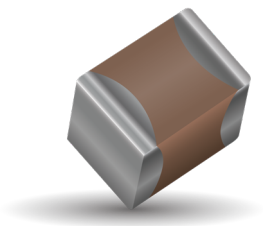
X7R Dielectric, KGM Series

General Specifications



The X7R dielectric is the most popular of the intermediate EIA class II materials due to its relative temperature stability. While the capacitance change is non-linear, temperature variation is within ±15% from - 55°C to + 125°C.

Capacitance for X7R varies under the influence of electrical operating conditions such as voltage and frequency. X7R dielectric chip usage covers a broad spectrum of industrial applications where known changes in capacitance due to applied voltages are acceptable.

SpiCAT is an additional online resource that KAVX offers to help create engineering simulations. Please visit spicat.kyocera-avx.com for more information.

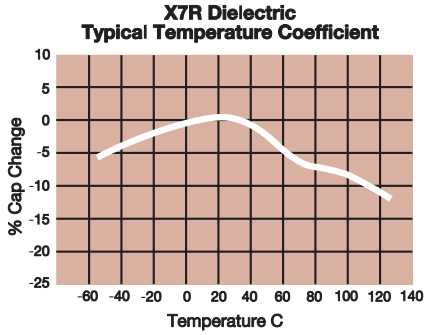
HOW TO ORDER

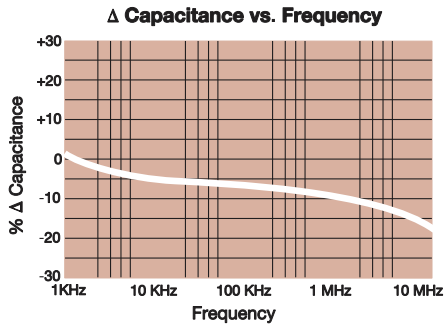
KGM	03	A	R7	1E	101	M	N
Series	**Size**	**Thickness**	**Dielectric**	**Voltage**	**Capacitance Code Code (in pF)**	**Capacitance Tolerance**	**Packaging**
General Purpose Tin/Nickel Finish	02= 0101 03= 0201 05= 0402 15=0603 21=0805 31=1206 32=1210 43=1812 44=1825 55=2220 56=2225	See Cap Chart	X7R = R7	0G= 4.0V 0J= 6.3V 1A=10V 1C=16V 1E= 25V 1H=50V 2A= 100V 2D= 200V 2E=250V 2H=500V	2 Significant Digits +Number of zeros eg. 10µF = 106 10nF = 103 47pF = 470	J* = +/- 5% K = +/- 10% M = +/- 20%	See Table Below

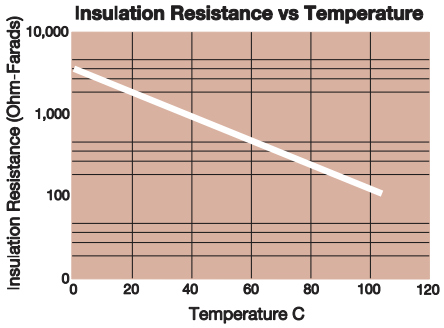
RoHS COMPLIANT

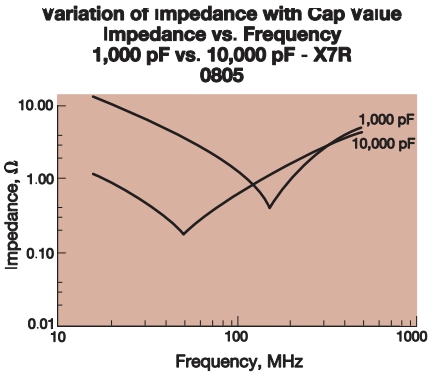
PACKAGING CODES

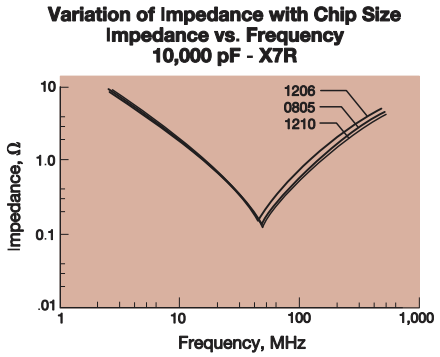
Code	EIA (inch)	IEC(mm)	7" Paper	7" Embossed	13" Paper	13"Embossed
02	0101	0402				
03	0201	0603	H		N	
05	0402	1005	H		N	
15	0603	1608	T	U	M	L
21	0805	2012	T	U	M	L
31	1206	3216	T	U	M	L
32	1210	3225		U		L
43	1812	4532		V		S
44	1825	4564		V		S
55	2220	5750		V		S
56	2225	5763		V		S

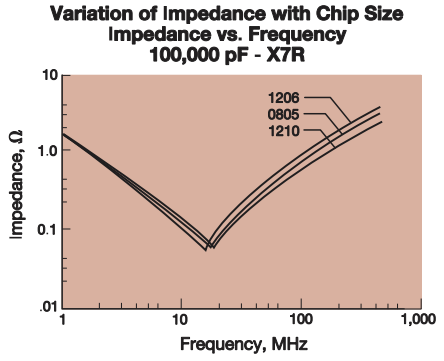












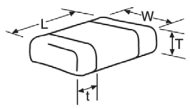
X7R Dielectric, KGM Series

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 For Cap > 10µF, 0.5Vrm @ 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 Contact Factory for DF by PN		
Insulation Resistance		10,000MΩ or 500MΩ - 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 ± 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 ± 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: -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	Pre-treatment: After mounting, perform heat treatment 150+0/-10C for 2 hour, then stabilise for 24+/-2 hour at room temp, then measure. Charge device with ≥ rated voltage in test chamber set at 125ºC ± 2ºC for 1000 hours (+48, -0). Pre-treatment: After remove from test chamber, perform heat treatment 150+0/-10C for 2 hour, then stabilise for 24+/-2 hour at room temp, then measure. Contact KYOCERA AVX for datasheet of specific parts.	
	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	Pre-treatment: After mounting, perform heat treatment 150+0/-10C for 2 hour, then stabilise for 24+/-2 hour at room temp, then measure. Store in a test chamber set at 85ºC ± 2ºC/ 85% ± 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied. Pre-treatment: After remove from test chamber, perform heat treatment 150+0/-10C for 2 hour, then stabilise for 24+/-2 hour at room temp, then measure.	
	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, KGM Series

Capacitance Range



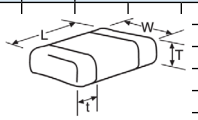
SIZE		0101*	0201					0402						0603								0805									1206								
Soldering		Reflow Only	Reflow Only					Reflow/Wave						Reflow/Wave								Reflow/Wave									Reflow/Wave								
Packaging		Paper	All Paper					All Paper						Paper/Embossed								Paper/Embossed									Paper/Embossed								
(L) Length	mm	0.40 ± 0.02	0.60 ± 0.03					1.00 ± 0.10						1.60 ± 0.15								2.01 ± 0.20									3.20 ± 0.30								
	(in.)	(0.016 ± 0.0008)	(0.024 ± 0.001)					(0.040 ± 0.004)						(0.063 ± 0.006)								(0.079 ± 0.008)									(0.126 ± 0.012)								
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 ± 0.30								
	(in.)	(0.008 ± 0.0008)	(0.011 ± 0.001)					(0.020 ± 0.004)						(0.032 ± 0.006)								(0.049 ± 0.008)									(0.063 ± 0.012)								
(t) Terminal	mm	0.10± 0.04	0.15 ± 0.05					0.25 ± 0.15						0.35 ± 0.15								0.50 ± 0.25									0.50 ± 0.25								
	(in.)	(0.004 ± 0.0016)	(0.006 ± 0.002)					(0.010 ± 0.006)						(0.014 ± 0.006)								(0.020 ± 0.010)									(0.020 ± 0.010)								
WVDC		16	6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250	500	6.3	10	16	25	50	100	200	250	500
Cap	100	101	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B								B									
(pF)	150	151	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B								B									
	220	221	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	N	B	B	B	B	B	B	B	T	T	D
	330	331	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	N	B	B	B	B	B	B	B	T	T	D
	470	471	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	N	B	B	B	B	B	B	B	T	T	D
	680	681	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	N	B	B	B	B	B	B	B	T	T	D
	1000	102	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	N	B	B	B	B	B	B	B	T	T	D
	1500	152		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	N	B	B	B	B	B	B	B	T	T	D
	2200	222		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	N	B	B	B	B	B	B	B	T	T	D
	3300	332		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	A	A	A	B	B	B	B	B	T	T	D
	3900	392		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	A	A	A	B	B	B	B	B	T	T	D
	4700	472		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	A	A	A	B	B	B	B	B	T	T	D
	5600	562		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	A	A	A	B	B	B	B	B	T	T	D
	6800	682		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	A	A	A	B	B	B	B	B	T	T	D
Cap	0.01	103		A	A	A		A	A	A	A	A	A	A	A	A	A	A	A	B	B		N	N	N	N	N	A	A	A	B	B	B	B	B	D	D	D
(µF)	0.012	123						A	A	A	A	A		A	A	A	A	A	A	B	B		N	N	N	N	N	A	A	A	B	B	B	B	B	D	D	D
	0.015	153						A	A	A	A	A		A	A	A	A	A	B	B	B		N	N	N	N	A	A	A	A	B	B	B	B	B	D	D	D
	0.018	183						A	A	A	A	A		A	A	A	A	A	B	B	B		N	N	N	N	A	A	A	A	B	B	B	B	B	D	D	D
	0.022	223		A	A	A		A	A	A	A	A		A	A	A	A	A	B	B	B		N	N	N	N	A	A	A	A	B	B	B	B	B	D	D	A
	0.027	273						A	A	A	A	A		A	A	A	A	A	B				N	N	N	N	A	A	A		B	B	B	B	B	D	D	A
	0.033	333						A	A	A	A	A		A	A	A	B	B	B				N	N	N	N	A	A	A		B	B	B	B	B	A	A	A
	0.039	393						A	A	A	A	A		A	A	A	B	B	B				N	N	N	N	A	A	A		B	B	B	B	B	A	A	A
	0.047	473						A	A	A	A	A		A	A	A	B	B	B				N	N	N	N	A	A	A		B	B	B	B	B	A	A	A
	0.068	683						A	A	A	A	C		A	A	A	B	B	B				N	N	N	N	A	A			B	B	B	B	B	D	A	A	
	0.082	823						A	A	A	A	C		A	A	A	B	B	B				N	N	N	N	A	A			B	B	B	B	B	D	A	A	
	0.1	104		A				A	A	A	A	C		A	A	A	B	B	B				N	N	N	N	A	A			B	B	B	B	B	D	A	A	
	0.12	124												A	A	A	B	B					N	N	N	E	A				B	B	B	B	B	D	A	A	
	0.15	154						A	A	A	A			A	A	A	B	B					E	E	E	E	A				V	V	V	M	M	A	A	A	
	0.22	224						A	A	A	A			A	B	B	B	B					A	A	A	A	A				V	V	V	M	M	A	A	A	
	0.33	334												B	B	B	B	B					A	A	A	A	A				V	V	V	M	P	A			
	0.47	474						A	A					B	B	B	B	B					A	A	A	A	A				H	H	H	H	H	A			
	0.68	684												B	B	B							A	A	A	A	A				H	H	H	H	H	H			
	1.0	105						A	A					B	B	B	B	C					A	A	A	A	A				H	H	H	H	H	H			
	2.2	225												B	B	C							A	A	A	A					H	H	H	H	H	H			
	4.7	475												C									A	A	A						H	H	H	H	H				
	10	106																					A	A							H	H	H	H	H				
	22	226																													H	H							
	47	476																																					
	100	107																																					
WVDC		16	6.3	10	16	25	50	6.3	10	16	25	50	100	6.3	10	16	25	50	100	200	250	6.3	10	16	25	50	100	200	250	500	6.3	10	16	25	50	100	200	250	500
SIZE		0101*	0201					0402						0603								0805									1206								

Case Size	0101 (KGM 02)	0201 (KGM03)	0402 (KGM05)		0603 (KGM15)			0805 (KGM21)			1206 (KGM31)							
Thickness Letter	A	A	A	C	A	B	C	A	E	N	A	B	D	H	M	P	T	V
Max Thickness (mm)	0.22	0.33	0.55	0.70	0.90	0.95	1.00	1.45	1.35	1.00	1.80	0.94	1.45	1.90	1.25	1.40	**1.35**	**1.22**
Carrier Tape	PAPER	PAPER	PAPER		PAPER	PAPER	PAPER	EMB	EMB	PAPER	EMB	PAPER	EMB	EMB	EMB	EMB	**EMB**	**EMB**
Packaging Code 7"reel	H	H	H	H	T	T	T	U	U	T	U	T	U	U	U	U	**U**	**U**
Packaging Code 13"reel	n/a	N	N	N	M	M	M	L	L	M	L	M	L	L	L	L	L	L
	PAPER								EMBOSSED (EMB)									

X7R Dielectric, KGM Series

Capacitance Range

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 ± 0.40 (0.177 ± 0.016)						4.50 ± 0.40 (0.177 ± 0.016)			5.70 ± 0.50 (0.224 ± 0.020)					5.70 ± 0.40 (0.224 ± 0.016)		
W) Width	mm (in.)	2.50 ± 0.30 (0.098 ± 0.012)							3.20 ± 0.40 (0.126 ± 0.016)						6.40 ± 0.40 (0.252 ± 0.016)			5.00 ± 0.40 (0.197 ± 0.016)					6.30 ± 0.40 (0.248 ± 0.016)		
(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 100	101																								
(pF) 150	151																								
220	221	R	R	R	R	R	R	D																	
330	331	R	R	R	R	R	R	D	A	A	A	A	A	A											
470	471	R	R	R	R	R	R	D	A	A	A	A	A	A											
680	681	R	R	R	R	R	R	D	A	A	A	A	A	A											
1000	102	R	R	R	R	R	R	D	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
1500	152	R	R	R	R	R	R	D	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
2200	222	R	R	R	R	R	R	D	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
3300	332	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
3900	392	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
4700	472	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
5600	562	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
6800	682	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
Cap 0.010	103	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
(µF) 0.012	123	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.015	153	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.018	183	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.022	223	R	R	R	R	R	E	E	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.027	273	R	R	R	R	R	E	H	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.033	333	R	R	R	R	R	E	H	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.039	393	R	R	R	R	R	E	H	A	A	A	A	A	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.047	473	R	R	R	R	R	E	H	A	A	A	A	B	B	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.068	683	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.082	823	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.100	104	R	R	R	R	R	H	P	A	A	A	B	B	F	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.120	124	R	R	R	R	R	H		A	A	A	B	B	J	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.150	154	E	E	E	E	E	L		A	A	A	B	F	J	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.220	224	E	E	E	E	E	L		A	A	A	B	F	J	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.330	334	E	E	E	E	H	L		A	A	A	B	F	J	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.470	474	E	E	E	E	L	L		A	A	A	F	F	J	C	C	C	Z	Z	Z	Z	Z	D	D	D
0.680	684	E	E	E	E	L	L		F	F	F	F	J		C	C	C	Z	Z	Z	Z	C	D	D	D
1.000	105	E	E	E	E	L			F	F	F	F	J		C	C	C	Z	Z	Z	Z	D	D	D	D
2.200	225	L	L	L	L	L			F	F	F	J			C	C	F	Z	Z	Z	C		D	D	G
4.700	475	L	L	L	L				J	J	J	J			C	F		Z	Z	Z			D	G	
10	106	L	L	L	L				J	J	J				F	F		C	C	C			G	G	
22	226	L	L	L														D							
47	476	L																							
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
SIZE		1210							1812						1825			2220					2225		



Case Size	1210 (KGM 32)						1812 (KGM 43)				1825 (KGM 44)		2220 (KGM 55)			2225 (KGM56)	
Thickness Letter	D	E	H	L	P	R	A	B	F	J	C	F	D	C	Z	D	**G**
Max Thickness (mm)	1.4	1.45	1.8	2.80	2.2	1.05	1.4	1.45	2.21	2.80	2.21	2.80	3.3	2.80	2.21	2.21	**2.80**
Carrier Tape	EMB	EMB	EMB	EMB	EMB	PAPER	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	**EMB**
Packaging Code 7"reel	U	U	U	U	U	T	V	V	V	V	V	V	V	V	V	V	**V**
Packaging Code 13"reel	L	L	L	L	L	M	S	S	S	S	S	S	S	S	S	S	S
	PAPER						**EMBOSSED(EMB)**										