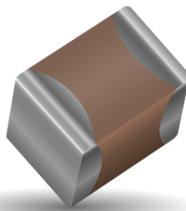


X7R Dielectric, KGM Series

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 $\pm 15\%$ from -55°C to $+125^\circ\text{C}$.

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	Capacitance Tolerance	Packaging		
General Purpose Tin/Nickel Finish	02= 01005 03= 0201 05= 0402 15= 0603 21= 0805 31= 1206	32= 1210 43= 1812 44= 1825 55= 2220 56= 2225	See Cap Chart	R7 = X7R	0G = 4.0V 0J = 6.3V 1A = 10V 1C = 16V 1E = 25V	1H = 50V 2A = 100V 2D = 200V 2E = 250V 2H = 500V	Code (in pF) 2 Significant Digits + Number of zeros eg. 106 = 10 μF 103 = 10nF	Code (in pF) 2 Significant Digits + Number of zeros eg. 106 = 10 μF 103 = 10nF	See Table Below

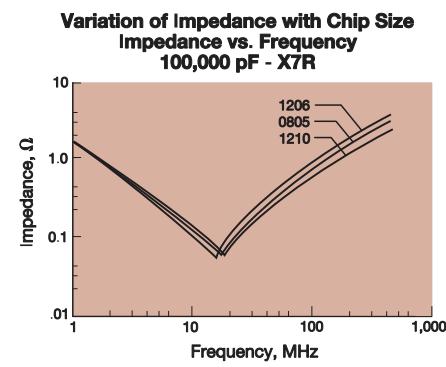
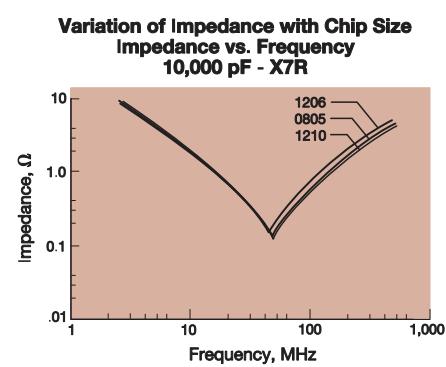
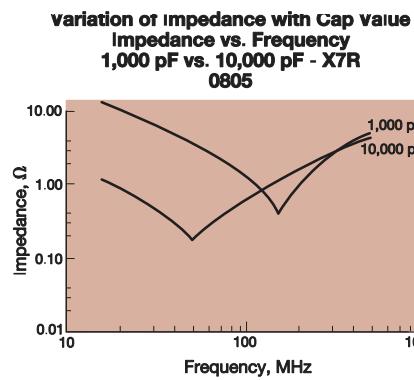
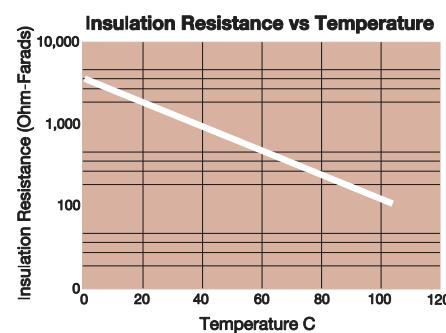
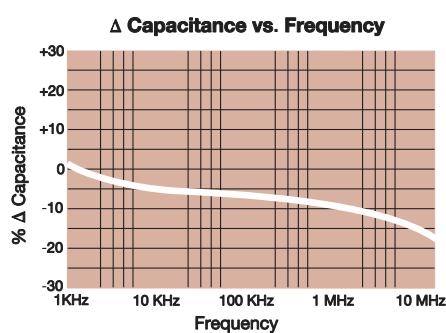
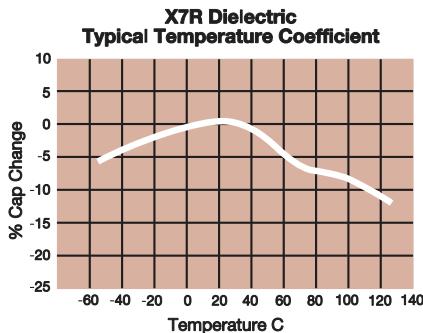
* $\leq 1\mu\text{F}$ only, contact factory for additional values



PACKAGING CODES

Code	EIA (inch)	IEC(mm)	7" Paper	7" Embossed	13" Paper	13" Embossed
02	01005	0402	H			
03	0201	0603	H		N	
05	0402	1005	H		N	
15	0603	1608	T		M	
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

*Note: The thickness determines if packaging is paper or embossed.



X7R Dielectric, KGM Series

Specifications and Test Methods



Parameter/Test		X7R Specification Limits	Measuring Conditions (Complies with JIS C5101 / IEC60384)
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber
Capacitance		Within specified tolerance	Measure after heat treatment Capacitance Frequency Volt C≤10μF Frequency : 1kHz±10% Volt : 1.0±0.2Vrms *0.5±0.2Vrms
Dissipation Factor / Tanδ		Refer to https://spicat.kyocera-avx.com for individual part number specification	C>10μF Frequency : 120Hz±10% Volt : 0.5±0.2Vrms The charge and discharge current of the capacitor must not exceed 50mA.
Insulation Resistance		Refer to https://spicat.kyocera-avx.com for individual part number specification	Apply the rated voltage for 1 minute, and measure it in normal temperature and humidity. The charge and discharge current of the capacitor must not exceed 50mA.
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.
Bending Strength		No significant damage with 1mm bending	Glass epoxy PCB: Fulcrum spacing: 90mm, duration time 10 seconds. Soaking condition Sn-3Ag-0.5Cu 245±5°C 3±0.5 sec.
Solderability		Solder coverage : 95% min.	Take the initial value after heat treatment. Soak the sample in 260°C±5°C solder for 10±0.5 seconds and place in normal temperature and humidity, and measure after heat treatment. (Pre-heating conditions) Order Temperature Time 1 80 to 100°C 2 minutes 2 150 to 200°C 2 minutes
Resistance to Solder Heat	Appearance	No problem observed	The charge and discharge current of the capacitor must not exceed 50mA for IR and withstand voltage measurement.
	Capacitance Variation	≤ ±7.5%	
	Dissipation Factor / Tanδ	Within specification	
	Insulation Resistance	Within specification	
	Withstanding Voltage / Dielectric Strength	Resist without problem	
Thermal Shock	Appearance	No visual defects	Take the initial value after heat treatment. (Cycle) Room temperature (3 min.)→> Lowest operation temperature (30 min.)→> Room temperature (3 min.)→> Highest operation temperature(30 min.) After 5 cycles, measure after heat treatment.
	Capacitance Variation	≤ ±7.5%	The charge and discharge current of the capacitor must not exceed 50mA for IR and withstand voltage measurement.
	Dissipation Factor	Within specification	
	Insulation Resistance	Within specification	
	Withstanding Voltage / Dielectric Strength	Resist without problem	
Load Life	Appearance	No visual defects	Take the initial value after heat treatment. After applying *1.5 the rated voltage at the highest operation temperature for 1000+12/-0 hours, and measure the sample after heat treatment in normal temperature and humidity.
	Capacitance Variation	≤ ±12.5%	The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.
	Dissipation Factor / Tanδ	≤ Initial Value x 2.0 (See Above)	*Apply 1.0 times when the rated voltage is 4V or less. Applied voltages for respective products are indicated in the chart below.
	Insulation Resistance	Over 1000MΩ or 50MΩ · μF, whichever is less. *Exceptions Listed Below	
Load Humidity	Appearance	No visual defects	Take the initial value after heat treatment. After applying rated voltage for 500+12/-0 hours in the condition of 40°C ± 2°C and 90 to 95%RH, and place in normal temperature and humidity, then measure the sample after heat treatment.
	Capacitance Variation	≤ ±12.5%	The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.
	Dissipation Factor / Tanδ	Within specification	
	Insulation Resistance	Over 1000MΩ or 50MΩ · μF, whichever is less. *Exceptions Listed Below	
Appearance		No problem observed	Microscope
Termination Strength		No problem observed	Apply a sideward force of 500g (5N) to a PCB-mounted sample. note : 2N for 0201 size, and 1N for 01005 size.
Vibration	Appearance	No problem observed	Take the initial value after heat treatment. Vibration frequency: 10 to 55 (Hz) Amplitude: 1.5mm
	Capacitance	Within tolerance	Sweeping condition: 10 → 55 → 10Hz/ 1 minute in X, Y and Z directions: 2 hours each, 6 hours in total, and place in normal temperature and humidity, then measure the sample after heat treatment.
	Tanδ	Within tolerance	
Heat Treatment		Expose sample in the temperature of 150+0/-10°C for 1 hour and leave the sample in normal temperature and humidity for 24±2 hours.	

Voltage to be applied in the High Temperature Load (Applied voltage is the multiple of the rated voltage)

Rated Voltage		Products
×1.0	16V	KGM21AR71C475

<Load Life / Load Humidity>Insulation Resistance : Over 10MΩ · μF

R7	05	KGM05AR70J474
	15	KGM15AR71E105
	21	KGM21AR71C475
	31	KGM31AR71E106, KGM31AR71H475

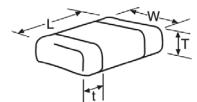


The Important Information/Disclaimer is incorporated in the catalog where these specifications came from or available online at www.kyocera-avx.com/disclaimer/ by reference and should be reviewed in full before placing any order.

X7R Dielectric, KGM Series



Capacitance Range

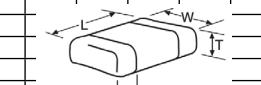


SIZE	01005	0201				0402				0603				0805				1206														
Soldering	Reflow Only	Reflow Only				Reflow/Wave				Reflow/Wave				Reflow/Wave				Reflow/Wave														
Packaging	All Paper	All Paper				All Paper				Paper/Embossed				Paper/Embossed				Paper/Embossed														
(L) Length (in.)	mm 0.40 ± 0.02 (0.016 ± 0.0008)	mm 0.60 ± 0.03 (0.024 ± 0.001)				mm 1.00 ± 0.10 (0.040 ± 0.004)				mm 1.60 ± 0.15 (0.063 ± 0.006)				mm 2.01 ± 0.20 (0.079 ± 0.008)				mm 3.20 ± 0.30 (0.126 ± 0.012)														
W) Width (in.)	mm 0.20 ± 0.02 (0.008 ± 0.0008)	mm 0.30 ± 0.03 (0.011 ± 0.001)				mm 0.50 ± 0.10 (0.020 ± 0.004)				mm 0.81 ± 0.15 (0.032 ± 0.006)				mm 1.25 ± 0.20 (0.049 ± 0.008)				mm 1.60 ± 0.30 (0.063 ± 0.012)														
(t) Terminal	mm 0.10 ± 0.04 (0.004 ± 0.0016)	mm 0.15 ± 0.05 (0.006 ± 0.002)				mm 0.25 ± 0.15 (0.010 ± 0.006)				mm 0.35 ± 0.15 (0.014 ± 0.006)				mm 0.50 ± 0.25 (0.020 ± 0.010)				mm 0.50 ± 0.25 (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	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	B	B					B										
(pF) 150 151	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	B	B	N	N	N	N	N	N	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	B	B	N	N	N	N	N	N	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	B	B	N	N	N	N	N	N	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	B	B	N	N	N	N	N	N	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	B	B	N	N	N	N	N	N	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	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	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	N	A	A	A	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	N	A	A	A	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	N	A	A	A	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	N	A	A	A	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	N	A	A	A	B	B	B	T	T	D
Cap 0.010 103	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	N	N	N	N	N	N	A	A	A	B	B	B	D	D	D
(μF) 0.012 123																A	A	A	A	A	A	A	B	B	B	B	B	D	D	D		
0.015 153																A	A	A	A	A	A	A	B	B	B	B	B	D	D	D		
0.018 183																A	A	A	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	A	A	B	B	N	N	N	N	N	N	A	A	A	B	B	B	D	D	A
0.027 273																A	A	A	A	A	A	A	B	B	B	B	B	D	D	A		
0.033 333																A	A	A	A	A	A	A	B	B	B	B	B	A	A	A		
0.039 393																A	A	A	A	A	A	A	B	B	B	B	B	B	A	A	A	
0.047 473																A	A	A	A	A	A	A	B	B	B	B	B	B	A	A	A	
0.068 683																A	A	A	C	A	A	A	B	B	B	N	N	N	A	A		
0.082 823																A	A	A	C	A	A	A	B	B	B	N	N	N	A	A		
0.1 104	A															A	A	A	C	A	A	A	B	B	B	N	N	N	A	A		
0.12 124																A	A	A	B	B			N	N	N	E	A					
0.15 154																A	A	A	B	B			E	E	E	E	A					
0.22 224																A	A	B	B	B	B		A	A	A	A	A		V	V	M	
0.33 334																B	B	B	B	B	B		A	A	A	A	A		V	V	M	
0.47 474																B	B	B	B	B	B		A	A	A	A	A		H	H	H	
0.68 684																B	B	B	B	B	B		A	A	A	A	A		H	H	H	
1.0 105																B	B	B	B	B	C		A	A	A	A	A		H	H	H	
2.2 225																B	B	B	C				A	A	A	A	A		H	H	H	
4.7 475																C							A	A	A	A	A		H	H	A	
10 106																							A	A	A	A	A		H	H	A	
22 226																							A	A								
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			
SIZE	01005	0201				0402				0603				0805				1206														

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 (in.)	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 (in.)	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 (in.)	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	500	25	50	100	200	500	50	100	200	500
Cap 100	101																									
(pF) 150	151																									
220	221	R	R	R	R	R	R	D	A	A	A	A	A													
330	331	R	R	R	R	R	R	D	A	A	A	A	A													
470	471	R	R	R	R	R	R	D	A	A	A	A	A													
680	681	R	R	R	R	R	R	D	A	A	A	A	A													
1000	102	R	R	R	R	R	R	D	A	A	A	A	A	B	C	C	C	C	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	C	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	C	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	C	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	C	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	C	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	C	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	C	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	C	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	C	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	C	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	C	Z	Z	Z	Z	D	D	D	
0.022	223	R	R	R	R	R	R	E	E	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	D	D	D	
0.027	273	R	R	R	R	R	R	E	H	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	D	D	D	
0.033	333	R	R	R	R	R	R	E	H	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	D	D	D	
0.039	393	R	R	R	R	R	R	E	H	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	D	D	D	
0.047	473	R	R	R	R	R	R	E	H	A	A	A	A	B	B	C	C	C	Z	Z	Z	Z	D	D	D	
0.068	683	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	Z	Z	Z	Z	D	D	D	
0.082	823	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	Z	Z	Z	Z	D	D	D	
0.100	104	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	Z	Z	Z	Z	D	D	D	
0.120	124	R	R	R	R	R	R	H		A	A	A	A	B	B	J	C	C	Z	Z	Z	Z	D	D	D	
0.150	154	E	E	E	E	E	L		A	A	A	A	B	F	J	C	C	C	Z	Z	Z	Z	D	D	D	
0.220	224	E	E	E	E	E	L		A	A	A	A	B	F	J	C	C	C	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	C	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	C	Z	Z	Z	Z	D	D	D	
0.680	684	E	E	E	E	L	L		F	F	F	J		C	C	C	C	Z	Z	Z	Z	C	D	D	G	
1.000	105	E	E	E	E	L		F	F	F	J		C	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	L		J	J	J	J		C	F		Z	Z	Z		D	G					
10	106	L	L	L	A			J	J	J			F	F		C	C	D		G	G					
22	226	L	A	L												D	D	H								
47	476	L																								
100	107																									
WVDC	10	16	25	50	100	200	500	16	25	50	100	200	500	50	100	200	500	25	50	100	200	500	50	100	200	500
SIZE	1210								1812								1825								2225	



Case Size	1210 (KGM 32)												1812 (KGM 43)												1825 (KGM 44)						2220 (KGM 55)						2225 (KGM56)					
Thickness Letter	R	D	E	H	P	A	L	A	B	F	J	C	F	J	C	F	Z	C	D	H	D	G	C	F	J	C	F	Z	C	D	H	D	G									
Max Thickness (mm)	1.05	1.4	1.45	1.8	2.2	2.70	2.80	1.4	1.45	2.21	2.80	2.21	2.80	2.21	2.80	2.21	2.80	3.3	3.4	2.21	2.80																					
Carrier Tape	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB	EMB										
Packaging Code 7"reel	U	U	U	U	U	U	U	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V									
Packaging Code 13"reel	L	L	L	L	L	L	L	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S										
EMBOSSED(EMB)																																										

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