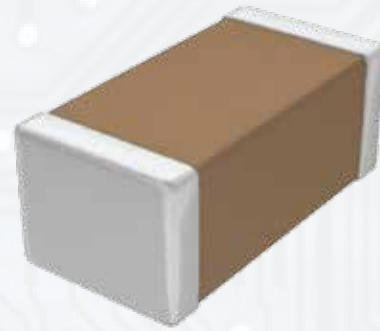


# AUTOMOTIVE MULTILAYER CERAMIC CHIP CAPACITORS

## - GMT SERIES -

### 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



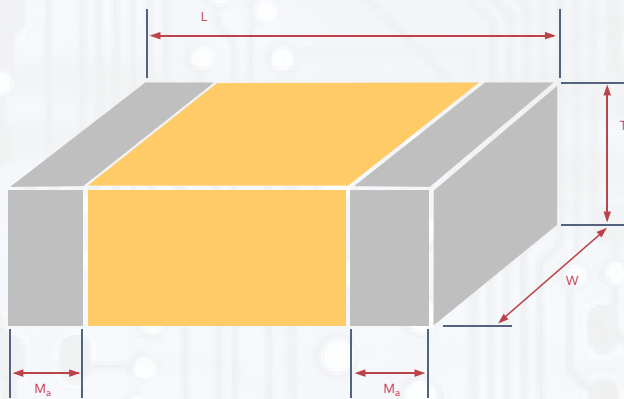
### APPLICATIONS

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

### FEATURES

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

### CONSTRUCTION AND DIMENSIONS



SIZE INCH (MM)	L (MM)	W (MM)	T (MM) / SYMBOL	REMARK	MA (MM)
0201 (0603)	0.60±0.03	0.30±0.03	0.30±0.03	#	0.15+/-0.05
0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	#	0.25+0.05 /-0.10
0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07		0.45±0.15
	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		0.50±0.20
			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	1.60±0.20	
3.20±0.3/-0.10	1.60±0.3/-0.1	1.60±0.3/-0.10	#		
1210 (3225)	3.20±0.30	2.50±0.20	0.95+/-0.10	#	1.25+/-0.10
			1.60+/-0.20	#	
			2.00+/-0.20	#	
3.20±0.40	2.50±0.30	2.50+/-0.30	#	0.75+/-0.25	

#Reflow soldering only is recommended

### ORDERING INFORMATION

GMT	04	CG	102	J	50	NT	4
PRODUCT TYPE	DIMENSIONS	DIELECTRIC	CAPACITANCE	TOLERANCE	RATED VOLTAGE	PACKAGING CODE	REEL SIZE
AECQ200 Qualified	02 - 0201 04 - 0402 10 - 0603 21 - 0805 31 - 1206 32 - 1210	CG - NPO / COG X7R - X7R	0R5: 0.5pF 5R0: 5pF 100: 10pF 101: 10pF 102: 1000pF 103: .01uF 104: 1uF 105: 1.0uF 106: 10uF	A: ± 0.05pF B: ± 0.1pF C: ± 0.25pF D: ± 0.5pF F: ± 1% G: ± 2% J: ± 5% K: ± 10% M: ± 20%	6R3: 6.3 VDC 10: 10 VDC 16: 16 VDC 25: 25 VDC 50: 50 VDC 100: 100 VDC 200: 200 VDC 250: 250 VDC 630: 630 VDC 1K0: 1000 VDC	NT: Tape & Reel	1: 1K reel 3: 3K reel 4: 4K reel 6: 6K reel 8: 8K reel 10: 10K reel 15: 15K reel  **See packaging quantity on page 1 for more info



## 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	15K	70K	-	-
0402 (1005)	0.50±0.05	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
1210 (3225)	0.95±0.10	-	-	3K	10K
	1.25±0.10	-	-	3K	10K
	1.60±0.20	-	-	2K	8K
	2.00±0.20	-	-	1K	6K
	2.50±0.30	-	-	1K	6K



## STANDARD ELECTRICAL SPECIFICATIONS

DIELECTRIC	NPO	X7R
SIZE	0201, 0402, 0603, 0805, 1206, 1210	0201, 0402, 0603, 0805, 1206, 1210
CAPACITANCE RANGE*	0.5pF to 0.01µF	100PF to 1µF
CAPACITANCE TOLERANCE**	Cap≤5pF: A (±0.5pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: B (±0.1pF), C (±0.25pF), D (±0.25pF) 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, 100V
TAN δ*	Cap <30pF: Q≥400+200C 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)	

NOTE 1: X7R

RATED VOL.	D.F.≤	EXCEPTION OF D.F.≤	
≥50V	≤2.5V	≤3%	0603≥0.047uF; 0805≥0.18uF; 1206≥0.47uF
		≤5%	1210≥4.7uF
		≤10%	0603≥1uF; 0805≥1uF; 1206≥0.47uF; 1210≥10uF
35V	≤3.5%	≤10%	0805≥2.2uF; 1210≥10uF
		≤5%	0805≥1uF; 1210≥10uF
25V	≤3.5%	≤7%	0603≥0.33uF; 1206≥0.47uF
		≤10%	0402≥ 0.10uF; 0603≥0.47uF 0805≥2.2uF; 1206≥6.8uF; 1210≥22uF
16V	≤3.5%	≤5%	0402≥0.033uF; 0603≥0.15uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF
		≤10%	0402≥ 0.47uF; 0603≥0.68uF 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF
10V	≤5%	≤10%	0402≥0.033uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF
		≤15%	0402≥1uF
6.3V	≤10%	≤15%	0402≥1uF; 0603≥10uF; 0905≥2.2uF; 1206≥47uF; 1210≥100uF
		≤20%	0402≥2.2uF
4V	≤15%	---	---





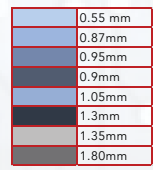
# NPO / COG

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																				

	0.55mm
	0.7mm
	0.87mm
	0.9mm
	1.05mm
	1.35mm



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																	
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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≥1000; Cap<30pF, Q≥400+20C 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">50V</td> <td rowspan="3">≤3%</td> <td>≤6% 0603≥0.047µF; 0805≥0.18µF; 1206≥0.47µF</td> </tr> <tr> <td>≤10% 1206≥0.47µF</td> </tr> <tr> <td>≤20% 0603≥1µF; 0805≥1µF; 1206≥0.47µF, 1210≥10µF</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤5%</td> <td>≤20% 0805≥2.2µF; 1210≥10µF</td> </tr> <tr> <td>≤10% 0805≥1µF; 1210≥10µF</td> </tr> <tr> <td>≤14% 0603≥0.33µF; 1206≥4.7µF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤15% 0402≥0.10µF; 0603≥0.47µF; 0805≥2.2µF; 1206≥6.8µF; 1210≥22µF</td> </tr> <tr> <td>≤10% 0603≥1.5µF; 0805≥0.68µF; 1206≥2.2µF, 1210≥4.7µF</td> </tr> <tr> <td>≤15% 0402≥0.033µF; 0603≥0.68µF; 0805≥2.2µF; 1206≥4.7µF; 1210≥22µF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤5%</td> <td>≤15% 0402≥0.33µF; 0603≥0.33µF; 0805≥2.2µF; 1206≥2.2µF; 1210≥2.2µF</td> </tr> <tr> <td>≤10% 0402≥0.33µF; 0603≥0.33µF; 0805≥2.2µF; 1206≥2.2µF; 1210≥2.2µF</td> </tr> <tr> <td>≤20% 0402≥1µF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤7.5%</td> <td>≤15% 0402≥1µF; 0603≥10µF; 0805≥4.7µF; 1206≥47µF; 1210≥100µF</td> </tr> <tr> <td>≤30% 0402≥1µF</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> Class II (X7R) <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">1GΩ or RxC≥10 Ω·F whichever is smaller.</td> </tr> <tr> <td>50V: 0603≥1µF; 0805≥1µF; 1206≥4.7µF; 1210≥4.7µF</td> </tr> <tr> <td>35V: 0805≥2.2µF; 1210≥10µF</td> </tr> <tr> <td>25V: 0402≥1µF; 0603≥2.2µF; 0805≥2.2µF; 1206≥10µF; 1210≥10µF</td> </tr> <tr> <td>16V: 0402≥0.22µF; 0603≥1µF; 0805≥2.2µF; 1206≥10µF; 1210≥47µF</td> </tr> <tr> <td>10V: 0402≥0.47µF; 0603≥0.47µF; 0805≥2.2µF; 1206≥4.7µF; 1210≥47µF</td> </tr> <tr> <td>6.3V; 4.3;</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% 1206≥0.47µF	≤20% 0603≥1µF; 0805≥1µF; 1206≥0.47µF, 1210≥10µF	35V	≤5%	≤20% 0805≥2.2µF; 1210≥10µF	≤10% 0805≥1µF; 1210≥10µF	≤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≥1.5µF; 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≥2.2µF; 1210≥2.2µF	≤10% 0402≥0.33µF; 0603≥0.33µF; 0805≥2.2µF; 1206≥2.2µF; 1210≥2.2µF	≤20% 0402≥1µF	10V	≤7.5%	≤15% 0402≥1µF; 0603≥10µF; 0805≥4.7µF; 1206≥47µF; 1210≥100µF	≤30% 0402≥1µF	≤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; 4.3;									
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3.	Destructive Physical Analysis EIA-469	-Per EIA-469	-No defects or abnormalities																																																					
4.	Temperature Cycling JESD22 Method JA-104	- Conduct 1000 cycles according to the temperatures and time. <table border="1"> <thead> <tr> <th>STEP</th> <th>TEMP. (°C)</th> <th>TIME (MIN.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55°C +0/-3</td> <td>5±1</td> </tr> <tr> <td>2</td> <td>+125°C+3/-0</td> <td>5±1</td> </tr> </tbody> </table> - Before initial measurement (X7R only): Perform 150+0/-10° for 1 hr and then set for 24±2 hrs at room temp. - Measurement to be made after keeping at room temp for 24±2hrs.	STEP	TEMP. (°C)	TIME (MIN.)	1	-55°C +0/-3	5±1	2	+125°C+3/-0	5±1	- No remarkable damage. - Cap Change: NPO: within ±2.5% or ±0.25pF whichever is larger X7R: within ±10.8 0% -Q/D.F. value: NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C 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">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="3">35V</td> <td rowspan="3">≤5%</td> <td>≤20% 0805≥2.2µF; 1210≥10µF</td> </tr> <tr> <td>≤10% 0805≥1µF; 1210≥10µF</td> </tr> <tr> <td>≤14% 0603≥0.33µF; 1206≥4.7µF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤15% 0402≥0.10µF; 0603≥0.47µF; 0805≥2.2µF; 1206≥6.8µF; 1210≥22µF</td> </tr> <tr> <td>≤10% 0603≥1.5µF; 0805≥0.68µF; 1206≥2.2µF, 1210≥4.7µF</td> </tr> <tr> <td>≤15% 0402≥0.033µF; 0603≥0.68µF; 0805≥2.2µF; 1206≥4.7µF; 1210≥22µF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤5%</td> <td>≤15% 0402≥0.33µF; 0603≥0.33µF; 0805≥2.2µF; 1206≥2.2µF; 1210≥2.2µF</td> </tr> <tr> <td>≤10% 0402≥0.33µF; 0603≥0.33µF; 0805≥2.2µF; 1206≥2.2µF; 1210≥2.2µF</td> </tr> <tr> <td>≤20% 0402≥1µF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤7.5%</td> <td>≤15% 0402≥1µF; 0603≥10µF; 0805≥4.7µF; 1206≥47µF; 1210≥100µF</td> </tr> <tr> <td>≤30% 0402≥1µF</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> Class II (X7R) <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">1GΩ or RxC≥10 Ω·F whichever is smaller.</td> </tr> <tr> <td>50V: 0603≥1µF; 0805≥1µF; 1206≥4.7µF; 1210≥4.7µF</td> </tr> <tr> <td>35V: 0805≥2.2µF; 1210≥10µF</td> </tr> <tr> <td>25V: 0402≥1µF; 0603≥2.2µF; 0805≥2.2µF; 1206≥10µF; 1210≥10µF</td> </tr> <tr> <td>16V: 0402≥0.22µF; 0603≥1µF; 0805≥2.2µF; 1206≥10µF; 1210≥47µF</td> </tr> <tr> <td>10V: 0402≥0.47µF; 0603≥0.47µF; 0805≥2.2µF; 1206≥4.7µF; 1210≥47µF</td> </tr> <tr> <td>6.3V; 4.3;</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	≤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≥1.5µF; 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≥2.2µF; 1210≥2.2µF	≤10% 0402≥0.33µF; 0603≥0.33µF; 0805≥2.2µF; 1206≥2.2µF; 1210≥2.2µF	≤20% 0402≥1µF	10V	≤7.5%	≤15% 0402≥1µF; 0603≥10µF; 0805≥4.7µF; 1206≥47µF; 1210≥100µF	≤30% 0402≥1µF	≤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; 4.3;
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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 24±2 hrs at room temp. - Measurement to be made after keeping at room temp. for 24±2hrs.	- No remarkable damage. - Cap Change: NPO: within ±3.0% or ±0.30pF whichever is larger X7R: within ±12.5% -Q/D.F. value: NPO: C≥30pF, Q≥200; Cap<30pF, Q≥100+10/3C X7R: <table border="1" data-bbox="982 1083 1523 1383"> <thead> <tr> <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>≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15% 0402≥1μF</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.: ≥1GΩ OR RxC≥50Ω·F whichever is smaller.</p> <table border="1" data-bbox="982 1415 1523 1575"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">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> <table border="1" data-bbox="982 1610 1523 1770"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">1GΩ or RxC≥10 Ω·F whichever is smaller.</td> </tr> <tr> <td>50V: 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td> </tr> <tr> <td>35V: 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF</td> </tr> <tr> <td>16V: 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF</td> </tr> <tr> <td>10V: 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF</td> </tr> <tr> <td>6.3V; 4V</td> </tr> </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	≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF	10V	≤7.5%	≤15% 0402≥1μF	≤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	10V: 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF	6.3V; 4V
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7.	Operational Life MIL-STD-202 Method 108	- Test temp.: 125±3°C - To apply voltage: full rated voltage - Test time: 1000+24/-0 - Before initial measurement (X7R only): Apply rated voltage for 1 hr at 125°C. Remove and let set for 24+2hrs 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: More than 30pF, Q≥350; 10pF≤C≤30pF, Q≥275+2.5C less than 10pF Q≥200+10C X7R: <table border="1" data-bbox="885 378 1429 682"> <thead> <tr> <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% 1206≥4.7μF</td> </tr> <tr> <td>≤20% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤5%</td> <td>≤20% 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>≤10% 0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤14% 0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <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>≤15% 0402≥0.033μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td rowspan="3">16V</td> <td rowspan="3">≤5%</td> <td>≤15% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 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>≤20% 0402≥1μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤7.5%</td> <td>≤15% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 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>≤20% 0402≥1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2">≤15%</td> <td>≤30% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>≤20% --- ---</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>--- ---</td> </tr> </tbody> </table> -I.R.: ≥1GΩ OR RxC≥50Ω-F whichever is smaller Class II (X7R) <table border="1" data-bbox="885 724 1429 882"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">1GΩ or RxC≥10 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td> </tr> <tr> <td>35V: 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF</td> </tr> <tr> <td>16V: 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF</td> </tr> <tr> <td>10V: 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF</td> </tr> <tr> <td>6.3V; 4V</td> </tr> </tbody> </table>	RATED VOL.	D.F. ≤	EXCEPTION OF D.F. ≤	50V	≤3%	≤6% 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤10% 1206≥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	≤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≥2.2μF; 1210≥22μF	≤15% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤20% 0402≥1μF	10V	≤7.5%	≤15% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤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
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8.	External Visual MIL-STD-202 Method 2009	- Visual inspection	- No remarkable defect.																																													
9.	Physical Dimension JESD22 Method JB-100	- Using by calipers	- Within the specified dimencions																																													
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 Change: within the specified tolerance. -Q/D.F. value: NPO: Cap≥30pf; Q≥1000; Cap<30pF, Q≥400+20C. X7R: <table border="1" data-bbox="885 1228 1429 1554"> <thead> <tr> <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% 1206≥4.7μF</td> </tr> <tr> <td>≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">35V</td> <td rowspan="3">≤3.5%</td> <td>≤10% 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>≤5 0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤7% 0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤3.5%</td> <td>≤10% 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF</td> </tr> <tr> <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 rowspan="3">16V</td> <td rowspan="3">≤3.5%</td> <td>≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 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>≤15% 0402≥1μF</td> </tr> <tr> <td rowspan="3">10V</td> <td rowspan="3">≤5%</td> <td>≤10% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <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>4V</td> <td>≤15%</td> <td>--- ---</td> </tr> </tbody> </table> -I.R.: ≥10GΩ OR RxC≥500Ω-F whichever is smaller Class II (X7R) <table border="1" data-bbox="885 1606 1429 1764"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">10GΩ or RxC≥100 Ω-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td> </tr> <tr> <td>35V: 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF</td> </tr> <tr> <td>16V: 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF</td> </tr> <tr> <td>10V: 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF</td> </tr> <tr> <td>6.3V; 4V</td> </tr> </tbody> </table>	RATED VOL.	D.F. ≤	EXCEPTION OF D.F. ≤	50V	≤2.5%	≤3% 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤5% 1206≥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	≤7% 0603≥0.33μF; 1206≥4.7μF	25V	≤3.5%	≤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	≤10% 0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF	16V	≤3.5%	≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤15% 0402≥1μF	10V	≤5%	≤10% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF	≤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				
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11.	Mechanical Shock  MIL-STD-202 Method 213	- Peak value: 1500g's - Wave: 1/2 sine. - Velocity: 15.4ft/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="982 331 1528 674"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. <math>\leq</math></th> <th>EXCEPTION OF D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="2">50V</td> <td rowspan="2"><math>\leq</math>2.5%</td> <td><math>\leq</math>3% 0603<math>\geq</math>0.047<math>\mu</math>F; 0805<math>\geq</math>0.18<math>\mu</math>F; 1206<math>\geq</math>0.47<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>5% 1206<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2"><math>\leq</math>3.5%</td> <td><math>\leq</math>10% 0603<math>\geq</math>1<math>\mu</math>F; 0805<math>\geq</math>1<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>5% 0805<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2"><math>\leq</math>3.5%</td> <td><math>\leq</math>7% 0603<math>\geq</math>0.33<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>10% 0402<math>\geq</math>0.10<math>\mu</math>F; 0603<math>\geq</math>0.47<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>6.8<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2"><math>\leq</math>3.5%</td> <td><math>\leq</math>5% 0402<math>\geq</math>0.033<math>\mu</math>F; 0603<math>\geq</math>0.15<math>\mu</math>F; 0805<math>\geq</math>0.68<math>\mu</math>F; 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>10% 0402<math>\geq</math>0.22<math>\mu</math>F; 0603<math>\geq</math>0.68<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2"><math>\leq</math>5%</td> <td><math>\leq</math>10% 0402<math>\geq</math>0.33<math>\mu</math>F; 0603<math>\geq</math>0.33<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>15% 0402<math>\geq</math>1<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2"><math>\leq</math>10%</td> <td><math>\leq</math>15% 0402<math>\geq</math>1<math>\mu</math>F; 0603<math>\geq</math>10<math>\mu</math>F; 0805<math>\geq</math>4.7<math>\mu</math>F; 1206<math>\geq</math>47<math>\mu</math>F; 1210<math>\geq</math>100<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>20% 0402<math>\geq</math>2.2<math>\mu</math>F</td> </tr> <tr> <td>4V</td> <td><math>\leq</math>15%</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: <math>\geq</math>10G<math>\Omega</math> OR RxC<math>\geq</math>5000<math>\Omega</math>-F whichever is smaller.</p> <p>Class II (X7R)</p> <table border="1" data-bbox="982 730 1528 877"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">10G<math>\Omega</math> or RxC<math>\geq</math>100 <math>\Omega</math>-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603<math>\geq</math>1<math>\mu</math>F; 0805<math>\geq</math>1<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>35V: 0805<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td>25V: 0402<math>\geq</math>1<math>\mu</math>F; 0603<math>\geq</math>2.2<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>10<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td>16V: 0402<math>\geq</math>0.22<math>\mu</math>F; 0603<math>\geq</math>1<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>10<math>\mu</math>F; 1210<math>\geq</math>47<math>\mu</math>F</td> </tr> <tr> <td>10V: 0402<math>\geq</math>0.47<math>\mu</math>F; 0603<math>\geq</math>0.47<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>47<math>\mu</math>F</td> </tr> <tr> <td>6.3V: 4V</td> </tr> </tbody> </table>	RATED VOL.	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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 Change: within the specified tolerance -Q/D.F. value: NPO: C $\geq$ 30pF, Q $\geq$ 1000; Cap $<$ 30pF, Q $\geq$ 400+20C  X7R: <table border="1" data-bbox="982 1024 1528 1367"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. <math>\leq</math></th> <th>EXCEPTION OF D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="2"><math>\geq</math>50V</td> <td rowspan="2"><math>\leq</math>2.5%</td> <td><math>\leq</math>3% 0603<math>\geq</math>0.047<math>\mu</math>F; 0805<math>\geq</math>0.18<math>\mu</math>F; 1206<math>\geq</math>0.47<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>5% 1206<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2"><math>\leq</math>3.5%</td> <td><math>\leq</math>10% 0603<math>\geq</math>1<math>\mu</math>F; 0805<math>\geq</math>1<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>5% 0805<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2"><math>\leq</math>3.5%</td> <td><math>\leq</math>7% 0603<math>\geq</math>0.33<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>10% 0402<math>\geq</math>0.10<math>\mu</math>F; 0603<math>\geq</math>0.47<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>6.8<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2"><math>\leq</math>3.5%</td> <td><math>\leq</math>5% 0402<math>\geq</math>0.033<math>\mu</math>F; 0603<math>\geq</math>0.15<math>\mu</math>F; 0805<math>\geq</math>0.68<math>\mu</math>F; 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>10% 0402<math>\geq</math>0.22<math>\mu</math>F; 0603<math>\geq</math>0.68<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2"><math>\leq</math>5%</td> <td><math>\leq</math>10% 0402<math>\geq</math>0.33<math>\mu</math>F; 0603<math>\geq</math>0.33<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>22<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>15% 0402<math>\geq</math>1<math>\mu</math>F</td> </tr> <tr> <td rowspan="2">6.3V</td> <td rowspan="2"><math>\leq</math>10%</td> <td><math>\leq</math>15% 0402<math>\geq</math>1<math>\mu</math>F; 0603<math>\geq</math>10<math>\mu</math>F; 0805<math>\geq</math>4.7<math>\mu</math>F; 1206<math>\geq</math>47<math>\mu</math>F; 1210<math>\geq</math>100<math>\mu</math>F</td> </tr> <tr> <td><math>\leq</math>20% 0402<math>\geq</math>2.2<math>\mu</math>F</td> </tr> <tr> <td>4V</td> <td><math>\leq</math>15%</td> <td>---</td> </tr> </tbody> </table> <p>*I.R.: <math>\geq</math>1G<math>\Omega</math> OR RxC<math>\geq</math>500<math>\Omega</math>-F whichever is smaller.</p> <p>Class II (X7R) for rated voltage test</p> <table border="1" data-bbox="982 1423 1528 1570"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">10M<math>\Omega</math> or RxC<math>\geq</math>100 <math>\Omega</math>-F whichever is smaller.</td> </tr> <tr> <td>50V: 0603<math>\geq</math>1<math>\mu</math>F; 0805<math>\geq</math>1<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>4.7<math>\mu</math>F</td> </tr> <tr> <td>35V: 0805<math>\geq</math>2.2<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td>25V: 0402<math>\geq</math>1<math>\mu</math>F; 0603<math>\geq</math>2.2<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>10<math>\mu</math>F; 1210<math>\geq</math>10<math>\mu</math>F</td> </tr> <tr> <td>16V: 0402<math>\geq</math>0.22<math>\mu</math>F; 0603<math>\geq</math>1<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>10<math>\mu</math>F; 1210<math>\geq</math>47<math>\mu</math>F</td> </tr> <tr> <td>10V: 0402<math>\geq</math>0.47<math>\mu</math>F; 0603<math>\geq</math>0.47<math>\mu</math>F; 0805<math>\geq</math>2.2<math>\mu</math>F; 1206<math>\geq</math>4.7<math>\mu</math>F; 1210<math>\geq</math>47<math>\mu</math>F</td> </tr> <tr> <td>6.3V: 4V</td> </tr> </tbody> </table>	RATED VOL.	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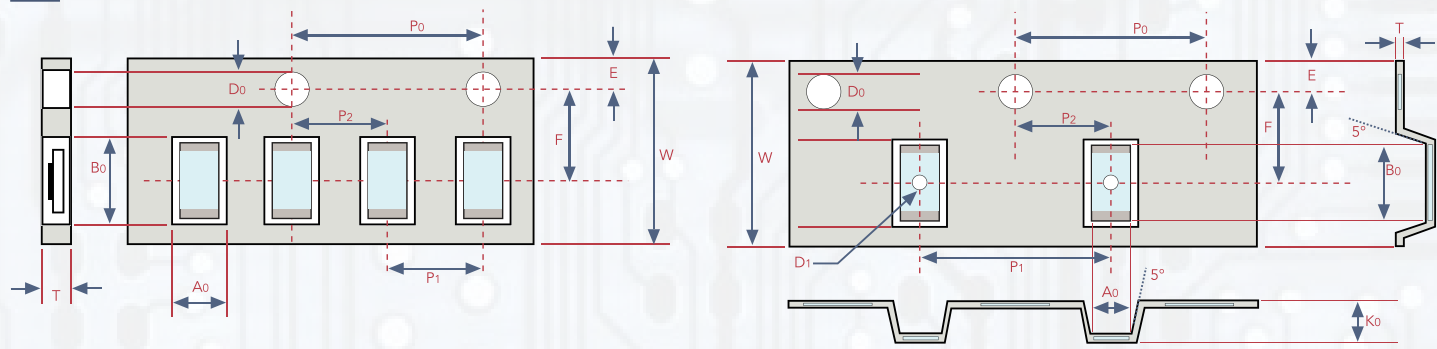
NO.	AEC-Q200 TEST ITEM	AEC-Q200 TEST CONDITION	REQUIREMENTS																																																				
13.	Resistance to Soldering Heat  MIL-STD-202 Method 210	- Solder temperature: 270±5°C - Dipping time: 10±1 sec - Before initial measurement (X7R only): perform 150+0/-10°C for 1 hr and then set 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 ±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="885 346 1429 682"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. ≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥50V</td> <td rowspan="2">≤2.5%</td> <td>≤3% 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤5% 1210≥4.7uF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤3.5%</td> <td>≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF, 1210≥10μF</td> </tr> <tr> <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="2">16V</td> <td rowspan="2">≤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 rowspan="2">10V</td> <td rowspan="2">≤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>6.3V</td> <td>≤10%</td> <td>≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>≤20% 0402≥2.2μF</td> </tr> <tr> <td></td> <td></td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥10GΩ OR RxC≥500Ω-F whichever is smaller. Class II (X7R) <table border="1" data-bbox="885 724 1429 871"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="8">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≥4.7uF	35V	≤3.5%	≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF, 1210≥10μF	≤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	4V	≤15%	≤20% 0402≥2.2μF			---	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									
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14.		Thermal Shock  MIL-STD-202 Method 107	- Conduct 300 cycles according to the temperatures and time. <table border="1" data-bbox="300 945 560 997"> <thead> <tr> <th>STEP</th> <th>TEMP. (°C)</th> <th>TIME (MIN.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55°C +0/-3</td> <td>15±3</td> </tr> <tr> <td>2</td> <td>+125°C +3/-0</td> <td>15±3</td> </tr> </tbody> </table> - Max. transfer time: 20 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.	STEP	TEMP. (°C)	TIME (MIN.)	1	-55°C +0/-3	15±3	2	+125°C +3/-0	15±3	- No remarkable damage. - Cap change: NPO: within ±2.5% or 0.25pF whichever is larger X7R: within 10.0% -Q/D.F. value: NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R: <table border="1" data-bbox="885 1029 1429 1333"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. ≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥50V</td> <td rowspan="2">≤3%</td> <td>≤6% 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤10% 1210≥4.7uF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤5%</td> <td>≤20% 0603≥1μF; 0805≥1μF; 1206≥4.7μF, 1210≥10μF</td> </tr> <tr> <td>≤20% 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤10% 0805≥1μF; 1210≥10μF</td> </tr> <tr> <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 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% 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% 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> <tr> <td></td> <td></td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥1GΩ OR RxC≥50Ω-F whichever is smaller. Class II (X7R) for rated voltage test <table border="1" data-bbox="885 1417 1429 1564"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="8">10GΩ 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≥4.7uF	35V	≤5%	≤20% 0603≥1μF; 0805≥1μF; 1206≥4.7μF, 1210≥10μF	≤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	10GΩ 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
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15.	ESD AEC-Q200-002	Per AEC-Q200-002	<ul style="list-style-type: none"> <li>- No remarkable damage.</li> <li>- Cap change: within the specified tolerance.</li> <li>- Q/D.F. value: NPO: Cap≥30pF, Q≥1000; Cap&lt;30pF, Q≥400+20C</li> </ul> X7R: <table border="1" data-bbox="974 315 1526 661"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. ≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥50V</td> <td>≤2.5%</td> <td>≤3% 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF ≤5% 1210≥4.7uF</td> </tr> <tr> <td>≤3.5%</td> <td>≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF ≤10% 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td>≤3.5%</td> <td>≤5% 0805≥1μF; 1210≥10μF ≤7% 0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>≤5%</td> <td>0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td>≤3.5%</td> <td>0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td>≤10%</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>≤5%</td> <td>0402≥1μF</td> </tr> <tr> <td>≤15%</td> <td>0402≥1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td>≤10%</td> <td>≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF ≤20% 0402≥2.2μF</td> </tr> <tr> <td>≤15%</td> <td>---</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥10GΩ OR RxC≥500Ω·F whichever is smaller. Class II (X7R) <table border="1" data-bbox="974 693 1526 850"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">10GΩ or RxC≥100 Ω·F whichever is smaller.</td> </tr> <tr> <td>50V: 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td> </tr> <tr> <td>35V: 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF</td> </tr> <tr> <td>16V: 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF</td> </tr> <tr> <td>10V: 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF</td> </tr> <tr> <td>6.3V; 4V</td> </tr> </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≥4.7uF	≤3.5%	≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF ≤10% 0805≥2.2μF; 1210≥10μF	25V	≤3.5%	≤5% 0805≥1μF; 1210≥10μF ≤7% 0603≥0.33μF; 1206≥4.7μF	≤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	16V	≤3.5%	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	10V	≤5%	0402≥1μF	≤15%	0402≥1μF	6.3V	≤10%	≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF ≤20% 0402≥2.2μF	≤15%	---	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
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16.	Solderability J-STD-002 JESD22-B102E	<ul style="list-style-type: none"> <li>- Condition A Un-mounted chips 4hrs / 155°C Dry then completely immersed for 5±0.5 sec in solder bath at 245±5°C.</li> <li>- Condition B Un-mounted chips steam 8 hrs then completely immersed for 10±1 sec in solder bath at 220+5/-0°C</li> <li>- Condition C Un-mounted chips steam 8 hrs then completely immersed for 10±1 sec in solder bath at 260+0/-5°C.</li> </ul>	- 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.																																											
17.	Electrical Characterization	<ul style="list-style-type: none"> <li>- Capacitance</li> <li>- Q/D.F. (Dissipation Factor)</li> </ul> Cap≤1000pF 1.0±0.2Vrms, 1MHz±10% Cap>1000pF 1.0±0.2Vrms, 1KHz±10%  - Insulation Resistance To apply rated voltage for max. 120 sec. - Dielectric Strength To apply 250% of rated voltage, duration 1~5 sec, charge and discharge current less than 50mA. - Temperature Coefficient (with no electrical load) - Operation temperature: -55~125°C at 25°C	<ul style="list-style-type: none"> <li>- Capacitance within the specified tolerance.</li> <li>- Q/D.F. value: NPO: Cap≥30pF, Q≥1000; Cap&lt;30pF, Q≥400+20C</li> </ul> X7R: <table border="1" data-bbox="974 1239 1526 1585"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. ≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥50V</td> <td>≤2.5%</td> <td>≤3% 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF ≤5% 1210≥4.7uF</td> </tr> <tr> <td>≤3.5%</td> <td>≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF ≤10% 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td>≤3.5%</td> <td>≤5% 0805≥1μF; 1210≥10μF ≤7% 0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>≤5%</td> <td>0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td>≤3.5%</td> <td>0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td>≤10%</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>≤5%</td> <td>0402≥1μF</td> </tr> <tr> <td>≤15%</td> <td>0402≥1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td>≤10%</td> <td>≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF ≤20% 0402≥2.2μF</td> </tr> <tr> <td>≤15%</td> <td>---</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥10GΩ OR RxC≥500Ω·F whichever is smaller. Class II (X7R) <table border="1" data-bbox="974 1617 1526 1774"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">10GΩ or RxC≥100 Ω·F whichever is smaller.</td> </tr> <tr> <td>50V: 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF</td> </tr> <tr> <td>35V: 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>25V: 0402≥1μF; 0603≥2.2μF; 0805≥2.2μF; 1206≥10μF; 1210≥10μF</td> </tr> <tr> <td>16V: 0402≥0.22μF; 0603≥1μF; 0805≥2.2μF; 1206≥10μF; 1210≥47μF</td> </tr> <tr> <td>10V: 0402≥0.47μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥47μF</td> </tr> <tr> <td>6.3V; 4V</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>- Dielectric strength</li> <li>- No evidence of damage or flash over during test.</li> <li>- Temperature Coefficient</li> <li>- Capacitance Change: NPO: Within ±30ppm/°C X7R: Within ±15%</li> </ul>	RATED VOL.	D.F. ≤	EXCEPTION OF D.F. ≤	≥50V	≤2.5%	≤3% 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF ≤5% 1210≥4.7uF	≤3.5%	≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF ≤10% 0805≥2.2μF; 1210≥10μF	25V	≤3.5%	≤5% 0805≥1μF; 1210≥10μF ≤7% 0603≥0.33μF; 1206≥4.7μF	≤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	16V	≤3.5%	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	10V	≤5%	0402≥1μF	≤15%	0402≥1μF	6.3V	≤10%	≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF ≤20% 0402≥2.2μF	≤15%	---	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
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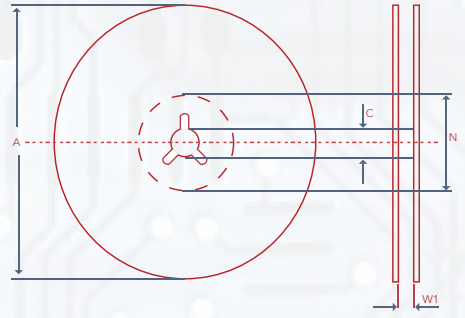


NO.	AEC-Q200 TEST ITEM	AEC-Q200 TEST CONDITION	REQUIREMENTS																																		
18.	Board Flex AEC-Q200-005	- The middle part of substrate shall be pressurized by means of pressurizing rod at a rate of about 1mm per second until the deflection becomes 3mm (2mm for X7R) and then the pressure shall be maintained for 5±1 sec.  - Measurement to be made after keeping at room temp. for 24±2 hrs.	- No remarkable damage. - Cap change: NPO: within ±5% or 0.5pF whichever is larger X7R: within ±12.5% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)																																		
19.	Terminal Strength AEC-Q200-006	- Pressurizing force: 2N (0402), 10N (0603), 18N (0805) - Test time: 60±1 sec.	- No remarkable damage or removal of the terminations - Capacitance within the specified tolerance. - Q/D.F. value: NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C  X7R: <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="2">≥50V</td> <td>≤2.5%</td> <td>≤3% 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF ≤5% 1210≥4.7μF</td> </tr> <tr> <td>≤5%</td> <td>≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF, 1210≥10μF</td> </tr> <tr> <td rowspan="2">35V</td> <td>≤3.5%</td> <td>≤10% 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>≤5%</td> <td>0805≥1μF; 1210≥10μF</td> </tr> <tr> <td rowspan="2">25V</td> <td>≤3.5%</td> <td>≤7% 0603≥0.33μF; 1206≥4.7μF ≤10% 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF</td> </tr> <tr> <td>≤5%</td> <td>0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF, 1210≥4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td>≤3.5%</td> <td>≤10% 0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td>≤5%</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>≤5%</td> <td>≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥2.2μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>---</td> </tr> <tr> <td>4V</td> <td>≤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	≤5%	≤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	≤5%	0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	10V	≤5%	≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF	≤10%	0402≥2.2μF	6.3V	≤15%	---	4V	≤15%	---
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20.	Beam Load Test AEC-Q200-003	- Break strength test - Beam speed: 2.5±0.25 mm/sec	The chip endure following force - Chip length ≤2.5mm: Thickness >0.5mm (20N), ≤0.5mm (8N) - Chip length ≥3.2mm: Thickness ≥1.25mm (54.5N), <1.25mm (15N)																																		

## TAPE & REEL DIMENSIONS



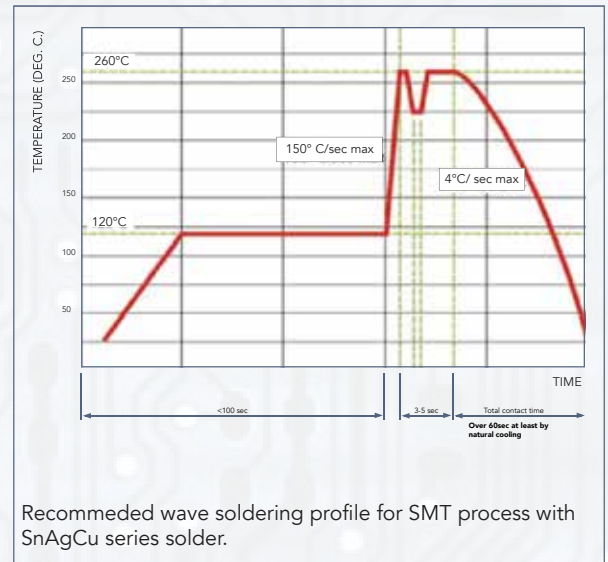
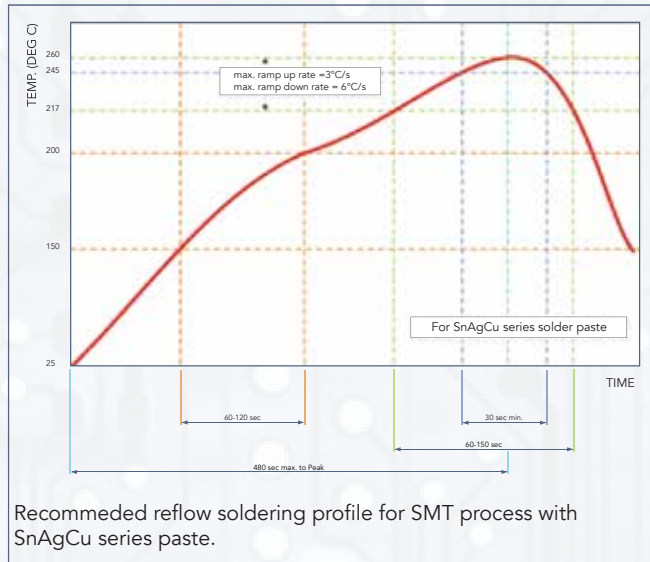
SIZE	0402	0603	0805			1206		
THICKNESS	N	S, B	A	X	M, C, I	X	M, J, C	E
A <sub>0</sub>	0.62±0.05	1.02±0.05	1.05±0.10	1.05±0.10	<1.57	2.00±0.10	<1.85	<1.95
B <sub>0</sub>	1.20±0.05	0.95±0.05	2.30±0.10	2.30±0.10	<2.40	3.50±0.10	<3.46	<3.67
T	0.60±0.05	0.95±0.05	0.75±0.05	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05
K <sub>0</sub>	-	-	-	-	<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 <sub>0</sub>	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
10 X P <sub>0</sub>	40.00±0.10	40.00±0.10	40.00±0.10	40.00±0.10	40.00±0.10	40.00±0.10	40.00±0.10	40.00±0.10
P <sub>1</sub>	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 <sub>2</sub>	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 <sub>0</sub>	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.50±0.05	1.50±0.05
D <sub>1</sub>	-	-	-	-	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"	10"
C	13.0±0.5/-0.2	13.0±0.5/-0.2
W <sub>1</sub>	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

## 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°C / 30 to 90°F  
 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\*\*\*\*\*

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