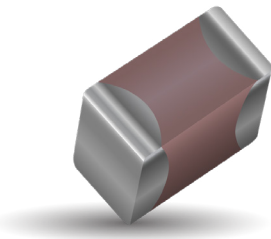


X5R Dielectric

General Specifications



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

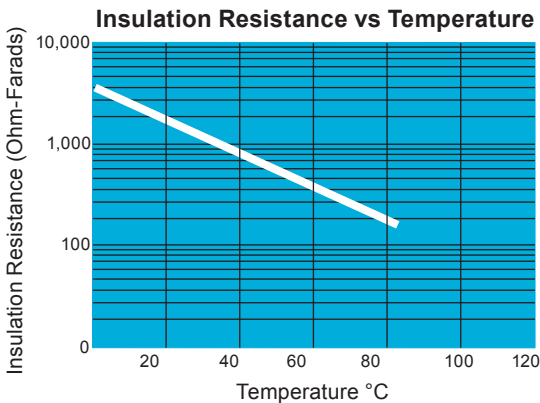
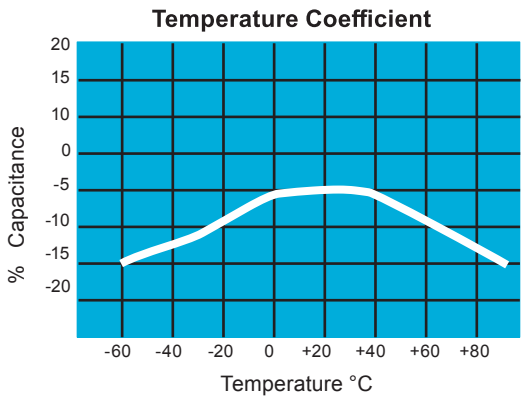
PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)

1210	4	D	107	M	A	T	2	A
Size (L" x W")	Voltage	Dielectric	Capacitance Code (In pF)	Capacitance Tolerance	Failure Rate	Terminations	Packaging	Special Code
0101**	4 = 4V	D = X5R	2 Sig. Digits + Number of Zeros	K = $\pm 10\%$ M = $\pm 20\%$	A = N/A	T = Plated Ni and Sn	2 = 7" Reel 4 = 13" Reel	A = Std.
0201	6 = 6.3V							
0402	Z = 10V							
0603	Y = 16V							
0805	3 = 25V							
1206	D = 35V							
1210	5 = 50V							
1812	1 = 100V							
**EIA 01005								



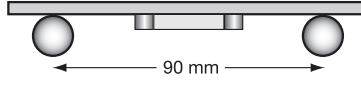
NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.
Contact factory for non-specified capacitance values.

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 μ 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		10,000MQ or 500MQ $\cdot$ μ F, whichever is less	Charge device with rated voltage for 120 $\pm$ 5 secs @ room temp/humidity	
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 1mm/sec 	
	Capacitance Variation	$\leq \pm 12\%$		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	$\geq$ Initial Value $\times$ 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 60seconds. 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)		
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).	
	Capacitance Variation	$\leq \pm 12.5\%$		
	Dissipation Factor	$\leq$ Initial Value $\times$ 2.0 (See Above)	Note: Contact factory for *optional specification part numbers that are tested at < 1.5X rated voltage.	
	Insulation Resistance	$\geq$ Initial Value $\times$ 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)	Remove from test chamber and stabilize at room temperature for 24 $\pm$ 2 hours	
Load Humidity	Appearance	No visual defects	Take the initial value after heat treatment. After applying rated voltage for 500+12/-0 hours in the condition of 40°C $\pm$ 2°C and 90 to 95%RH, and place in normal temperature and humidity, then measure the sample after heat treatment.	
	Capacitance Variation	$\leq \pm 12.5\%$		
	Dissipation Factor / Tan δ	Within specification	The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.	
	Insulation Resistance	Over 1000MQ or 50MQ $\cdot$ μ F, whichever is less. *Exceptions Listed Below		

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 ± 0.09				1.00 ± 0.20					1.60 ± 0.20							2.01 ± 0.20								
	(in.)	(0.016 ± 0.0008)		(0.024 ± 0.004)				(0.040 ± 0.008)					(0.063 ± 0.008)							(0.079 ± 0.008)								
(W) Width	mm	0.20 ± 0.02		0.30 ± 0.09				0.50 ± 0.20					0.80 ± 0.20							1.25 ± 0.20								
	(in.)	(0.008 ± 0.0008)		(0.011 ± 0.004)				(0.020 ± 0.008)					(0.031 ± 0.008)							(0.049 ± 0.008)								
(t) Terminal	mm	0.10 ± 0.04		0.15 ± 0.05				0.25 ± 0.10					0.35 ± 0.15							0.50 ± 0.25								
	(in.)	(0.004 ± 0.0016)		(0.006 ± 0.002)				(0.010 ± 0.004)					(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																
6800	682	B	B			A	A	A				C																
Cap (µF)	0.01	103	B	B			A	A	A				C					G	G	G								
	0.015	153	B									C						G	G	G								
0.022	223	B			A	A	A	A				C	C					G	G	G							N	
0.033	333	B										C						G	G	G							N	
0.047	473	B			A	A	A	A				C	C					G	G	G							N	
0.068	689	B										C						G		G							N	
0.1	104	B			A	A	A	A				C	C	C	C			G	G	G					N	N	N	
0.15	154																	G							N	N		
0.22	224	B			A	A	A					C	C	C	C	C		G	G						N	N	N	
0.33	334																	G	G						N			
0.47	474	B			A	A						C	C	C	C	C	E	G	J						N	P	P	
0.68	684																	G							N			
1.0	105				A	A	C	C				C	C	C	C	C		G	G	G	G	J	G	G		N	N	P
1.5	155																											
2.2	225				C	C	C					C	C	C	C	C		G	G	J	J	J	K	K		N	N	P
3.3	335																	J	J	J	J				N	N	P	P
4.7	475				C	C						E	E	E	E			J	J	J	G	K			N	P	P	P
10	106											E	E	E				K	J	K	K	K			P	P	P	P
22	226											E	G					K	K	K					P	P	P	P
47	476																	K	K						P	P	P	
100	107																											
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 (0.013)	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 (0.057)	1.78 (0.070)	2.29 (0.090)	2.54 (0.100)	2.79 (0.110)
PAPER							EMBOSSED							

PAPER and EMBOSSED 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	(in.)	3.20 ± 0.40 (0.126 ± 0.016)							3.20 ± 0.40 (0.126 ± 0.016)							4.50 ± 0.30 (0.177 ± 0.012)						
W) Width	mm	(in.)	1.60 ± 0.30 (0.063 ± 0.012)							2.50 ± 0.30 (0.098 ± 0.012)							3.20 ± 0.20 (0.126 ± 0.008)						
(t) Terminal	mm	(in.)	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	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																					
Cap (μF)	4700	472																					
	6800	682																					
	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	X			Z	Z	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	Z			
	47	476	X	X	X	X				Z	Z	Z	Z	Z									
	100	107	X	X						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
Case Size			1206							1210							1812						

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 (0.057)	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