

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 KYOCERA AVX offers to help create engineering simulations. Please visit spicat.kyocera-avx.com for more information.

HOW TO ORDER

KGM

Series
General Purpose
Tin/Nickel Finish

03

Size
02= 01005 32= 1210
03= 0201 43= 1812
05= 0402 44= 1825
15= 0603 55= 2220
21= 0805 56= 2225
31= 1206

A

Thickness
See Cap Chart

R7

Dielectric
R7 = X7R

1E

Voltage
0G = 4.0V 1H = 50V
0J = 6.3V 2A = 100V
1A = 10V 2D = 200V
1C = 16V 2E = 250V
1E = 25V 2H = 500V

101

Capacitance Code
2 Significant Digits +
Number of zeros
eg. 106 = $10\mu\text{F}$
103 = 10nF

M

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

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

N

Packaging
See Table Below



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.



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Specifications and Test Methods

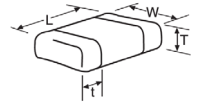


Parameter/Test		X7R Specification Limits	Measuring Conditions (Complies with JIS C5101 / IEC60384)
Operating Temperature Range		-55°C to +125°C	Temperature Cycle Chamber
Capacitance		Within specified tolerance	Measure after heat treatment
Dissipation Factor / Tanδ		Refer to https://spicat.kyocera-avx.com for individual part number specification	Capacitance Frequency Volt C≤10μF Frequency : 1kHz±10% Volt : 1.0±0.2Vrms *0.5±0.2Vrms 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.
Solderability		Solder coverage : 95% min.	Soaking condition Sn-3Ag-0.5Cu 245±5°C 3±0.5 sec.
Resistance to Solder Heat	Appearance	No problem observed	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 The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding 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. The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement.
	Capacitance Variation	≤ ±7.5%	
	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. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement. *Apply 1.0 times when the rated voltage is 4V or less. Applied voltages for respective products are indicated in the chart below.
	Capacitance Variation	≤ ±12.5%	
	Dissipation Factor / Tanδ	≤ Initial Value x 2.0 (See Above)	
	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. The charge and discharge current of the capacitor must not exceed 50mA for IR measurement.
	Capacitance Variation	≤ ±12.5%	
	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 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.
	Capacitance	Within tolerance	
	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)

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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	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 ± 0.30 (0.126 ± 0.012)														
(W) Width	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 ± 0.30 (0.063 ± 0.012)														
(t) Terminal	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 50 100					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	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
Cap (pF) 150 151	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
220 221	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
330 331	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
470 471	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
680 681	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
1000 102	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
1500 152	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
2200 222	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3300 332	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
3900 392	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
4700 472	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
5600 562	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
6800 682	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Cap (µF) 0.010 103	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
0.012 123						A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
0.015 153						A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
0.018 183						A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
0.022 223	A	A	A			A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
0.027 273						A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
0.033 333						A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
0.039 393						A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
0.047 473						A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
0.068 683						A	A	A	A	C	A	A	A	A	B	B	B	B	B	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
0.082 823						A	A	A	A	C	A	A	A	A	B	B	B	B	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N		
0.1 104	A					A	A	A	A	C	A	A	A	A	B	B	B	A	A	A	A	A	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N			
0.12 124											A	A	A	B	B	B						N	N	N	E	A	B	B	B	B	B	D	A	A	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	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	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						C	C				B	B	C								A	A	A	A		H	H	H	H	H	H									
4.7 475											C										A	A	A			H	H	H	A	A										
10 106																					A	A	A			H	H	A	A	H										
22 226																					A*	A*				A	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					6.3 10 16 25 50 100 200 250 500														

*Available with M tolerance only

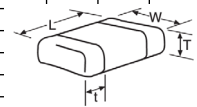
Case Size	01005 (KGM 02)		0201 (KGM03)		0402 (KGM05)		0603 (KGM15)			0805 (KGM21)				1206 (KGM31)							
Thickness Letter	A		A		A	C	A	B	C	B	N	E	A	B	V	M	T	P	D	A	H
Max Thickness (mm)	0.22		0.33		0.55	0.70	0.90	0.95	1.00	0.94	1.00	1.35	1.45	0.94	1.22	1.25	1.35	1.40	1.45	1.80	1.90
Carrier Tape	PAPER		PAPER		PAPER		PAPER	PAPER	PAPER	PAPER	PAPER	EMB	EMB	PAPER	EMB	EMB	EMB	EMB	EMB	EMB	EMB
Packaging Code 7" reel	H		H		H	H	T	T	T	T	T	U	U	T	U	U	U	U	U	U	U
Packaging Code 13" reel	n/a		N		N	N	M	M	M	M	M	L	L	M	L	L	L	L	L	L	L
	PAPER											EMBOSSED (EMB)									

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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	500	25	50	100	200	500	50	100	200	500					
Cap 100 (pF)	101																														
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	C	Z	Z	Z	Z	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	D	D	D	
Cap 0.010 (µF)	103	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	
0.012	123	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	D	D	D	
0.022	223	R	R	R	R	R	R	E	A	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	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	Z	Z	Z	Z	D	D	D	D	
0.047	473	R	R	R	R	R	R	E	H	A	A	A	A	B	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	
0.068	683	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D
0.082	823	R	R	R	R	R	R	H	P	A	A	A	A	B	F	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D
0.100	104	R	R	R	R	R	R	H	P	A	A	A	B	F	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D	
0.120	124	R	R	R	R	R	R	H		A	A	A	B	B	J	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D
0.150	154	E	E	E	E	E	E	L		A	A	A	B	F	J	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D
0.220	224	E	E	E	E	E	E	L		A	A	A	B	F	J	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D
0.330	334	E	E	E	E	E	H	L		A	A	A	B	F	J	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D
0.470	474	E	E	E	E	H	L			A	A	A	F	F	J	C	C	C	C	Z	Z	Z	Z	Z	Z	Z	Z	D	D	D	D
0.680	684	E	E	E	E	K	L	L		F	F	F	F	J		C	C	C		Z	Z	Z	Z	Z	C	D	D	D	G		
1.000	105	E	E	E	E	G	L			F	F	F	F	J		C	C	C		Z	Z	Z	Z	Z	C	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	C	C					D	G			
10	106	L	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				2220					2225								



*Dimension exception for KGM32AR71H106:
 (L) 3.2 ± 0.3 mm
 (W) 2.5 ± 0.2mm

Case Size	1210 (KGM 32)								1812 (KGM 43)				1825 (KGM 44)				2220 (KGM 55)				2225 (KGM56)			
Thickness Letter	R	D	E	G	H	P	A	L	A	B	F	J	C	F	Z	C	D	H	D	G				
Max Thickness (mm)	1.05	1.4	1.45	1.78	1.8	2.2	2.70	2.80	1.4	1.45	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				
Packaging Code 7"reel	U	U	U	U	U	U	U	U	V	V	V	V	V	V	V	V	V	V	V	V				
Packaging Code 13"reel	L	L	L	L	L	L	L	L	S	S	S	S	S	S	S	S	S	S	S	S				

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