

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.



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. | | | | | | | | | |
| 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) <table border="1"> <thead> <tr> <th>Order</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>80 to 100°C</td> <td>2 minutes</td> </tr> <tr> <td>2</td> <td>150 to 200°C</td> <td>2 minutes</td> </tr> </tbody> </table> The charge and discharge current of the capacitor must not exceed 50mA for IR and withstanding voltage measurement. | Order | Temperature | Time | 1 | 80 to 100°C | 2 minutes | 2 | 150 to 200°C | 2 minutes |
| | Order | Temperature | | Time | | | | | | | | |
| | 1 | 80 to 100°C | | 2 minutes | | | | | | | | |
| | 2 | 150 to 200°C | | 2 minutes | | | | | | | | |
| 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. | | | | | | | | | | |

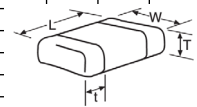
Voltage to be applied in the High Temperature Load (Applied voltage is the multiple of the rated voltage)

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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | D | D | D | D | |
| 0.015 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | 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 | D | D | D | D |
| 0.470 | 474 | E | E | E | E | H | L | L | | A | A | A | F | F | J | C | C | C | C | 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 | C | D | D | D | D | G | |
| 1.000 | 105 | E | E | E | E | G | L | L | | F | F | F | F | J | | C | C | C | | Z | Z | Z | Z | C | D | D | D | D | | |
| 2.200 | 225 | L | L | L | L | L | L | L | | F | F | F | J | | | C | C | F | | Z | Z | Z | C | | D | D | D | G | | |
| 4.700 | 475 | L | L | 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 | |

EMBOSS (EMB)

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

 [View KGM15AR71A103KT on WIN SOURCE](#)

 [AVX Corp/Kyocera Corp](#) Information

Optimize Your Supply Chain with WIN SOURCE Solutions

-  Global Sourcing Solution
-  Obsolete Management
-  Cost Control Management
-  Shortage Management
-  Alternative Solution
-  Excess Inventory Management