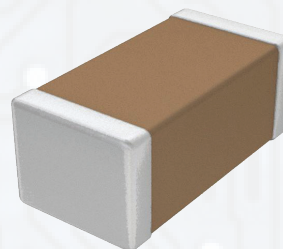


AUTOMOTIVE MULTILAYER CERAMIC CHIP CAPACITORS

- GMT SERIES -

SCOPE

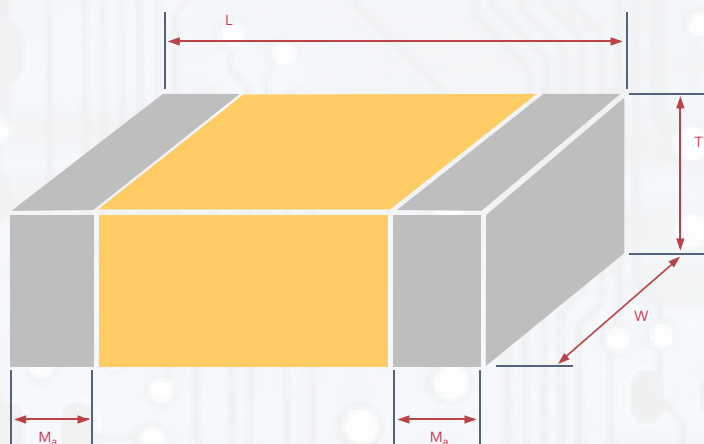
- Consists of conducting material and electrodes - to achieve chip-type SMT and small size, high density and high efficiency ceramic condensers are used
- NPO/X7R dielectrics provides product with high electrical precision, stability and reliability
- Assured quality performance in automotive applications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



APPLICATIONS

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

CONSTRUCTION AND DIMENSIONS



FEATURES

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

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	#	
1210 (3225)	3.20±0.30	2.50±0.20	0.80±0.10		1.25±/-0.10
			0.95±/-0.10	#	
			1.60±/-0.20	#	
1210 (3225)	3.20±0.40	2.50±0.30	2.00±/-0.20	#	0.75±/-0.25
			2.50±/-0.30	#	

PART NUMBER

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 35: 35 VDC 50: 50 VDC 100: 100 VDC 200: 200 VDC 250: 250 VDC 630: 630 VDC 1K0: 1000 VDC	NT: Sn/Ni XT: Nickel Barrier/ Flex Term.	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*	0.1pF to 0.047µF	100PF to 10µF
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)	250V, 500V, 630V 1000V	
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)	

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
		≤5%	0402≥0.033uF; 0603≥0.15uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF
16V	≤3.5%	≤10%	0402≥ 0.47uF; 0603≥0.68uF 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF
		≤10%	0402≥0.033uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF
10V	≤5%	≤15%	0402≥1uF
		≤15%	0402≥1uF; 0603≥10uF; 0905≥2.2uF; 1206≥47uF; 1210≥100uF
6.3V	≤10%	≤20%	0402≥2.2uF
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DIELECTRIC		X8G																					
DIMENSION (MM)		GMT04 (0402)				GMT10 (0603)				GMT21 (0805)				GMT31 (1206)				GMT31 (1210)					
RATED VOLTAGE		10	16	25	50	10	16	25	20	10	16	25	50	100	10	16	25	50	10	16	25	50	100
0.1pF	0R1	B	B	B	B																		
0.2pF	0R2	B	B	B	B										E	E	E	E					
0.3pF	0R3	B	B	B	B										E	E	E	E					
0.4pF	0R4	B	B	B	B										E	E	E	E					
0.5	0R5	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
1	1R0	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
1.2	1R2	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
1.5	1R5	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
1.8	1R8	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
2.0	2R0	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
2.2	2R2	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
2.7	2R7	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
3.0	3R0	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
3.3	3R3	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
3.9	3R9	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
4.0	4R0	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
4.7	4R7	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
5.0	5R0	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
5.6	5R6	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
6.0	6R0	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
6.8	6R8	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
7.0	7R0	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
8.0	8R0	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
8.2	8R2	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
9.0	9R0	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E				
10pF	100	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
12pF	120	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
15	150	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
18	180	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
22	220	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
27	270	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
33	330	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
39	390	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
47	470	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
56	560	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
68	680	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
82	820	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
100	101	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
120	121	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
150	151	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
180	181	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
220	221	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
270	271	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
330	331	B	B	B	B	D	D	D	D	C	C	C	C	C	E	E	E	E	E	F	F	F	F
390	391	B	B	B	B	D	D	D	D	E	E	E	E	E	E	E	E	E	E	F	F	F	F
470	471	B	B	B	B	D	D	D	D	E	E	E	E	E	E	E	E	E	E	F	F	F	F
560	561	B	B	B	B	D	D	D	D	E	E	E	E	E	E	E	E	E	E	F	F	F	F
680	681	B	B	B	B	D	D	D	D	E	E	E	E	E	E	E	E	E	E	F	F	F	F
820	821	B	B	B	B	D	D	D	D	E	E	E	E	E	E	E	E	E	E	F	F	F	F
1,000	102	B	B	B	B	D	D	D	D	E	E	E	E	E	E	E	E	E	E	F	F	F	F
1,200	122					E	E	E	E	E	E	E	E	E	E	E	E	E	E	F	F	F	F
1,500	152					E	E	E	E	E	E	E	E	E	E	E	E	E	E	F	F	F	F
1,800	182					E	E	E	E	E	E	E	E	E	E	E	E	E	E	F	F	F	F
2,200	222					E	E	E	E	E	E	E	E	E	E	E	E	E	E	F	F	F	F
2,700	272					E	E	E	E	G	G	G	G	G	E	E	E	E	E	F	F	F	F
3,300	332					E	E	E	E	G	G	G	G	G	E	E	E	E	E	F	F	F	F
3,900	392									G	G	G	G	G	E	E	E	E	E	F	F	F	F
4,700	472									G	G	G	G	G	E	E	E	E	E	F	F	F	F
5,600	562									G	G	G	G	G	E	E	E	E	E	F	F	F	F
6,800	682									G	G	G	G	G	F	F	F	F	F	F	F	F	F
8,200	822									G	G	G	G	G	G	G	G	G	G	F	F	F	F
0.010μF	103									G	G	G	G	G	G	G	G	G	G	F	F	F	F
0.012μF	123																			G	G	G	G
0.015μF	153																			G	G	G	G

CAP. RANGE



DIELECTRIC		X5R																										
DIMENSION (MM)		GMT04 (0402)				GMT10 (0603)				GMT21 (0805)				GMT31 (1206)														
RATED VOLTAGE		10	16	25	35	50	6.3	10	16	25	35	50	10	16	25	35	50	16	25	35	50							
100	101																											
120	121																											
150	151																											
180	181																											
220	221					A2																						
270	271																											
330	331					A2																						
390	391																											
470	471					A2																						
560	561																											
680	681					A2																						
820	821																											
1,000	102					A2						C2																
1,200	122																											
1,500	152					A2						C2																
1,800	182																											
2,200	222					A2						C2																
2,700	272																											
3,300	332					A2						C2																
3,900	392																											
4,700	472					A2						C2																
5,600	562																											
6,800	682					A2						C2																
8,200	822																											
0.010μF	103			A2	A2	A2						C2																
0.012	123																											
0.015	153			A2	A2	A2						C2																
0.018	193																											
0.022	223			A2	A2	A2						C2																
0.027	273																											
0.033	333			A2	A2	A2	A2					C2																
0.039	393																											
0.047	473			A2	A2	A2	A2					C2																
0.056	563																											
0.068	683											C2																
0.082	823			A2	A2	A2	A2																					
0.10	104	A2	A2	A2	A2	A2					C2	C2																
0.12	124																											
0.15	154	A2	A2								C2	C2	C2							F2								
0.18	184																											
0.22	224	A2	A2								C2	C2	C2	C2							F2							
0.27	274																											
0.33	334										C2	C2	C2	C2	C2						F2							
0.39	394																											
0.47	474										C2	C2	C2	C2						F2	F2	F2		H2				
0.56	564																											
0.68	684										C2	C2	C2	C2	C2						F2	F2	F2	F2	H2			
0.82	824																											
1.00	105										C2	C2	C2	C2	D2						F2	F2	F2	F2	H2			
1.5	155										C2										F2	F2	F2	F2	H2	H2	H2	
2.2	225										C2										F2	F2	F2	F2	H2	H2	H2	
3.3	335										C2	C2									F2	F2	F2	F2	H2	H2	H2	
4.70	475										C2										F2	F2	F2	F2	H2	H2	H2	
6.8	685																				F2				H2	H2	H2	H2
10	106																				H	H			H2	H2	H2	J
15	156																								H2			
22	226																								H2			

CAP. RANGE

A	A2	B	C	C2	D	D2	E	F	F2	G	H	H2	I	J	K	L
0.33mm	0.5mm	0.55mm	0.7mm	0.8mm	0.87mm	0.9mm	0.95mm	1.05mm	1.25mm	1.35mm	1.45mm	1.60mm	1.8mm	1.9mm	2.2mm	2.8mm



RELIABILITY TEST CONDITIONS AND DIMENSIONS

NO.	TEST ITEM	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 Tlme: 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="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≥1.5μF; 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≥2.2μF; 1210≥2.2μF</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≥2.2μF</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> <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	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≥1.5μF; 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≥2.2μF; 1210≥2.2μF	10V	≤7.5%	≤15% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥2.2μF	≤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; 4.3;									
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RELIABILITY TEST CONDITIONS AND DIMENSIONS

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5.	Moisture Resistance MIL-STD-202 Method 106	- Test temp.: 25~65°C - Humidity: 80~100% RH - Test Time: 10 cycles, t=24hrs/cycle - Measurement to be made after keeping at room temp. for 24±2 hrs.	- No remarkable damage. - Cap Change: NPO: within ±3.0% or ±0.30pF whichever is larger X7R: within ±12.5% -Q/D.F. value: NPO: More than 30pF, Q≥350; 10pF≤C≤30pF, Q≥275+2.5C Less than 10pF Q≥200+10C 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≥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>≤10% 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">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>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.</p> <p>Class II X7R:</p> <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; 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	≤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	≤10% 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	≤20% 0402≥1μF	6.3V	≤15%	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										
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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"> <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≥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>≤10% 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">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td>≤20% 0402≥1μF</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>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> <p>Class II (X7R) for rated voltage test:</p> <table border="1"> <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> <p>Class II (X7R) for 1.3~1.5Vdc</p> <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; 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	≤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	≤10% 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≥4.7μF; 1210≥22μF	≤20% 0402≥1μF	6.3V	≤15%	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"> <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>≤3%</td> <td>0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤10%</td> <td>1206≥4.7μF</td> </tr> <tr> <td rowspan="2">35V</td> <td>≤20%</td> <td>0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td>≤10%</td> <td>0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="2">25V</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 rowspan="2">16V</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>≤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>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 CLASS II X7R:</p> <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="8">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> <tr> <td>6.3V: 4V</td> </tr> </tbody> </table>	RATED VOL.	D.F. ≤	EXCEPTION OF D.F. ≤	50V	≤3%	0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤10%	1206≥4.7μF	35V	≤20%	0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF	≤10%	0805≥2.2μF; 1210≥10μF	25V	≤14%	0603≥0.33μF; 1206≥4.7μF	≤15%	0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF	16V	≤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	≤15%	0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤20%	0402≥1μF	6.3V	≤15%	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	6.3V: 4V
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9.	Physical Dimension JESD22 Method JB-100	- Using by calipers	- Within the specified dimensions																																													
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"> <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>≤3%</td> <td>0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤5%</td> <td>1206≥4.7μF</td> </tr> <tr> <td rowspan="2">35V</td> <td>≤10%</td> <td>0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td>≤10%</td> <td>0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="2">25V</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 rowspan="2">16V</td> <td>≤10%</td> <td>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">10V</td> <td>≤10%</td> <td>0402≥0.22μF; 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>6.3V</td> <td>≤10%</td> <td>0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>0402≥2.2μF</td> </tr> </tbody> </table> <p>I.R.: ≥10GΩ OR RxC≥500Ω-F whichever is smaller CLASS II X7R:</p> <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: 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> <tr> <td>6.3V: 4V</td> </tr> </tbody> </table>	RATED VOL.	D.F. ≤	EXCEPTION OF D.F. ≤	50V	≤3%	0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤5%	1206≥4.7μF	35V	≤10%	0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF	≤10%	0805≥2.2μF; 1210≥10μF	25V	≤5%	0805≥1μF; 1210≥10μF	≤7%	0603≥0.33μF; 1206≥4.7μF	16V	≤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	10V	≤10%	0402≥0.22μF; 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	6.3V	≤10%	0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF	4V	≤15%	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	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: Cap30pF, 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</td> </tr> <tr> <td>≤3.5%</td> <td>≤5% 1206≥4.7μF</td> </tr> <tr> <td rowspan="2">35V</td> <td>≤2.5%</td> <td>≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td>≤3.5%</td> <td>≤5% 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="2">25V</td> <td>≤2.5%</td> <td>≤7% 0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>≤3.5%</td> <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>≤2.5%</td> <td>≤5% 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>≤3.5%</td> <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>≤2.5%</td> <td>≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>≤3.5%</td> <td>≤15% 0402≥1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td>≤2.5%</td> <td>≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>≤3.5%</td> <td>≤20% 0402≥2.2μF</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> <table border="1"> <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	≤3.5%	≤5% 1206≥4.7μF	35V	≤2.5%	≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF	≤3.5%	≤5% 0805≥2.2μF; 1210≥10μF	25V	≤2.5%	≤7% 0603≥0.33μF; 1206≥4.7μF	≤3.5%	≤10% 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF	16V	≤2.5%	≤5% 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF	≤3.5%	≤10% 0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF	10V	≤2.5%	≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤3.5%	≤15% 0402≥1μF	6.3V	≤2.5%	≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF	≤3.5%	≤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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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≥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</td> </tr> <tr> <td>≤3.5%</td> <td>≤5% 1206≥4.7μF</td> </tr> <tr> <td rowspan="2">35V</td> <td>≤2.5%</td> <td>≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td>≤3.5%</td> <td>≤5% 0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="2">25V</td> <td>≤2.5%</td> <td>≤7% 0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td>≤3.5%</td> <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>≤2.5%</td> <td>≤5% 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>≤3.5%</td> <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>≤2.5%</td> <td>≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>≤3.5%</td> <td>≤15% 0402≥1μF</td> </tr> <tr> <td rowspan="2">6.3V</td> <td>≤2.5%</td> <td>≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>≤3.5%</td> <td>≤20% 0402≥2.2μF</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>—</td> </tr> </tbody> </table> <p>*I.R.: ≥1GΩ OR RxC≥50Ω-F whichever is smaller.</p> <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">10MΩ 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	≤3.5%	≤5% 1206≥4.7μF	35V	≤2.5%	≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF	≤3.5%	≤5% 0805≥2.2μF; 1210≥10μF	25V	≤2.5%	≤7% 0603≥0.33μF; 1206≥4.7μF	≤3.5%	≤10% 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF	16V	≤2.5%	≤5% 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF	≤3.5%	≤10% 0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF	10V	≤2.5%	≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤3.5%	≤15% 0402≥1μF	6.3V	≤2.5%	≤15% 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF	≤3.5%	≤20% 0402≥2.2μF	4V	≤15%	—	RATED VOLTAGE	INSULATION RESISTANCE	100V: X7R	10MΩ 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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RELIABILITY TEST CONDITIONS AND DIMENSIONS

NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS																																																		
13.	Resistance to Soldering Heat MIL-STD-202 Method 210	<ul style="list-style-type: none"> - Solder temperature: 270±5°C - Dipping time: 10±1 sec - Before initial measurement (X7R only): perform 150+0/-10°C for 1 hr and then set 24±2 hrs at room temp. - Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> - No remarkable damage. - Cap change: NPO: within ±2.5% or 0.25pF whichever is larger X7R: within 7.5% -Q/D.F. value: NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C <p>X7R:</p> <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. ≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="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≥4.7μF</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 rowspan="2">6.3V</td> <td rowspan="2">≤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>4V</td> <td>≤15%</td> <td>—</td> </tr> </tbody> </table> <p>*I.R.: ≥10GΩ OR RxC≥500Ω-F whichever is smaller.</p> <table border="1"> <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≥4.7μF	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	≤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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14.	Thermal Shock MIL-STD-202 Method 107	<ul style="list-style-type: none"> - Conduct 300 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>15±3</td> </tr> <tr> <td>2</td> <td>+125°C +3/-0</td> <td>15±3</td> </tr> </tbody> </table> <ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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 <p>X7R:</p> <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. ≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="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≥4.7μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤5%</td> <td>≤10% 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 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> <p>*I.R.: ≥1GΩ OR RxC≥500Ω-F whichever is smaller.</p> <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="7">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≥4.7μF	35V	≤5%	≤10% 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	≤20% —	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	6.3V: 4V
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RELIABILITY TEST CONDITIONS AND DIMENSIONS

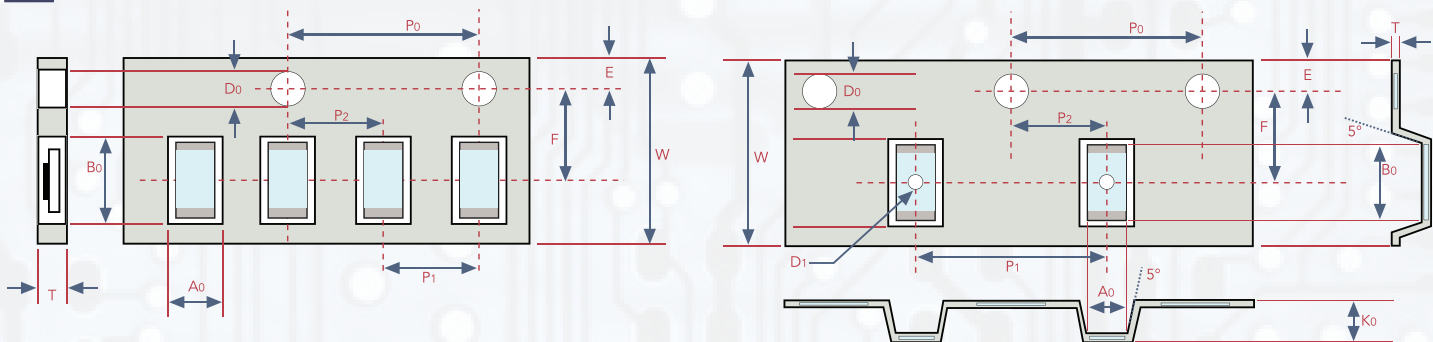
NO.	TEST ITEM	TEST CONDITION	REQUIREMENTS																																									
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16.	Solderability J-STD-002 JESD22-B102E	<p>- Condition A Un-mounted chips 4hrs / 155°C Dry then completely immersed for 5\pm0.5 sec in solder bath at 245\pm5°C.</p> <p>- Condition B Un-mounted chips steam 8 hrs then completely immersed for 10\pm1 sec in solder bath at 220+5/-0°C</p> <p>- Condition C Un-mounted chips steam 8 hrs then completely immersed for 10\pm1 sec in solder bath at 260+0/-5°C.</p>	<p>- All terminations shall exhibit a continuous solder coating free from defects from a minimum of 95% of the critical surface area of any individual termination.</p>																																									
17.	Electrical Characterization	<p>- Capacitance - Q/D.F. (Dissipation Factor)</p> <p>Cap\leq1000pF 1.0\pm0.2Vrms, 1MHz\pm10% Cap$>$1000pF 1.0\pm0.2Vrms, 1KHz\pm10%</p> <p>- Insulation Resistance To apply rated voltage for max. 120 sec. - Dielectric Strength To apply 250% of rated voltage, duration 1~5 sec, charge and discharge current less than 50mA. - Temperature Coefficient (with no electrical load) - Operation temperature: -55~125°C at 25°C</p>	<p>- Capacitance within the specified tolerance. - Q/D.F. value: NPO: Cap\geq30pF, Q\geq1000; Cap$<$30pF, Q\geq400+20C</p> <p>X7R:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. \leq</th> <th>EXCEPTION OF D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="2" style="text-align: center;">≥50V</td> <td rowspan="2" style="text-align: center;">≤2.5%</td> <td>≤3% 0603\geq0.047μF; 0805\geq0.18μF; 1206\geq0.47μF</td> </tr> <tr> <td>≤5% 1210\geq4.7μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">35V</td> <td rowspan="2" style="text-align: center;">≤3.5%</td> <td>≤10% 0603\geq1μF; 0805\geq1μF; 1206\geq4.7μF; 1210\geq10μF</td> </tr> <tr> <td>≤5% 0805\geq2.2μF; 1210\geq10μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">25V</td> <td rowspan="2" style="text-align: center;">≤3.5%</td> <td>≤7% 0603\geq0.33μF; 1206\geq4.7μF</td> </tr> <tr> <td>≤10% 0402\geq0.10μF; 0603\geq0.47μF; 0805\geq2.2μF; 1206\geq6.8μF; 1210\geq22μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">16V</td> <td rowspan="2" style="text-align: center;">≤3.5%</td> <td>0402\geq0.033μF; 0603\geq0.15μF; 0805\geq0.68μF; 1206\geq2.2μF; 1210\geq4.7μF</td> </tr> <tr> <td>≤10% 0402\geq0.22μF; 0603\geq0.68μF; 0805\geq2.2μF; 1206\geq4.7μF; 1210\geq22μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">10V</td> <td rowspan="2" style="text-align: center;">≤5%</td> <td>0402\geq0.33μF; 0603\geq0.33μF; 0805\geq2.2μF; 1206\geq2.2μF; 1210\geq22μF</td> </tr> <tr> <td>≤15% 0402\geq1μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">6.3V</td> <td rowspan="2" style="text-align: center;">≤10%</td> <td>0402\geq1μF; 0603\geq10μF; 0805\geq4.7μF; 1206\geq47μF; 1210\geq100μF</td> </tr> <tr> <td>≤20% 0402\geq2.2μF</td> </tr> <tr> <td rowspan="2" style="text-align: center;">4V</td> <td rowspan="2" style="text-align: center;">≤15%</td> <td>-- --</td> </tr> </tbody> </table> <p>*1.R.: \geq10GΩ OR RxC\geq500Ω-F whichever is smaller.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Class II (X7R)</th> <th style="text-align: left;">INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>RATED VOLTAGE</td> <td rowspan="8" style="text-align: center; vertical-align: middle;">10GΩ or RxC\geq100 Ω-F whichever is smaller.</td> </tr> <tr> <td>100V: X7R</td> </tr> <tr> <td>50V: 0603\geq1μF; 0805\geq1μF; 1206\geq4.7μF; 1210\geq4.7μF</td> </tr> <tr> <td>35V: 0805\geq2.2μF; 1210\geq10μF</td> </tr> <tr> <td>25V: 0402\geq1μF; 0603\geq2.2μF; 0805\geq2.2μF; 1206\geq10μF; 1210\geq10μF</td> </tr> <tr> <td>16V: 0402\geq0.22μF; 0603\geq1μF; 0805\geq2.2μF; 1206\geq10μF; 1210\geq47μF</td> </tr> <tr> <td>10V: 0402\geq0.47μF; 0603\geq0.47μF; 0805\geq2.2μF; 1206\geq4.7μF; 1210\geq47μF</td> </tr> <tr> <td>6.3V; 4V</td> </tr> </tbody> </table> <p>- Dielectric strength - No evidence of damage or flash over during test. - Temperature Coefficient - Capacitance Change: NPO: Within \pm30ppm/°C X7R: Within \pm15%</p>	RATED VOL.	D.F. \leq	EXCEPTION OF D.F. \leq	≥50V	≤2.5%	≤3% 0603 \geq 0.047 μ F; 0805 \geq 0.18 μ F; 1206 \geq 0.47 μ F	≤5% 1210 \geq 4.7 μ F	35V	≤3.5%	≤10% 0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 10 μ F	≤5% 0805 \geq 2.2 μ F; 1210 \geq 10 μ F	25V	≤3.5%	≤7% 0603 \geq 0.33 μ F; 1206 \geq 4.7 μ F	≤10% 0402 \geq 0.10 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 6.8 μ F; 1210 \geq 22 μ F	16V	≤3.5%	0402 \geq 0.033 μ F; 0603 \geq 0.15 μ F; 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F; 1210 \geq 4.7 μ F	≤10% 0402 \geq 0.22 μ F; 0603 \geq 0.68 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F	10V	≤5%	0402 \geq 0.33 μ F; 0603 \geq 0.33 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 22 μ F	≤15% 0402 \geq 1 μ F	6.3V	≤10%	0402 \geq 1 μ F; 0603 \geq 10 μ F; 0805 \geq 4.7 μ F; 1206 \geq 47 μ F; 1210 \geq 100 μ F	≤20% 0402 \geq 2.2 μ F	4V	≤15%	-- --	Class II (X7R)	INSULATION RESISTANCE	RATED VOLTAGE	10G Ω or RxC \geq 100 Ω -F whichever is smaller.	100V: X7R	50V: 0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 4.7 μ F	35V: 0805 \geq 2.2 μ F; 1210 \geq 10 μ F	25V: 0402 \geq 1 μ F; 0603 \geq 2.2 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 10 μ F	16V: 0402 \geq 0.22 μ F; 0603 \geq 1 μ F; 0805 \geq 2.2 μ F; 1206 \geq 10 μ F; 1210 \geq 47 μ F	10V: 0402 \geq 0.47 μ F; 0603 \geq 0.47 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 47 μ F	6.3V; 4V
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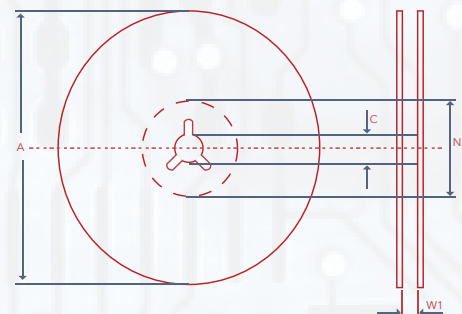
RELIABILITY TEST CONDITIONS AND DIMENSIONS

NO.	TEST ITEM	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 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. 	<ul style="list-style-type: none"> No remarkable damage. Cap change: <ul style="list-style-type: none"> 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	<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 especified tolerance. Q/D.F. value: <ul style="list-style-type: none"> NPO: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C <p>X7R:</p> <table border="1"> <thead> <tr> <th>RATED VOL.</th> <th>D.F. ≤</th> <th>EXCEPTION OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥50V</td> <td>≤2.5%</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 rowspan="2">35V</td> <td>≤3.5%</td> <td>≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF</td> </tr> <tr> <td>≤5%</td> <td>0805≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="2">25V</td> <td>≤3.5%</td> <td>≤5% 0805≥1μF; 1210≥10μF</td> </tr> <tr> <td>≤7%</td> <td>0603≥0.33μF; 1206≥4.7μF</td> </tr> <tr> <td rowspan="2">16V</td> <td>≤3.5%</td> <td>≤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">10V</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>≤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>≤10%</td> <td>≤15% 0402≥1μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>0402≥2.2μF</td> </tr> </tbody> </table>	RATED VOL.	D.F. ≤	EXCEPTION OF D.F. ≤	≥50V	≤2.5%	0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤5%	1210≥4.7μF	35V	≤3.5%	≤10% 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥10μF	≤5%	0805≥2.2μF; 1210≥10μF	25V	≤3.5%	≤5% 0805≥1μF; 1210≥10μF	≤7%	0603≥0.33μF; 1206≥4.7μF	16V	≤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	10V	≤3.5%	≤10% 0402≥0.22μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF	≤5%	≤10% 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	6.3V	≤10%	≤15% 0402≥1μF	≤20%	0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF	4V	≤15%	0402≥2.2μF
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20.	Beam Load Test AEC-Q200-003	<ul style="list-style-type: none"> Break strength test Beam speed: 2.5±0.25 mm/sec 	<ul style="list-style-type: none"> 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



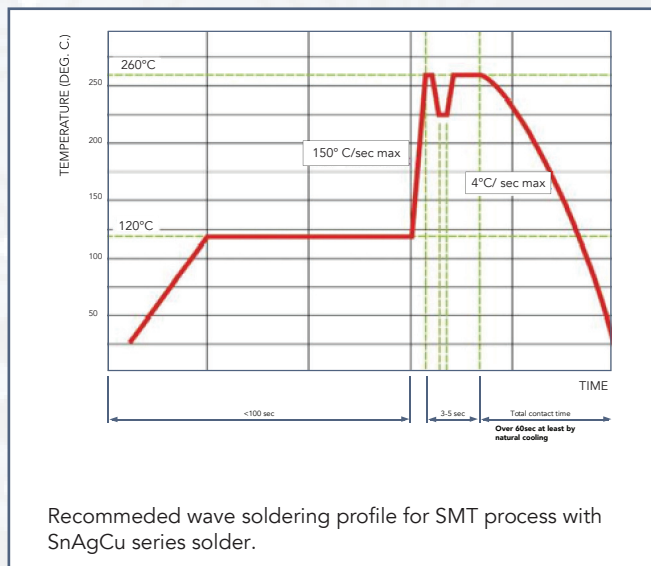
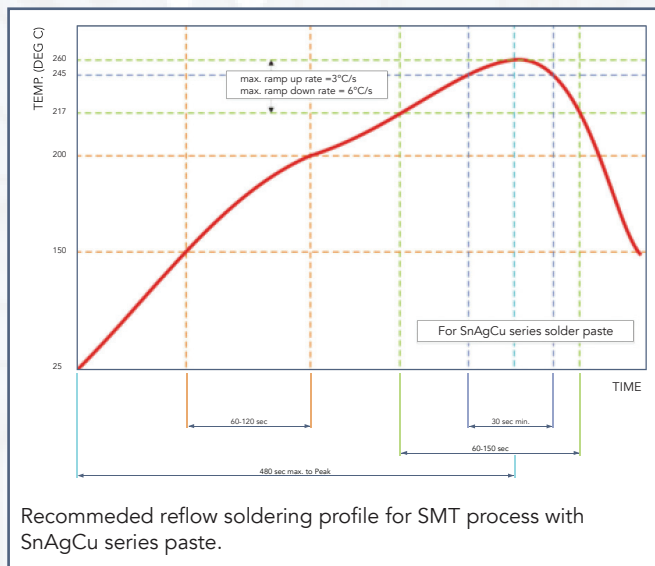
SIZE	0402		0603		0805			1206	
THICKNESS	N	S, B	A	X	M, C, I	X	M, J, C	E	
A ₀	0.62±0.05	1.02±0.05	1.05±0.10	1.05±0.10	<1.57	2.00±0.10	<1.85	<1.95	
B ₀	1.20±0.05	0.95±0.05	2.30±0.10	2.30±0.10	<2.40	3.50±0.10	<3.46	<3.67	
T	0.60±0.05	0.95±0.05	0.75±0.05	0.95±0.05	0.23±0.05	0.95±0.05	0.23±0.05	0.23±0.05	
K 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	
10 X P ₀	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 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	1.55±0.05	1.55±0.05	1.55±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"	10"
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

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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