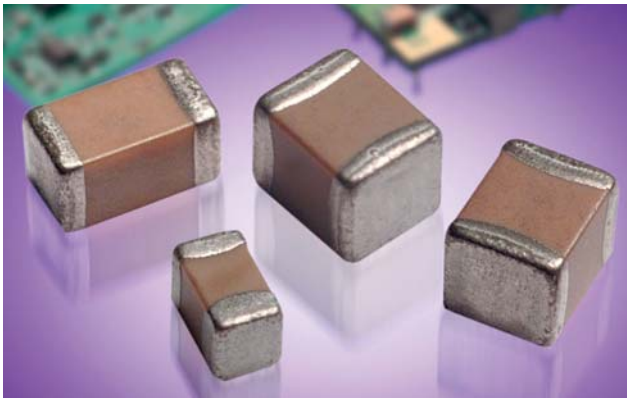
X7R Dielectric

General Specifications



X7R formulations are called “temperature stable” ceramics and fall into EIA Class II materials. X7R is the most popular of these intermediate dielectric constant materials. Its temperature variation of capacitance is within ±15% from -55°C to +125°C. This capacitance change is non-linear.

Capacitance for X7R varies under the influence of electrical operating conditions such as voltage and frequency.

X7R dielectric chip usage covers the broad spectrum of industrial applications where known changes in capacitance due to applied voltages are acceptable.

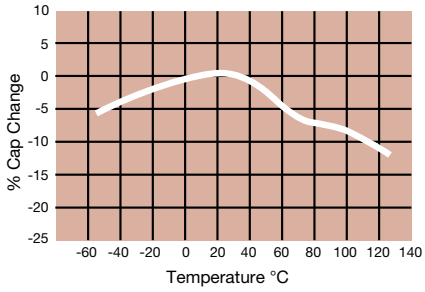
RoHS COMPLIANT

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

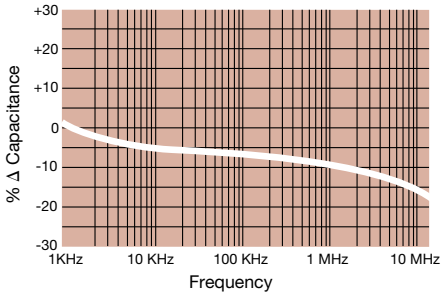
0805	5	C	103	M	A	T	2	A
Size (L" x W")	**Voltage** 4V = 4, 6.3V = 6, 10V = Z, 16V = Y, 25V = 3, 50V = 5, 100V = 1, 200V = 2, 500V = 7	**Dielectric** X7R = C	**Capacitance Code (In pF)** 2 Sig. Digits + Number of Zeros	**Capacitance Tolerance** J = ± 5%* K = ±10% M = ± 20% *≤1µF only, contact factory for additional values	**Failure Rate** A = Not Applicable	**Terminations** T = Plated Ni and Sn 7 = Gold Plated* Z = FLEXITERM®** *Optional termination **See FLEXITERM® X7R section	**Packaging** 2 = 7" Reel 4 = 13" Reel 7 = Bulk Cass. 9 = Bulk **Contact Factory For Multiples**	**Special Code** A = Std. Product

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

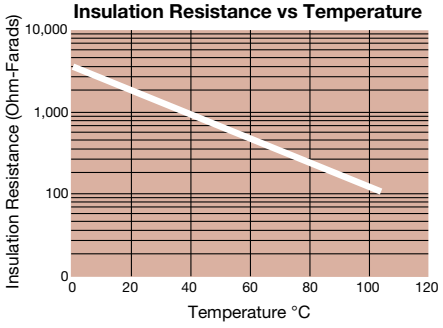
X7R Dielectric
Typical Temperature Coefficient



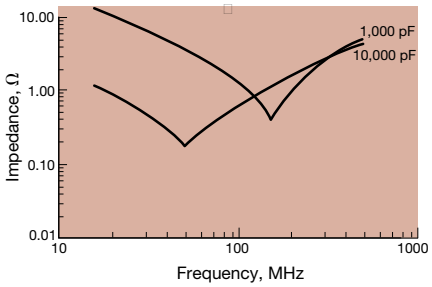
Δ Capacitance vs. Frequency



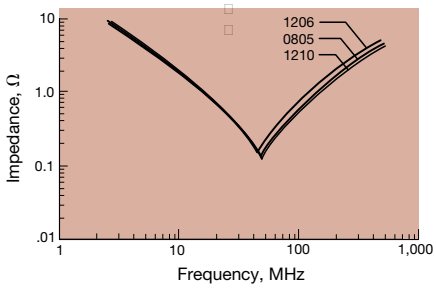
Insulation Resistance vs Temperature



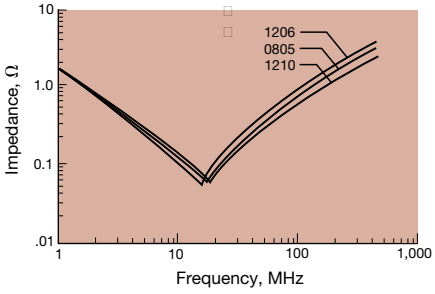
Variation of Impedance with Cap Value
Impedance vs. Frequency
1,000 pF vs. 10,000 pF - X7R
0805



Variation of Impedance with Chip Size
Impedance vs. Frequency
10,000 pF - X7R

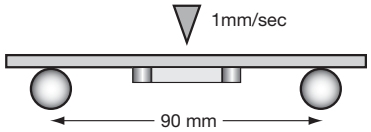


Variation of Impedance with Chip Size
Impedance vs. Frequency
100,000 pF - X7R



X7R Dielectric

Specifications and Test Methods

Parameter/Test		X7R Specification Limits	Measuring Conditions	
Operating Temperature Range		-55ºC to +125ºC	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 kHz ± 10% Voltage: 1.0Vrms ± .2V	
Dissipation Factor		≤ 2.5% for ≥ 50V DC rating ≤ 3.0% for 25V DC rating ≤ 3.5% for 25V and 16V DC rating ≤ 5.0% for ≤ 10V DC rating		
Insulation Resistance		100,000MΩ or 1000MΩ - µF, whichever is less	Charge device with rated voltage for 120 ± 5 secs @ room temp/humidity	
Dielectric Strength		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) Note: Charge device with 150% of rated voltage for 500V devices.	
Resistance to Flexure Stresses	Appearance	No defects	Deflection: 2mm Test Time: 30 seconds 	
	Capacitance Variation	≤ ±12%		
	Dissipation Factor	Meets Initial Values (As Above)		
	Insulation Resistance	≥ Initial Value x 0.3		
Solderability		≥ 95% of each terminal should be covered with fresh solder	Dip device in eutectic solder at 230 ± 5ºC for 5.0 ± 0.5 seconds	
Resistance to Solder Heat	Appearance	No defects, <25% leaching of either end terminal	Dip device in eutectic solder at 260ºC for 60 seconds. Store at room temperature for 24 ± 2 hours before measuring electrical properties.	
	Capacitance Variation	≤ ±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: -55ºC ± 2º	30 ± 3 minutes
	Capacitance Variation	≤ ±7.5%	Step 2: Room Temp	≤ 3 minutes
	Dissipation Factor	Meets Initial Values (As Above)	Step 3: +125ºC ± 2º	30 ± 3 minutes
	Insulation Resistance	Meets Initial Values (As Above)	Step 4: Room Temp	≤ 3 minutes
	Dielectric Strength	Meets Initial Values (As Above)	Repeat for 5 cycles and measure after 24 ± 2 hours at room temperature	
Load Life	Appearance	No visual defects	Charge device with 1.5 rated voltage (≤ 10V) in test chamber set at 125ºC ± 2ºC for 1000 hours (+48, -0) Remove from test chamber and stabilize at room temperature for 24 ± 2 hours before measuring.	
	Capacitance Variation	≤ ±12.5%		
	Dissipation Factor	≤ Initial Value x 2.0 (See Above)		
	Insulation Resistance	≥ 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 85ºC ± 2ºC/ 85% ± 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied. Remove from chamber and stabilize at room temperature and humidity for 24 ± 2 hours before measuring.	
	Capacitance Variation	≤ ±12.5%		
	Dissipation Factor	≤ Initial Value x 2.0 (See Above)		
	Insulation Resistance	≥ Initial Value x 0.3 (See Above)		
	Dielectric Strength	Meets Initial Values (As Above)		

X7R Dielectric

Capacitance Range

PREFERRED SIZES ARE SHADED

SIZE		0101	0201			0402			0603							0805							1206							
Soldering		Reflow Only	Reflow Only			Reflow/Wave			Reflow/Wave							Reflow/Wave							Reflow/Wave							
Packaging		Paper/Embossed	All Paper			All Paper			All Paper							Paper/Embossed							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							3.20 ± 0.20							
	(in.)	(0.016 ± 0.0008)	(0.024 ± 0.001)			(0.040 ± 0.004)			(0.063 ± 0.006)							(0.079 ± 0.008)							(0.126 ± 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							1.60 ± 0.20							
	(in.)	(0.008 ± 0.0008)	(0.011 ± 0.001)			(0.020 ± 0.004)			(0.032 ± 0.006)							(0.049 ± 0.008)							(0.063 ± 0.008)							
(t) Terminal	mm	0.20 ± 0.02	0.15 ± 0.05			0.25 ± 0.15			0.35 ± 0.15							0.50 ± 0.25							0.50 ± 0.25							
	(in.)	(0.008 ± 0.0008)	(0.006 ± 0.002)			(0.010 ± 0.006)			(0.014 ± 0.006)							(0.020 ± 0.010)							(0.020 ± 0.010)							
	WVDC	10	10	16	25	16	25	50	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	500
Cap	100	A	A	A	A																									
(pF)	150	A	A	A	A																									
	220	A	A	A	A			C																						
	330	A	A	A	A			C					G	G	G		J	J	J	J	J	J								K
	470	A	A	A				C					G	G	G		J	J	J	J	J	J								K
	680	A	A	A				C					G	G	G		J	J	J	J	J	J								K
	1000	A	A	A				C					G	G	G		J	J	J	J	J	J								K
	1500		A					C					G	G			J	J	J	J	J	J		J	J	J	J	J	J	M
	2200		A					C					G	G			J	J	J	J	J	J		J	J	J	J	J	J	M
	3300		A				C	C					G	G			J	J	J	J	J	J		J	J	J	J	J	J	M
	4700		A				C	C					G	G			J	J	J	J	J	J		J	J	J	J	J	J	M
	6800		A			C	C						G	G			J	J	J	J	J	J		J	J	J	J	J	J	P
Cap	0.010		A			C	C						G	G			J	J	J	J	J	J		J	J	J	J	J	J	P
(µF	0.015					C						G	G				J	J	J	J	J		J	J	J	J	M		
	0.022					C	C					G	G				J	J	J	J	J	N		J	J	J	J	M		
	0.033					C	C					G	G				J	J	J	J	N			J	J	J	J	M		
	0.047					C	C				G	G	G				J	J	J	J	N			J	J	J	J	M		
	0.068					C	C				G	G	G				J	J	J	J	N			J	J	J	J	P		
	0.10					C	C			G	G	G	G				J	J	J	J	N			J	J	J	M	P		
	0.15								G	G							J	J	J	N	N			J	J	J	Q			
	0.22								G	G		J*					J	J	N	N	N			J	J	J	Q			
	0.33																N	N	N	N	N			J	J	M	P	Q		
	0.47											J*					N	N	N	N	N			M	M	M	P	Q		
	0.68																N	N	N					M	M	Q	Q	Q		
	1.0									J*	J*						N	N	N	N				M	M	Q	Q	Q		
	1.5																							P	Q	Q				
	2.2								J*										P*					Q	Q	Q		Q*		
	3.3																													
	4.7																P*	P*						Q*	Q*	Q*	Q*			
	10															P*	P*							Q*	Q*	Q*				
	22																						Q*	Q*						
	47																													
	100																													
	WVDC	10	10	16	25	16	25	50	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	6.3	10	16	25	50	100	200	500
	SIZE	0101	0201			0402			0603							0805							1206							

Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	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					EMBOSSED							

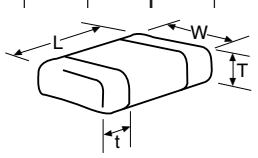
*Optional Specifications – Contact factory

X7R Dielectric

Capacitance Range

PREFERRED SIZES ARE SHADED

SIZE		1210							1812				1825		2220				2225	
Soldering		Reflow Only							Reflow Only				Reflow Only		Reflow Only				Reflow Only	
Packaging		Paper/Embossed							All Embossed				All Embossed		All Embossed				All Embossed	
(L) Length	mm (in.)	3.20 ± 0.20 (0.126 ± 0.008)							4.50 ± 0.30 (0.177 ± 0.012)				4.50 ± 0.30 (0.177 ± 0.012)		5.70 ± 0.40 (0.225 ± 0.016)				5.72 ± 0.25 (0.225 ± 0.010)	
(W) Width	mm (in.)	2.50 ± 0.20 (0.098 ± 0.008)							3.20 ± 0.20 (0.126 ± 0.008)				6.40 ± 0.40 (0.252 ± 0.016)		5.00 ± 0.40 (0.197 ± 0.016)				6.35 ± 0.25 (0.250 ± 0.010)	
(t) Terminal	mm (in.)	0.50 ± 0.25 (0.020 ± 0.010)							0.61 ± 0.36 (0.024 ± 0.014)				0.61 ± 0.36 (0.024 ± 0.014)		0.64 ± 0.39 (0.025 ± 0.015)				0.64 ± 0.39 (0.025 ± 0.015)	
	WVDC	10	16	25	50	100	200	500	50	100	200	500	50	100	25	50	100	200	50	100
Cap (pF)	100																			
	150																			
	220																			
	330																			
	470																			
	680																			
	1000																			
	1500	J	J	J	J	J	J	M												
	2200	J	J	J	J	J	J	M												
	3300	J	J	J	J	J	J	M												
	4700	J	J	J	J	J	J	M												
	6800	J	J	J	J	J	J	M												
Cap (µF)	0.010	J	J	J	J	J	J	M	K	K	K	K	M	M		X	X	X	M	P
	0.015	J	J	J	J	J	J	P	K	K	K	P	M	M		X	X	X	M	P
	0.022	J	J	J	J	J	J	Q	K	K	K	P	M	M		X	X	X	M	P
	0.033	J	J	J	J	J	J	Q	K	K	K	X	M	M		X	X	X	M	P
	0.047	J	J	J	J	J	J		K	K	K	Z	M	M		X	X	X	M	P
	0.068	J	J	J	J	J	M		K	K	K	Z	M	M		X	X	X	M	P
	0.10	J	J	J	J	J	M		K	K	K	Z	M	M		X	X	X	M	P
	0.15	J	J	J	J	M	Z		K	K	P		M	M		X	X	X	M	P
	0.22	J	J	J	J	P	Z		K	K	P		M	M		X	X	X	M	P
	0.33	J	J	J	J	Q			K	M	X		M	M		X	X	X	M	P
	0.47	M	M	M	M	Q			K	P			M	M		X	X	X	M	P
	0.68	M	M	P	X	X			M	Q			M	P		X	X		M	P
	1.0	N	N	P	X	Z			M	X			M	P		X	X		M	P
	1.5	N	N	Z	Z	Z			Z	Z			M			X	X		M	X
	2.2	X	X	Z	Z	Z			Z	Z						X	X		M	
	3.3	X	X	Z	Z				Z							X	Z			
	4.7	X	X	Z	Z				Z							X	Z			
	10	Z	Z	Z*												Z				
	22	Z*	Z*												Z					
	47																			
	100																			
	WVDC	10	16	25	50	100	200	500	50	100	200	500	50	100	25	50	100	200	50	100
SIZE		1210							1812				1825		2220				2225	



Letter	A	C	E	G	J	K	M	N	P	Q	X	Y	Z
Max. Thickness	0.33 (0.013)	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					EMBOSSED							

*Optional Specifications – Contact factory

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

AVX:

18087C103KAT2A 08053C153K4T2A 0805YC224KAT2A 06031A8R2DAQ2A 08051C332KAJ2A 12061C102MA12A 0805ZC105KA19A 12065C123KHT1A 1206VC104MAT2A 08055C102KBT1A 1210YC106KAZ2A 08055C473KBT1A 12101C104KAJ2A 0402YA180JAJ2A 08055A102JAQ2A 06035A270KAJ2A 06031A560GAQ2A 12065C472K4T2A 1206VC103KAT2A 0402YC103KAQ2A 08051C152KAJ4A 08055C104KAJ4A 08055C471KBT1A 12065C392KHT1A 08051C471KAJ2A 06123C473MAT2U 0402YC102KAJ2A 08051C332J4T2A 08055C103KAJ4A 18127C223JAT2A 12062C272JAT2A 0805YC224KBT1A 08055C153KAJ2A 08055C333KAJ2A 08053C104JAT2A 08055C104KAT2A 0805YC474KAT1A 12065C104KBT1A 12065C124KBT1A 12105C224KAT1A 05045C102KAT1A 06125C103MAT2A 08051C104KAT2A 05045C103KA79A 08051A101KSJ9A 08052C471KAJ2A 08055C103MA12A 08055C104JAJ2A 08055C104KA16A 08055C473KA12A 0805ZC105KBT1A 12065C104K4Z2A 12065C393KHT1A 12065C822KHT1A 18252C224JATME 0402YA120GAJ2A 04025A0R5BAQ2A 04025A470JAQ2A 06031A150KAJ4A 06031A270KAJ2A 06031C102KAQ2A 06031C331KA14A 06033A470KAJ2A 06035A271JAQ2A 06035C331KA14A 0805ZC474KAJ2A 08051A510JAJ2A 08051C681KAJ2A 08053A472FAJ2A 08055A130JAQ2A 08055A561JAQ2A 08055C101KAJ2A 08055C104KAJ9A 08055C152KA12A 08055C393KAQ2A 1206VC104KAT2A 1206ZC106MAT2A 06033C103KB11A 08055C122KBT1A 18125A103FSJ9A 08051A220FST9A 08051X471KSJME 08053C222K4T2A 1206YC475KAT2A 12061C643JAT2A 0603YC474MAT2A 06033C392K4T2A 08055C681K4T2A 12061C154JAT2A 12101C155KAT2A 18125C155MAT2A 06031C202MAT2A 0603YC103J4T2A 0805YC181KAT2A 0805YC472JA12A 0805ZC104M4T2A 08051C222KAT2A 08053C104KA12A 08055C152KAJ2A 12105C224JAT1A