### **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 con-ditions such as voltage and frequency.

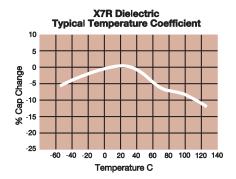
X7R dielectric chip usage covers the broad spectrum of industrial applications where known changes in capacitance

due to applied voltages are acceptable.

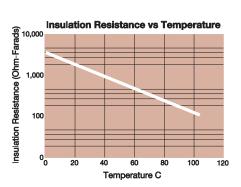
#### PART NUMBER (SEE PAGE 4 FOR COMPLETE PART NUMBER EXPLANATION)

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

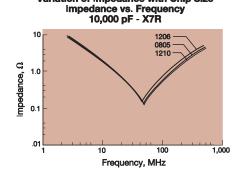
Contact factory for availability of Termination and Tolerance Options for Specific Part Numbers. Contact factory for non-specified capacitance values.



△ Capacitance vs. Frequency ∆ Capacitance -30 1KHz 10 KHz 100 KHz 1 MHz 10 MHz Frequency



Variation of Impedance with Cap Value Impedance vs. Frequency 1,000 pF vs. 10,000 pF - X7R 10.00 1.000 pF 0.10 mpedance, 0 0.01 Frequency, MHz



Variation of Impedance with Chip Size

Variation of Impedance with Chip Size Impedance vs. Frequency 100,000 pF - X7R mpedance, Ω 100 1,000 Frequency, MHz



# **Specifications and Test Methods**



Parame	ter/Test	X7R Specification Limits	Measuring Conditions							
Operating Tem	perature Range	-55°C to +125°C	Temperature (	Cycle Chamber						
Capac Dissipati	itance on Factor	Within specified tolerance ≤ 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 Contact Factory for DF by PN	Freq.: 1.0 kHz ± 10% Voltage: 1.0Vrms ± .2V For Cap > 10μF, 05Vrm @ 120Hz							
Insulation	Resistance	100,000ΜΩ or 1000ΜΩ - 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.							
	Appearance	No defects								
Resistance to	Capacitance Variation	≤ ±12%	Deflecti	on: 2mm						
Flexure Stresses	Dissipation Factor	Meets Initial Values (As Above)	Test Time:	30 seconds						
	Insulation Resistance	≥ Initial Value x 0.3								
Solder	ability	≥ 95% of each terminal should be covered with fresh solder		c solder at 230 ± 5°C .5 seconds						
	Appearance	No defects, <25% leaching of either end terminal								
	Capacitance Variation	≤ ±7.5%								
Resistance to Solder Heat	Dissipation Factor	Meets Initial Values (As Above)	seconds. Store at roo	solder at 260°C for 60 m temperature for 24 ±						
Soluei rieat	Insulation Resistance	Meets Initial Values (As Above)	2hours before measuri	ng electrical properties.						
	Dielectric Strength	Meets Initial Values (As Above)								
	Appearance	No visual defects	Step 1: -55°C ± 2°	30 ± 3 minutes						
	Capacitance Variation	≤ ±7.5%	Step 2: Room Temp	≤ 3 minutes						
Thermal Shock	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							
	Appearance	No visual defects	_							
	Capacitance Variation	≤ ±12.5%	test chamber set at 125	rated voltage (≤ 10V) in 5°C ± 2°C for 1000 hours						
	Dissipation Factor	≤ Initial Value x 2.0 (See Above)	,	8, -0)						
Load Life	Insulation Resistance	≥ Initial Value x 0.3 (See Above)	but there are exceptions	est voltage will be 2xRV s (please contact AVX for on exceptions)						
	Dielectric Strength	Meets Initial Values (As Above)	Remove from test cham	ber and stabilize at room hours before measuring.						
	Appearance	No visual defects								
	Capacitance Variation	≤ ±12.5%		set at 85°C ± 2°C/ 85% ± 1000 hours (+48, -0) with						
Load Humidity	Dissipation Factor	≤ Initial Value x 2.0 (See Above)	rated voltage applied.  Remove from chamber and stabilize at room temperature and humidity for 24 ± 2 hours before measuring.							
riamunty	Insulation Resistance	≥ Initial Value x 0.3 (See Above)								
	Dielectric Strength	Meets Initial Values (As Above)								



## **Capacitance Range**



### **PREFERRED SIZES ARE SHADED**

		(	201	1		0402									06	503				0805							1206												
Sol	Iderin	g	Reflow Only		Ref	low C	nly			Re	flow/\	Wave		T			R	eflov	v/Wa	ive						Reflo	w/Wa	ve						Re	eflow/	Wave	<b>.</b>		
Pac	kagin	g	Paper/Embossed		Α	II Pap	er			A	All Pa	per						All F	Paper	r					P	aper/	Embo	ssed			Paper/Embossed								
		mm	0.40 ± 0.02		0.6	0 ± 0	.09			1.00 ± 0.10							1	1.60	± 0.1	5			2.01 ± 0.20							3.20 ± 0.20									
(L) Leng	th	(in.)	(0.016 ± 0.0008)		(0.02	4 ± 0	.004)		(0.040 ± 0.004)				(0.063 ± 0.006)								(0.079 ± 0.008)							(0.126 ± 0.008)											
		mm	0.20 ± 0.02		0.3	0 ± 0	.09		0.50 ± 0.10				0.81 ± 0.15								1.25 ± 0.20							1.60 ± 0.20											
W) Widtl	h	(in.)	(0.008 ± 0.0008)		(0.01	1 ± 0	.004)		(0.020 ± 0.004)					(0.032 ± 0.006)							(0.049 ± 0.008)							(0.063 ± 0.008)											
(I) T	I	mm	0.10± 0.04		0.1	5 ± 0	.05			0.	25 ± (	0.15					(	0.35	± 0.1	5						0.50	± 0.2	5			0.50 ± 0.25								
(t) Termi	inai	(in.)	(0.004 ± 0.0016)		(0.00	6 ± 0	.002)			(0.0	10 ± (	0.006)	)				(0.	.014	± 0.0	06)					(	0.020	± 0.0	10)						(0.0	020 ±	0.010	))		
1	WVDC		16	63	10	16	25	50	63	10	16	25	50	6	3 10	0 '	16 2	25	50	100	200	250	63	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250	500
Сар	100	101	В	Α	Α	Α	Α	Α			С	С	С						G	G	G																		
(pF)	150	151	В	Α	Α	Α	Α	Α			С	С	С						G	G	G																		
	220	221	В	Α	Α	Α	Α	Α			С	С	С						G	G	G		Е	Е	Е	Е	Е	Е	Е										
	330	331	В	Α	Α	Α	Α	Α			С	С	С			Т		П	G	G	G			J	J	J	J	J	J				П						K
	470	471	В	Α	Α	Α	Α	Α			С	С	С						G	G	G			J	J	J	J	J	J										K
	680	681	В	Α	Α	Α	Α				С	С	С						G	G	G			J	J	J	J	J	J										K
	1000	102	В	Α	Α	Α	Α			С	С	С	С						G	G	G	G		J	J	J	J	J	J	J			П					J	K
	1500	152	В	Α	Α	Α	Α			С	С	С	С						G	G	J	G		J	J	J	J	J	J	J		J	J	J	J	J	J	J	М
	2200	222	В	Α	Α	Α	Α			С	С	С	С						G	G	J	G		J	J	J	J	J	J	J		J	J	J	J	J	J	J	М
	3300	332		Α	Α	Α	Α			С	С	С	С						G	G	J	G		J	J	J	J	J	J	J		J	J	J	J	J	J	J	М
	4700	472		Α	Α	Α	Α			С	С	С	С			Т			G	G	J	G		J	J	J	J	J	J	J		J	J	J	J	J	J	J	М
	6800	682		Α	Α	Α	Α			С	С	С	С			Т			G	G	J	G		J	J	J	J	J	J	J		J	J	J	J	J	J	J	Р
Сар	0.01	103		Α	Α	Α	Α			С	С	С	С					G	G	G	J	G		J	J	J	J	J	J	J		J	J	J	J	J	J	J	Р
(µF)	0.015	153								С	С	С	С			Т		G	G	G	J			J	J	J	J	J	J	N		J	J	J	٦	J	М	J	Q
	0.022	223								С	С	С	С					G	G	G				J	J	J	J	J	N	N		J	J	J	J	J	М	J	Q
	0.033	333								С	С	С	С					G	G	J				J	J	J	J	N	N	N		J	٦	ے	ے	J	М	J	Q
	0.047	473								С	С	С	С				G	G	G	J				J	J	J	J	N	N	N		J	J	J	J	J	М	М	
	0.068	683								С	С	С	С				G	G	G	J				J	J	J	J	N	N			J	J	J	J	J	Р	М	
	0.1	104								С	С	С	С		G	3	G	G	G	J				J	J	J	J	N	N			J	٦	٦	٦	Р	Р	Р	
	0.15	154												(	3 6	3	G	G	J					J	J	J	N	N				J	J	J	J	Q	Q	Q	
	0.22	224								С	С	С		(	3 6	3	J	J	J					J	J	N	N	N				J	J	J	J	Q	Q	Q	
	0.33	334	·												J J	J	J	J	J					N	N	N	N	N				J	J	М	Р	Q			
	0.47	474							С	С					J J	ı	J	J	J					N	N	N	N	N				М	М	М	Р	Q			
	0.68	684												,	J J	J	J							N	N	N						М	М						
	1.0	105							С						J J	J	J	J	J					N	N	N	N					М	М						
	2.2	225													J J	J	J							Р	Р	Р	P**					Q	Q	Q	Q	Q**		oxdot	Ш
	4.7	475												,	J			$\perp$						Р	Р	Р						Q	Q	Q	Z				
	10	106																					Р	Р	Р							Q	Q	Х	Х				
	22	226	·															$\Box$	[												Х	Q	Q						
	47	476																																					
	100	107																																					
	WVDC 16			6.3	10	16	25	50	6.3	10			50	6	3 10	0 .	16 2	_	50	100	200	250	6.3	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250	500
	SIZE		0101*		(	201	1				040	2						06	503							0	805				1206								

Letter	А	В	С	E	G	J	K	М	N	Р	Q	Х	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)
			PAF	PER						EMBO	SSED			

NOTE: Contact factory for non-specified capacitance values



<sup>\*</sup>EIA 01005

<sup>\*\*</sup>Contact Factory for Specifications

## **Capacitance Range**



### **PREFERRED SIZES ARE SHADED**

	SIZE		1210								1812								2220						2225			
,	Soldering				Re	flow (	nly					Reflo	w Only	/		Re	eflow O	nly		Re	flow O	nly		Re	flow O	nly		
Р	ackaging				Pape	r/Emb	ossec	 I			-	All Em	bosse	:d		All	Embos	sed		All I	Embos	sed		All E	Embos	sed		
(L) Leng	**h	mm			3	3.30 ± 0	1.4					4.50	± 0.30			4	.50 ± 0.	30	5.70 ± 0.40					5.	72 ± 0.2	25		
(L) Leng	Jui	(in.)				30± 0.				(0.177 ± 0.012)							177 ± 0.				25 ± 0.		, , ,					
W) Widt	:h	mm				.50 ± 0.				3.20 ± 0.20							.40 ± 0.				00 ± 0.							
		(in.)				98 ± 0.						(0.126	± 0.008 ± 0.36	3)			252 ± 0. .61 ± 0.				97 ± 0.0			,				
(t) Term	inal	mm (in.)										0.01		1)			024 ± 0.				25 ± 0.							
		WVDC	(0.020 ± 0.010) 10   16   25   50   100   200   500   16					16	25	50	100	200	500	50	100	200	25	50	100	200				200				
Сар	100	101				- 00		200	000	1.0				200	000	- 00	100	200		- 00	100	200	000		1			
(pF)	150	151																						<	_W_	_		
, ,	220	221																			~				<b>∑</b> <	<del>_</del> -		
	330	331																			(	_			- لــــــــــــــــــــــــــــــــــــ	ŢT 🖯		
	470	471																			`			_				
	680	681																		<u> </u>			4			_		
	1000	102											_				1			<u> </u>	i		111			, -		
	1500	152	J	J	J	J	J	J	M			-					-											
	2200 3300	222 332	J	J	J	J	J	J	M M																			
	4700	472	J	J	J	J	J	J	M																	$\vdash$		
	6800	682	J	J	J	J	J	J	M								+											
Сар	0.01	103	J	J	J	J	J	J	М		K	K	K	K	K	М	М	М		Х	Х	Х	Х	М	Р	Р		
(μF)	0.015	153	J	J	J	J	J	J	Р		K	K	K	К	М	М	М	М		Х	Х	Х	Х	М	Р	Р		
	0.022	223	J	J	J	J	J	J	Q		K	K	K	K	Р	М	М	М		Х	Х	Х	Х	М	Р	Р		
	0.033	333	J	J	J	J	J	J	Q		K	K	K	K	Х	М	М	М		Х	Х	Х	Х	М	Р	Р		
	0.047	473	J	J	J	J	J	J	Q		K	K	K	K	Χ	М	М	М		Χ	Х	Х	Х	М	Р	Р		
	0.058	683	J	J	J	J	J	М	Q		K	K	K	K	Х	М	М	М		Х	Х	Х	Х	М	Р	Р		
	0.1	104	J	J	J	J	J	М	Х		K	K	K	K	Х	М	М	М		Х	Х	Х	Х	М	Р	Р		
	0.15	154	J	J	J	J	M	Z			K	K	K	Р	Z	М	M	М		X	X	X	Х	М	Р	X		
	0.22	224	J	J	J	J	P	Z			K	K	K	P	Z	M	M	М		X	X	X	X	M	Р	X		
	0.33	334 474	J M	J M	J M	J M	Q Q				K K	K	M P	X	Z Z	M M	M			X	X	X	X	M M	P P	X		
	0.47	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			М	X	Z		
	2.2	225	Х	Х	Z	Z	Z				Z	Z	Z				1			Х	Х			М	Х	Z		
	3.3	335	Х	Х	Z	Z	Z				Z	Z	Z							Х	Z							
	4.7	475	Z	Z	Z	Z	Z				Z	Z								Х	Z							
	10	106	Z	Z	Z	Z				Z										Z	Z							
	22	226	Z	Z	Z					_							1		Z							$\sqcup$		
	47	476	Z				-	$\vdash$		-		_	_				1				-					$\sqcup$		
	100	107	10	16	25	F0.	100	200	FOC	16	25	FO	100	200	F00	FC	100	200	25	FO	100	200	F00	FO	100	200		
	WVDC		10	16	25	50	100	200	500	16	25	50	100	200	500	50	100	200	25	50	100	200	500	50	100 <b>2225</b>	200		
	SIZE		1210					1812							1825				2220		2223							
1.	etter	٨	A B C E G J						J K M N P							Q	X		Υ	Z								
LE	ener	Α		В	U		E .	G		J	K	I	VI	N	P		Ų	_ X		r								

Letter	Α	В	С	E	G	J	K	М	N	Р	Q	Х	Υ	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)			
			PA	PER			EMBOSSED										

NOTE: Contact factory for non-specified capacitance values