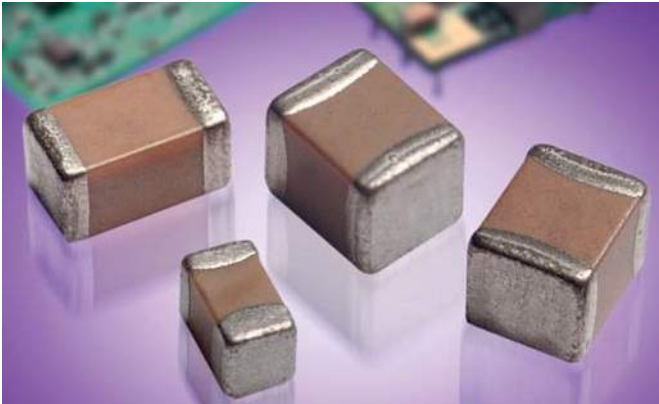


X5R Dielectric

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 2 for complete part number explanation)

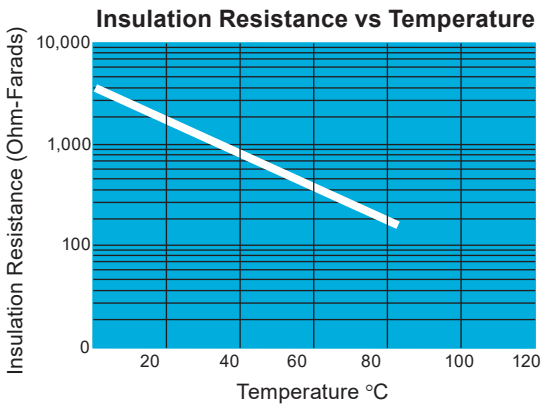
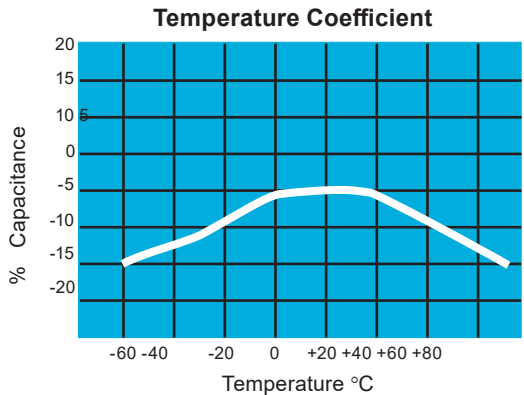
1210	4	D	107	M	A	T	2	A
Size (L" x W")	Voltage	Dielectric D = X5R	Capacitance Code (In pF) 2 Sig. Digits + Number of Zeros	Capacitance Tolerance K = $\pm 10\%$ M = $\pm 20\%$	Failure Rate A = N/A	Terminations T = Plated Ni and Sn	Packaging 2 = 7" Reel 4 = 13" Reel U = 4mm TR (01005)	Special Code A = Std.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

**EIA 01005

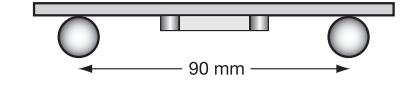


NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.
Contact factory for non-specified capacitance values.

TYPICAL ELECTRICAL CHARACTERISTICS



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		10,000M Ω or 500M Ω - μ 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	mm	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	mm	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	mm	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					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																				
Cap(μF)	4700	472	B	B			A	A	A				C								G												
	6800	682	B	B			A	A	A				C								G												
	0.01	103	B	B			A	A	A				C								G												
	0.015	150	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						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	E	G	G	G	G	J	G	G			N	N	P	P			
1.5	155																																
2.2	225				C	C	C					C	C	C	C	C		G	G	J	J	J	K	K			N	N	N	P	P		
3.3	335																	J	J	J							N	N					
4.7	475				C	C						E	E	E	E			J	J	J	G	G					N	P	J	N	N	P	P
10	106											E	E	E				K	J	J	J						P	P	P	P	P	P	
22	226											E	E					K	K	K							P	P	P	P			
47	476																	K	K								P	P	P				
100	107																										P	P					
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.	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
Thickness	(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							

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																				
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	Z	
	47	476	X	X		X	X				Z	Z	Z	Z	Z							
	100	107	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
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 (0.060)	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

How to Order



Part Number Explanation

Commercial Surface Mount Chips

EXAMPLE: 08055A101JAT2A

0805	5	A	101	J*	A	T	2	A
Size (L" x W")	Voltage	Dielectric	Capacitance	Tolerance	Failure Rate	Terminations	Packaging	Special Code
0201 0402 0603 0805 1206 1210 1812 1825 2220 2225	4 = 4V 6 = 6.3V Z = 10V Y = 16V 3 = 25V D = 35V 5 = 50V 1 = 100V 2 = 200V	A = NP0(C0G) C = X7R D = X5R G = Y5V U = U Series W = X6S Z = X7S	2 Sig. Fig + No. of Zeros Examples: 100 = 10 pF 101 = 100 pF 102 = 1000 pF 223 = 22000 pF 224 = 220000 pF 105 = 1μF 106 = 10μF 107 = 100μF For values below 10 pF, use "R" in place of Decimal point, e.g., 9.1 pF = 9R1.	B = ±.10 pF C = ±.25 pF D = ±.50 pF F = ±1% (≥ 25 pF) G = ±2% (≥ 13 pF) J = ±5% K = ±10% M = ±20% Z = +80%, -20% P = +100%, -0%	A = N/A	T = Plated Ni and Sn 7 = Gold Plated	<u>Available</u> 2 = 7" Reel 4 = 13" Reel 7 = Bulk Cass. 9 = Bulk	A = Std.
Contact Factory for Special Voltages		Contact Factory For Multiples		Contact Factory For 1 = Pd/Ag Term				
F = 63V * = 75V E = 150V V = 250V		9 = 300V X = 350V 8 = 400V		* B, C & D tolerance for ≤10 pF values. Standard Tape and Reel material (Paper/Embossed) depends upon chip size and thickness. See individual part tables for tape material type for each capacitance value.				

High Voltage Surface Mount Chips

EXAMPLE: 1808AA271KA11A

1808	A	A	271	K	A	1	1A
AVX Style	Voltage	Temperature Coefficient	Capacitance Code	Capacitance Tolerance	Failure Rate	Termination	Packaging/Marking
1206 1210 1808 1812 1825 2220 2225 3640	7 = 500V C = 600V A = 1000V S = 1500V G = 2000V W = 2500V H = 3000V J = 4000V K = 5000V	A = C0G C = X7R	(2 significant digits + no. of zeros) Examples: 10 pF = 100 100 pF = 101 1,000 pF = 102 22,000 pF = 223 220,000 pF = 224 1 μF = 105	C0G: J = ±5% K = ±10% M = ±20% X7R: K = ±10% M = ±20% Z = +80%, -20%	A=Not Applicable	1 = Pd/Ag T = Plated Ni and Sn	1A = 7" Reel Unmarked 3A = 13" Reel Unmarked 9A = Bulk/Unmarked

Ultra Thin Surface Mount Chips

EXAMPLE: UT023C223MAT2A

UT	02	3	C	223	M	A	T	2	A
Style	Case Size	Voltage	Dielectric	Capacitance Code (In pF)	Capacitance Tolerance	Std.	Term	Packaging Code	Terminations Code (max.)
Ultrathin	01 = 0603 02 = 0805 03 = 1206	Y = 16Vdc 3 = 25Vdc 5 = 50Vdc	A = C0G C = X7R	2 Sig Digits + Number of Zeros			T = Plated Ni and Sn	2 = 7" reel	A = 0.50mm (0.020) B = 0.40mm (0.016) C = 0.35mm (0.014)

Please handle these products with due care as they are inherently more fragile than standard MLC capacitors because of their physical dimensions.

How to Order



Part Number Explanation

Capacitor Array

EXAMPLE: W2A43C103MAT2A

W	2	A	4	3	C	103	M	A	T	2A
Style	Case Size 1 = 0405 2 = 0508 3 = 0612	Array	Number of Caps	Voltage 6 = 6.3V Z = 10V Y = 16V 3 = 25V 5 = 50V 1 = 100V	Dielectric A = NP0 C = X7R D = X5R	Capacitance Code (In pF) 2 Sig Digits + Number of Zeros	Capacitance Tolerance J = ±5% K = ±10% M = ±20%	Failure Rate	Termination Code T = Plated Ni and Sn	Packaging & Quantity Code 2A = 7" Reel (4000) 4A = 13" Reel (10000) 2F = 7" Reel (1000)

Low Inductance Capacitors (LICC)

EXAMPLE: 0612ZD105MAT2A

0612	Z	D	105	M	A	T	2	A
Size 0306 0508 0612	Voltage 6 = 6.3V Z = 10V Y = 16V 3 = 25V	Dielectric C = X7R D = X5R	Capacitance Code (In pF) 2 Sig. Digits + Number of Zeros	Capacitance Tolerance K = ±10% M = ±20%	Failure Rate A = N/A	Terminations T = Plated Ni and Sn	Packaging Available 2 = 7" Reel 4 = 13" Reel	Thickness See Page 34 for Codes

Interdigitated Capacitors (IDC)

EXAMPLE: W3L16D225MAT3A

W	3	L	1	6	D	225	M	A	T	3	A
Style	Case Size 2 = 0508 3 = 0612	Low Inductance ESL = 95pH ESL = 120pH	Number of Caps	Voltage 4 = 4V 6 = 6.3V Z = 10V Y = 16V	Dielectric C = X7R D = X5R	Capacitance Code (In pF) 2 Sig. Digits + Number of Zeros	Capacitance Tolerance K = ±10% M = ±20%	Failure Rate A = N/A	Termination T = Plated Ni and Sn	Packaging Available 1 = 7" Reel 3 = 13" Reel	Thickness <u>Max. Thickness</u> mm (in.) A=0.95 (0.037) S=0.55 (0.022)

Decoupling Capacitor Arrays (LICA)

EXAMPLE: LICA3T183M3FC4AA

LICA	3	T	183	M	3	F	C	4	A	A
Style & Size	Voltage 5V = 9 25V = 3 50V = 5	Dielectric D = X5R T = T55T S = High K T55T	Cap/Section (EIA Code)	Capacitance Tolerance M = ±20% P = GMV	Height Code 6 = 0.500mm 3 = 0.650mm 1 = 0.875mm 5 = 1.100mm 7 = 1.600mm	Termination F = C4 Solder Balls- 97Pb/3Sn P = Cr-Cu-Au N = Cr-Ni-Au X = None	Reel Packaging M = 7" Reel R = 13" Reel 6 = 2"x2" Waffle Pack 8 = 2"x2" Black Waffle Pack 7 = 2"x2" Waffle Pack w/ termination facing up A = 2"x2" Black Waffle Pack w/ termination facing up C = 4"x4" Waffle Pack w/ clear lid	# of Caps/Part 1 = one 2 = two 4 = four	Inspection Code A = Standard B = Established Reliability Testing	Code Face A = Bar B = No Bar C = Dot, S55S Dielectrics

