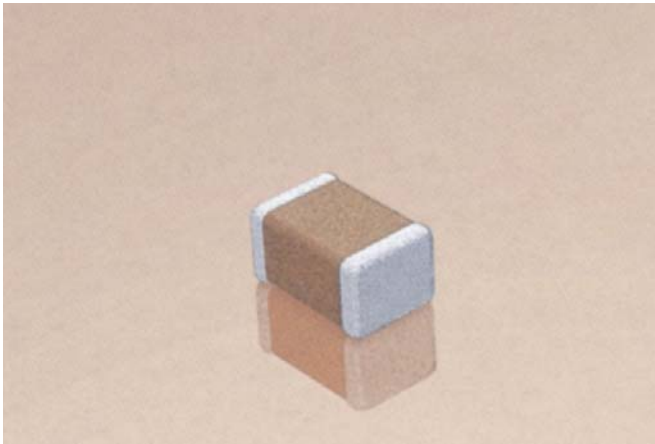


# X7R Dielectric

## 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  $\pm 15\%$  from  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ . This capacitance change is non-linear.

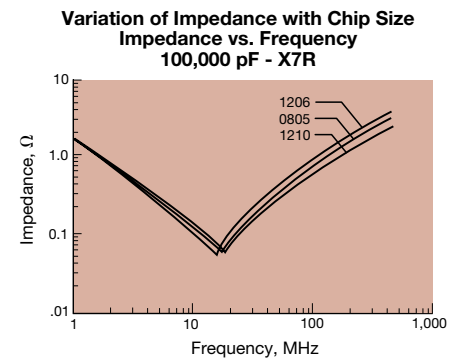
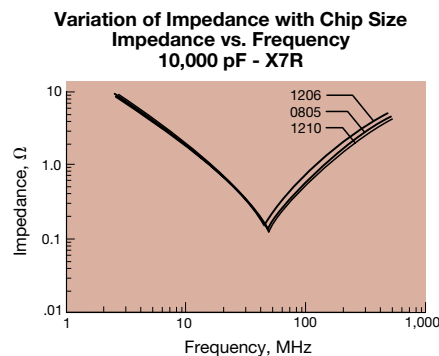
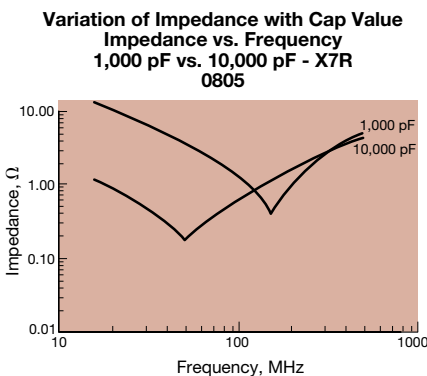
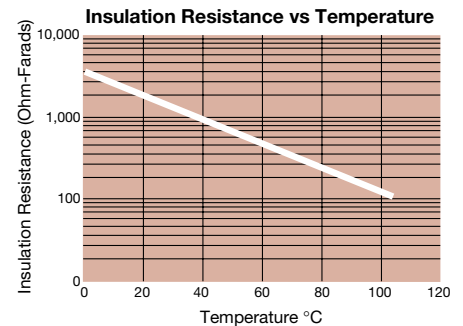
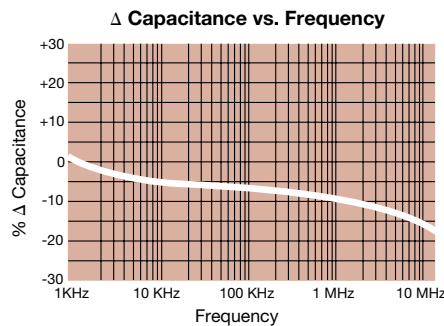
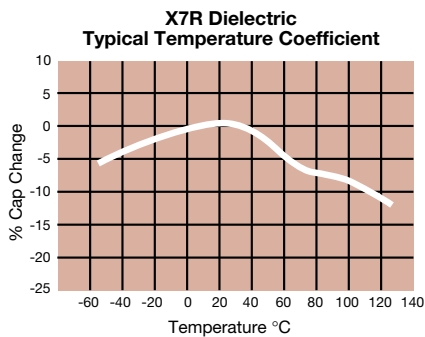
Capacitance for X7R varies under the influence of electrical operating conditions such as voltage and frequency.

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

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

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

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



## Specifications and Test Methods

Parameter/Test		X7R Specification Limits	Measuring Conditions	
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber	
Capacitance		Within specified tolerance	Freq.: 1.0 kHz ± 10% Voltage: 1.0Vrms ± .2V For Cap > 10 µF, 0.5Vrms @ 120Hz	
Dissipation Factor		$\leq 2.5\%$ for $\geq 50V$ DC rating $\leq 3.0\%$ for 25V DC rating $\leq 3.5\%$ for 16V DC rating $\leq 5.0\%$ for $\leq 10V$ 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	$\leq \pm 12\%$		
	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 ± 5°C 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 260°C for 60 seconds. Store at room temperature for 24 ± 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 ± 2°	30 ± 3 minutes
	Capacitance Variation	$\leq \pm 7.5\%$	Step 2: Room Temp	$\leq 3$ minutes
	Dissipation Factor	Meets Initial Values (As Above)	Step 3: +125°C ± 2°	30 ± 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 ± 2 hours at room temperature	
Load Life	Appearance	No visual defects	Charge device with 1.5 rated voltage ( $\leq 10V$ ) in test chamber set at 125°C ± 2°C for 1000 hours (+48, -0)  Remove from test chamber and stabilize at room temperature for 24 ± 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)		
Load Humidity	Appearance	No visual defects	Store in a test chamber set at 85°C ± 2°C/ 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	$\leq \pm 12.5\%$		
	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)		

# X7R Dielectric



## Capacitance Range

PREFERRED SIZES ARE SHADED

SIZE	0201		0402			0603						0805						1206					
	Reflow Only		Reflow Only			Reflow Only						Reflow/Wave						Reflow/Wave					
Packaging	All Paper		All Paper			All Paper						Paper/Embossed						Paper/Embossed					
(L) Length	MM	0.60 ± 0.03 (0.024 ± 0.001)	1.00 ± 0.10 (0.040 ± 0.004)			1.60 ± 0.15 (0.063 ± 0.006)						2.01 ± 0.20 (0.079 ± 0.008)						3.20 ± 0.20 (0.126 ± 0.008)					
(W) Width	MM	0.30 ± 0.03 (0.011 ± 0.001)	0.50 ± 0.10 (0.020 ± 0.004)			0.81 ± 0.15 (0.032 ± 0.006)						1.25 ± 0.20 (0.049 ± 0.008)						1.60 ± 0.20 (0.063 ± 0.008)					
(t) Terminal	MM	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)						0.50 ± 0.25 (0.020 ± 0.010)					
WVDC		10 16	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	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200						
Cap (pF)	100	A A																					
	150	A A																					
	220	A A			C																		
	330	A A			C				G	G	G		J	J	J	J	J						
	470	A A			C				G	G	G		J	J	J	J	J						
	680	A A			C				G	G	G		J	J	J	J	J						
	1000	A A			C				G	G	G		J	J	J	J	J						
	1500	A			C				G	G	G		J	J	J	J	J						
	2200	A			C				G	G	G		J	J	J	J	J						
	3300	A			C				G	G	G		J	J	J	J	J						
	4700	A			C				G	G	G		J	J	J	J	J						
	6800	A			C				G	G	G		J	J	J	J	J						
Cap (µF)	0.010	A			C				G	G	G		J	J	J	J	J						
	0.015				C				G	G	G		J	J	J	J	J						
	0.022				C				G	G	G		J	J	J	J	J						
	0.033								G	G	G		J	J	J	J	J						
	0.047								G	G	G		J	J	J	J	J						
	0.068								G	G	G		J	J	J	J	J						
	0.10								G	G	G		J	J	J	J	J						
	0.15								G	G	G		J	J	J	J	J						
	0.22								G	G	G		J	J	J	J	J						
	0.33												N	N	N	N	N						
	0.47												N	N	N	N	N						
	0.68												N	N	N	N	N						
	1.0												N	N	N	N	N						
	1.5												N	N	N	N	N						
	2.2												N	N	N	N	N						
	3.3																						
	4.7																						
	10																						
	22																						
	47																						
	100																						
WVDC		10 16	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	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200	6.3 10 16 25 50 100 200						

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					EMBOSS							

= Under Development



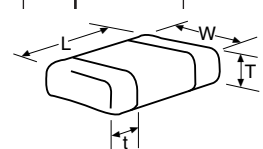
# X7R Dielectric



## 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		6.3	10	16	25	50	100	200	500	50	100	200	500	50	100	6.3	50	100	200	50	100
Cap (pF)	100																				
	150																				
	220																				
	330																				
	470																				
	680																				
	1000																				
	1500	J	J	J	J	J	J	J	M												
	2200	J	J	J	J	J	J	J	M												
	3300	J	J	J	J	J	J	J	M												
	4700	J	J	J	J	J	J	J	M												
	6800	J	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	X	M	P	
	0.015	J	J	J	J	J	J	P	K	K	K	P	M	M	X	X	X	X	M	P	
	0.022	J	J	J	J	J	J	Q	K	K	K	P	M	M	X	X	X	X	M	P	
	0.033	J	J	J	J	J	J		K	K	K	X	M	M	X	X	X	X	M	P	
	0.047	J	J	J	J	J	J		K	K	K	Z	M	M	X	X	X	X	M	P	
	0.068	J	J	J	J	J	M		K	K	K		M	M	X	X	X	X	M	P	
	0.10	J	J	J	J	J	M		K	K	K		M	M	X	X	X	X	M	P	
	0.15	J	J	J	J	M			K	K	K		M	M	X	X	X	X	M	P	
	0.22	J	J	J	J	P			K	K	P		M	M	X	X	X		M	P	
	0.33	J	J	J	J	Z			K	M			M	M	X	X	X		M	P	
	0.47	M	M	M	M	Z			K	P			M	M	X	X	X		M	P	
	0.68	M	M	P	X	Z			M	Q			M		X	X	X		M	P	
	1.0	N	N	P	X	Z			M	X			M		X	Z		M	P		
	1.5	N	N	Z	Z	Z			Z	Z			M		X	Z		M	X		
	2.2	Z	Z	Z	Z				Z	Z								M			
	3.3	Z	Z	Z	Z				Z												
	4.7	Z	Z	Z	Z				Z												
	10	Z	Z	Z											Z						
	22	Z	Z																		
	47																				
	100																				
WVDC		6.3	10	16	25	50	100	200	500	50	100	200	500	50	100	6.3	50	100	200	50	100



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)	0.86 (0.034)	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					EMBOSS							

= Under Development