



FEATURES:

- Capacitance range: 0.1pF to 220uF
- Voltage range: 4V to 100V
- Terminations: 100% matte Tin (Sn), Palladium (Pd-Ag), Gold (Au) and Lead (Pb)
- Very low ESR in X7R/X7S/X6S/X5R (<10mΩ typical)
- Ceramic monolithic structure provides excellent reliability



PART NUMBER STRUCTURE

C	0805	COG	500	-	101	J	N	P	□ □
Series	Size	Temperature Characteristic (Dielectric)	Rated Voltage		Capacitance	Tolerance	Termination	Packaging	Optional Thickness Identifier
01005			1st two digits are significant		(picofarads)	* B = ± 0.1pF	N = 100% matte Tin (Sn) over Nickel	D = Paper Tape (10" Reel)	Leave blank for standard thickness.
0201		COG	followed by number of zeroes.		1st two digits are significant,	* C = ± 0.25pF	* P = Palladium Silver	E = Embossed Tape (7" Reel)	Designate
0603		X7R			followed by number of zeroes. e.g:	* D = ± 0.5pF	* G = Gold over Nickel	P = Paper Tape (7" Reel)	"-" for Min.
0805		X7S	4R0 = 4.0 VDCW		101 = 100pF	F = ± 1%	Pb = 90% Tin (Sn) /10% Lead (Pb)	R = Paper Tape (13" Reel)	"*" for Max.
1206		X6S	6R3 = 6.3 VDCW		R denotes decimal	G = ± 2%	* Pd/Ag & Gold terminations have limited values & sizes available.	U = Embossed Tape (13" Reel)	followed by Thickness Code
1210		X5R	100 = 10 VDCW		6R8 = 6.8pF	J = ± 5%			e.g:
1812		Y5V	160 = 16 VDCW			K = ± 10%			- E (min. thickness of .026")
2220		Z5U	250 = 25 VDCW			M = ± 20%			* E (max. thickness of .026")
2221			500 = 50 VDCW			N = ± 30%			
			630 = 63 VDCW			Z = +80 - 20%			
			101 = 100 VDCW			* For values below 10pF only.			

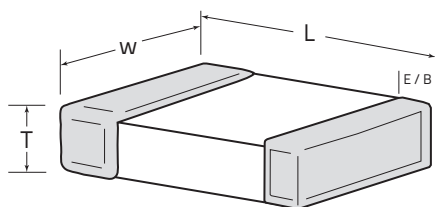
Example P/N: C0805COG500-101JNP

Optional Thickness Identifier Codes:

CODE:	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	6
DIMENSION:	.015	.020	.026	.030	.035	.040	.045	.050	.055	.060	.065	.070	.075	.080	.085	.090	.095	.100	.105	.110	.023

DIMENSIONS

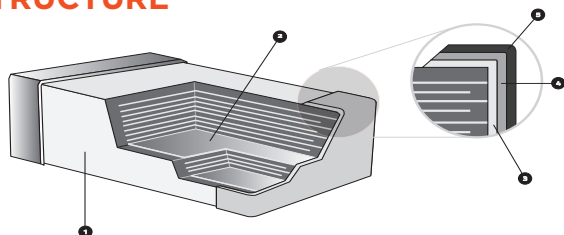
Unit: inches (mm)



SIZE	L	W	T	MIN. E/B
01005	0.016 ± 0.0008 (0.4 ± 0.02)	0.008 ± 0.0008 (0.2 ± 0.02)	See Specific Value	0.002 (0.05)
0201	0.024 ± 0.002 (0.6 ± 0.05)	0.012 ± 0.002 (0.3 ± 0.05)	See Specific Value	0.002 (0.05)
0402*	0.040 ± 0.002 (1.0 ± 0.05)	0.020 ± 0.002 (0.5 ± 0.05)	See Specific Value	0.004 (0.10)
0603	0.063 ± 0.006 (1.6 ± 0.15)	0.031 ± 0.0046 (0.8 ± 0.15)	See Specific Value	0.008 (0.20)
0805	0.08 ± 0.008 (2.0 ± 0.20)	0.050 ± 0.008 (1.25 ± 0.20)	See Specific Value	0.010 (0.25)
1206	0.126 ± 0.008 (3.2 ± 0.20)	0.063 ± 0.008 (1.6 ± 0.20)	See Specific Value	0.010 (0.25)
1210	0.126 ± 0.0157 (3.2 ± 0.40)	0.098 ± 0.0118 (2.50 ± 0.30)	See Specific Value	0.010 (0.25)
1812	0.177 ± 0.012 (4.495 ± 0.30)	0.126 ± 0.012 (3.20 ± 0.30)	See Specific Value	0.010 (0.25)
2220/2221	0.225 ± 0.016 (5.715 ± 0.41)	0.200 ± 0.006 (5.08 ± 0.41)	See Specific Value	0.010 (0.25)

* 0402 size in the X6S/X7S/X5R dielectrics will have a dimensional tolerance of ±0.20mm

STRUCTURE

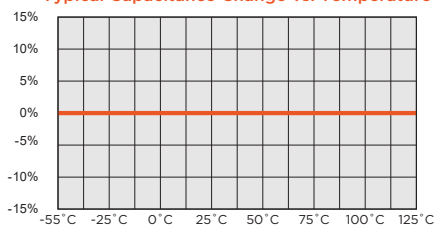


1	Ceramic Body (dielectric)	4	Nickel Plating
2	Inner Electrode	5	Tin Plating
3	Inner Termination		

ELECTRICAL SPECIFICATIONS

NP0/COG

Typical Capacitance Change vs. Temperature



Operating Temperature Range:

-55°C to +125°C

Temperature Coefficient:

0 ±30PPM/°C

Temperature Voltage Coefficient:

0 ±30PPM/°C

Insulation Resistance:

>1000 Ω-F or 10 GΩ, for values ≤ 0.047μF (whichever is less at 25°C, WDCV).
For Capacitance values > 0.047μF, the 500 Ω-F rule applies. (The IR at 125°C is 10% of the value at 25°C)

Ageing:

None

Withstanding Voltage:

>2.5 times VDCW

Capacitance Tolerance:

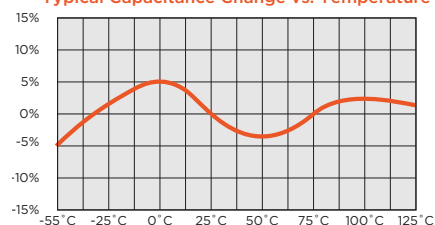
B,C,D,F,G,J,K

Dissipation Factor:

0.1% max

X7R

Typical Capacitance Change vs. Temperature



Operating Temperature Range:

-55°C to +125°C

Temperature Coefficient:

0 ±15%Δ°C MAX.

Temperature Voltage Coefficient:

X7R not applicable

Insulation Resistance:

>100 Ω-F or 10 GΩ, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)

Ageing:

2.5% per decade hour, typical

Withstanding Voltage:

>2.5 times VDCW

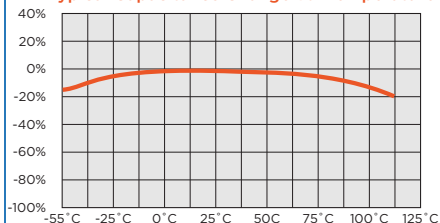
Capacitance Tolerance:

J,K,M

RATED VOLTAGE	D.F.	EXCEPTION OF D.F.	
≥50V	≤2.5%	≤3%	0201 (50V); 0603≥0.047μF 0805≥0.22μF; 1206≥0.47μF
		≤5%	0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF
25V	≤2.5%	≤5%	0201≥0.01μF; 0805≥1μF; 1210≥4.7μF
		≤10%	0402≥0.10μF; 0603≥0.33μF; 0805≥2.2μF 1206≥4.7μF; 1210≥22μF
16V	≤3.5%	≤5%	0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF
		≤10%	0402≥0.47μF; 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
6.3V	≤10%		

X7S

Typical Capacitance Change vs. Temperature



Operating Temperature Range:

-55°C to +125°C

Temperature Coefficient:

0 ±22%Δ°C MAX.

Insulation Resistance:

>1000 Ω-F or 100 GΩ, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)

Ageing:

2.5% per decade hour, typical

Withstanding Voltage:

>2.5 times VDCW

Capacitance Tolerance:

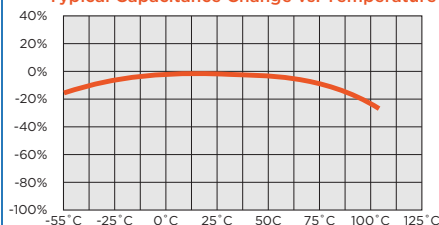
K,M

RATED VOLTAGE	D.F.	EXCEPTION OF D.F.	
≥50V	≤2.5%	≤3%	0201 (50V); 0603≥0.047μF 0805≥0.22μF; 1206≥0.47μF
		≤5%	0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF
25V	≤2.5%	≤5%	0201≥0.01μF; 0805≥1μF; 1210≥4.7μF
		≤10%	0402≥0.10μF; 0603≥0.33μF; 0805≥2.2μF 1206≥4.7μF; 1210≥22μF
16V	≤3.5%	≤5%	0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF
		≤10%	0402≥0.47μF; 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
6.3V	≤10%		

ELECTRICAL SPECIFICATIONS

X6S

Typical Capacitance Change vs. Temperature

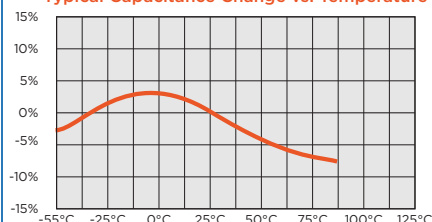


Operating Temperature Range:
-55°C to +105°C
Temperature Coefficient:
0 $\pm$ 22% Δ °C MAX.
Insulation Resistance:
100,000 M Ω min., or 1000 M Ω (@ +25°C, RVDC) per uF min. or 100GW, whichever is less
Ageing:
2.5% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
K,M

RATED VOLTAGE	D.F.	EXCEPTION OF D.F.	
$\geq 50V$	$\leq 2.5\%$	$\leq 3\%$	0201 (50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.22\mu F$; 1206 $\geq 0.47\mu F$
		$\leq 5\%$	0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 4.7\mu F$
25V	$\leq 2.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 4.7\mu F$
		$\leq 10\%$	0402 $\geq 0.10\mu F$; 0603 $\geq 0.33\mu F$; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$
16V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0402 $\geq 0.033\mu F$; 0805 $\geq 0.68\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 4.7\mu F$
		$\leq 10\%$	0402 $\geq 0.47\mu F$; 0603 $\geq 0.68\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$
$\leq 10V$	$\leq 5\%$	$\leq 10\%$	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 $\geq 22\mu F$
4V/6.3V	$\leq 10\%$	$\leq 15\%$	0402 $\geq 10\mu F$

X5R

Typical Capacitance Change vs. Temperature

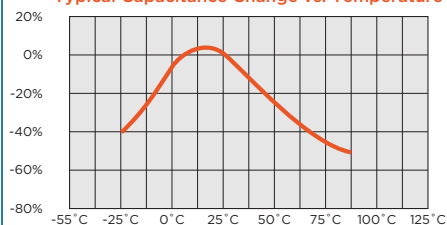


Operating Temperature Range:
-55°C to +85°C
Temperature Coefficient:
0 $\pm$ 15% Δ °C MAX.
Insulation Resistance:
>100 Ω -F or 10 G Ω , whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
Ageing:
2.5% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
K,M

RATED VOLTAGE	D.F.	EXCEPTION OF D.F.	
$\geq 50V$	$\leq 2.5\%$	$\leq 3\%$	0201 (50V); 0603 $\geq 0.047\mu F$ 0805 $\geq 0.22\mu F$; 1206 $\geq 0.47\mu F$
		$\leq 5\%$	0603 $\geq 1\mu F$; 0805 $\geq 1\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 4.7\mu F$
25V	$\leq 2.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0805 $\geq 1\mu F$; 1210 $\geq 4.7\mu F$
		$\leq 10\%$	0402 $\geq 0.10\mu F$; 0603 $\geq 0.33\mu F$; 0805 $\geq 2.2\mu F$ 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$
16V	$\leq 3.5\%$	$\leq 5\%$	0201 $\geq 0.01\mu F$; 0402 $\geq 0.033\mu F$; 0805 $\geq 0.68\mu F$; 1206 $\geq 2.2\mu F$; 1210 $\geq 4.7\mu F$
		$\leq 10\%$	0402 $\geq 0.47\mu F$; 0603 $\geq 0.68\mu F$; 0805 $\geq 2.2\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 22\mu F$
$\leq 10V$	$\leq 5\%$	$\leq 10\%$	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	$\leq 15\%$		

Z5U

Typical Capacitance Change vs. Temperature

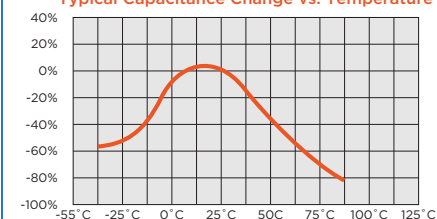


Operating Temperature Range:
+10°C to +85°C
Temperature Coefficient:
+22% - 56% Δ °C MAX.
Insulation Resistance:
>100 Ω -F or 10 G Ω , whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
Ageing:
5% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
M,Z

RATED VOLTAGE	D.F.	EXCEPTION OF D.F.	
$\geq 50V$	$\leq 5\%$	$\leq 9\%$	0603 $\geq 0.1\mu F$; 0805 $\geq 0.47\mu F$; 1206 $\geq 4.7\mu F$;
25V	$\leq 5\%$	$\leq 9\%$	0402 $\geq 0.047\mu F$; 0603 $\geq 0.1\mu F$; 0805 $\geq 0.33\mu F$; 1206 $\geq 1\mu F$; 1210 $\geq 4.7\mu F$
		$\leq 12.5\%$	0603 $\geq 2.2\mu F$; 0805 $\geq 3.3\mu F$; 1206 $\geq 10\mu F$; 1210 $\geq 22\mu F$; 1812 $\geq 47\mu F$
16V	$\leq 9\%$	$\leq 12.5\%$	0603 $\geq 2.2\mu F$; 0805 $\geq 3.3\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 10\mu F$; 1812 $\geq 47\mu F$
10V	$\leq 12.5\%$	$\leq 16\%$	0603 $\geq 2.2\mu F$; 0805 $\geq 3.3\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 10\mu F$; 1812 $\geq 47\mu F$
6.3V	$\leq 16\%$		

Y5V

Typical Capacitance Change vs. Temperature



Operating Temperature Range:
-30°C to +85°C
Temperature Coefficient:
+22% - 82% Δ °C MAX.
Insulation Resistance:
>100 Ω -F or 10 G Ω , whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
Ageing:
7% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
M,Z

RATED VOLTAGE	D.F.	EXCEPTION OF D.F.	
$\geq 50V$	$\leq 5\%$	$\leq 9\%$	0603 $\geq 0.1\mu F$; 0805 $\geq 0.47\mu F$; 1206 $\geq 4.7\mu F$;
25V	$\leq 5\%$	$\leq 9\%$	0402 $\geq 0.047\mu F$; 0603 $\geq 0.1\mu F$; 0805 $\geq 0.33\mu F$; $\geq 1206\geq 1\mu F$; 1210 $\geq 4.7\mu F$
		$\leq 12.5\%$	0603 $\geq 2.2\mu F$; 0805 $\geq 3.3\mu F$; 1206 $\geq 10\mu F$; 1210 $\geq 22\mu F$; 1812 $\geq 47\mu F$
16V	$\leq 9\%$	$\leq 12.5\%$	0603 $\geq 2.2\mu F$; 0805 $\geq 3.3\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 10\mu F$; 1812 $\geq 47\mu F$
10V	$\leq 12.5\%$	$\leq 16\%$	0603 $\geq 2.2\mu F$; 0805 $\geq 3.3\mu F$; 1206 $\geq 4.7\mu F$; 1210 $\geq 10\mu F$; 1812 $\geq 47\mu F$
6.3V	$\leq 16\%$		

TEST PARAMETERS

Test parameters for Multilayer Ceramic Capacitors
- X7R, X7S, X6S, X5R and Y5V:

1KHz $\pm$ 100Hz at 1.0 $\pm$ 0.2 Vrms < 10uF (10 V min.)
1KHz $\pm$ 100Hz at 1.0 $\pm$ 0.1 Vrms < 10uF (6.3V max.)
120Hz $\pm$ 24Hz at 1.0 $\pm$ 0.1 Vrms $\geq$ 10uF

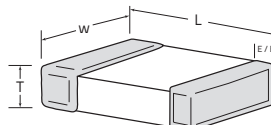
Test parameters for Multilayer Ceramic Capacitors
- COG:

1MHz $\pm$ 100KHz at 1.0 $\pm$ 0.2 Vrms $\leq$ 1000pF, 25°C
1KHz $\pm$ 100Hz at 1.0 $\pm$ 0.2 Vrms > 1000pF, 25°C

NOTE: To ensure proper capacitance readings, the voltage level must be held constant. The HP4284 and Agilent E4980 has a "ALC" (Automatic Level Control) function and should be switched to the "ON" position for accurate capacitance readings.

VOLTAGE AND CAPACITANCE RANGE

COG (COG) DIELECTRIC



Values that are typically available.

(All measurements in inches)

SIZE		01005				0201		0402			0603		0805			1206		1210		1812	
T (max)		0.008				0.012		0.025			0.033		0.055			0.075		0.103		0.110	
VDCW (MAX)		6.3V	16V	25V	50V	25V	50V	25V	50V	100V	50V	100V	25V	50V	100V	50V	100V	50V	100V	50V	100V
CAPACITANCE CODE	OR1	0.1pF																			
	OR2	0.2pF																			
	OR3	0.3pF																			
	OR4	0.4pF																			
	OR5	0.5pF																			
	1R0	1.0pF																			
	1R2	1.2pF																			
	1R5	1.5pF																			
	1R8	1.8pF																			
	2R2	2.2pF																			
	2R7	2.7pF																			
	3R3	3.3pF																			
	3R9	3.9pF																			
	4R7	4.7pF																			
	5R0	5.0pF																			
	5R6	5.6pF																			
	6R8	6.8pF																			
	8R2	8.2pF																			
	100	10pF																			
	120	12pF																			
	150	15pF																			
	180	18pF																			
	220	22pF																			

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.

VOLTAGE AND CAPACITANCE RANGE

X7R DIELECTRIC

Values that are typically available.

(All measurements in inches)

SIZE		01005		0201				0402				0603					0805		
T (max)		0.008		0.012				0.025				0.038					0.058		
VDCW (MAX)		6.3V	10V	6.3V	10V	16V	25V	16V	25V	50V	100V	10V	16V	25V	50V	100V	25V	50V	100V
CAPACITANCE CODE ↑ ↓	101	100pF																	
	121	120pF																	
	151	150pF																	
	181	180pF																	
	221	220pF																	
	271	270pF																	
	331	330pF																	
	391	390pF																	
	471	470pF																	
	561	560pF																	
	681	680pF																	
	821	820pF																	
	102	1000pF																	
	122	1200pF																	
	152	1500pF																	
	182	1800pF																	
	222	2200pF																	
	272	2700pF																	
	332	3300pF																	
	392	3900pF																	
	472	4700pF																	
	562	5600pF																	
	682	6800pF																	
	822	8200pF																	
	103	.01uF																	
	123	.012uF																	
	153	.015uF																	
	183	.018uF																	
	223	.022uF																	
	273	.027uF																	
	333	.033uF																	

* For values above 1uF, thickness may be greater than specified above.

T(max): 0603 - 0.040"

0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.

All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X7R DIELECTRIC

Values that are typically available.

(All measurements in inches)

SIZE		0201			0402					0603						0805					
T (max)*		0.012			0.025					0.038						0.059					
VDCW (MAX)		4V	6.3V	10V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V
CAPACITANCE CODE ↑ ↓	393	.039uF																			
	473	.047uF																			
	563	.056uF																			
	683	.068uF																			
	823	.082uF																			
	104	0.10uF	**	**	**																
	124	.120uF																			
	154	.150uF																			
	184	.180uF																			
	224	.220uF																			
	274	.270uF																			
	334	.330uF																			
	394	.390uF																			
	474	.470uF																			
	564	.560uF																			
	684	.680uF																			
	824	.820uF																			
	105	1.00uF																			
	125	1.20uF																			
	155	1.50uF																			
	185	1.80uF																			
	225	2.20uF																			
	335	3.30uF																			
	475	4.70uF																			
	685	6.80uF																			
	106	10.0uF																			
	156	15.0uF																		35V	
	226	22.0uF																			
	476	47.0uF																			
	107	100.0uF																			

* For values above 1uF, thickness may be greater than specified above.

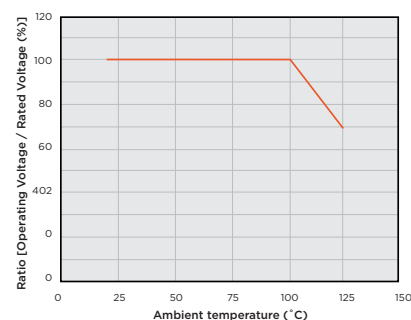
T(max): 0603 - 0.040"
0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.

All components manufactured with the X7R dielectric are also available as an X5R dielectric.

** RE: 0201, X7R, 0.1uF; When the operating temperature range is between 100°C and 125°C, it is recommended to apply the following voltage derating as shown in the diagram below.

DERATING CURVE FOR 0201, 0.1UF, X7R ONLY



VOLTAGE AND CAPACITANCE RANGE

X7R DIELECTRIC

Values that are typically available.

(All measurements in inches)

SIZE		1206					1210					1812						2220 / 2221			
T (max)*		0.070					0.125					0.085						0.108 / 0.108			
VDCW (MAX)		10V	16V	25V	50V	100V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V	16V	25V	50V	100V
CAPACITANCE CODE ↑ ↓	102	1000pF																			
	122	1200pF																			
	152	1500pF																			
	182	1800pF																			
	222	2200pF																			
	272	2700pF																			
	332	3300pF																			
	392	3900pF																			
	472	4700pF																			
	562	5600pF																			
	682	6800pF																			
	822	8200pF																			
	103	.01uF																			
	123	.012uF																			
	153	.015uF																			
	183	.018uF																			
	223	.022uF																			
	273	.027uF																			
	333	.033uF																			
	393	.039uF																			
	473	.047uF																			
	563	.056uF																			
	683	.068uF																			
	823	.082uF																			
	104	.100uF																			
	124	.120uF																			
	154	.150uF																			
	184	.180uF																			
	224	.220uF																			
	274	.270uF																			
	334	.330uF																			

* For values above 1uF, thickness may be greater than specified above.

T(max): 0603 - 0.040"

0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available. All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X7R DIELECTRIC

Values that are typically available.

(All measurements in inches)

SIZE		1206						1210						1812						2220 / 2221			
T (max)*		0.070						0.125						0.095						0.108 / 0.108			
VDCW (MAX)		6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V	6.3V	10V	16V	25V	50V	100V	16V	25V	50V	100V
CAPACITANCE CODE ↑ ↓	394	.390uF																					
	474	.470uF																					
	564	.560uF																					
	684	.680uF																					
	824	.820uF																					
	105	1.00uF																					
	125	1.20uF																					
	155	1.50uF																					
	185	1.80uF																					
	225	2.20uF																					
	335	3.30uF																					
	475	4.70uF																					
	685	6.80uF																					
	106	10.0uF																					
	156	15.0uF																			X7S/X7R	X7S/X7R	X7S/X7R
	226	22.0uF																					
	476	47.0uF																					
	107	100.0uF																					

* For values above 1uF, thickness may be greater than specified above.

T(max): 1206 - 0.075" 1812 - 0.130"
1210 - 0.125" 2220 - 0.135"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X7S DIELECTRIC (0201-0805)

Values that are typically available.

(All measurements in inches)

SIZE			0201				0402					0603					0805				
T (max)*			0.012				0.025					0.038					0.059				
VDCW (MAX)			4V	6.3V	10V	16V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V
CAPACITANCE CODE	104	CAPACITANCE VALUE	0.10uF																		
	224		0.22uF																		
	474		0.47uF																		
	105		1.00uF																		
	225		2.2uF																		
	475		4.7uF																		
	106		10.0uF																		
	226		22.0uF																		
	476		47.0uF																		
	107		100.0uF																		

X7S DIELECTRIC (1206-2220/2221)

(All measurements in inches)

SIZE			1206					1210					1812				2220/2221				
T (max)*			0.080					0.125					0.095				0.108				
VDCW (MAX)			6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	100V	16V	25V	50V	100V	16V	25V	50V	100V
<-----CAPACITANCE CODE----->	104	↑ 0.10uF																			
	224	0.22uF																			
	474	0.47																			
	105	1.00uF																			
	225	2.2uF																			
	335	3.3uF																			
	475	4.7uF																			
	106	10.0uF																			
	156	15.0uF																			
	226	22.0uF																			
	476	47.0uF																			
	107	↑ 100.0uF																			

* For values above 1uF, thickness may be greater than specified above.

T(max): 0603 - 0.040"

0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available. All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X6S DIELECTRIC (0201-0805)

Values that are typically available.

(All measurements in inches)

SIZE		0201				0402					0603						0805					
T (max)*		0.012				0.025					0.038						0.059					
VDCW (MAX)		4V	6.3V	10V	16V	6.3V	10V	16V	25V	50V	4V	6.3V	10V	16V	25V	50V	4V	6.3V	10V	16V	25V	50V
CAPACITANCE CODE	104	CAPACITANCE VALUE	0.10uF																			
	224		0.22uF																			
	474		0.47uF																			
	105		1.00uF																			
	225		2.2uF																			
	475		4.7uF																			
	106		10.0uF																			
	226		22.0uF																			
	476		47.0uF																			
	107		100.0uF																			

X6S DIELECTRIC (1206-2220/2221)

(All measurements in inches)

SIZE		1206					1210					1812				2220/2221			
T (max)*		0.080					0.125					0.095				0.108			
VDCW (MAX)		6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	16V	25V	50V	100V	16V	25V	50V	100V
CAPACITANCE CODE	104	CAPACITANCE VALUE	0.10uF																
	224		0.22uF																
	474		0.47uF																
	105		1.00uF																
	225		2.2uF																
	335		3.3uF																
	475		4.7uF																
	106		10.0uF																
	156		15.0uF																
	226		22.0uF																
	476		47.0uF																
	107		100.0uF																

* For values above 1uF, thickness may be greater than specified above.

T(max): 0603 - 0.040"

0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available. All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X5R DIELECTRIC

Values that are typically available.

(All measurements in inches)

SIZE		01005		0201						0402						0603						0805						1206				1210		1812	
T (max)		0.008		0.0216						0.025						0.040						0.060						0.072				0.125		0.130	
VDCW (MAX)		6.3V	10V	4V	6.3V	10V	16V	25V	50V	4V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	35V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	16V	25V	16V	25V	
CAPACITANCE CODE ^ 102 122 152 182 222 272 332 392 472 562 682 822 103 153 223 333 393 473 104 154 224 334 474 684 105 125 155 185 225 335 v	CAPACITANCE VALUE ^ 1000pF 1200pF 1500pF 1800pF 2200pF 2700pF 3300pF 3900pF 4700pF 5600pF 6800pF 8200pF .01uF .015uF .022uF .033uF .039uF .047uF 0.10uF .150uF .220uF .330uF .470uF .680uF 1.00uF 1.20uF 1.50uF 1.80uF 2.20uF 3.30uF v																																		
																													</						

* For values above 1uF, thickness may be greater than specified above.

T(max): 1206 - 0.075" 1812 - 0.130"
1210 - 0.125" 2220 - 0.135"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X5R DIELECTRIC (0402-1206)

Values that are typically available.

(All measurements in inches)

SIZE		0201			0402				0603						0805						1206					
T (max)		0.0216			0.0335				0.040						0.060						0.072					
VDCW (MAX)		4V	6.3V	10V	4V	6.3V	10V	16V	4V	6.3V	10V	16V	25V	35V	4V	6.3V	10V	16V	25V	35V	50V	6.3V	10V	16V	25V	50V
CAPACITANCE CODE 395 475 685 106 156 226 476 107 157 227	CAPACITANCE VALUE	3.90uF																								
		4.70uF																								
		6.80uF																								
		10.0uF																								
		15.0uF																								
		22.0uF																								
		47.0uF																								
		100.0uF																								
		150.0uF																								
		220.0uF																								

X5R DIELECTRIC (1210-2221)

(All measurements in inches)

SIZE		1210					1812				2220 / 2221				
T (max)		0.125					0.130				0.135				
VDCW (MAX)		6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	6.3V	10V	16V	25V	50V
CAPACITANCE CODE 395 475 685 106 156 226 476 107 157 227	395	3.90uF													
	475	4.70uF													
	685	6.80uF													
	106	10.0uF													
	156	15.0uF													
	226	22.0uF													
	476	47.0uF													
	107	100.0uF													
	157	150.0uF													
	227	220.0uF													

* For values above 1uF, thickness may be greater than specified above.

T(max): 1206 - 0.075" 1812 - 0.130"
1210 - 0.125" 2220 - 0.135"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

Z5U DIELECTRIC

Values that are typically available.

(All measurements in inches)

SIZE		0603		0805		1206		1210		1812		2220 / 2221	
T (max)		0.038		0.058		0.070		0.075		0.085		0.108 / 0.108	
VDCW (MAX)		25V	50V	25V	50V	25V	50V	25V	50V	25V	50V	25V	50V
CAPACITANCE CODE	102	1000pF											
	122	1200pF											
	152	1500pF											
	182	1800pF											
	222	2200pF											
	272	2700pF											
	332	3300pF											
	392	3900pF											
	472	4700pF											
	562	5600pF											
	682	6800pF											
	822	8200pF											
	103	.01uF											
	123	.012uF											
	153	.015uF											
	183	.018uF											
	223	.022uF											
	273	.027uF											
	333	.033uF											
	393	.039uF											
	473	.047uF											
CAPACITANCE CODE	563	.056uF											
	683	.068uF											
	823	.082uF											
	104	.100uF											
	124	.120uF											
	154	.150uF											
	184	.180uF											
	224	.220uF											
	274	.270uF											
	334	.330uF											

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.

VOLTAGE AND CAPACITANCE RANGE

Z5U DIELECTRIC

Values that are typically available.

(All measurements in inches)

SIZE		0603		0805		1206		1210		1812		2220 / 2221	
T (max)		0.038		0.058		0.070		0.075		0.085		0.108 / 0.108	
VDCW (MAX)		25V	50V	25V	50V	25V	50V	25V	50V	25V	50V	25V	50V
CAPACITANCE CODE	394	.390uF											
	474	.470uF											
	564	.560uF											
	684	.680uF											
	824	.820uF											
	105	1.00uF											
	125	1.20uF											
	155	1.50uF											
	185	1.80uF											
	225	2.20uF											
	335	3.30uF											
	395	3.90uF											
	475	4.70uF											
	685	6.80uF											
	106	10.0uF											
	156	15.0uF											
	226	22.0uF											
	476	47.0uF											
	107	100.0uF											

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
For values above 1uF, thickness may be greater than specified above.

VOLTAGE AND CAPACITANCE RANGE

Y5V DIELECTRIC

Values that are typically available.

(All measurements in inches)

SIZE		0201		0402				0603				0805				1206				1210				1812					
T (max)		0.012		0.025				0.038				0.058				0.070				0.096				0.085					
VDCW (MAX)		10V		6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	10V	16V	25V	50V	6.3V	10V	16V	25V	6.3V	10V	25V
CAPACITANCE CODE ↑ ↓	102	1000pF																											
	122	1200pF																											
	152	1500pF																											
	182	1800pF																											
	222	2200pF																											
	272	2700pF																											
	332	3300pF																											
	392	3900pF																											
	472	4700pF																											
	562	5600pF																											
	682	6800pF																											
	822	8200pF																											
	103	.01uF																											
	123	.012uF																											
	153	.015uF																											
	183	.018uF																											
	223	.022uF																											
	273	.027uF																											
	333	.033uF																											
	393	.039uF																											
	473	.047uF																											
	563	.056uF																											
	683	.068uF																											
	823	.082uF																											
	104	.100uF																											
	124	.120uF																											
	154	.150uF																											
	184	.180uF																											
	224	.220uF																											
	274	.270uF																											
	334	.330uF																											

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
For values above 1uF, thickness may be greater than specified above.

VOLTAGE AND CAPACITANCE RANGE

Y5V DIELECTRIC

Values that are typically available.

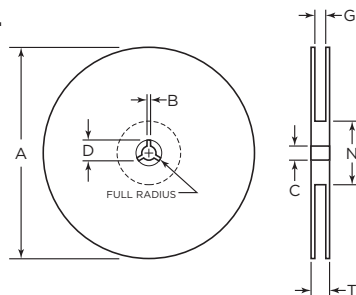
(All measurements in inches)

SIZE		0201		0402		0603					0805					1206				1210					1812		
T (max)		0.012		0.025		0.038					0.058					0.070				0.10					0.085		
VDCW (MAX)		10V	6.3V	10V	16V	6.3V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	10V	16V	25V	50V	6.3V	10V	16V	25V	50V	6.3V	10V	25V
CAPACITANCE CODE	394	.390uF																									
	474	.470uF																									
	564	.560uF																									
	684	.680uF																									
	824	.820uF																									
	105	1.00uF																									
	125	1.20uF																									
	155	1.50uF																									
	185	1.80uF																									
	225	2.20uF																									
CAPACITANCE VALUE	335	3.30uF																									
	395	3.90uF																									
	475	4.70uF																									
	685	6.80uF																									
	106	10.0uF																									
	156	15.0uF																									
	226	22.0uF																									
	476	47.0uF																									
	107	100.0uF																									

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
For values above 1uF, thickness may be greater than specified above.

TAPE & REEL SPECIFICATIONS

REEL

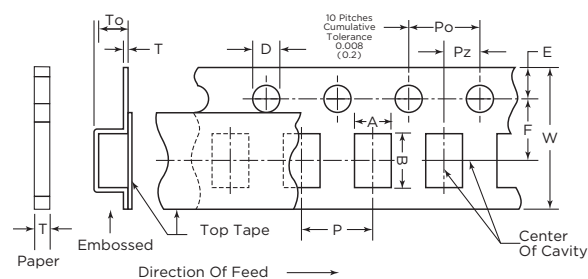


All tape and reel specifications must be adhered to per EIA-481-1-A.

Unit: mm (inch)

Tape	B min	C	A (7")	A (13")	D min	N min	G	T max
4mm	2.0 (0.079)	13 ± 0.05 (0.512 ± 0.02)	178 ± 2.0 (7 ± 0.079)	-	21 ± 0.8 (0.82 ± 0.03)	50 (1.97)	5.0 ± 1.5 (0.196 ± 0.05)	8.0 max (0.315 max)
8mm	2.0 (0.07)	13 ± 0.05 (0.512 ± 0.02)	178 ± 2.0 (7 ± 0.079)	330 ± 2.0 (13 ± 0.08)	20.2 (0.795)	50 (1.97)	10 ± 1.5 (0.394 ± 0.059)	14.9 (0.587)
12mm	2.0 (0.07)	13 ± 0.05 (0.512 ± 0.02)	178 ± 2.0 (7 ± 0.079)	330 ± 2.0 (13 ± 0.08)	20.2 (0.795)	50 (1.97)	10 ± 1.5 (0.394 ± 0.059)	14.9 (0.587)

TAPE



7" Reel Quantities **

SIZE	01005 (E)	01005 (P)	0201	0402	0603	0805	1206	1210	1812	2220/2221
Tape Size	4mm	8mm	8mm	8mm	8mm	8mm	8mm	8mm	12mm	12mm
Min Qty Per Reel	40,000*	20,000*	15,000	5,000	3,000	2,000	2,000	1,000	1,000	1,000
Max Qty Per Reel	40,000*	20,000*	15,000	10,000	4,000	5,000	5,000	5,000	3,000	1,000

NOTE: ** Quantity dependent on thickness

*Smaller quantities may be available. Please contact us.

Paper Tape Carrier Dimensions (8mm)

Unit: mm (inch)

Size (inches)	A	B	W	F	E	Po	Pz	D	t	P
01005	$\frac{0.25 \pm 0.05}{(0.010 \pm 0.002)}$	$\frac{0.45 \pm 0.05}{(0.018 \pm 0.002)}$	$\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{-0.0}$ $\frac{(0.039 \pm 0.002)}{-0.000}$	$\frac{1.5 \pm 0.1}{(0.064 \pm 0.004)}$	$\frac{1.15 \text{ max}}{(0.045 \text{ max})}$	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$
0201	$\frac{0.37 \pm 0.05}{(0.014 \pm 0.002)}$	$\frac{0.67 \pm 0.05}{(0.026 \pm 0.002)}$	$\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{-0.0}$ $\frac{(0.039 \pm 0.002)}{-0.000}$	$\frac{1.5 \pm 0.1}{(0.064 \pm 0.004)}$	$\frac{1.15 \text{ max}}{(0.045 \text{ max})}$	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$
0402	$\frac{0.65 \pm 0.1}{(0.026 \pm 0.004)}$	$\frac{1.10 \pm 0.2}{(0.043 \pm 0.008)}$	$\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{-0.0}$ $\frac{(0.039 \pm 0.002)}{-0.000}$	$\frac{1.5 \pm 0.1}{(0.064 \pm 0.004)}$	$\frac{1.15 \text{ max}}{(0.045 \text{ max})}$	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$
0603	$\frac{1.10 \pm 0.2}{(0.043 \pm 0.008)}$	$\frac{1.90 \pm 0.2}{(0.075 \pm 0.008)}$	$\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{-0.0}$ $\frac{(0.039 \pm 0.002)}{-0.000}$	$\frac{1.5 \pm 0.1}{(0.064 \pm 0.004)}$	$\frac{1.15 \text{ max}}{(0.045 \text{ max})}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$
0805	$\frac{1.16 \pm 0.2}{(0.046 \pm 0.008)}$	$\frac{2.4 \pm 0.2}{(0.095 \pm 0.008)}$	$\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{-0.0}$ $\frac{(0.039 \pm 0.002)}{-0.000}$	$\frac{1.5 \pm 0.1}{(0.064 \pm 0.004)}$	$\frac{1.15 \text{ max}}{(0.045 \text{ max})}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$
1206	$\frac{2.0 \pm 0.2}{(0.079 \pm 0.008)}$	$\frac{3.6 \pm 0.2}{(0.142 \pm 0.008)}$	$\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{-0.0}$ $\frac{(0.039 \pm 0.002)}{-0.000}$	$\frac{1.5 \pm 0.1}{(0.064 \pm 0.004)}$	$\frac{1.15 \text{ max}}{(0.045 \text{ max})}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$

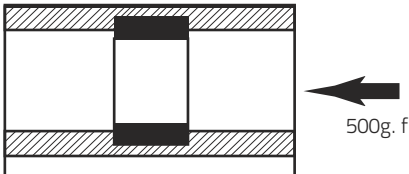
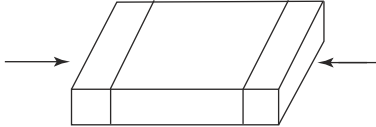
Embossed Carrier Dimensions (4mm, 8mm & 12mm)

Size (inches)	A	B	W	F	E	Po	Pz	D	To	T	P
01005	$\frac{0.23}{(0.009)}$	$\frac{0.43}{(0.016)}$	$\frac{4.0 \pm 0.05}{(0.157 \pm 0.002)}$	$\frac{1.8 \pm 0.02}{(0.070 \pm 0.001)}$	$\frac{0.9 \pm 0.05}{(0.035 \pm 0.002)}$	$\frac{2.0 \pm 0.04}{(0.079 \pm 0.001)}$	$\frac{2.00}{(0.079)}$	$\frac{0.8 \pm 0.04}{(0.031 \pm 0.001)}$	$\frac{0.5 \text{ max}}{(0.019 \text{ max})}$	$\frac{0.15 - 0.4}{(0.005 - 0.015)}$	$\frac{1.00}{(0.039)}$
0603	$\frac{1.05 \pm 0.15}{(0.042 \pm 0.006)}$	$\frac{1.90 \pm 0.15}{(0.075 \pm 0.006)}$	$\frac{8.0 \pm 0.3}{(0.315 \pm 0.012)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$	$\frac{1.5 \pm 0.1}{-0.0}$ $\frac{(0.06 \pm 0.004)}{-0.000}$	$\frac{0.75 \text{ max}}{(0.03 \text{ max})}$	$\frac{0.6 \text{ max}}{(0.024 \text{ max})}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$
0805	$\frac{1.48 \pm 0.2}{(0.058 \pm 0.008)}$	$\frac{2.3 \pm 0.3}{(0.091 \pm 0.008)}$	$\frac{8.0 \pm 0.3}{(0.315 \pm 0.008)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$	$\frac{1.5 \pm 0.1}{-0.0}$ $\frac{(0.06 \pm 0.004)}{-0.000}$	$\frac{2.5 \text{ max}}{(0.098 \text{ max})}$	$\frac{0.6 \text{ max}}{(0.024 \text{ max})}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$
1206	$\frac{2.0 \pm 0.2}{(0.079 \pm 0.008)}$	$\frac{3.6 \pm 0.3}{(0.142 \pm 0.008)}$	$\frac{8.0 \pm 0.3}{(0.315 \pm 0.008)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$	$\frac{1.5 \pm 0.1}{-0.0}$ $\frac{(0.06 \pm 0.004)}{-0.000}$	$\frac{2.5 \text{ max}}{(0.098 \text{ max})}$	$\frac{0.6 \text{ max}}{(0.024 \text{ max})}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$
1210	$\frac{2.9 \pm 0.2}{(0.114 \pm 0.008)}$	$\frac{3.6 \pm 0.3}{(0.142 \pm 0.008)}$	$\frac{8.0 \pm 0.3}{(0.315 \pm 0.008)}$	$\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$	$\frac{1.5 \pm 0.1}{-0.0}$ $\frac{(0.06 \pm 0.004)}{-0.000}$	$\frac{2.5 \text{ max}}{(0.098 \text{ max})}$	$\frac{0.6 \text{ max}}{(0.024 \text{ max})}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$
1812	$\frac{3.6 \pm 0.2}{(0.142 \pm 0.008)}$	$\frac{4.9 \pm 0.3}{(0.193 \pm 0.008)}$	$\frac{12.0 \pm 0.3}{(0.472 \pm 0.012)}$	$\frac{5.6 \pm 0.1}{(0.221 \pm 0.004)}$	$\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$	$\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$	$\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$	$\frac{1.5 \pm 0.1}{-0.0}$ $\frac{(0.06 \pm 0.004)}{-0.000}$	$\frac{3.8 \text{ max}}{(0.150 \text{ max})}$	$\frac{0.6 \text{ max}}{(0.024 \text{ max})}$	$\frac{8.0 \pm 0.1}{(0.315 \pm 0.004)}$

ENVIRONMENTAL CHARACTERISTICS

NO	ITEM		PERFORMANCE		TEST CONDITION				
1	APPEARANCE		NO ABNORMAL EXTERIOR APPEARANCE		THROUGH MICROSCOPE (X10)				
2	INSULATION RESISTANCE		10,000M OR 500M μF PRODUCT WHICHEVER IS SMALLER (RATED VOLTAGE IS BELOW 16V: 10,000M OR 100M μF)		RATED VOLTAGE SHALL BE APPLIED. MEASUREMENT TIME IS 60 - 120 RATED VOLTAGE TIME 60 SEC .				
3	WITHSTANDING VOLTAGE		NO DIELECTRIC BREAKDOWN OR MECHANICAL BREAKDOWN		CLASS I : 300% OF THE RATED VOLTAGE FOR 1-5 SEC, CLASS II: 250% OF THE RATED VOLTAGE FOR 1-5 SEC IS APPLIED WITH LESS THAN 50mA CURRENT				
4	CAPACITANCE	CLASS I	WITHIN THE SPECIFIED TOLERANCE		CAPACITANCE	FREQUENCY	VOLTAGE		
					1,000pF AND BELOW	1MHz ±10%	0.5 - 5 Vrms		
					MORE THAN 1,000 pF	1kHz ± 10%			
		CLASS II	WITHIN THE SPECIFIED TOLERANCE		CAPACITANCE	FREQUENCY	VOLTAGE		
					4.7μF AND BELOW	1kHz ± 10%	1.0 ± 0.2Vrms		
					MORE THAN 4.7μF	120Hz ± 20%	1.0 ± 0.2Vrms		
5	Q	CLASS I	OVER 30pF : Q 1,000 LESS THAN 30pF: Q 400 +20C (C: CAPACITANCE)		CAPACITANCE	FREQUENCY	VOLTAGE		
					1,000pF AND BELOW	1MHz ±10%	0.5 - 5 Vrms		
					MORE THAN 1,000 pF	1kHz ± 10%			
6	DISSIPATION FACTOR (Tanθ CLASS II)	CLASS II	X7R, X6S, X5R						
			Rated Voltage	D.F.	Exception of D.F.				
			≥50V	≤2.5%	≤3%	0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF			
					≤5%	0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF			
			25V	≤2.5%	≤5%	0201≥0.01uF; 0805≥1uF; 1210≥4.7uF			
					≤10%	0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF			
			16V	≤3.5%	≤5%	0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF			
					≤10%	0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF			
			10V	≤5%	≤10%	0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF			
			6.3V	≤15%					
			Y5V, Z5U						
			Rated Voltage	D.F.	Exception of D.F.				
			≥50V	≤5%	≤9%	0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF;			
			25V	≤5%	≤9%	0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF			
			16V	≤9%	≤12.5%	0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF			
			10V	≤12.5%	≤16%	0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF			
			6.3V	≤16%					

ENVIRONMENTAL CHARACTERISTICS

NO	ITEM		PERFORMANCE			TEST CONDITION			
7	CAPACITANCE TEMPERATURE COEFFICIENT	CLASS I	CHARACTERISTIC	TEMP. COEFFICIENT (PPM/°C)		THESE SYMMETRICAL TOLERANCE APPLY TO 2 POINT MEASURE- MENT OF TEMPERATURE COEFFICIENT: ONE AT -25°C AND AT 85°C			
			COG/COG	0 ± 60 (±30)		STEP	TEMPERATURE (°C)		
				-150 ± 60		1	25 ± 2		
				-220 ± 60		2	MIN RATED TEMP ± 2		
				-330 ± 60		3	25 ± 2		
				-470 ± 60		4	MAX RATED TEMP ± 2		
				-750 ± 120		5	25 ± 2		
				+350 - -1000					
8	TEMPERATURE CHARACTERISTICS		CLASS II	CAPACITANCE CHANGE		STEP	TEMP. (°C) B	TEMP. (°C) F	
				CHAR.	CAP. CHANGE (%)				
				X	X7R	±15%	1	25 ± 2	25 ± 2
					X6S	±22%	2	-55 ± 2	-25 ± 2
					X5R	±15%	3	25 ± 2	25 ± 2
				Y	Y5V	-82% ~ +22%	4	125 ± 2	85 ± 2
					Z5U	-56% ~ +22%	5	25 ± 2	25 ± 2
							$\frac{C2 - C1}{C1} \times 100\%$		
								C1: CAPACITANCE AT STANDARD TEMPERATURE (25°C) C2: CAPACITANCE AT EACH TEMPERATURE	
				9	ADHESIVE STRENGTH OF TERMINATION		NO INDICATION OF PEELING SHALL OCCUR ON THE TERMINAL ELECTRODE		A 500g.f PRESSURE SHALL BE APPLIED FOR 10±1 SECOND
									
10	BENDING STRENGTH	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCURE		BENDING SHALL BE APPLIED TO THE LIMIT (1mm) WITH 0.3mm/SEC				
		CAPACITANCE	CHARACTER	CHANGE OF CAPACITANCE					
			CLASS I	WITHIN ±5% OR ±0.5pF WHICHEVER IS LARGER					
			CLASS II	X (X7R, X6S, X5R)				WITHIN ±12.5%	
				Y (Y5V,Z5U)				WITHIN ±30%	
11	SOLDERABILITY		MORE THAN 75% OF THE TERMINAL SURFACE IS TO BE SOLDERED NEWLY, SO METAL PART (A) DOES NOT COME OUT OR DISSOLVE		 SOLDER TEMPERATURE: 245 ± 5 °C SOLDER: Sn_Ag3_0.5Cu FLUX: RMA Type PRE-HEATING: AT 80 - 120 °C FOR 10 - 30 SEC.				

ENVIRONMENTAL CHARACTERISTICS

NO	ITEM		PERFORMANCE			TEST CONDITION									
12	RESISTANCE TO SOLDERING HEAT	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR			DIP : SOLDER TEMPERATURE OF 270± 5 °C DIP TIME :10±1 SEC. EACH TERMINATION SHALL BE FULLY IMMERSED AND PREHEATED AS FOLLOWING: <table><tr><th>STEP</th><th>TEMP. (°C)</th><th>TIME (SEC.)</th></tr><tr><td>1</td><td>80-100</td><td>60</td></tr><tr><td>2</td><td>150-180</td><td>60</td></tr></table> MEASURE AT ROOM TEMP. AFTER COOLING FOR CLASS I : 24 ± 2 HOURS CLASS II : 48 ± 4 HOURS	STEP	TEMP. (°C)	TIME (SEC.)	1	80-100	60	2	150-180	60
		STEP	TEMP. (°C)	TIME (SEC.)											
		1	80-100	60											
		2	150-180	60											
		CAPACITANCE	CHARACTERISTIC		CAP. CHANGE										
			CLASSES I		WITHIN ±2.5% OR ±0.25 pF WHICHEVER IS LARGER										
			CLASS II	X	WITHIN ±7.5%										
				Y	WITHIN ±20%										
		QCLASS I	30 pF AND OVER: Q 1000 LESS THAN 30 pF: Q 400 + 20xC												
Tan CLASS II	TO SATISFY THE SPECIFIED INITIAL VALUE														
INSULATION RESISTANCE	TO SATISFY THE SPECIFIED INITIAL VALUE														
WITHSTANDING VOLTAGE	TO SATISFY THE SPECIFIED INITIAL VALUE														
13	VIBRATION TEST	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR			THE CAPACITOR SHALL BE SUBJECTED TO A HARMONIC MOTION HAVING A TOTAL AMPLITUDE of 1.5mm THE ENTIRE FREQUENCY RANGE, FROM 10 TO 55Hz AND RETURN TO 10Hz SHALL BE TRAVERSED IN 1 MINUTE. THIS CYCLE SHALL BE PERFORMED 2 HOURS IN EACH THREE MUTUALLY PERPENDICULAR DIRECTION, FOR TOTAL PERIOD of 6 HOURS.									
		CAPACITANCE	CHARACTERISTIC		CAP. CHANGE										
			CLASSES I		WITHIN ±2.5% OR ±0.25 pF WHICHEVER IS LARGER										
			CLASS II	X	WITHIN ±5%										
				Y	WITHIN ±20%										
		QCLASS I	30 pF AND OVER: Q 1000 LESS THAN 30 pF: Q 400 + 20xC												
		Tan CLASS II	TO SATISFY THE SPECIFIED INITIAL VALUE												
		INSULATION RESISTANCE	TO SATISFY THE SPECIFIED INITIAL VALUE												

ENVIRONMENTAL CHARACTERISTICS

NO	ITEM		PERFORMANCE				TEST CONDITION			
14	HUMIDITY (STEADY STATE)	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR					TEMPERATURE : 40±2 °C RELATIVE HUMIDITY: 90-95 %RH TEST TIME : 500 +12/-0 Hr. MEASURE AT ROOM TEMPERATURE AFTER COOLING FOR CLASS I : 24±2 Hr. CLASS II : 48±4 Hr. SEE (FIG.3)		
		CAPACITANCE	CHARACTERISTIC		CAPACITANCE CHANGE					
			CLASS I		WITHIN ±5% OR±0.5pF WHICHEVER IS LARGER					
			CLASS II	X	WITHIN ±12.5%					
				Y	WITHIN ±30%					
		QCLASS I	30pF AND OVER : Q 350 10 - 30pF : Q 275 + 2.5xC LESS THAN 10pF : Q 200 + 10xC							
		DISSIPATION FACTOR (Tanθ CLASS II)	X7R, X6S, X5R							
			Rated Voltage	D.F.	Exception of D.F.					
					≥50V	≤2.5%	≤3%		0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF	
			≤5%	0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF						
			25V	≤2.5%	≤5%	0201≥0.01uF; 0805≥1uF; 1210≥4.7uF				
					≤10%	0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF				
			16V	≤3.5%	≤5%	0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF				
					≤10%	0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF				
	10V		≤5%	≤10%	0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF					
6.3V	≤15%									
Y5V, Z5U										
Rated Voltage	D.F.		Exception of D.F.							
			≥50V	≤5%	≤9%	0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF;				
25V	≤5%		≤9%	0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF						
16V	≤9%		≤12.5%	0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF						
10V	≤12.5%		≤16%	0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF						
6.3V	≤16%									
INSULATION RESISTANCE	MINIMUM INSULATION RESISTANCE: 1,000M OR 50M μF PRODUCT WHICHEVER IS SMALLER									

ENVIRONMENTAL CHARACTERISTICS

NO	ITEM	PERFORMANCE	TEST CONDITION
15	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR	APPLIED VOLTAGE: RATED VOLTAGE TEMPERATURE : 40±2 °C RELATIVE HUMIDITY: 90-95%RH TEST TIME : 500 +12/-0 Hr. CURRENT APPLIED: 50mA MAX. MEASURING AT ROOM TEMPERATURE AFTER COOLING FOR CLASS I : 24±2 Hr. CLASS II : 48±4 Hr. SEE (FIG.3)
	CAPACITANCE	CHARACTERISTIC	CAPACITANCE CHANGE
		CLASS I	WITHIN ±7.5% OR±0.75pF WHICHEVER IS LARGER
		CLASS II	X WITHIN ±12.5%
			Y WITHIN ±30%
	QCLASS I	30pF AND OVER : Q 200 30pF AND BELOW : Q 100 + 10/3xC	
	DISSIPATION FACTOR (Tanθ CLASS II)	X7R, X6S, X5R	
		Rated Voltage	D.F.
		Exception of D.F.	
		≥50V	≤2.5%
			≤3%
		25V	≤5%
			≤10%
		16V	≤3.5%
			≤10%
		10V	≤5%
			≤10%
		6.3V	≤15%
		Y5V, Z5U	
		Rated Voltage	D.F.
		Exception of D.F.	
		≥50V	≤5%
			≤9%
		25V	≤5%
			≤9%
		16V	≤9%
			≤12.5%
		10V	≤12.5%
			≤16%
		6.3V	≤16%
	INSULATION RESISTANCE	MINIMUM INSULATION RESISTANCE: 100 M OR 25M μF PRODUCT, WHICHEVER IS SMALLER	

ENVIRONMENTAL CHARACTERISTICS

NO	ITEM			PERFORMANCE			TEST CONDITION			
16	HIGH TEMERATURE RESISTANCE	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR			APPLIED VOLTAGE: 200% OF RATED VOLTAGE TEST TIME : 1000 +48/-0 Hr. CURRENT APPLIED: 50mA MAX.				
		CAPACITANCE	CHARACTERISTIC		CAP. CHANGE					
			CLASS I		WITHIN ±3% OR ±0.3pF, WHICHEVER IS LARGER					
			CLASS II	X	WITHIN ±12.5%	CHAR.	TEMP.			
		Y		WITHIN ±30%	CLASS I		125 ±3 °C			
		QCLASS I	30pF AND OVER : Q 350 10 - 30 pF : Q 275 + 2.5xC LESS THAN 10pF :Q 200 + 10xC				CLASS II	X	125 ±3 °C	
					Y	85 ±3 °C				
		DISSIPATION FACTOR (Tanθ CLASS II)	X7R, X6S, X5R					(INITIAL VALUE MEASUREMENT) FOR CLASS II CAPACITORS, 200 % OF RATED VOLTAGE SHALL BE APPLIED FOR 1 HOUR AT THE MAXIMUM OPERATING TEMPERATURE, THEN KEEP IT AT ROOM TEMPERATURE FOR 48 ±4 HRS. SEE (FIG.3)		
			Rated Voltage	D.F.	Exception of D.F.					
					≥50V	≤2.5%	≤3%			
					≤5%	0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF				
			25V	≤2.5%	≤5%	0201≥0.01uF; 0805≥1uF; 1210≥4.7uF				
					≤10%	0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF				
			16V	≤3.5%	≤5%	0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF				
					≤10%	0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF				
10V	≤5%		≤10%	0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF						
6.3V	≤15%									
Y5V, Z5U										
Rated Voltage	D.F.		Exception of D.F.							
		≥50V	≤5%	≤9%	0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF;					
		25V	≤5%	≤9%	0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF					
		16V	≤9%	≤12.5%	0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF					
		10V	≤12.5%	≤16%	0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF					
		6.3V	≤16%							
INSULATION RESISTANCE	MINIMUM INSULATION RESISTANCE: 1,000M OR 50M μF PRODUCT WHICHEVER IS SMALLER									

ENVIRONMENTAL CHARACTERISTICS

NO	ITEM			PERFORMANCE				TEST CONDITION		
17	TEMPERATURE CYCLE	APPEARANCE	NO MECHANICAL DAMAGE SHALL OCCUR				CAPACITORS SHALL BE SUBJECTED TO FIVE CYCLES OF THE TEMPERATURE CYCLE AS FOLLOWING			
		CAPACITANCE	CHARACTERISTIC		CAP. CHANGE					
			CLASS I		WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER					
			CLASS II	X	WITHIN ±7.5%					
				Y	WITHIN ±20%					
		QCLASS I	30 pF AND OVER : Q 1000 LESS THAN 3OpF:Q 400 +20xC				STEP	TEMP.(°C)	TIME (MIN)	
		TAN CLASS II	X7R, X6S, X5R				1	MIN. RATED TEMP. +0/-3	30	
			Rated Voltage	D.F.	Exception of D.F.		2	25	2 - 3	
							3	MAX. RATED TEMP. +3/-0	30	
			≥50V	≤2.5%	≤3%	0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF		4	25	2 - 3
					≤5%	0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF				
			25V	≤2.5%	≤5%	0201≥0.01uF; 0805≥1uF; 1210≥4.7uF				
					≤10%	0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF				
			16V	≤3.5%	≤5%	0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF				
					≤10%	0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF				
			10V	≤5%	≤10%	0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF				
			6.3V	≤15%						
			Y5V, Z5U				MEASURE AT ROOM TEMPERATURE AFTER COOLING FOR CLASS I : 24±2 Hr. CLASS II : 48±4 Hr. SEE(FIG.3)			
			Rated Voltage	D.F.	Exception of D.F.					
			≥50V	≤5%	≤9%	0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF;				
			25V	≤5%	≤9%	0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF				
			16V	≤9%	≤12.5%	0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF				
			10V	≤12.5%	≤16%	0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF				
			6.3V	≤16%						
		INSULATION RESISTANCE	TO SATISFY THE SPECIFIED INITIAL VALUE							

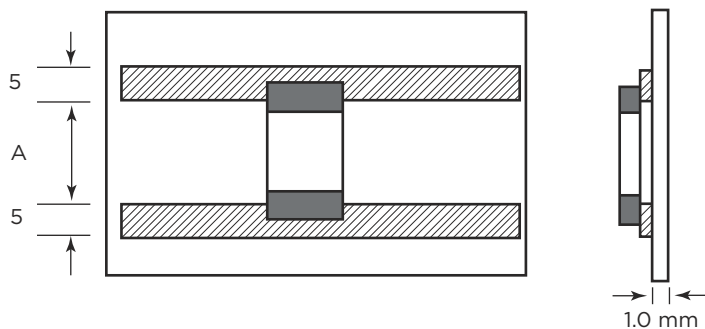
ENVIRONMENTAL CHARACTERISTICS

NO	ITEM	TEST CONDITION	REQUIREMENTS																																																																																																																							
18	HIGH TEMPERATURE Load-Endurance (Life Testing)	*Test Temperature: C0G, X7R/X7S: 125±3°C X5R, Y5V: 85±3°C Test time: 1000+24/-0 hrs. Endurance or Life Test Voltage (RVLL) * All components are tested at 100% of rated voltage (Vr) for the below range: <table> <tr> <th>SIZE</th><th>DIELECTRIC</th><th>RATED VOLTAGE</th><th>CAPACITANCE</th></tr> <tr> <td>0201</td><td>X5R/X7R/X6S</td><td>≤10V</td><td>C≥0.1μF</td></tr> <tr> <td></td><td></td><td>≥16V</td><td>C>0.1μF</td></tr> <tr> <td rowspan="6">0402</td><td rowspan="2">X5R</td><td>≤16V</td><td>C>0.1μF</td></tr> <tr> <td>25V, 50V</td><td>C≥0.1μF</td></tr> <tr> <td rowspan="2">X6S</td><td>6.3V, 10V</td><td>C>0.1μF</td></tr> <tr> <td>16V, 25V</td><td>C≥0.1μF</td></tr> <tr> <td rowspan="2">X7R/X7S/Y5V</td><td>25V</td><td>C≥0.1μF</td></tr> <tr> <td>35V</td><td>C≥0.1μF</td></tr> <tr> <td rowspan="4">0603</td><td rowspan="2">X5R/X7R/X6S/X7S</td><td>4V</td><td>C≥22μF</td></tr> <tr> <td>6.3V, 10V</td><td>C≥4.7μF</td></tr> <tr> <td>X5R/X7R/X6S</td><td>25V</td><td>C≥0.1μF</td></tr> <tr> <td>X7R</td><td>35V</td><td>C≥0.1μF</td></tr> <tr> <td rowspan="5">0805</td><td rowspan="3">X5R/X7R/X6S/X7S</td><td>4V</td><td>C≥47μF</td></tr> <tr> <td>6.3V</td><td>C≥22μF</td></tr> <tr> <td>10V, 50V</td><td>C≥10μF</td></tr> <tr> <td>X7R/X6S</td><td>16V, 25V</td><td>C≥10μF</td></tr> <tr> <td>X5R</td><td></td><td>C≥22μF</td></tr> <tr> <td>1206</td><td>X5R/X7R/X6S</td><td>≤6.3V</td><td>C≥47μF</td></tr> <tr> <td rowspan="2">1210</td><td>X5R/X7R/X6S</td><td>16V</td><td>C≥47μF</td></tr> <tr> <td>X7R</td><td>100V</td><td>C≥43.3μF</td></tr> </table> *Any items outside this range or with a different dielectric will hold the following test conditions: (1) ≤ 6.3V or C ≥ 10μF : 150% of rated voltage. (2) 10V ≤ Vr ≤ 100V: 200% of rated voltage.	SIZE	DIELECTRIC	RATED VOLTAGE	CAPACITANCE	0201	X5R/X7R/X6S	≤10V	C≥0.1μF			≥16V	C>0.1μF	0402	X5R	≤16V	C>0.1μF	25V, 50V	C≥0.1μF	X6S	6.3V, 10V	C>0.1μF	16V, 25V	C≥0.1μF	X7R/X7S/Y5V	25V	C≥0.1μF	35V	C≥0.1μF	0603	X5R/X7R/X6S/X7S	4V	C≥22μF	6.3V, 10V	C≥4.7μF	X5R/X7R/X6S	25V	C≥0.1μF	X7R	35V	C≥0.1μF	0805	X5R/X7R/X6S/X7S	4V	C≥47μF	6.3V	C≥22μF	10V, 50V	C≥10μF	X7R/X6S	16V, 25V	C≥10μF	X5R		C≥22μF	1206	X5R/X7R/X6S	≤6.3V	C≥47μF	1210	X5R/X7R/X6S	16V	C≥47μF	X7R	100V	C≥43.3μF	• No remarkable damage. CAP CHANGE: C0G: ±3.0% or ±0.3pF whichever is larger X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; **10V: 0603≥4.7μF; 0402≥1.0μF; 0201≥0.1μF, within ±25% Y5V≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. VALUE: C0G: More than 30pF, Q≥350 10pF≤30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C X7R, X5R, X6S, X7S: <table> <tr> <th>RATED VOLTAGE</th><th>D.F.</th><th colspan="2">EXCEPTIONS OF D.F. ≤</th></tr> <tr> <td rowspan="3">≥100V</td><td rowspan="3">≤3%</td><td>≤6%</td><td>1206≥0.47μF</td></tr> <tr> <td>≤7.5%</td><td>0603≥0.068μF; 0805>0.1μF; 1206≥1μF; 1210≥2.2μF</td></tr> <tr> <td>≤20%</td><td>0805>2.2μF; 1210≤3.3μF</td></tr> <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>0201≥0.01μF; 1210≥3.3μF</td></tr> <tr> <td>≤20%</td><td>0402≥0.012μF; 0603>0.1μF; 0805≥1.0μF (0805/X7R>0.47μF); 1206≥2.2μF; 1210≥10μF</td></tr> <tr> <td>35V</td><td>≤5%</td><td>≤20%</td><td>0603≥1.0μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF</td></tr> <tr> <td rowspan="4">25V</td><td rowspan="4">≤5%</td><td>≤10%</td><td>0201=0.01μF; 0805≥1.0μF; 1210≥10μF</td></tr> <tr> <td>≤14%</td><td>0603≥0.33μF</td></tr> <tr> <td>≤15%</td><td>0201>0.01μF; 0402>0.10μF (0402/X7R≥0.056μF); 0603>0.47μF; 0805≥2.2μF; 1206≥0.47μF; 1210≥22μF (1210/X5R≥10μF)</td></tr> <tr> <td>≤20%</td><td>0402≥0.47μF</td></tr> <tr> <td rowspan="2">16V</td><td rowspan="2">≤5%</td><td>≤10%</td><td>0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td></tr> <tr> <td>≤15%</td><td>0201≥0.01μF (0201/X7R≥0.022μF); 0402≥0.033μF 0603>0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td></tr> <tr> <td rowspan="2">10V</td><td rowspan="2">≤7.5%</td><td>≤15%</td><td>0201≥0.012μF; 0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td></tr> <tr> <td>≤20%</td><td>0201≥0.01μF; 0402≥1.0μF; 0603/X5R≥10μF; 01R5/X5R</td></tr> <tr> <td>6.3V</td><td>≤15%</td><td>≤30%</td><td>0201≥0.01μF; 0402≥1.0μF (0402/X6S≥0.47μF); 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td></tr> <tr> <td>4V</td><td>≤20%</td><td>-</td><td>-</td></tr> </table>	RATED VOLTAGE	D.F.	EXCEPTIONS OF D.F. ≤		≥100V	≤3%	≤6%	1206≥0.47μF	≤7.5%	0603≥0.068μF; 0805>0.1μF; 1206≥1μF; 1210≥2.2μF	≤20%	0805>2.2μF; 1210≤3.3μF	50V	≤3%	≤6%	0201(50V); 0603>0.047μF; 0805≥0.18μF; 1206≥0.47μF	≤10%	0201≥0.01μF; 1210≥3.3μF	≤20%	0402≥0.012μF; 0603>0.1μF; 0805≥1.0μF (0805/X7R>0.47μF); 1206≥2.2μF; 1210≥10μF	35V	≤5%	≤20%	0603≥1.0μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF	25V	≤5%	≤10%	0201=0.01μF; 0805≥1.0μF; 1210≥10μF	≤14%	0603≥0.33μF	≤15%	0201>0.01μF; 0402>0.10μF (0402/X7R≥0.056μF); 0603>0.47μF; 0805≥2.2μF; 1206≥0.47μF; 1210≥22μF (1210/X5R≥10μF)	≤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>0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF	10V	≤7.5%	≤15%	0201≥0.012μF; 0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF	≤20%	0201≥0.01μF; 0402≥1.0μF; 0603/X5R≥10μF; 01R5/X5R	6.3V	≤15%	≤30%	0201≥0.01μF; 0402≥1.0μF (0402/X6S≥0.47μF); 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF	4V	≤20%	-	-
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ENVIRONMENTAL CHARACTERISTICS

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18	HIGH TEMPERATURE Load-Endurance (Life Testing)	(3) 150% of rated voltage for below range.	No remarkable damage. CAP CHANGE: COG: $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever Is larger X7R, X5R, X6S, X7S: $\geq 10\text{V}^{**}$, within $\pm 12.5\%$; $\leq 6.3\text{V}$ within $\pm 25\%$; **10V: 0603 $\geq 4.7\mu\text{F}$; 0402 $\geq 1.0\mu\text{F}$; 0201 $\geq 0.1\mu\text{F}$, within $\pm 25\%$ Y5V $\geq 10\text{V}$, within $\pm 30\%$; $\leq 6.3\text{V}$, within $+30\%$ /-40% Q/D.F. VALUE: COG: More than 30pF, Q ≥ 350 10pF $\leq 30\text{pF}$, Q $\geq 275+2.5\text{C}$ Less than 10pF, Q $\geq 200+10\text{C}$ Y5V:																																							
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* Before initial measurement (Class II only): To apply de-aging at 150°C for 1 hr then set for 24$\pm$2 hrs at room temp * Cap./DF(Q)/I.R. Measurement to be made after de-aging at 150°C for 1hr then set for 24$\pm$2hrs at room temp. ** De-rating conditions:																																										
DERATING CURVE Ratio [Operating Voltage / Rated Voltage (%)] Ambient temperature (°C) — Product for 85°C — Product for 105°C — Product for 125°C																																										
<table><tr><th>RATED VOLTAGE</th><th>INSULATION RESISTANCE</th></tr><tr><td>100V: All X7R; 1210$\geq 3.3\mu\text{F}$</td><td rowspan="6">1GΩ or apply $\geq 10\Omega$-F rule, whichever is smaller.</td></tr><tr><td>50V: 0402$\geq 0.01\mu\text{F}$; 0603$\geq 1.0\mu\text{F}$; 0805$\geq 1.0\mu\text{F}$; 1206$\geq 4.7\mu\text{F}$; 1210$\geq 4.7\mu\text{F}$</td></tr><tr><td>35V: 0603$\geq 1.0\mu\text{F}$; 0805$\geq 2.2\mu\text{F}$; 1206$\geq 2.2\mu\text{F}$; 1210$\geq 10\mu\text{F}$</td></tr><tr><td>25V: 0201$\geq 0.1\mu\text{F}$; 0402$\geq 0.22\mu\text{F}$; 0603$\geq 2.2\mu\text{F}$; 0805$\geq 2.2\mu\text{F}$; 1206$\geq 10\mu\text{F}$; 1210$\geq 10\mu\text{F}$</td></tr><tr><td>16V: 0201$\geq 0.1\mu\text{F}$; 0402$\geq 0.22\mu\text{F}$; 0603$\geq 1.0\mu\text{F}$; 0805$\geq 2.2\mu\text{F}$; 1206$\geq 10\mu\text{F}$; 1210$\geq 47\mu\text{F}$</td></tr><tr><td>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$\geq 47\mu\text{F}$</td></tr><tr><td>6.3V; 4V : All X6S/X7S items, Size≥ 1812</td><td></td></tr></table>			RATED VOLTAGE	INSULATION RESISTANCE	100V: All X7R; 1210 $\geq 3.3\mu\text{F}$	1G Ω or apply $\geq 10\Omega$ -F rule, whichever is smaller.	50V: 0402 $\geq 0.01\mu\text{F}$; 0603 $\geq 1.0\mu\text{F}$; 0805 $\geq 1.0\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$	35V: 0603 $\geq 1.0\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$	25V: 0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 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 $\geq 1.0\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 47\mu\text{F}$	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 $\geq 47\mu\text{F}$	6.3V; 4V : All X6S/X7S items, Size ≥ 1812																														
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ADHESIVE STRENGTH OF TERMINATION



CODE	DIMENSION (mm)	A (mm)	CODE	DIMENSION (mm)	A (mm)
01005 (0402)	0.40 x 0.20	0.12	1206 (3216)	3.2 x 1.6	2.2
0201 (0603)	0.61 x 0.31	0.2	1210 (3225)	3.2 x 2.5	2.2
0402 (1005)	1.0 x 0.5	0.4	1812 (4532)	4.5 x 3.2	3.5
0603 (1608)	1.6 x 0.8	1.0	2220 (5750)	5.7 x 5.08	4.7
0805 (2012)	2.0 x 1.25	1.2			

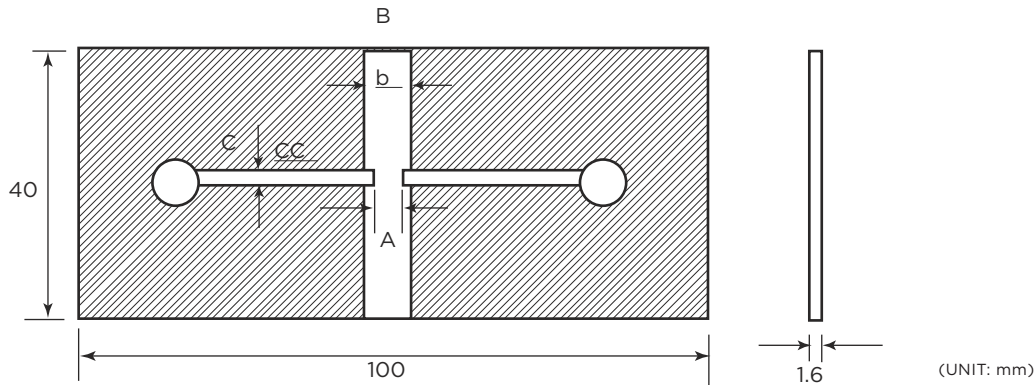


Material: Alumina Substrate (Al₂O₃ 95% Min) or Glass Epoxy Substrate



Copper Foil (T = 0.035mm)

SUBSTRATE BENDING STRENGTH



CODE	DIMENSION (mm)	A (mm)	B (mm)	C (mm)
01005 (0402)	0.40 x 0.20	0.12	0.7	0.20
0201 (0603)	0.61 x 0.31	0.2	1.0	0.4
0402 (1005)	1.0 x 0.5	0.4	1.4	0.5
0603 (1608)	1.6 x 0.8	1.0	3.0	1.0
0805 (2012)	2.0 x 1.25	1.2	4.0	1.65
1206 (3216)	3.2 x 1.6	2.2	5.0	2.0
1210 (3225)	3.2 x 2.5	2.2	5.0	3.2
1812 (4532)	4.5 x 3.2	3.5	7.0	4.0
2220 (5750)	5.7 x 5.08	4.7	8.5	5.0

MATERIAL: GLASS EPOXY SUBSTRATE

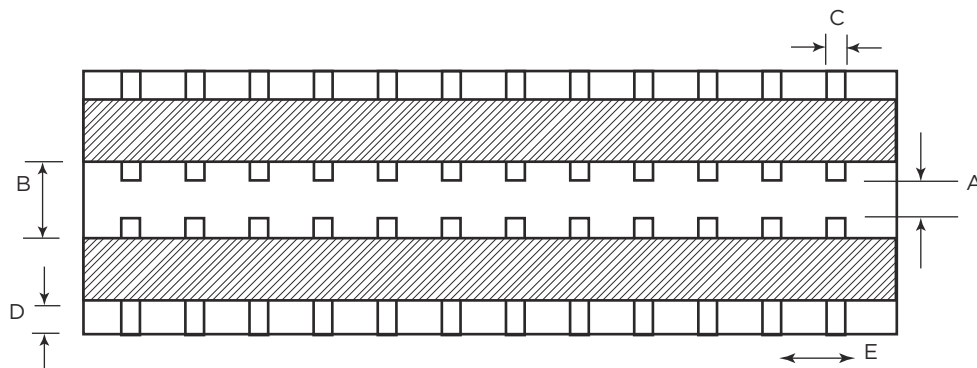


COPPER FOIL (t = 0.035mm)



SOLDER RESIST

TEST SUBSTRATE



(UNIT: mm)

CODE	DIMENSION (MM)	A	B	C	D	E
0201 (0603)	0.61 x 0.31	0.2	1.0	0.4	7.5	3.6
0402 (1005)	1.0 x 0.5	0.4	1.4	0.5	7.5	3.8
0603 (1608)	1.6 x 0.8	1.0	3.0	0.7	7.5	4.0
0805 (2012)	2.0 x 1.25	1.2	4.0	1.0	7.5	4.2
1206 (3216)	3.2 x 1.6	2.2	5.0	1.3	7.5	4.6
1210 (3225)	3.2 x 2.5	2.2	5.0	2.0	7.5	5.5
1812 (4532)	4.5 x 3.2	3.5	7.0	2.7	7.5	6.2
2220 (5750)	5.7 x 5.08	4.7	8.5	3.4	7.5	7.0

MATERIAL: GLASS EPOXY SUBSTRATE



COPPER FOIL (t = 0.035mm)



SOLDER RESIST