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

NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature
Measured at 1.0±0.2Vrms, 1.0kHz±10% for C≤10μF; 0.5±0.2Vrms, 120Hz±20% for C>10μF, 30~70% related humidity, 25°C ambient temperature for X7R.

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



7. CAPACITANCE RANGE

NP0 Dielectric

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

* NP0, 0.1pF product only provide B tolerance.

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

2. For more information about products with special capacitance or other data, please contact a Surge local representative.

NP0 Dielectric

DIELECTRIC		NP0								
SIZE		0805								
RATED VOLTAGE		10	16	25	50	100	200	250	500	630
Capacitance	0.5pF (0R5)	A	A	A	A	A	A	A	A	A
	0.6pF (0R6)	A	A	A	A	A	A	A	A	A
	0.7pF (0R7)	A	A	A	A	A	A	A	A	A
	0.8pF (0R8)	A	A	A	A	A	A	A	A	A
	0.9pF (0R9)	A	A	A	A	A	A	A	A	A
	1.0pF (1R0)	A	A	A	A	A	A	A	A	A
	1.2pF (1R2)	A	A	A	A	A	A	A	A	A
	1.5pF (1R5)	A	A	A	A	A	A	A	A	A
	1.8pF (1R8)	A	A	A	A	A	A	A	A	A
	2.2pF (2R2)	A	A	A	A	A	A	A	A	A
	2.7pF (2R7)	A	A	A	A	A	A	A	A	A
	3.3pF (3R3)	A	A	A	A	A	A	A	A	A
	3.9pF (3R9)	A	A	A	A	A	A	A	A	A
	4.7pF (4R7)	A	A	A	A	A	A	A	A	A
	5.6pF (5R6)	A	A	A	A	A	A	A	A	A
	6.8pF (6R8)	A	A	A	A	A	A	A	A	A
	8.2pF (8R2)	A	A	A	A	A	A	A	A	A
	10pF (100)	A	A	A	A	A	A	A	A	A
	12pF (120)	A	A	A	A	A	A	A	A	A
	15pF (150)	A	A	A	A	A	A	A	A	A
	18pF (180)	A	A	A	A	A	A	A	A	A
	22pF (220)	A	A	A	A	A	A	A	A	A
	27pF (270)	A	A	A	A	A	A	A	A	A
	33pF (330)	A	A	A	A	A	A	A	A	A
	39pF (390)	A	A	A	A	A	A	A	A	A
	47pF (470)	A	A	A	A	A	A	A	A	A
	56pF (560)	A	A	A	A	A	A	A	A	A
	68pF (680)	A	A	A	A	A	A	A	A	A
	82pF (820)	A	A	A	A	A	A	A	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	B	B	B	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	D					
0.01µF (103)	D	D	D	D	D					

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

2. For more information about products with special capacitance or other data, please contact a Surge local representative.

NP0 Dielectric

DIELECTRIC		NP0									
SIZE		1206									
RATED VOLTAGE		10	16	25	50	100	200	250	500	630	1000
Capacitance	1.0pF (1R0)										
	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	
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						

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

2. For more information about products with special capacitance or other data, please contact a Surge local representative.

NP0 Dielectric

DIELECTRIC SIZE		NP0 1210									
RATED VOLTAGE		10	16	25	50	100	200	250	500	630	1000
Capacitance	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
	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						

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

2. For more information about products with special capacitance or other data, please contact a Surge local representative.

X7R Dielectric

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

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

2. For more information about products with special capacitance or other data, please contact a Surge local representative.



X7R Dielectric

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

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

2. For more information about products with special capacitance or other data, please contact a Surge local representative.

X7R Dielectric

DIELECTRIC		X7R							
SIZE		1210							
RATED VOLTAGE (VDC)		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
6,800pF (682)		C	C	C	C	C	C	D	G
8,200pF (822)		C	C	C	C	C	C	D	G
0.010μF (103)		C	C	C	C	C	C	D	G
0.012μF (123)		C	C	C	C	C	C	D	
0.015μF (153)		C	C	C	C	C	C	D	
0.018μF (183)		C	C	C	C	C	C	D	
0.022μF (223)		C	C	C	C	C	C	D	
0.027μF (273)		C	C	C	C	C	C		
0.033μF (333)		C	C	C	C	C	C		
0.039μF (393)		C	C	C	C	C	C		
0.047μF (473)		C	C	C	C	C	D		
0.056μF (563)		C	C	C	C	C			
0.068μF (683)		C	C	C	C	C			
0.082μF (823)		C	C	C	C	C			
0.10μF (104)		C	C	C	C	C			
0.12μF (124)		C	C	C	C				
0.15μF (154)		C	C	C	C				
0.18μF (184)		C	C	C	C				
0.22μF (224)		C	C	C	C				
0.27μF (274)		C	C	C	C				
0.33μF (334)		C	C	C	D				
0.39μF (394)		C	C	C	D				
0.47μF (474)		C	C	C	D				
0.56μF (564)		D	D	D	D				
0.68μF (684)		D	D	D	D				
0.82μF (824)		D	D	D	D				
1.0μF (105)		D	D	D	D				
1.5μF (155)			K						
2.2μF (225)			K						
4.7μF (475)									
10μF (106)									

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

2. For more information about products with special capacitance or other data, please contact a Surge local representative.

8. PACKAGING STYLE AND QUANTITY

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0201 (0603)	0.30±0.03	L	15k	70k	-	-
0402 (1005)	0.50±0.05	N	10k	50k	-	-
0603 (1608)	0.80±0.07	S	4k	15k	-	-
	0.80+0.15/-0.10	X	4k	15k	-	-
0805 (2012)	0.60±0.10	A	4k	15k	-	-
	0.80±0.10	B	4k	15k	-	-
	1.25±0.10	D	-	-	3k	10k
	1.25±0.20	I	-	-	3k	10k
1206 (3216)	0.80±0.10	B	4k	15k	-	-
	0.95±0.10	C	-	-	3k	10k
	1.15±0.15	J	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	10k
	1.60+0.30/-0.10	P	-	-	2k	9k
1210 (3225)	0.95±0.10	C	-	-	3k	10k
	1.25±0.10	D	-	-	3k	10k
	1.60±0.20	G	-	-	2k	-
	2.00±0.20	K	-	-	1k	6k
	2.50±0.30	M	-	-	1k	6k

Unit: pieces

9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																					
1.	Pre-and Post-Stress Electrical Test	---																																																						
2.	High Temperature Exposure (Storage) MIL-STD-202 Method 108	* Test temp.: 150±3°C * Unpowered. * Test time: 1000+24/-0 hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs.	<p>* No remarkable damage. * Cap change : NPO: within ±2.5% or ±0.25pF whichever is larger. X7R: within ±10.00%. * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td rowspan="3">≤3%</td> <td>≤6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤3%</td> <td>≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤5%</td> <td>≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤14% 0603 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤20% 0402 ≥ 0.47μF</td> </tr> <tr> <td>≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤5%</td> <td>≤15% 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤7.5%</td> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>≤30%</td> </tr> <tr> <td>---</td> </tr> <tr> <td rowspan="3">6.3V</td> <td rowspan="3">≤15%</td> <td>---</td> </tr> <tr> <td>≤20%</td> </tr> <tr> <td>---</td> </tr> <tr> <td rowspan="3">4V</td> <td rowspan="3">≤20%</td> <td>---</td> </tr> <tr> <td>---</td> </tr> <tr> <td>---</td> </tr> </tbody> </table> <p>* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller. Class II (X7R)</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210 ≥ 3.3μF</td> <td rowspan="7">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V; 4V; Size ≥ 1812</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥100V	≤3%	≤6% 1206 ≥ 0.47μF	≤7.5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF	≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤3%	≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF	≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	35V	≤5%	≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	≤10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤14% 0603 ≥ 0.33μF	25V	≤5%	≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤20% 0402 ≥ 0.47μF	≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	16V	≤5%	≤15% 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF	10V	≤7.5%	≤15% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	≤30%	---	6.3V	≤15%	---	≤20%	---	4V	≤20%	---	---	---	Rated voltage	Insulation Resistance	100V: All X7R; 1210 ≥ 3.3μF	1GΩ or RxC ≥ 10 Ω-F whichever is smaller.	50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF	35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V; 4V; Size ≥ 1812
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No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements
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4.	Destructive Physical Analysis EIA-469	Per EIA-469	No defects or abnormalities
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5.	Moisture Resistance MIL-STD-202 Method 106	<ul style="list-style-type: none"> * 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. 	<ul style="list-style-type: none"> * 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+10C
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X7R:

Rated vol.	D.F. ≤	Exception of D.F. ≤	
≥ 100V	≤ 3%	≤ 6%	1206 ≥ 0.47μF
		≤ 7.5%	0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF
		≤ 20%	0805 > 0.22μF; 1210 ≥ 3.3μF
50V	≤ 3%	≤ 6%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
		≤ 10%	0201 ≥ 0.01μF; 1210 ≥ 3.3μF
		≤ 20%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
35V	≤ 5%	≤ 20%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF
25V	≤ 5%	≤ 10%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF
		≤ 14%	0603 ≥ 0.33μF
		≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
		≤ 20%	0402 ≥ 0.47μF
16V	≤ 5%	≤ 10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
		≤ 15%	0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
10V	≤ 7.5%	≤ 15%	0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 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%	---	---

* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.

Class II (X7R)

Rated voltage	Insulation Resistance
100V: All X7R; 1210 ≥ 3.3μF	1GΩ or RxC ≥ 10 Ω-F whichever is smaller.
50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF	
35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	
25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF	
16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	
10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	
6.3V; 4V; Size ≥ 1812	

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																				
6.	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±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: C≥30pF , Q≥200 ; C<30pF , Q≥100+10/3C X7R:																																				
			<table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td rowspan="3">≤3%</td> <td>≤6% 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤3%</td> <td>≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤5%</td> <td>≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤14% 0603 ≥ 0.33μF</td> </tr> <tr> <td>≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤20% 0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤15% 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤20% 0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30% 0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥100V	≤3%	≤6% 1206 ≥ 0.47μF	≤7.5% 0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF	≤20% 0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤3%	≤6% 0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤10% 0201 ≥ 0.01μF; 1210 ≥ 3.3μF	≤20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	35V	≤5%	≤20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	≤10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	25V	≤5%	≤14% 0603 ≥ 0.33μF	≤15% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤20% 0402 ≥ 0.47μF	16V	≤5%	≤10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤15% 0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤7.5%	≤15% 0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 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%	---
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No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																																		
7.	Operational Life MIL-STD-202 Method 108	<p>* Test temp.: 125±3°C</p> <p>* To apply voltage:</p> <p>(1) 10V≤U_r≤250V:200% of rated voltage.</p> <p>(2) 150% of rated voltage:</p> <p>a) 500V</p> <p>b) 0603/X7R/50V/Cap.>0.1μF</p> <p>(3) 630V≤U_r≤1000V:120% of rated voltage.</p> <p>* Test time: 1000+24/-0 hrs.</p> <p>* Before initial measurement (X7R only): Apply test voltage for 1 hr at 125°C. Remove and let 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 ±3.0% or ±0.3pF whichever is larger X7R: within ±12.5%.</p> <p>* Q/D.F. value: NPO: More than 30pF, Q≥350 ; 10pF≤C<30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C</p> <p>X7R:</p> <table border="1" data-bbox="635 426 1328 998"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤20%</td> <td>0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤10%</td> <td>0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤20%</td> <td>0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤5%</td> <td>≤20%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤10%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">≤5%</td> <td>≤14%</td> <td>0603 ≥ 0.33μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤20%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>≤10%</td> <td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤15%</td> <td>0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤20%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201 ≥ 0.1μF; 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> </tbody> </table> <p>* I.R.: ≥1GΩ or RxC≥50Ω·F whichever is smaller.</p> <p>Class II (X7R)</p> <table border="1" data-bbox="635 1084 1328 1386"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210 ≥ 3.3μF</td> <td rowspan="7">1GΩ or RxC ≥ 10 Ω·F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0201 ≥ 0.1μF; 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V; 4V; Size ≥ 1812</td> </tr> </tbody> </table>	Rated vol.	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8.	External Visual MIL-STD-883 Method 2009	Visual inspection	No remarkable defect.																																																																		
9.	Physical Dimension JESD22 Method JB-100	Using by calipers	Within the specified dimensions																																																																		

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10.	Resistance to Solvents MIL-STD-202 Method 215	* Temperature: 25±5°C * Time: 3+0.5/-0 min. * Solvent: Iso-propyl alcohol.	* No remarkable damage. * Cap.: within the specified tolerance. * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. 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		≤ 10%	0201 ≥ 0.022μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																																													
10V	≤ 5%	≤ 10%	0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																																													
		≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																																													
6.3V	≤ 10%	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																																													
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6.3V; 4V; Size≥1812																																																																																
Rated voltage	Insulation Resistance																																																																															
100V: 1210≥3.3μF	RxC≥50 Ω-F.																																																																															
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4V: 0603≥22μF; 0805≥47μF; 1206≥100μF																																																																																

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																																															
11.	Mechanical Shock MIL-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.: within the specified tolerance. * Q/D.F. value: NPO: Cap \geq 30pF, Q \geq 1000 ; Cap<30pF, Q \geq 400+20C. X7R: <table border="1" data-bbox="637 398 1337 1002"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="3">\geq 100V</td> <td rowspan="3">\leq 2.5%</td> <td>\leq 3%</td> <td>1206 \geq 0.47μF</td> </tr> <tr> <td>\leq 5%</td> <td>0603 \geq 0.068μF; 0805 > 0.1μF; 1206 \geq 1μF; 1210 \geq 2.2μF</td> </tr> <tr> <td>\leq 10%</td> <td>0805 > 0.22μF; 1210 \geq 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">\leq 2.5%</td> <td>\leq 3%</td> <td>0201(50V); 0603 \geq 0.047μF; 0805 \geq 0.18μF; 1206 \geq 0.47μF</td> </tr> <tr> <td>\leq 5%</td> <td>0201 \geq 0.01μF; 1210 \geq 3.3μF</td> </tr> <tr> <td>\leq 10%</td> <td>0402 \geq 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 \geq 2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td>35V</td> <td>\leq 3.5%</td> <td>\leq 10%</td> <td>0603 \geq 1μF; 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">\leq 3.5%</td> <td>\leq 5%</td> <td>0201 \geq 0.01μF; 0805 \geq 1μF; 1210 \geq 10μF</td> </tr> <tr> <td>\leq 7%</td> <td>0603 \geq 0.33μF</td> </tr> <tr> <td>\leq 10%</td> <td>0201 \geq 0.1μF; 0402 \geq 0.056μF; 0603 \geq 0.47μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 22μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">\leq 3.5%</td> <td>\leq 12.5%</td> <td>0402 \geq 0.47μF</td> </tr> <tr> <td>\leq 5%</td> <td>0201 \geq 0.01μF; 0402 \geq 0.033μF; 0603 \geq 0.15μF; 0805 \geq 0.68μF; 1206 \geq 2.2μF; 1210 \geq 4.7μF</td> </tr> <tr> <td>\leq 10%</td> <td>0201 \geq 0.022μF; 0402 \geq 0.22μF; 0603 > 0.47μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 22μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">\leq 5%</td> <td>\leq 10%</td> <td>0201 \geq 0.012μF; 0402 \geq 0.22μF; 0603 \geq 0.33μF; 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 22μF</td> </tr> <tr> <td>\leq 15%</td> <td>0201 \geq 0.1μF; 0402 \geq 1μF</td> </tr> <tr> <td>\leq 20%</td> <td>0402 \geq 2.2μF</td> </tr> <tr> <td>6.3V</td> <td>\leq 10%</td> <td>\leq 15%</td> <td>0201 \geq 0.1μF; 0402 \geq 1μF; 0603 \geq 10μF; 0805 \geq 4.7μF; 1206 \geq 47μF; 1210 \geq 100μF</td> </tr> <tr> <td>4V</td> <td>\leq 15%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>* I.R.: \geq10GΩ or Rx$C \geq$500Ω-F whichever is smaller.</p> <table border="1" data-bbox="637 1067 1337 1606"> <thead> <tr> <th colspan="2">Class II (X7R)</th> </tr> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R</td> <td rowspan="7">10GΩ or Rx$C \geq$100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 > 0.01μF; 0603 \geq 1μF; 0805 \geq 1μF; 1206 \geq 4.7μF; 1210 \geq 4.7μF</td> </tr> <tr> <td>35V: 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td>25V: 0402 \geq 1μF; 0603 \geq 2.2μF; 0805 \geq 2.2μF; 1206 \geq 10μF; 1210 \geq 10μF</td> </tr> <tr> <td>16V: 0201 \geq 0.1μF; 0402 \geq 0.22μF; 0603 \geq 1μF; 0805 \geq 2.2μF; 1206 \geq 10μF; 1210 \geq 47μF</td> </tr> <tr> <td>10V: 0201 \geq 47nF; 0402 \geq 0.47μF; 0603 \geq 0.47μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 47μF</td> </tr> <tr> <td>6.3V; 4V; Size \geq 1812</td> </tr> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>100V: 1210 \geq 3.3μF</td> <td rowspan="7">Rx$C \geq$ 50 Ω-F.</td> </tr> <tr> <td>50V: 0402 \geq 0.1μF; 0603 \geq 2.2μF; 0805 \geq 10μF; 1206 \geq 10μF</td> </tr> <tr> <td>35V: 0603 \geq 1μF;</td> </tr> <tr> <td>25V: 0201 \geq 0.1μF; 0402 \geq 2.2μF; 0603 \geq 10μF; 0805 \geq 10μF; 1206 \geq 22μF</td> </tr> <tr> <td>16V: 0603 \geq 10μF; 0402 \geq 1μF; 0201 \geq 0.22μF</td> </tr> <tr> <td>10V: 0201 > 0.1μF; 0402 \geq 1μF; 0603 \geq 10μF; 0805 \geq 47μF</td> </tr> <tr> <td>6.3V: 0201 \geq 0.1μF; 0402 \geq 1μF; 0603 > 4.7μF; 0805 \geq 47μF; 1206 \geq 10μF</td> </tr> <tr> <td>4V: 0603 \geq 22μF; 0805 \geq 47μF; 1206 \geq 100μF</td> </tr> </tbody> </table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		\geq 100V	\leq 2.5%	\leq 3%	1206 \geq 0.47 μ F	\leq 5%	0603 \geq 0.068 μ F; 0805 > 0.1 μ F; 1206 \geq 1 μ F; 1210 \geq 2.2 μ F	\leq 10%	0805 > 0.22 μ F; 1210 \geq 3.3 μ F	50V	\leq 2.5%	\leq 3%	0201(50V); 0603 \geq 0.047 μ F; 0805 \geq 0.18 μ F; 1206 \geq 0.47 μ F	\leq 5%	0201 \geq 0.01 μ F; 1210 \geq 3.3 μ F	\leq 10%	0402 \geq 0.012 μ F; 0603 > 0.1 μ F; 0805 > 0.47 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F	35V	\leq 3.5%	\leq 10%	0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F	25V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0805 \geq 1 μ F; 1210 \geq 10 μ F	\leq 7%	0603 \geq 0.33 μ F	\leq 10%	0201 \geq 0.1 μ F; 0402 \geq 0.056 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F	16V	\leq 3.5%	\leq 12.5%	0402 \geq 0.47 μ F	\leq 5%	0201 \geq 0.01 μ F; 0402 \geq 0.033 μ F; 0603 \geq 0.15 μ F; 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F; 1210 \geq 4.7 μ F	\leq 10%	0201 \geq 0.022 μ F; 0402 \geq 0.22 μ F; 0603 > 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F	10V	\leq 5%	\leq 10%	0201 \geq 0.012 μ F; 0402 \geq 0.22 μ F; 0603 \geq 0.33 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 22 μ F	\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F	\leq 20%	0402 \geq 2.2 μ F	6.3V	\leq 10%	\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 4.7 μ F; 1206 \geq 47 μ F; 1210 \geq 100 μ F	4V	\leq 15%	---	---	Class II (X7R)		Rated voltage	Insulation Resistance	100V: All X7R	10G Ω or Rx $C \geq$ 100 Ω -F whichever is smaller.	50V: 0402 > 0.01 μ F; 0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 4.7 μ F	35V: 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F	25V: 0402 \geq 1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 10 μ F	16V: 0201 \geq 0.1 μ F; 0402 \geq 0.22 μ F; 0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 47 μ F	10V: 0201 \geq 47nF; 0402 \geq 0.47 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 47 μ F	6.3V; 4V; Size \geq 1812	Rated voltage	Insulation Resistance	100V: 1210 \geq 3.3 μ F	Rx $C \geq$ 50 Ω -F.	50V: 0402 \geq 0.1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 10 μ F; 1206 \geq 10 μ F	35V: 0603 \geq 1 μ F;	25V: 0201 \geq 0.1 μ F; 0402 \geq 2.2 μ F; 0603 \geq 10 μ F; 0805 \geq 10 μ F; 1206 \geq 22 μ F	16V: 0603 \geq 10 μ F; 0402 \geq 1 μ F; 0201 \geq 0.22 μ F	10V: 0201 > 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 47 μ F	6.3V: 0201 \geq 0.1 μ F; 0402 \geq 1 μ F; 0603 > 4.7 μ F; 0805 \geq 47 μ F; 1206 \geq 10 μ F	4V: 0603 \geq 22 μ F; 0805 \geq 47 μ F; 1206 \geq 100 μ F
Rated vol.	D.F. \leq	Exception of D.F. \leq																																																																																
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		\leq 10%	0402 \geq 0.012 μ F; 0603 > 0.1 μ F; 0805 > 0.47 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F																																																																															
35V	\leq 3.5%	\leq 10%	0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F																																																																															
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Rated voltage	Insulation Resistance																																																																																	
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6.3V; 4V; Size \geq 1812																																																																																		
Rated voltage	Insulation Resistance																																																																																	
100V: 1210 \geq 3.3 μ F	Rx $C \geq$ 50 Ω -F.																																																																																	
50V: 0402 \geq 0.1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 10 μ F; 1206 \geq 10 μ F																																																																																		
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No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements			
12.	Vibration MIL-STD-202 Method 204	* Vibration frequency: 10~2000 Hz/min. (5g's for 20 min) * Total amplitude: 1.5mm * 12 cycles each of 3 orientations (36 times)	* No remarkable damage. * Cap.: within the specified tolerance. * Q/D.F. value: NPO:Cap \geq 30pF, Q \geq 1000 ; Cap<30pF, Q \geq 400+20C.			
			X7R:			
			Rated vol.	D.F. \leq	Exception of D.F. \leq	
			\geq 100V	\leq 2.5%	\leq 3%	1206 \geq 0.47 μ F
					\leq 5%	0603 \geq 0.068 μ F; 0805 $>$ 0.1 μ F; 1206 \geq 1 μ F; 1210 \geq 2.2 μ F
					\leq 10%	0805 $>$ 0.22 μ F; 1210 \geq 3.3 μ F
			50V	\leq 2.5%	\leq 3%	0201(50V); 0603 \geq 0.047 μ F; 0805 \geq 0.18 μ F; 1206 \geq 0.47 μ F
					\leq 5%	0201 \geq 0.01 μ F; 1210 \geq 3.3 μ F
					\leq 10%	0402 \geq 0.012 μ F; 0603 $>$ 0.1 μ F; 0805 $>$ 0.47 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F
			35V	\leq 3.5%	\leq 10%	0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F
			25V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0805 \geq 1 μ F; 1210 \geq 10 μ F
					\leq 7%	0603 \geq 0.33 μ F
					\leq 10%	0201 \geq 0.1 μ F; 0402 \geq 0.056 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F
			16V	\leq 3.5%	\leq 12.5%	0402 \geq 0.47 μ F
					\leq 5%	0201 \geq 0.01 μ F; 0402 \geq 0.033 μ F; 0603 \geq 0.15 μ F; 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F; 1210 \geq 4.7 μ F
\leq 10%	0201 \geq 0.022 μ F; 0402 \geq 0.22 μ F; 0603 $>$ 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F					
10V	\leq 5%	\leq 10%	0201 \geq 0.012 μ F; 0402 \geq 0.22 μ F; 0603 \geq 0.33 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 22 μ F			
		\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F			
		\leq 20%	0402 \geq 2.2 μ F			
6.3V	\leq 10%	\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 4.7 μ F; 1206 \geq 47 μ F; 1210 \geq 100 μ F			
4V	\leq 15%	---	---			
* I.R.: \geq 10G Ω or RxC \geq 500 Ω -F whichever is smaller.						
Class II (X7R)						
Rated voltage		Insulation Resistance				
100V: All X7R		10G Ω or RxC \geq 100 Ω -F whichever is smaller.				
50V: 0402 \geq 0.01 μ F; 0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 4.7 μ F						
35V: 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F						
25V: 0402 \geq 1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 10 μ F						
16V: 0201 \geq 0.1 μ F; 0402 \geq 0.22 μ F; 0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 47 μ F						
10V: 0201 \geq 47nF; 0402 \geq 0.47 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 47 μ F						
6.3V; 4V; Size \geq 1812						
Rated voltage		Insulation Resistance				
		RxC \geq 50 Ω -F.				
100V: 1210 \geq 3.3 μ F						
50V: 0402 \geq 0.1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 10 μ F; 1206 \geq 10 μ F						
35V: 0603 \geq 1 μ F;						
25V: 0201 \geq 0.1 μ F; 0402 \geq 2.2 μ F; 0603 \geq 10 μ F; 0805 \geq 10 μ F; 1206 \geq 22 μ F						
16V: 0603 \geq 10 μ F; 0402 \geq 1 μ F; 0201 \geq 0.22 μ F						
10V: 0201 \geq 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 47 μ F						
6.3V: 0201 \geq 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 4.7 μ F; 0805 \geq 47 μ F; 1206 \geq 10 μ F						
4V: 0603 \geq 22 μ F; 0805 \geq 47 μ F; 1206 \geq 100 μ F						

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																																																
13.	Resistance to Soldering Heat MIL-STD-202 Method 210	<ul style="list-style-type: none"> * Solder temperature: 270±5°C * Dipping time: 10±1 sec * Before initial measurement (X7R only): Perform 150+0/-10°C for 1 hr and then set for 24±2 hrs at room temp. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: NPO: within ±2.5% or 0.25pF whichever is larger X7R: within ±7.5% * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R: <table border="1" data-bbox="605 441 1317 1045"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5%</td> <td>0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤ 10%</td> <td>0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤ 10%</td> <td>0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 3.5%</td> <td>≤ 10%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">≤ 3.5%</td> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 7%</td> <td>0603 ≥ 0.33μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 12.5%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0201 ≥ 0.022μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 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>0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 10%</td> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 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> </tbody> </table> <ul style="list-style-type: none"> * I.R.: ≥10GΩ or RxC≥500Ω·F whichever is smaller. <table border="1" data-bbox="605 1088 1317 1627"> <thead> <tr> <th colspan="2">Class II (X7R)</th> </tr> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R</td> <td rowspan="6">10GΩ or RxC≥100 Ω·F whichever is smaller.</td> </tr> <tr> <td>50V: 0402>0.01μF; 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td> </tr> <tr> <td>35V: 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF</td> </tr> <tr> <td>16V: 0201≥0.1μF; 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF</td> </tr> <tr> <td>10V: 0201≥47nF; 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF</td> </tr> <tr> <td>6.3V; 4V; Size≥1812</td> <td></td> </tr> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>100V: 1210≥3.3μF</td> <td rowspan="7">RxC≥50 Ω·F.</td> </tr> <tr> <td>50V: 0402≥0.1μF; 0603≥2.2μF; 0805≥10μF; 1206≥10μF</td> </tr> <tr> <td>35V: 0603≥1μF;</td> </tr> <tr> <td>25V: 0201≥0.1μF; 0402≥2.2μF; 0603≥10μF; 0805≥10μF; 1206≥22μF</td> </tr> <tr> <td>16V: 0603≥10μF; 0402≥1μF; 0201≥0.22μF</td> </tr> <tr> <td>10V: 0201>0.1μF; 0402≥1μF; 0603≥10μF; 0805≥47μF</td> </tr> <tr> <td>6.3V: 0201>0.1μF; 0402≥1μF; 0603>4.7μF; 0805≥47μF; 1206≥10μF</td> </tr> <tr> <td>4V: 0603≥22μF; 0805≥47μF; 1206≥100μF</td> </tr> </tbody> </table>	Rated vol.	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		≤ 20% 0402 ≥ 0.012μF; 0603 > 0.1μF; 0805/X7R > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																									
35V	≤ 5%	≤ 20% 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																									
		≤ 10% 0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																																									
25V	≤ 5%	≤ 14% 0603 ≥ 0.33μF																																																									
		≤ 15% 0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																									
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		≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																									
16V	≤ 5%	0201 ≥ 0.022μF; 0402 ≥ 0.033μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																									
		0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																									
10V	≤ 7.5%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																									
		0201 ≥ 0.1μF; 0402 ≥ 1μF																																																									
6.3V	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																									
4V	≤ 20%	---																																																									
Rated voltage	Insulation Resistance																																																										
100V: All X7R; 1210 ≥ 3.3μF	1GΩ or RxC ≥ 10 Ω·F whichever is smaller.																																																										
50V: 0402 > 0.01μF; 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF																																																											
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10V: 0201 ≥ 47nF; 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																																											
6.3V; 4V; Size ≥ 1812																																																											

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																																																	
15.	ESD AEC-Q200-002	Per AEC-Q200-002	<p>* No remarkable damage.</p> <p>* Cap.: within the specified tolerance.</p> <p>* Q/D.F. value:</p> <p>NPO: Cap\geq30pF, Q\geq1000 ; Cap$<$30pF, Q\geq400+20C.</p> <p>X7R:</p> <table border="1" data-bbox="627 405 1327 1009"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th colspan="2">Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="3">\geq 100V</td> <td rowspan="3">\leq 2.5%</td> <td>\leq 3%</td> <td>1206 \geq 0.47μF</td> </tr> <tr> <td>\leq 5%</td> <td>0603 \geq 0.068μF; 0805 $>$ 0.1μF; 1206 \geq 1μF; 1210 \geq 2.2μF</td> </tr> <tr> <td>\leq 10%</td> <td>0805 $>$ 0.22μF; 1210 \geq 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">\leq 2.5%</td> <td>\leq 3%</td> <td>0201(50V); 0603 \geq 0.047μF; 0805 \geq 0.18μF; 1206 \geq 0.47μF</td> </tr> <tr> <td>\leq 5%</td> <td>0201 \geq 0.01μF; 1210 \geq 3.3μF</td> </tr> <tr> <td>\leq 10%</td> <td>0402 \geq 0.012μF; 0603 $>$ 0.1μF; 0805 $>$ 0.47μF; 1206 \geq 2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td>35V</td> <td>\leq 3.5%</td> <td>\leq 10%</td> <td>0603 \geq 1μF; 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">\leq 3.5%</td> <td>\leq 5%</td> <td>0201 \geq 0.01μF; 0805 \geq 1μF; 1210 \geq 10μF</td> </tr> <tr> <td>\leq 7%</td> <td>0603 \geq 0.33μF</td> </tr> <tr> <td>\leq 10%</td> <td>0201 \geq 0.1μF; 0402 \geq 0.056μF; 0603 \geq 0.47μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 22μF</td> </tr> <tr> <td></td> <td></td> <td>\leq 12.5%</td> <td>0402 \geq 0.47μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">\leq 3.5%</td> <td>\leq 5%</td> <td>0201 \geq 0.01μF; 0402 \geq 0.033μF; 0603 \geq 0.15μF; 0805 \geq 0.68μF; 1206 \geq 2.2μF; 1210 \geq 4.7μF</td> </tr> <tr> <td>\leq 10%</td> <td>0201 \geq 0.022μF; 0402 \geq 0.22μF; 0603 $>$ 0.47μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">\leq 5%</td> <td>\leq 10%</td> <td>0201 \geq 0.012μF; 0402 \geq 0.22μF; 0603 \geq 0.33μF; 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 22μF</td> </tr> <tr> <td>\leq 15%</td> <td>0201 \geq 0.1μF; 0402 \geq 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">\leq 10%</td> <td>\leq 15%</td> <td>0201 \geq 0.1μF; 0402 \geq 1μF; 0603 \geq 10μF; 0805 \geq 4.7μF; 1206 \geq 47μF; 1210 \geq 100μF</td> </tr> <tr> <td>\leq 20%</td> <td>0402 \geq 2.2μF</td> </tr> <tr> <td>4V</td> <td>\leq 15%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>* I.R.: \geq10GΩ or Rx$C \geq$500Ω-F whichever is smaller.</p> <table border="1" data-bbox="627 1052 1327 1597"> <thead> <tr> <th colspan="2">Class II (X7R)</th> </tr> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R</td> <td rowspan="7">10GΩ or Rx$C \geq$100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402 $>$ 0.01μF; 0603 \geq 1μF; 0805 \geq 1μF; 1206 \geq 4.7μF; 1210 \geq 4.7μF</td> </tr> <tr> <td>35V: 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td>25V: 0402 \geq 1μF; 0603 \geq 2.2μF; 0805 \geq 2.2μF; 1206 \geq 10μF; 1210 \geq 10μF</td> </tr> <tr> <td>16V: 0201 \geq 0.1μF; 0402 \geq 0.22μF; 0603 \geq 1μF; 0805 \geq 2.2μF; 1206 \geq 10μF; 1210 \geq 47μF</td> </tr> <tr> <td>10V: 0201 \geq 47nF; 0402 \geq 0.47μF; 0603 \geq 0.47μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 47μF</td> </tr> <tr> <td>6.3V; 4V; Size \geq 1812</td> </tr> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>100V: 1210 \geq 3.3μF</td> <td rowspan="7">Rx$C \geq$ 50 Ω-F.</td> </tr> <tr> <td>50V: 0402 \geq 0.1μF; 0603 \geq 2.2μF; 0805 \geq 10μF; 1206 \geq 10μF</td> </tr> <tr> <td>35V: 0603 \geq 1μF;</td> </tr> <tr> <td>25V: 0201 \geq 0.1μF; 0402 \geq 2.2μF; 0603 \geq 10μF; 0805 \geq 10μF; 1206 \geq 22μF</td> </tr> <tr> <td>16V: 0603 \geq 10μF; 0402 \geq 1μF; 0201 \geq 0.22μF</td> </tr> <tr> <td>10V: 0201 $>$ 0.1μF; 0402 \geq 1μF; 0603 \geq 10μF; 0805 \geq 47μF</td> </tr> <tr> <td>6.3V: 0201 \geq 0.1μF; 0402 \geq 1μF; 0603 \geq 4.7μF; 0805 \geq 47μF; 1206 \geq 10μF</td> </tr> <tr> <td>4V: 0603 \geq 22μF; 0805 \geq 47μF; 1206 \geq 100μF</td> </tr> </tbody> </table>	Rated vol.	D.F. \leq	Exception of D.F. \leq		\geq 100V	\leq 2.5%	\leq 3%	1206 \geq 0.47 μ F	\leq 5%	0603 \geq 0.068 μ F; 0805 $>$ 0.1 μ F; 1206 \geq 1 μ F; 1210 \geq 2.2 μ F	\leq 10%	0805 $>$ 0.22 μ F; 1210 \geq 3.3 μ F	50V	\leq 2.5%	\leq 3%	0201(50V); 0603 \geq 0.047 μ F; 0805 \geq 0.18 μ F; 1206 \geq 0.47 μ F	\leq 5%	0201 \geq 0.01 μ F; 1210 \geq 3.3 μ F	\leq 10%	0402 \geq 0.012 μ F; 0603 $>$ 0.1 μ F; 0805 $>$ 0.47 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F	35V	\leq 3.5%	\leq 10%	0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F	25V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0805 \geq 1 μ F; 1210 \geq 10 μ F	\leq 7%	0603 \geq 0.33 μ F	\leq 10%	0201 \geq 0.1 μ F; 0402 \geq 0.056 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F			\leq 12.5%	0402 \geq 0.47 μ F	16V	\leq 3.5%	\leq 5%	0201 \geq 0.01 μ F; 0402 \geq 0.033 μ F; 0603 \geq 0.15 μ F; 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F; 1210 \geq 4.7 μ F	\leq 10%	0201 \geq 0.022 μ F; 0402 \geq 0.22 μ F; 0603 $>$ 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F	10V	\leq 5%	\leq 10%	0201 \geq 0.012 μ F; 0402 \geq 0.22 μ F; 0603 \geq 0.33 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 22 μ F	\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F	6.3V	\leq 10%	\leq 15%	0201 \geq 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 4.7 μ F; 1206 \geq 47 μ F; 1210 \geq 100 μ F	\leq 20%	0402 \geq 2.2 μ F	4V	\leq 15%	---	---	Class II (X7R)		Rated voltage	Insulation Resistance	100V: All X7R	10G Ω or Rx $C \geq$ 100 Ω -F whichever is smaller.	50V: 0402 $>$ 0.01 μ F; 0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 4.7 μ F	35V: 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 10 μ F	25V: 0402 \geq 1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 10 μ F	16V: 0201 \geq 0.1 μ F; 0402 \geq 0.22 μ F; 0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 47 μ F	10V: 0201 \geq 47nF; 0402 \geq 0.47 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 47 μ F	6.3V; 4V; Size \geq 1812	Rated voltage	Insulation Resistance	100V: 1210 \geq 3.3 μ F	Rx $C \geq$ 50 Ω -F.	50V: 0402 \geq 0.1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 10 μ F; 1206 \geq 10 μ F	35V: 0603 \geq 1 μ F;	25V: 0201 \geq 0.1 μ F; 0402 \geq 2.2 μ F; 0603 \geq 10 μ F; 0805 \geq 10 μ F; 1206 \geq 22 μ F	16V: 0603 \geq 10 μ F; 0402 \geq 1 μ F; 0201 \geq 0.22 μ F	10V: 0201 $>$ 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 47 μ F	6.3V: 0201 \geq 0.1 μ F; 0402 \geq 1 μ F; 0603 \geq 4.7 μ F; 0805 \geq 47 μ F; 1206 \geq 10 μ F	4V: 0603 \geq 22 μ F; 0805 \geq 47 μ F; 1206 \geq 100 μ F
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16.	Solderability J-STD-002 JESD22-B102E	<p>* Condition A Un-mounted chips 4hrs / 155°C* dry then completely immersed for 5\pm0.5 sec in solder bath at 235\pm5°C.</p> <p>* Condition B Un-mounted chips steam 8 hrs then completely immersed for 10\pm1sec in solder bath at 215+5/-0°C.</p> <p>* Condition C Un-mounted chips steam 8 hrs then completely immersed for 10\pm1 sec. in solder bath at 260+0/-5°C.</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.																																																																																	

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																																			
17.	Electrical Characterization	<p>* Capacitance</p> <p>* Q/ D.F. (Dissipation Factor)</p> <p>Class I: (NPO)</p> <p>Cap\leq1000pF 1.0\pm0.2Vrms, 1MHz\pm10%</p> <p>Cap$>$1000pF 1.0\pm0.2Vrms, 1KHz\pm10%</p> <p>Class II: (X7R)</p> <p>Cap \leq10μF, 1.0\pm0.2Vrms, 1KHz\pm10%</p> <p>Cap $>$ 10μF, 0.5\pm0.2Vrms, 120Hz\pm20%</p> <p>* Insulation Resistance</p> <p>To apply rated voltage(500V max.) for max. 120 sec.</p> <p>* Dielectric Strength</p> <p>To apply voltage:</p> <table border="0"> <tr><td>\leq 100</td><td>\geq2.5 times VDC</td></tr> <tr><td>200V~300V</td><td>\geq2 times VDC</td></tr> <tr><td>400V~450V</td><td>\geq1.2 times VDC</td></tr> <tr><td>500V~999V</td><td>\geq1.5 times VDC</td></tr> <tr><td>1000V~3000V</td><td>\geq1.2 times VDC</td></tr> </table> <p>, duration 1~5 sec,</p> <p>charge and discharge current less than 50mA.</p> <p>* Temperature Coefficient (with no electrical load)</p> <p>Operation temperature: -55~125$^{\circ}$C at 25$^{\circ}$C</p>	\leq 100	\geq 2.5 times VDC	200V~300V	\geq 2 times VDC	400V~450V	\geq 1.2 times VDC	500V~999V	\geq 1.5 times VDC	1000V~3000V	\geq 1.2 times VDC	<p>* Capacitance within the specified tolerance.</p> <p>* Q/D.F. value:</p> <p>NPO: Cap\geq30pF, Q\geq1000 ; Cap$<$30pF, Q\geq400+20C.</p> <p>X7R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. \leq</th> <th>Exception of D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="3">\geq 100V</td> <td rowspan="3">\leq 2.5%</td> <td>\leq 3% 1206 \geq 0.47μF</td> </tr> <tr> <td>\leq 5% 0603 \geq 0.068μF; 0805 $>$ 0.1μF; 1206 \geq 1μF; 1210 \geq 2.2μF</td> </tr> <tr> <td>\leq 10% 0805 $>$ 0.22μF; 1210 \geq 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">\leq 2.5%</td> <td>\leq 3% 0201(50V); 0603 \geq 0.047μF; 0805 \geq 0.18μF; 1206 \geq 0.47μF</td> </tr> <tr> <td>\leq 5% 0201 \geq 0.01μF; 1210 \geq 3.3μF</td> </tr> <tr> <td>\leq 10% 0402 \geq 0.012μF; 0603 $>$ 0.1μF; 0805 $>$ 0.47μF; 1206 \geq 2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td>35V</td> <td>\leq 3.5%</td> <td>\leq 10% 0603 \geq 1μF; 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 10μF</td> </tr> <tr> <td rowspan="4">25V</td> <td rowspan="4">\leq 3.5%</td> <td>\leq 5% 0201 \geq 0.01μF; 0805 \geq 1μF; 1210 \geq 10μF</td> </tr> <tr> <td>\leq 7% 0603 \geq 0.33μF</td> </tr> <tr> <td>\leq 10% 0201 \geq 0.1μF; 0402 \geq 0.056μF; 0603 \geq 0.47μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 22μF</td> </tr> <tr> <td>\leq 12.5% 0402 \geq 0.47μF</td> </tr> <tr> <td>16V</td> <td>\leq 3.5%</td> <td>\leq 5% 0201 \geq 0.01μF; 0402 \geq 0.033μF; 0603 \geq 0.15μF; 0805 \geq 0.68μF; 1206 \geq 2.2μF; 1210 \geq 4.7μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">\leq 5%</td> <td>\leq 10% 0201 \geq 0.022μF; 0402 \geq 0.22μF; 0603 $>$ 0.47μF; 0805 \geq 2.2μF; 1206 \geq 4.7μF; 1210 \geq 22μF</td> </tr> <tr> <td>\leq 15% 0201 \geq 0.012μF; 0402 \geq 0.22μF; 0603 \geq 0.33μF; 0805 \geq 2.2μF; 1206 \geq 2.2μF; 1210 \geq 22μF</td> </tr> <tr> <td>6.3V</td> <td>\leq 10%</td> <td>\leq 10% 0201 \geq 0.1μF; 0402 \geq 1μF; 0603 \geq 10μF; 0805 \geq 4.7μF; 1206 \geq 47μF; 1210 \geq 100μF</td> </tr> <tr> <td rowspan="2">4V</td> <td rowspan="2">\leq 15%</td> <td>\leq 20% 0402 \geq 2.2μF</td> </tr> <tr> <td>---</td> </tr> </tbody> </table> <p>* I.R.: \geq10GΩ or RxC\geq500Ω-F whichever is smaller.</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R</td> <td rowspan="7">10GΩ or RxC\geq100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0402$>$0.01μF; 0603\geq1μF; 0805\geq1μF; 1206\geq4.7μF; 1210\geq4.7μF</td> </tr> <tr> <td>35V: 0805\geq2.2μF; 1206\geq2.2μF; 1210\geq10μF</td> </tr> <tr> <td>25V: 0402\geq1μF; 0603\geq2.2μF; 0805\geq2.2μF; 1206\geq10μF; 1210\geq10μF</td> </tr> <tr> <td>16V: 0201\geq0.1μF; 0402\geq0.22μF; 0603\geq1μF; 0805\geq2.2μF; 1206\geq10μF; 1210\geq47μF</td> </tr> <tr> <td>10V: 0201\geq47nF; 0402\geq0.47μF; 0603\geq0.47μF; 0805\geq2.2μF; 1206\geq4.7μF; 1210\geq47μF</td> </tr> <tr> <td>6.3V; 4V; Size\geq1812</td> </tr> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> <tr> <td>100V: 1210\geq3.3μF</td> <td rowspan="7">RxC\geq50 Ω-F.</td> </tr> <tr> <td>50V: 0402\geq0.1μF; 0603\geq2.2μF; 0805\geq10μF; 1206\geq10μF</td> </tr> <tr> <td>35V: 0603\geq1μF;</td> </tr> <tr> <td>25V: 0201\geq0.1μF; 0402\geq2.2μF; 0603\geq10μF; 0805\geq10μF; 1206\geq22μF</td> </tr> <tr> <td>16V: 0603\geq10μF; 0402\geq1μF; 0201\geq0.22μF</td> </tr> <tr> <td>10V: 0201$>$0.1μF; 0402\geq1μF; 0603\geq10μF; 0805\geq47μF</td> </tr> <tr> <td>6.3V: 0201\geq0.1μF; 0402\geq1μF; 0603$>$4.7μF; 0805\geq47μF; 1206\geq10μF</td> </tr> <tr> <td>4V: 0603\geq22μF; 0805\geq47μF; 1206\geq100μF</td> </tr> </tbody> </table> <p>* Dielectric strength</p> <p>No evidence of damage or flash over during test.</p> <p>* Temperature Coefficient</p> <p>Capacitance Change: NPO: Within \pm30ppm/$^{\circ}$C</p> <p>X7R: Within \pm15%</p>	Rated vol.	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18.	Board Flex AEC-Q200-005	<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 60±1 sec.</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 ±5% or 0.5pF whichever is larger X7R: within ±12.5%</p> <p>(This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)</p>																																																										
19.	Terminal Strength AEC-Q200-006	<p>* Pressurizing force : 2N (0201 & 0402), 10N(0603), 18N(≥0805).</p> <p>* Test time: 60±1 sec.</p>	<p>* No remarkable damage or removal of the terminations.</p> <p>* Capacitance within the specified tolerance.</p> <p>* Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R:</p> <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 100V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3%</td> <td>1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5%</td> <td>0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF</td> </tr> <tr> <td>≤ 10%</td> <td>0805 > 0.22μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td rowspan="3">50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3%</td> <td>0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 1210 ≥ 3.3μF</td> </tr> <tr> <td>≤ 10%</td> <td>0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 10%</td> <td>0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 7%</td> <td>0603 ≥ 0.33μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 10%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 12.5%</td> <td>0402 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5%</td> <td>0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 10%</td> <td>0201 ≥ 0.022μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10%</td> <td>0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 10%</td> <td>≤ 15%</td> <td>0201 ≥ 0.1μF; 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> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 100V	≤ 2.5%	≤ 3%	1206 ≥ 0.47μF	≤ 5%	0603 ≥ 0.068μF; 0805 > 0.1μF; 1206 ≥ 1μF; 1210 ≥ 2.2μF	≤ 10%	0805 > 0.22μF; 1210 ≥ 3.3μF	50V	≤ 2.5%	≤ 3%	0201(50V); 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 5%	0201 ≥ 0.01μF; 1210 ≥ 3.3μF	≤ 10%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	35V	≤ 3.5%	≤ 10%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF	≤ 5%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF	≤ 7%	0603 ≥ 0.33μF	25V	≤ 3.5%	≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 12.5%	0402 ≥ 0.47μF	≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	16V	≤ 3.5%	≤ 10%	0201 ≥ 0.022μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF	10V	≤ 5%	≤ 10%	0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 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%	---	---
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		≤ 10%	0402 ≥ 0.012μF; 0603 > 0.1μF; 0805 > 0.47μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																										
35V	≤ 3.5%	≤ 10%	0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 10μF																																																										
		≤ 5%	0201 ≥ 0.01μF; 0805 ≥ 1μF; 1210 ≥ 10μF																																																										
		≤ 7%	0603 ≥ 0.33μF																																																										
25V	≤ 3.5%	≤ 10%	0201 ≥ 0.1μF; 0402 ≥ 0.056μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																										
		≤ 12.5%	0402 ≥ 0.47μF																																																										
		≤ 5%	0201 ≥ 0.01μF; 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																										
16V	≤ 3.5%	≤ 10%	0201 ≥ 0.022μF; 0402 ≥ 0.22μF; 0603 > 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																										
		≤ 15%	0201 ≥ 0.1μF; 0402 ≥ 1μF																																																										
10V	≤ 5%	≤ 10%	0201 ≥ 0.012μF; 0402 ≥ 0.22μF; 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%	---	---																																																										
20	Beam Load Test AEC-Q200-003	<p>* Break strength test</p> <p>* Beam speed: 2.5±0.25 mm/sec</p>	<p>The chip endure following force</p> <p>* Chip length ≤2.5mm: Thickness >0.5mm (20N), ≤0.5mm (8N)</p> <p>* Chip length ≥3.2mm: Thickness ≥1.25mm (54.5N), <1.25mm (15N)</p>																																																										

APPENDICES

■ Tape & reel dimensions

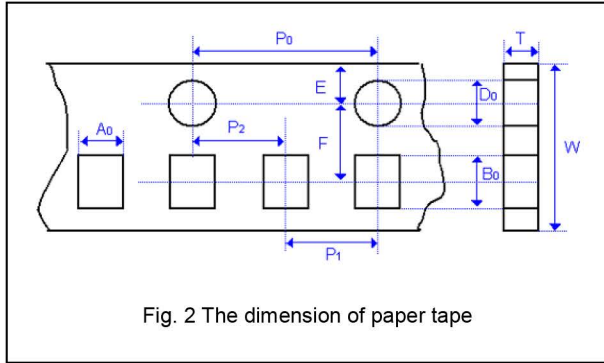


Fig. 2 The dimension of paper tape

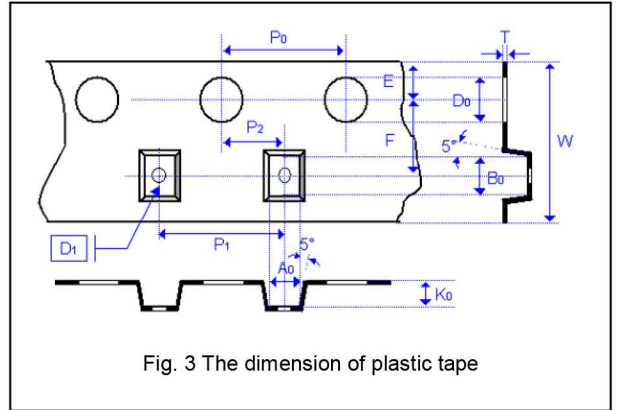


Fig. 3 The dimension of plastic tape

Size	0201	0402	0603	0805			1206			1210		
Thickness	L	N,E	S,H,X	A,H	B,T	D,I	B,T	C,J,D	G,P	T	C,D,G,K	M
A ₀	0.40 +/-0.10	0.70 +/-0.20	1.05 +/-0.30	1.50 +/-0.20	1.50 +/-0.20	< 1.80	1.90 +/-0.50	< 2.00	<2.30	< 3.05	< 3.05	< 3.20
B ₀	0.70 +/-0.10	1.20 +/-0.20	1.80 +/-0.30	2.30 +/-0.20	2.30 +/-0.20	< 2.70	3.50 +/-0.50	< 3.70	< 4.00	< 3.80	< 3.80	<4.00
T	≤0.55	≤0.80	≤1.20	≤1.15	≤1.20	0.23 +/-0.1	≤1.20	+/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1	0.23 +/-0.1
K ₀	-	-	-	-	-	< 2.50	-	< 2.50	< 2.50	< 1.50	< 2.50	< 3.20
W	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30	8.00 +/-0.30
P ₀	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
10xP ₀	40.00 +/-0.10	40.00 +/-0.10	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20	40.00 +/-0.20
P ₁	2.00 +/-0.05	2.00 +/-0.05	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10	4.00 +/-0.10
P ₂	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05	2.00 +/-0.05
D ₀	1.50 +0.1/-0	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	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	1.50 +0.1/-0
D ₁	-	-	-	-	-	1.00 +/-0.10	-	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10	1.00 +/-0.10
E	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	1.75 +/-0.10	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	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05	3.50 +/-0.05

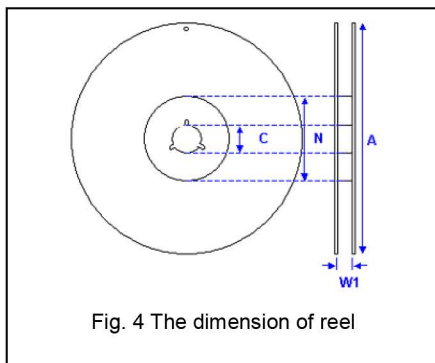
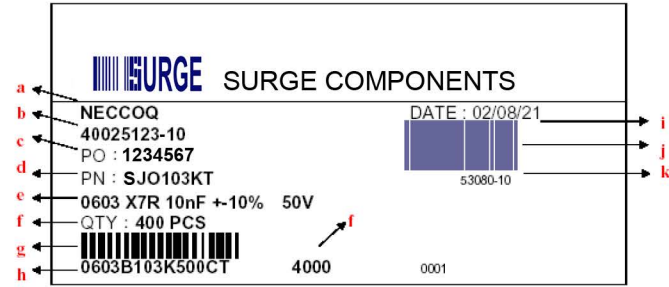


Fig. 4 The dimension of reel

Size	0201, 0402, 0603, 0805, 1206, 1210		
Reel size	7"	10"	13"
C	13.0±0.5	13.0±0.5	13.0±0.5
W ₁	10.0±1.5	10.0±1.5	10.0±1.5
A	178.0±2.0	250.0±2.0	330.0±2.0
N	60.0+1.0/-0	50 min	50 min

Example of customer label



- a. Customer name
- b. Order series and item number
- c. Customer P/O
- d. Customer P/N
- e. Description of product
- f. Quantity
- g. Bar code including quantity & P/N or customer
- h. Surge P/N
- i. Shipping date
- j. Order bar code including series and item numbers
- k. Serial number of label

*Customized label is available upon request

Constructions

No.	Name	NP0,	X7R
①	Ceramic material	CaZrO ₃ based	BaTiO ₃ based
②	Inner electrode	Ni	
③	Termination	Inner layer	Cu
④		Middle layer	Ni
⑤		Outer layer	Sn (Matt)

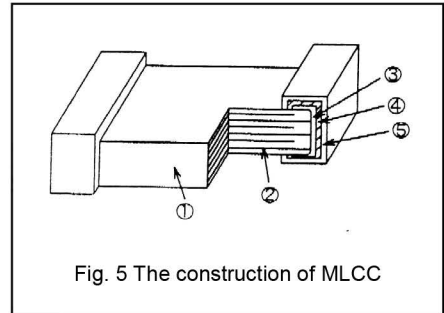


Fig. 5 The construction of MLCC

Storage and handling conditions

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

Cautions:

- a. The corrosive gas reacts on the terminal electrodes of capacitors, and results in the poor solderability. Do not store the capacitors in the ambience of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.)
- b. In corrosive atmosphere, solderability might be degraded, and silver migration might occur to cause low reliability.
- c. Due to the dewing by rapid humidity change, or the photochemical change of the terminal electrode by direct sunlight, the solderability 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.

Recommended soldering 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.

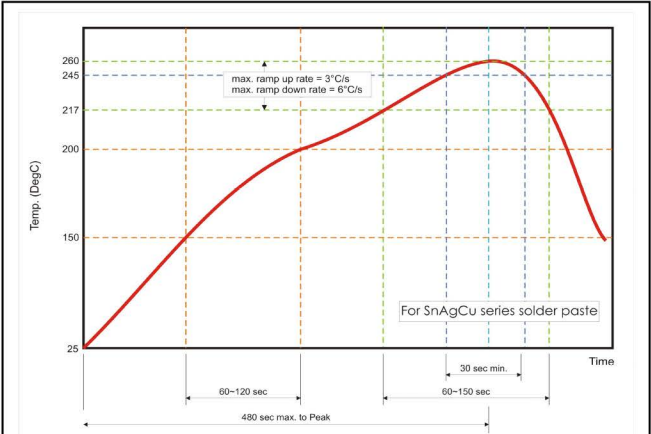


Fig. 5 Recommended reflow soldering profile for SMT process with SnAgCu series solder paste.

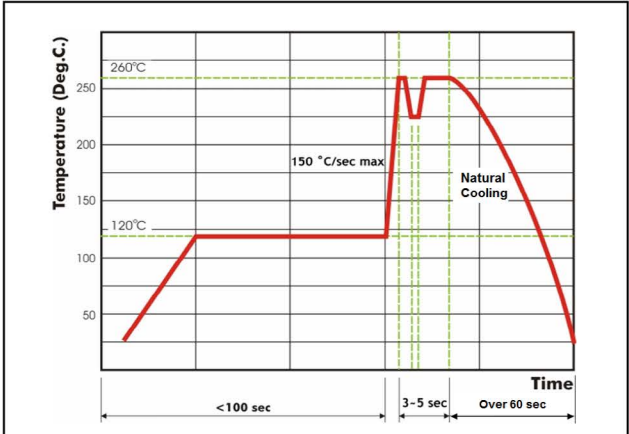


Fig. 6 Recommended wave soldering profile for SMT process with SnAgCu series solder.