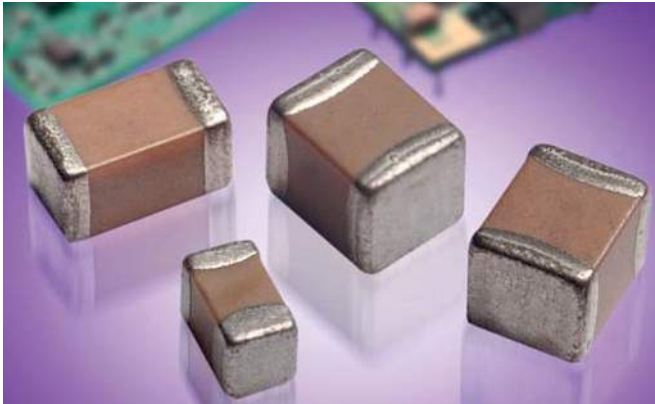


# X5R Dielectric

## 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  
U = 4mm TR  
(01005)

**A**

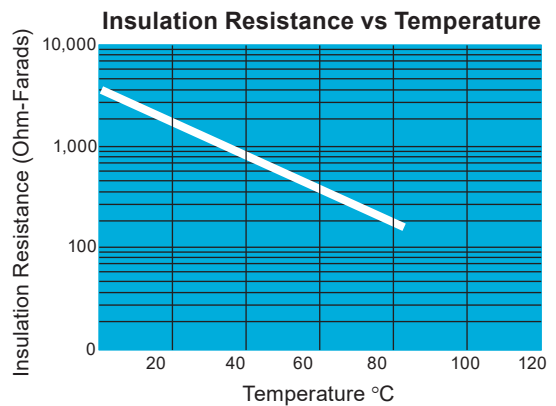
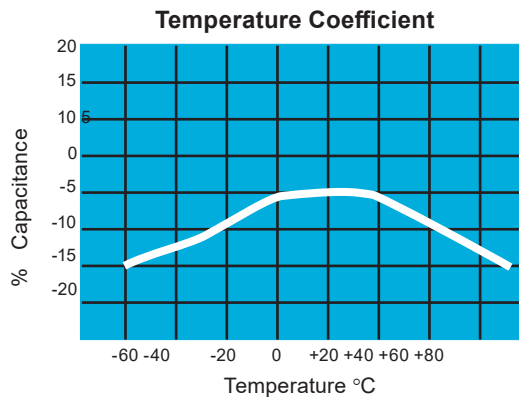
**Special Code**  
A = Std.

\*\*EIA 01005



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

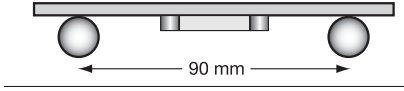
### TYPICAL ELECTRICAL CHARACTERISTICS



# X5R Dielectric



## Specifications and Test Methods

Parameter/Test		X5R Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +85°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 kHz $\pm$ 10% Voltage: 1.0Vrms $\pm$ .2V For Cap > 10 $\mu$ F, 0.5Vrms @ 120Hz	
Dissipation Factor		$\leq$ 2.5% for $\geq$ 50V DC rating $\leq$ 12.5% for 25V, 35V DC rating $\leq$ 12.5% Max. for 16V DC rating and lower Contact Factory for DF by PN		
Insulation Resistance		10,000M $\Omega$ or 500M $\Omega$ - $\mu$ F, whichever is less		
Dielectric Strength		No breakdown or visual defects	Charge device with 250% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max)	
Resistance to Flexure Stresses	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		
Solderability		$\geq$ 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	
Resistance to Solder Heat	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260°C for 60sec-onds. Store at room temperature for 24 $\pm$ 2hours 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)		
Thermal Shock	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	
Load Life	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.  Remove from test chamber and stabilize at room temperature for 24 $\pm$ 2 hours	
	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)		
Load Humidity	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.  Remove from chamber and stabilize at room temperature and humidity for 24 $\pm$ 2 hours before measuring.	
	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)		

# 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	0.40 ± 0.02 (0.016 ± 0.0008)		0.60 ± 0.09 (0.024 ± 0.004)				1.00 ± 0.15 (0.040 ± 0.006)					1.60 ± 0.15 (0.063 ± 0.006)					2.01 ± 0.20 (0.079 ± 0.008)											
(W) Width	0.20 ± 0.02 (0.008 ± 0.0008)		0.30 ± 0.09 (0.011 ± 0.004)				0.50 ± 0.15 (0.020 ± 0.006)					0.81 ± 0.15 (0.032 ± 0.006)					1.25 ± 0.20 (0.049 ± 0.008)											
(t) Terminal	0.10 ± 0.04 (0.004 ± 0.0016)		0.15 ± 0.05 (0.006 ± 0.002)				0.25 ± 0.15 (0.010 ± 0.006)					0.35 ± 0.15 (0.014 ± 0.006)					0.50 ± 0.25 (0.020 ± 0.010)											
Voltage:	6.3	16	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																								
	150	151		B								A																
	220	221		B									C															
	330	331		B										C														
	470	471		B										C														
	680	681		B										C														
	1000	102		B											C													
	1500	152	B	B																								
	2200	222	B	B				A	A	A																		
	3300	332	B	B				A	A	A																		
	4700	472	B	B				A	A	A				C														
	6800	682	B	B				A	A	A				C														
Cap(μF)	0.01	103	B	B				A	A	A				C														
	0.015	150	B											C														
	0.022	223	B					A	A	A	A			C	C													N
	0.033	333	B											C														N
	0.047	473	B					A	A	A	A			C	C													N
	0.068	689	B											C														N
	0.1	104	B					A	A	A	A			C	C	C	C											N
	0.15	154																										N
	0.22	224	B					A	A	A				C	C	C	C	C										N
	0.33	334																										N
	0.47	474	B					A	A					C	C	C	C	C	E									N
	0.68	684																										N
	1.0	105						F	F	F	F			C	C	C	C	C	E									N
	1.5	155																										N
	2.2	225						F	F	F				C	C	C	C	C										N
	3.3	335																										N
	4.7	475						A	C					E	E	E	E											N
	10	106												E	E	E												N
	22	226												E	E													N
	47	476																										N
	100	107																										N
Voltage:	6.3	16	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 (0.013)	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							

PAPER and EMBOSSSED available for 01005

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	mm	3.20 ± 0.20								3.20 ± 0.20								4.50 ± 0.30							
	(in.)	(0.126 ± 0.008)								(0.126 ± 0.008)								(0.177 ± 0.012)							
(W) Width	mm	1.60 ± 0.20								2.50 ± 0.20								3.20 ± 0.20							
	(in.)	(0.063 ± 0.008)								(0.098 ± 0.008)								(0.126 ± 0.008)							
(t) Terminal	mm	0.50 ± 0.25								0.50 ± 0.25								0.61 ± 0.36							
	(in.)	(0.020 ± 0.010)								(0.020 ± 0.010)								(0.024 ± 0.014)							
Voltage:		4	6.3	10	16	25	35	50	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	150																							
	0.022	223																							
	0.033	333																							
	0.047	473																							
	0.068	689																							
	0.1	104																							
	0.15	154																							
	0.22	224																							
	0.33	334																							
	0.47	474				Q	Q							X	X										
	0.68	684																							
	1.0	105				Q	Q	Q						X	X	X									
	1.5	155																							
	2.2	225				Q	Q	Q	Q	Q				X	Z	Z									
	3.3	335			Q	Q																			
	4.7	475	X	X	X	X	X	X			Q	Q	Z	Z	Z										
	10	106	X	X	X	X	X	X			X	X	Z	Z	Z	Z						Z			
	22	226	X	X	X	X	X				Z	Z	Z	Z	Z			Z	Z	Z	Z				
	47	476	X	X	X	X					Z	Z	Z	Z	Z										
	100	107	X	X	X						Z	Z	Z	Z											
Voltage:		4	6.3	10	16	25	35	50	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							

PAPER and EMBOSSSED available for 01005

NOTE: Contact factory for non-specified capacitance values

\*EIA 01005