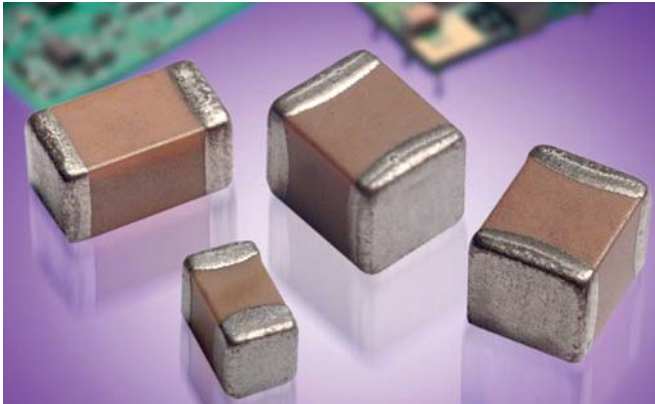


# X5R Dielectric

## 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**

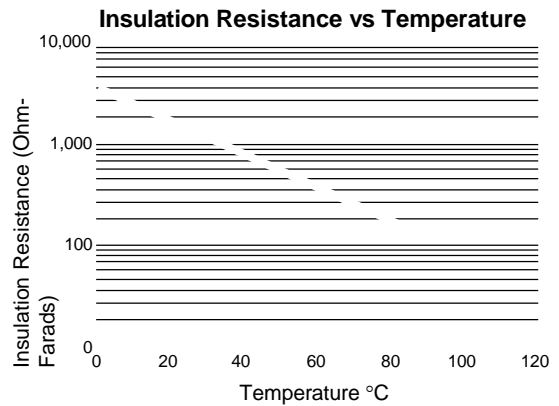
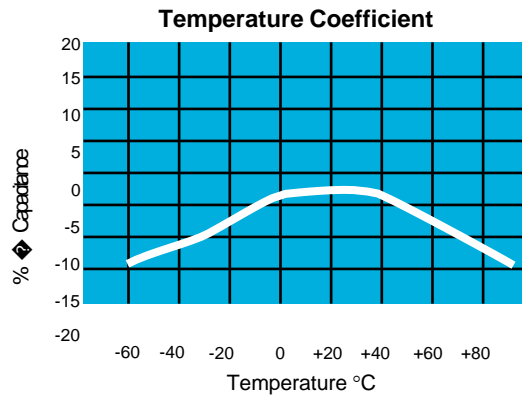
**Special Code**  
A = Std.



\*\*EIA 01005

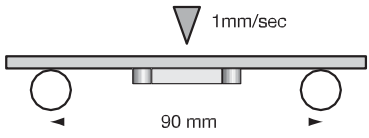
NOTE: Contact factory for availability of Tolerance Options for Specific PartNumbers.  
Contact factory for non-specified capacitance values.

### 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		
<b>Dissipation Factor</b>		$\leq 2.5\%$ 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	Freq.: 1.0 kHz $\pm 10\%$ Voltage: 1.0Vrms $\pm .2V$ For Cap $> 10 \mu F$ , 0.5Vrms @ 120Hz	
<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 250% 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 $\pm 5^\circ C$ 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 $\pm 2^\circ$	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 $\pm 2^\circ$	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 $\pm 2^\circ C$ 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)		
<b>Load Humidity</b>	Appearance	No visual defects	Store in a test chamber set at 85°C $\pm 2^\circ C$ / 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 ± 0.10 (0.040 ± 0.004)					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 ± 0.10 (0.020 ± 0.004)					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(µF)	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)	001	103	B	B				A	A	A				C														
	0015	153	B											C														
	0022	223	B					A	A	A	A			C	C													
	0033	333	B											C														
	0047	473	B					A	A	A	A			C	C													
	0068	683	B											C														
	01	104	B					A	A	A	A			C	C	C	C											
	015	154																										
	022	224	B					A	A	A				C	C	C	C	C										
	033	334																										
	047	474	B					A	A					C	C	C	C	C	E									
	068	684																										
	10	105						F	F	F	F			C	C	C	C	C	E									
	15	155																										
	22	225						F	F	F				C	C	C	C	C										
	33	335																										
	47	475						A	C					E	E	E	E											
	10	106												E	E	E												
	22	226												E	E													
	47	476																										
	100	107																										
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

Letter	A	B	C	E	F	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)	0.40 (0.016)	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	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(μF)	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)	001	103																						
	0015	153																						
	0022	223																						
	0033	333																						
	0047	473																						
	0068	683																						
	01	104																						
	015	154																						
	022	224																						
	033	334																						
	047	474				Q	Q							X	X									
	068	684																						
	10	105				Q	Q	Q	Q				X	X	X									
	15	155																						
	22	225			Q	Q	Q	Q	Q	Q			X	Z	Z									
	33	335			Q	Q																		
	47	475	X	X	X	X	X	X	X	X			Q	Q	Z	Z	Z							
	10	106	X	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			
	47	476	X	X	X	X						Z	Z	Z	Z									
	100	107	X	X	X							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	F	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)	0.40 (0.016)	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



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Authorized Distributor

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