



# H SERIES HIGH Q CAPACITOR SPEC

Rev. C

## FEATURES:

- High Q and low ESR
- Extend working range for wireless products
- Extend battery life of portable devices

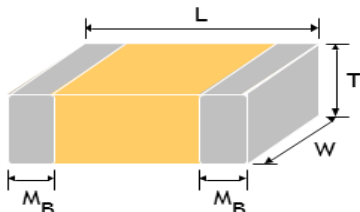
## PART NUMBER DESCRIPTION

0402	H	250	N	0R1	B	C	T
Size	Series	Rated Voltage (VDC)	Dielectric	Capacitance	Tolerance	Termination	Packaging
0201 (0603)	H: High Q, Low ESR	6R3=6.3	N: NP0	0R1=0.10pF	A: ±0.05pF	C=Cu/Ni/Sn	T=7" Paper Tape
0402 (1005)		100=10		0R5=0.5pF	B: ±0.1pF		U=13" Paper Tape
0603 (1608)		160=16		1R0=1.0pF	C: ±0.25pF		E=7" Plastic Tape
0805 (2012)		250=25		100=10pF	D: ±0.5pF		Q=13" Plastic Tape
		500=50		101=100pF	F: ±1%		Z or blank=Bulk
		101=100			G: ±2%		
		201=200			J: ±5%		
		251=250					
501=500							
631=630							

## General Electrical Data

Dielectric	NP0
Size	0201, 0402, 0603, 0805
Capacitance Range	0201: 0.2pF to 33pF 0402: 0.2pF to 470pF 0603: 0.5pF to 3300pF 0805: 0.5pF to 390pF
Capacitance tolerance	Cap≤5pF: A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: B (±0.1pF), C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)
Rated voltage (WVDC)	16V, 25V, 50V, 100V, 200V, 250V, 500V, 630V
Q	Cap≥30pF, Q≥1000 Cap<30pF, Q≥400+20C
Insulation resistance (25°C)	≥10GΩ
Operating temperature	-55°C to +125°C
Temperature coefficient of capacitance	±30ppm/°C
Termination	Ni/Sn (lead-free termination)

## External Dimensions

Outline	Case Size EIA (mm)	L (mm)	W (mm)	T (mm)	Soldering Method	M <sub>B</sub> (mm)
	0201 (0603)	0.6 ± 0.03	0.3 ± 0.03	0.3 ± 0.03	R	0.15 ± 0.05
	0402 (1005)	1.0 ± 0.05	0.5 ± 0.05	0.5 ± 0.05	R	0.25 +0.05/-0.1
		1.0 ± 0.2	0.5 ± 0.2	0.5 ± 0.2		
	0603 (1608)	1.6 ± 0.1	0.8 ± 0.1	0.8 ± 0.07	R / W	0.4 ± 0.15
		1.6 +0.15/-0.1	0.8 +0.15/-0.1	0.5 ± 0.1		
		1.6 ± 0.2	0.8 ± 0.2	0.8 ± 0.2		
	0805 (2012)	2.0 ± 0.15	1.25 ± 0.1	0.5 ± 0.1	R / W	0.5 ± 0.2
				0.6 ± 0.1	R / W	
				0.8 ± 0.1	R / W	
		1.25 ± 0.1	R			
		2.0 ± 0.2	1.25 ± 0.2	0.85 ± 0.1	R / W	
				1.25 ± 0.2	R	

## Thickness Codes/Packaging Quantity

Case Size	Size Code	Max Thickness	Length	Width	Thickness	Paper Tape		Embossed Plastic Tape	
						7" Reel	13" Reel	7" Reel	13" Reel
0201	AA	0.33	0.6 ± 0.03	0.3 ± 0.03	0.3 ± 0.03	15,000	70,000	-	-
0402	BA	0.55	1.0 ± 0.05	0.5 ± 0.05	0.5 ± 0.05	10,000	50,000	-	-
	BC	0.7	1.0 ± 0.2	0.5 ± 0.2	0.5 ± 0.2	10,000	-	-	-
0603	CA	0.87	1.6 ± 0.1	0.8 ± 0.1	0.8 ± 0.07	4,000	15,000	-	-
	CC	0.95	1.6 +0.15/-0.01	0.8 +0.15/-0.1	0.8 ± +0.15/-0.1	4,000	15,000	-	-
	CD	1	1.6 ± 0.2	0.8 ± 0.2	0.8 ± 0.2	4,000	15,000	-	-
0805	DB	0.7	2.0 ± 0.15	1.25 ± 0.1	0.6 ± 0.1	4,000	15,000	-	-
	DC	0.9	2.0 ± 0.15	1.25 ± 0.1	0.8 ± 0.1	4,000	15,000	-	-
	DD	1.35	2.0 ± 0.15	1.25 ± 0.1	1.25 ± 0.1	-	-	3,000	10,000
	DE	0.95	2.0 ± 0.2	1.25 ± 0.2	0.85 ± 0.1	4,000	15,000	-	-
	DF	1.45	2.0 ± 0.2	1.25 ± 0.2	1.25 ± 0.2	-	-	3,000	10,000



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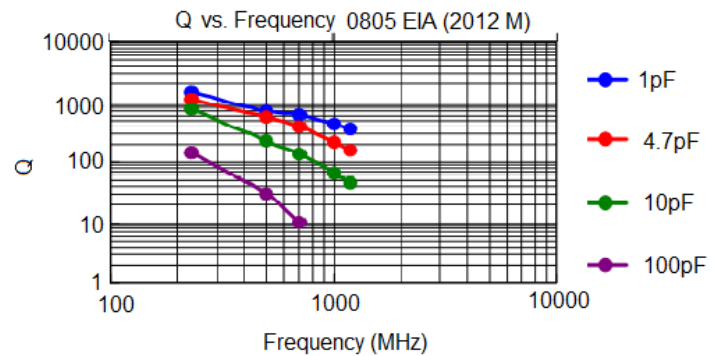
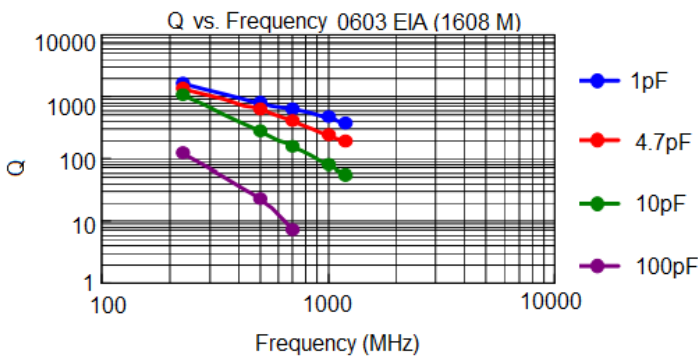
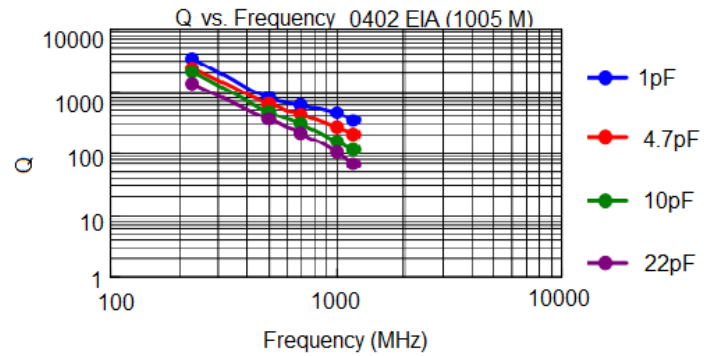
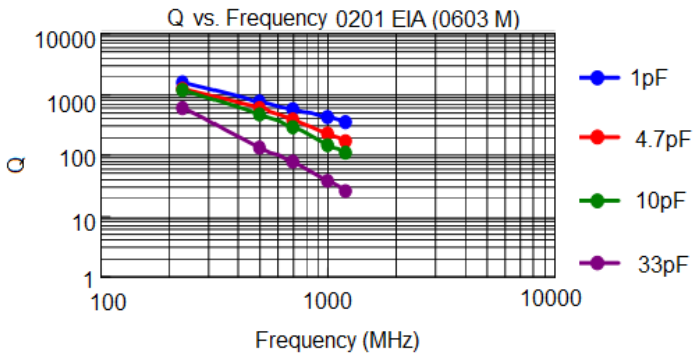
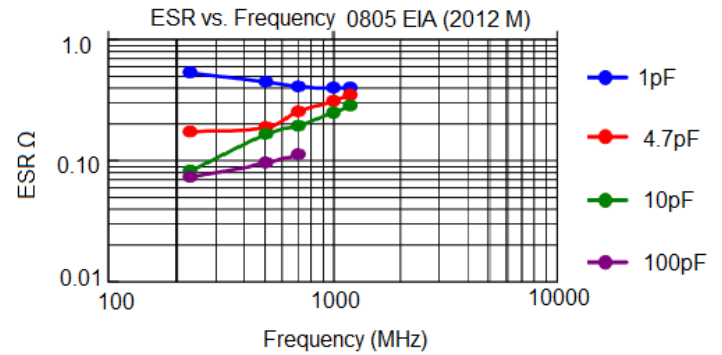
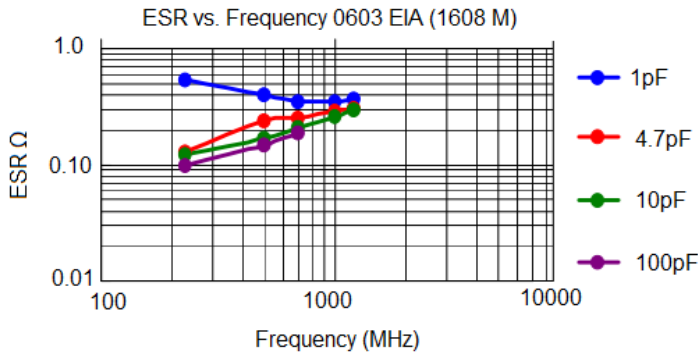
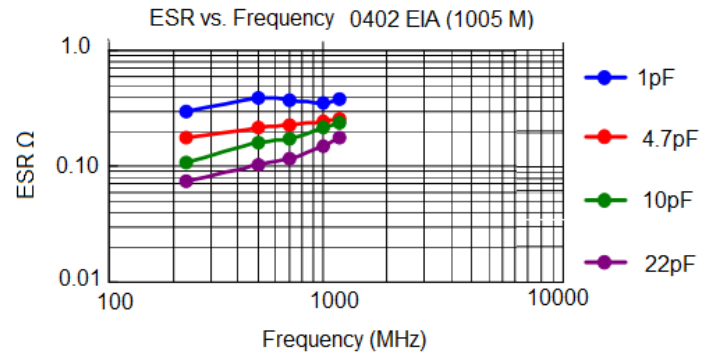
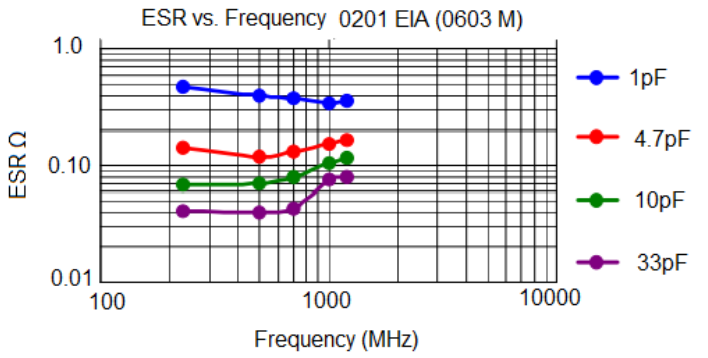
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		Tolerance	0201				0402				0603					0805						
			10	16	25	50	10	25	50	100	10	25	50	100	200	10	25	50	200	500		
			DC Volts																			
0R2	0.2pF	A	AA	AA	AA	AA	BA	BA	BA	BA												
0R3	0.3pF		AA	AA	AA	AA	BA	BA	BA	BA												
0R5	0.5pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC				
0R6	0.6 pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC				
0R7	0.7 pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC				
0R8	0.8 pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC				
0R9	0.9 pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC				
1R0	1.0 pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
1R2	1.2 pF		B	AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
1R5	1.5 pF			AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
1R8	1.8 pF			AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
2R0	2.0pF			AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
2R2	2.2 pF			AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
2R4	2.4pF			AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
2R7	2.7 pF			AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
3R0	3.0pF			AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
3R3	3.3 pF			C	AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC
3R6	3.6 pF				AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC
3R9	3.9 pF		AA		AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
4R7	4.7 pF		AA		AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
5R0	5.0pF	AA	AA		AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
5R6	5.6pF	AA	AA		AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
6R0	6.0pF	AA	AA		AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
6R8	6.8 pF	AA	AA		AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
7R5	7.5 pF	D	AA		AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
8R0	8.0pF		AA		AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
8R2	8.2pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
9R0	9.0pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
100	10 pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
120	12 pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
130	13pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
150	15 pF		AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
180	18 pF		E	AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
220	22 pF			AA	AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC	
240	24pF	AA		AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
270	27 pF	AA		AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
330	33 pF	AA		AA	AA	AA	BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
390	39 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
470	47 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
560	56 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
680	68 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
820	82 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
101	100 pF	F					BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DC	DC	DC		
121	120 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DD	DD	DD	DD	DD		
151	150 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DD	DD	DD	DD	DD		
181	180 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DD	DD	DD	DD	DD		
221	220 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DD	DD	DD	DD	DD		
271	270 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DD	DD	DD		
331	330 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DC	DC	DD	DD	DD		
391	390 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA	DD	DD	DD	DD	DD		
471	470 pF						BA	BA	BA	BA	CA	CA	CA	CA	CA							
561	560 pF										CA	CA	CA	CA	CA							
681	680 pF									CA	CA	CA	CA	CA								
821	820 pF									CA	CA	CA	CA	CA								
102	1,000 pF									CA	CA	CA	CA	CA								
122	1,200 pF									CA	CC	CC										
152	1,500 pF									CA	CC	CC										
182	1,800 pF									CA	CC	CC										
222	2,200 pF									CA	CC	CC										
272	2,700 pF									CA	CC	CC										
332	3,300 pF									CA	CC	CC										



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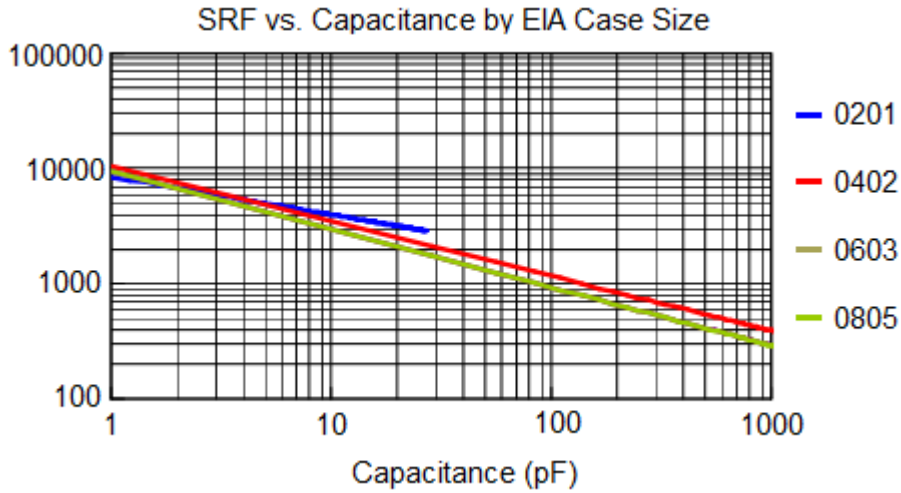
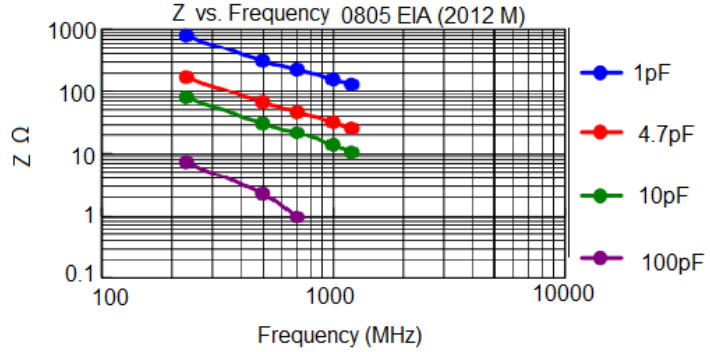
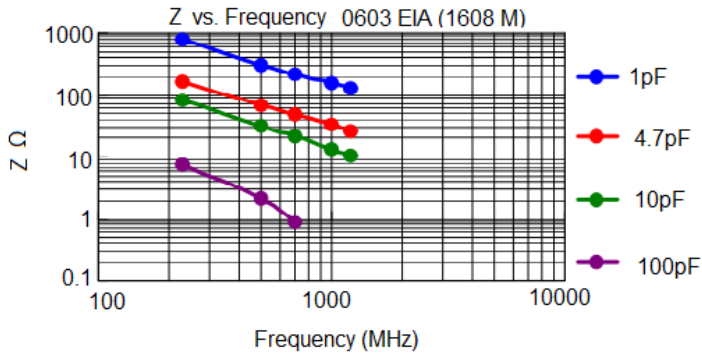
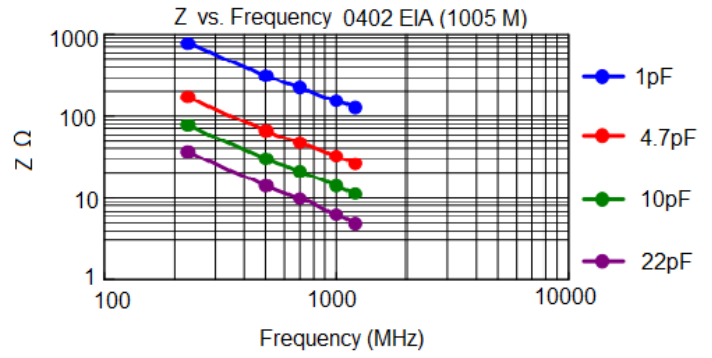
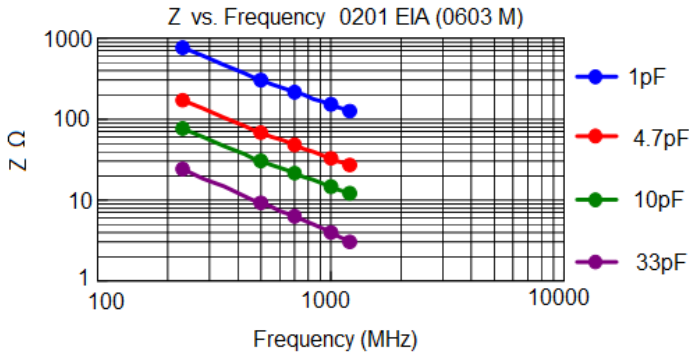
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Item	Test Condition	Requirements																																																																																				
1 Visual and Mechanical	---	* No remarkable defect * Dimensions conform to individual specification sheet																																																																																				
2 Capacitance		* Shall not exceed the limits given in the detailed spec NPO: Cap≥30pF, Q≥1000, Cap<30pF, Q≥400+20C X7R, X5R:																																																																																				
3 Q/ DF (Dissipation Factor)	Class I: NPO Class I: NPO Cap≤1,000pF 1.0±0.2Vrms, 1MHz±10% Cap>1,000pF 1.0±0.2Vrms, 1KHz±10%  Class II: X7R, X5R, Y5V Cap≤10μF, 1.0±0.2Vrms, 1KHz±10% ** Cap>10μF, 0.5±0.2Vrms, 120Hz±20%  ** Test condition: 0.5±0.2Vrms, 1KHz±10% X7R: 0603≥225 (10V), 0805=106 (6.3V&10V) X5R: 0201≥224 (6.3V), 0402≥475 (6.3V), 0402≥225(10V),0603=106 (6.3V)	<table border="1"> <thead> <tr> <th>Rated voltage (DCV)</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥ 50V</td> <td rowspan="3">≤ 2.5%</td> <td>≤3%</td> <td>0201(50V), 0603 ≥ 0.047μF, 0805 ≥ 0.18μF, 1206 ≥ 0.47μF</td> </tr> <tr> <td>≤5%</td> <td>1210 ≥ 4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0603≥1μF, 0805≥1μF, 1206≥2.2μF, 1210≥10μF</td> </tr> <tr> <td>35V</td> <td>≤3.5%</td> <td>≤10%</td> <td>0805≥2.2μF, 1210≥10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤3.5%</td> <td>≤5%</td> <td>0201≥0.01μF, 0805≥1μF, 1210≥10μF</td> </tr> <tr> <td>≤7%</td> <td>0603≥0.33μF, 1206≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.10μF, 0603≥0.47μF, 0805≥2.2μF,</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤3.5%</td> <td>≤5%</td> <td>0201≥0.01μF, 0402≥0.033μF, 0603≥0.15μF, 0805≥0.68μF, 1206≥2.2μF, 1210≥4.7μF</td> </tr> <tr> <td>≤10%</td> <td>0402≥ 0.22μF, 0603≥0.68μF, 0805≥2.2μF, 1206≥4.7μF, 1210≥22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.012μF, 0402≥0.33μF, 0603≥0.33μF, 0805 ≥2.2μF, 1206≥2.2μF, 1210≥22μF</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.1μF, 0402≥1μF</td> </tr> <tr> <td rowspan="3">6.3V</td> <td rowspan="3">≤10%</td> <td>≤15%</td> <td>0201≥0.1μF, 0402≥1μF, 0603≥10μF, 0805≥4.7μF, 1206≥47μF :1210≥100μF</td> </tr> <tr> <td>≤20%</td> <td>0402≥2.2μF</td> </tr> <tr> <td>---</td> <td>---</td> </tr> <tr> <td>4V</td> <td>≤15%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>D.F. ≤</th> <th colspan="2">Exception of D.F. ≤</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤5%</td> <td>≤7%</td> <td>0603≥0.1μF, 0805≥0.47μF, 1206≥4.7μF, Cap≥1μF</td> </tr> <tr> <td>35V</td> <td>≤7%</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤5%</td> <td>≤7%</td> <td>0402≥0.047μF, 0603≥0.1μF, 0805≥0.33μF, 1206≥1μF, 1210≥4.7μF</td> </tr> <tr> <td>≤9%</td> <td>0402≥0.068μF, 0603≥0.47μF, 1206≥4.7μF, 1210≥22μF, Cap≥1μF</td> </tr> <tr> <td>16V (C&lt;1.0μF)</td> <td>≤7%</td> <td>≤9%</td> <td>0402≥0.068μF, 0603≥0.68μF</td> </tr> <tr> <td rowspan="2">16V (C≥1.0μF)</td> <td rowspan="2">≤9%</td> <td>≤12.5%</td> <td>0402≥0.22μF</td> </tr> <tr> <td>≤12.5%</td> <td>0603≥2.2μF, 0805≥3.3μF, 1206≥10μF, 1210≥22μF, 1812≥47μF, Cap≥1μF</td> </tr> <tr> <td>10V</td> <td>≤12.5%</td> <td>≤20%</td> <td>0402≥0.47μF</td> </tr> <tr> <td>6.3V</td> <td>≤20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table>	Rated voltage (DCV)	D.F. ≤	Exception of D.F. ≤		≥ 50V	≤ 2.5%	≤3%	0201(50V), 0603 ≥ 0.047μF, 0805 ≥ 0.18μF, 1206 ≥ 0.47μF	≤5%	1210 ≥ 4.7μF	≤10%	0603≥1μF, 0805≥1μF, 1206≥2.2μF, 1210≥10μF	35V	≤3.5%	≤10%	0805≥2.2μF, 1210≥10μF	25V	≤3.5%	≤5%	0201≥0.01μF, 0805≥1μF, 1210≥10μF	≤7%	0603≥0.33μF, 1206≥4.7μF	≤10%	0402≥0.10μF, 0603≥0.47μF, 0805≥2.2μF,	16V	≤3.5%	≤5%	0201≥0.01μF, 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%	0201≥0.012μF, 0402≥0.33μF, 0603≥0.33μF, 0805 ≥2.2μF, 1206≥2.2μF, 1210≥22μF	≤15%	0201≥0.1μF, 0402≥1μF	6.3V	≤10%	≤15%	0201≥0.1μF, 0402≥1μF, 0603≥10μF, 0805≥4.7μF, 1206≥47μF :1210≥100μF	≤20%	0402≥2.2μF	---	---	4V	≤15%	---	---	Rated voltage	D.F. ≤	Exception of D.F. ≤		≥50V	≤5%	≤7%	0603≥0.1μF, 0805≥0.47μF, 1206≥4.7μF, Cap≥1μF	35V	≤7%	---	---	25V	≤5%	≤7%	0402≥0.047μF, 0603≥0.1μF, 0805≥0.33μF, 1206≥1μF, 1210≥4.7μF	≤9%	0402≥0.068μF, 0603≥0.47μF, 1206≥4.7μF, 1210≥22μF, Cap≥1μF	16V (C<1.0μF)	≤7%	≤9%	0402≥0.068μF, 0603≥0.68μF	16V (C≥1.0μF)	≤9%	≤12.5%	0402≥0.22μF	≤12.5%	0603≥2.2μF, 0805≥3.3μF, 1206≥10μF, 1210≥22μF, 1812≥47μF, Cap≥1μF	10V	≤12.5%	≤20%	0402≥0.47μF	6.3V	≤20%	---	---
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4 Dielectric Strength	*To apply voltage(≤100V) 250%. *Duration: 1 to 5 sec. *Charge & discharge current less than 50mA  *To apply voltage: 200V ~ 300V & LD series ≥2 times V DC 500V ~ 999V ≥1.5 times V DC 1000V ~ 3000V ≥1.2 times V DC *Cut-off, set at 10mA *TEST= 15 sec. *RAMP=0	*No evidence of damage or flash over during test.																																																																																				
5 Insulation Resistance	To apply rated voltage for max. 120 sec.	10GΩ or RxC≥500Ω-F whichever is lower. Class II (X7R, X7E, X5R, Y5V): <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: X7R</td> <td rowspan="6">10GΩ or RxC≥100 Ω-F whichever is lower.</td> </tr> <tr> <td>50V:0603≥1μF, 0805≥1μF, 1206≥2.2μF, 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:0201≥47nF, 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF,</td> </tr> </tbody> </table>	Rated voltage	Insulation Resistance	100V: X7R	10GΩ or RxC≥100 Ω-F whichever is lower.	50V:0603≥1μF, 0805≥1μF, 1206≥2.2μF, 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:0201≥47nF, 0402≥0.47μF, 0603≥0.47μF, 0805≥2.2μF,																																																																											
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7 Adhesive Strength of Termination	*Pressurizing force : 0201: 2N 0402 & 0603: 5N >0603: 10N *Test time : 10 ±1 sec	* No remarkable damage or removal of the terminations.																																																																																				



# H SERIES HIGH Q CAPACITOR SPEC

Rev. C

Item	Test Condition	Requirements																																																																																									
8	Vibration Resistance * Vibration frequency: 10~55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hours (Two hrs each in three mutually perpendicular directions) * Measurement to be made after keeping at room temp. for 24±2 hours	* No remarkable damage. * Cap change and Q/D.F.: To meet initial spec.																																																																																									
9	Solderability * Solder temperature: 235±5°C * Dipping time: 2±0.5 sec.	95% min. coverage of all metalized area.																																																																																									
10	Bending Test * The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of approximately 1 mm per second until the deflection becomes 1 mm 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. * Capacitance change : NP0: within ±5% or 0.5pF whichever is larger X7R, X7E, X5R: within ±12.5% Y5V: within ±30% (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.)																																																																																									
11	Resistance to Soldering Heat * Solder temperature: 260±5°C * Dipping time: 10±1 sec * Preheating: 120 to 150°C for 1 minute before immersing the capacitor in an eutectic solder. * Before initial measurement (Class II 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.	* No remarkable damage. * Capacitance change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X7E, X5R: within ±7.5% Y5V: within ±20% * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge.																																																																																									
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13	Humidity (Damp Heat) Steady State * Test temp.: 40±2°C * Humidity: 90~95% RH * Test time: 500+24/-0hrs. * Before initial measurement (Class II 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.	* No remarkable damage. * Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X7E, X5R: ≥10V**, within ±12.5%; 6.3V within ±25%; TT series, within ±25% **10V:0603≥4.7µF;0402≥1µF;0201≥0.1µF, within ±25%; Y5V: ≥10V, within ±30%; 6.3V, within +30/-40% * Q/D.F. value: NP0: More than 30pF Q≥350, 10pF≤C≤30pF, Q≥275+2.5C, Less than 10pF Q≥200+10C  X7R, X5R: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.≤</th> <th colspan="2">Exception of D.F.≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥50V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>0201(50V); 0603≥0.047µF; 0805≥0.18µF; 1206≥0.47µF</td> </tr> <tr> <td>≤10%</td> <td>1210≥4.7µF</td> </tr> <tr> <td>≤20%</td> <td>0603≥1µF; 0805≥1µF; 1206≥2.2µF; 1210≥10µF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤5%</td> <td>≤20%</td> <td>0805≥2.2µF; 1210≥10µF</td> </tr> <tr> <td>≤10%</td> <td>0201≥0.01µF; 0805≥1µF; 1210≥10µF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤14%</td> <td>0603≥0.33µF; 1206≥4.7µF</td> </tr> <tr> <td>≤15%</td> <td>6≥6.8µF; 1210≥22µF</td> </tr> <tr> <td>≤10%</td> <td>0603≥0.15µF; 0805≥0.68µF; 1206≥2.2µF; 1210≥4.7µF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0201≥0.01µF; 0402≥0.033µF; 0603≥0.68µF; 0805≥2.2µF; 1206≥4.7µF; 1210≥22µF</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.012µF; 0402≥0.33µF; 0603≥0.33µF; 0805≥2.2µF; 1206≥2.2µF;</td> </tr> <tr> <td>10V</td> <td>≤7.5%</td> <td>≤15%</td> <td>0201≥0.1µF; 0402≥1µF; 0603≥10µF; 0805≥4.7µF;</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201≥0.1µF; 0402≥1µF; 0603≥10µF; 0805≥4.7µF;</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> Y5V: <table border="1"> <thead> <tr> <th>Rated vol.</th> <th>D.F.≤</th> <th colspan="2">Exception of D.F.≤</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤7.5%</td> <td>≤10%</td> <td>0603≥0.1µF; 0805≥0.47µF; 1206≥4.7µF; Cap≥1µF</td> </tr> <tr> <td>35V</td> <td>≤10%</td> <td>---</td> <td>---</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤7.5%</td> <td>≤10%</td> <td>0402≥0.047µF; 0603≥0.1µF; 0805≥0.33µF; 1206≥1µF; 1210≥4.7µF</td> </tr> <tr> <td>≤15%</td> <td>0402≥0.068µF; 0603≥0.47µF; 1206≥4.7µF; 1210≥22µF; Cap≥1µF</td> </tr> <tr> <td>≤12.5%</td> <td>0402≥0.068µF; 0603≥0.68µF</td> </tr> <tr> <td>16V (C&lt;1.0µF)</td> <td>≤10%</td> <td>≤20%</td> <td>0402≥0.22µF</td> </tr> <tr> <td>16V (C≥1.0µF)</td> <td>≤12.5%</td> <td>≤20%</td> <td>0603≥2.2µF; 0805≥3.3µF; 1206≥10µF; 1210≥22µF; 1812≥47µF; Cap≥1µF</td> </tr> <tr> <td>10V</td> <td>≤20%</td> <td>≤30%</td> <td>0402≥0.47µF</td> </tr> <tr> <td>6.3V</td> <td>≤30%</td> <td>---</td> <td>---</td> </tr> </tbody> </table> *I.R.: ≥10V, 1GΩ or 50 Ω-F whichever is lower. 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# H SERIES HIGH Q CAPACITOR SPEC

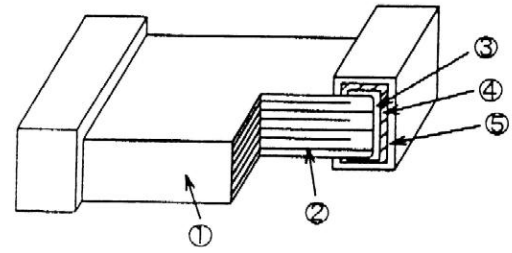
Rev. C

Item	Test Condition	Requirements																																																																																																																																
14	Humidity (Damp Heat) Load	<p>* No remarkable damage. Cap change: NPO: <math>\pm 7.5\%</math> or <math>0.75pF</math> whichever is larger. X7R, X7E, X5R: <math>\geq 10V^{**}</math>, within <math>\pm 12.5\%</math>; <math>6.3V</math> within <math>\pm 25\%</math>; **<math>10V:0603 \geq 4.7\mu F; 0402 \geq 1\mu F; 0201 \geq 0.1\mu F</math>, within <math>\pm 25\%</math>; Y5V: <math>\geq 10V</math>, within <math>\pm 30\%</math>; <math>6.3V</math>, within <math>+30/-40\%</math> Q/D.F. value: NPO: <math>C \geq 30pF, Q \geq 200; C &lt; 30pF, Q \geq 100+10/3C</math> X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq 50V</math></td> <td rowspan="3"><math>\leq 3\%</math></td> <td><math>\leq 6\%</math></td> <td>0201(50V);0603<math>\geq 0.047\mu F</math>; 0805<math>\geq 0.18\mu F</math>; 1206<math>\geq 0.47\mu F</math></td> </tr> <tr> <td><math>\leq 10\%</math></td> <td>1210<math>\geq 4.7\mu F</math></td> </tr> <tr> <td><math>\leq 20\%</math></td> <td>0603<math>\geq 1\mu F</math>; 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15	High Temperature Load (Endurance)	<p>* Test temp. : NPO, X7R/X7E: <math>125 \pm 3^{\circ}C</math> X5R, Y5V: <math>85 \pm 3^{\circ}C</math> * Test time: 1000+24/0 hrs. * To apply voltage: (1) <math>6.3V</math> or <math>C \geq 10\mu F</math> 150% of rated voltage; (2) <math>10VsUr &lt; 500V</math>: 200% of rated voltage. (3) <math>500V</math>: 150% of rated voltage. (4) <math>Ur \geq 630V</math>: 120% of rated voltage.(5) 100% of rated voltage for below range:</p> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> </tr> </thead> <tbody> <tr> <td>0201</td> <td>X5R/X7R</td> <td>6.3V, 10V</td> </tr> <tr> <td>0402</td> <td>X5R/X7R</td> <td>6.3V, 10V</td> </tr> <tr> <td>0603</td> <td>X5R/X7R</td> <td>6.3V, 10V</td> </tr> <tr> <td>0805</td> <td>X5R/X7R</td> <td>6.3V</td> </tr> <tr> <td rowspan="2">1206</td> <td>X5R/X7R</td> <td>6.3V</td> </tr> <tr> <td>NPO</td> <td>3000V</td> </tr> </tbody> </table> <p>(6) 150% of rated voltage for below range:</p> <table border="1"> <thead> <tr> <th>Size</th> <th>Dielectric</th> <th>Rated voltage</th> <th>Capacitance</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0402</td> <td>X5R/X7R</td> <td>10V, 16V, 25V</td> <td>C<math>\geq 0.22\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C<math>\geq 0.47\mu F</math></td> </tr> <tr> <td rowspan="2">0603</td> <td>X5R/X7R</td> <td>10V, 16V</td> <td>C<math>\geq 1.0\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C<math>\geq 2.2\mu F</math></td> </tr> <tr> <td rowspan="2">0805</td> <td>X5R/X7R</td> <td>10V</td> <td>C<math>\geq 4.7\mu F</math></td> </tr> <tr> <td>Y5V</td> <td>16V</td> <td>C<math>\geq 4.7\mu F</math></td> </tr> </tbody> </table> <p>* Before initial measurement (Class II only): To apply test voltage for 1hr at test temp. and then set for 24<math>\pm 2</math> hrs at room temp. * Measurement to be made after keeping at room temp. for 24<math>\pm 2</math> hrs.</p> <p>* No remarkable damage. Cap change: NPO: <math>\pm 3.0\%</math> or <math>\pm 0.3pF</math> whichever is larger X7R, X7E, X5R: <math>\geq 10V^{**}</math>, within <math>\pm 12.5\%</math>; <math>6.3V</math> within <math>\pm 25\%</math>; **<math>10V:0603 \geq 4.7\mu F; 0402 \geq 1\mu F; 0201 \geq 0.1\mu F</math>, within <math>\pm 25\%</math>; Y5V: <math>\geq 10V</math>, within <math>\pm 30\%</math>; <math>6.3V</math>, within <math>+30/-40\%</math> Q/D.F. value: NPO: More than <math>30pF, Q \geq 350</math>; <math>10pF &lt; C &lt; 30pF, Q \geq 275+2.5C</math>; Less than <math>10pF, Q \geq 200+10C</math> X7R, X5R:</p> <table border="1"> <thead> <tr> <th>Rated voltage</th> <th>D.F. <math>\leq</math></th> <th colspan="2">Exception of D.F. <math>\leq</math></th> </tr> </thead> <tbody> <tr> <td rowspan="3"><math>\geq 50V</math></td> <td rowspan="3"><math>\leq 3\%</math></td> <td><math>\leq 6\%</math></td> <td>0201(50V);0603<math>\geq 0.047\mu F</math>; 0805<math>\geq 0.18\mu F</math>; 1206<math>\geq 0.47\mu F</math></td> </tr> <tr> <td><math>\leq 10\%</math></td> <td>1210<math>\geq 4.7\mu F</math></td> </tr> <tr> <td><math>\leq 20\%</math></td> <td>0603<math>\geq 1\mu F</math>; 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0805 $\geq 0.18\mu F$ ; 1206 $\geq 0.47\mu F$	$\leq 10\%$	1210 $\geq 4.7\mu F$	$\leq 20\%$	0603 $\geq 1\mu F$ ; 0805 $\geq 1\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$	35V	$\leq 5\%$	$\leq 20\%$	0805 $\geq 2.2\mu F$ ; 1210 $\geq 10\mu F$	25V	$\leq 5\%$	$\leq 10\%$	0201 $\geq 0.01\mu F$ ; 0805 $\geq 1\mu F$ ; 1210 $\geq 10\mu F$	$\leq 14\%$	0603 $\geq 0.33\mu F$ ; 1206 $\geq 4.7\mu F$	$\leq 15\%$	0402 $\geq 0.10\mu F$ ; 0603 $\geq 0.47\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 6.8\mu F$ ; 1210 $\geq 22\mu F$	16V	$\leq 5\%$	$\leq 10\%$	0603 $\geq 0.15\mu F$ ; 0805 $\geq 0.68\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 4.7\mu F$	$\leq 15\%$	0201 $\geq 0.01\mu F$ ; 0402 $\geq 0.033\mu F$ ; 0603 $\geq 0.68\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$	10V	$\leq 7.5\%$	$\leq 15\%$	0201 $\geq 0.012\mu F$ ; 0402 $\geq 0.33\mu F$ ; 0603 $\geq 0.33\mu F$ ; 0805 $\geq 2.2\mu F$ ; 1206 $\geq 2.2\mu F$ ; 1210 $\geq 22\mu F$	6.3V	$\leq 15\%$	$\leq 20\%$	0201 $\geq 0.1\mu F$ ; 0402 $\geq 1\mu F$	4V	$\leq 20\%$	---	---	Rated voltage	D.F. $\leq$	Exception of D.F. $\leq$		$\geq 50V$	$\leq 7.5\%$	$\leq 10\%$	0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.47\mu F$ ; 1206 $\geq 4.7\mu F$ ; Cap $\geq 1\mu F$	25V	$\leq 7.5\%$	$\leq 10\%$	0402 $\geq 0.047\mu F$ ; 0603 $\geq 0.1\mu F$ ; 0805 $\geq 0.33\mu F$ ; 1206 $\geq 1\mu F$ ; 1210 $\geq 4.7\mu F$	$\leq 15\%$	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.47\mu F$ ; 1206 $\geq 4.7\mu F$ ; 1210 $\geq 22\mu F$ ; Cap $\geq 1\mu F$	16V (C $< 1.0\mu F$ )	$\leq 10\%$	$\leq 12.5\%$	0402 $\geq 0.068\mu F$ ; 0603 $\geq 0.68\mu F$	16V (C $\geq 1.0\mu F$ )	$\leq 12.5\%$	$\leq 20\%$	0603 $\geq 2.2\mu F$ ; 0805 $\geq 3.3\mu F$ ; 1206 $\geq 10\mu F$ ; 1210 $\geq 22\mu F$ ; 1812 $\geq 47\mu F$ ; Cap $\geq 1\mu F$	$\leq 20\%$	0402 $\geq 0.22\mu F$	10V	$\leq 20\%$	$\leq 30\%$	0402 $\geq 0.47\mu F$	6.3V	$\leq 30\%$	---	---	Rated voltage	Insulation Resistance	100V: X7R	1G $\Omega$ or RxC $\geq 10 \Omega$ -F whichever is lower.	50V:0603 $\geq 1\mu F$ ; 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## Storage and handling

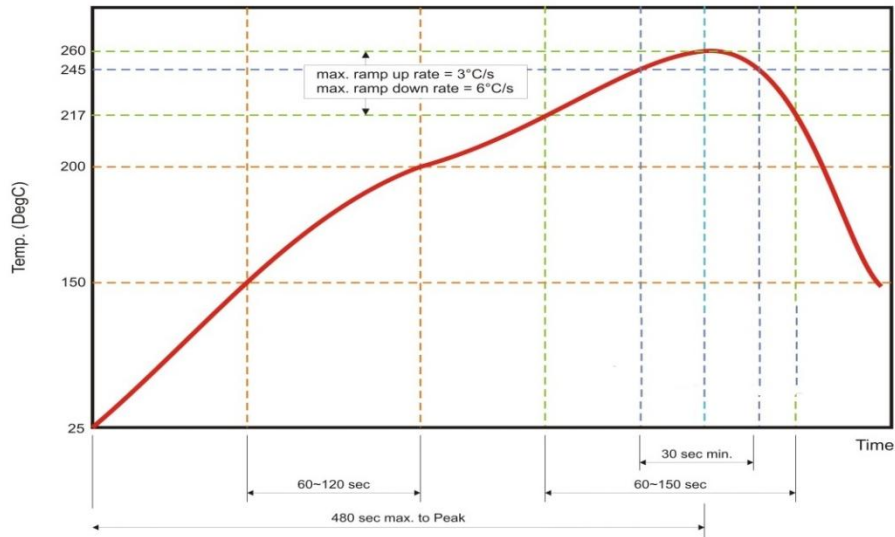
- (1) Products should be stored at 5 to 40°C ambient temperature and 20 to 80% relative humidity.
- (2) It is recommended that the product be used within one year from shipment. If longer storage is required, the product should be checked.



## Cautions

- a. Corrosive gas reacts with the terminal electrodes of capacitors. Do not store capacitors in the proximity of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas etc.) otherwise there can be solderability issues.
- b. In a corrosive atmosphere, solderability might be degraded, and/or silver migration may occur which can cause lower reliability.
- c. Dewing caused by rapid humidity changes and/or photochemical changes of the terminal electrode (caused by direct sunlight contact) can affect the solderability and electrical performance. Do not store capacitors under direct sunlight or in dewing conditions.

Recommended **reflow** profile for SnAgCu solder paste:



Recommended **wave** profile for SnAgCu solder paste:

