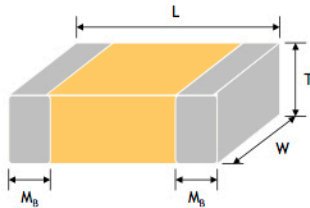


Automotive Multilayer Ceramic Chip Capacitors - GMT Series



Construction and Dimensions



Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Remark	M _a (mm)
0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	#	0.25±0.05/-0.10
	1.60±0.10	0.80±0.10	0.80±0.07		0.45±0.15
0603 (1608)	1.60±0.15/-0.10	0.80±0.15/-0.10	0.80±0.15/-0.10		
	0805 (2012)	2.00±0.15	1.25±0.10	0.60±0.10	
0.80±0.10					
1.25±0.10				#	
1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10		0.60±0.20
			0.95±0.10		
	1.25±0.10		#		
	1.15±0.15		#		
	1.60±0.20		#		
3.20±0.20	1.60±0.20	1.60±0.20	#		
3.20±0.3/-0.1	1.60±0.3/-0.1	1.60±0.30/-0.10	#		

#Reflow soldering only is recommended

Scope

- Consists of conducting material and electrodes - to achieve chip-type SMT and small size, high density and high efficiency ceramic condensers are used
- NPO/X7R dielectrics provides product with high electrical precision, stability and reliability
- Assured quality performance in automotive applications qualified to AEC-Q200.

Features

- Wide selection of sizes available
- High capacitance in given case size
- Lead free termination (pure Tin)
- Meets AEC-Q200 requirement

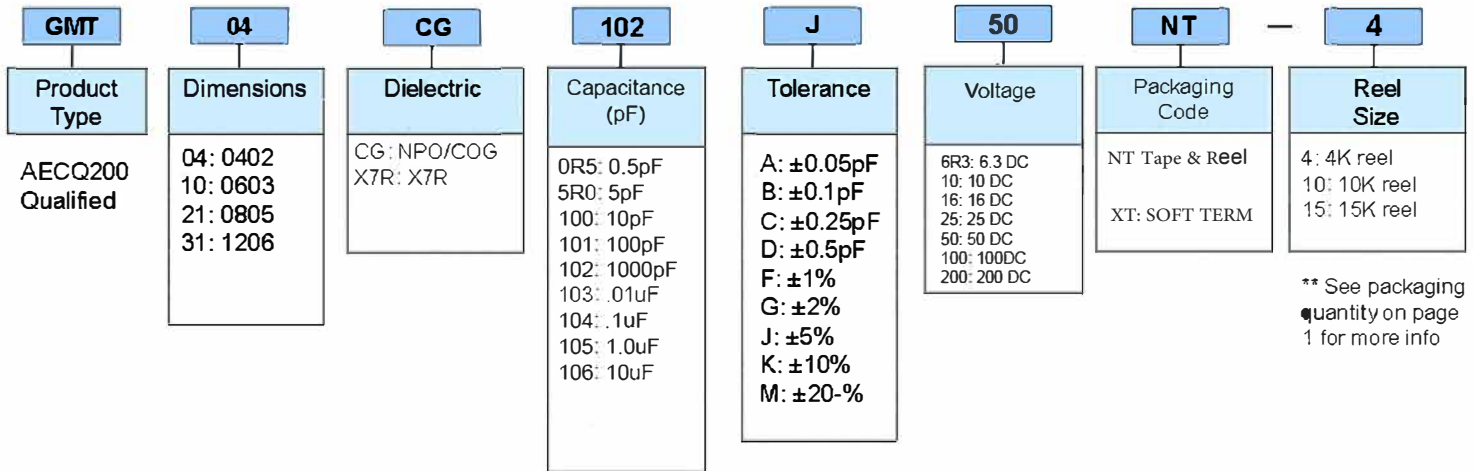
Applications

- For navigation and information equipment
- For entertainment equipment
- For comfortable equipment
- For automotive electronic equipment

Packaging Style and Quantity

Size	Thickness (mm)/Symbol	Paper Tape		Plastic Tape	
		7" reel	13" reel	7" reel	13" reel
0402 (1005)	0.50±0.5	10K	50K	--	--
0603 (1608)	0.80±0.07	4K	15K	--	--
	0.80±0.15/-0.10	4K	15K	--	--
0805 (2012)	0.60±0.10	4K	15K	--	--
	0.80±0.10	4K	15K	--	--
	1.25±0.10	--	--	3K	10K
	1.25±0.20	--	--	3K	10K
1206 (3216)	0.80±0.10	4K	15K	--	--
	0.95±0.10	--	--	3K	10K
	1.15±0.15	--	--	3K	10K
	1.25±0.10	--	--	3K	10K
	1.60±0.20	--	--	3K	10K
	1.60±0.30/-0.10	--	--	3K	10K

Part Numbering



Standard Electrical Specifications

Dielectric	NPO	X7R
Size	0402, 0603, 0805, 1206	0402, 0603, 0805, 1206
Capacitance range*	0.5pF to 0.01uF	100pF to 1uF
Capacitance tolerance**	Caps≤5pF: 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	10V, 16V, 25V, 50V
Tan δ*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1
Insulation resistance at Ur	≥10GΩ or RxC≥500ΩxF whichever is less	
Operating temperature	-55 to +125°C	
Capacitance characteristic	±30ppm/°C	±15%
Termination	Ni/Sn (lead-free termination)	

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

NPO: Apply 1.0±0.2Vrms, 1.0MHz±10% for Caps<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 Cs<10μF; 0.5±0.2Vrms, 120Hz±20% for C>10μF, 30~70% related humidity, 25°C ambient temperature for X7R.






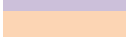

** Preconditioning for Class II MLCC: Perform a heat treatment at 150±10°C for 1 hour, then leave in a mbient condition for 24±2 hours before measurement.

Note 1: X7R

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

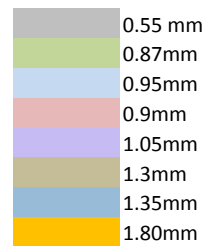
NGO/COG

DIMENSION (MM)		GMT04 (0402)				GMT10 (0603)						GMT21 (0805)					GMT31 (1206)					
Rated Voltage		10	16	25	50	10	16	25	50	100	200	10	16	25	50	100	10	16	25	50	100	
Cap. Range																						
0.5pF	0R5																					
0.6	0R6																					
0.7	0R7																					
0.8	0R8																					
0.9	0R9																					
1	1R0																					
1.2	1R2																					
1.5	1R5																					
1.8	1R8																					
2.2	2R2																					
2.7	2R7																					
3.3	3R3																					
3.9	3R9																					
4.7	4R7																					
5.6	5R6																					
6.8	6R8																					
8.2	8R2																					
10	100																					
12	120																					
15	150																					
18	180																					
22	220																					
27	270																					
33	330																					
39	390																					
47	470																					
56	560																					
68	680																					
82	820																					
100	101																					
120	121																					
150	151																					
180	181																					
220	221																					
270	271																					
330	331																					
390	391																					
470	471																					
560	561																					
680	681																					
820	821																					
1000	102																					
1200	122																					
1500	152																					
180	182																					
2200	222																					
2700	272																					
3300	332																					
3900	392																					
4700	472																					
5600	562																					
6800	682																					
8200	822																					
0.010 uF	103																					

	0.55 mm
	0.7mm
	0.87mm
	0.9mm
	.95mm
	1.05mm
	1.35mm

X7R

DIMENSION (MM)		GMT04 (0402)				GMT10 (0603)				GMT21 (0805)				GMT31 (1206)				
Rated Voltage		10	16	25	50	10	16	25	50	10	16	25	50	10	16	25	50	100
Cap. Range																		
100 pF	101																	
120	121																	
150	151																	
180	181																	
220	221																	
270	271																	
330	331																	
390	391																	
470	471																	
560	561																	
680	681																	
820	821																	
1000	102																	
1200	122																	
1500	152																	
1800	182																	
2200	222																	
2700	272																	
3300	332																	
3900	392																	
4700	472																	
5600	562																	
6800	682																	
8200	822																	
0.010uF	103																	
0.012	123																	
0.015	153																	
0.018	183																	
0.022	223																	
0.027	273																	
0.033	333																	
0.039	393																	
0.047	473																	
0.056	563																	
0.068	683																	
0.082	823																	
0.10	104																	
0.12	124																	
0.15	154																	
0.18	184																	
0.22	224																	
0.27	274																	
0.33	334																	
0.39	394																	
0.47	474																	
0.56	564																	
0.68	684																	
1.00	105																	
2.20	225																	



Reliability Test Conditions and Dimensions

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.	* 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≥1 000 ; Cap<30pF, Q≥400+20C. X7R: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤ 5%</td> <td>≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 10% 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 10% 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% 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 0.33μF; 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% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20% 0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30% 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> <p>* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller. Class II (X7R)</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7" style="text-align: center; vertical-align: middle;">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V ;</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 3%	≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10% 1210 ≥ 4.7μF	≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF	≤ 10% 0805 ≥ 1μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	16V	≤ 5%	≤ 15% 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	10V	≤ 7.5%	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20% 0402 ≥ 1μF	6.3V	≤ 15%	≤ 30% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4V	≤ 20%	---	Rated voltage	Insulation Resistance	100V: X7R	1GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V ;
Rated vol.	D.F. ≤	Exception of D.F. ≤																																										
≥ 50V	≤ 3%	≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																										
		≤ 10% 1210 ≥ 4.7μF																																										
		≤ 20% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																										
35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF																																										
		≤ 10% 0805 ≥ 1μF; 1210 ≥ 10μF																																										
25V	≤ 5%	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																										
		≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																										
		≤ 10% 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																										
16V	≤ 5%	≤ 15% 0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																										
		≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																										
10V	≤ 7.5%	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																										
		≤ 20% 0402 ≥ 1μF																																										
6.3V	≤ 15%	≤ 30% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																										
4V	≤ 20%	---																																										
Rated voltage	Insulation Resistance																																											
100V: X7R	1GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																												
10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																												
6.3V ; 4V ;																																												
3.	Destructive Physical Analysis EIA-469	Per EIA-469	No defects or abnormalities																																									

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																						
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 <p>X7R:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6%</td> <td>0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 5%</td> <td>≤ 20%</td> <td>0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 10%</td> <td>0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10%</td> <td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 7.5%</td> <td>≤ 15%</td> <td>0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30%</td> <td>0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <ul style="list-style-type: none"> * I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller. <p>Class II (X7R)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7" style="vertical-align: middle; text-align: center;">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	≤ 3%	≤ 6%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10%	1210 ≥ 4.7μF	≤ 20%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20%	0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 10%	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%	0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤ 7.5%	≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20%	0402 ≥ 1μF	6.3V	≤ 15%	≤ 30%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4V	≤ 20%	---	---	Rated voltage	Insulation Resistance	100V: X7R	1GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																							
≥ 50V	≤ 3%	≤ 6%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																						
		≤ 10%	1210 ≥ 4.7μF																																																						
		≤ 20%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																																						
35V	≤ 5%	≤ 20%	0805 ≥ 2.2μF; 1210 ≥ 10μF																																																						
25V	≤ 5%	≤ 10%	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%	0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																						
10V	≤ 7.5%	≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																						
		≤ 20%	0402 ≥ 1μF																																																						
6.3V	≤ 15%	≤ 30%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																						
4V	≤ 20%	---	---																																																						
Rated voltage	Insulation Resistance																																																								
100V: X7R	1GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																																									
10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																																									
6.3V ; 4V																																																									

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																																		
6.	Biased Humidity MIL-STD-202 Method 103	<ul style="list-style-type: none"> * 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. 	<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: C≥30pF , Q≥200 ; C<30pF , Q≥100+10/3C X7R: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6%</td> <td>0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤ 5%</td> <td>≤ 20%</td> <td>0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 10%</td> <td>0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 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>0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15%</td> <td>0402 ≥ 0.33μF; 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>0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30%</td> <td>0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p style="margin-top: 5px;">* I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller.</p> <p style="margin-top: 5px;">Class II (X7R) for rated voltage test</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7" style="text-align: center; vertical-align: middle;">500MΩ or RxC ≥ 5 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td> </tr> <tr> <td>35V:0805≥2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td> </tr> <tr> <td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF</td> </tr> <tr> <td>10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table> <p style="margin-top: 5px;">Class II (X7R) for 1.3~1.5Vdc</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7" style="text-align: center; vertical-align: middle;">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V:0603≥1μF;0805≥1μF;1206≥4.7μF;1210≥4.7μF</td> </tr> <tr> <td>35V:0805≥2.2μF;1210 ≥ 10μF</td> </tr> <tr> <td>25V:0402≥1μF;0603≥2.2μF;0805≥2.2μF;1206≥10μF;1210≥10μF</td> </tr> <tr> <td>16V:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF</td> </tr> <tr> <td>0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	≤ 3%	≤ 6%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10%	1210 ≥ 4.7μF	≤ 20%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20%	0805 ≥ 2.2μF; 1210 ≥ 10μF	≤ 10%	0805 ≥ 1μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤ 15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	≤ 10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	16V	≤ 5%	≤ 15%	0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	10V	≤ 7.5%	≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20%	0402 ≥ 1μF	6.3V	≤ 15%	≤ 30%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4V	≤ 20%	---	---	Rated voltage	Insulation Resistance	100V: X7R	500MΩ or RxC ≥ 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:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF	10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF	6.3V ; 4V	Rated voltage	Insulation Resistance	100V: X7R	1GΩ or RxC ≥ 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:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF	0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF	6.3V ; 4V
			Rated vol.	D.F. ≤	Exception of D.F. ≤																																																																
			≥ 50V	≤ 3%	≤ 6%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																															
					≤ 10%	1210 ≥ 4.7μF																																																															
					≤ 20%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																																															
			35V	≤ 5%	≤ 20%	0805 ≥ 2.2μF; 1210 ≥ 10μF																																																															
					≤ 10%	0805 ≥ 1μF; 1210 ≥ 10μF																																																															
			25V	≤ 5%	≤ 14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																															
					≤ 15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																																															
					≤ 10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																															
			16V	≤ 5%	≤ 15%	0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																															
					≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																															
			10V	≤ 7.5%	≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																															
					≤ 20%	0402 ≥ 1μF																																																															
			6.3V	≤ 15%	≤ 30%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																															
4V	≤ 20%	---	---																																																																		
Rated voltage	Insulation Resistance																																																																				
100V: X7R	500MΩ or RxC ≥ 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:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF																																																																					
10V:0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF																																																																					
6.3V ; 4V																																																																					
Rated voltage	Insulation Resistance																																																																				
100V: X7R	1GΩ or RxC ≥ 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:0402≥0.22μF;0603≥1μF;0805≥2.2μF;1206≥10μF;1210≥47μF																																																																					
0402≥0.47μF;0603≥0.47μF;0805≥2.2μF; 1206≥4.7μF;1210≥47μF																																																																					
6.3V ; 4V																																																																					

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																								
7.	Operational Life MIL-STD-202 Method 108	<ul style="list-style-type: none"> * Test temp.: 125±3°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°C. Remove and let 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 ±3.0% or ±0.3pF 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 X7R: <table border="1" style="width: 100%; border-collapse: collapse; margin-bottom: 10px;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 3%</td> <td>≤ 6%</td> <td>0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 10%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 20%</td> <td>0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤ 5%</td> <td>≤ 20%</td> <td>0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 10%</td> <td>0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 5%</td> <td>≤ 14%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 15%</td> <td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 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>0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15%</td> <td>0402 ≥ 0.33μF; 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>0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 1μF</td> </tr> <tr> <td>6.3V</td> <td>≤ 15%</td> <td>≤ 30%</td> <td>0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>4V</td> <td>≤ 20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <ul style="list-style-type: none"> * I.R.: ≥1GΩ or RxC≥50Ω-F whichever is smaller. <p>Class II (X7R)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7" style="text-align: center; vertical-align: middle;">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	≤ 3%	≤ 6%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 10%	1210 ≥ 4.7μF	≤ 20%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20%	0805 ≥ 2.2μF; 1210 ≥ 10μF	≤ 10%	0805 ≥ 1μF; 1210 ≥ 10μF	25V	≤ 5%	≤ 14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF	≤ 15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	≤ 10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	16V	≤ 5%	≤ 15%	0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	10V	≤ 7.5%	≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20%	0402 ≥ 1μF	6.3V	≤ 15%	≤ 30%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	4V	≤ 20%	---	---	Rated voltage	Insulation Resistance	100V: X7R	1GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																									
≥ 50V	≤ 3%	≤ 6%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																								
		≤ 10%	1210 ≥ 4.7μF																																																								
		≤ 20%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																																								
35V	≤ 5%	≤ 20%	0805 ≥ 2.2μF; 1210 ≥ 10μF																																																								
		≤ 10%	0805 ≥ 1μF; 1210 ≥ 10μF																																																								
25V	≤ 5%	≤ 14%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																								
		≤ 15%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																																								
		≤ 10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																								
16V	≤ 5%	≤ 15%	0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																								
		≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																								
10V	≤ 7.5%	≤ 15%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																								
		≤ 20%	0402 ≥ 1μF																																																								
6.3V	≤ 15%	≤ 30%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																								
4V	≤ 20%	---	---																																																								
Rated voltage	Insulation Resistance																																																										
100V: X7R	1GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																																											
10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																																											
6.3V ; 4V																																																											
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																																																								

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements			
10.	Resistance to Solvents MIL-STD-202 Method 215	<ul style="list-style-type: none"> * Temperature: 25±5°C * Time: 3+0.5/-0 min. * Solvent: Iso-propyl alcohol. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap.: within the specified tolerance. * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R: 			
			Rated vol.	D.F. ≤	Exception of D.F. ≤	
			≥ 50V	≤ 2.5%	<ul style="list-style-type: none"> ≤ 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF ≤ 5% 1210 ≥ 4.7μF ≤ 10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF 	
			35V	≤ 3.5%	<ul style="list-style-type: none"> ≤ 10% 0805 ≥ 2.2μF; 1210 ≥ 10μF 	
			25V	≤ 3.5%	<ul style="list-style-type: none"> ≤ 5% 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 	
					≤ 3.5%	<ul style="list-style-type: none"> ≤ 5% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF ≤ 10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
						<ul style="list-style-type: none"> ≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF ≤ 15% 0402 ≥ 1μF
			10V	≤ 5%	<ul style="list-style-type: none"> ≤ 15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 4.7μF ; 1210 ≥ 100μF ≤ 20% 0402 ≥ 2.2μF 	
			6.3V	≤ 10%	---	
			4V	≤ 15%	---	
						<ul style="list-style-type: none"> * I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.
						Class II (X7R)
			Rated voltage		Insulation Resistance	
			100V: X7R		10GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 4.7μF						
10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF						
6.3V ; 4V						

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements			
11.	Mechanical Shock MIL-STD-202 Method 213	<ul style="list-style-type: none"> * 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) 	<ul style="list-style-type: none"> * No remarkable damage. * Cap.: within the specified tolerance. * Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. 			
			X7R:			
			Rated vol.	D.F. ≤	Exception of D.F. ≤	
			≥ 50V	≤ 2.5%	≤ 3%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF
					≤ 5%	1210 ≥ 4.7μF
					≤ 10%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF
			35V	≤ 3.5%	≤ 10%	0805 ≥ 2.2μF; 1210 ≥ 10μF
					≤ 5%	0805 ≥ 1μF; 1210 ≥ 10μF
			25V	≤ 3.5%	≤ 7%	0603 ≥ 0.33μF; 1206 ≥ 4.7μF
					≤ 10%	0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF
					≤ 5%	0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF
			16V	≤ 3.5%	≤ 10%	0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF
					≤ 15%	0402 ≥ 1μF
			10V	≤ 5%	≤ 10%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF
					≤ 15%	0402 ≥ 1μF
6.3V	≤ 10%	≤ 15%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF			
		≤ 20%	0402 ≥ 2.2μF			
4V	≤ 15%	---	---			
* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.						
Class II (X7R)						
Rated voltage			Insulation Resistance			
100V: X7R			10GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF						
10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF						
6.3V ; 4V						

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																												
12.	Vibration MIL-STD-202 Method 204	<ul style="list-style-type: none"> * Vibration frequency: 10~2000 Hz/min. (5g's for 20 min) * Total amplitude: 1.5mm * 12 cycles each of 3 orientations (36 times) 	<ul style="list-style-type: none"> * No remarkable damage. * Cap.: within the specified tolerance. * Q/D.F. value: NPO:Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥50V</td> <td rowspan="3">≤2.5%</td> <td>≤3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤3.5%</td> <td>≤10% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤3.5%</td> <td>≤5% 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤10% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤3.5%</td> <td>≤5% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15% 0402 ≥ 1μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤5%</td> <td>≤10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤15% 0402 ≥ 1μF</td> </tr> <tr> <td>≤20% 0402 ≥ 2.2μF</td> </tr> <tr> <td rowspan="3">6.3V</td> <td rowspan="3">≤10%</td> <td>≤15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF</td> </tr> <tr> <td>≤20% 0402 ≥ 2.2μF</td> </tr> <tr> <td>---</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>---</td> </tr> </tbody> </table> <p style="margin-top: 5px;">* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.</p> <p>Class II (X7R)</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7" style="text-align: center; vertical-align: middle;">10GΩ or RxC ≥ 100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥50V	≤2.5%	≤3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤5% 1210 ≥ 4.7μF	≤10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤3.5%	≤10% 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤3.5%	≤5% 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% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤15% 0402 ≥ 1μF	10V	≤5%	≤10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤15% 0402 ≥ 1μF	≤20% 0402 ≥ 2.2μF	6.3V	≤10%	≤15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF	≤20% 0402 ≥ 2.2μF	---	4V	≤15%	---	Rated voltage	Insulation Resistance	100V: X7R	10GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V
Rated vol.	D.F. ≤	Exception of D.F. ≤																																													
≥50V	≤2.5%	≤3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																													
		≤5% 1210 ≥ 4.7μF																																													
		≤10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																													
35V	≤3.5%	≤10% 0805 ≥ 2.2μF; 1210 ≥ 10μF																																													
25V	≤3.5%	≤5% 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% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																													
		≤10% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																													
		≤15% 0402 ≥ 1μF																																													
10V	≤5%	≤10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																													
		≤15% 0402 ≥ 1μF																																													
		≤20% 0402 ≥ 2.2μF																																													
6.3V	≤10%	≤15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF																																													
		≤20% 0402 ≥ 2.2μF																																													

4V	≤15%	---																																													
Rated voltage	Insulation Resistance																																														
100V: X7R	10GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																															
10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																															
6.3V ; 4V																																															

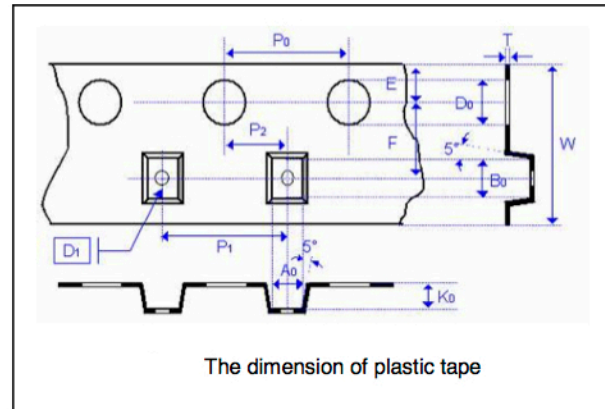
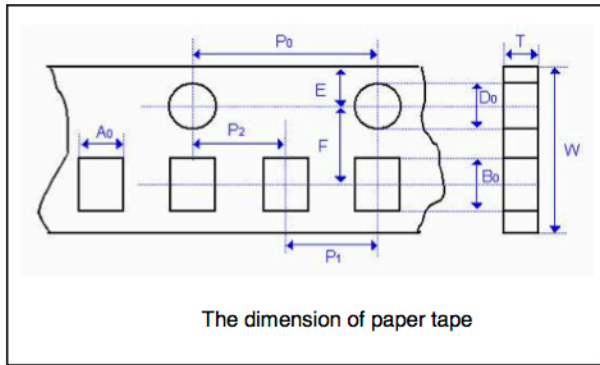
No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																								
13.	Resistance to Soldering Heat MIL-STD-202 Method 210	<p>* Solder temperature: 270±5°C</p> <p>* Dipping time: 10±1 sec</p> <p>* Before initial measurement (X7R only): Perform 150+0/-10°C 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 7.5%</p> <p>* Q/D.F. value: NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C. X7R:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated vol.</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3%</td> <td>0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 3.5%</td> <td>≤ 10%</td> <td>0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤ 3.5%</td> <td>≤ 5%</td> <td>0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 7%</td> <td>0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 5%</td> <td>0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10%</td> <td>0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 5%</td> <td>≤ 10%</td> <td>0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15%</td> <td>0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 10%</td> <td>≤ 15%</td> <td>0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td>≤ 20%</td> <td>0402 ≥ 2.2μF</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <p>* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.</p> <p>Class II (X7R)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7" style="text-align: center; vertical-align: middle;">10GΩ or RxC ≥ 100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤		≥ 50V	≤ 2.5%	≤ 3%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 5%	1210 ≥ 4.7μF	≤ 10%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 3.5%	≤ 10%	0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 3.5%	≤ 5%	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%	0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 10%	0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤ 5%	≤ 10%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 15%	0402 ≥ 1μF	6.3V	≤ 10%	≤ 15%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	≤ 20%	0402 ≥ 2.2μF	4V	≤ 15%	---	---	Rated voltage	Insulation Resistance	100V: X7R	10GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																									
≥ 50V	≤ 2.5%	≤ 3%	0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																								
		≤ 5%	1210 ≥ 4.7μF																																																								
		≤ 10%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																																								
35V	≤ 3.5%	≤ 10%	0805 ≥ 2.2μF; 1210 ≥ 10μF																																																								
25V	≤ 3.5%	≤ 5%	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%	0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																								
		≤ 10%	0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																								
10V	≤ 5%	≤ 10%	0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																								
		≤ 15%	0402 ≥ 1μF																																																								
6.3V	≤ 10%	≤ 15%	0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																								
		≤ 20%	0402 ≥ 2.2μF																																																								
4V	≤ 15%	---	---																																																								
Rated voltage	Insulation Resistance																																																										
100V: X7R	10GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																																											
10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																																											
6.3V ; 4V																																																											

No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																																										
14	Thermal Shock MIL-STD-202 Method 107	<p>* Conduct 300 cycles according to the temperatures and time.</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">-55°C +0/-3</td> <td style="text-align: center;">15±3</td> </tr> <tr> <td style="text-align: center;">2</td> <td style="text-align: center;">+125°C +3/-0</td> <td style="text-align: center;">15±3</td> </tr> </tbody> </table> <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>	Step	Temp. (°C)	Time (min.)	1	-55°C +0/-3	15±3	2	+125°C +3/-0	15±3	<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<30pF, Q≥400+20C. X7R:</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center;">≥ 50V</td> <td style="text-align: center;">≤ 3%</td> <td>≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td style="text-align: center;">≤ 5%</td> <td>≤ 10% 1210 ≥ 4.7μF</td> </tr> <tr> <td style="text-align: center;">≤ 20%</td> <td>0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="3" style="text-align: center;">35V</td> <td style="text-align: center;">≤ 5%</td> <td>≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td style="text-align: center;">≤ 10%</td> <td>0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td style="text-align: center;">≤ 5%</td> <td>≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td rowspan="3" style="text-align: center;">25V</td> <td style="text-align: center;">≤ 5%</td> <td>≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF</td> </tr> <tr> <td style="text-align: center;">≤ 10%</td> <td>0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td style="text-align: center;">≤ 15%</td> <td>0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="3" style="text-align: center;">16V</td> <td style="text-align: center;">≤ 5%</td> <td>≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td style="text-align: center;">≤ 7.5%</td> <td>≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td style="text-align: center;">≤ 20%</td> <td>0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">6.3V</td> <td style="text-align: center;">≤ 15%</td> <td>≤ 30% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF</td> </tr> <tr> <td style="text-align: center;">≤ 20%</td> <td>---</td> </tr> <tr> <td rowspan="2" style="text-align: center;">4V</td> <td style="text-align: center;">≤ 20%</td> <td>---</td> </tr> </tbody> </table> <p>* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.</p> <p>Class II (X7R)</p> <table border="1" style="margin-left: 20px; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7" style="text-align: center; vertical-align: middle;">1GΩ or RxC ≥ 10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 3%	≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 5%	≤ 10% 1210 ≥ 4.7μF	≤ 20%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF	≤ 10%	0805 ≥ 1μF; 1210 ≥ 10μF	≤ 5%	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	25V	≤ 5%	≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF	≤ 10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 15%	0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	16V	≤ 5%	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 7.5%	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 20%	0402 ≥ 1μF	6.3V	≤ 15%	≤ 30% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF	≤ 20%	---	4V	≤ 20%	---	Rated voltage	Insulation Resistance	100V: X7R	1GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V
Step	Temp. (°C)	Time (min.)																																																											
1	-55°C +0/-3	15±3																																																											
2	+125°C +3/-0	15±3																																																											
Rated vol.	D.F. ≤	Exception of D.F. ≤																																																											
≥ 50V	≤ 3%	≤ 6% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																																											
	≤ 5%	≤ 10% 1210 ≥ 4.7μF																																																											
	≤ 20%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																																											
35V	≤ 5%	≤ 20% 0805 ≥ 2.2μF; 1210 ≥ 10μF																																																											
	≤ 10%	0805 ≥ 1μF; 1210 ≥ 10μF																																																											
	≤ 5%	≤ 14% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																																											
25V	≤ 5%	≤ 15% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF; 1210 ≥ 22μF																																																											
	≤ 10%	0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																																											
	≤ 15%	0402 ≥ 0.033μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																											
16V	≤ 5%	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																																											
	≤ 7.5%	≤ 15% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																																											
	≤ 20%	0402 ≥ 1μF																																																											
6.3V	≤ 15%	≤ 30% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF; 1210 ≥ 100μF																																																											
	≤ 20%	---																																																											
4V	≤ 20%	---																																																											
	Rated voltage	Insulation Resistance																																																											
100V: X7R	1GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																																													
10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																																													
6.3V ; 4V																																																													

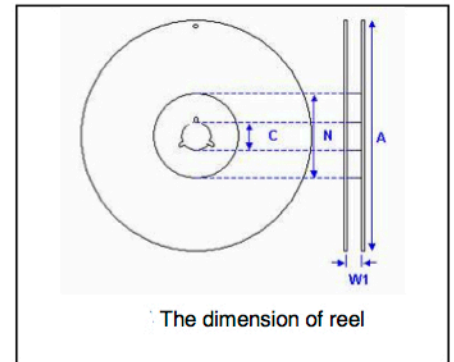
No.	AEC-Q200 Test Item	AEC-Q200 Test Condition	Requirements																																								
15.	ESD AEC-Q200-002	Per AEC-Q200-002	<p>* No remarkable damage.</p> <p>* Cap.: within the specified tolerance.</p> <p>* Q/D.F. value:</p> <p>NPO: Cap≥30pF, Q≥1000 ; Cap<30pF, Q≥400+20C.</p> <p>X7R:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated vol.</th> <th>D.F. ≤</th> <th>Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤ 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤ 5% 1210 ≥ 4.7μF</td> </tr> <tr> <td>≤ 10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td>35V</td> <td>≤ 3.5%</td> <td>≤ 10% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 5% 0805 ≥ 1μF; 1210 ≥ 10μF</td> </tr> <tr> <td>≤ 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤ 3.5%</td> <td>≤ 5% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 10% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤ 5%</td> <td>≤ 5% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤ 10%</td> <td>≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td>≤ 15% 0402 ≥ 1μF</td> </tr> <tr> <td>4V</td> <td>≤ 15%</td> <td>--- ---</td> </tr> </tbody> </table> <p>* I.R.: ≥10GΩ or RxC≥500Ω-F whichever is smaller.</p> <p>Class II (X7R)</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr style="background-color: #ADD8E6;"> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7" style="text-align: center; vertical-align: middle;">10GΩ or RxC ≥ 100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td>35V: 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td>25V: 0402 ≥ 1μF; 0603 ≥ 2.2μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 10μF</td> </tr> <tr> <td>16V: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF</td> </tr> <tr> <td>10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF</td> </tr> <tr> <td>6.3V ; 4V</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 2.5%	≤ 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF	≤ 5% 1210 ≥ 4.7μF	≤ 10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 3.5%	≤ 10% 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 3.5%	≤ 5% 0805 ≥ 1μF; 1210 ≥ 10μF	≤ 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF	16V	≤ 3.5%	≤ 5% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF	≤ 10% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	10V	≤ 5%	≤ 5% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	6.3V	≤ 10%	≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 15% 0402 ≥ 1μF	4V	≤ 15%	--- ---	Rated voltage	Insulation Resistance	100V: X7R	10GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF	10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF	6.3V ; 4V
Rated vol.	D.F. ≤	Exception of D.F. ≤																																									
≥ 50V	≤ 2.5%	≤ 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF																																									
		≤ 5% 1210 ≥ 4.7μF																																									
		≤ 10% 0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																									
35V	≤ 3.5%	≤ 10% 0805 ≥ 2.2μF; 1210 ≥ 10μF																																									
25V	≤ 3.5%	≤ 5% 0805 ≥ 1μF; 1210 ≥ 10μF																																									
		≤ 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF																																									
16V	≤ 3.5%	≤ 5% 0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF																																									
		≤ 10% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																									
10V	≤ 5%	≤ 5% 0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																									
		≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																									
6.3V	≤ 10%	≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																									
		≤ 15% 0402 ≥ 1μF																																									
4V	≤ 15%	--- ---																																									
Rated voltage	Insulation Resistance																																										
100V: X7R	10GΩ or RxC ≥ 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: 0402 ≥ 0.22μF; 0603 ≥ 1μF; 0805 ≥ 2.2μF; 1206 ≥ 10μF; 1210 ≥ 47μF																																											
10V: 0402 ≥ 0.47μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 47μF																																											
6.3V ; 4V																																											
16.	Solderability J-STD-002 JESD22-B102E	<p>* Condition A Un-mounted chips 4hrs / 155°C*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>	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																																		
18.	Board Flex AEC-Q200-005	<ul style="list-style-type: none"> * 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. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change : NPO: within ±5% or 0.5pF whichever is larger X7R: within ±12.5% <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	<ul style="list-style-type: none"> * Pressurizing force : 2N (0402), 10N(0603), 18N(0805). * Test time: 60±1 sec. 	<ul style="list-style-type: none"> * 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: <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr style="background-color: #ADD8E6;"> <th style="width: 10%;">Rated vol.</th> <th style="width: 10%;">D.F. ≤</th> <th style="width: 80%;">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2" style="text-align: center;">≥ 50V</td> <td style="text-align: center;">≤ 2.5%</td> <td>≤ 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF ≤ 5% 1210 ≥ 4.7μF</td> </tr> <tr> <td style="text-align: center;">≤ 10%</td> <td>0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF</td> </tr> <tr> <td style="text-align: center;">35V</td> <td style="text-align: center;">≤ 3.5%</td> <td>≤ 10% 0805 ≥ 2.2μF; 1210 ≥ 10μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">25V</td> <td style="text-align: center;">≤ 3.5%</td> <td>≤ 5% 0805 ≥ 1μF; 1210 ≥ 10μF ≤ 7% 0603 ≥ 0.33μF; 1206 ≥ 4.7μF</td> </tr> <tr> <td style="text-align: center;">≤ 10%</td> <td>0402 ≥ 0.10μF; 0603 ≥ 0.47μF; 0805 ≥ 2.2μF; 1206 ≥ 6.8μF ; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">16V</td> <td style="text-align: center;">≤ 3.5%</td> <td>≤ 5% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF</td> </tr> <tr> <td style="text-align: center;">≤ 10%</td> <td>0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">10V</td> <td style="text-align: center;">≤ 5%</td> <td>≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF</td> </tr> <tr> <td style="text-align: center;">≤ 15%</td> <td>0402 ≥ 1μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">6.3V</td> <td style="text-align: center;">≤ 10%</td> <td>≤ 15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF</td> </tr> <tr> <td style="text-align: center;">≤ 20%</td> <td>0402 ≥ 2.2μF</td> </tr> <tr> <td style="text-align: center;">4V</td> <td style="text-align: center;">≤ 15%</td> <td>---</td> </tr> </tbody> </table>	Rated vol.	D.F. ≤	Exception of D.F. ≤	≥ 50V	≤ 2.5%	≤ 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF ≤ 5% 1210 ≥ 4.7μF	≤ 10%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF	35V	≤ 3.5%	≤ 10% 0805 ≥ 2.2μF; 1210 ≥ 10μF	25V	≤ 3.5%	≤ 5% 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% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF	≤ 10%	0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF	10V	≤ 5%	≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF	≤ 15%	0402 ≥ 1μF	6.3V	≤ 10%	≤ 15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF	≤ 20%	0402 ≥ 2.2μF	4V	≤ 15%	---
Rated vol.	D.F. ≤	Exception of D.F. ≤																																			
≥ 50V	≤ 2.5%	≤ 3% 0603 ≥ 0.047μF; 0805 ≥ 0.18μF; 1206 ≥ 0.47μF ≤ 5% 1210 ≥ 4.7μF																																			
	≤ 10%	0603 ≥ 1μF; 0805 ≥ 1μF; 1206 ≥ 4.7μF; 1210 ≥ 10μF																																			
35V	≤ 3.5%	≤ 10% 0805 ≥ 2.2μF; 1210 ≥ 10μF																																			
25V	≤ 3.5%	≤ 5% 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% 0402 ≥ 0.033μF; 0603 ≥ 0.15μF; 0805 ≥ 0.68μF; 1206 ≥ 2.2μF; 1210 ≥ 4.7μF																																			
	≤ 10%	0402 ≥ 0.22μF; 0603 ≥ 0.68μF; 0805 ≥ 2.2μF; 1206 ≥ 4.7μF; 1210 ≥ 22μF																																			
10V	≤ 5%	≤ 10% 0402 ≥ 0.33μF; 0603 ≥ 0.33μF; 0805 ≥ 2.2μF; 1206 ≥ 2.2μF; 1210 ≥ 22μF																																			
	≤ 15%	0402 ≥ 1μF																																			
6.3V	≤ 10%	≤ 15% 0402 ≥ 1μF; 0603 ≥ 10μF; 0805 ≥ 4.7μF; 1206 ≥ 47μF ; 1210 ≥ 100μF																																			
	≤ 20%	0402 ≥ 2.2μF																																			
4V	≤ 15%	---																																			
20	Beam Load Test AEC-Q200-003	<ul style="list-style-type: none"> * Break strength test * Beam speed: 2.5±0.25 mm/sec 	<p>The chip endure following force</p> <ul style="list-style-type: none"> * Chip length ≤2.5mm: Thickness >0.5mm (20N), ≤0.5mm (8N) * Chip length ≥3.2mm: Thickness ≥1.25mm (54.5N), <1.25mm (15N) 																																		

■ Tape & reel dimensions



Size	0402		0603		0805			1206	
Thickness	N	S, B	A	X	M, C, I	X	M, J, C	E	
A ₀	0.62±0.05	1.02±0.05	1.50±0.10	1.50±0.10	<1.57	2.00±0.10	<1.85	<1.95	
B ₀	1.12±0.05	1.80±0.05	2.30±0.10	2.30±0.10	<2.40	3.50±0.10	<3.46	<3.67	
T	0.60±0.05	0.95±0.05	0.75±0.05	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05	
K ₀	-	-	-	-	<2.50	-	<2.50	<2.50	
W	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	8.00±0.10	
P ₀	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	4.00±0.10	
10xP ₀	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	40.0±0.10	
P ₁	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	
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	
D ₀	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.50±0.05	1.50±0.05	1.50±0.05	1.50±0.05	
D ₁	-	-	-	-	1.00±0.10	-	1.00±0.10	1.00±0.10	
E	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.05	1.75±0.10	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	



Size	0402, 0603, 0805, 1206	
Reel size	7"	13"
C	13.0+0.5/-0.2	13.0+0.5/-0.2
W ₁	8.4+1.5/-0	8.4+1.5/-0
A	178.0±0.10	330.0±1.0
N	60.0+1.0/-0	100±1.0

■ Storage and handling conditions

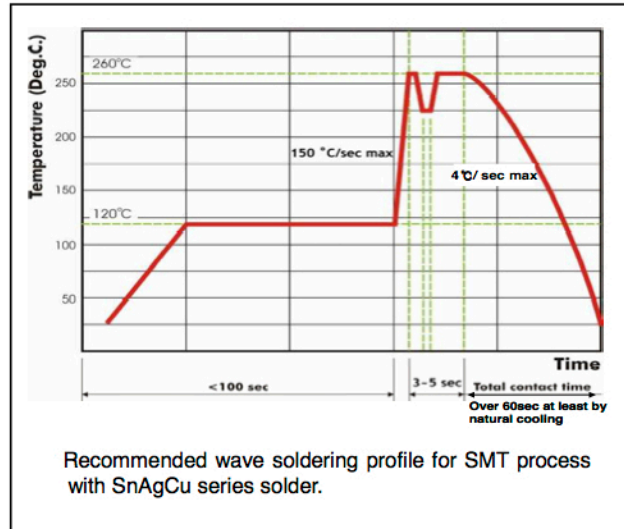
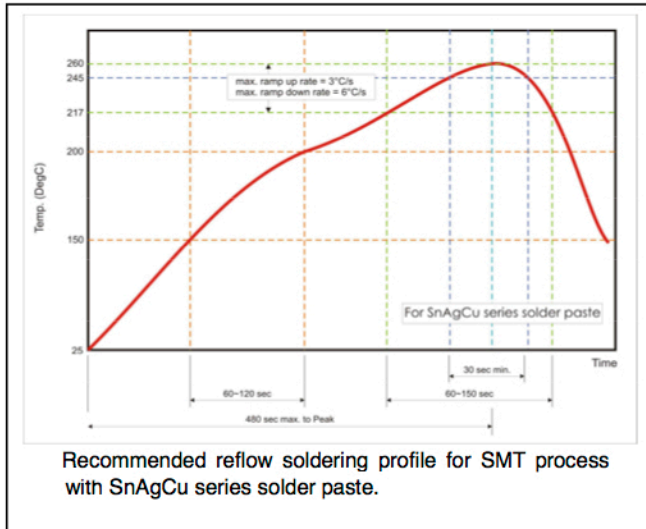
- (1) To store products at 5 to 40°C ambient temperature and 20 to 70% related humidity conditions.
- (2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

Cautions:

- Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering.
- To store products on the shelf and avoid exposure to moisture.
- Don't expose products to excessive shock, vibration, direct sunlight and so on.

■ 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.



WARRANTY: All passive components supplied by Calchip Electronics, 59 Steamwhistle Drive, Ivyland, PA. 18974, are under warranty for a period of 2 years from the date of manufacture. Product will meet or exceed all reliability and test specifications expressed by Calchip for the above mentioned time period provided storage conditions (stated below) are met.

Product Storage Instructions:

- 1) Product must be kept away from direct sunlight.
- 2) Product must be stored in the following conditions - Temperature; 5 to 35 degrees Celsius/40 to 95 degrees Fahrenheit
Humidity; 45 to 85%
- 3) Product to be kept free of moisture, dirt and debris.

*****WHEN THESE CONDITIONS ARE NOT MET, PRODUCT LIFE COULD BE SHORTENED*****

NOTICE: Specifications are subject to change without notice. Contact your nearest Cal-Chip Sales Office for the latest specifications. All statements, information and data given herein are believed to be accurate and reliable, but are presented without guarantee, warranty, or responsibility of any kind, expressed or implied. Statements or suggestions concerning possible use of our products are made without representation or warranty that any such use is free of patent infringement and are not recommendations to infringe any patent. The user should not assume that all safety measures are indicated or that other measures may not be required. Specifications are typical and may not apply to all applications.