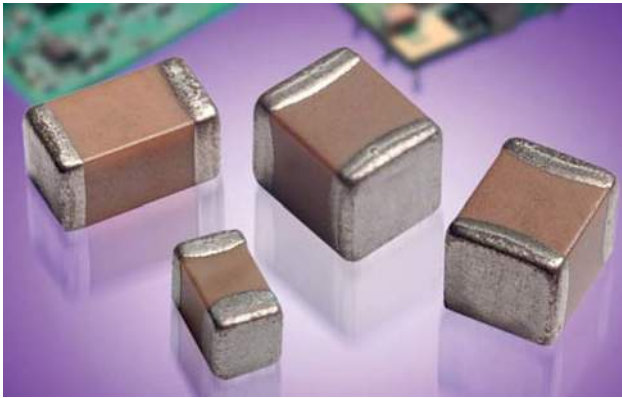


X7R Dielectric

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°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)

0805

Size
(L" x W")

5

Voltage
4V = 4
6.3V = 6
10V = Z
16V = Y
25V = 3
50V = 5
100V = 1
200V = 2
500V = 7

C

Dielectric
X7R = C

103

Capacitance Code (In pF)
2 Sig. Digits + Number of Zeros

M

Capacitance Tolerance
J = $\pm 5\%$ *
K = $\pm 10\%$
M = $\pm 20\%$

* $\leq 1\mu\text{F}$ only,
contact factory for additional values

A

Failure Rate
A = Not Applicable

T

Terminations
T = Plated Ni and Sn
7 = Gold Plated*
Z = FLEXITERM®**

*Optional termination
**See FLEXITERM® X7R section

2

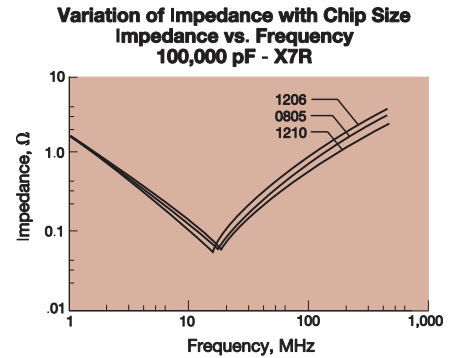
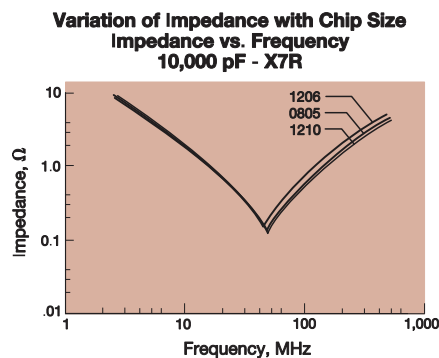
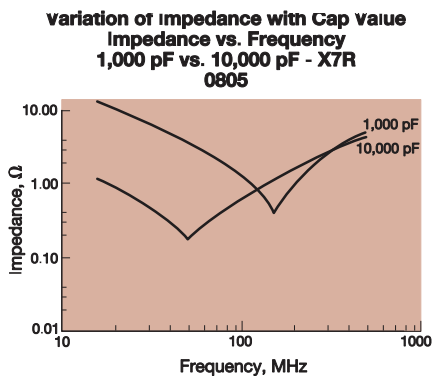
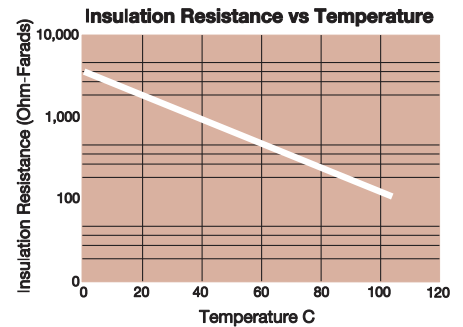
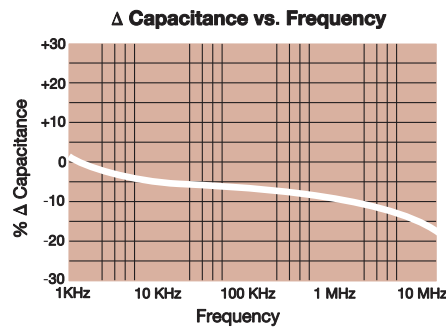
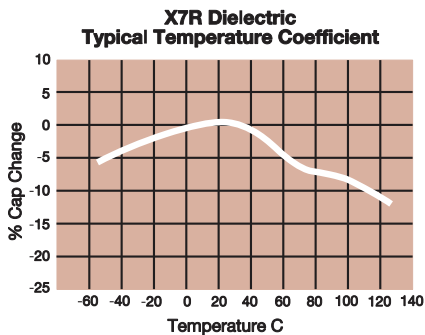
Packaging
2 = 7" Reel
4 = 13" Reel

Contact Factory For Multiples

A

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.



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 > 10µF, 05Vrm @ 120Hz	
Dissipation Factor		≤ 10% for ≥ 50V DC rating ≤ 12.5% for 25V DC rating ≤ 12.5% for 25V and 16V DC rating ≤ 12.5% 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 250% 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 ± 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 60seconds. Store at room temperature for 24 ± 2hours 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: -55°C ± 2°	30 ± 3 minutes
	Capacitance Variation	≤ ±7.5%	Step 2: Room Temp	≤ 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	≤ 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 125°C ± 2°C for 1000 hours (+48, -0) If RV > 10V then Life Test voltage will be 2xRV but there are exceptions (please contact AVX for further details on exceptions) 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 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	≤ ±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 (in)	0.40 ± 0.02 (0.016 ± 0.0008)					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 (in)	0.20 ± 0.02 (0.008 ± 0.0008)					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 (in)	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)					0.50 ± 0.25 (0.020 ± 0.010)																
WVDC		16	6.3	10	16	25	50	6.3	10	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	500		
Cap	100	101	B	A	A	A	A						C	C	C	C				G	G	G																					
(pF)	150	151	B	A	A	A	A						C	C	C	C				G	G	G																					
	220	221	B	A	A	A	A						C	C	C	C				G	G	G	E	E	E	E	E	E	E														
	330	331	B	A	A	A	A						C	C	C	C				G	G	G	J	J	J	J	J	J	J													K	
	470	471	B	A	A	A	A						C	C	C	C				G	G	G	J	J	J	J	J	J	J													K	
	680	681	B	A	A	A	A						C	C	C	C				G	G	G	J	J	J	J	J	J	J														K
	1000	102	B	A	A	A	A						C	C	C	C				G	G	G	J	J	J	J	J	J	J														K
	1500	152	B	A	A	A	A						C	C	C	C				G	G		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	M	
	2200	222	B	A	A	A	A						C	C	C	C				G	G		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	M	
	3300	332		A	A	A	A						C	C	C	C				G	G		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	M	
	4700	472		A	A	A	A						C	C	C	C				G	G		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	M	
	6800	682		A	A	A	A						C	C	C	C				G	G		J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	P	
Cap	0.01	103		A	A	A	A						C	C	C	C				G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	P	
(μF)	0.015	153											C	C	C	C				G	G	G	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	Q	
	0.022	223											C	C	C	C				G	G	G				J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	Q
	0.033	333											C	C	C	C				G	G	J				J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	Q	
	0.047	473											C	C	C	C				G	G	G	J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	M	
	0.068	683											C	C	C	C				G	G	G	J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	P	
	0.1	104											C	C	C	C				G	G	G	J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	P	
	0.15	154																		G	G	G				J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	Q	
	0.22	224											C	C	C					G	G	J	J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	Q	
	0.33	334																		J	J	J	J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	Q	
	0.47	474											C	C						J	J	J	J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	Q	
	0.68	684																		J	J	J	J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	Q	
	1.0	105											C							J	J	J	J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	M	
	2.2	225																		J	J	J	J			J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	Q*
	4.7	475																		J						J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	J	P
	10	106																																								P	
	22	226																																									Q
	47	476																																									Q
	100	107																																									Q
WVDC		16	6.3	10	16	25	50	6.3	10	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	500		
SIZE		0101	0201					0402					0603					0805					1206																				

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

**Contact Factory for Specifications

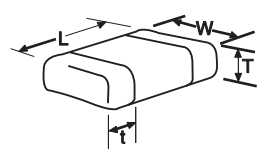
X7R Dielectric

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.)	3.30 ± 0.4 (0.130 ± 0.016)						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	16	25	50	100	200	500	50	100	200	25	50	100	200	500	50	100	200										
Cap	(pF)	100	101																																
150	151																																		
220	221																																		
330	331																																		
470	471																																		
680	681																																		
1000	102																																		
1500	152	J	J	J	J	J	J	M																											
2200	222	J	J	J	J	J	J	M																											
3300	332	J	J	J	J	J	J	M																											
4700	472	J	J	J	J	J	J	M																											
6800	682	J	J	J	J	J	J	M																											
Cap	(μF)	0.01	103	J	J	J	J	J	M						K	K	K	M	M	M		X	X	X	X	M	P	P							
0.015	153	J	J	J	J	J	J	P						K	K	K	P	M	M	M		X	X	X	X	M	P	P							
0.022	223	J	J	J	J	J	J	Q						K	K	K	P	M	M	M		X	X	X	X	M	P	P							
0.033	333	J	J	J	J	J	J	Q						K	K	K	X	M	M	M		X	X	X	X	M	P	P							
0.047	473	J	J	J	J	J	J	Q						K	K	K	Z	M	M	M		X	X	X	X	M	P	P							
0.058	683	J	J	J	J	J	M	Q						K	K	K	Z	M	M	M		X	X	X	X	M	P	P							
0.1	104	J	J	J	J	J	M	X						K	K	K	Z	M	M	M		X	X	X	X	M	P	P							
0.15	154	J	J	J	J	J	M	Z						K	K	K	P	Z	M	M	M		X	X	X	X	M	P	X						
0.22	224	J	J	J	J	P	Z							K	K	K	P	Z	M	M	M		X	X	X	X	M	P	X						
0.33	334	J	J	J	J	Q								K	K	M	X		M	M		X	X	X	X	M	P	X							
0.47	474	M	M	M	M	Q								K	K	P	X		M	M		X	X	X	X	M	P	X							
0.68	684	M	M	P	X	X								M	M	Q			M	P		X	X			M	P	X							
1.0	105	N	N	P	X	Z								M	M	X	Z		M	P		X	X			M	P	X							
1.5	155	N	N	Z	Z	Z								Z	Z	Z			Q			X	X			M	X	Z							
2.2	225	X	X	Z	Z	Z								Z	Z	Z						X	X			M	X	Z							
3.3	335	X	X	Z	Z	Z								Z	Z	Z						X	Z												
4.7	475	Z	Z	Z	Z	Z								Z	Z	Z						X	Z												
10	106	Z	Z	Z	Z	Z							Z									Z	Z												
22	226	Z	Z	Z																		Z													
47	476	Z																																	
100	107																																		
WVDC		10	16	25	50	100	200	500	16	25	50	100	200	500	50	100	200	25	50	100	200	500	50	100	200										



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							

NOTE: Contact factory for non-specified capacitance values