



**Product Family:** [Multilayer Ceramic Capacitors -General Purpose](#)  
**Part Number Series:** [CGL Series](#)

	<p><b>Construction:</b></p> <ul style="list-style-type: none"> <li>• High Density, High Efficiency Ceramic Capacitors</li> <li>• NPO, X7R, X5R and Y5V dielectric materials</li> <li>• Wrap around electrodes</li> <li>• 100% matte tin over Ni terminations (RoHS compliant) RoHS 2011/65/EU compliant and Pb Free (100% tin terminations)</li> </ul>	<p><b>Features:</b></p> <ul style="list-style-type: none"> <li>• 0201, 0402, 0603,0805, 1206, 1210, and 1812 English sizes (0603 to 4532 Metric)</li> <li>• 0.1pF to 1.0µF capacitance range—high capacitance to size ratio</li> <li>• 4V to 100V</li> <li>• High volume production suitable for commercial and special applications</li> </ul>
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**Description:**  
 These general purpose chip capacitors are ideal for consumer electronics, telecom, power supply and other applications. They feature a wide range of sizes and a high capacitance for the given component size.

**Product Dimensions:**

Outline	Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol	Soldering Method *	M <sub>B</sub> (mm)	
	0201 (0603)	0.6±0.03	0.3±0.03	0.3±0.03	L	R	0.15±0.05
		0.6±0.05 <sup>#1</sup>	0.3±0.05 <sup>#1</sup>	0.3±0.05 <sup>#1</sup>			0.15±0.1/-0.05
		0.6±0.09 <sup>#2</sup>	0.3±0.09 <sup>#2</sup>	0.3±0.09 <sup>#2</sup>			
	0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	R	0.25 +0.05/-0.10
		1.00±0.20	0.50±0.20	0.50+0.02/-0.05	Q	R	
		1.60±0.10	0.80±0.10	0.5±0.20	E	R	
	0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S	R / W	0.40±0.15
		1.60+0.15/-0.10	0.80+0.15/-0.10	0.50±0.10	H	R / W	
		1.60±0.20	0.80±0.20	0.80+0.15/-0.10	X	R / W	
	0805 (2012)	2.00±0.15	1.25±0.10	0.50±0.10	H	R / W	0.50±0.20
				0.60±0.10	A	R / W	
				0.80±0.10	B	R / W	
		1.25±0.10	D	R			
		2.00±0.20	1.25±0.20	0.85±0.10 <sup>#3</sup>	T <sup>#3</sup>	R / W	
	1206 (3216)	3.20±0.15	1.60±0.15	0.80±0.10	B	R / W	0.60±0.20 (0.5±0.25) <sup>***</sup>
				0.95±0.10	C	R	
		3.20±0.20	1.60±0.20	1.25±0.10	D	R	
		1.15±0.15	J	R			
		1.60±0.20	G	R			
	3.20+0.30/-0.10	1.60+0.30/-0.10	0.85±0.10	T	R / W		
	1210 (3225)	3.20±0.30	2.50±0.20	0.95±0.10	C	R	0.75±0.25
				0.85±0.10	T	R	
				1.25±0.10	D	R	
		3.20±0.40	2.50±0.30	1.60±0.20	G	R	
2.00±0.20		K	R				
1812 (4532)	4.50±0.40 (4.5+0.5/-0.3) <sup>**</sup>	3.20±0.30	2.50±0.30	M	R	0.75±0.25 (0.5±0.25) <sup>***</sup>	
			1.25±0.10	D	R		
	1.60±0.20	G	R				
	2.00±0.20	K	R				
	3.20±0.40	2.50±0.30	2.80±0.30	U	R		

\* R = Reflow soldering process ; W = Wave soldering process.  
 \*\* For 1808\_200V ~3kV, 1812\_200V~3kV and safety certificated products.  
 \*\*\* For 1206\_1000V ~3kV,1808\_200V ~3kV, 1812\_200V~3kV and safety certificated products.  
 #1 : For 0603/Cap ≥10µF or 0603/Cap≥4.7µF(≤6.3V) or 0603/Cap>1µF(>10V) products.  
 #2 : For 0201/Cap ≥0.68µF products.  
 #3 : For 0201/Cap ≥1µF products.  
 #4 : For 0805/0.22µF/100V/ T thickness:0.85+0.15/-0.1(mm)

**Part Numbering:** Ex: CGLC0402B101A101J-T10

Series	Termination	English Size (Metric)	Dielectric Type	Rated Voltage	Internal Code	Capacitance Value in pF	Capacitance Tolerance	T&R Packaging Quantity
CGL	C = Cu/Ni/Sn	0201 (0603) 0402 (1005) 0603 (1608) 0805 (2012) 1206 (3216) 1210 (3225) 1812 (4532)	B = X7R F = Y5V N = NPO (COG) X = X5R	3 digits with the first 2 being significant. The last digit specifies the number of zeros. "R" denotes decimal position as necessary. Ex. 6R3=6.3V 101=100V	A	3 digits with the first 2 being significant. The last digit specifies the number of zeros. "R" denotes decimal position as necessary. Ex. 1R5=1.5pF 101=100pF	A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1.0% G = ±2.0% J = ±5.0% K = ±10.0% M = ±20.0% Z = -20/+80%	-T05 = 500 -T1 = 1,000 -T2 = 2,000 -T3 = 3,000 -T4 = 4,000 -T5 = 5,000 -T6 = 6,000 -T9 = 9,000 -T10 = 10,000 -T15 = 15,000 -T50 = 50,000 -T70 = 70,000 (see packaging section for offering and corresponding reel diameter)

**Electrical Specifications:**

Dielectric	NP0	X7R	Y5V	X5R
Size	0201, 0402, 0603, 0805, 1206, 1210, 1812			
Capacitance range*	0.1pF to 0.1µF	100pF to 1µF	0.01µF to 1µF	100pF to 1µF
Capacitance tolerance**	Cap≤5pF <sup>#1</sup> : A (±0.05pF), B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%), K (±10%)	J (±5%), K (±10%), M (±20%)	M (±20%), Z (-20/+80%)	K (±10%), M (±20%)
Rated voltage (WVDC)	10V, 16V, 25V, 50V, 100V	6.3V, 10V, 16V, 25V, 50V, 100V		4V, 6.3V, 10V, 16V, 25V, 50V
DF(Tan δ)*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000	Note 1		
Operating temperature	-55 to +125°C		-25 to +85°C	-55 to +85°C
Capacitance characteristic	±30ppm	±15%	+30/-80%	±15%
Termination	Ni/Sn (lead-free termination)			

#1: NP0, 0.1pF product only provide B tolerance; 0603N0R4 provide B&C tolerance; 0603N0R3 only provide C tolerance.

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

NP0: Apply 1.0±0.2Vrms, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2Vrms, 1.0kHz±10% for Cap>1000pF, 25°C at ambient temperature

X7R/X5R: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 25°C ambient temperature.

Y5V: Apply 1.0±0.2Vrms, 1.0kHz±10%, at 20°C ambient temperature.

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

Note 1:

X5R/X7R

Y5V

Rated Vol.	D.F.≤	Exception of D.F. ≤	
≥100V	≤2.5%	≤3%	1206≥0.47µF
		≤5%	0805 > 0.1µF; 0603≥0.068µF; 1206>1µF; CLP series
50V	≤2.5%	≤3%	0201(50V); 0603≥0.047µF; 0805≥0.18µF; 1206≥0.47µF
		≤10%	0402≥0.1µF; 0603>0.1µF; 0805≥1µF; CLP series
35V	≤3.5%	≤10%	0603≥1µF
25V	≤3.5%	≤5%	0201≥0.01µF; 0805≥1µF
		≤7%	0603≥0.33µF
		≤10%	0201≥0.1µF; 0402≥0.10µF; 0603≥0.47µF; CLP series
		≤12.5%	0402≥0.47µF
16V	≤3.5%	≤5%	0201≥0.01µF; 0402≥0.033µF; 0603≥0.15µF; 0603≥0.15µF; 0805≥0.68µF
		≤10%	0201≥0.1µF; 0402≥ 0.22µF; 0603≥0.68µF; CLP series
10V	≤5%	≤10%	0201≥0.012µF; 0402≥0.33µF (0402/X7R≥0.22µF); CLP series
		≤15%	0603≥0.33µF; 01R5 0201≥0.1µF; 0402≥1µF
6.3V	≤10%	≤15%	0201≥0.1µF; 0402≥1µF; CLP series
4V	≤15%	---	---

Rated Vol.	D.F. ≤	Exception of D.F. ≤	
≥50V	≤5%	≤7%	0603≥0.1µF; 0805≥0.47µF
35V	≤7%	---	---
25V	≤5%	≤7%	0402≥0.047µF; 0603≥0.1µF; 0805≥0.33µF; 1206≥1µF
		≤9%	0402≥0.068µF; 0603≥0.47µF
16V (C<1.0µF)	≤7%	≤9%	0402≥0.068µF; 0603≥0.68µF
		≤12.5%	0402≥0.22µF
10V	≤12.5%	≤20%	0402≥0.47µF
6.3V	≤20%	---	---

**Capacitance Range–NPO Dielectric** (0201, 0402, 0603, 0805 English sizes):

DIELECTRIC		NPO																	
SIZE		0201			0402					0603					0805				
RATED VOLTAGE (VDC)		16	25	50	10	16	25	50	100	10	16	25	50	100	10	16	25	50	100
C a p a c i t a n c e	0.1pF (0R1)	L	L	L	N	N	N	N											
	0.2pF (0R2)	L	L	L	N	N	N	N											
	0.3pF (0R3)	L	L	L	N	N	N	N		S	S	S	S						
	0.4pF (0R4)	L	L	L	N	N	N	N		S	S	S	S						
	0.5pF (0R5)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.6pF (0R6)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.7pF (0R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.8pF (0R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	0.9pF (0R9)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.0pF (1R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.2pF (1R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.5pF (1R5)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	1.8pF (1R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.0pF (2R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.2pF (2R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	2.7pF (2R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.0pF (3R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.3pF (3R3)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	3.9pF (3R9)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.0pF (4R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	4.7pF (4R7)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.0pF (5R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	5.6pF (5R6)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.0pF (6R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	6.8pF (6R8)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	7.0pF (7R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.0pF (8R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	8.2pF (8R2)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	9.0pF (9R0)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	10pF (100)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	12pF (120)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	15pF (150)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	18pF (180)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	22pF (220)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	27pF (270)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	33pF (330)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	39pF (390)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	47pF (470)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	56pF (560)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	68pF (680)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	82pF (820)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
	100pF (101)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A
120pF (121)	L	L	L	N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
150pF (151)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
180pF (181)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
220pF (221)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
270pF (271)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
330pF (331)				N	N	N	N	N	S	S	S	S	S	A	A	A	A	A	
390pF (391)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
470pF (471)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
560pF (561)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
680pF (681)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
820pF (821)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
1,000pF (102)				N	N	N	N	N	S	S	S	S	S	B	B	B	B	B	
1,200pF (122)									X	X	X	X	X*	B	B	B	B	B	
1,500pF (152)									X	X	X	X	X*	B	B	B	B	B	
1,800pF (182)									X	X	X	X		B	B	B	B	B	
2,200pF (222)									X	X	X	X		B	B	B	B	B	
2,700pF (272)									X	X	X	X		D	D	D	D	D	
3,300pF (332)									X	X	X	X		D	D	D	D	D	
3,900pF (392)									X*	X*	X*	X*		D	D	D	D	D	
4,700pF (472)									X*	X*	X*	X*		D	D	D	D	D	
5,600pF (562)									X*	X*	X*	X*		D	D	D	D	D	
6,800pF (682)									X*	X*	X*	X*		D	D	D	D	D	
8,200pF (822)									X*	X*	X*	X*		D	D	D	D	D	
0.010uF (103)									X*	X*	X*	X*		D	D	D	D	D	
0.012uF (123)														T*	T*	T*	T*		
0.018uF (183)														D*	D*	D*	D*		
0.022uF (223)														D*	D*	D*	D*		

**Capacitance Range—NPO Dielectric** (1206, 1210, 1812 English sizes):

DIELECTRIC		NPO												
SIZE		1206					1210					1812		
RATED VOLTAGE (VDC)		10	16	25	50	100	10	16	25	50	100	16	50	100
1.0pF (1R0)														
1.2pF (1R2)		B	B	B	B	B								
1.5pF (1R5)		B	B	B	B	B								
1.8pF (1R8)		B	B	B	B	B								
2.2pF (2R2)		B	B	B	B	B								
2.7pF (2R7)		B	B	B	B	B								
3.3pF (3R3)		B	B	B	B	B								
3.9pF (3R9)		B	B	B	B	B								
4.7pF (4R7)		B	B	B	B	B								
5.6pF (5R6)		B	B	B	B	B								
6.8pF (6R8)		B	B	B	B	B								
8.2pF (8R2)		B	B	B	B	B								
10pF (100)		B	B	B	B	B	C	C	C	C	C	D	D	D
12pF (120)		B	B	B	B	B	C	C	C	C	C	D	D	D
15pF (150)		B	B	B	B	B	C	C	C	C	C	D	D	D
18pF (180)		B	B	B	B	B	C	C	C	C	C	D	D	D
22pF (220)		B	B	B	B	B	C	C	C	C	C	D	D	D
27pF (270)		B	B	B	B	B	C	C	C	C	C	D	D	D
33pF (330)		B	B	B	B	B	C	C	C	C	C	D	D	D
39pF (390)		B	B	B	B	B	C	C	C	C	C	D	D	D
47pF (470)		B	B	B	B	B	C	C	C	C	C	D	D	D
56pF (560)		B	B	B	B	B	C	C	C	C	C	D	D	D
68pF (680)		B	B	B	B	B	C	C	C	C	C	D	D	D
82pF (820)		B	B	B	B	B	C	C	C	C	C	D	D	D
100pF (101)		B	B	B	B	B	C	C	C	C	C	D	D	D
120pF (121)		B	B	B	B	B	C	C	C	C	C	D	D	D
150pF (151)		B	B	B	B	B	C	C	C	C	C	D	D	D
180pF (181)		B	B	B	B	B	C	C	C	C	C	D	D	D
220pF (221)		B	B	B	B	B	C	C	C	C	C	D	D	D
270pF (271)		B	B	B	B	B	C	C	C	C	C	D	D	D
330pF (331)		B	B	B	B	B	C	C	C	C	C	D	D	D
390pF (391)		B	B	B	B	B	C	C	C	C	C	D	D	D
470pF (471)		B	B	B	B	B	C	C	C	C	C	D	D	D
560pF (561)		B	B	B	B	B	C	C	C	C	C	D	D	D
680pF (681)		B	B	B	B	B	C	C	C	C	C	D	D	D
820pF (821)		B	B	B	B	B	C	C	C	C	C	D	D	D
1,000pF (102)		B	B	B	B	B	C	C	C	C	C	D	D	D
1,200pF (122)		B	B	B	B	B	C	C	C	C	C	D	D	D
1,500pF (152)		B	B	B	B	B	C	C	C	C	C	D	D	D
1,800pF (182)		B	B	B	B	B	C	C	C	C	C	D	D	D
2,200pF (222)		B	B	B	B	B	C	C	C	C	C	D	D	D
2,700pF (272)		B	B	B	B	B	C	C	C	C	C	D	D	D
3,300pF (332)		B	B	B	B	B	C	C	C	C	C	D	D	D
3,900pF (392)		B	B	B	B	B	C	C	C	C	C	D	D	D
4,700pF (472)		B	B	B	B	B	C	C	C	C	C	D	D	D
5,600pF (562)		B	B	B	B	B	C	C	C	C	C	D	D	D
6,800pF (682)		C	C	C	C	C	C	C	C	C	C	D	D	D
8,200pF (822)		D	D	D	D	D	C	C	C	C	C	D	D	D
0.010µF (103)		D	D	D	D	D	C	C	C	C	C	D	D	D
0.012µF (123)		P	P	P	P	P	D	D	D	D	D	D	D	D
0.015µF (153)		P	P	P	P	P	D	D	D	D	D	D	D	D
0.018µF (183)		P	P	P	P	P						D	D	D
0.022µF (223)		P	P	P	P	P						D	D	D
0.027µF (273)		P	P	P	P	P						D	D	D
0.033µF (333)		P	P	P	P	P						D	D	D
0.039µF (393)		P	P	P	P	P								
0.047µF (473)		J*	J*	J*	J*	J*								
0.056µF (563)		J*	J*	J*	J*	J*								
0.068µF (683)		G*	G*	G*	G*	G*								
0.082µF (823)		G*	G*	G*	G*	G*								
0.1µF (104)		G*	G*	G*	G*	G*								

Capacitance

**Capacitance Range—X7R Dielectric** (0201, 0402, 0603, 0805 English sizes):

DIELECTRIC		X7R																							
		0201					0402						0603						0805						
SIZE		6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	6.3	10	16	25	50	100	
RATED VOLTAGE (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	6.3	10	16	25	50	100	
C a p a c i t a n c e	100pF (101)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	120pF (121)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	150pF (151)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	180pF (181)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	220pF (221)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	270pF (271)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	330pF (331)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	390pF (391)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	470pF (471)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	560pF (561)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	680pF (681)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	820pF (821)			L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	1,000pF (102)	L	L	L	L	L		N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	1,200pF (122)	L	L	L	L			N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	1,500pF (152)	L	L	L	L			N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	1,800pF (182)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	2,200pF (222)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	2,700pF (272)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	3,300pF (332)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	3,900pF (392)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	4,700pF (472)	L	L	L				N	N	N	N	N		S	S	S	S	S		B	B	B	B	B	
	5,600pF (562)	L	L					N	N	N	N			S	S	S	S	S		B	B	B	B	B	
	6,800pF (682)	L	L					N	N	N	N			S	S	S	S	S		B	B	B	B	B	
	8,200pF (822)	L	L					N	N	N	N			S	S	S	S	S		B	B	B	B	B	
	0.010μF (103)	L	L	L				N	N	N	N			S	S	S	S	S		B	B	B	B	B	
	0.012μF (123)							N	N	N				S	S	S	S	X		B	B	B	B	B	
	0.015μF (153)							N	N	N				S	S	S	S	X		B	B	B	B	B	
	0.018μF (183)							N	N	N				S	S	S	S	X		B	B	B	B	B	
	0.022μF (223)							N	N	N	N			S	S	S	S	X		B	B	B	B	B	
	0.027μF (273)							N	N	N				S	S	S	S	X		B	B	B	B	D	
0.033μF (333)							N	N	N	N			S	S	S	X	X		B	B	B	B	D		
0.039μF (393)							N	N	N				S	S	S	X	X		B	B	B	B	D		
0.047μF (473)							N	N	N	N			S	S	S	X	X		B	B	B	B	D		
0.056μF (563)							N	N					S	S	S	X	X		B	B	B	B	D		
0.068μF (683)							N	N		N			S	S	S	X	X		B	B	B	B	D		
0.082μF (823)							N	N					S	S	S	X	X		B	B	B	B	D		
0.10μF (104)						N	N	N	N	N			S	S	S	X	X		B	B	B	B	D		
0.12μF (124)													S	S	X				B	B	B	D			
0.15μF (154)													S	S	X				D	D	D	D			
0.18μF (184)													S	S	X				D	D	D	D			
0.22μF (224)						N	N	N	N				S	S	X	X			D	D	D	D	T		
0.27μF (274)													X	X	X	X			D	D	D	I			
0.33μF (334)													X	X	X	X			D	D	D	I			
0.39μF (394)													X	X	X	X			D	D	D	I			
0.47μF (474)						N	N						X	X	X	X	X		D	D	D	I	I		
0.56μF (564)													X	X	X				D	D	D				
0.68μF (684)													X	X	X				D	D	D				
0.82μF (824)													X	X	X				D	D	D				
1.0μF (105)						N							X	X	X	X	X		D	D	D	I			

**Capacitance Range—X7R Dielectric** (1206, 1210, 1812 English sizes):

DIELECTRIC		X7R																	
		1206							1210						1812				
SIZE		6.3	10	16	25	35	50	100	6.3	10	16	25	50	100	10	16	25	50	100
RATED VOLTAGE (VDC)		6.3	10	16	25	35	50	100	6.3	10	16	25	50	100	10	16	25	50	100
C0G	100pF (101)																		
	120pF (121)																		
	150pF (151)		B	B	B		B	B											
	180pF (181)		B	B	B		B	B											
	220pF (221)		B	B	B		B	B											
	270pF (271)		B	B	B		B	B											
	330pF (331)		B	B	B		B	B											
	390pF (391)		B	B	B		B	B											
	470pF (471)		B	B	B		B	B											
	560pF (561)		B	B	B		B	B											
	680pF (681)		B	B	B		B	B											
	820pF (821)		B	B	B		B	B											
	1,000pF (102)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	1,200pF (122)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	1,500pF (152)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	1,800pF (182)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	2,200pF (222)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	2,700pF (272)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	3,300pF (332)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	3,900pF (392)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	4,700pF (472)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	5,600pF (562)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	6,800pF (682)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	8,200pF (822)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.010μF (103)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.012μF (123)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.015μF (153)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.018μF (183)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.022μF (223)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.027μF (273)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.033μF (333)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.039μF (393)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.047μF (473)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.056μF (563)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
	0.068μF (683)		B	B	B		B	B		C	C	C	C	C	D	D	D	D	D
0.082μF (823)		B	B	B		B	D		C	C	C	C	C	D	D	D	D	D	
0.10μF (104)		B	B	B		B	D		C	C	C	C	C	D	D	D	D	D	
0.12μF (124)		B	B	B		B	D		C	C	C	C	C	D	D	D	D	D	
0.15μF (154)		C	C	C		C	G		C	C	C	C	D	D	D	D	D	D	
0.18μF (184)		C	C	C		C	G		C	C	C	C	D	D	D	D	D	D	
0.22μF (224)		C	C	C		C	G		C	C	C	C	D	D	D	D	D	D	
0.27μF (274)		C	C	C		D	G		C	C	C	C	G	D	D	D	D	D	
0.33μF (334)		C	C	C		D	G		C	C	C	D	G	D	D	D	D	D	
0.39μF (394)		C	C	J		P	G		C	C	C	D	M	D	D	D	D	D	
0.47μF (474)		J	J	J		P	G		C	C	C	D	M	D	D	D	D	K	
0.56μF (564)		J	J	J		P	P		D	D	D	D	M	D	D	D	D	K	
0.68μF (684)		J	J	J		P	P		D	D	D	D	K	D	D	D	K	K	
0.82μF (824)		J	J	J		P	P		D	D	D	D	K	D	D	D	K	K	
1.0μF (105)		J	J	J		P	P		D	D	D	D	K	D	D	D	K	K	

**Capacitance Range—Y5V Dielectric** (0402, 0603, 0805 English sizes):

DIELECTRIC		Y5V															
SIZE		0402					0603					0805					
RATED VOLTAGE (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50	100
Capacitance	0.010µF (103)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.015µF (153)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.022µF (223)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.033µF (333)		N	N	N	N		S	S	S	S		A	A	A	A	B
	0.047µF (473)		N	N	N			S	S	S	S		A	A	A	A	B
	0.068µF (683)		N	N	N			S	S	S	S		A	A	A	A	B
	0.10µF (104)		N	N	N			S	S	S	S		A	A	A	A	B
	0.15µF (154)		N	N				S	S	S	S		A	A	A	A	
	0.22µF (224)	N	N	N				S	S	S	S		A	A	A	A	
	0.33µF (334)	N	N	N				S	S	S	X		B	B	B	B	
	0.47µF (474)	N	N	N				S	S	X	X		B	B	B	B	
	0.68µF (684)	N						S	X	X			B	B	D	D	
	1.0µF (105)	N	N					S	X	X			B	B	D	D	

**Capacitance Range—Y5V Dielectric** (1206, 1210, 1812 English sizes):

DIELECTRIC		Y5V																		
SIZE		1206					1210					1812								
RATED VOLTAGE (VDC)		6.3	10	16	25	50	100	6.3	10	16	25	35	50	100	10	16	25	50	100	
Capacitance	0.010µF (103)		B	B	B	B	B							C					D	
	0.015µF (153)		B	B	B	B	B							C					D	
	0.022µF (223)		B	B	B	B	B							C					D	
	0.033µF (333)		B	B	B	B	B							C					D	
	0.047µF (473)		B	B	B	B	B							C					D	
	0.068µF (683)		B	B	B	B	B							C					D	
	0.10µF (104)		B	B	B	B	B		C	C	C			C	C	D	D	D	D	D
	0.15µF (154)		B	B	B	B	C		C	C	C			C	C	D	D	D	D	D
	0.22µF (224)		B	B	B	B	C		C	C	C			C	C	D	D	D	D	D
	0.33µF (334)		B	B	B	B			C	C	C			C	C	D	D	D	D	D
	0.47µF (474)		B	B	B	B			C	C	C			C		D	D	D	D	D
	0.68µF (684)		B	B	B	B			C	C	C			C		D	D	D	D	D
	1.0µF (105)		C	C	C	C			C	C	C			C		D	D	D	D	D

**Capacitance Range—X5R Dielectric** (0201, 0402, 0603 English sizes):

Dielectric		X5R														
Size		0201					0402					0603				
Rated Voltage (VDC)		6.3	10	16	25	50	6.3	10	16	25	50	6.3	10	16	25	50
<b>C</b> <b>a</b> <b>p</b> <b>a</b> <b>c</b> <b>i</b> <b>t</b> <b>a</b> <b>n</b> <b>c</b> <b>e</b>	100pF (101)			L	L	L										
	120pF (121)			L	L	L										
	150pF (151)			L	L	L										
	180pF (181)			L	L	L										
	220pF (221)			L	L	L										
	270pF (271)			L	L	L										
	330pF (331)			L	L	L										
	390pF (391)			L	L	L										
	470pF (471)			L	L	L										
	560pF (561)			L	L	L										
	680pF (681)			L	L	L										
	820pF (821)			L	L	L										
	1,000pF (102)		L	L	L	L										
	1,500pF (152)		L	L												
	2,200pF (222)		L	L												
	2,700pF (272)		L	L												
	3,300pF (332)		L	L												
	4,700pF (472)		L	L												
	6,800pF (682)		L													
	0.010µF (103)	L	L	L	L											
	0.015µF (153)	L	L													
	0.022µF (223)	L	L													
	0.027µF (273)	L	L						N							
	0.033µF (333)	L	L						N							
	0.039µF (393)	L	L						N							
	0.047µF (473)	L	L						N							
	0.056µF (563)	L	L					N	N							
	0.068µF (683)	L	L					N	N							
	0.082µF (823)	L	L				N	N	N							
	0.10µF (104)	L	L	L	L		N	N	N	N	N					
0.15µF (154)						N	N	N	N							
0.22µF (224)	L	L				N	N	N	N	N			X	X		
0.27µF (274)												X	X	X		
0.33µF (334)						N	N				X	X	X	X		
0.39µF (394)												X	X	X		
0.47µF (474)	L					N	N	E	E	E	X	X	X	X	X	
0.68µF (684)						N	N				X	X	X	X		
0.82µF (824)											X	X	X			
1.0µF (105)	L	L*				E	E	E	E		X	X	X	X	X	

**Capacitance Range—X5R Dielectric** (0805, 1206, 1210 English sizes):

Dielectric		X5R																
Size		0805					1206					1210						
Rated Voltage (VDC)		4	6.3	10	16	25	50	6.3	10	16	25	50	4	6.3	10	16	25	50
<b>Capacitance</b>	1.0µF (105)			D	D	D	I											



**Packaging Type and Quantity:**

Size	Thickness (mm)/Symbol		Paper tape		Plastic tape	
			7" reel	13" reel	7" reel	13" reel
0201 (0603)	0.30±0.03	L	15,000	70,000	-	-
	0.30±0.05	L	15,000	-	-	-
	0.30±0.09	L	15,000	-	-	-
0402 (1005)	0.50±0.05	N	10,000	50,000	-	-
	0.50+0.02/-0.05	Q	10,000	50,000	-	-
	0.50±0.20	E	10,000	-	-	-
0603 (1608)	0.50±0.10	H	4,000	-	-	-
	0.80±0.07	S	4,000	15,000	-	-
	0.80+0.15/-0.10	X	4,000	15,000	-	-
0805 (2012)	0.50±0.10	H	4,000	15,000	-	-
	0.60±0.10	A	4,000	15,000	-	-
	0.80±0.10	B	4,000	15,000	-	-
	0.85±0.10	T	4,000	15,000	-	-
	1.25±0.10	D	-	-	3,000	10,000
	1.25±0.20	I	-	-	3,000	10,000
1206 (3216)	0.80±0.10	B	4,000	15,000	-	-
	0.85±0.10	T	4,000	15,000	-	-
	0.95±0.10	C	-	-	3,000	10,000
	1.15±0.15	J	-	-	3,000	10,000
	1.25±0.10	D	-	-	3,000	10,000
	1.60±0.20	G	-	-	2,000	10,000
	1.60+0.30/-0.10	P	-	-	2,000	9,000
1210 (3225)	0.85±0.10	T	-	-	3,000	10,000
	0.95±0.10	C	-	-	3,000	10,000
	1.25±0.10	D	-	-	3,000	10,000
	1.60±0.20	G	-	-	2,000	-
	2.00±0.20	K	-	-	1,000	6,000
	2.50±0.30	M	-	-	1,000	6,000
1812 (4532)	1.25±0.10	D	-	-	1,000	5,000
	1.60±0.20	G	-	-	1,000	-
	2.00±0.20	K	-	-	1,000	-
	2.50±0.30	M	-	-	500	3,000
	2.80±0.30	U	-	-	500	-

1. The letter in the cell is corresponding to the symbol of product thickness as reflected in the dimensional table.
2. The letter in cell with " \* " mark is expressed capacitance tolerance "J" (±5%) only for NPO dielectric and "K" (±10%) for other dielectrics
3. For more information about products with special capacitance or other data, please contact the factory.

**Reliability Test Conditions and Requirements:**

Item	Test Condition	Requirements			
Visual and Mechanical	- - -	*No remarkable defect. *Dimensions to conform to individual specification sheet			
Capacitance	<b>Class I: (NP0)</b> ≤1000pF, 1.0±0.2Vrms, 1MHz ± 10% >1000pF, 1.0 1KHz±10% <b>Class II: (X7R, X5R, Y5V)</b> C≤10μF, 1.0±0.2Vrms, 1KHz±10%** C>10μF, 0.5±0.2Vrms, 120Hz±20%	*Shall not exceed the limits given in the detailed spec.			
Q/D.F. (Dissipation Factor)	**Test condition: 0.5±0.2Vrms. 1KHz±10% X7R: 0805=106(6.3V), 0603/475(6.3V) X5R: 01R5≥103, 0201≥224 (6.3V, 10V, 16V) #1, 0402≥475 (6.3V, 16V), 0402≥225 (10V), TT18X≥475(10V), TT15X series #1 Excluding X5R/0201/105(6.3V); 225 (10V), (1.0±0.2Vrms, 1KHz±10%) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C X7R, X5R:			
		Rated Vol.	D.F. ≤	Exception of D.F. ≤	
		≥100V	≤2.5%	≤3%	1206≥0.47μF
				≤5%	0805>0.1μF; 0603≥0.068μF; 1206>1μF; 1210≥2.2μF; TT series
				≤10%	0805>0.22μF; 1210≥3.3μF
		50V	≤2.5%	≤3%	0201(50V); 0603≥0.047μF; 0805≥0.18μF; 1206≥0.47μF
				≤5%	0201≥0.01μF; 1210≥4.7μF
				≤10%	0402≥0.01μF; 0603>0.1μF; 0805≥1μF; 1206≥2.2μF; 1210≥10μF; TT series
		35V	≤3.5%	≤10%	0603≥1μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF
		25V	≤3.5%	≤5%	0201≥0.01μF; 0805≥1μF; 1210≥10μF
				≤7%	0603≥0.33μF; 1206≥4.7μF
				≤10%	0201≥0.1μF; 0402≥0.10μF; 0603≥0.47μF; 0805≥2.2μF; 1206≥6.8μF; 1210≥22μF; TT series
				≤12.5%	0402≥0.47μF
		16V	≤3.5%	≤5%	0201≥0.01μF; 0402≥0.033μF; 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF
				≤10%	0201≥0.1μF(0201/X7R≥0.022μF); 0402≥0.22μF; 0603≥0.68μ; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF; TT series
		10V	≤5%	≤10%	0201≥0.012μF; 0402≥0.33μF(0402/X7R≥0.22μF); TT series 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF; 01R5
				≤15%	0201≥0.1μF; 0402≥1μF
		6.3V	≤10%	≤15%	0201≥0.1μF; 0402≥1μF; 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF; TT series
				≤20%	0402≥2.2μF
		4V	≤15%	- - -	- - -
		Y5V:			
		Rated Vol	D.F. ≤	Exception of D.F. ≤	
		≥50V	≤5%	≤7%	0603≥0.1μF;0805≥0.47μF;1206≥4.7μF;TT series
				≤12.5%	1210≥6.8μF
		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;TT series
		16V (C<1.0μF)	≤7%	≤9%	0402≥0.068μF;0603≤0.68μF
				≤12.5%	0402≤0.22μF
		16V (C≥1.0μF)	≤9%	≤12.5%	0603≥2.2μF;0805≤3.3μF;1206≥10μF;1210≤22μF;1812≥47μF;TT series
		10V	≤12.5%	≤20%	0402≥0.47μF
		6.3V	≤20%	- - -	- - -

**Reliability Test Conditions and Requirements Continued:**

Item	Test Condition	Requirements											
Dielectric Strength	*To apply voltage ( $\leq 100V$ ) 250% *Duration: 1 to 5 sec. *Charge and discharge current less than 50mA.	*No evidence of damage or flash over during test.											
Insulation Resistance	To apply rated voltage for MAX. 120 sec. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2hrs at room temp.	10GΩ or RxC $\geq 500\Omega\text{-F}$ whichever is smaller Class II (X7R, X5R, Y5V):											
		<table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>Insulation Resistance</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R</td> <td rowspan="6">10FΩ or RxC <math>\geq 100\Omega\text{-F}</math> whichever is smaller</td> </tr> <tr> <td>50V: 0402 <math>&gt; 0.01\mu\text{F}</math>; 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 1\mu\text{F}</math>; 1206 <math>\geq 4.7\mu\text{F}</math>; 1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td>35V: 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 2.2\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>25V: 0402 <math>\geq 1\mu\text{F}</math>; 0603 <math>\geq 2.2\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 10\mu\text{F}</math>; 1210 <math>\geq 10\mu\text{F}</math></td> </tr> <tr> <td>16V: 0201 <math>\geq 0.1\mu\text{F}</math>; 0402 <math>\geq 0.22\mu\text{F}</math>; 0603 <math>\geq 1\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 10\mu\text{F}</math>; 1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td>10V: 0201 <math>\geq 47\text{nF}</math>; 0402 <math>\geq 0.47\mu\text{F}</math>; 0603 <math>\geq 0.47\mu\text{F}</math>; 0805 <math>\geq 2.2\mu\text{F}</math>; 1206 <math>\geq 4.7\mu\text{F}</math>; 1210 <math>\geq 4.7\mu\text{F}</math></td> </tr> <tr> <td>6.3V; 4V; TT series; Size <math>\geq 1812</math></td> <td></td> </tr> </tbody> </table>	Rated Voltage	Insulation Resistance	100V: All X7R	10FΩ or RxC $\geq 100\Omega\text{-F}$ whichever is smaller	50V: 0402 $> 0.01\mu\text{F}$ ; 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 1\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$	35V: 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 2.2\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$	25V: 0402 $\geq 1\mu\text{F}$ ; 0603 $\geq 2.2\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ; 1210 $\geq 10\mu\text{F}$	16V: 0201 $\geq 0.1\mu\text{F}$ ; 0402 $\geq 0.22\mu\text{F}$ ; 0603 $\geq 1\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 10\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$	10V: 0201 $\geq 47\text{nF}$ ; 0402 $\geq 0.47\mu\text{F}$ ; 0603 $\geq 0.47\mu\text{F}$ ; 0805 $\geq 2.2\mu\text{F}$ ; 1206 $\geq 4.7\mu\text{F}$ ; 1210 $\geq 4.7\mu\text{F}$	6.3V; 4V; TT series; Size $\geq 1812$	
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6.3V; 4V; TT series; Size $\geq 1812$													
Temperature Coefficient	With no electrical load.	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Capacitance Change</th> </tr> </thead> <tbody> <tr> <td>NP0</td> <td>Within <math>\pm 30\text{ppm}/^\circ\text{C}</math></td> </tr> <tr> <td>X7R</td> <td>Within <math>\pm 15\%</math></td> </tr> <tr> <td>X5R</td> <td>Within <math>\pm 15\%</math></td> </tr> <tr> <td>Y5R</td> <td>Within <math>+30\%/ -80\%</math></td> </tr> </tbody> </table>	T.C.	Capacitance Change	NP0	Within $\pm 30\text{ppm}/^\circ\text{C}$	X7R	Within $\pm 15\%$	X5R	Within $\pm 15\%$	Y5R	Within $+30\%/ -80\%$	
	T.C.		Capacitance Change										
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	T.C.		Operating Temp										
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	X7R		-55~125°C at 25°C										
	X5R		-55~85°C at 25°C										
	Y5R		-25~85°C at 20°C										
	*Before Initial Measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2hrs at room temp. *Measurement voltage for Class II:												
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01005	0201												
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0402	0603												
Cap $< 1\mu\text{F}$ : 1V	Cap $\leq 1\mu\text{F}$ : 1V												
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0805	1206/1210												
Cap $< 10\mu\text{F}$ : 1V	Cap $\leq 10\mu\text{F}$ : 1V												
Cap = 10 $\mu\text{F}$ : 0.5V	10 $\mu\text{F}$ $<$ Cap $\leq 100\mu\text{F}$ : 0.5V												
Cap $> 10\mu\text{F}$ : 0.2V	Cap $> 100\mu\text{F}$ : 0.2V												
Adhesive Strength of Termination	*Pressurizing force: 1N (0201) and 5N ( $\leq 0603$ ) and 10N ( $> 0603$ ) *Test time: 10±1 sec.	*No remarkable damage or removal of the terminations											
Vibration Resistance	*Vibration frequency: 10~55 Hz/min. *Total amplitude: 1.5mm *Test time: 6hrs. (two hrs each in three mutually perpendicular directions) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Cap./DF(Q) Measurement to be made after de-aging at 150°C for 1 hr then set for 24±2 hrs at room temp.												

**Reliability Test Conditions and Requirements Continued:**

Item	Test Condition	Requirements															
Solderability	*Solder temperature: 235±5°C *Dipping time: 2±0.5 sec.	95% min. coverage of all metalized area.															
Bending Test	*The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Measurement to be made after keeping at room temp. for 24±2hrs.	*No remarkable damage. *Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, 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.)															
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 a eutectic solder. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Cap./DF(Q)/I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	*No remarkable damage. *Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, 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.															
Temperature Cycle	*Conduct the five cycles according to the temperatures and time. <table border="1" data-bbox="245 1312 727 1491"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Cap./DF(Q)/I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	Step	Temp. (°C)	Time (min)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	*No remarkable damage. *Cap change: NP0: within ±2.5% or 0.25pF whichever is larger X7R, X5R: within ±7.5% Y5V: within ±20% *Q/D.F., I.R. and dielectric strength: To meet initial requirements
Step	Temp. (°C)	Time (min)															
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2	Room temp.	2~3															
3	Max. operating temp. +3/-0	30±3															
4	Room temp.	2~3															

**Reliability Test Conditions and Requirements Continued:**

Item	Test Condition	Requirements			
Humidity (Damp Heat) Steady State	*No remarkable damage. *Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series **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	*No remarkable damage. *Cap change: NP0: within ±5% or 0.5pF whichever is larger X7R, X5R: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series & C≥1µF, 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:			
		Rated Vol.	D.F. ≤	Exception of D.F. ≤	
		≥100V	≤3%	≤6%	1206≥0.47µF
				≤7.5%	0805>0.1µF;0603≥0.068µF;1206>1µF;1210≥2.2µF; TT series
				≤20%	0805>0.22µ;1210≥3.3µF
		50V	≤3%	≤6%	0201(50V);0603≥0.047µF;0805≥0.18µF;1206≥0.47µF
				≤10%	0201≥0.01µF;1210≥4.7µF
				≤20%	0402≥0.01µF;0603>0.1µF;0805≥1µF;1206≥2.2µF;1210≥10µF; TT series
		35V	≤5%	≤20%	0603≥1µF;0805≥2.2µF;1206≥2.2µF;1210≥10µF
		25V	≤5%	≤10%	0201≥0.01µF;0805≥1µF;1210≥10µF
				≤14%	0603≥0.33µ;1206≥4.7µF
				≤15%	0201≥0.1µF;0402≥0.10µF;0603≥0.47µ;0805≥2.2µF;1206≥6.8µF;1210≥22µF; TT series
				≤20%	0402≥0.47µF
		16V	≤5%	≤10%	0603≥0.15µF;0805≥0.68µF;1206≥2.2µF;1210≥4.7µF
				≤15%	0201≥0.01µF(0201/X7R≥0.022µF);0402≥0.033µF;0603≥0.68µF;0805≥2.2;1206≥4.7µF;1210≥22µF; TT series
		10V	≤7.5%	≤15%	0201≥0.012µF;0402≥0.33µF(0402/X7R≥0.22µF);0603≥0.33µF;0805≥2.2µF;1206≥2.2µF;1210≥22µF
				≤20%	0201≥0.1µF;0402≥1µF; TT series; 01R5
		6.3V	≤15%	≤30%	0201≥0.1µF;0402≥1µF;0603≥10µF;0805≥4.7µF;1206≥47µF1210≥100µF; TT series
		4V	≤20%	---	---
		Y5V:			
		Rated Vol.	D.F. ≤	Exception of D.F. ≤	
		≥50V	≤7.5%	≤10%	0603≥0.1µF;0805≥0.47µF;1206≥4.7µF
				≤20%	1210≥6.8µF
		35V	≤10%	---	---
		25V	≤7.5%	≤10%	0402≥0.047µF;0603≥0.1µF;0805≥0.33µF;1206≥1µF;1210≥4.7µF
				≤15%	0402≥0.068µF;0603≥0.47µF;1206≥4.7µF;1210≥22µF
		16V (C≥1.0µF)	≤10%	≤12.5%	0402≥0.068µF;0603≥0.68µF
≤20%	0402≥0.22µF				
16V (C≥1.0µF)	≤12.5%	≤20%	0603≥2.2µF;0805≥3.3µF;1206≥10µF;1210≥22µF;1812≥47µF		
10V	≤20%	≤30%	0402≥0.47µF		
6.3V	≤30%	---	---		
*1.R.:≥10V, 1GΩ or 50 Ω-F whichever is smaller Class II (X7R, X5R, Y5V)					
Rated Voltage			Insulation Resistance		
100V: All X7R; 1210≥3.3µF			1GΩ or RxC ≥ 10 Ω-F whichever is smaller		
50V: 0402>0.01µF;0603≥1µF;0805≥1µF;1206≥4.7µF;1210≥4.7µF					
35V: 0603≥1µF;0805≥2.2µF;1206≥2.2µF;1210≥10F					
25V: 0201≥0.1µF;0402≥0.22µF;0603≥2.2µF;0805≥2.2µF;1206≥10µF;1210≥10µF					
16V:0201≥0.1µF;0402≥0.22µF;0603≥1µF;0805≥2.2µF1206≥10µF;1210≥47µF					
10V:1201≥47nF;0402≥0.47µF;0603≥0.47µF; 0805≥2.2µF;1206≥4.7µF;1210≥47µF					
6.3V ; 4V ; TT series ; Size≥1812					

**Reliability Test Conditions and Requirements Continued:**

Item	Test Condition	Requirements																																																																																																																			
Humidity (Damp Heat) Load	*Test temp.: 40±2°C *Humidity: 90~95%RH *Test time: 500+24/-0hrs *To apply voltage: Rated voltage (MAX. 500V) *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Cap./DF(Q)/I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp.	*No remarkable damage. *Cap change: NP0: within ±7.5% or 0.75pF whichever is larger X7R, X5R: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series & C≥1μF, 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: C≥30pF, Q≥200; C<30pF, Q≥100+10/3C  X7R, X5R:																																																																																																																			
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**Reliability Test Conditions and Requirements Continued:**

Item	Test Condition				Requirements			
High Temperature Load (Endurance)	*Test temp: NP0, X7R: 125±3°C X5R, Y5V: 85±3°C *To apply voltage: (1) ≤6.3V, C≥10µF or TT series:150% of rated vol. (2) 10V≤Ur<500V: 200% of rated voltage. (3) 500V: 150% of rated voltage. (4) Ur≥630V: 120% of rated voltage. (5) 100% of rated voltage for below range.				*No remarkable damage. Cap change: NP0: ±3.0% or ±0.3pF whichever is larger X7R, X5R: ≥10V**, within ±12.5%; ≤6.3V within ±25%; TT series & C≥1µF, 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			
	<b>Size</b>	<b>Dielectric</b>	<b>Rated Voltage</b>	<b>Capacitance Range</b>	<b>Rated Vol.</b>	<b>D.F. ≤</b>	<b>Exception of D.F. ≤</b>	
0201	X5R/X7R	≤10V	C≥0.1µF	≥100V	≤3%	≤6%	1206≥0.47µF	
		≥16V	C>0.1µF			≤7.5%	0805>0.1µF;0603≥0.068µF; 1206>1µF;1210≥2.2µF; TT series	
0402	X5R/X7R/Y5V	6.3V, 10V, 16V, 25V	C≥1.0µF	50V	≤3%	≤20%	0805>0.22µ;1210≥3.3µF	
0603	X5R/X7R	4V	C≥2.2µF			≤6%	0201(50V);0603≥0.047µF;0805≥0.18µF;1206≥0.47µF	
		6.3V, 10V	C≥4.7µF	50V	≤3%	≤10%	0201≥0.01µF;1210≥4.7µF	
		25V, 35V	C≥1.0µF			≤20%	0402≥0.01µF;0603>0.1µF;0805≥1µF; 1206≥2.2µF;1210≥10µF; TT series	
0805	X5R/X7R	4V	C≥4.7µF	35V	≤5%	≤20%	0603≥1µF;0805≥2.2µF;1206≥2.2µF;1210≥10µF	
		6.3V	C≥2.2µF	25V	≤5%	≤10%	0201≥0.01µF;0805≥1µF;1210≥10µF	
1206	X5R/X7R	≥6.3V	C≥4.7µF			≤14%	0603≥0.33µ;1206≥4.7µF	
	NP0	3000V	C≥1.5pF	25V	≤5%	≤15%	0201≥0.1µF;0402≥0.10µF;0603≥0.47µ; 0805≥2.2µF;1206≥6.8µF;1210≥22µF; TT series	
1210	X5R/X7R	16V	C≥4.7µF			≤20%	0402≥0.47µF	
	X7R	100V	C≥3.3µF	16V	≤5%	≤10%	0603≥0.15µF;0805≥0.68µF;1206≥2.2µ;1210≥4.7µF	
TT15	X5R	6.3V	C>1.0µF			≤15%	0201≥0.01µF(0201/X7R≥0.022µF);0402≥0.033µF; 0603≥0.68µF;0805≥2.2;1206≥4.7µF;1210≥22µF; TT series	
TT18	Y5V	6.3V, 10V	C≥2.2µF	16V	≤5%	≤15%	0201≥0.1µF;0402≥1µF; TT series; 01R5	
	Y5V	6.3V	C≥10µF			≤30%	0201≥0.1µF;0402≥1µF;0603≥10µF;0805≥4.7µF; 1206≥4.7µF 1210≥100µF; TT series	
TT21	X5R/X7R	≤10V	C≥10µF	10V	≤7.5%	≤15%	0201≥0.012µF;0402≥0.33µF(0402/X7R≥0.22µF); 0603≥0.33µF0805≥2.2µF;1206≥2.2µF;1210≥22µF	
TT31	Y5V	6.3V	C≥2.2µF			≤20%	0201≥0.1µF;0402≥1µF; TT series; 01R5	
**1WV items must follow de-rating conditions (6)150% of rated voltage for below range.				6.3V	≤15%	≤30%	0201≥0.1µF;0402≥1µF;0603≥10µF;0805≥4.7µF; 1206≥4.7µF 1210≥100µF; TT series	
	<b>Size</b>	<b>Dielectric</b>	<b>Rated Voltage</b>	<b>Capacitance Range</b>	<b>Rated Vol.</b>	<b>D.F. ≤</b>	<b>Exception of D.F. ≤</b>	
	0201	X5R, X74	16V/25V	C≥0.1µF	4V	≤20%	---	
		X74	16V	C≥0.022µF	Y5V:			
	0402	X5R/X7R	50V	C≥0.1µF		<b>Rated Vol.</b>	<b>D.F. ≤</b>	<b>Exception of D.F. ≤</b>
		Y5V	10~25V	C≥0.22µF	≥50V	≤7.5%	≤10% 0603≥0.1µF;0805≥0.47µF;1206≥4.7µF	
		Y5V	16V	C≥0.47µF	≥50V	≤7.5%	≤20%	1210≥6.8µF
	0603	X7R	50V	C>0.1µF			35V	≤10%
		X5R/X74	10V, 16V, 50V	C≥1.0µF	25V	≤7.5%	≤10%	0402≥0.047µF;0603≥0.1µF; 0805≥0.33µF;1206≥1µF;1210≥4.7µF
		Y5V	16V	C≥2.2µF			≤15%	0402≥0.068µF;0603≥0.47µF; 1206≥4.7µF;1210≥22µF
	0805	X5R/X7R	10~50V	C≥4.7µF	16V (C≥1.0µF)	≤10%	≤12.5%	0402≥0.068µF;0603≥0.68µF
		X5R/X7R	50V	C≥2.2µF			≤20%	0402≥0.22µF
		Y5V	100V	C≥0.47µF	16V (C≥1.0µF)	≤12.5%	≤20%	0603≥2.2µF;0805≥3.3µF;1206≥10µF; 1210≥22µF;1812≥47µF
	1206	X5R/X7R	100V	C>1.0µF			10V	≤20%
	1210	X5R/X7R	50V~100v	C≥2.2µF	6.3V	≤30%	---	
	1825 2220 2225	X7R	100V~250V	C≥1.0µF	6.3V	≤30%	---	
	*Test time: 1000+24/-0 hrs. *Before initial measurement (Class II only): To apply de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. *Cap./DF(Q)/I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24±2 hrs at room temp. ** De-rating conditions:				*I.R.:≥10V, 1GΩ or 50 Ω-F whichever is smaller Class II (X7R, X5R, Y5V)			
					<b>Rated Voltage</b>			<b>Insulation Resistance</b>
					100V: All X7R; 1210≥3.3µF			1GΩ or RxC ≥ 10 Ω-F whichever is smaller
					50V: 0402>0.01µF;0603≥1µF;0805≥1µF;1206≥4.7µF;1210≥4.7µF			
					35V: 0603≥1µF;0805≥2.2µF;1206≥2.2µF;1210≥10F			
					25V: 0201≥0.1µF;0402≥0.22µF;0603≥2.2µF;0805≥2.2µF;1206≥10µF;1210≥10µF			
					16V:0201≥0.1µF;0402≥0.22µF;0603≥1µF;0805≥2.2µF 1206≥10µF;1210≥47µF			
					10V:1201≥47nF;0402≥0.47µF;0603≥0.47µF; 0805≥2.2µF;1206≥4.7µF;1210≥47µF			
					6.3V ; 4V ; TT series ; Size≥1812			

