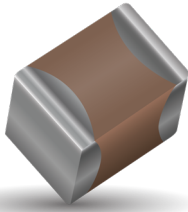


# X7R Dielectric, KGM Series

## 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  $-55^{\circ}\text{C}$  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](http://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 =  $10\text{nF}$

#### M

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

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

#### N

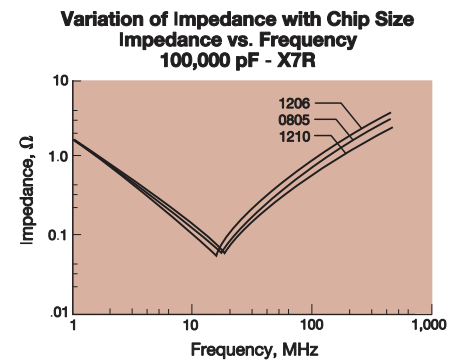
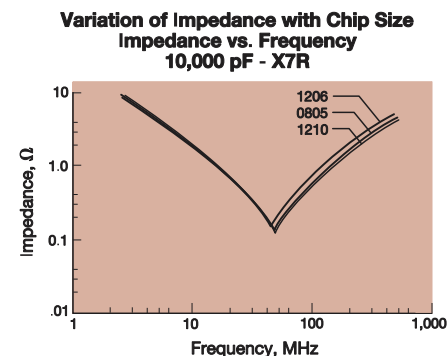
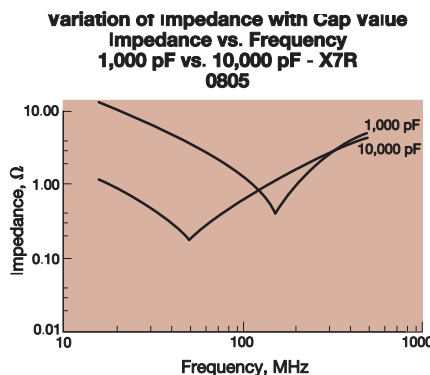
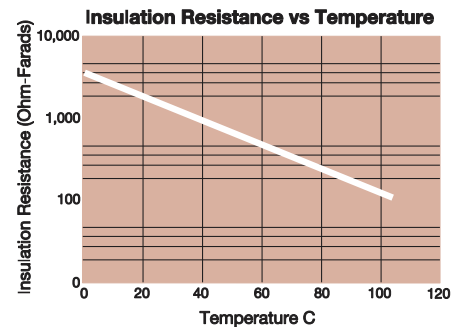
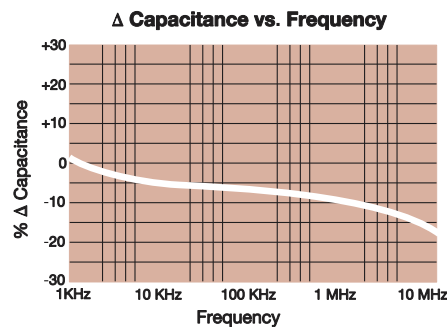
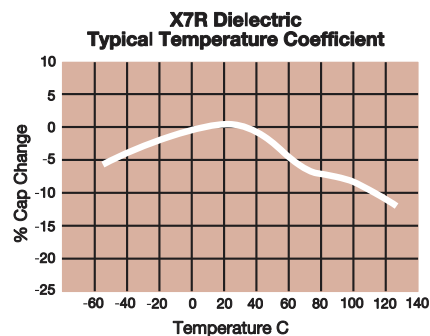
**Packaging**  
See Table Below



### 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

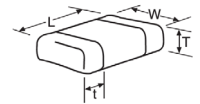


| Parameter/Test                                |                                               | X7R Specification Limits                                                                                                               | Measuring Conditions (Complies with JIS C5101 / IEC60384)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |             |      |   |             |           |   |              |           |
|-----------------------------------------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------|------|---|-------------|-----------|---|--------------|-----------|
| Operating Temperature Range                   |                                               | -55°C to +125°C                                                                                                                        | Temperature Cycle Chamber                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |             |      |   |             |           |   |              |           |
| Capacitance                                   |                                               | Within specified tolerance                                                                                                             | Measure after heat treatment<br>Capacitance Frequency Volt<br>C≤10μF<br>Frequency : 1kHz±10%<br>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<br>Frequency : 120Hz±10%<br>Volt : 0.5±0.2Vrms<br>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 specifiction                                                        | Apply the rated voltage for 1 minute, and measure it in normal tempera-<br>ture and humidity. The charge and discharge current of the capacitor must<br>not exceed 50mA.                                                                                                                                                                                                                                                                                                                                                                     |           |             |      |   |             |           |   |              |           |
| Dielectric Strength                           |                                               | No breakdown or visual defects                                                                                                         | Charge device with 250% of rated voltage for 1-5 seconds, w/charge and<br>discharge current limited to 50 mA (max)<br>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<br>Sn-3Ag-0.5Cu 245±5°C 3±0.5 sec.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |           |             |      |   |             |           |   |              |           |
| Resistance to<br>Solder Heat                  | Appearance                                    | No problem observed                                                                                                                    | Take the initial value after heat treatment.<br>Soak the sample in 260°C±5°C solder for 10±0.5 seconds and place in nor-<br>mal temperature and humidity, and measure after heat treatment.<br>(Pre-heating conditions)<br><table><tr><td>Order</td><td>Temperature</td><td>Time</td></tr><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></table> The charge and discharge current of the capacitor must not exceed 50mA<br>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 /<br>Dielectric Strength | Resist without problem                        |                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |             |      |   |             |           |   |              |           |
| Thermal Shock                                 | Appearance                                    | No visual defects                                                                                                                      | Take the initial value after heat treatment.<br>(Cycle)<br>Room temperature (3 min.)→<br>Lowest operation temperature (30 min.)→<br>Room temperature (3 min.)→<br>Highest operation temperature(30 min.)<br>After 5 cycles, measure after heat treatment.<br>The charge and discharge current of the capacitor must not exceed 50mA<br>for IR and withstanding voltage measurement.                                                                                                                                                          |           |             |      |   |             |           |   |              |           |
|                                               | Capacitance Variation                         | ≤ ±7.5%                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |             |      |   |             |           |   |              |           |
|                                               | Dissipation Factor                            | Within specification                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |             |      |   |             |           |   |              |           |
|                                               | Insulation Resistance                         | Within specification                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |             |      |   |             |           |   |              |           |
|                                               | Withstanding Voltage /<br>Dielectric Strength | Resist without problem                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |             |      |   |             |           |   |              |           |
| Load Life                                     | Appearance                                    | No visual defects                                                                                                                      | Take the initial value after heat treatment.<br>After applying *1.5 the rated voltage at the highest operation<br>temperature for 1000+12/- 0 hours, and measure the sample after heat<br>treatment in normal temperature and humidity.<br>The charge and discharge current of the capacitor must not exceed<br>50mA for IR measurement.<br>*Apply 1.0 times when the rated voltage is 4V or less. Applied voltages<br>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.<br>*Exceptions Listed Below                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |             |      |   |             |           |   |              |           |
| Load<br>Humidity                              | Appearance                                    | No visual defects                                                                                                                      | Take the initial value after heat treatment.<br>After applying rated voltage for 500+12/- 0 hours in the condition of<br>40°C ± 2°C and 90 to 95%RH, and place in normal temperature and<br>humid- ity, then measure the sample after heat treatment.<br>The charge and discharge current of the capacitor must not exceed<br>50mA for IR measurement.                                                                                                                                                                                       |           |             |      |   |             |           |   |              |           |
|                                               | Capacitance Variation                         | ≤ ±12.5%                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |             |      |   |             |           |   |              |           |
|                                               | Dissipation Factor / Tanδ                     | Within specification                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |             |      |   |             |           |   |              |           |
|                                               | Insulation Resistance                         | Over 1000MΩ or 50MΩ · μF, whichever is less.<br>*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 :<br>2N for 0201 size, and 1N for 01005 size.                                                                                                                                                                                                                                                                                                                                                                                                                              |           |             |      |   |             |           |   |              |           |
| Vibration                                     | Appearance                                    | No problem observed                                                                                                                    | Take the initial value after heat treatment.<br>Vibration frequency: 10 to 55 (Hz)<br>Amplitude: 1.5mm<br>Sweeping condition: 10 → 55 → 10Hz/ 1 minute in X, Y and Z<br>directions: 2 hours each, 6 hours in total, and place in normal temperature<br>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<br>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         | 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   | mm<br>(in.) | 0.40 ± 0.02<br>(0.016 ± 0.0008) | 0.60 ± 0.03<br>(0.024 ± 0.001) |    |    |    |      | 1.00 ± 0.10<br>(0.040 ± 0.004) |    |    |    |      | 1.60 ± 0.15<br>(0.063 ± 0.006) |    |    |    |      | 2.01 ± 0.20<br>(0.079 ± 0.008) |     |     |     |      | 3.20 ± 0.30<br>(0.126 ± 0.012) |    |    |     |     |     |     |     |    |    |    |    |     |     |     |     |
| (W) Width    | mm<br>(in.) | 0.20 ± 0.02<br>(0.008 ± 0.0008) | 0.30 ± 0.03<br>(0.011 ± 0.001) |    |    |    |      | 0.50 ± 0.10<br>(0.020 ± 0.004) |    |    |    |      | 0.81 ± 0.15<br>(0.032 ± 0.006) |    |    |    |      | 1.25 ± 0.20<br>(0.049 ± 0.008) |     |     |     |      | 1.60 ± 0.30<br>(0.063 ± 0.012) |    |    |     |     |     |     |     |    |    |    |    |     |     |     |     |
| (t) Terminal | mm<br>(in.) | 0.10± 0.04<br>(0.004 ± 0.0016)  | 0.15 ± 0.05<br>(0.006 ± 0.002) |    |    |    |      | 0.25 ± 0.15<br>(0.010 ± 0.006) |    |    |    |      | 0.35 ± 0.15<br>(0.014 ± 0.006) |    |    |    |      | 0.50 ± 0.25<br>(0.020 ± 0.010) |     |     |     |      | 0.50 ± 0.25<br>(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   | B   | B   |      |                                |    |    |     |     |     | B   |     |    |    |    |    |     |     |     |     |
| (pF)         | 150 151     | A                               | 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                              | A   | B   | B   | N    | N                              | N  | N  | N   | N   | N   | 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                              | A   | B   | B   | N    | N                              | N  | N  | N   | N   | N   | 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                              | A   | B   | B   | N    | N                              | N  | N  | N   | N   | N   | 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                              | A   | B   | B   | N    | N                              | N  | N  | N   | N   | N   | 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                              | A   | B   | B   | N    | N                              | N  | N  | N   | N   | N   | 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    | A                              | A   | B   | B   | N    | N                              | N  | N  | N   | N   | N   | 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    | A                              | A   | B   | B   | N    | N                              | N  | N  | N   | N   | N   | 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   | 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          | 0.010 103   |                                 | 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   |     | 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   |     | 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  | B    | B                              |     |     |     | N    | N                              | N  | N  | A   | A   |     |     | B   | B  | B  | B  | B  | D   | D   | A   |     |
|              | 0.033 333   |                                 |                                |    |    |    | A    | A                              | A  | A  |    |      | A                              | A  | A  | B  | B    | B                              |     |     |     | N    | N                              | N  | N  | A   | A   |     |     | B   | B  | B  | B  | B  | A   | A   | A   |     |
|              | 0.039 393   |                                 |                                |    |    |    | 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  | 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  | 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  | 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  | 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  | A  | A  |     |     |     |     |
|              | 10 106      |                                 |                                |    |    |    |      |                                |    |    |    |      |                                |    |    |    |      |                                |     |     |     | A    | A                              | A  |    |     |     |     |     | H   | H  | A  | A  | H  |     |     |     |     |
|              | 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 | 6.3 | 10 | 16 | 25 | 50 | 100 | 200 | 250 | 500 |
| SIZE         | 01005       | 0201                            |                                |    |    |    | 0402 |                                |    |    |    | 0603 |                                |    |    |    | 0805 |                                |     |     |     | 1206 |                                |    |    |     |     |     |     |     |    |    |    |    |     |     |     |     |

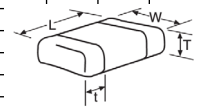
| Case Size              | 01005 (KGM 02) | 0201 (KGM03) | 0402 (KGM05) | 0603 (KGM15) |       |       | 0805 (KGM21) |       |       |      |      | 1206 (KGM31)   |      |      |      |      |      |      |      |
|------------------------|----------------|--------------|--------------|--------------|-------|-------|--------------|-------|-------|------|------|----------------|------|------|------|------|------|------|------|
| 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 | 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) |      |      |      |      |      |      |      |

# 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    | 3.30± 0.4       |    |    |    |     |     |     | 4.50 ± 0.40     |    |    |     |     |     |    | 4.50 ± 0.40     |     |     |    |    |     |     | 5.70 ± 0.50     |    |     |     |     | 5.70 ± 0.40     |  |  |  |
|              | (in.) | (0.130± 0.016)  |    |    |    |     |     |     | (0.177 ± 0.016) |    |    |     |     |     |    | (0.177 ± 0.016) |     |     |    |    |     |     | (0.224 ± 0.020) |    |     |     |     | (0.224 ± 0.016) |  |  |  |
| (W) Width    | mm    | 2.50±0.30       |    |    |    |     |     |     | 3.20 ± 0.40     |    |    |     |     |     |    | 6.40 ± 0.40     |     |     |    |    |     |     | 5.00 ± 0.40     |    |     |     |     | 6.30 ± 0.40     |  |  |  |
|              | (in.) | (0.098 ± 0.012) |    |    |    |     |     |     | (0.126 ± 0.016) |    |    |     |     |     |    | (0.252 ± 0.016) |     |     |    |    |     |     | (0.197 ± 0.016) |    |     |     |     | (0.248 ± 0.016) |  |  |  |
| (t) Terminal | mm    | 0.50 ± 0.25     |    |    |    |     |     |     | 0.61 ± 0.36     |    |    |     |     |     |    | 0.61 ± 0.36     |     |     |    |    |     |     | 0.64 ± 0.39     |    |     |     |     | 0.64 ± 0.39     |  |  |  |
|              | (in.) | (0.020 ± 0.010) |    |    |    |     |     |     | (0.024 ± 0.014) |    |    |     |     |     |    | (0.024 ± 0.014) |     |     |    |    |     |     | (0.025 ± 0.015) |    |     |     |     | (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   |                 |    |    |     |     |     |    |                 |     |     |    |    |     |     |                 |    |     |     |     |                 |  |  |  |
| 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               | 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               | 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               | 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               | 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               | 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               | 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               | 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               | D  | 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   | Z               | D  | D   | D   | D   |                 |  |  |  |
| (pF) 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               | 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               | 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               | D  | D   | D   | D   |                 |  |  |  |
| 0.022        | 223   | R               | R  | R  | R  | R   | E   | E   | A               | A  | A  | A   | A   | B   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.027        | 273   | R               | R  | R  | R  | R   | E   | H   | A               | A  | A  | A   | A   | B   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.033        | 333   | R               | R  | R  | R  | R   | E   | H   | A               | A  | A  | A   | A   | B   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.039        | 393   | R               | R  | R  | R  | R   | E   | H   | A               | A  | A  | A   | A   | B   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.047        | 473   | R               | R  | R  | R  | R   | E   | H   | A               | A  | A  | A   | B   | B   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.068        | 683   | R               | R  | R  | R  | R   | H   | P   | A               | A  | A  | A   | B   | F   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.082        | 823   | R               | R  | R  | R  | R   | H   | P   | A               | A  | A  | A   | B   | F   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.100        | 104   | R               | R  | R  | R  | R   | H   | P   | A               | A  | A  | B   | B   | F   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.120        | 124   | R               | R  | R  | R  | R   | H   |     | A               | A  | A  | B   | B   | J   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.150        | 154   | E               | E  | E  | E  | E   | L   |     | A               | A  | A  | B   | F   | J   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | D   | D   | D   |                 |  |  |  |
| 0.220        | 224   | E               | E  | E  | E  | E   | L   |     | A               | A  | A  | B   | F   | J   | C  | C               | C   | C   | Z  | Z  | Z   | Z   | Z               | D  | 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   | Z               | D  | 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   | Z               | D  | 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   | G   |                 |  |  |  |
| 1.000        | 105   | E               | E  | E  | G  | 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  | L   |     |     | J               | J  | J  | J   |     |     | C  | F               |     |     | Z  | C  | C   |     |                 | 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            |     |     |    |    |     |     | 2220            |    |     |     |     | 2225            |  |  |  |



| Case Size               | 1210 (KGM 32) |     |      |      |     |     |      |      | 1812 (KGM 43) |      |      |      | 1825 (KGM 44) |      | 2220 (KGM 55) |      |     |     | 2225 (KGM 56) |      |
|-------------------------|---------------|-----|------|------|-----|-----|------|------|---------------|------|------|------|---------------|------|---------------|------|-----|-----|---------------|------|
| 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    |
| EMBOSSED (EMB)          |               |     |      |      |     |     |      |      |               |      |      |      |               |      |               |      |     |     |               |      |