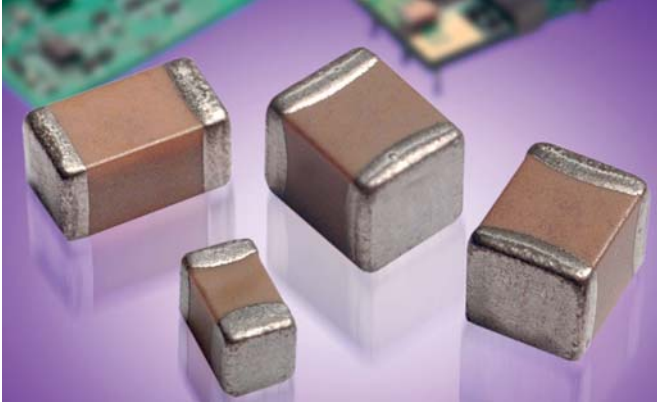


# X5R Dielectric

## General Specifications



### GENERAL DESCRIPTION

- General Purpose Dielectric for Ceramic Capacitors
- EIA Class II Dielectric
- Temperature variation of capacitance is within  $\pm 15\%$  from  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Well suited for decoupling and filtering applications
- Available in High Capacitance values (up to  $100\mu\text{F}$ )

### PART NUMBER (see page 2 for complete part number explanation)

**1210**

**Size**  
(L" x W")  
0101\*\*  
0201  
0402  
0603  
0805  
1206  
1210  
1812

**4**

**Voltage**  
4 = 4V  
6 = 6.3V  
Z = 10V  
Y = 16V  
3 = 25V  
D = 35V  
5 = 50V  
1 = 100V

**D**

**Dielectric**  
D = X5R

**107**

**Capacitance Code (In pF)**  
2 Sig. Digits +  
Number of  
Zeros

**M**

**Capacitance Tolerance**  
K =  $\pm 10\%$   
M =  $\pm 20\%$

**A**

**Failure Rate**  
A = N/A

**T**

**Terminations**  
T = Plated Ni  
and Sn

**2**

**Packaging**  
2 = 7" Reel  
4 = 13" Reel  
7 = Bulk Cass.  
9 = Bulk  
U = 4mm TR  
(01005)

**A**

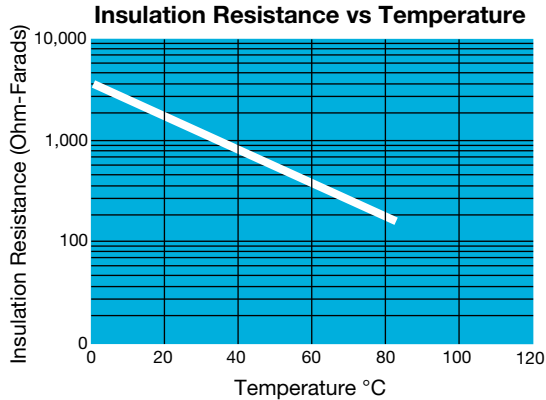
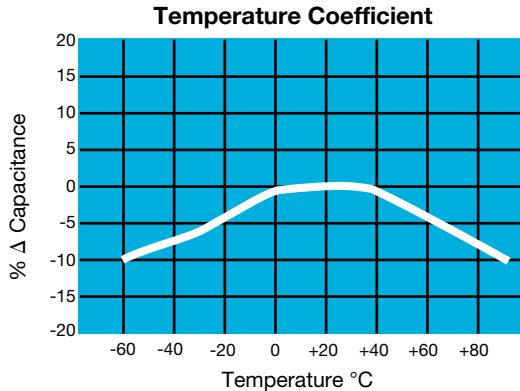
**Special Code**  
A = Std.



\*\*EIA 01005

NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.  
Contact factory for non-specified capacitance values.

### TYPICAL ELECTRICAL CHARACTERISTICS



# X5R Dielectric



## Specifications and Test Methods

Parameter/Test		X5R Specification Limits	Measuring Conditions	
<b>Operating Temperature Range</b>		-55°C to +85°C	Temperature Cycle Chamber	
<b>Capacitance</b>		Within specified tolerance	Freq.: 1.0 kHz $\pm$ 10% Voltage: 1.0Vrms $\pm$ .2V For Cap > 10 $\mu$ F, 0.5Vrms @ 120Hz	
<b>Dissipation Factor</b>		$\leq$ 2.5% for $\geq$ 50V DC rating $\leq$ 3.0% for 25V DC rating $\leq$ 12.5% Max. for 16V DC rating and lower Contact Factory for DF by PN		
<b>Insulation Resistance</b>		10,000M $\Omega$ or 500M $\Omega$ - $\mu$ F, whichever is less	Charge device with rated voltage for 120 $\pm$ 5 secs @ room temp/humidity	
<b>Dielectric Strength</b>		No breakdown or visual defects	Charge device with 300% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max)	
<b>Resistance to Flexure Stresses</b>	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 	
	Capacitance Variation	$\leq$ $\pm$ 12%		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3		
<b>Solderability</b>		$\geq$ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 $\pm$ 5°C for 5.0 $\pm$ 0.5 seconds	
<b>Resistance to Solder Heat</b>	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 $\pm$ 2 hours before measuring electrical properties.	
	Capacitance Variation	$\leq$ $\pm$ 7.5%		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	Meets Initial Values (As Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
<b>Thermal Shock</b>	Appearance	No visual defects	Step 1: -55°C $\pm$ 2°	30 $\pm$ 3 minutes
	Capacitance Variation	$\leq$ $\pm$ 7.5%	Step 2: Room Temp	$\leq$ 3 minutes
	Dissipation Factor	Meets Initial Values (As Above)	Step 3: +85°C $\pm$ 2°	30 $\pm$ 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	$\leq$ 3 minutes
	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 $\pm$ 2 hours at room temperature	
	<b>Load Life</b>	Appearance	No visual defects	Charge device with 1.5X rated voltage in test chamber set at 85°C $\pm$ 2°C for 1000 hours (+48, -0). Note: Contact factory for *optional specification part numbers that are tested at < 1.5X rated voltage.
<b>Load Humidity</b>	Capacitance Variation	$\leq$ $\pm$ 12.5%	Remove from test chamber and stabilize at room temperature for 24 $\pm$ 2 hours before measuring.	
	Dissipation Factor	$\leq$ Initial Value x 2.0 (See Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
<b>Load Humidity</b>	Appearance	No visual defects	Store in a test chamber set at 85°C $\pm$ 2°C/ 85% $\pm$ 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied.	
	Capacitance Variation	$\leq$ $\pm$ 12.5%		
	Dissipation Factor	$\leq$ Initial Value x 2.0 (See Above)		
	Insulation Resistance	$\geq$ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		
<b>Load Humidity</b>		Remove from chamber and stabilize at room temperature and humidity for 24 $\pm$ 2 hours before measuring.		

# X5R Dielectric



## Capacitance Range

### PREFERRED SIZES ARE SHADED

Case Size	0101*		0201				0402					0603					0805											
Soldering	Reflow Only		Reflow Only				Reflow/Wave					Reflow/Wave					Reflow/Wave											
Packaging	Paper/Embossed		All Paper				All Paper					All Paper					Paper/Embossed											
(L) Length	mm	0.40 ± 0.02	0.60 ± 0.03				1.00 ± 0.10					1.60 ± 0.15					2.01 ± 0.20											
	(in.)	(0.016 ± 0.0008)	(0.024 ± 0.001)				(0.040 ± 0.004)					(0.063 ± 0.006)					(0.079 ± 0.008)											
(W) Width	mm	0.20 ± 0.02	0.30 ± 0.03				0.50 ± 0.10					0.81 ± 0.15					1.25 ± 0.20											
	(in.)	(0.008 ± 0.0008)	(0.011 ± 0.001)				(0.020 ± 0.004)					(0.032 ± 0.006)					(0.049 ± 0.008)											
(t) Terminal	mm	0.10 ± 0.04	0.15 ± 0.05				0.25 ± 0.15					0.35 ± 0.15					0.50 ± 0.25											
	(in.)	(0.004 ± 0.016)	(0.006 ± 0.002)				(0.010 ± 0.006)					(0.014 ± 0.006)					(0.020 ± 0.010)											
Voltage:		6.3	10	4	6.3	10	16	25	4	6.3	10	16	25	50	4	6.3	10	16	25	35	50	4	6.3	10	16	25	35	50
Cap (pF)	100	101		B				A																				
	150	151		B				A																				
	220	221		B				A					C															
	330	331		B				A					C															
	470	471		B				A					C															
	680	681		B				A					C															
	1000	102		B				A	A				C															
	1500	152	B	B				A	A				C															
	2200	222	B	B				A	A	A			C															
	3300	332	B	B				A	A	A			C															
	4700	472	B	B				A	A	A			C														G	
	6800	682	B	B				A	A	A			C														G	
Cap (µF)	0.01	103	B	B				A	A	A			C															
	0.015	153	B										C															
	0.022	223	B					A					C	C														N
	0.033	333	B										C															N
	0.047	473	B					A					C	C														N
	0.068	683	B										C															N
	0.1	104	B					A	A				C	C	C	C												N
	0.15	154																										N
	0.22	224	B					A	A	A			C	C	C													N
	0.33	334																										N
	0.47	474						A	A				C	C	C	C												N
	0.68	684																										N
	1.0	105						A	A				C	C	C	C												N
	1.5	155																										N
	2.2	225						A	A				C	C	C													N
	3.3	335																										N
	4.7	475																										N
	10	106											E	E														N
	22	226											E	E														N
	47	476																										N
	100	107																										N
Voltage:		6.3	10	4	6.3	10	16	25	4	6.3	10	16	25	50	4	6.3	10	16	25	35	50	4	6.3	10	16	25	35	50
Case Size	0101*		0201				0402					0603					0805											

Letter	A	B	C	E	G	J	K	M	N	P	Q	X	Y	Z	
Max. Thickness	0.33	0.22	0.56	0.71	0.90	0.94	1.02	1.27	1.40	1.52	1.78	2.29	2.54	2.79	
	(0.013)	(0.009)	(0.022)	(0.028)	(0.035)	(0.037)	(0.040)	(0.050)	(0.055)	(0.060)	(0.070)	(0.090)	(0.100)	(0.110)	
	PAPER						EMBOSSSED								

NOTE: Contact factory for non-specified capacitance values

\*EIA 01005



# X5R Dielectric

## Capacitance Range



### PREFERRED SIZES ARE SHADED

Case Size	1206								1210								1812							
Soldering	Reflow/Wave								Reflow Only								Reflow Only							
Packaging	Paper/Embossed								Paper/Embossed								All Embossed							
(L) Length	3.20 ± 0.20 (0.126 ± 0.008)								3.20 ± 0.20 (0.126 ± 0.008)								4.50 ± 0.30 (0.177 ± 0.012)							
(W) Width	1.60 ± 0.20 (0.063 ± 0.008)								2.50 ± 0.20 (0.098 ± 0.008)								3.20 ± 0.20 (0.126 ± 0.008)							
(t) Terminal	0.50 ± 0.25 (0.020 ± 0.010)								0.50 ± 0.25 (0.020 ± 0.010)								0.61 ± 0.36 (0.024 ± 0.014)							
Voltage:	4	6.3	10	16	25	35	50	100	4	6.3	10	16	25	35	50	4	6.3	10	16	25	35	50		
Cap (pF) 100 101																								
150 151																								
220 221																								
330 331																								
470 471																								
680 681																								
1000 102																								
1500 152																								
2200 222																								
3300 332																								
4700 472																								
6800 682																								
Cap (µF) 0.01 103																								
0.015 153																								
0.022 223																								
0.033 333																								
0.047 473																								
0.068 683																								
0.1 104																								
0.15 154																								
0.22 224																								
0.33 334																								
0.47 474					Q	Q								X	X									
0.68 684					Q	Q	Q	Q					X	X	X									
1.0 105					Q	Q	Q	Q					X	X	X									
1.5 155					Q	Q	Q	Q					X	Z	Z									
2.2 225			Q	Q	Q	Q	Q	Q					X	Z	Z									
3.3 335		Q	Q																					
4.7 475	Q	Q	Q	Q	Q	Q	Q	Q	X			Q	Q	Z	Z	Z								
10 106	Q	Q	Q	Q	Q	Q	Q	X			X	X	Z	Z	Z	Z					Z			
22 226	Q	Q	Q	Q	Q	Q				Z	Z	Z	Z	Z										
47 476	Q	Q	Q							Z	Z	Z	Z						Z					
100 107	Q	Q								Z	Z	Z	Z											
Voltage:	4	6.3	10	16	25	35	50	100	4	6.3	10	16	25	35	50	4	6.3	10	16	25	35	50		

Letter	A	B	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	0.22 (0.009)	0.56 (0.022)	0.71 (0.028)	0.90 (0.035)	0.94 (0.037)	1.02 (0.040)	1.27 (0.050)	1.40 (0.055)	1.52 (0.060)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
	PAPER						EMBOSSSED							

NOTE: Contact factory for non-specified capacitance values

\*EIA 01005

