

# Chip Multilayer Ceramic Capacitors for Automotive



2017



#### EU RoHS Compliant

- All the products in this catalog comply with EU RoHS.
- EU RoHS is "the European Directive 2011/65/EU on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment."
- For more details, please refer to our web page, "Murata's Approach for EU RoHS" (<http://www.murata.com/en-eu/support/compliance/rohs>).

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Product specifications are as of May 2017.

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Please check the MURATA website (<http://www.murata.com/>)  
if you cannot find a part number in this catalog.

# Explanation of Symbols in This Catalog



Links are provided to the latest information from the PDF version of the catalog, which is available on the web.

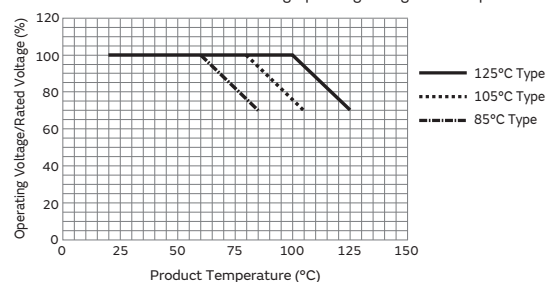
|                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>General</b>                             | For applications that do not require the particular reliability such as the general equipment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Info-tainment</b>                       | Infotainment for Automotive<br>The product for entertainment equipment like car navigations, car audios, and body control equipment like wipers, power windows.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Power-train</b>                         | Powertrain/Safety for Automotive<br>Product used for applications (running, turning, stopping and safety devices) which particularly concern human life, such as in devices for automobiles.                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Medical Device</b>                      | Medical-grade products for Implanted Medical Devices<br>These products are intended for use in implanted medical devices such as cardiac pacemakers, cochlear implants, insulin pumps and gastric electrostimulators.<br>They are suitable for use in non-critical circuits. *1<br>*1 Non-critical circuits<br>This term refers to circuits in implanted medical devices that are not directly linked to life support, i.e. circuits that will not directly endanger the life of the patient should the functionality of the device be reduced or halted by failure of the circuit. |
| <b>AEC-Q200</b>                            | AEC-Q200 compliant product                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Safety standard</b>                     | Safety Standard Certified Product<br>Products that acquired safety standard certification IEC60384-14 and products based on the Electrical Appliance and Material Safety Law of Japan.                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>High Q</b>                              | Low dissipation for high frequency<br>By devising ceramic materials and electrode materials, low dissipation is achieved in frequency bands of VHF, UHF and microwave or beyond.                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Low ESL</b>                             | Low inductance<br>This capacitor is designed so that the parasitic inductance component (ESL) that the capacitor has on the high frequency side becomes lower.                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Fail safe</b>                           | Fail safe product<br>This capacitor is designed to prevent failures as much as possible by short mode.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Deflecting crack</b>                    | Product resistant to deflection cracking<br>This capacitor is designed to prevent failures as much as possible by short mode caused by cracking when there is board deflection.                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Soldering crack</b>                     | Product with solder cracking suppression<br>This capacitor is configured with metal terminals and leads connected to the chip. The metal terminals and leads relieve the stress from expansion and contraction of the solder, to suppress solder cracking.                                                                                                                                                                                                                                                                                                                          |
| <b>Anti-noise</b>                          | Product suitable for acoustic noise reduction and low distortion<br>This product suppresses acoustic noise, which occurs when a ceramic capacitor is used, by devising the materials and configuration.                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Effective Cap</b>                       | No DC bias characteristics<br>Polymer capacitor is no capacitance change with DC bias due to aluminum oxidized film for dielectric.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>EMI FIL®</b>                            | Low-inductance product suitable for noise suppression.<br>This product has extremely low ESL and is suitable for suppression of noise, including high frequencies.<br>This product can also be used as a low-ESL, high-performance bypass capacitor.                                                                                                                                                                                                                                                                                                                                |
| <b>Limited to conductive glue mounting</b> | Limited to Conductive Glue Mounting<br>Since silver palladium is used for the external electrodes, the capacitor can be mounted by conductive adhesive.                                                                                                                                                                                                                                                                                                                                                                                                                             |

## D1 Derating 1

### Derating 1

This product is suitable when a voltage continuously applied to a capacitor in an operating circuit, is used below (derated) the rated voltage of the capacitor. This model guarantees the test conditions in the endurance test, at a rated voltage x 100% at the maximum operating temperature. A reliability assurance level equivalent to a common product can be secured, by using this product within the voltage and temperature derated conditions recommended in the figure below.

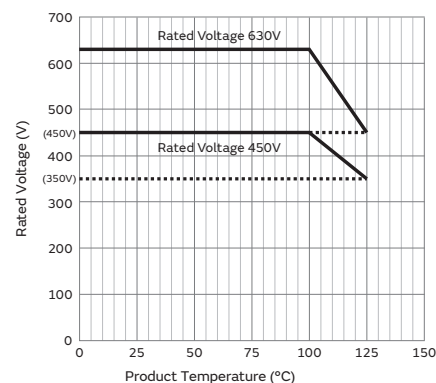
Recommended Conditions of the Derating Operating Voltage and Temperature



## D2 Derating 2

### Derating 2

When the product temperature exceeds 105°C, please use this product within the voltage and temperature derated conditions in the figure below.



## D3 Derating 3

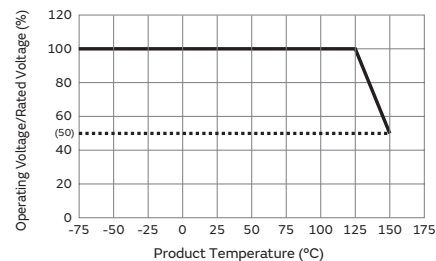
### Derating 3

Please apply the derating curve according to the operating temperature.  
Please refer to detailed specifications sheet for details.

## D4 Derating 4

### Derating 4

When the product temperature exceeds 125°C, please use this product within the voltage and temperature derated conditions in the figure below.



## D5 Derating 5

### Derating 5

Please apply the rated voltage derating over 150°C. Please refer to detailed specifications sheet for details.

# Selection Guide for Capacitors

| Infotainment for automotive |                 |     |     |
|-----------------------------|-----------------|-----|-----|
| Info-tainment<br>AEC-Q200   | SMD             |     |     |
|                             | Solder mounting |     |     |
|                             | Chip type       | GRT | P23 |

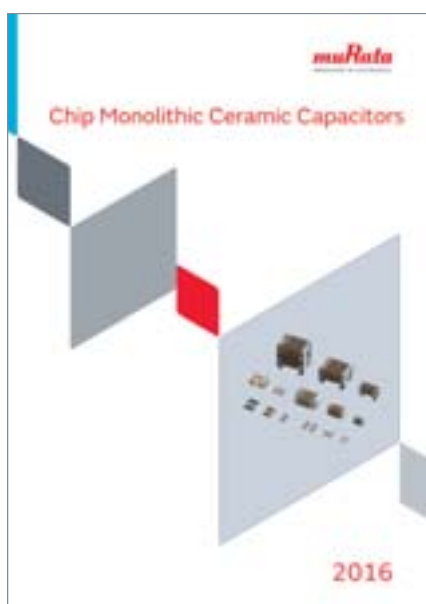
| Powertrain/Safety for automotive |                                                             |     |                                                                  |
|----------------------------------|-------------------------------------------------------------|-----|------------------------------------------------------------------|
| Powertrain<br>AEC-Q200           | SMD                                                         |     |                                                                  |
|                                  | Solder mounting                                             |     |                                                                  |
|                                  | Chip type                                                   |     |                                                                  |
|                                  |                                                             | GCM | P29                                                              |
|                                  | Anti-noise                                                  | GC3 | High effective capacitance & high ripple current P37             |
|                                  | Fail safe Deflecting crack                                  | GCJ | Soft termination P39                                             |
|                                  | Water Resistant                                             | GGM | WEB                                                              |
|                                  | High Q                                                      | GCQ | WEB                                                              |
|                                  | Fail safe Deflecting crack                                  | GCD | MLSC design P45                                                  |
|                                  | Fail safe Deflecting crack                                  | GCE | Soft termination MLSC design P47                                 |
|                                  | Fail safe Deflecting crack Water Resistant                  | GGD | MLSC design WEB                                                  |
|                                  | Low ESL                                                     | NFM | 3 terminals P49                                                  |
|                                  | Metal terminal type                                         |     |                                                                  |
|                                  | Anti-noise Deflecting crack Soldering crack                 | KCM | P51                                                              |
|                                  | Anti-noise Deflecting crack Soldering crack                 | KC3 | High effective capacitance & high ripple current P54             |
|                                  | Safety standard Anti-noise Deflecting crack Soldering crack | KCA | P57                                                              |
|                                  | Limited to Conductive Glue Mounting                         |     |                                                                  |
|                                  | Chip type                                                   |     |                                                                  |
|                                  | Deflecting crack Soldering crack                            | GCB | Ni plating + Pd plating termination conductive glue mounting WEB |
|                                  | Deflecting crack Soldering crack                            | GCG | AgPd termination conductive glue mounting P60                    |
|                                  | Lead type                                                   |     |                                                                  |
|                                  | Solder mounting                                             |     |                                                                  |
|                                  | Anti-noise Deflecting crack Soldering crack                 | RCE | WEB                                                              |
|                                  | Anti-noise Deflecting crack Soldering crack                 | RHE | 150°C operation leaded WEB                                       |
|                                  | Anti-noise Deflecting crack Soldering crack                 | RHS | 200°C operation leaded WEB                                       |
|                                  | Safety standard                                             | DE6 | WEB                                                              |

| Medical-grade products for implanted medical devices |                 |     |     |
|------------------------------------------------------|-----------------|-----|-----|
| Medical Device                                       | SMD             |     |     |
|                                                      | Solder mounting |     |     |
|                                                      | Chip type       | GCH | WEB |

| For general |                                                    |           |                                                                        |
|-------------|----------------------------------------------------|-----------|------------------------------------------------------------------------|
| General     | SMD                                                |           |                                                                        |
|             | Solder mounting                                    |           |                                                                        |
|             | Chip type                                          |           |                                                                        |
|             |                                                    | GRM       | WEB                                                                    |
|             |                                                    | GRM       | For LCD backlight inverter circuit only WEB                            |
|             | Anti-noise                                         | GR3       | High effective capacitance & high ripple current WEB                   |
|             | Deflecting crack                                   | GRJ       | Soft termination WEB                                                   |
|             | Water Resistant                                    | GXM       | WEB                                                                    |
|             |                                                    | GR4       | For information devices only WEB                                       |
|             |                                                    | GR7       | For camera flash circuit only WEB                                      |
|             | High Q                                             | GJM       | WEB                                                                    |
|             | High Q                                             | GQM       | High power WEB                                                         |
|             |                                                    | GA2       | Based on the Electrical Appliance and Material Safety Law of Japan WEB |
|             | Safety standard                                    | GA3       | WEB                                                                    |
|             | Low ESL                                            | LLL       | LW reversed WEB                                                        |
|             | Low ESL                                            | LLA       | 8 terminals WEB                                                        |
|             | Low ESL                                            | LLM       | 10 terminals WEB                                                       |
|             | Low ESL                                            | LLR       | LW reversed controlled ESR WEB                                         |
|             | Low ESL                                            | NFM       | 3 terminals WEB                                                        |
|             | Anti-noise                                         | GJ4       | Low distortion WEB                                                     |
|             | Anti-noise                                         | GJ8       | Low acoustic noise WEB                                                 |
|             | On interposer board                                |           |                                                                        |
|             | Anti-noise                                         | ZRA       | WEB                                                                    |
|             | Anti-noise                                         | ZRB       | WEB                                                                    |
|             | Metal terminal type                                |           |                                                                        |
|             | Anti-noise Deflecting crack Soldering crack        | KRM       | WEB                                                                    |
|             | Anti-noise Deflecting crack Soldering crack        | KR3       | High effective capacitance & high ripple current WEB                   |
|             | Resin molding SMD type                             |           |                                                                        |
|             | Safety standard                                    | DK1       | WEB                                                                    |
|             | Wire bonding mounting                              |           |                                                                        |
|             | Bonding                                            | Chip type |                                                                        |
|             |                                                    |           | GMA Microchip WEB                                                      |
|             |                                                    |           | GMD WEB                                                                |
|             | Lead type                                          |           |                                                                        |
|             | Solder mounting                                    |           |                                                                        |
|             | Anti-noise Deflecting crack Soldering crack        | RDE       | WEB                                                                    |
|             |                                                    | DEH       | High temperature low loss WEB                                          |
|             |                                                    | DEA       | High temperature Class 1 WEB                                           |
|             |                                                    | DEB       | Class 2 WEB                                                            |
|             |                                                    | DEC       | WEB                                                                    |
|             |                                                    | DEF       | For LCD backlight inverter circuit only WEB                            |
|             | Ultrahigh-voltage Deflecting crack Soldering crack | DHR       | WEB                                                                    |
|             |                                                    | DEJ       | Based on the Electrical Appliance and Material Safety Law of Japan WEB |
|             | Safety standard                                    | DE1       | X1/Y1 Class certified product WEB                                      |
|             | Safety standard                                    | DE2       | X1/Y2 Class certified product WEB                                      |
|             | Screw termination mounting                         |           |                                                                        |
|             | Ultrahigh-voltage                                  | DHS       | WEB                                                                    |
|             | Ultrahigh-voltage                                  | DHK       | High voltage AC rated WEB                                              |

# Catalog Information

Catalog relates to a multilayer ceramic capacitor is below.



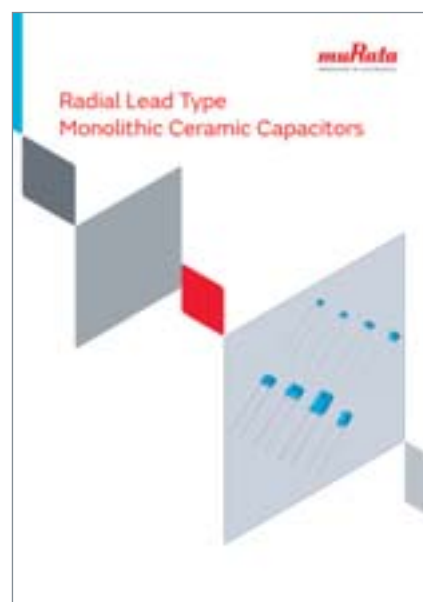
**Chip Monolithic Ceramic Capacitors**  
Cat No. C02E-20



**Chip Multilayer Ceramic Capacitors for Automotive**  
Cat No. C03E-9



**Safety Certified Ceramic Capacitors/High Voltage Ceramic Capacitors**  
Cat No. C85E-5



**Radial Lead Type Monolithic Ceramic Capacitors**  
Cat No. C49E-23

## ● Part Numbering

### Chip Multilayer Ceramic Capacitors for Automotive

WEB 

(Part Number)

|    |   |    |   |    |    |     |   |     |   |
|----|---|----|---|----|----|-----|---|-----|---|
| GC | M | 18 | 8 | R7 | 1H | 102 | K | A37 | D |
| ①  | ② | ③  | ④ | ⑤  | ⑥  | ⑦   | ⑧ | ⑨   | ⑩ |

① Product ID

② Series

| Product ID | Code | Series                                                                         |
|------------|------|--------------------------------------------------------------------------------|
| GC         | 3    | High effective capacitance & High allowable ripple current                     |
|            | D    | Specially designed product to reduce shorts                                    |
|            | E    | Specially designed product to reduce shorts & resin electrode product          |
|            | G    | Limited to conductive glue mounting                                            |
|            | J    | Soft termination type                                                          |
|            | M    | For automotive                                                                 |
| GR         | T    | Meet AEC-Q200 for infotainment                                                 |
| KC         | 3    | Metal terminal type/High effective capacitance & High allowable ripple current |
|            | A    | Metal terminal type/<br>Safety standard certified product                      |
|            | M    | Metal terminal type                                                            |

③ Chip Dimension (L x W)

| Code | Dimension (L x W) | EIA  |
|------|-------------------|------|
| 03   | 0.6 x 0.3mm       | 0201 |
| 15   | 1.0 x 0.5mm       | 0402 |
| 18   | 1.6 x 0.8mm       | 0603 |
| 21   | 2.0 x 1.25mm      | 0805 |
| 31   | 3.2 x 1.6mm       | 1206 |
| 32   | 3.2 x 2.5mm       | 1210 |
| 43   | 4.5 x 3.2mm       | 1812 |
| 55   | 5.7 x 5.0mm       | 2220 |

⑤ Temperature Characteristics

| Temperature Characteristic Codes |                 |     | Temperature Characteristics |                   |                                               | Operating Temperature Range | Capacitance Change Each Temperature (%) |       |      |       |       |       |
|----------------------------------|-----------------|-----|-----------------------------|-------------------|-----------------------------------------------|-----------------------------|-----------------------------------------|-------|------|-------|-------|-------|
| Code                             | Public STD Code | EIA | Reference Temperature       | Temperature Range | Capacitance Change or Temperature Coefficient |                             | -55°C                                   |       | *4   |       | -10°C |       |
|                                  |                 |     |                             |                   |                                               |                             | Max.                                    | Min.  | Max. | Min.  | Max.  | Min.  |
| 5C                               | C0G             | EIA | 25°C                        | 25 to 125°C       | 0±30ppm/°C                                    | -55 to 125°C                | 0.58                                    | -0.24 | 0.4  | -0.17 | 0.25  | -0.11 |
| 5G                               | X8G             | *2  | 25°C                        | 25 to 150°C       | 0±30ppm/°C                                    | -55 to 150°C                | 0.58                                    | -0.24 | 0.4  | -0.17 | 0.25  | -0.11 |
| 7U                               | U2J             | EIA | 25°C                        | 25 to 125°C *3    | -750±120ppm/°C                                | -55 to 125°C                | 8.78                                    | 5.04  | 6.04 | 3.47  | 3.84  | 2.21  |
| 9E                               | ZLM             | *2  | 20°C                        | -55 to -40°C      | -4700+1000/-2500ppm/°C                        | -55 to 125°C                | -                                       | -     | -    | -     | -     | -     |
|                                  |                 |     |                             | -40 to 20°C       | -5350±750ppm/°C                               |                             | -                                       | -     | -    | -     | -     |       |
|                                  |                 |     |                             | 20 to 85°C        | -4700±500ppm/°C                               |                             | -                                       | -     | -    | -     | -     |       |
|                                  |                 |     |                             | 85 to 125°C       | -4700+2000/-1000ppm/°C                        |                             | -                                       | -     | -    | -     | -     |       |
| C7                               | X7S             | EIA | 25°C                        | -55 to 125°C      | ±22%                                          | -55 to 125°C                | -                                       | -     | -    | -     | -     | -     |
| C8                               | X6S             | EIA | 25°C                        | -55 to 105°C      | ±22%                                          | -55 to 105°C                | -                                       | -     | -    | -     | -     | -     |
| D7                               | X7T             | EIA | 25°C                        | -55 to 125°C      | +22%, -33%                                    | -55 to 125°C                | -                                       | -     | -    | -     | -     | -     |
| L8                               | X8L             | *2  | 25°C                        | -55 to 150°C      | +15%, -40%                                    | -55 to 150°C                | -                                       | -     | -    | -     | -     | -     |
| M8                               | X8M             | *2  | 25°C                        | -55 to 150°C      | +15%, -50%                                    | -55 to 150°C                | -                                       | -     | -    | -     | -     | -     |
| R6                               | X5R             | EIA | 25°C                        | -55 to 85°C       | ±15%                                          | -55 to 85°C                 | -                                       | -     | -    | -     | -     | -     |
| R7                               | X7R             | EIA | 25°C                        | -55 to 125°C      | ±15%                                          | -55 to 125°C                | -                                       | -     | -    | -     | -     | -     |
| R9                               | X8R             | EIA | 25°C                        | -55 to 150°C      | ±15%                                          | -55 to 150°C                | -                                       | -     | -    | -     | -     | -     |

\*1 Capacitance change is specified with 50% rated voltage applied.

\*2 Murata Temperature Characteristic Code.

\*3 Rated Voltage 100Vdc max: 25 to 85°C

\*4 -25°C (Reference Temperature 20°C) / -30°C (Reference Temperature 25°C)

④ Height Dimension (T) (Except KC□)

| Code | Dimension (T)                    |
|------|----------------------------------|
| 3    | 0.3mm                            |
| 5    | 0.5mm                            |
| 6    | 0.6mm                            |
| 8    | 0.8mm                            |
| 9    | 0.85mm                           |
| A    | 1.0mm                            |
| B    | 1.25mm                           |
| C    | 1.6mm                            |
| D    | 2.0mm                            |
| E    | 2.5mm                            |
| M    | 1.15mm                           |
| Q    | 1.5mm                            |
| X    | Depends on individual standards. |

④ Height Dimension (T) (KC□ Only)

| Code | Dimension (T) |
|------|---------------|
| L    | 2.8mm         |
| Q    | 3.7mm         |
| T    | 4.8mm         |
| W    | 6.4mm         |

Continued on the following page. ↗

(Part Number)

| GC | M | 18 | 8 | R7 | 1H | 102 | K | A37 | D  |
|----|---|----|---|----|----|-----|---|-----|----|
| 1  | 2 | 3  | 4 | 5  | 6  | 7   | 8 | 9   | 10 |

Continued from the preceding page. ↘

#### ⑥ Rated Voltage

| Code             |                         | Rated Voltage                                        |
|------------------|-------------------------|------------------------------------------------------|
| Standard Product | Voltage Derated Product |                                                      |
| 0E               | -                       | DC2.5V                                               |
| 0G               | -                       | DC4V                                                 |
| 0J               | EC                      | DC6.3V                                               |
| 1A               | ED                      | DC10V                                                |
| 1C               | EE                      | DC16V                                                |
| 1E               | EF                      | DC25V                                                |
| YA               | EG                      | DC35V                                                |
| 1H               | EH                      | DC50V                                                |
| 1J               | -                       | DC63V                                                |
| 1K               | -                       | DC80V                                                |
| 2A               | EL                      | DC100V                                               |
| 2E               | -                       | DC250V                                               |
| 2W               | LP                      | DC450V                                               |
| 2J               | LQ                      | DC630V                                               |
| 3A               | -                       | DC1kV                                                |
| MF               | -                       | X1/Y2: AC250V<br>(Safety Standard Certified Type MF) |

#### ⑦ Capacitance

Expressed by three-digit alphanumerics. The unit is pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zeros that follow the two numbers.

If there is a decimal point, it is expressed by the capital letter "R."

In this case, all figures are significant digits.

If any letter, other than "R" is included, this indicates the specific part number is a non-standard part.

Ex.)

| Code | Capacitance |
|------|-------------|
| R50  | 0.50pF      |
| 1R0  | 1.0pF       |
| 100  | 10pF        |
| 103  | 10000pF     |

#### ⑧ Capacitance Tolerance

| Code | Capacitance Tolerance   |
|------|-------------------------|
| C    | ±0.25pF                 |
| D    | ±0.5pF (Less than 10pF) |
|      | ±0.5% (10pF and over)   |
| J    | ±5%                     |
| K    | ±10%                    |
| M    | ±20%                    |

#### ⑨ Individual Specification Code

Expressed by three figures.

#### ⑩ Package

| Code | Package                |
|------|------------------------|
| L    | ø180mm Embossed Taping |
| D/W  | ø180mm Paper Taping    |
| K    | ø330mm Embossed Taping |
| J    | ø330mm Paper Taping    |

Please contact us if you find any part number not provided in this table.

### 3 Terminal Low ESL Multilayer Ceramic Capacitors

WEB 

(Part Number)

|    |   |    |    |     |   |    |   |   |
|----|---|----|----|-----|---|----|---|---|
| NF | M | 3D | CC | 102 | R | 1H | 3 | L |
| 1  | 2 | 3  | 4  | 5   | 6 | 7  | 8 | 9 |

#### ①Product ID ②Series

| Product ID | Series                  |
|------------|-------------------------|
| NFM        | 3 Terminal Low ESL Type |

#### ③Dimensions (LxW)

| Code | Dimensions (LxW) | EIA  |
|------|------------------|------|
| 21   | 2.0x1.25mm       | 0805 |
| 31   | 3.2x1.6mm        | 1206 |

#### ④Features

| Code | Features                            |                                         |
|------|-------------------------------------|-----------------------------------------|
| HC   | Powertrain/Safety<br>for Automotive | For Signal Lines /<br>For Large Current |
| HK   |                                     | For Very Large Current                  |

#### ⑤Capacitance

Expressed by three figures. The unit is in pico-farad (pF). The first and second figures are significant digits, and the third figure expresses the number of zeros that follow the two figures.

#### ⑥Characteristics

| Code | Capacitance Temperature Characteristics |
|------|-----------------------------------------|
| R    | ±15%, +15/-18%                          |

#### ⑦Rated Voltage

| Code | Rated Voltage |
|------|---------------|
| 1A   | 10V           |
| 1C   | 16V           |
| 1H   | 50V           |
| 2A   | 100V          |

#### ⑧Electrode

| Code | Electrode  |
|------|------------|
| 3    | Sn Plating |

#### ⑨Packaging

| Code | Packaging                     |
|------|-------------------------------|
| L    | Embossed Taping (ø180mm Reel) |
| D    | Paper Taping (ø180mm Reel)    |

Please contact us if you find any part number not provided in this table.

# Capacitance Table

## How to read the Capacitance Table

| L×W (mm)            | 1.0×0.5 |     |     | 1.6× |    |
|---------------------|---------|-----|-----|------|----|
| T max. (mm)         | 0.55    |     |     | 0.5  |    |
| Rated Voltage (Vdc) | 100     | 50  | 25  | 100  | 50 |
| Cap. / TC Code      | C0G     | C0G | C0G | C0G  | C0 |
| 1.0pF               | p24     | p24 |     | p24  | p2 |
| 2.0pF               | p24     | p24 |     | p24  | p2 |
| 3.0pF               | p24     | p24 |     | p24  | p2 |
| 4.0pF               | p24     | p24 |     | p24  | p2 |
| 5.0pF               | p24     | p24 |     | p24  | p2 |

→ The values can be narrowed down in the order of size, rated voltage, and temperature characteristics.

→ Refers to the page of the part number list.  
Check the part number list for the applicable product number.

## Temperature Characteristics Table

The Table is colored by temperature characteristic codes. Refer to the following Table for the meaning of each code.

| Temperature Characteristic Codes |     | Temperature Characteristics |                   |                                               | Operating Temperature Range | Capacitance Change Each Temperature (%) |       |      |       |      |       |
|----------------------------------|-----|-----------------------------|-------------------|-----------------------------------------------|-----------------------------|-----------------------------------------|-------|------|-------|------|-------|
| Public STD Code                  |     | Reference Temperature       | Temperature Range | Capacitance Change or Temperature Coefficient |                             | -55℃                                    |       | *3   |       | -10℃ |       |
|                                  |     |                             |                   |                                               |                             | Max.                                    | Min.  | Max. | Min.  | Max. | Min.  |
| C0G                              | EIA | 25℃                         | 25 to 125℃        | 0±30ppm/℃                                     | -55 to 125℃                 | 0.58                                    | -0.24 | 0.4  | -0.17 | 0.25 | -0.11 |
| X8G                              | *1  | 25℃                         | 25 to 150℃        | 0±30ppm/℃                                     | -55 to 150℃                 | 0.58                                    | -0.24 | 0.4  | -0.17 | 0.25 | -0.11 |
| U2J                              | EIA | 25℃                         | 25 to 125℃ *2     | -750±120ppm/℃                                 | -55 to 125℃                 | 8.78                                    | 5.04  | 6.04 | 3.47  | 3.84 | 2.21  |
| ZLM                              | *1  | 20℃                         | -55 to -40℃       | -4700+1000/-2500ppm/℃                         | -55 to 125℃                 | -                                       | -     | -    | -     | -    | -     |
|                                  |     |                             | -40 to 20℃        | -5350±750ppm/℃                                |                             | -                                       | -     | -    | -     | -    | -     |
|                                  |     |                             | 20 to 85℃         | -4700±500ppm/℃                                |                             | -                                       | -     | -    | -     | -    | -     |
|                                  |     |                             | 85 to 125℃        | -4700+2000/-1000ppm/℃                         |                             | -                                       | -     | -    | -     | -    | -     |
| X7S                              | EIA | 25℃                         | -55 to 125℃       | ±22%                                          | -55 to 125℃                 | -                                       | -     | -    | -     | -    | -     |
| X6S                              | EIA | 25℃                         | -55 to 105℃       | ±22%                                          | -55 to 105℃                 | -                                       | -     | -    | -     | -    | -     |
| X7T                              | EIA | 25℃                         | -55 to 125℃       | +22%, -33%                                    | -55 to 125℃                 | -                                       | -     | -    | -     | -    | -     |
| X8L                              | *1  | 25℃                         | -55 to 150℃       | +15%, -40%                                    | -55 to 150℃                 | -                                       | -     | -    | -     | -    | -     |
| X8M                              | *1  | 25℃                         | -55 to 150℃       | +15%, -50%                                    | -55 to 150℃                 | -                                       | -     | -    | -     | -    | -     |
| X5R                              | EIA | 25℃                         | -55 to 85℃        | ±15%                                          | -55 to 85℃                  | -                                       | -     | -    | -     | -    | -     |
| X7R                              | EIA | 25℃                         | -55 to 125℃       | ±15%                                          | -55 to 125℃                 | -                                       | -     | -    | -     | -    | -     |
| X8R                              | EIA | 25℃                         | -55 to 150℃       | ±15%                                          | -55 to 150℃                 | -                                       | -     | -    | -     | -    | -     |

\*1 Murata Temperature Characteristic Code.

\*2 Rated Voltage 100Vdc max: 25 to 85°C

\*3 -25°C (Reference Temperature 20°C) / -30°C (Reference Temperature 25°C)

## Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

### GRT Series Temperature Compensating Type

p00 ← Part Number List EIA: C0G

| L×W (mm)            | 1.0×0.5 |     |     | 1.6×0.8 |     |     | 2.0×1.25 | 3.2×1.6 |     |     |
|---------------------|---------|-----|-----|---------|-----|-----|----------|---------|-----|-----|
| T max. (mm)         | 0.55    |     |     | 0.9     |     |     | 1.35     | 1.8     |     |     |
| Rated Voltage (Vdc) | 100     | 50  | 25  | 100     | 50  | 25  | 50       | 50      | 25  | 16  |
| Cap. / TC Code      | C0G     | C0G | C0G | C0G     | C0G | C0G | C0G      | C0G     | C0G | C0G |
| 1.0pF               | p24     | p24 |     | p24     | p25 |     |          |         |     |     |
| 2.0pF               | p24     | p24 |     | p24     | p25 |     |          |         |     |     |
| 3.0pF               | p24     | p24 |     | p24     | p25 |     |          |         |     |     |
| 4.0pF               | p24     | p24 |     | p24     | p25 |     |          |         |     |     |
| 5.0pF               | p24     | p24 |     | p24     | p25 |     |          |         |     |     |
| 6.0pF               | p24     | p24 |     | p24     | p25 |     |          |         |     |     |
| 7.0pF               | p24     | p24 |     | p24     | p25 |     |          |         |     |     |
| 8.0pF               | p24     | p24 |     | p24     | p25 |     |          |         |     |     |
| 9.0pF               | p24     | p24 |     | p24     | p25 |     |          |         |     |     |
| 10pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 12pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 15pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 18pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 22pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 27pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 33pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 39pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 47pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 56pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 68pF                | p24     | p24 | p24 | p24     | p25 |     |          |         |     |     |
| 82pF                | p24     | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 100pF               | p24     | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 120pF               |         | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 150pF               |         | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 180pF               |         | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 220pF               |         | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 270pF               |         | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 330pF               |         | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 390pF               |         | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 470pF               |         | p24 | p24 | p25     | p25 |     |          |         |     |     |
| 560pF               |         | p24 | p24 | p25     | p25 | p25 |          |         |     |     |
| 680pF               |         | p24 | p24 | p25     | p25 | p25 |          |         |     |     |
| 820pF               |         | p24 | p24 | p25     | p25 | p25 |          |         |     |     |
| 1000pF              |         | p24 | p24 | p25     | p25 | p25 |          |         |     |     |
| 1200pF              |         |     |     | p25     | p25 | p25 |          |         |     |     |
| 1500pF              |         |     |     | p25     | p25 | p25 |          |         |     |     |
| 1800pF              |         |     |     |         | p25 |     |          |         |     |     |
| 2200pF              |         |     |     |         | p25 |     |          |         |     |     |
| 2700pF              |         |     |     |         | p25 |     |          |         |     |     |
| 3300pF              |         |     |     |         | p25 |     |          |         |     |     |
| 3900pF              |         |     |     |         | p25 |     |          |         |     |     |
| 4700pF              |         |     |     |         | p25 | p25 |          |         |     |     |
| 5600pF              |         |     |     |         | p25 | p25 |          |         |     |     |
| 6800pF              |         |     |     |         | p25 | p25 |          |         |     |     |
| 8200pF              |         |     |     |         | p25 | p25 |          |         |     |     |
| 10000pF             |         |     |     |         | p25 | p25 |          |         |     |     |
| 18000pF             |         |     |     |         |     |     | p25      |         |     |     |
| 22000pF             |         |     |     |         |     |     | p25      |         |     |     |
| 56000pF             |         |     |     |         |     |     |          | p25     |     |     |
| 68000pF             |         |     |     |         |     |     |          | p25     |     |     |
| 82000pF             |         |     |     |         |     |     |          | p25     |     |     |
| 0.10μF              |         |     |     |         |     |     |          | p25     | p25 |     |
| 0.12μF              |         |     |     |         |     |     |          |         | p25 | p25 |

# Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

## GRT Series High Dielectric Constant Type

p00 ← Part Number List

EIA: X6S X7S X5R X7R

| L×W (mm)            | 0.6×0.3 |     |     |     |     |     |     |     |     |     |     |     |     |     | 1.0×0.5 |     |      |     |     |     |     |     |     |     |     |     |
|---------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T max. (mm)         | 0.33    |     |     |     |     |     |     |     |     |     |     |     |     |     | 0.35    |     | 0.55 |     |     |     |     |     |     |     |     |     |
| Rated Voltage (Vdc) | 35      | 25  |     |     | 16  |     | 10  |     |     | 6.3 |     |     | 4   | 6.3 | 4       | 50  | 35   | 25  |     |     | 16  |     |     | 10  |     |     |
| Cap. / TC Code      | X5R     | X7R | X6S | X5R | X6S | X5R | X7R | X6S | X5R | X7R | X6S | X5R | X6S | X5R | X5R     | X7R | X6S  | X5R | X7R | X6S | X5R | X7R | X6S | X5R | X7R | X6S |
| 100pF               |         |     |     | p26 |     |     |     |     |     |     |     |     |     |     |         |     |      |     |     |     |     |     |     |     |     |     |
| 220pF               |         |     |     | p26 |     |     |     |     |     |     |     |     |     |     |         | p26 |      |     |     |     |     |     |     |     |     |     |
| 470pF               |         | p26 | p26 | p26 |     |     |     |     |     |     |     |     |     |     |         | p26 |      |     |     |     |     |     |     |     |     |     |
| 1000pF              |         | p26 | p26 | p26 |     |     |     |     |     |     |     |     |     |     |         | p26 |      |     |     |     |     |     |     |     |     |     |
| 2200pF              |         |     |     |     |     |     |     |     | p26 | p26 | p26 |     |     |     |         | p26 |      |     |     |     |     |     |     |     |     |     |
| 4700pF              |         |     |     | p26 |     |     |     |     | p26 | p26 | p26 |     |     |     |         | p26 |      |     |     |     |     |     |     |     |     |     |
| 10000pF             |         |     |     | p26 |     | p26 | p26 |     | p26 | p26 | p26 | p26 |     |     |         | p26 |      |     | p26 |     |     | p26 |     |     |     |     |
| 22000pF             |         |     |     |     |     | p26 |     |     | p26 |     | p26 | p26 |     |     |         | p26 |      |     | p26 |     |     | p26 |     |     |     |     |
| 47000pF             |         |     |     |     |     | p26 |     |     | p26 |     | p26 | p26 |     |     |         | p26 |      |     | p26 |     |     | p26 |     |     |     |     |
| 68000pF             |         |     |     |     |     |     |     |     |     |     | p26 | p26 | p26 |     |         |     |      |     |     |     |     |     |     |     |     |     |
| 0.10μF              | p26     |     | p26 | p26 | p26 | p26 |     | p26 | p26 |     | p26 | p26 | p26 |     |         | p26 |      |     | p26 |     |     | p26 |     |     |     |     |
| 0.22μF              |         |     |     |     |     |     |     |     | p26 |     | p26 | p26 | p26 |     |         |     | p26  | p26 |     | p26 | p26 | p26 |     |     | p26 | p26 |
| 0.47μF              |         |     |     |     |     |     |     |     |     |     |     |     | p26 |     |         |     |      |     |     |     |     |     | p26 |     | p26 | p26 |
| 1.0μF               |         |     |     |     |     |     |     |     |     |     |     |     |     |     | p26     | p26 |      |     |     |     |     | p26 |     |     | p26 |     |
| 2.2μF               |         |     |     |     |     |     |     |     |     |     |     |     |     |     |         |     |      |     |     |     |     |     |     |     |     |     |
| 4.7μF               |         |     |     |     |     |     |     |     |     |     |     |     |     |     |         |     |      |     |     |     |     |     |     |     |     |     |
| 10μF                |         |     |     |     |     |     |     |     |     |     |     |     |     |     |         |     |      |     |     |     |     |     |     |     |     |     |
| 22μF                |         |     |     |     |     |     |     |     |     |     |     |     |     |     |         |     |      |     |     |     |     |     |     |     |     |     |
| 33μF                |         |     |     |     |     |     |     |     |     |     |     |     |     |     |         |     |      |     |     |     |     |     |     |     |     |     |
| 47μF                |         |     |     |     |     |     |     |     |     |     |     |     |     |     |         |     |      |     |     |     |     |     |     |     |     |     |
| 100μF               |         |     |     |     |     |     |     |     |     |     |     |     |     |     |         |     |      |     |     |     |     |     |     |     |     |     |

Continued to the following table. ↗

| L×W (mm)            | 1.0×0.5 |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     | 1.6×0.8 |     |     |     |     |     |     |     |     |  |
|---------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|-----|-----|-----|--|
| T max. (mm)         | 0.55    |     |     |     |     |     | 0.6 |     |     |     |     |     | 0.65 |     | 0.7 |     |     |     |         |     | 0.9 |     |     |     |     |     |     |  |
| Rated Voltage (Vdc) | 10      | 6.3 |     |     |     | 4   | 35  | 25  | 16  | 10  | 6.3 | 4   | 10   | 6.3 | 25  | 16  | 10  | 2.5 | 50      | 35  | 25  |     |     |     | 16  |     |     |  |
| Cap. / TC Code      | X5R     | X7R | X6S | X5R | X7R | X5R | X6S | X6S | X7S | X5R | X5R | X5R | X6S  | X5R | X6S | X5R | X7S | X6S | X6S     | X5R | X6S | X5R | X7R | X6S | X5R | X7R |     |  |
| 100pF               |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 220pF               |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 470pF               |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 1000pF              |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 2200pF              |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 4700pF              |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 10000pF             |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 22000pF             |         | p26 |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 47000pF             |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 68000pF             |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 0.10μF              |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 0.22μF              | p26     |     | p26 | p26 |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 0.47μF              | p26     |     | p26 | p26 |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 1.0μF               | p26     | p26 | p26 | p26 | p26 | p26 | p26 | p26 | p26 |     |     |     |      |     |     |     |     |     |         |     | p27 | p27 | p27 | p27 | p27 | p27 | p27 |  |
| 2.2μF               | p26     |     | p26 | p26 |     |     |     |     |     |     |     |     |      |     | p27 | p27 | p27 | p27 | p27     |     |     |     |     | p27 |     |     |     |  |
| 4.7μF               |         |     |     |     |     |     |     |     |     | p26 | p27 | p27 | p27  |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 10μF                |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 22μF                |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 33μF                |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 47μF                |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |
| 100μF               |         |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |  |

Continued on the following page. ↗

## Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ GRT Series High Dielectric Constant Type)

p00 ← Part Number List

EIA: X6S X7S X5R X7R

| L×W (mm)            | 1.6×0.8 |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     | 2.0×1.25 |     |     |     |      |     |     |     |
|---------------------|---------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|----------|-----|-----|-----|------|-----|-----|-----|
| T max. (mm)         | 0.9     |     |     |     |     |     |     |     | 0.95 |     |     |     | 1.0 |     |     |     |          |     |     |     | 1.35 |     |     |     |
| Rated Voltage (Vdc) | 16      |     | 10  |     | 6.3 |     | 4   |     | 25   | 16  |     | 10  | 2.5 | 50  | 35  | 25  |          | 16  | 10  | 6.3 | 4    | 50  | 25  |     |
| Cap. / TC Code      | X6S     | X5R | X6S | X5R | X7R | X6S | X5R | X6S | X5R  | X5R | X6S | X5R | X5R | X5R | X6S | X5R | X6S      | X5R | X6S | X6S | X6S  | X7R | X6S | X5R |
| 100pF               |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 220pF               |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 470pF               |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 1000pF              |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 2200pF              |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 4700pF              |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 10000pF             |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 22000pF             |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 47000pF             |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 68000pF             |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 0.10μF              |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 0.22μF              |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 0.47μF              |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 1.0μF               | p27     | p27 | p27 | p27 |     |     |     | p27 | p27  |     |     |     |     |     |     |     |          |     |     |     |      | p27 |     |     |
| 2.2μF               | p27     |     |     |     | p27 | p27 |     |     |      |     |     |     |     | p27 | p27 |     | p27      |     |     |     |      |     | p27 | p27 |
| 4.7μF               |         |     |     |     |     | p27 | p27 | p27 |      | p27 | p27 | p27 |     |     |     | p27 | p27      |     |     |     |      |     | p27 | p27 |
| 10μF                |         |     |     |     |     |     | p27 | p27 | p27  |     |     | p27 | p27 |     |     |     |          | p27 | p27 | p27 |      |     |     |     |
| 22μF                |         |     |     |     |     |     |     |     |      |     |     |     |     | p27 |     |     |          |     |     |     | p27  | p27 |     |     |
| 33μF                |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     | p27  | p27 |     |     |
| 47μF                |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |
| 100μF               |         |     |     |     |     |     |     |     |      |     |     |     |     |     |     |     |          |     |     |     |      |     |     |     |

Continued to the following table. ↗

| L×W (mm)            | 2.0×1.25 |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     | 3.2×1.6 |     |     |     |
|---------------------|----------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|---------|-----|-----|-----|
| T max. (mm)         | 1.35     |     |     |     |     |     | 1.4 |     |     |     |     |     |     |     | 1.45 |     |     |     |     |     | 1.8     |     |     |     |
| Rated Voltage (Vdc) | 16       |     |     | 10  |     | 6.3 | 50  | 35  | 25  | 16  | 10  | 6.3 | 25  | 16  | 10   | 6.3 | 4   | 50  |     | 35  |         |     |     |     |
| Cap. / TC Code      | X7R      | X6S | X5R | X6S | X5R | X5R | X6S | X7R | X5R | X7R | X7R | X5R | X7R | X5R | X7S  | X5R | X6S | X5R | X5R | X7R | X6S     | X5R | X6S | X5R |
| 100pF               |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 220pF               |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 470pF               |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 1000pF              |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 2200pF              |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 4700pF              |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 10000pF             |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 22000pF             |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 47000pF             |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 68000pF             |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 0.10μF              |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 0.22μF              |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 0.47μF              |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 1.0μF               |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 2.2μF               | p27      | p27 | p27 |     |     |     | p27 | p27 | p27 |     |     |     |     |     |      |     |     |     |     | p27 | p27     |     |     |     |
| 4.7μF               |          | p27 | p27 |     |     |     | p27 | p27 |     |     | p27 | p27 | p27 |     | p27  |     |     |     |     |     |         |     |     |     |
| 10μF                |          | p27 | p27 | p27 | p27 | p27 |     |     |     | p27 |     | p27 |     | p27 |      | p27 |     |     |     |     |         | p27 | p27 | p27 |
| 22μF                |          |     |     |     |     |     |     |     |     |     |     | p27 |     | p27 |      | p27 | p27 | p27 |     |     |         |     |     |     |
| 33μF                |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |
| 47μF                |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     | p27 | p27     |     |     |     |
| 100μF               |          |     |     |     |     |     |     |     |     |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |

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# Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ GRT Series High Dielectric Constant Type)

p00 ← Part Number List EIA: X6S X7S X5R X7R

| L×W (mm)            | 3.2×1.6 |     |     |     |     |     |     |     |     |     |     |     | 3.2×2.5 |     |     |     |     |     |     |     |     |     |     |     |     |
|---------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T max. (mm)         | 1.8     |     |     |     |     |     |     |     |     |     |     |     | 2.2     |     |     |     | 2.7 |     |     |     |     |     |     |     |     |
| Rated Voltage (Vdc) | 25      |     |     | 16  |     |     | 10  |     |     | 6.3 |     |     | 4       |     | 25  | 6.3 | 50  |     |     | 16  | 10  | 6.3 |     |     |     |
| Cap. / TC Code      | X7R     | X6S | X5R | X6S | X5R | X6S | X5R | X7R | X6S | X5R | X6S | X6S | X5R     | X5R | X5R | X7R | X6S | X6S | X6S | X7R | X6S | X5R | X7R | X6S | X5R |
| 100pF               |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 220pF               |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 470pF               |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 1000pF              |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 2200pF              |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 4700pF              |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 10000pF             |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 22000pF             |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 47000pF             |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 68000pF             |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 0.10μF              |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 0.22μF              |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 0.47μF              |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 1.0μF               |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 2.2μF               |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 4.7μF               |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 10μF                | p27     | p27 | p27 |     |     |     |     |     |     |     |     |     | p28     | p28 |     |     |     | p28 | p28 |     |     |     |     |     |     |
| 22μF                |         |     |     | p28 | p28 | p28 | p28 | p28 | p28 | p28 | p28 |     |         |     |     |     |     |     |     |     |     |     |     |     |     |
| 33μF                |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     | p28 |     |     |     |     |     |     |     |     |
| 47μF                |         |     |     |     |     |     | p28 |     | p28 | p28 | p28 |     |         |     |     |     |     |     |     | p28 | p28 | p28 | p28 |     |     |
| 100μF               |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     | p28 |



# Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ GCM Series Temperature Compensating Type)

p00 ← Part Number List EIA: C0G U2J Murata Temperature Characteristic: X8G ZLM

| L×W (mm)            | 3.2×1.6 |     |      |     |      |      |     |     |     |     |      |     | 3.2×2.5 |      |     |      |     |      |     |      | 4.5×3.2 |      |     |  |
|---------------------|---------|-----|------|-----|------|------|-----|-----|-----|-----|------|-----|---------|------|-----|------|-----|------|-----|------|---------|------|-----|--|
| T max. (mm)         | 1.0     |     |      |     | 1.25 |      |     |     | 1.8 |     |      |     | 1.0     | 1.25 | 1.5 | 2.0  | 1.5 | 2.0  |     |      |         |      |     |  |
| Rated Voltage (Vdc) | 630     | 250 | 1000 | 630 | 250  | 1000 | 630 | 250 | 630 | 250 | 1000 | 630 | 630     | 1000 | 630 | 1000 | 630 | 1000 | 630 | 1000 | 630     | 1000 | 630 |  |
| Cap. / TC Code      | U2J     | C0G | U2J  | C0G | U2J  | C0G  | U2J | C0G | U2J | C0G | U2J  | C0G | U2J     | C0G  | U2J | U2J  | U2J | U2J  | U2J | U2J  | U2J     | U2J  | U2J |  |
| 1.0pF               |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 2.0pF               |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 3.0pF               |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 4.0pF               |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 5.0pF               |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 6.0pF               |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 7.0pF               |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 8.0pF               |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 9.0pF               |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 10pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 12pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 15pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 18pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 22pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 27pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 33pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 39pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 47pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 56pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 68pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 82pF                | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 100pF               | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 120pF               | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 150pF               | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 180pF               | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 220pF               | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 270pF               | p33     | p33 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 330pF               | p33     | p34 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 390pF               | p33     | p34 |      |     | p34  |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 470pF               | p33     | p34 |      |     | p34  |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 560pF               | p33     | p34 |      | p34 | p34  |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 680pF               | p33     | p34 |      | p34 | p34  |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 820pF               | p33     | p34 |      |     |      |      |     | p34 | p34 |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 1000pF              | p33     | p34 |      |     |      |      |     | p34 | p34 |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 1100pF              |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 1200pF              | p33     | p34 |      |     |      |      |     |     |     |     |      |     | p34     | p34  |     |      |     |      |     |      |         |      |     |  |
| 1300pF              |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 1500pF              | p33     | p34 |      |     |      |      |     |     |     |     |      |     | p34     |      |     | p34  |     |      |     |      |         |      |     |  |
| 1800pF              | p33     | p34 |      |     |      |      |     |     |     |     |      |     | p34     |      |     |      | p34 |      |     |      |         |      |     |  |
| 2200pF              | p33     | p34 |      |     |      |      |     |     |     |     |      |     | p34     |      |     |      | p34 |      |     |      |         |      |     |  |
| 2700pF              |         | p34 | p34  |     |      | p34  | p34 |     |     |     |      |     |         |      |     |      |     | p34  |     |      |         |      |     |  |
| 3300pF              |         | p34 | p34  |     |      |      | p34 |     |     |     |      | p34 |         |      |     |      |     | p34  |     |      |         |      |     |  |
| 3900pF              |         | p34 | p34  |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      | p34     |      |     |  |
| 4700pF              |         | p34 | p34  |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      | p34     |      |     |  |
| 5600pF              |         | p34 | p34  |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 6800pF              |         | p34 |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 8200pF              |         |     |      |     |      |      |     | p34 |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 10000pF             |         |     |      |     |      |      |     | p34 | p34 |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 12000pF             |         |     |      |     |      |      |     | p34 |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 15000pF             |         |     |      |     |      |      |     |     |     |     |      |     | p34     |      |     |      |     |      |     |      |         |      |     |  |
| 18000pF             |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      | p34 |  |
| 20000pF             |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      | p34 |  |
| 22000pF             |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      | p34 |  |
| 27000pF             |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 33000pF             |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 39000pF             |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |
| 47000pF             |         |     |      |     |      |      |     |     |     |     |      |     |         |      |     |      |     |      |     |      |         |      |     |  |

Continued on the following page. ↗

## Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ GCM Series Temperature Compensating Type)

p00 ← Part Number List

EIA:

C0G

U2J

Murata Temperature Characteristic:

X8G

ZLM

| L×W (mm)            | 5.7×5.0 |     |      |     |
|---------------------|---------|-----|------|-----|
| T max. (mm)         | 1.5     |     | 2.0  |     |
| Rated Voltage (Vdc) | 1000    | 630 | 1000 | 630 |
| Cap. / TC Code      | U2J     | U2J | U2J  | U2J |
| 1.0pF               |         |     |      |     |
| 2.0pF               |         |     |      |     |
| 3.0pF               |         |     |      |     |
| 4.0pF               |         |     |      |     |
| 5.0pF               |         |     |      |     |
| 6.0pF               |         |     |      |     |
| 7.0pF               |         |     |      |     |
| 8.0pF               |         |     |      |     |
| 9.0pF               |         |     |      |     |
| 10pF                |         |     |      |     |
| 12pF                |         |     |      |     |
| 15pF                |         |     |      |     |
| 18pF                |         |     |      |     |
| 22pF                |         |     |      |     |
| 27pF                |         |     |      |     |
| 33pF                |         |     |      |     |
| 39pF                |         |     |      |     |
| 47pF                |         |     |      |     |
| 56pF                |         |     |      |     |
| 68pF                |         |     |      |     |
| 82pF                |         |     |      |     |
| 100pF               |         |     |      |     |
| 120pF               |         |     |      |     |
| 150pF               |         |     |      |     |
| 180pF               |         |     |      |     |
| 220pF               |         |     |      |     |
| 270pF               |         |     |      |     |
| 330pF               |         |     |      |     |
| 390pF               |         |     |      |     |
| 470pF               |         |     |      |     |
| 560pF               |         |     |      |     |
| 680pF               |         |     |      |     |
| 820pF               |         |     |      |     |
| 1000pF              |         |     |      |     |
| 1100pF              |         |     |      |     |
| 1200pF              |         |     |      |     |
| 1300pF              |         |     |      |     |
| 1500pF              |         |     |      |     |
| 1800pF              |         |     |      |     |
| 2200pF              |         |     |      |     |
| 2700pF              |         |     |      |     |
| 3300pF              |         |     |      |     |
| 3900pF              |         |     |      |     |
| 4700pF              |         |     |      |     |
| 5600pF              | p34     |     |      |     |
| 6800pF              | p34     |     |      |     |
| 8200pF              |         |     | p34  |     |
| 10000pF             |         |     | p34  |     |
| 12000pF             |         |     |      |     |
| 15000pF             |         |     |      |     |
| 18000pF             |         |     |      |     |
| 20000pF             |         |     |      |     |
| 22000pF             |         |     |      |     |
| 27000pF             |         | p34 |      |     |
| 33000pF             |         |     |      | p34 |
| 39000pF             |         |     |      | p34 |
| 47000pF             |         |     |      | p34 |

## Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

### GCM Series High Dielectric Constant Type

p00 ← Part Number List

EIA: X7S X7R

Murata Temperature Characteristic: X8L

| L×W (mm)            | 0.6×0.3 |     |     | 1.0×0.5 |     |     |     |     |     |     | 1.6×0.8 |     |     |     |     | 2.0×1.25 |     |     |     |     |     |     |     |     |  |
|---------------------|---------|-----|-----|---------|-----|-----|-----|-----|-----|-----|---------|-----|-----|-----|-----|----------|-----|-----|-----|-----|-----|-----|-----|-----|--|
| T max. (mm)         | 0.33    |     |     | 0.55    |     |     |     |     |     |     | 0.9     |     |     |     |     | 0.7      |     |     |     |     | 1.4 |     |     |     |  |
| Rated Voltage (Vdc) | 25      | 16  | 10  | 100     | 50  | 25  | 16  | 10  | 10  | 100 | 50      | 25  | 16  | 6.3 | 100 | 100      | 50  | 25  | 16  | 100 | 50  | 35  |     |     |  |
| Cap. / TC Code      | X7R     | X7R | X7R | X7R     | X8L | X7R | X8L | X7R | X7S | X7S | X7R     | X7R | X7R | X7R | X7R | X7R      | X7R | X7R | X7R | X7R | X8L | X7R | X7S |     |  |
| 100pF               | p35     |     |     |         |     |     |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 150pF               | p35     |     |     |         |     |     |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 220pF               | p35     |     |     | p35     |     | p35 |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 330pF               | p35     | p35 |     | p35     |     | p35 |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 470pF               | p35     |     |     | p35     |     | p35 |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 680pF               | p35     | p35 |     | p35     |     | p35 |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 1000pF              | p35     |     |     | p35     |     | p35 |     |     |     |     | p35     |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 1500pF              | p35     |     |     | p35     |     | p35 |     |     |     |     | p35     |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 2200pF              | p35     | p35 |     | p35     |     | p35 |     |     |     |     | p35     |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 3300pF              | p35     | p35 |     | p35     |     | p35 |     |     |     |     | p35     |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 4700pF              |         |     | p35 | p35     |     | p35 |     |     |     |     | p35     |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 6800pF              |         | p35 |     |         | p35 |     |     |     |     |     | p35     |     |     |     |     | p35      |     |     |     |     |     |     |     |     |  |
| 10000pF             |         | p35 |     |         | p35 |     | p35 |     |     |     | p35     |     |     |     |     | p35      |     |     |     |     |     |     |     |     |  |
| 15000pF             |         |     |     |         | p35 |     | p35 |     |     |     | p35     |     |     |     |     | p35      |     |     |     |     |     |     |     |     |  |
| 22000pF             |         |     |     |         | p35 |     | p35 |     |     |     | p35     |     |     |     |     | p35      |     |     |     |     |     |     |     |     |  |
| 33000pF             |         |     |     | p35     | p35 |     | p35 | p35 |     |     |         |     |     |     |     | p35      |     |     |     |     |     |     |     |     |  |
| 47000pF             |         |     |     | p35     | p35 |     | p35 | p35 |     |     |         |     |     |     |     |          |     |     |     |     | p35 |     |     |     |  |
| 68000pF             |         |     |     | p35     | p35 |     |     | p35 |     |     |         |     |     |     |     |          |     |     |     |     | p35 |     |     |     |  |
| 0.10μF              |         |     |     | p35     | p35 | p35 |     | p35 |     |     |         |     |     |     |     |          |     |     |     |     | p35 |     |     |     |  |
| 0.15μF              |         |     |     |         |     |     |     | p35 |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 0.22μF              |         |     |     |         |     |     |     | p35 |     |     |         | p35 | p35 |     |     |          |     |     |     |     |     | p36 | p36 |     |  |
| 0.33μF              |         |     |     |         |     |     |     |     |     |     |         |     |     | p35 |     |          | p35 |     |     |     |     |     |     |     |  |
| 0.47μF              |         |     |     |         |     |     |     |     | p35 |     |         |     | p35 | p35 |     |          |     | p35 |     |     |     | p36 |     |     |  |
| 0.68μF              |         |     |     |         |     |     |     |     |     | p35 |         |     |     |     |     |          |     | p35 |     |     |     |     |     | p36 |  |
| 1.0μF               |         |     |     |         |     |     |     |     |     |     |         |     | p35 | p35 |     |          |     | p35 |     |     |     | p36 |     | p36 |  |
| 1.5μF               |         |     |     |         |     |     |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     | p36 |     |  |
| 2.2μF               |         |     |     |         |     |     |     |     |     |     |         |     |     | p35 |     |          |     |     |     |     |     |     |     | p36 |  |
| 4.7μF               |         |     |     |         |     |     |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 10μF                |         |     |     |         |     |     |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 22μF                |         |     |     |         |     |     |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |
| 47μF                |         |     |     |         |     |     |     |     |     |     |         |     |     |     |     |          |     |     |     |     |     |     |     |     |  |

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# Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ GCM Series High Dielectric Constant Type)

p00 ← Part Number List EIA: X7S X7R Murata Temperature Characteristic: X8L

| L×W (mm)            | 2.0×1.25 |     |     |     |     |     |      |     |     |     |     |     | 3.2×1.6 |     |     |     |     |     |     |     |     |     |     |     | 3.2×2.5 |     |     |     |     |     |     |  |
|---------------------|----------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|-----|--|
| T max. (mm)         | 1.4      |     |     |     |     |     | 1.45 |     |     |     |     |     | 1.25    |     | 1.8 |     |     |     |     |     |     |     | 1.9 | 2.2 |         |     |     |     |     |     |     |  |
| Rated Voltage (Vdc) | 25       |     | 16  |     | 10  |     | 6.3  |     | 100 |     | 35  |     | 25      |     | 16  |     | 100 |     | 50  |     | 25  |     | 16  |     | 10      |     | 6.3 |     | 25  |     | 100 |  |
| Cap. / TC Code      | X8L      | X7R | X7R | X7R | X7S | X7R | X7S  | X8L | X7S | X8L | X7S | X7S | X7R     | X7R | X8L | X7R | X7S | X7R | X7S | X7R | X7S | X7R | X7R | X7R | X7R     | X7R | X7S | X7S | X8L | X7S |     |  |
| 100pF               |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 150pF               |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 220pF               |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 330pF               |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 470pF               |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 680pF               |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 1000pF              |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 1500pF              |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 2200pF              |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 3300pF              |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 4700pF              |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 6800pF              |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 10000pF             |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 15000pF             |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 22000pF             |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 33000pF             |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 47000pF             |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 68000pF             |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 0.10μF              |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 0.15μF              | p36      | p36 |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 0.22μF              |          | p36 |     |     |     |     |      |     |     |     |     |     | p36     |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 0.33μF              |          | p36 |     |     |     |     |      |     |     |     |     |     |         | p36 |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 0.47μF              |          |     |     |     |     |     |      |     |     |     |     |     |         | p36 |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 0.68μF              |          | p36 |     |     |     |     |      |     |     |     |     |     |         | p36 |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 1.0μF               |          | p36 |     |     |     |     |      | p36 |     |     |     |     |         |     |     |     | p36 |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 1.5μF               |          | p36 |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 2.2μF               |          | p36 | p36 | p36 |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |
| 4.7μF               |          |     | p36 |     | p36 |     |      | p36 | p36 | p36 | p36 |     |         |     |     |     | p36 |     | p36 |     |     | p36 | p36 | p36 |         |     |     |     | p36 | p36 |     |  |
| 10μF                |          |     |     | p36 |     | p36 |      |     |     |     |     | p36 |         |     |     |     |     |     |     |     |     |     | p36 | p36 |         |     |     | p36 |     |     |     |  |
| 22μF                |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     | p36     | p36 |     |     |     |     |     |  |
| 47μF                |          |     |     |     |     |     |      |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |     |     |         |     |     |     |     |     |     |  |

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## Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

### (→ GCM Series High Dielectric Constant Type)

p00 ← Part Number List EIA: X7S X7R Murata Temperature Characteristic: X8L

| L×W (mm)            | 3.2×2.5 |     |     |     |     |     |     |     |     |      |     |
|---------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|
| T max. (mm)         | 2.2     | 2.7 |     |     |     |     |     |     |     | 2.85 |     |
| Rated Voltage (Vdc) | 16      | 50  |     |     |     | 35  | 25  | 16  | 10  | 6.3  | 25  |
| Cap. / TC Code      | X7R     | X8L | X7R | X7S | X7S | X7R | X7R | X7R | X7R | X8L  | X7S |
| 100pF               |         |     |     |     |     |     |     |     |     |      |     |
| 150pF               |         |     |     |     |     |     |     |     |     |      |     |
| 220pF               |         |     |     |     |     |     |     |     |     |      |     |
| 330pF               |         |     |     |     |     |     |     |     |     |      |     |
| 470pF               |         |     |     |     |     |     |     |     |     |      |     |
| 680pF               |         |     |     |     |     |     |     |     |     |      |     |
| 1000pF              |         |     |     |     |     |     |     |     |     |      |     |
| 1500pF              |         |     |     |     |     |     |     |     |     |      |     |
| 2200pF              |         |     |     |     |     |     |     |     |     |      |     |
| 3300pF              |         |     |     |     |     |     |     |     |     |      |     |
| 4700pF              |         |     |     |     |     |     |     |     |     |      |     |
| 6800pF              |         |     |     |     |     |     |     |     |     |      |     |
| 10000pF             |         |     |     |     |     |     |     |     |     |      |     |
| 15000pF             |         |     |     |     |     |     |     |     |     |      |     |
| 22000pF             |         |     |     |     |     |     |     |     |     |      |     |
| 33000pF             |         |     |     |     |     |     |     |     |     |      |     |
| 47000pF             |         |     |     |     |     |     |     |     |     |      |     |
| 68000pF             |         |     |     |     |     |     |     |     |     |      |     |
| 0.10μF              |         |     |     |     |     |     |     |     |     |      |     |
| 0.15μF              |         |     |     |     |     |     |     |     |     |      |     |
| 0.22μF              |         |     |     |     |     |     |     |     |     |      |     |
| 0.33μF              |         |     |     |     |     |     |     |     |     |      |     |
| 0.47μF              |         |     |     |     |     |     |     |     |     |      |     |
| 0.68μF              |         |     |     |     |     |     |     |     |     |      |     |
| 1.0μF               |         |     |     |     |     |     |     |     |     |      |     |
| 1.5μF               |         |     |     |     |     |     |     |     |     |      |     |
| 2.2μF               |         |     |     |     |     |     |     |     |     |      |     |
| 4.7μF               |         |     |     | p36 |     |     |     |     |     |      |     |
| 10μF                | p36     | p36 |     | p36 | p36 | p36 |     |     |     |      |     |
| 22μF                |         |     |     |     |     |     | p36 | p36 |     | p36  | p36 |
| 47μF                |         |     |     |     |     |     |     |     | p36 |      |     |

### GC3 Series High Dielectric Constant Type

p00 ← Part Number List EIA: X7T

| L×W (mm)            | 2.0×1.25 |      |     | 3.2×1.6 |      |     |     |     |     | 3.2×2.5 |     |     |     |     | 4.5×3.2 |     |     |     | 5.7×5.0 |     |     |     |     |     |
|---------------------|----------|------|-----|---------|------|-----|-----|-----|-----|---------|-----|-----|-----|-----|---------|-----|-----|-----|---------|-----|-----|-----|-----|-----|
| T max. (mm)         | 1.0      | 1.45 |     | 1.0     | 1.25 | 1.8 |     |     |     | 1.5     | 2.0 |     |     |     | 1.5     | 2.0 |     |     | 2.0     | 2.7 |     |     |     |     |
| Rated Voltage (Vdc) | 250      | 250  | 450 | 250     | 630  | 450 | 250 | 630 | 450 | 250     | 630 | 250 | 630 | 450 | 250     | 630 | 450 | 250 | 630     | 450 | 250 | 630 | 250 |     |
| Cap. / TC Code      | X7T      | X7T  | X7T | X7T     | X7T  | X7T | X7T | X7T | X7T | X7T     | X7T | X7T | X7T | X7T | X7T     | X7T | X7T | X7T | X7T     | X7T | X7T | X7T | X7T | X7T |
| 10000pF             | p38      |      | p38 |         | p38  |     |     |     |     |         |     |     |     |     |         |     |     |     |         |     |     |     |     |     |
| 15000pF             | p38      |      | p38 |         |      |     |     | p38 |     |         |     |     |     |     |         |     |     |     |         |     |     |     |     |     |
| 22000pF             |          | p38  |     |         | p38  |     |     |     |     | p38     |     |     |     |     |         |     |     |     |         |     |     |     |     |     |
| 33000pF             |          |      |     | p38     | p38  |     |     |     |     |         | p38 |     |     |     |         |     |     |     |         |     |     |     |     |     |
| 47000pF             |          |      |     |         |      | p38 |     | p38 |     |         |     | p38 |     |     |         |     |     |     |         |     |     |     |     |     |
| 68000pF             |          |      |     |         |      |     |     |     | p38 |         |     |     | p38 |     |         | p38 |     |     |         |     |     |     |     |     |
| 0.10μF              |          |      |     |         |      |     |     |     |     | p38     |     |     | p38 |     |         |     |     |     | p38     |     |     |     |     |     |
| 0.15μF              |          |      |     |         |      |     |     |     |     |         |     |     |     | p38 |         |     |     | p38 |         |     |     |     |     |     |
| 0.22μF              |          |      |     |         |      |     |     |     |     |         |     |     |     |     | p38     |     |     |     |         |     |     |     | p38 |     |
| 0.33μF              |          |      |     |         |      |     |     |     |     |         |     |     |     |     |         |     | p38 |     |         |     |     |     |     |     |
| 0.47μF              |          |      |     |         |      |     |     |     |     |         |     |     |     |     |         |     |     | p38 |         | p38 |     |     |     |     |
| 0.68μF              |          |      |     |         |      |     |     |     |     |         |     |     |     |     |         |     |     |     |         | p38 |     |     |     |     |
| 1.0μF               |          |      |     |         |      |     |     |     |     |         |     |     |     |     |         |     |     |     |         |     |     |     |     | p38 |



# Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ GCJ Series High Dielectric Constant Type)

p00 ← Part Number List

EIA: X7S X7R X8R

Murata Temperature Characteristic: X8L X8M

| L×W (mm)            | 2.0×1.25 |     |     |     |     |      |      |      |     |     | 3.2×1.6 |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
|---------------------|----------|-----|-----|-----|-----|------|------|------|-----|-----|---------|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|--|
| T max. (mm)         | 1.45     |     |     |     |     | 1.5  | 0.95 | 1.25 |     |     |         |     | 1.35 |     |     |     | 1.8 |     |     | 1.9 |     |     |     |     |     |     |     |     |     |  |
| Rated Voltage (Vdc) | 25       | 16  | 10  | 100 | 100 | 1000 | 630  | 250  | 100 | 50  | 25      | 16  | 1000 | 630 | 250 | 100 | 50  | 35  | 25  | 16  | 10  | 6.3 |     |     |     |     |     |     |     |  |
| Cap. / TC Code      | X8L      | X7R | X8L | X7R | X7R | X7S  | X7R  | X7R  | X7R | X7R | X7R     | X7R | X7R  | X7R | X7R | X7R | X8L | X7R | X7R | X7S | X8L | X8L | X7R | X8L | X7R | X8L | X7R | X8L | X7R |  |
| 220pF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 270pF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 330pF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 390pF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 470pF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 560pF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 680pF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 820pF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 1000pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 1200pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 1500pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 1800pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 2200pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 2700pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 3300pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 3900pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 4700pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 5600pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 6800pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 8200pF              |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 10000pF             |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 12000pF             |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 15000pF             |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 18000pF             |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 22000pF             |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 27000pF             |          | p42 |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 33000pF             |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 39000pF             |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 47000pF             |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 56000pF             |          | p42 |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 68000pF             |          | p42 |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 82000pF             |          | p42 |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.10μF              |          | p42 |     |     |     |      | p42  |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.12μF              | p42      |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.15μF              | p42      |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.18μF              | p42      |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.22μF              | p42      |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.27μF              | p42      | p42 |     | p42 |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.33μF              | p42      |     |     | p42 |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.39μF              | p42      | p42 |     | p42 |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.47μF              | p42      |     |     | p42 |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.56μF              |          | p42 | p42 | p42 |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.68μF              | p42      | p42 | p42 |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 0.82μF              | p42      | p42 | p42 |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 1.0μF               | p42      | p42 | p42 | p42 |     | p42  |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 1.5μF               |          | p42 |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 2.2μF               |          | p42 |     | p42 | p42 |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 3.3μF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 4.7μF               |          |     |     | p42 |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 6.8μF               |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 10μF                |          |     |     |     | p42 |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 22μF                |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |
| 47μF                |          |     |     |     |     |      |      |      |     |     |         |     |      |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |  |

Continued on the following page. ↗

## Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ GCJ Series High Dielectric Constant Type)

p00 ← Part Number List

EIA: X7S X7R X8R

Murata Temperature Characteristic: X8L X8M

| L×W (mm)            | 3.2×1.6 |     | 3.2×2.5 |     |      |     |     |     |     |     |     |     |      |     |     |     | 4.5×3.2 |     |     |      |     |     | 5.7×5.0 |     |     |      |     |     |
|---------------------|---------|-----|---------|-----|------|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|---------|-----|-----|------|-----|-----|---------|-----|-----|------|-----|-----|
| T max. (mm)         | 2.0     |     | 1.5     |     | 2.0  |     | 2.3 |     | 2.8 |     |     |     | 2.85 |     | 1.5 |     | 2.0     |     | 2.0 |      |     |     |         |     |     |      |     |     |
| Rated Voltage (Vdc) | 25      |     | 630     | 250 | 1000 | 630 | 250 | 100 |     | 50  | 25  | 16  | 6.3  | 25  | 630 | 250 | 1000    | 630 | 250 | 1000 | 630 | 250 | 1000    | 630 | 250 | 1000 | 630 | 250 |
| Cap. / TC Code      | X8L     | X7S | X7R     | X7R | X7R  | X7R | X7R | X8L | X7R | X7S | X7R | X7S | X8L  | X8R | X7R | X7R | X8L     | X7S | X7R | X7R  | X7R | X7R | X7R     | X7R | X7R | X7R  | X7R | X7R |
| 220pF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 270pF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 330pF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 390pF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 470pF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 560pF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 680pF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 820pF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 1000pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 1200pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 1500pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 1800pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 2200pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 2700pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 3300pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 3900pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 4700pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 5600pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 6800pF              |         |     | p43     |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 8200pF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 10000pF             |         |     | p43     |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 12000pF             |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 15000pF             |         |     |         |     | p43  | p43 |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 18000pF             |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 22000pF             |         |     |         |     | p43  | p43 |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 27000pF             |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 33000pF             |         |     |         |     |      | p43 |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 39000pF             |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 47000pF             |         |     |         |     |      | p43 |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 56000pF             |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 68000pF             |         |     | p43     |     |      |     |     |     |     |     |     |     |      |     |     |     | p43     |     |     |      |     |     |         | p43 |     |      |     |     |
| 82000pF             |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 0.10μF              |         |     |         |     |      | p43 |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         | p43 | p43 |      |     |     |
| 0.12μF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 0.15μF              |         |     | p43     |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     | p43 |      |     |     |         |     |     | p43  |     |     |
| 0.18μF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 0.22μF              |         |     |         |     |      | p43 |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         | p43 |     | p44  |     |     |
| 0.27μF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 0.33μF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     | p43 |      | p44 |     |
| 0.39μF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 0.47μF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     | p43 |      | p44 |     |
| 0.56μF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 0.68μF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     | p44 |
| 0.82μF              |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 1.0μF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     | p44 |
| 1.5μF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 2.2μF               |         |     |         |     |      |     | p43 | p43 |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 3.3μF               |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 4.7μF               |         |     |         |     |      |     |     |     | p43 | p43 |     |     | p43  |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 6.8μF               |         |     |         |     |      |     |     |     |     |     |     |     |      | p43 |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 10μF                | p43     | p43 |         |     |      |     |     |     |     |     |     | p43 |      |     |     |     |         |     |     |      |     |     |         |     |     |      |     |     |
| 22μF                |         |     |         |     |      |     |     |     |     |     |     |     |      |     | p43 |     | p43     | p43 |     |      |     |     |         |     |     |      |     |     |
| 47μF                |         |     |         |     |      |     |     |     |     |     |     |     |      |     |     | p43 |         |     |     |      |     |     |         |     |     |      |     |     |

## Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

### GCD Series High Dielectric Constant Type

p00 ← Part Number List EIA: X7R

| L×W (mm)            | 1.6×0.8 |     |     | 2.0×1.25 |      |     |     |
|---------------------|---------|-----|-----|----------|------|-----|-----|
| T max. (mm)         | 0.9     |     |     | 0.7      | 0.95 | 1.4 |     |
| Rated Voltage (Vdc) | 100     | 50  | 25  | 100      | 100  | 100 | 50  |
| Cap. / TC Code      | X7R     | X7R | X7R | X7R      | X7R  | X7R | X7R |
| 1000pF              | p46     | p46 |     | p46      |      |     |     |
| 1200pF              | p46     | p46 |     | p46      |      |     |     |
| 1500pF              | p46     | p46 |     | p46      |      |     |     |
| 1800pF              | p46     | p46 |     | p46      |      |     |     |
| 2200pF              | p46     | p46 |     | p46      |      |     |     |
| 2700pF              | p46     | p46 |     | p46      |      |     |     |
| 3300pF              | p46     | p46 |     | p46      |      |     |     |
| 3900pF              | p46     | p46 |     | p46      |      |     |     |
| 4700pF              | p46     | p46 |     | p46      |      |     |     |
| 5600pF              | p46     | p46 |     | p46      |      |     |     |
| 6800pF              | p46     | p46 |     |          | p46  |     |     |
| 8200pF              | p46     | p46 |     |          |      | p46 |     |
| 10000pF             | p46     | p46 |     |          |      | p46 |     |
| 12000pF             | p46     | p46 |     |          |      | p46 |     |
| 15000pF             | p46     | p46 |     |          |      | p46 | p46 |
| 18000pF             | p46     | p46 |     |          |      | p46 | p46 |
| 22000pF             | p46     | p46 |     |          |      | p46 | p46 |
| 27000pF             |         |     | p46 |          |      | p46 | p46 |
| 33000pF             |         |     | p46 |          |      | p46 | p46 |
| 39000pF             |         |     | p46 |          |      | p46 | p46 |
| 47000pF             |         |     | p46 |          |      | p46 | p46 |
| 56000pF             |         |     |     |          |      | p46 | p46 |
| 68000pF             |         |     |     |          |      | p46 | p46 |
| 82000pF             |         |     |     |          |      | p46 | p46 |
| 0.10μF              |         |     |     |          |      | p46 | p46 |

### GCE Series High Dielectric Constant Type

p00 ← Part Number List EIA: X7R

| L×W (mm)            | 1.6×0.8 |     |     | 2.0×1.25 |      |      |     |
|---------------------|---------|-----|-----|----------|------|------|-----|
| T max. (mm)         | 0.9     |     |     | 0.7      | 0.95 | 1.45 |     |
| Rated Voltage (Vdc) | 100     | 50  | 25  | 100      | 100  | 100  | 50  |
| Cap. / TC Code      | X7R     | X7R | X7R | X7R      | X7R  | X7R  | X7R |
| 220pF               |         |     |     |          | p48  |      |     |
| 270pF               |         |     |     |          | p48  |      |     |
| 330pF               |         |     |     |          | p48  |      |     |
| 390pF               |         |     |     |          | p48  |      |     |
| 470pF               |         |     |     |          | p48  |      |     |
| 560pF               |         |     |     |          | p48  |      |     |
| 680pF               |         |     |     |          | p48  |      |     |
| 820pF               |         |     |     |          | p48  |      |     |
| 1000pF              | p48     | p48 |     | p48      |      |      |     |
| 1200pF              | p48     | p48 |     | p48      |      |      |     |
| 1500pF              | p48     | p48 |     | p48      |      |      |     |
| 1800pF              | p48     | p48 |     | p48      |      |      |     |
| 2200pF              | p48     | p48 |     | p48      |      |      |     |
| 2700pF              | p48     | p48 |     | p48      |      |      |     |
| 3300pF              | p48     | p48 |     | p48      |      |      |     |
| 3900pF              | p48     | p48 |     | p48      |      |      |     |
| 4700pF              | p48     | p48 |     | p48      |      |      |     |
| 5600pF              | p48     | p48 |     | p48      |      |      |     |
| 6800pF              | p48     | p48 |     |          | p48  |      |     |
| 8200pF              | p48     | p48 |     |          |      | p48  |     |
| 10000pF             | p48     | p48 |     |          |      | p48  |     |
| 12000pF             | p48     | p48 |     |          |      | p48  |     |
| 15000pF             | p48     | p48 |     |          |      | p48  | p48 |
| 18000pF             | p48     | p48 |     |          |      | p48  | p48 |
| 22000pF             | p48     | p48 |     |          |      | p48  | p48 |
| 27000pF             |         |     | p48 |          |      | p48  | p48 |
| 33000pF             |         |     | p48 |          |      | p48  | p48 |
| 39000pF             |         |     | p48 |          |      | p48  | p48 |
| 47000pF             |         |     | p48 |          |      | p48  | p48 |
| 56000pF             |         |     |     |          |      | p48  | p48 |
| 68000pF             |         |     |     |          |      | p48  | p48 |
| 82000pF             |         |     |     |          |      | p48  | p48 |
| 0.10μF              |         |     |     |          |      | p48  | p48 |

### NFM Series

p00 ← Part Number List

| L×W (mm)            | 2.0×1.25 |     |     | 3.2×1.6 |     |
|---------------------|----------|-----|-----|---------|-----|
| T max. (mm)         | 0.95     |     |     | 1.5     |     |
| Rated Voltage (Vdc) | 50       | 16  | 10  | 100     | 50  |
| Cap. / TC Code      | -        | -   | -   | -       | -   |
| 220pF               | p50      |     |     |         |     |
| 470pF               | p50      |     |     |         |     |
| 1000pF              | p50      |     |     |         |     |
| 2200pF              | p50      |     |     |         |     |
| 10000pF             |          |     |     | p50     | p50 |
| 15000pF             |          |     |     |         | p50 |
| 22000pF             | p50      |     |     |         | p50 |
| 0.10μF              |          |     | p50 |         | p50 |
| 0.22μF              |          |     | p50 |         |     |
| 0.47μF              |          |     | p50 |         |     |
| 1.0μF               |          | p50 |     |         |     |

## Capacitance Table

p00

Each number in the Part Number List refers to the page number printed at the bottom of the page.

### KCM Series High Dielectric Constant Type

p00 ← Part Number List

EIA: X7S X7R

| L×W (mm)            | 6.1×5.3 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
|---------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T max. (mm)         | 3.0     |     |     |     |     | 3.9 |     |     |     |     | 5.0 |     |     |     |     | 6.7 |     |     |     |     |
| Rated Voltage (Vdc) | 100     | 63  | 50  | 35  | 25  | 100 | 63  | 50  | 35  | 25  | 100 | 50  | 35  | 25  | 100 | 63  | 50  | 35  | 25  |     |
| Cap. / TC Code      | X7R     | X7R | X7R | X7R | X7R | X7R | X7R | X7R | X7R | X7S | X7R | X7R | X7R | X7R | X7R | X7R | X7R | X7R | X7R | X7S |
| 4.7μF               | p53     | p53 | p53 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 6.8μF               |         |     |     |     |     | p53 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 10μF                |         |     | p53 | p53 |     | p53 | p53 |     |     |     | p53 |     |     |     |     |     |     |     |     |     |
| 15μF                |         |     |     | p53 | p53 |     |     |     |     |     |     |     |     |     |     | p53 |     |     |     |     |
| 17μF                |         |     |     |     |     |     |     | p53 | p53 |     |     |     |     |     |     |     |     |     |     |     |
| 22μF                |         |     |     |     |     |     |     | p53 | p53 |     |     | p53 | p53 |     | p53 | p53 |     |     |     |     |
| 33μF                |         |     |     |     |     |     |     |     | p53 |     |     |     | p53 | p53 |     |     |     | p53 |     |     |
| 47μF                |         |     |     |     |     |     |     |     |     | p53 |     |     |     |     |     |     |     |     | p53 | p53 |
| 68μF                |         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | p53 |
| 100μF               |         |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | p53 |

### KC3 Series High Dielectric Constant Type

p00 ← Part Number List

EIA: X7T

| L×W (mm)            | 6.1×5.3 |     |     |     |     |     |     |     |     |     |     |     |
|---------------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T max. (mm)         | 3.0     |     |     | 3.9 |     |     | 5.0 |     |     | 6.7 |     |     |
| Rated Voltage (Vdc) | 630     | 450 | 250 | 630 | 450 | 250 | 630 | 450 | 250 | 630 | 450 | 250 |
| Cap. / TC Code      | X7T     | X7T | X7T | X7T | X7T | X7T | X7T | X7T | X7T | X7T | X7T | X7T |
| 0.10μF              | p56     |     |     |     |     |     |     |     |     |     |     |     |
| 0.15μF              | p56     |     |     |     |     |     |     |     |     |     |     |     |
| 0.22μF              |         | p56 |     | p56 |     |     |     |     |     |     |     |     |
| 0.27μF              |         |     |     | p56 |     |     |     |     |     |     |     |     |
| 0.33μF              | p56     | p56 |     |     |     |     |     |     |     |     |     |     |
| 0.47μF              | p56     | p56 | p56 |     |     |     |     |     |     | p56 |     |     |
| 0.56μF              |         |     |     | p56 | p56 |     |     |     |     | p56 |     |     |
| 0.68μF              |         | p56 | p56 |     |     |     | p56 | p56 |     |     |     |     |
| 1.0μF               |         |     |     | p56 | p56 | p56 | p56 |     |     |     |     |     |
| 1.2μF               |         |     |     |     |     |     |     |     |     | p56 | p56 |     |
| 1.5μF               |         |     |     |     |     |     | p56 | p56 |     |     |     |     |
| 2.2μF               |         |     |     |     |     |     |     |     |     | p56 | p56 |     |

### GCG Series Temperature Compensating Type

p00 ← Part Number List

Murata Temperature Characteristic: X8G

| L×W (mm)            | 1.0×0.5 | 1.6×0.8 | 2.0×1.25 |      |
|---------------------|---------|---------|----------|------|
| T max. (mm)         | 0.55    | 0.9     | 0.7      | 0.95 |
| Rated Voltage (Vdc) | 50      | 50      | 50       | 50   |
| Cap. / TC Code      | X8G     | X8G     | X8G      | X8G  |
| 10pF                |         | p61     |          |      |
| 12pF                |         | p61     |          |      |
| 15pF                |         | p61     |          |      |
| 18pF                |         | p61     |          |      |
| 22pF                |         | p61     |          |      |
| 27pF                |         | p61     |          |      |
| 33pF                |         | p61     |          |      |
| 39pF                |         | p61     |          |      |
| 47pF                |         | p61     |          |      |
| 56pF                |         | p61     |          |      |
| 68pF                |         | p61     |          |      |
| 82pF                |         | p61     |          |      |
| 100pF               |         | p61     |          |      |
| 120pF               | p61     | p61     |          |      |
| 150pF               | p61     | p61     |          |      |
| 180pF               | p61     | p61     |          |      |
| 220pF               | p61     | p61     |          |      |
| 270pF               | p61     | p61     |          |      |
| 330pF               | p61     | p61     |          |      |
| 390pF               | p61     | p61     |          |      |
| 470pF               | p61     | p61     |          |      |
| 560pF               |         | p61     |          |      |
| 680pF               |         | p61     |          |      |
| 820pF               |         | p61     |          |      |
| 1000pF              |         | p61     | p61      |      |
| 1200pF              |         | p61     | p61      |      |
| 1500pF              |         | p61     | p61      |      |
| 1800pF              |         | p61     | p61      |      |
| 2200pF              |         | p61     | p61      |      |
| 2700pF              |         |         | p61      |      |
| 3300pF              |         |         | p61      |      |
| 3900pF              |         |         | p61      |      |
| 4700pF              |         |         | p61      |      |
| 5600pF              |         |         |          | p61  |
| 6800pF              |         |         |          | p61  |
| 8200pF              |         |         |          | p61  |
| 10000pF             |         |         |          | p61  |

### KCA Series Temperature Compensating Type

p00 ← Part Number List

EIA: U2J

| L×W (mm)                     | 6.1×5.3 |     |     |     |
|------------------------------|---------|-----|-----|-----|
| T max. (mm)                  | 3.0     | 3.9 | 5.0 | 6.7 |
| Rated Voltage (Vac (r.m.s.)) | 250     | 250 | 250 | 250 |
| Cap. / TC Code               | U2J     | U2J | U2J | U2J |
| 100pF                        | p59     |     |     |     |
| 150pF                        | p59     |     |     |     |
| 220pF                        | p59     |     |     |     |
| 330pF                        | p59     |     |     |     |
| 470pF                        | p59     |     |     |     |
| 680pF                        | p59     |     |     |     |
| 1000pF                       | p59     |     |     |     |
| 1500pF                       | p59     |     |     |     |
| 2200pF                       | p59     |     |     |     |
| 3300pF                       | p59     |     |     |     |
| 4700pF                       |         | p59 |     |     |
| 6800pF                       |         |     | p59 |     |
| 10000pF                      |         |     |     | p59 |

# Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

## GCG Series High Dielectric Constant Type

p00 ← Part Number List

EIA: X7S X7R X8R

Murata Temperature Characteristic: X8L

| L×W (mm)            | 1.0×0.5 |     |     |     |     | 1.6×0.8 |     |     |     |     |     |     |     |     |     | 2.0×1.25 |      |     |     |     |     |     |     |     |     |     |
|---------------------|---------|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|----------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T max. (mm)         | 0.55    |     |     |     |     | 0.9     |     |     |     |     |     |     |     |     |     | 0.95     | 1.45 |     |     |     |     |     |     |     |     |     |
| Rated Voltage (Vdc) | 50      | 25  | 16  | 100 | 50  | 25      | 16  | 10  | 6.3 | 50  | 100 | 50  | 35  | 25  |     |          |      |     |     |     |     |     |     |     |     |     |
| Cap. / TC Code      | X7R     | X8L | X7R | X8L | X7R | X8R     | X8L | X8R | X7R | X8R | X7R | X8L | X8R | X7R | X7R | X8R      | X7R  | X8L | X8R | X7R | X8L | X7R | X8L | X8R | X7R | X8R |
| 220pF               | p62     |     |     |     |     |         | p62 |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 270pF               | p62     |     |     |     |     |         | p62 |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 330pF               | p62     |     |     |     |     |         | p62 |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 390pF               | p62     |     |     |     |     |         | p62 |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 470pF               | p62     |     |     |     |     |         | p62 |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 560pF               | p62     |     |     |     |     |         | p62 |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 680pF               | p62     |     |     |     |     |         | p62 |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 820pF               | p62     |     |     |     |     |         | p62 |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 1000pF              | p62     |     |     |     |     | p62     | p62 |     |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 1200pF              | p62     |     |     |     |     | p62     | p62 | p62 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 1500pF              | p62     |     |     |     |     | p62     | p62 | p62 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 1800pF              | p62     |     |     |     |     | p62     | p62 |     |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 2200pF              | p62     |     |     |     |     | p62     | p62 | p62 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 2700pF              | p62     |     |     |     |     | p62     | p62 | p62 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 3300pF              | p62     |     |     |     |     | p62     | p62 | p62 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 3900pF              | p62     |     |     |     |     | p62     | p62 | p62 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 4700pF              | p62     |     |     |     |     | p62     | p62 | p62 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 5600pF              |         | p62 | p62 |     |     | p62     | p62 | p63 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 6800pF              |         | p62 | p62 |     |     | p62     | p62 | p63 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 8200pF              |         | p62 | p62 |     |     | p62     | p62 | p63 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 10000pF             |         | p62 | p62 |     |     | p62     | p62 | p63 | p63 | p63 |     |     |     |     |     |          | p63  |     |     |     |     |     |     |     |     |     |
| 12000pF             |         |     |     |     |     | p62     | p62 |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 15000pF             |         |     |     | p62 | p62 | p62     | p62 | p63 | p63 | p63 |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 18000pF             |         |     |     | p62 | p62 | p62     | p62 |     |     |     |     |     |     |     |     |          | p63  |     |     |     |     |     |     |     |     |     |
| 22000pF             |         |     |     | p62 | p62 | p62     | p62 | p63 | p63 | p63 |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 27000pF             |         |     |     | p62 | p62 | p62     |     |     |     | p63 |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 33000pF             |         |     |     | p62 | p62 | p62     |     |     |     | p63 | p63 | p63 |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 39000pF             |         |     |     | p62 | p62 | p62     |     |     |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     | p63 |
| 47000pF             |         |     |     | p62 | p62 | p62     |     |     |     |     | p63 | p63 | p63 |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 56000pF             |         |     |     |     | p62 | p62     |     |     |     |     | p63 |     |     |     |     |          |      |     |     | p63 |     |     |     |     |     |     |
| 68000pF             |         |     |     |     | p62 | p62     |     |     |     |     | p63 | p63 |     |     |     |          |      |     |     | p63 |     |     |     |     |     |     |
| 82000pF             |         |     |     |     | p62 |         |     |     |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     | p63 |     |
| 0.10μF              |         |     |     | p62 | p62 |         |     | p63 | p63 |     |     |     |     |     |     |          |      |     |     | p63 | p63 |     |     | p63 |     |     |
| 0.12μF              |         |     |     |     |     |         |     | p63 |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 0.15μF              |         |     |     |     |     | p62     | p63 | p63 |     |     | p63 | p63 |     |     |     |          |      |     |     | p63 |     |     |     |     | p63 |     |
| 0.18μF              |         |     |     |     |     |         | p63 |     |     |     | p63 |     |     |     |     |          |      |     |     | p63 |     |     |     |     | p63 |     |
| 0.22μF              |         |     |     |     |     | p62     | p63 | p63 |     |     | p63 | p63 |     |     |     |          |      |     |     | p63 |     |     |     |     | p63 |     |
| 0.27μF              |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     | p63 |     |
| 0.33μF              |         |     |     |     |     |         |     |     |     |     | p63 |     |     |     |     |          |      |     |     | p63 |     |     |     | p63 |     | p63 |
| 0.39μF              |         |     |     |     |     |         |     |     |     |     | p63 |     |     |     |     |          |      |     |     |     |     |     |     | p63 |     | p63 |
| 0.47μF              |         |     |     |     |     |         |     |     |     |     | p63 |     |     |     |     |          |      |     |     | p63 |     |     |     | p63 |     | p63 |
| 0.56μF              |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     | p63 | p63 |     |
| 0.68μF              |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     | p63 | p63 |     |     | p63 | p63 |     |
| 0.82μF              |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     | p63 | p63 |     |
| 1.0μF               |         |     |     |     |     |         |     |     |     |     |     | p63 |     | p63 |     |          |      |     |     | p63 |     | p63 | p63 |     | p63 | p63 |
| 1.2μF               |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 1.5μF               |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 2.2μF               |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 3.3μF               |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 3.9μF               |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 4.7μF               |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 6.8μF               |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 10μF                |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 22μF                |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |
| 47μF                |         |     |     |     |     |         |     |     |     |     |     |     |     |     |     |          |      |     |     |     |     |     |     |     |     |     |

Continued on the following page. ↗

## Capacitance Table

p00 Each number in the Part Number List refers to the page number printed at the bottom of the page.

(→ GCG Series High Dielectric Constant Type)

p00 ← Part Number List

EIA: X7S X7R X8R

Murata Temperature Characteristic: X8L

| L×W (mm)            | 2.0×1.25 |     |     |     |     |     | 3.2×1.6 |     |     |     |     |     | 3.2×2.5 |     |     |     |     |     |     |     |     |     |
|---------------------|----------|-----|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| T max. (mm)         | 1.45     |     |     |     |     |     | 1.35    |     |     |     |     |     | 1.9     |     |     |     |     |     |     |     |     |     |
| Rated Voltage (Vdc) | 16       |     | 10  |     | 6.3 |     | 50      |     | 25  |     | 16  |     | 25      |     | 16  |     | 6.3 |     |     |     |     |     |
| Cap. / TC Code      | X8L      | X7R | X7R | X8L | X7R | X8R | X8R     | X7R | X8L | X8R | X7R | X8L | X8R     | X7R | X7R | X8L | X7S | X8L | X7S | X7R | X8R | X7R |
| 220pF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 270pF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 330pF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 390pF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 470pF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 560pF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 680pF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 820pF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 1000pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 1200pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 1500pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 1800pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 2200pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 2700pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 3300pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 3900pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 4700pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 5600pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 6800pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 8200pF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 10000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 12000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 15000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 18000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 22000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 27000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 33000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 39000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 47000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 56000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 68000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 82000pF             |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.10μF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.12μF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.15μF              |          |     |     |     |     |     |         |     |     | p64 |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.18μF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.22μF              |          |     |     |     |     |     |         |     |     | p64 | p64 |     |         |     |     |     |     |     |     |     |     |     |
| 0.27μF              |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.33μF              | p63      |     |     |     |     |     |         |     |     | p64 | p64 |     |         |     |     |     |     |     |     |     |     |     |
| 0.39μF              | p63      |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.47μF              | p63      |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.56μF              | p63      |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.68μF              | p63      |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 0.82μF              | p63      |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 1.0μF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 1.2μF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 1.5μF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 2.2μF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 3.3μF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 3.9μF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 4.7μF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 6.8μF               |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 10μF                |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 22μF                |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |
| 47μF                |          |     |     |     |     |     |         |     |     |     |     |     |         |     |     |     |     |     |     |     |     |     |

## Search Capacitors

Specifications and Test Methods, Package, Chart of Characteristic Data, please refer to the search web page.  
<http://www.murata.com/en-global/products/capacitor>

### GRT Series Temperature Compensating

1.0×0.5mm

| T max. | Rated Voltage | TC Code | Cap.  | Tol.    | Part Number      |
|--------|---------------|---------|-------|---------|------------------|
| 0.5mm  | 100Vdc        | COG     | 1.0pF | ±0.25pF | GRT1555A1R0CA02# |
|        |               |         | 2.0pF | ±0.25pF | GRT1555A2R0CA02# |
|        |               |         | 3.0pF | ±0.25pF | GRT1555A3R0CA02# |
|        |               |         | 4.0pF | ±0.25pF | GRT1555A4R0CA02# |
|        |               |         | 5.0pF | ±0.25pF | GRT1555A5R0CA02# |

Links are provided to the product detail pages on the web, and are shown below in the product number table from the PDF version of the catalog which is available on the web.

### Status and Features Icons

The status and features of products can be checked at once. When ? is clicked, a description of each icon will be displayed

### Stock Check (Where to buy)

Reference inventory information from agents and web-based companies.

### Data Sheet

The product details page can be output in PDF.

### How to read part numbers

Describes the meaning of the part number

### Series Information

This links to the introduction page of each series.

### Detailed Specifications Sheet

- Rated value
- Specifications and Test Methods
- Package
- Caution, Notice (Storage, Soldering and Mounting, ....etc.)

### Characteristics Data

The following characteristics data of the main products can be acquired.

- SPICE Netlist (mod type)
- S parameter (S2P type)
- Reliability Test Data \*Typical data

- Shape (Dimensions)
- Rated Values

- Specification by Packaging Code/ Minimum Order Quantity
- Weight (1 pc/ø180mm reel)

### Chart of Characteristic Data

The main products published characteristic data.

- Frequency characteristics (ESR, Impedance)
- DC bias characteristics
- AC voltage characteristics
- Capacitance - temperature characteristics
- Calorific property by ripple current

### Design Tools SimSurfing

The SimSurfing design tools are useful for displaying the graph, downloading CSV data and overwriting the product number graph.

## AEC-Q200 Compliant Chip Multilayer Ceramic Capacitors for Infotainment

### GRT Series



Capacitor meet AEC-Q200 (Grade2 or Grade3).

### Features

#### ① This product has cleared test conditions meet AEC-Q200.

This series is designed for use in Car Multimedia, Car Interior, Car Comfort application and General Electronic equipment. It is not appropriate for use in applications critical to passenger safety and car driving function (e.g. ABS, AIRBAG, etc.). Please use the GCM series is in critical applications.

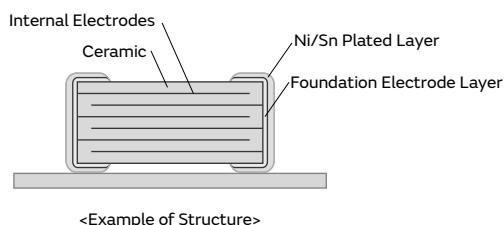
|                   | General Purpose GRM Series<br>Maximum operating temperature: <b>125°C</b>                    | AEC-Q200 meeted GRT Series<br>Maximum operating temperature: <b>125°C</b>                      |
|-------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| Items             | Test Method                                                                                  | Test Method                                                                                    |
| Temperature Cycle | Temperature Cycle: <b>5 cycles</b>                                                           | Temperature Cycle: <b>1,000 cycles</b>                                                         |
| Humidity Loading  | Test temperature: <b>40±2°C</b><br>Test humidity: <b>90 to 95%RH</b><br>Test time: 500 hours | Test temperature: <b>85±2°C</b><br>Test humidity: <b>80 to 85%RH</b><br>Test time: 1,000 hours |

#### ② Meet AEC-Q200 (Grade2 or Grade3).

105°C product: Grade2.

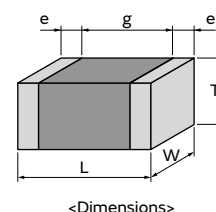
85°C product: Grade3.

#### ③ Sn plating is applied to the external electrodes; excellent solderability.



### Specifications

|                   |                                                                                                          |
|-------------------|----------------------------------------------------------------------------------------------------------|
| Size              | 0.6×0.3mm to 3.2×2.5mm                                                                                   |
| Rated Voltage     | 2.5Vdc to 100Vdc                                                                                         |
| Capacitance       | 0.50pF to 100μF                                                                                          |
| Main Applications | Such as Information and Comfort equipment, car navigation, communication module and entertainment system |



# GRT Series Temperature Compensating Type Part Number List

## 1.0×0.5mm

| T max. | Rated Voltage | TC Code | Cap.  | Tol.    | Part Number        |  |
|--------|---------------|---------|-------|---------|--------------------|--|
| 0.55mm | 100Vdc        | COG     | 1.0pF | ±0.25pF | GRT1555C2A1R0CA02# |  |
|        |               |         | 2.0pF | ±0.25pF | GRT1555C2A2R0CA02# |  |
|        |               |         | 3.0pF | ±0.25pF | GRT1555C2A3R0CA02# |  |
|        |               |         | 4.0pF | ±0.25pF | GRT1555C2A4R0CA02# |  |
|        |               |         | 5.0pF | ±0.25pF | GRT1555C2A5R0CA02# |  |
|        |               |         | 6.0pF | ±0.5pF  | GRT1555C2A6R0DA02# |  |
|        |               |         | 7.0pF | ±0.5pF  | GRT1555C2A7R0DA02# |  |
|        |               |         | 8.0pF | ±0.5pF  | GRT1555C2A8R0DA02# |  |
|        |               |         | 9.0pF | ±0.5pF  | GRT1555C2A9R0DA02# |  |
|        |               |         | 10pF  | ±5%     | GRT1555C2A100JA02# |  |
|        |               |         | 12pF  | ±5%     | GRT1555C2A120JA02# |  |
|        |               |         | 15pF  | ±5%     | GRT1555C2A150JA02# |  |
|        |               |         | 18pF  | ±5%     | GRT1555C2A180JA02# |  |
|        |               |         | 22pF  | ±5%     | GRT1555C2A220JA02# |  |
|        |               |         | 27pF  | ±5%     | GRT1555C2A270JA02# |  |
|        |               |         | 33pF  | ±5%     | GRT1555C2A330JA02# |  |
|        |               |         | 39pF  | ±5%     | GRT1555C2A390JA02# |  |
|        |               |         | 47pF  | ±5%     | GRT1555C2A470JA02# |  |
|        |               |         | 56pF  | ±5%     | GRT1555C2A560JA02# |  |
|        |               |         | 68pF  | ±5%     | GRT1555C2A680JA02# |  |
|        |               |         | 82pF  | ±5%     | GRT1555C2A820JA02# |  |
|        |               |         | 100pF | ±5%     | GRT1555C2A101JA02# |  |
|        | 50Vdc         | COG     | 1.0pF | ±0.25pF | GRT1555C1H1R0CA02# |  |
|        |               |         | 2.0pF | ±0.25pF | GRT1555C1H2R0CA02# |  |
|        |               |         | 3.0pF | ±0.25pF | GRT1555C1H3R0CA02# |  |
|        |               |         | 4.0pF | ±0.25pF | GRT1555C1H4R0CA02# |  |
|        |               |         | 5.0pF | ±0.25pF | GRT1555C1H5R0CA02# |  |
|        |               |         | 6.0pF | ±0.5pF  | GRT1555C1H6R0DA02# |  |
|        |               |         | 7.0pF | ±0.5pF  | GRT1555C1H7R0DA02# |  |
|        |               |         | 8.0pF | ±0.5pF  | GRT1555C1H8R0DA02# |  |
|        |               |         | 9.0pF | ±0.5pF  | GRT1555C1H9R0DA02# |  |
|        |               |         | 10pF  | ±5%     | GRT1555C1H100JA02# |  |
|        |               |         | 12pF  | ±5%     | GRT1555C1H120JA02# |  |
|        |               |         | 15pF  | ±5%     | GRT1555C1H150JA02# |  |
|        |               |         | 18pF  | ±5%     | GRT1555C1H180JA02# |  |
|        |               |         | 22pF  | ±5%     | GRT1555C1H220JA02# |  |
|        |               |         | 27pF  | ±5%     | GRT1555C1H270JA02# |  |
|        |               |         | 33pF  | ±5%     | GRT1555C1H330JA02# |  |
|        |               |         | 39pF  | ±5%     | GRT1555C1H390JA02# |  |
|        |               |         | 47pF  | ±5%     | GRT1555C1H470JA02# |  |
|        |               |         | 56pF  | ±5%     | GRT1555C1H560JA02# |  |
|        |               |         | 68pF  | ±5%     | GRT1555C1H680JA02# |  |
|        |               |         | 82pF  | ±5%     | GRT1555C1H820JA02# |  |
|        |               |         | 100pF | ±5%     | GRT1555C1H101JA02# |  |
|        |               |         | 120pF | ±5%     | GRT1555C1H121JA02# |  |
|        |               |         | 150pF | ±5%     | GRT1555C1H151JA02# |  |
|        |               |         | 180pF | ±5%     | GRT1555C1H181JA02# |  |
|        |               |         | 220pF | ±5%     | GRT1555C1H221JA02# |  |
|        |               |         | 270pF | ±5%     | GRT1555C1H271JA02# |  |
|        |               |         | 330pF | ±5%     | GRT1555C1H331JA02# |  |
|        |               |         | 390pF | ±5%     | GRT1555C1H391JA02# |  |
|        |               |         | 470pF | ±5%     | GRT1555C1H471JA02# |  |

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 0.55mm | 50Vdc         | COG     | 560pF  | ±5%  | GRT1555C1H561JA02# |  |
|        |               |         | 680pF  | ±5%  | GRT1555C1H681JA02# |  |
|        |               |         | 820pF  | ±5%  | GRT1555C1H821JA02# |  |
|        |               |         | 1000pF | ±5%  | GRT1555C1H102JA02# |  |
|        | 25Vdc         | COG     | 10pF   | ±5%  | GRT1555C1E100JA02# |  |
|        |               |         | 12pF   | ±5%  | GRT1555C1E120JA02# |  |
|        |               |         | 15pF   | ±5%  | GRT1555C1E150JA02# |  |
|        |               |         | 18pF   | ±5%  | GRT1555C1E180JA02# |  |
|        |               |         | 22pF   | ±5%  | GRT1555C1E220JA02# |  |
|        |               |         | 27pF   | ±5%  | GRT1555C1E270JA02# |  |
|        |               |         | 33pF   | ±5%  | GRT1555C1E330JA02# |  |
|        |               |         | 39pF   | ±5%  | GRT1555C1E390JA02# |  |
|        |               |         | 47pF   | ±5%  | GRT1555C1E470JA02# |  |
|        |               |         | 56pF   | ±5%  | GRT1555C1E560JA02# |  |
|        |               |         | 68pF   | ±5%  | GRT1555C1E680JA02# |  |
|        |               |         | 82pF   | ±5%  | GRT1555C1E820JA02# |  |
|        |               |         | 100pF  | ±5%  | GRT1555C1E101JA02# |  |
|        |               |         | 120pF  | ±5%  | GRT1555C1E121JA02# |  |
|        |               |         | 150pF  | ±5%  | GRT1555C1E151JA02# |  |
|        |               |         | 180pF  | ±5%  | GRT1555C1E181JA02# |  |
|        |               |         | 220pF  | ±5%  | GRT1555C1E221JA02# |  |
|        |               |         | 270pF  | ±5%  | GRT1555C1E271JA02# |  |
|        |               |         | 330pF  | ±5%  | GRT1555C1E331JA02# |  |
|        |               |         | 390pF  | ±5%  | GRT1555C1E391JA02# |  |
|        |               |         | 470pF  | ±5%  | GRT1555C1E471JA02# |  |
|        |               |         | 560pF  | ±5%  | GRT1555C1E561JA02# |  |
|        |               |         | 680pF  | ±5%  | GRT1555C1E681JA02# |  |
|        |               |         | 820pF  | ±5%  | GRT1555C1E821JA02# |  |
|        |               |         | 1000pF | ±5%  | GRT1555C1E102JA02# |  |

## 1.6×0.8mm

| T max. | Rated Voltage | TC Code | Cap.  | Tol.    | Part Number        |  |
|--------|---------------|---------|-------|---------|--------------------|--|
| 0.9mm  | 100Vdc        | COG     | 1.0pF | ±0.25pF | GRT1885C2A1R0CA02# |  |
|        |               |         | 2.0pF | ±0.25pF | GRT1885C2A2R0CA02# |  |
|        |               |         | 3.0pF | ±0.25pF | GRT1885C2A3R0CA02# |  |
|        |               |         | 4.0pF | ±0.25pF | GRT1885C2A4R0CA02# |  |
|        |               |         | 5.0pF | ±0.25pF | GRT1885C2A5R0CA02# |  |
|        |               |         | 6.0pF | ±0.5pF  | GRT1885C2A6R0DA02# |  |
|        |               |         | 7.0pF | ±0.5pF  | GRT1885C2A7R0DA02# |  |
|        |               |         | 8.0pF | ±0.5pF  | GRT1885C2A8R0DA02# |  |
|        |               |         | 9.0pF | ±0.5pF  | GRT1885C2A9R0DA02# |  |
|        |               |         | 10pF  | ±5%     | GRT1885C2A100JA02# |  |
|        |               |         | 12pF  | ±5%     | GRT1885C2A120JA02# |  |
|        |               |         | 15pF  | ±5%     | GRT1885C2A150JA02# |  |
|        |               |         | 18pF  | ±5%     | GRT1885C2A180JA02# |  |
|        |               |         | 22pF  | ±5%     | GRT1885C2A220JA02# |  |
|        |               |         | 27pF  | ±5%     | GRT1885C2A270JA02# |  |
|        |               |         | 33pF  | ±5%     | GRT1885C2A330JA02# |  |
|        |               |         | 39pF  | ±5%     | GRT1885C2A390JA02# |  |
|        |               |         | 47pF  | ±5%     | GRT1885C2A470JA02# |  |
|        |               |         | 56pF  | ±5%     | GRT1885C2A560JA02# |  |
|        |               |         | 68pF  | ±5%     | GRT1885C2A680JA02# |  |

Part number # indicates the package specification code.

# GRT Series Temperature Compensating Type Part Number List

(→ 1.6×0.8mm)

| T max. | Rated Voltage | TC Code | Cap.   | Tol.    | Part Number        |  |
|--------|---------------|---------|--------|---------|--------------------|--|
| 0.9mm  | 100Vdc        | COG     | 82pF   | ±5%     | GRT1885C2A820JA02# |  |
|        |               |         | 100pF  | ±5%     | GRT1885C2A101JA02# |  |
|        |               |         | 120pF  | ±5%     | GRT1885C2A121JA02# |  |
|        |               |         | 150pF  | ±5%     | GRT1885C2A151JA02# |  |
|        |               |         | 180pF  | ±5%     | GRT1885C2A181JA02# |  |
|        |               |         | 220pF  | ±5%     | GRT1885C2A221JA02# |  |
|        |               |         | 270pF  | ±5%     | GRT1885C2A271JA02# |  |
|        |               |         | 330pF  | ±5%     | GRT1885C2A331JA02# |  |
|        |               |         | 390pF  | ±5%     | GRT1885C2A391JA02# |  |
|        |               |         | 470pF  | ±5%     | GRT1885C2A471JA02# |  |
|        |               |         | 560pF  | ±5%     | GRT1885C2A561JA02# |  |
|        |               |         | 680pF  | ±5%     | GRT1885C2A681JA02# |  |
|        |               |         | 820pF  | ±5%     | GRT1885C2A821JA02# |  |
|        |               |         | 1000pF | ±5%     | GRT1885C2A102JA02# |  |
|        |               |         | 1200pF | ±5%     | GRT1885C2A122JA02# |  |
|        |               |         | 1500pF | ±5%     | GRT1885C2A152JA02# |  |
|        | 50Vdc         | COG     | 1.0pF  | ±0.25pF | GRT1885C1H1R0CA02# |  |
|        |               |         | 2.0pF  | ±0.25pF | GRT1885C1H2R0CA02# |  |
|        |               |         | 3.0pF  | ±0.25pF | GRT1885C1H3R0CA02# |  |
|        |               |         | 4.0pF  | ±0.25pF | GRT1885C1H4R0CA02# |  |
|        |               |         | 5.0pF  | ±0.25pF | GRT1885C1H5R0CA02# |  |
|        |               |         | 6.0pF  | ±0.5pF  | GRT1885C1H6R0DA02# |  |
|        |               |         | 7.0pF  | ±0.5pF  | GRT1885C1H7R0DA02# |  |
|        |               |         | 8.0pF  | ±0.5pF  | GRT1885C1H8R0DA02# |  |
|        |               |         | 9.0pF  | ±0.5pF  | GRT1885C1H9R0DA02# |  |
|        |               |         | 10pF   | ±5%     | GRT1885C1H100JA02# |  |
|        |               |         | 12pF   | ±5%     | GRT1885C1H120JA02# |  |
|        |               |         | 15pF   | ±5%     | GRT1885C1H150JA02# |  |
|        |               |         | 18pF   | ±5%     | GRT1885C1H180JA02# |  |
|        |               |         | 22pF   | ±5%     | GRT1885C1H220JA02# |  |
|        |               |         | 27pF   | ±5%     | GRT1885C1H270JA02# |  |
|        |               |         | 33pF   | ±5%     | GRT1885C1H330JA02# |  |
|        |               |         | 39pF   | ±5%     | GRT1885C1H390JA02# |  |
|        |               |         | 47pF   | ±5%     | GRT1885C1H470JA02# |  |
|        |               |         | 56pF   | ±5%     | GRT1885C1H560JA02# |  |
|        |               |         | 68pF   | ±5%     | GRT1885C1H680JA02# |  |
|        |               |         | 82pF   | ±5%     | GRT1885C1H820JA02# |  |
|        |               |         | 100pF  | ±5%     | GRT1885C1H101JA02# |  |
|        |               |         | 120pF  | ±5%     | GRT1885C1H121JA02# |  |
|        |               |         | 150pF  | ±5%     | GRT1885C1H151JA02# |  |
|        |               |         | 180pF  | ±5%     | GRT1885C1H181JA02# |  |
|        |               |         | 220pF  | ±5%     | GRT1885C1H221JA02# |  |
|        |               |         | 270pF  | ±5%     | GRT1885C1H271JA02# |  |
|        |               |         | 330pF  | ±5%     | GRT1885C1H331JA02# |  |
|        |               |         | 390pF  | ±5%     | GRT1885C1H391JA02# |  |
|        |               |         | 470pF  | ±5%     | GRT1885C1H471JA02# |  |
|        |               |         | 560pF  | ±5%     | GRT1885C1H561JA02# |  |
|        |               |         | 680pF  | ±5%     | GRT1885C1H681JA02# |  |
|        |               |         | 820pF  | ±5%     | GRT1885C1H821JA02# |  |
|        |               |         | 1000pF | ±5%     | GRT1885C1H102JA02# |  |
|        |               |         | 1200pF | ±5%     | GRT1885C1H122JA02# |  |
|        |               |         | 1500pF | ±5%     | GRT1885C1H152JA02# |  |
|        |               |         | 1800pF | ±5%     | GRT1885C1H182JA02# |  |
|        |               |         | 2200pF | ±5%     | GRT1885C1H222JA02# |  |

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 0.9mm  | 50Vdc         | COG     | 2700pF  | ±5%  | GRT1885C1H272JA02# |  |
|        |               |         | 3300pF  | ±5%  | GRT1885C1H332JA02# |  |
|        |               |         | 3900pF  | ±5%  | GRT1885C1H392JA02# |  |
|        |               |         | 4700pF  | ±5%  | GRT1885C1H472JA02# |  |
|        |               |         | 5600pF  | ±5%  | GRT1885C1H562JA02# |  |
|        |               |         | 6800pF  | ±5%  | GRT1885C1H682JA02# |  |
|        |               |         | 8200pF  | ±5%  | GRT1885C1H822JA02# |  |
|        |               |         | 10000pF | ±5%  | GRT1885C1H103JA02# |  |
|        | 25Vdc         | COG     | 560pF   | ±5%  | GRT1885C1E561JA02# |  |
|        |               |         | 680pF   | ±5%  | GRT1885C1E681JA02# |  |
|        |               |         | 820pF   | ±5%  | GRT1885C1E821JA02# |  |
|        |               |         | 1000pF  | ±5%  | GRT1885C1E102JA02# |  |
|        |               |         | 1200pF  | ±5%  | GRT1885C1E122JA02# |  |
|        |               |         | 1500pF  | ±5%  | GRT1885C1E152JA02# |  |
|        |               |         | 4700pF  | ±5%  | GRT1885C1E472JA02# |  |
|        |               |         | 5600pF  | ±5%  | GRT1885C1E562JA02# |  |
|        |               |         | 6800pF  | ±5%  | GRT1885C1E682JA02# |  |
|        |               |         | 8200pF  | ±5%  | GRT1885C1E822JA02# |  |
|        |               |         | 10000pF | ±5%  | GRT1885C1E103JA02# |  |

## 2.0×1.25mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.35mm | 50Vdc         | COG     | 18000pF | ±5%  | GRT21B5C1H183JA02# |  |
|        |               |         | 22000pF | ±5%  | GRT21B5C1H223JA02# |  |

## 3.2×1.6mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.8mm  | 50Vdc         | COG     | 56000pF | ±5%  | GRT31C5C1H563JA02# |  |
|        |               |         | 68000pF | ±5%  | GRT31C5C1H683JA02# |  |
|        |               |         | 82000pF | ±5%  | GRT31C5C1H823JA02# |  |
|        |               |         | 0.10μF  | ±5%  | GRT31C5C1H104JA02# |  |
|        | 25Vdc         | COG     | 0.10μF  | ±5%  | GRT31C5C1E104JA02# |  |
|        |               |         | 0.12μF  | ±5%  | GRT31C5C1E124JA02# |  |
|        | 16Vdc         | COG     | 0.12μF  | ±5%  | GRT31C5C1C124JA02# |  |





## GRT Series High Dielectric Constant Type Part Number List

(→ 3.2×1.6mm)

| T max. | Rated Voltage | TC Code | Cap. | Tol. | Part Number        |  |
|--------|---------------|---------|------|------|--------------------|--|
| 1.8mm  | 25Vdc         | X5R     | 22μF | ±10% | GRT31CR61E226KE01# |  |
|        |               | X6S     | 22μF | ±10% | GRT31CC81C226KE01# |  |
|        |               | X5R     | 22μF | ±10% | GRT31CR61C226KE01# |  |
|        | 16Vdc         | X6S     | 22μF | ±10% | GRT31CC81A226KE01# |  |
|        |               | X5R     | 22μF | ±10% | GRT31CR61A226KE01# |  |
|        |               |         | 47μF | ±10% | GRT31CR61A476KE13# |  |
|        | 10Vdc         | X6S     | 22μF | ±10% | GRT31CC81A226KE01# |  |
|        |               | X5R     | 22μF | ±10% | GRT31CR61A226KE01# |  |
|        |               |         | 47μF | ±10% | GRT31CR61A476KE13# |  |
|        |               |         | 22μF | ±10% | GRT31CR60J226KE01# |  |
|        |               |         | 47μF | ±10% | GRT31CR60J476KE13# |  |
|        | 6.3Vdc        | X7R     | 22μF | ±10% | GRT31CR70J226KE13# |  |
|        |               | X6S     | 22μF | ±10% | GRT31CC80J226KE01# |  |
|        |               |         | 47μF | ±10% | GRT31CC80J476KE13# |  |
|        |               | X5R     | 22μF | ±10% | GRT31CR60J226KE01# |  |
|        | 4Vdc          | X6S     | 22μF | ±10% | GRT31CC80G226KE01# |  |
|        |               |         | 47μF | ±20% | GRT31CC80G476ME01# |  |

3.2×2.5mm

| T max. | Rated Voltage | TC Code | Cap.  | Tol. | Part Number        |           |
|--------|---------------|---------|-------|------|--------------------|-----------|
| 2.2mm  | 25Vdc         | X6S     | 10μF  | ±10% | GRT32DC81E106KE01# |           |
|        |               | X5R     | 10μF  | ±10% | GRT32DR61E106KE01# |           |
|        | 6.3Vdc        | X5R     | 33μF  | ±20% | GRT32DR60J336ME01# |           |
| 2.7mm  | 50Vdc         | X7R     | 4.7μF | ±10% | GRT32ER71H475KE01# |           |
|        |               | X6S     | 4.7μF | ±10% | GRT32EC81H475KE01# |           |
|        | 16Vdc         | X6S     | 47μF  | ±10% | GRT32EC81C476KE13# | <b>D1</b> |
|        | 10Vdc         | X6S     | 47μF  | ±10% | GRT32EC81A476KE13# |           |
|        | 6.3Vdc        | X7R     | 47μF  | ±10% | GRT32ER70J476KE13# |           |
|        |               | X6S     | 47μF  | ±10% | GRT32EC80J476KE13# |           |
|        |               | X5R     | 100μF | ±20% | GRT32ER60J107ME13# |           |

## Chip Multilayer Ceramic Capacitors for Automotive

# GCM Series



Capacitor for automotive applications such as power train and safety equipment.

## Features

### ① Ideal for powertrains and safety devices in automotive.

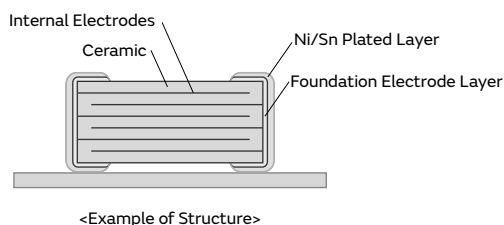
This product can be used for safety devices, such as the drive system control for engine ECU, air bags, and ABS. This product has cleared test conditions more severe than that of general products (GRM Series) even in temperature cycle and humidity load tests.

|                   | General Purpose GRM Series<br>Maximum operating temperature: <b>125°C</b>                    | GCM Series for Automotive<br>Maximum operating temperature: <b>150°C</b>                                                                       |
|-------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Items             | Test Method                                                                                  | Test Method                                                                                                                                    |
| Temperature Cycle | Temperature Cycle: <b>5 cycles</b>                                                           | Temperature Cycle: <b>100 cycles</b><br>(1,000 cycles for AEC-Q200 conforming products)                                                        |
| Humidity Loading  | Test temperature: <b>40±2°C</b><br>Test humidity: <b>90 to 95%RH</b><br>Test time: 500 hours | Test temperature: <b>85±2°C</b><br>Test humidity: <b>80 to 85%RH</b><br>Test time: 500 hours<br>(1,000 hours for AEC-Q200 conforming products) |

### ② Can be used at 125°C and 150°C temperatures.

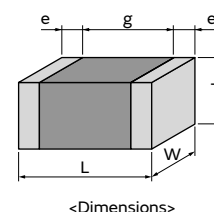
We also offer a lineup for 150°C that can be used in the engine room.

### ③ Sn plating is applied to the external electrodes; excellent solderability.



## Specifications

|                   |                                                                                 |
|-------------------|---------------------------------------------------------------------------------|
| Size              | 0.6×0.3mm to 5.7×5.0mm                                                          |
| Rated Voltage     | 4Vdc to 1000Vdc                                                                 |
| Capacitance       | 0.10pF to 47μF                                                                  |
| Main Applications | Safety equipment, such as drive system control, air bags, and ABS of engine ECU |



# GCM Series Temperature Compensating Type Part Number List

## 1.0×0.5mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol.    | Part Number        |  |
|--------|---------------|---------|--------|---------|--------------------|--|
| 0.55mm | 50Vdc         | COG     | 1.0pF  | ±0.25pF | GCM1555C1H1R0CA16# |  |
|        |               |         | 2.0pF  | ±0.25pF | GCM1555C1H2R0CA16# |  |
|        |               |         | 3.0pF  | ±0.25pF | GCM1555C1H3R0CA16# |  |
|        |               |         | 4.0pF  | ±0.25pF | GCM1555C1H4R0CA16# |  |
|        |               |         | 5.0pF  | ±0.25pF | GCM1555C1H5R0CA16# |  |
|        |               |         | 6.0pF  | ±0.5pF  | GCM1555C1H6R0DA16# |  |
|        |               |         | 7.0pF  | ±0.5pF  | GCM1555C1H7R0DA16# |  |
|        |               |         | 8.0pF  | ±0.5pF  | GCM1555C1H8R0DA16# |  |
|        |               |         | 9.0pF  | ±0.5pF  | GCM1555C1H9R0DA16# |  |
|        |               |         | 10pF   | ±5%     | GCM1555C1H100JA16# |  |
|        |               |         | 12pF   | ±5%     | GCM1555C1H120JA16# |  |
|        |               |         | 15pF   | ±5%     | GCM1555C1H150JA16# |  |
|        |               |         | 18pF   | ±5%     | GCM1555C1H180JA16# |  |
|        |               |         | 22pF   | ±5%     | GCM1555C1H220JA16# |  |
|        |               |         | 27pF   | ±5%     | GCM1555C1H270JA16# |  |
|        |               |         | 33pF   | ±5%     | GCM1555C1H330JA16# |  |
|        |               |         | 39pF   | ±5%     | GCM1555C1H390JA16# |  |
|        |               |         | 47pF   | ±5%     | GCM1555C1H470JA16# |  |
|        |               |         | 56pF   | ±5%     | GCM1555C1H560JA16# |  |
|        |               |         | 68pF   | ±5%     | GCM1555C1H680JA16# |  |
|        |               |         | 82pF   | ±5%     | GCM1555C1H820JA16# |  |
|        |               |         | 100pF  | ±5%     | GCM1555C1H101JA16# |  |
|        |               |         | 120pF  | ±5%     | GCM1555C1H121JA16# |  |
|        |               |         | 150pF  | ±5%     | GCM1555C1H151JA16# |  |
|        |               |         | 180pF  | ±5%     | GCM1555C1H181JA16# |  |
|        |               |         | 220pF  | ±5%     | GCM1555C1H221JA16# |  |
|        |               |         | 270pF  | ±5%     | GCM1555C1H271JA16# |  |
|        |               |         | 330pF  | ±5%     | GCM1555C1H331JA16# |  |
|        |               |         | 390pF  | ±5%     | GCM1555C1H391JA16# |  |
|        |               |         | 470pF  | ±5%     | GCM1555C1H471JA16# |  |
|        |               |         | 560pF  | ±5%     | GCM1555C1H561JA16# |  |
|        |               |         | 680pF  | ±5%     | GCM1555C1H681JA16# |  |
|        |               |         | 820pF  | ±5%     | GCM1555C1H821JA16# |  |
|        |               |         | 1000pF | ±5%     | GCM1555C1H102JA16# |  |
|        |               | X8G     | 1.0pF  | ±0.25pF | GCM1555G1H1R0CA16# |  |
|        |               |         | 2.0pF  | ±0.25pF | GCM1555G1H2R0CA16# |  |
|        |               |         | 3.0pF  | ±0.25pF | GCM1555G1H3R0CA16# |  |
|        |               |         | 4.0pF  | ±0.25pF | GCM1555G1H4R0CA16# |  |
|        |               |         | 5.0pF  | ±0.25pF | GCM1555G1H5R0CA16# |  |
|        |               |         | 12pF   | ±5%     | GCM1555G1H120JA16# |  |
|        |               |         | 15pF   | ±5%     | GCM1555G1H150JA16# |  |
|        |               |         | 18pF   | ±5%     | GCM1555G1H180JA16# |  |
|        |               |         | 22pF   | ±5%     | GCM1555G1H220JA16# |  |
|        |               |         | 27pF   | ±5%     | GCM1555G1H270JA16# |  |
|        |               |         | 33pF   | ±5%     | GCM1555G1H330JA16# |  |
|        |               |         | 39pF   | ±5%     | GCM1555G1H390JA16# |  |
|        |               |         | 47pF   | ±5%     | GCM1555G1H470JA16# |  |
|        |               |         | 56pF   | ±5%     | GCM1555G1H560JA16# |  |
|        |               |         | 68pF   | ±5%     | GCM1555G1H680JA16# |  |
|        |               |         | 82pF   | ±5%     | GCM1555G1H820JA16# |  |
|        |               |         | 100pF  | ±5%     | GCM1555G1H101JA16# |  |
|        |               |         | 120pF  | ±5%     | GCM1555G1H121JA16# |  |

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 0.55mm | 50Vdc         | X8G     | 150pF  | ±5%  | GCM1555G1H151JA16# |  |
|        |               |         | 180pF  | ±5%  | GCM1555G1H181JA16# |  |
|        |               |         | 220pF  | ±5%  | GCM1555G1H221JA16# |  |
|        |               |         | 270pF  | ±5%  | GCM1555G1H271JA16# |  |
|        |               |         | 330pF  | ±5%  | GCM1555G1H331JA16# |  |
|        |               |         | 390pF  | ±5%  | GCM1555G1H391JA16# |  |
|        |               |         | 470pF  | ±5%  | GCM1555G1H471JA16# |  |
|        |               |         | 560pF  | ±5%  | GCM1555G1H561JA16# |  |
|        |               |         | 680pF  | ±5%  | GCM1555G1H681JA16# |  |
|        |               |         | 820pF  | ±5%  | GCM1555G1H821JA16# |  |
|        |               |         | 1000pF | ±5%  | GCM1555G1H102JA16# |  |

## 1.6×0.8mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol.    | Part Number        |  |
|--------|---------------|---------|--------|---------|--------------------|--|
| 0.9mm  | 100Vdc        | COG     | 1.0pF  | ±0.25pF | GCM1885C2A1R0CA16# |  |
|        |               |         | 2.0pF  | ±0.25pF | GCM1885C2A2R0CA16# |  |
|        |               |         | 3.0pF  | ±0.25pF | GCM1885C2A3R0CA16# |  |
|        |               |         | 4.0pF  | ±0.25pF | GCM1885C2A4R0CA16# |  |
|        |               |         | 5.0pF  | ±0.25pF | GCM1885C2A5R0CA16# |  |
|        |               |         | 6.0pF  | ±0.5pF  | GCM1885C2A6R0DA16# |  |
|        |               |         | 7.0pF  | ±0.5pF  | GCM1885C2A7R0DA16# |  |
|        |               |         | 8.0pF  | ±0.5pF  | GCM1885C2A8R0DA16# |  |
|        |               |         | 9.0pF  | ±0.5pF  | GCM1885C2A9R0DA16# |  |
|        |               |         | 10pF   | ±5%     | GCM1885C2A100JA16# |  |
|        |               |         | 12pF   | ±5%     | GCM1885C2A120JA16# |  |
|        |               |         | 15pF   | ±5%     | GCM1885C2A150JA16# |  |
|        |               |         | 18pF   | ±5%     | GCM1885C2A180JA16# |  |
|        |               |         | 22pF   | ±5%     | GCM1885C2A220JA16# |  |
|        |               |         | 27pF   | ±5%     | GCM1885C2A270JA16# |  |
|        |               |         | 33pF   | ±5%     | GCM1885C2A330JA16# |  |
|        |               |         | 39pF   | ±5%     | GCM1885C2A390JA16# |  |
|        |               |         | 47pF   | ±5%     | GCM1885C2A470JA16# |  |
|        |               |         | 56pF   | ±5%     | GCM1885C2A560JA16# |  |
|        |               |         | 68pF   | ±5%     | GCM1885C2A680JA16# |  |
|        |               |         | 82pF   | ±5%     | GCM1885C2A820JA16# |  |
|        |               |         | 100pF  | ±5%     | GCM1885C2A101JA16# |  |
|        |               |         | 120pF  | ±5%     | GCM1885C2A121JA16# |  |
|        |               |         | 150pF  | ±5%     | GCM1885C2A151JA16# |  |
|        |               |         | 180pF  | ±5%     | GCM1885C2A181JA16# |  |
|        |               |         | 220pF  | ±5%     | GCM1885C2A221JA16# |  |
|        |               |         | 270pF  | ±5%     | GCM1885C2A271JA16# |  |
|        |               |         | 330pF  | ±5%     | GCM1885C2A331JA16# |  |
|        |               |         | 390pF  | ±5%     | GCM1885C2A391JA16# |  |
|        |               |         | 470pF  | ±5%     | GCM1885C2A471JA16# |  |
|        |               |         | 560pF  | ±5%     | GCM1885C2A561JA16# |  |
|        |               |         | 680pF  | ±5%     | GCM1885C2A681JA16# |  |
|        |               |         | 820pF  | ±5%     | GCM1885C2A821JA16# |  |
|        |               |         | 1000pF | ±5%     | GCM1885C2A102JA16# |  |
|        |               |         | 1200pF | ±5%     | GCM1885C2A122JA16# |  |
|        |               |         | 1500pF | ±5%     | GCM1885C2A152JA16# |  |
|        |               | U2J     | 1000pF | ±5%     | GCM1887U2A102JA16# |  |
|        |               |         | 1200pF | ±5%     | GCM1887U2A122JA16# |  |

Part number # indicates the package specification code.







# GCM Series Temperature Compensating Type Part Number List

(→ 3.2×1.6mm)

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.0mm  | 250Vdc        | C0G     | 330pF   | ±5%  | GCM31A5C2E331JX01# |  |
|        |               |         | 390pF   | ±5%  | GCM31A5C2E391JX01# |  |
|        |               |         | 470pF   | ±5%  | GCM31A5C2E471JX01# |  |
|        |               |         | 560pF   | ±5%  | GCM31A5C2E561JX01# |  |
|        |               |         | 680pF   | ±5%  | GCM31A5C2E681JX01# |  |
|        |               |         | 820pF   | ±5%  | GCM31A5C2E821JX01# |  |
|        |               |         | 1000pF  | ±5%  | GCM31A5C2E102JX01# |  |
|        |               |         | 1200pF  | ±5%  | GCM31A5C2E122JX01# |  |
|        |               |         | 1500pF  | ±5%  | GCM31A5C2E152JX01# |  |
|        |               |         | 1800pF  | ±5%  | GCM31A5C2E182JX01# |  |
|        |               |         | 2200pF  | ±5%  | GCM31A5C2E222JX01# |  |
|        |               |         | 2700pF  | ±5%  | GCM31A5C2E272JX01# |  |
|        |               |         | 3300pF  | ±5%  | GCM31A5C2E332JX01# |  |
|        |               |         | 3900pF  | ±5%  | GCM31A5C2E392JX01# |  |
|        |               |         | 4700pF  | ±5%  | GCM31A5C2E472JX01# |  |
|        |               |         | 5600pF  | ±5%  | GCM31A5C2E562JX01# |  |
|        |               |         | 6800pF  | ±5%  | GCM31A5C2E682JX01# |  |
|        |               | U2J     | 2700pF  | ±5%  | GCM31A7U2E272JX01# |  |
|        |               |         | 3300pF  | ±5%  | GCM31A7U2E332JX01# |  |
|        |               |         | 3900pF  | ±5%  | GCM31A7U2E392JX01# |  |
|        |               |         | 4700pF  | ±5%  | GCM31A7U2E472JX01# |  |
|        |               |         | 5600pF  | ±5%  | GCM31A7U2E562JX01# |  |
| 1.25mm | 1000Vdc       | C0G     | 560pF   | ±5%  | GCM31B5C3A561JX01# |  |
|        |               |         | 680pF   | ±5%  | GCM31B5C3A681JX01# |  |
|        |               |         | 390pF   | ±5%  | GCM31B7U3A391JX01# |  |
|        |               |         | 470pF   | ±5%  | GCM31B7U3A471JX01# |  |
|        |               | U2J     | 560pF   | ±5%  | GCM31B7U3A561JX01# |  |
|        |               |         | 680pF   | ±5%  | GCM31B7U3A681JX01# |  |
|        |               |         | 2200pF  | ±5%  | GCM31B5C2J222JX01# |  |
|        |               |         | 2700pF  | ±5%  | GCM31B5C2J272JX01# |  |
|        |               | 630Vdc  | 2700pF  | ±5%  | GCM31B7U2J272JX01# |  |
|        |               |         | 3300pF  | ±5%  | GCM31B7U2J332JX01# |  |
|        |               | 250Vdc  | 8200pF  | ±5%  | GCM31B5C2E822JX01# |  |
|        |               |         | 10000pF | ±5%  | GCM31B5C2E103JX01# |  |
| 1.8mm  | 1000Vdc       | C0G     | 820pF   | ±5%  | GCM31C5C3A821JX03# |  |
|        |               |         | 1000pF  | ±5%  | GCM31C5C3A102JX03# |  |
|        |               |         | 820pF   | ±5%  | GCM31C7U3A821JX03# |  |
|        |               |         | 1000pF  | ±5%  | GCM31C7U3A102JX03# |  |
|        |               | 630Vdc  | 3300pF  | ±5%  | GCM31C5C2J332JX03# |  |
|        |               |         | 3900pF  | ±5%  | GCM31C7U2J392JX03# |  |
|        |               |         | 4700pF  | ±5%  | GCM31C7U2J472JX03# |  |
|        |               |         | 15000pF | ±5%  | GCM31C5C2E153JX03# |  |

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.0mm  | 630Vdc        | U2J     | 2200pF  | ±5%  | GCM32A7U2J222JX01# |  |
| 1.25mm | 1000Vdc       | U2J     | 1200pF  | ±5%  | GCM32B7U3A122JX01# |  |
|        | 630Vdc        | U2J     | 5600pF  | ±5%  | GCM32B7U2J562JX01# |  |
| 1.5mm  | 1000Vdc       | U2J     | 1500pF  | ±5%  | GCM32Q7U3A152JX01# |  |
|        | 630Vdc        | U2J     | 6800pF  | ±5%  | GCM32Q7U2J682JX01# |  |
| 2.0mm  | 1000Vdc       | U2J     | 1800pF  | ±5%  | GCM32D7U3A182JX01# |  |
|        |               |         | 2200pF  | ±5%  | GCM32D7U3A222JX01# |  |
|        | 630Vdc        | U2J     | 8200pF  | ±5%  | GCM32D7U2J822JX01# |  |
|        |               |         | 10000pF | ±5%  | GCM32D7U2J103JX01# |  |

## 4.5×3.2mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.5mm  | 1000Vdc       | U2J     | 2700pF  | ±5%  | GCM43Q7U3A272JX01# |  |
|        |               |         | 3300pF  | ±5%  | GCM43Q7U3A332JX01# |  |
|        | 630Vdc        | U2J     | 12000pF | ±5%  | GCM43Q7U2J123JX01# |  |
|        |               |         | 3900pF  | ±5%  | GCM43D7U3A392JX01# |  |
| 2.0mm  | 1000Vdc       | U2J     | 4700pF  | ±5%  | GCM43D7U3A472JX01# |  |
|        |               |         | 15000pF | ±5%  | GCM43D7U2J153JX01# |  |
|        | 630Vdc        | U2J     | 18000pF | ±5%  | GCM43D7U2J183JX01# |  |
|        |               |         | 22000pF | ±5%  | GCM43D7U2J223JX01# |  |

## 5.7×5.0mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.5mm  | 1000Vdc       | U2J     | 5600pF  | ±5%  | GCM55Q7U3A562JX01# |  |
|        |               |         | 6800pF  | ±5%  | GCM55Q7U3A682JX01# |  |
|        | 630Vdc        | U2J     | 27000pF | ±5%  | GCM55Q7U2J273JX01# |  |
|        |               |         | 8200pF  | ±5%  | GCM55D7U3A822JX01# |  |
| 2.0mm  | 1000Vdc       | U2J     | 10000pF | ±5%  | GCM55D7U3A103JX01# |  |
|        |               |         | 33000pF | ±5%  | GCM55D7U2J333JX01# |  |
|        | 630Vdc        | U2J     | 39000pF | ±5%  | GCM55D7U2J393JX01# |  |
|        |               |         | 47000pF | ±5%  | GCM55D7U2J473JX01# |  |

## 3.2×2.5mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 1.0mm  | 630Vdc        | U2J     | 1200pF | ±5%  | GCM32A7U2J122JX01# |  |
|        |               |         | 1500pF | ±5%  | GCM32A7U2J152JX01# |  |
|        |               |         | 1800pF | ±5%  | GCM32A7U2J182JX01# |  |

Part number # indicates the package specification code.



# GCM Series High Dielectric Constant Type Part Number List

(→ 2.0×1.25mm)

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 1.4mm  | 50Vdc         | X7R     | 0.22μF | ±10% | GCM21BR71H224KA37# |  |
|        |               |         | 0.47μF | ±10% | GCM21BR71H474KA55# |  |
|        |               |         | 1.0μF  | ±10% | GCM21BR71H105KA03# |  |
|        | 35Vdc         | X8L     | 2.2μF  | ±10% | GCM21BL8EG225KE07# |  |
|        |               |         | 0.68μF | ±10% | GCM21BR7YA684KA55# |  |
|        |               | X7R     | 1.0μF  | ±10% | GCM21BR7YA105KA55# |  |
|        |               |         | 1.5μF  | ±10% | GCM21BR7YA155KA54# |  |
|        |               | X7S     | 2.2μF  | ±10% | GCM21BC7YA225KE02# |  |
|        |               |         |        |      |                    |  |
|        | 25Vdc         | X8L     | 1.5μF  | ±10% | GCM21BL8EF155KA07# |  |
|        |               |         | 0.15μF | ±10% | GCM21BR71E154KA37# |  |
|        |               | X7R     | 0.22μF | ±10% | GCM21BR71E224KA37# |  |
|        |               |         | 0.33μF | ±10% | GCM21BR71E334KA37# |  |
|        |               |         | 0.68μF | ±10% | GCM21BR71E684KA55# |  |
|        |               |         | 1.0μF  | ±10% | GCM21BR71E105KA56# |  |
|        |               |         | 1.5μF  | ±10% | GCM21BR71E155KA54# |  |
|        |               |         | 2.2μF  | ±10% | GCM21BR71E225KA73# |  |
|        |               | X7R     | 2.2μF  | ±10% | GCM21BR71C225KA64# |  |
|        |               |         | 4.7μF  | ±10% | GCM21BR71C475KA73# |  |
|        | 10Vdc         | X7R     | 2.2μF  | ±10% | GCM21BR71A225KA37# |  |
|        |               |         | 10μF   | ±10% | GCM21BR71A106KE22# |  |
|        | 6.3Vdc        | X7S     | 4.7μF  | ±10% | GCM21BC71A475KA73# |  |
|        |               |         |        |      |                    |  |
|        |               |         |        |      |                    |  |
| 1.45mm | 100Vdc        | X7S     | 1.0μF  | ±10% | GCM21BC72A105KE36# |  |
|        | 35Vdc         | X8L     | 4.7μF  | ±10% | GCM21BL8EG475KE08# |  |
|        |               | X7S     | 4.7μF  | ±10% | GCM21BC7YA475KE36# |  |
|        | 25Vdc         | X8L     | 4.7μF  | ±10% | GCM21BL8EF475KE08# |  |
|        |               | X7S     | 4.7μF  | ±10% | GCM21BC71E475KE36# |  |
|        | 16Vdc         | X7S     | 10μF   | ±10% | GCM21BC71C106KE36# |  |

3.2×2.5mm

| T max. | Rated Voltage | TC Code | Cap.  | Tol. | Part Number        |  |
|--------|---------------|---------|-------|------|--------------------|--|
| 2.2mm  | 100Vdc        | X8L     | 4.7μF | ±10% | GCM32DL8EL475KE07# |  |
|        |               | X7S     | 4.7μF | ±10% | GCM32DC72A475KE02# |  |
|        | 16Vdc         | X7R     | 10μF  | ±10% | GCM32DR71C106KA37# |  |
| 2.7mm  | 50Vdc         | X8L     | 10μF  | ±10% | GCM32EL8EH106KA07# |  |
|        |               | X7R     | 4.7μF | ±10% | GCM32ER71H475KA55# |  |
|        |               | X7S     | 10μF  | ±10% | GCM32EC71H106KA03# |  |
|        |               |         |       |      |                    |  |
|        | 35Vdc         | X7S     | 10μF  | ±10% | GCM32EC7YA106KA03# |  |
|        | 25Vdc         | X7R     | 10μF  | ±10% | GCM32ER71E106KA57# |  |
|        | 16Vdc         | X7R     | 22μF  | ±20% | GCM32ER71C226ME19# |  |
|        | 10Vdc         | X7R     | 22μF  | ±20% | GCM32ER71A226ME12# |  |
| 2.85mm | 25Vdc         | X7R     | 47μF  | ±20% | GCM32ER70J476ME19# |  |
|        |               | X8L     | 22μF  | ±10% | GCM32EL8EF226KE08# |  |
|        |               | X7S     | 22μF  | ±10% | GCM32EC71E226KE36# |  |

3.2×1.6mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 1.25mm | 100Vdc        | X7R     | 0.22μF | ±10% | GCM31MR72A224KA37# |  |
|        | 50Vdc         | X7R     | 0.33μF | ±10% | GCM31MR71H334KA37# |  |
|        |               |         | 0.47μF | ±10% | GCM31MR71H474KA37# |  |
|        |               |         | 0.68μF | ±10% | GCM31MR71H684KA55# |  |
| 1.8mm  | 100Vdc        | X8L     | 2.2μF  | ±10% | GCM31CL8EL225KE07# |  |
|        |               | X7R     | 1.0μF  | ±10% | GCM31CR72A105KA03# |  |
|        |               | X7S     | 2.2μF  | ±10% | GCM31CC72A225KE02# |  |
|        | 50Vdc         | X7R     | 2.2μF  | ±10% | GCM31CR71H225KA55# |  |
|        |               | X7S     | 4.7μF  | ±10% | GCM31CC71H475KA03# |  |
|        | 25Vdc         | X7R     | 4.7μF  | ±10% | GCM31CR71E475KA55# |  |
|        | 16Vdc         | X7R     | 4.7μF  | ±10% | GCM31CR71C475KA37# |  |
|        |               |         | 10μF   | ±10% | GCM31CR71C106KA64# |  |
|        | 10Vdc         | X7R     | 10μF   | ±10% | GCM31CR71A106KA64# |  |
|        |               |         | 22μF   | ±10% | GCM31CR71A226KE02# |  |
|        | 6.3Vdc        | X7R     | 22μF   | ±20% | GCM31CR70J226ME23# |  |
| 1.9mm  | 25Vdc         | X7S     | 10μF   | ±10% | GCM31CC71E106KA03# |  |

Part number # indicates the package specification code.

High Effective Capacitance & High Ripple Current Chip Multilayer Ceramic Capacitors for Automotive

## GC3 Series

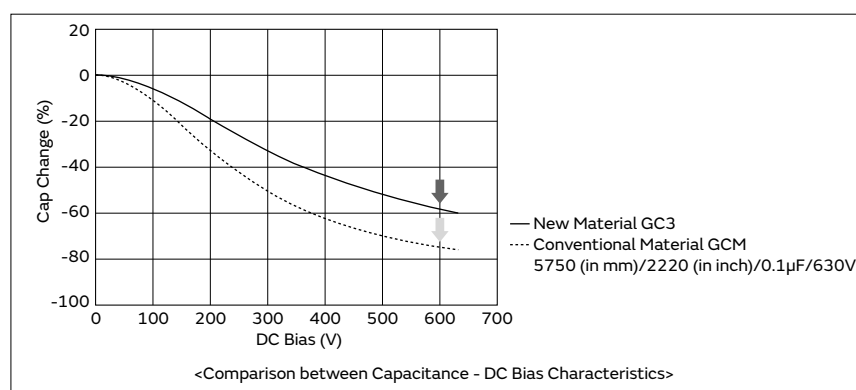


This is a high ripple resistance product for automotive excellent in DC bias characteristics.

### Features

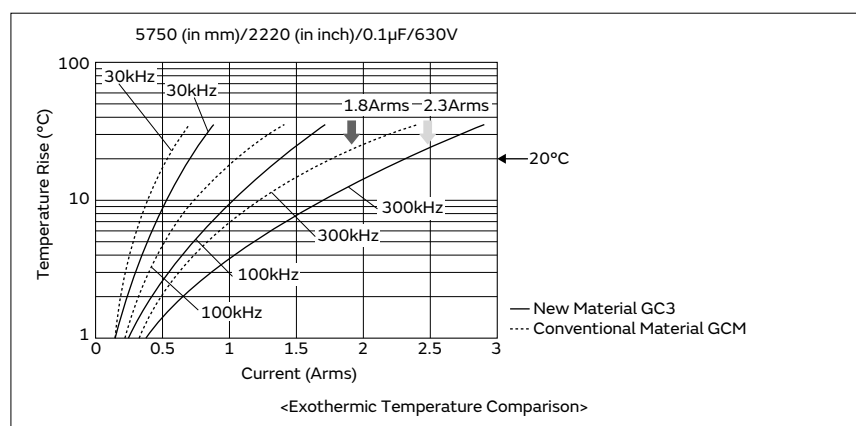
- 1 When a DC bias is applied, a capacitance higher than conventional products (X7R characteristics) can be acquired.

When DC600V is applied, about twice the capacitance can be secured.



- 2 Improved ripple resistance performance compared to conventional products (X7R characteristics).

In the case of a product with a capacitance of 0.1μF, when the exothermic temperature reaches 20°C at frequency f=300kHz, the amount of resistance of a product with conventional material is 1.8Arms; however, the new material is 2.3Arms.

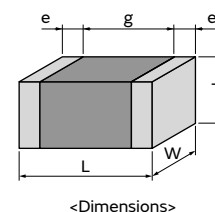


- 3 This product has a noise reduction effect.

Since dielectric materials that enable a reduction of noise are used, this product is more effective for reducing noise compared to the GCM series for automotive.

### Specifications

|                   |                                                                                                                    |
|-------------------|--------------------------------------------------------------------------------------------------------------------|
| Size              | 2.0×1.25mm to 5.7×5.0mm                                                                                            |
| Rated Voltage     | 250Vdc to 630Vdc                                                                                                   |
| Capacitance       | 10000pF to 1.0μF                                                                                                   |
| Main Applications | For PFC (Power Factor Correction) Circuits of Power Supplies, EMI Suppression and Smoothing Circuits of automotive |



## GC3 Series High Dielectric Constant Type Power-train AEC-Q200 Anti-noise Part Number List

### 2.0×1.25mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.0mm  | 250Vdc        | X7T     | 10000pF | ±10% | GC321AD72E103KX01# |  |
|        |               |         | 15000pF | ±10% | GC321AD72E153KX01# |  |
| 1.45mm | 250Vdc        | X7T     | 22000pF | ±10% | GC321BD72E223KX03# |  |

| T max. | Rated Voltage | TC Code | Cap.  | Tol. | Part Number        |  |
|--------|---------------|---------|-------|------|--------------------|--|
| 2.7mm  | 250Vdc        | X7T     | 1.0μF | ±10% | GC355XD72E105KX05# |  |

### 3.2×1.6mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.0mm  | 450Vdc        | X7T     | 10000pF | ±10% | GC331AD72W103KX01# |  |
|        |               |         | 15000pF | ±10% | GC331AD72W153KX01# |  |
|        | 250Vdc        | X7T     | 33000pF | ±10% | GC331AD72E333KX01# |  |
| 1.25mm | 630Vdc        | X7T     | 10000pF | ±10% | GC331BD72J103KX01# |  |
|        | 450Vdc        | X7T     | 22000pF | ±10% | GC331BD72W223KX01# |  |
|        |               |         | 33000pF | ±10% | GC331BD72W333KX01# |  |
|        | 250Vdc        | X7T     | 47000pF | ±10% | GC331BD72E473KX01# |  |
| 1.8mm  | 630Vdc        | X7T     | 15000pF | ±10% | GC331CD72J153KX03# |  |
|        | 450Vdc        | X7T     | 47000pF | ±10% | GC331CD72W473KX03# |  |
|        | 250Vdc        | X7T     | 68000pF | ±10% | GC331CD72E683KX03# |  |

### 3.2×2.5mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.5mm  | 630Vdc        | X7T     | 22000pF | ±10% | GC332QD72J223KX01# |  |
|        | 250Vdc        | X7T     | 0.10μF  | ±10% | GC332QD72E104KX01# |  |
| 2.0mm  | 630Vdc        | X7T     | 33000pF | ±10% | GC332DD72J333KX01# |  |
|        |               |         | 47000pF | ±10% | GC332DD72J473KX01# |  |
|        | 450Vdc        | X7T     | 68000pF | ±10% | GC332DD72W683KX01# |  |
|        |               |         | 0.10μF  | ±10% | GC332DD72W104KX01# |  |
|        | 250Vdc        | X7T     | 0.15μF  | ±10% | GC332DD72E154KX01# |  |

### 4.5×3.2mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 1.5mm  | 250Vdc        | X7T     | 0.22μF  | ±10% | GC343QD72E224KX01# |  |
| 2.0mm  | 630Vdc        | X7T     | 68000pF | ±10% | GC343DD72J683KX01# |  |
|        | 450Vdc        | X7T     | 0.15μF  | ±10% | GC343DD72W154KX01# |  |
|        | 250Vdc        | X7T     | 0.33μF  | ±10% | GC343DD72E334KX01# |  |

### 5.7×5.0mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 2.0mm  | 630Vdc        | X7T     | 0.10μF | ±10% | GC355DD72J104KX01# |  |
|        |               |         | 0.15μF | ±10% | GC355DD72J154KX01# |  |
|        | 450Vdc        | X7T     | 0.22μF | ±10% | GC355DD72W224KX01# |  |
|        |               |         | 0.33μF | ±10% | GC355DD72W334KX01# |  |
|        |               |         | 0.47μF | ±10% | GC355DD72W474KX01# |  |
|        | 250Vdc        | X7T     | 0.47μF | ±10% | GC355DD72E474KX01# |  |
|        |               |         | 0.68μF | ±10% | GC355DD72E684KX01# |  |
| 2.7mm  | 630Vdc        | X7T     | 0.22μF | ±10% | GC355XD72J224KX05# |  |

Part number # indicates the package specification code.

## Soft Termination Chip Multilayer Ceramic Capacitors for Automotive

### GCJ Series

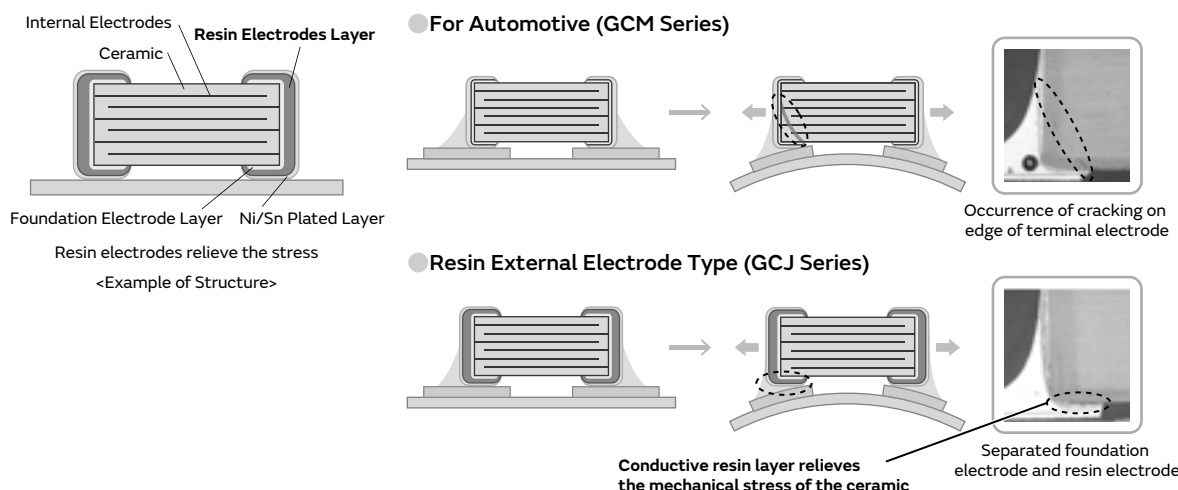


**Cracking caused by flexing stress after board mounting is minimized due to resin external electrodes!**

### Features

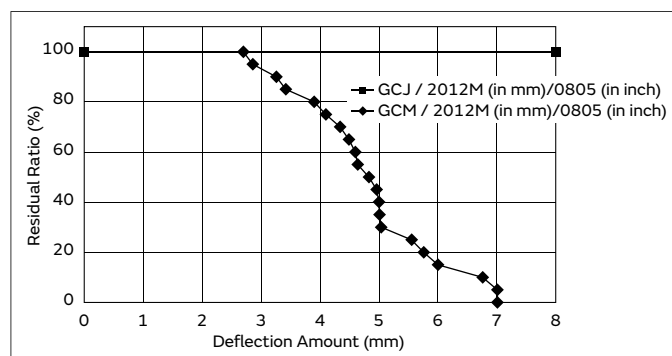
#### ① The resin external electrodes suppress cracks by board deflection.

Cracking of the ceramic element is suppressed by the resin of the external electrodes, which releases the stress.



Note: Cracks may occur in the capacitor body if excessive stress beyond the "guaranteed range of board bending strength (\*)" provided in the specifications is applied. Capacitors with cracks in them may cause a drop in insulation resistance, which could lead to a short circuit.  
(\*) For details on the guaranteed range of board bending strength, check the "Detailed Specification Sheet" on the Product Details Page.

#### ② Suppresses the occurrence of cracking caused by deflection stress at the time of board mounting, etc.



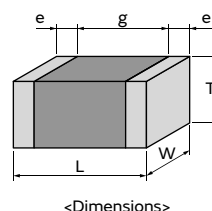
Due to the specification of the measuring instrument, measurements can be performed up to 8mm.

#### ③ Ideal for automotive.

This AEC-Q200 conforming product is ideal for the ECU, control circuits of headlights, etc. of automotive.

### Specifications

|                   |                                              |
|-------------------|----------------------------------------------|
| Size              | 1.6×0.8mm to 5.7×5.0mm                       |
| Rated Voltage     | 6.3Vdc to 1000Vdc                            |
| Capacitance       | 220pF to 47μF                                |
| Main Applications | Battery Lines and Powertrains for automotive |



# GCJ Series High Dielectric Constant Type Part Number List

1.6×0.8mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |
|--------|---------------|---------|---------|------|--------------------|
| 0.9mm  | 100Vdc        | X8L     | 0.10μF  | ±10% | GCJ188L8EL104KA07# |
|        |               |         |         |      |                    |
|        |               | X8R     | 1000pF  | ±10% | GCJ188R92A102KA01# |
|        |               |         | 1200pF  | ±10% | GCJ188R92A122KA01# |
|        |               |         | 1500pF  | ±10% | GCJ188R92A152KA01# |
|        |               |         | 1800pF  | ±10% | GCJ188R92A182KA01# |
|        |               |         | 2200pF  | ±10% | GCJ188R92A222KA01# |
|        |               |         | 2700pF  | ±10% | GCJ188R92A272KA01# |
|        |               |         | 3300pF  | ±10% | GCJ188R92A332KA01# |
|        |               |         | 3900pF  | ±10% | GCJ188R92A392KA01# |
|        |               |         | 4700pF  | ±10% | GCJ188R92A472KA01# |
|        |               |         | 5600pF  | ±10% | GCJ188R92A562KA01# |
|        |               |         | 6800pF  | ±10% | GCJ188R92A682KA01# |
|        |               |         | 8200pF  | ±10% | GCJ188R92A822KA01# |
|        |               |         | 10000pF | ±10% | GCJ188R92A103KA01# |
|        |               |         | 12000pF | ±10% | GCJ188R92A123KA01# |
|        |               |         | 15000pF | ±10% | GCJ188R92A153KA01# |
|        |               |         | 18000pF | ±10% | GCJ188R92A183KA01# |
|        |               |         | 22000pF | ±10% | GCJ188R92A223KA01# |
|        |               |         | 27000pF | ±10% | GCJ188R92A273KA01# |
|        |               |         | 33000pF | ±10% | GCJ188R92A333KA01# |
|        |               |         | 39000pF | ±10% | GCJ188R92A393KA01# |
|        |               |         | 47000pF | ±10% | GCJ188R92A473KA01# |
|        |               |         | 56000pF | ±10% | GCJ188R92A563KA01# |
|        |               |         | 68000pF | ±10% | GCJ188R92A683KA01# |
|        |               | X7R     | 1000pF  | ±10% | GCJ188R72A102KA01# |
|        |               |         | 1200pF  | ±10% | GCJ188R72A122KA01# |
|        |               |         | 1500pF  | ±10% | GCJ188R72A152KA01# |
|        |               |         | 1800pF  | ±10% | GCJ188R72A182KA01# |
|        |               |         | 2200pF  | ±10% | GCJ188R72A222KA01# |
|        |               |         | 2700pF  | ±10% | GCJ188R72A272KA01# |
|        |               |         | 3300pF  | ±10% | GCJ188R72A332KA01# |
|        |               |         | 3900pF  | ±10% | GCJ188R72A392KA01# |
|        |               |         | 4700pF  | ±10% | GCJ188R72A472KA01# |
|        |               |         | 5600pF  | ±10% | GCJ188R72A562KA01# |
|        |               |         | 6800pF  | ±10% | GCJ188R72A682KA01# |
|        |               |         | 8200pF  | ±10% | GCJ188R72A822KA01# |
|        |               |         | 10000pF | ±10% | GCJ188R72A103KA01# |
|        |               |         | 12000pF | ±10% | GCJ188R72A123KA01# |
|        |               |         | 15000pF | ±10% | GCJ188R72A153KA01# |
|        |               |         | 18000pF | ±10% | GCJ188R72A183KA01# |
|        |               |         | 22000pF | ±10% | GCJ188R72A223KA01# |
|        |               |         | 0.10μF  | ±10% | GCJ188R72A104KA01# |
|        | 50Vdc         | X8L     | 1000pF  | ±10% | GCJ188L81H102KA01# |
|        |               |         | 1200pF  | ±10% | GCJ188L81H122KA01# |
|        |               |         | 1500pF  | ±10% | GCJ188L81H152KA01# |
|        |               |         | 1800pF  | ±10% | GCJ188L81H182KA01# |
|        |               |         | 2200pF  | ±10% | GCJ188L81H222KA01# |
|        |               |         | 2700pF  | ±10% | GCJ188L81H272KA01# |
|        |               |         | 3300pF  | ±10% | GCJ188L81H332KA01# |
|        |               |         | 3900pF  | ±10% | GCJ188L81H392KA01# |
|        |               |         | 4700pF  | ±10% | GCJ188L81H472KA01# |
|        |               |         | 5600pF  | ±10% | GCJ188L81H562KA01# |

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |
|--------|---------------|---------|---------|------|--------------------|
| 0.9mm  | 50Vdc         | X8L     | 6800pF  | ±10% | GCJ188L81H682KA01# |
|        |               |         | 8200pF  | ±10% | GCJ188L81H822KA01# |
|        |               |         | 10000pF | ±10% | GCJ188L81H103KA01# |
|        |               |         | 12000pF | ±10% | GCJ188L81H123KA01# |
|        |               |         | 15000pF | ±10% | GCJ188L81H153KA01# |
|        |               |         | 18000pF | ±10% | GCJ188L81H183KA01# |
|        |               |         | 22000pF | ±10% | GCJ188L81H223KA01# |
|        |               |         | 0.15μF  | ±10% | GCJ188L8EH154KA07# |
|        |               |         | 0.22μF  | ±10% | GCJ188L8EH224KA07# |
|        |               | X8R     | 4700pF  | ±10% | GCJ188R91H472KA01# |
|        |               |         | 10000pF | ±10% | GCJ188R91H103KA01# |
|        |               |         | 0.10μF  | ±10% | GCJ188R91H104KA01# |
|        |               |         | 0.12μF  | ±10% | GCJ188R91H124KA01# |
|        |               |         | 0.15μF  | ±10% | GCJ188R91H154KA01# |
|        |               |         | 0.18μF  | ±10% | GCJ188R91H184KA01# |
|        |               |         | 0.22μF  | ±10% | GCJ188R91H224KA01# |
|        |               | X7R     | 1000pF  | ±10% | GCJ188R71H102KA01# |
|        |               |         | 1200pF  | ±10% | GCJ188R71H122KA01# |
|        |               |         | 1500pF  | ±10% | GCJ188R71H152KA01# |
|        |               |         | 1800pF  | ±10% | GCJ188R71H182KA01# |
|        |               |         | 2200pF  | ±10% | GCJ188R71H222KA01# |
|        |               |         | 2700pF  | ±10% | GCJ188R71H272KA01# |
|        |               |         | 3300pF  | ±10% | GCJ188R71H332KA01# |
|        |               |         | 3900pF  | ±10% | GCJ188R71H392KA01# |
|        |               |         | 4700pF  | ±10% | GCJ188R71H472KA01# |
|        |               |         | 5600pF  | ±10% | GCJ188R71H562KA01# |
|        |               |         | 6800pF  | ±10% | GCJ188R71H682KA01# |
|        |               |         | 8200pF  | ±10% | GCJ188R71H822KA01# |
|        |               |         | 10000pF | ±10% | GCJ188R71H103KA01# |
|        |               |         | 12000pF | ±10% | GCJ188R71H123KA01# |
|        |               |         | 15000pF | ±10% | GCJ188R71H153KA01# |
|        |               |         | 18000pF | ±10% | GCJ188R71H183KA01# |
|        |               |         | 22000pF | ±10% | GCJ188R71H223KA01# |
|        |               |         | 33000pF | ±10% | GCJ188R71H333KA12# |
|        |               |         | 39000pF | ±10% | GCJ188R71H393KA12# |
|        |               |         | 47000pF | ±10% | GCJ188R71H473KA12# |
|        |               |         | 56000pF | ±10% | GCJ188R71H563KA12# |
|        |               |         | 68000pF | ±10% | GCJ188R71H683KA12# |
|        |               |         | 82000pF | ±10% | GCJ188R71H823KA12# |
|        |               |         | 0.10μF  | ±10% | GCJ188R71H104KA12# |
|        |               |         | 0.15μF  | ±10% | GCJ188R71H154KA01# |
|        |               |         | 0.22μF  | ±10% | GCJ188R71H224KA01# |
|        | 35Vdc         | X8L     | 33000pF | ±10% | GCJ188L8YA333KA01# |
|        |               |         | 39000pF | ±10% | GCJ188L8YA393KA01# |
|        |               |         | 56000pF | ±10% | GCJ188L8YA563KA01# |
|        |               |         | 68000pF | ±10% | GCJ188L8YA683KA01# |
|        | 25Vdc         | X8L     | 33000pF | ±10% | GCJ188L81E333KA01# |
|        |               |         | 39000pF | ±10% | GCJ188L81E393KA01# |
|        |               |         | 56000pF | ±10% | GCJ188L81E563KA01# |
|        |               |         | 68000pF | ±10% | GCJ188L81E683KA01# |
|        |               |         | 82000pF | ±10% | GCJ188L81E823KA01# |
|        |               |         | 0.15μF  | ±10% | GCJ188L81E154KA01# |
|        |               |         | 0.18μF  | ±10% | GCJ188L81E184KA01# |
|        |               |         | 0.22μF  | ±10% | GCJ188L81E224KA01# |

Part number # indicates the package specification code.







GRT Series

GCM Series

GC3 Series

GCJ Series

GCD Series

GCE Series

NMF Series

KCM Series

KC3 Series

KCA Series

GCG Series

⚠Caution/  
 Notice

# GCJ Series High Dielectric Constant Type Part Number List

(→ 5.7×5.0mm)

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 2.0mm  | 630Vdc        | X7R     | 0.22μF | ±10% | GCJ55DR72J224KXJ1# |  |
|        |               |         | 0.33μF | ±10% | GCJ55DR72E334KXJ1# |  |
|        |               |         | 0.47μF | ±10% | GCJ55DR72E474KXJ1# |  |
|        |               |         | 0.68μF | ±10% | GCJ55DR72E684KXJ1# |  |
|        |               |         | 1.0μF  | ±10% | GCJ55DR72E105KXJ1# |  |

## MLSC Design Chip Multilayer Ceramic Capacitors for Automotive

# GCD Series

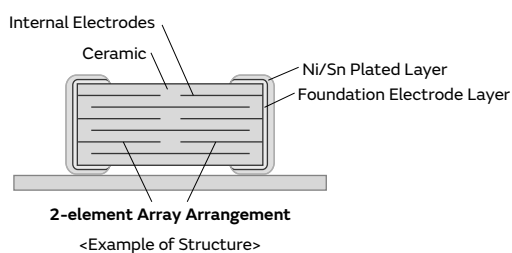


**Prevents momentary dielectric breakdown by a 2-element array structure!**

## Features

### ① Prevents momentary dielectric breakdown by a 2-element array structure!

This product consists of 2 elements arranged in 1 capacitor. It is structured so that even when 1 element is shorted, the other capacitor element will not short.

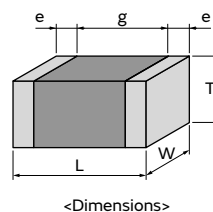


### ② This AEC-Q200 conforming product is ideal for the battery lines of automotive.

Space can be reduced in battery lines where 2 capacitors are arranged in an array.

## Specifications

|                   |                                              |
|-------------------|----------------------------------------------|
| Size              | 1.6×0.8mm to 2.0×1.25mm                      |
| Rated Voltage     | 16Vdc to 100Vdc                              |
| Capacitance       | 1000pF to 0.50μF                             |
| Main Applications | Battery Lines and Powertrains for automotive |



GRT Series

GCM Series

GC3 Series

GCJ Series

GCD Series

GCE Series

NMF Series

KCM Series

KC3 Series

KCA Series

GCG Series

⚠Caution / Notice

# GCD Series High Dielectric Constant Type Part Number List

## 1.6×0.8mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 0.9mm  | 100Vdc        | X7R     | 1000pF  | ±10% | GCD188R72A102KA01# |  |
|        |               |         | 1200pF  | ±10% | GCD188R72A122KA01# |  |
|        |               |         | 1500pF  | ±10% | GCD188R72A152KA01# |  |
|        |               |         | 1800pF  | ±10% | GCD188R72A182KA01# |  |
|        |               |         | 2200pF  | ±10% | GCD188R72A222KA01# |  |
|        |               |         | 2700pF  | ±10% | GCD188R72A272KA01# |  |
|        |               |         | 3300pF  | ±10% | GCD188R72A332KA01# |  |
|        |               |         | 3900pF  | ±10% | GCD188R72A392KA01# |  |
|        |               |         | 4700pF  | ±10% | GCD188R72A472KA01# |  |
|        |               |         | 5600pF  | ±10% | GCD188R72A562KA01# |  |
|        |               |         | 6800pF  | ±10% | GCD188R72A682KA01# |  |
|        |               |         | 8200pF  | ±10% | GCD188R72A822KA01# |  |
|        |               |         | 10000pF | ±10% | GCD188R72A103KA01# |  |
|        |               |         | 12000pF | ±10% | GCD188R72A123KA01# |  |
|        |               |         | 15000pF | ±10% | GCD188R72A153KA01# |  |
|        |               |         | 18000pF | ±10% | GCD188R72A183KA01# |  |
|        |               |         | 22000pF | ±10% | GCD188R72A223KA01# |  |
|        | 50Vdc         | X7R     | 1000pF  | ±10% | GCD188R71H102KA01# |  |
|        |               |         | 1200pF  | ±10% | GCD188R71H122KA01# |  |
|        |               |         | 1500pF  | ±10% | GCD188R71H152KA01# |  |
|        |               |         | 1800pF  | ±10% | GCD188R71H182KA01# |  |
|        |               |         | 2200pF  | ±10% | GCD188R71H222KA01# |  |
|        |               |         | 2700pF  | ±10% | GCD188R71H272KA01# |  |
|        |               |         | 3300pF  | ±10% | GCD188R71H332KA01# |  |
|        |               |         | 3900pF  | ±10% | GCD188R71H392KA01# |  |
|        |               |         | 4700pF  | ±10% | GCD188R71H472KA01# |  |
|        |               |         | 5600pF  | ±10% | GCD188R71H562KA01# |  |
|        |               |         | 6800pF  | ±10% | GCD188R71H682KA01# |  |
|        |               |         | 8200pF  | ±10% | GCD188R71H822KA01# |  |
|        |               |         | 10000pF | ±10% | GCD188R71H103KA01# |  |
|        |               |         | 12000pF | ±10% | GCD188R71H123KA01# |  |
|        |               |         | 15000pF | ±10% | GCD188R71H153KA01# |  |
|        |               |         | 18000pF | ±10% | GCD188R71H183KA01# |  |
|        |               |         | 22000pF | ±10% | GCD188R71H223KA01# |  |
|        | 25Vdc         | X7R     | 27000pF | ±10% | GCD188R71E273KA01# |  |
|        |               |         | 33000pF | ±10% | GCD188R71E333KA01# |  |
|        |               |         | 39000pF | ±10% | GCD188R71E393KA01# |  |
|        |               |         | 47000pF | ±10% | GCD188R71E473KA01# |  |

## 2.0×1.25mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 0.7mm  | 100Vdc        | X7R     | 1000pF | ±10% | GCD216R72A102KA01# |  |
|        |               |         | 1200pF | ±10% | GCD216R72A122KA01# |  |
|        |               |         | 1500pF | ±10% | GCD216R72A152KA01# |  |
|        |               |         | 1800pF | ±10% | GCD216R72A182KA01# |  |
|        |               |         | 2200pF | ±10% | GCD216R72A222KA01# |  |
|        |               |         | 2700pF | ±10% | GCD216R72A272KA01# |  |
|        |               |         | 3300pF | ±10% | GCD216R72A332KA01# |  |
|        |               |         | 3900pF | ±10% | GCD216R72A392KA01# |  |
|        |               |         | 4700pF | ±10% | GCD216R72A472KA01# |  |

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 0.7mm  | 100Vdc        | X7R     | 5600pF  | ±10% | GCD216R72A562KA01# |  |
| 0.95mm | 100Vdc        | X7R     | 6800pF  | ±10% | GCD219R72A682KA01# |  |
| 1.4mm  | 100Vdc        | X7R     | 8200pF  | ±10% | GCD21BR72A822KA01# |  |
|        |               |         | 10000pF | ±10% | GCD21BR72A103KA01# |  |
|        |               |         | 12000pF | ±10% | GCD21BR72A123KA01# |  |
|        |               |         | 15000pF | ±10% | GCD21BR72A153KA01# |  |
|        |               |         | 18000pF | ±10% | GCD21BR72A183KA01# |  |
|        |               |         | 22000pF | ±10% | GCD21BR72A223KA01# |  |
|        |               |         | 27000pF | ±10% | GCD21BR72A273KA01# |  |
|        |               |         | 33000pF | ±10% | GCD21BR72A333KA01# |  |
|        |               |         | 39000pF | ±10% | GCD21BR72A393KA01# |  |
|        |               |         | 47000pF | ±10% | GCD21BR72A473KA01# |  |
|        |               |         | 56000pF | ±10% | GCD21BR72A563KA01# |  |
|        |               |         | 68000pF | ±10% | GCD21BR72A683KA01# |  |
|        |               |         | 82000pF | ±10% | GCD21BR72A823KA01# |  |
|        |               |         | 0.10μF  | ±10% | GCD21BR72A104KA01# |  |
|        | 50Vdc         | X7R     | 15000pF | ±10% | GCD21BR71H153KA01# |  |
|        |               |         | 18000pF | ±10% | GCD21BR71H183KA01# |  |
|        |               |         | 22000pF | ±10% | GCD21BR71H223KA01# |  |
|        |               |         | 27000pF | ±10% | GCD21BR71H273KA01# |  |
|        |               |         | 33000pF | ±10% | GCD21BR71H333KA01# |  |
|        |               |         | 39000pF | ±10% | GCD21BR71H393KA01# |  |
|        |               |         | 47000pF | ±10% | GCD21BR71H473KA01# |  |
|        |               |         | 56000pF | ±10% | GCD21BR71H563KA01# |  |
|        |               |         | 68000pF | ±10% | GCD21BR71H683KA01# |  |
|        |               |         | 82000pF | ±10% | GCD21BR71H823KA01# |  |
|        |               |         | 0.10μF  | ±10% | GCD21BR71H104KA01# |  |

Part number # indicates the package specification code.

## Soft Termination MLSC Design Chip Multilayer Ceramic Capacitors for Automotive

### GCE Series

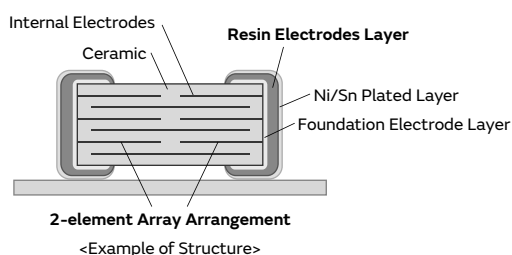


**Further improved safety performance with a combination of a 2-element array structure & resin external electrodes!**

### Features

#### ① Avoid instantaneous dielectric breakdown with the 2-element array structure

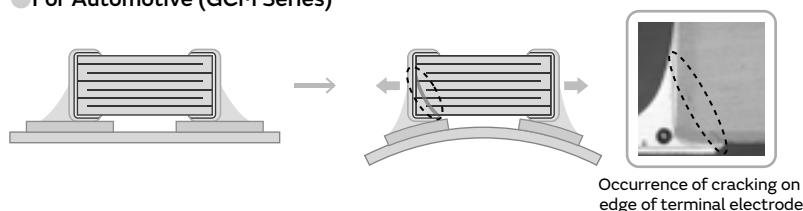
This product is configured with 2 elements arranged in one capacitor. Even if one element short circuits, the other element in the capacitor does not short.



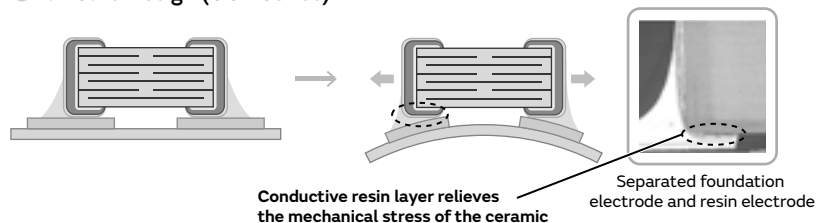
#### ② Provides additional safety performance in combination with resin electrodes

Adopting resin electrodes as the external electrodes will suppress the occurrence of cracking in the capacitor by mechanical stress.

##### ● For Automotive (GCM Series)



##### ● Fail Safe Design (GCE Series)



Note: Cracks may occur in the capacitor body if excessive stress beyond the "guaranteed range of board bending strength (\*)" provided in the specifications is applied. Capacitors with cracks in them may cause a drop in insulation resistance, which could lead to a short circuit.

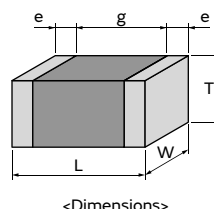
(\*) For details on the guaranteed range of board bending strength, check the "Detailed Specification Sheet" on the Product Details Page.

#### ③ Ideal for battery lines of on-board applications

Space can be reduced for battery lines, when 2 capacitors are configured in an array.

### Specifications

|                   |                                             |
|-------------------|---------------------------------------------|
| Size              | 1.6×0.8mm to 2.0×1.25mm                     |
| Rated Voltage     | 25Vdc to 100Vdc                             |
| Capacitance       | 220pF to 0.10μF                             |
| Main Applications | For automotive, Battery lines, power trains |



# GCE Series High Dielectric Constant Type Part Number List

## 1.6×0.8mm

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 0.9mm  | 100Vdc        | X7R     | 1000pF  | ±10% | GCE188R72A102KA01# |  |
|        |               |         | 1200pF  | ±10% | GCE188R72A122KA01# |  |
|        |               |         | 1500pF  | ±10% | GCE188R72A152KA01# |  |
|        |               |         | 1800pF  | ±10% | GCE188R72A182KA01# |  |
|        |               |         | 2200pF  | ±10% | GCE188R72A222KA01# |  |
|        |               |         | 2700pF  | ±10% | GCE188R72A272KA01# |  |
|        |               |         | 3300pF  | ±10% | GCE188R72A332KA01# |  |
|        |               |         | 3900pF  | ±10% | GCE188R72A392KA01# |  |
|        |               |         | 4700pF  | ±10% | GCE188R72A472KA01# |  |
|        |               |         | 5600pF  | ±10% | GCE188R72A562KA01# |  |
|        |               |         | 6800pF  | ±10% | GCE188R72A682KA01# |  |
|        |               |         | 8200pF  | ±10% | GCE188R72A822KA01# |  |
|        |               |         | 10000pF | ±10% | GCE188R72A103KA01# |  |
|        |               |         | 12000pF | ±10% | GCE188R72A123KA01# |  |
|        |               |         | 15000pF | ±10% | GCE188R72A153KA01# |  |
|        |               |         | 18000pF | ±10% | GCE188R72A183KA01# |  |
|        |               |         | 22000pF | ±10% | GCE188R72A223KA01# |  |
|        | 50Vdc         | X7R     | 1000pF  | ±10% | GCE188R71H102KA01# |  |
|        |               |         | 1200pF  | ±10% | GCE188R71H122KA01# |  |
|        |               |         | 1500pF  | ±10% | GCE188R71H152KA01# |  |
|        |               |         | 1800pF  | ±10% | GCE188R71H182KA01# |  |
|        |               |         | 2200pF  | ±10% | GCE188R71H222KA01# |  |
|        |               |         | 2700pF  | ±10% | GCE188R71H272KA01# |  |
|        |               |         | 3300pF  | ±10% | GCE188R71H332KA01# |  |
|        |               |         | 3900pF  | ±10% | GCE188R71H392KA01# |  |
|        |               |         | 4700pF  | ±10% | GCE188R71H472KA01# |  |
|        |               |         | 5600pF  | ±10% | GCE188R71H562KA01# |  |
|        |               |         | 6800pF  | ±10% | GCE188R71H682KA01# |  |
|        |               |         | 8200pF  | ±10% | GCE188R71H822KA01# |  |
|        |               |         | 10000pF | ±10% | GCE188R71H103KA01# |  |
|        |               |         | 12000pF | ±10% | GCE188R71H123KA01# |  |
|        |               |         | 15000pF | ±10% | GCE188R71H153KA01# |  |
|        |               |         | 18000pF | ±10% | GCE188R71H183KA01# |  |
|        |               |         | 22000pF | ±10% | GCE188R71H223KA01# |  |
|        | 25Vdc         | X7R     | 27000pF | ±10% | GCE188R71E273KA01# |  |
|        |               |         | 33000pF | ±10% | GCE188R71E333KA01# |  |
|        |               |         | 39000pF | ±10% | GCE188R71E393KA01# |  |
|        |               |         | 47000pF | ±10% | GCE188R71E473KA01# |  |

## 2.0×1.25mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 0.7mm  | 100Vdc        | X7R     | 1000pF | ±10% | GCE216R72A102KA01# |  |
|        |               |         | 1200pF | ±10% | GCE216R72A122KA01# |  |
|        |               |         | 1500pF | ±10% | GCE216R72A152KA01# |  |
|        |               |         | 1800pF | ±10% | GCE216R72A182KA01# |  |
|        |               |         | 2200pF | ±10% | GCE216R72A222KA01# |  |
|        |               |         | 2700pF | ±10% | GCE216R72A272KA01# |  |
|        |               |         | 3300pF | ±10% | GCE216R72A332KA01# |  |
|        |               |         | 3900pF | ±10% | GCE216R72A392KA01# |  |
|        |               |         | 4700pF | ±10% | GCE216R72A472KA01# |  |

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 0.7mm  | 100Vdc        | X7R     | 5600pF  | ±10% | GCE216R72A562KA01# |  |
| 0.95mm | 100Vdc        | X7R     | 220pF   | ±10% | GCE219R72A221KA01# |  |
|        |               |         | 270pF   | ±10% | GCE219R72A271KA01# |  |
|        |               |         | 330pF   | ±10% | GCE219R72A331KA01# |  |
|        |               |         | 390pF   | ±10% | GCE219R72A391KA01# |  |
|        |               |         | 470pF   | ±10% | GCE219R72A471KA01# |  |
|        |               |         | 560pF   | ±10% | GCE219R72A561KA01# |  |
|        |               |         | 680pF   | ±10% | GCE219R72A681KA01# |  |
|        |               |         | 820pF   | ±10% | GCE219R72A821KA01# |  |
|        |               |         | 6800pF  | ±10% | GCE219R72A682KA01# |  |
|        |               |         |         |      |                    |  |
| 1.45mm | 100Vdc        | X7R     | 8200pF  | ±10% | GCE21BR72A822KA01# |  |
|        |               |         | 10000pF | ±10% | GCE21BR72A103KA01# |  |
|        |               |         | 12000pF | ±10% | GCE21BR72A123KA01# |  |
|        |               |         | 15000pF | ±10% | GCE21BR72A153KA01# |  |
|        |               |         | 18000pF | ±10% | GCE21BR72A183KA01# |  |
|        |               |         | 22000pF | ±10% | GCE21BR72A223KA01# |  |
|        |               |         | 27000pF | ±10% | GCE21BR72A273KA01# |  |
|        |               |         | 33000pF | ±10% | GCE21BR72A333KA01# |  |
|        |               |         | 39000pF | ±10% | GCE21BR72A393KA01# |  |
|        |               |         | 47000pF | ±10% | GCE21BR72A473KA01# |  |
|        |               |         | 56000pF | ±10% | GCE21BR72A563KA01# |  |
|        |               |         | 68000pF | ±10% | GCE21BR72A683KA01# |  |
|        |               |         | 82000pF | ±10% | GCE21BR72A823KA01# |  |
|        |               |         | 0.10μF  | ±10% | GCE21BR72A104KA01# |  |
|        | 50Vdc         | X7R     | 15000pF | ±10% | GCE21BR71H153KA01# |  |
|        |               |         | 18000pF | ±10% | GCE21BR71H183KA01# |  |
|        |               |         | 22000pF | ±10% | GCE21BR71H223KA01# |  |
|        |               |         | 27000pF | ±10% | GCE21BR71H273KA01# |  |
|        |               |         | 33000pF | ±10% | GCE21BR71H333KA01# |  |
|        |               |         | 39000pF | ±10% | GCE21BR71H393KA01# |  |
|        |               |         | 47000pF | ±10% | GCE21BR71H473KA01# |  |
|        |               |         | 56000pF | ±10% | GCE21BR71H563KA01# |  |
|        |               |         | 68000pF | ±10% | GCE21BR71H683KA01# |  |
|        |               |         | 82000pF | ±10% | GCE21BR71H823KA01# |  |
|        |               |         | 0.10μF  | ±10% | GCE21BR71H104KA01# |  |

Part number # indicates the package specification code.

## Very Large Current 3 Terminals Low ESL Chip Multilayer Ceramic Capacitors for Automotive (EMIFIL®)

### NFM Series



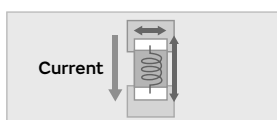
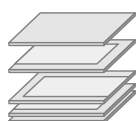
This is the most suitable Low ESL capacitors for noise measurement and power decoupling of highspeed electrical devices.

### Features

#### ① Low ESL

Since the equivalent series inductance (ESL) is low and excellent in high frequency characteristics, this capacitor is suitable for power supply decoupling of high-speed operation electronic equipment.

##### • 2-terminal Capacitor

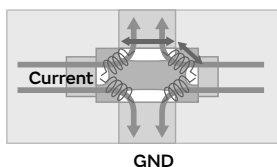
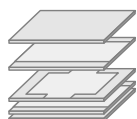


HOT  
GND

- × long current distance
- × Narrow wiring width

Realizes Ultra low ESL by using a extremely shorter high frequency current path

##### • 3-terminal capacitor



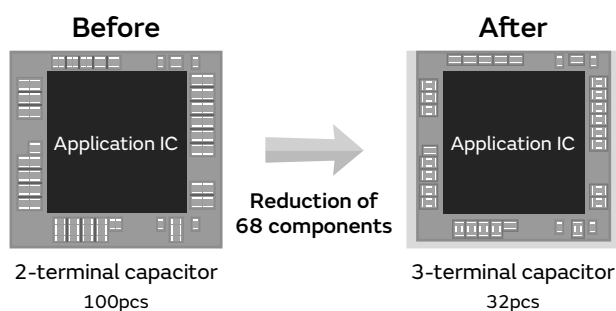
HOT

GND

- Short current distance
- Wide wiring width
- Four routes formed in parallel

#### ② Contributes to a reduction in the number of components.

The number of components can be reduced by using low ESL capacitors, while maintaining functions equivalent to 2-terminal capacitor.



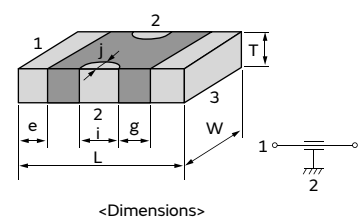
#### ③ Contributes to noise suppression

Example of noise suppression effect



### Specifications

|                   |                                                                           |
|-------------------|---------------------------------------------------------------------------|
| Size              | 2.0×1.25mm to 3.2×1.6mm                                                   |
| Rated Voltage     | 10Vdc to 100Vdc                                                           |
| Capacitance       | 220pF to 1.0μF                                                            |
| Main Applications | Safety equipment, Drive system control, Information and Comfort equipment |



<Dimensions>

GRT Series

GCM Series

GC3 Series

GCJ Series

GCD Series

GCE Series

NMF Series

KCM Series

KC3 Series

KCA Series

GCJ Series

⚠Caution / Notice

## NFM Series Part Number List

### 2.0×1.25mm

| T max. | Rated Voltage | Cap.    | Tol. | Part Number     |  |
|--------|---------------|---------|------|-----------------|--|
| 0.95mm | 50Vdc         | 220pF   | ±20% | NFM21HC221R1H3# |  |
|        |               | 470pF   | ±20% | NFM21HC471R1H3# |  |
|        |               | 1000pF  | ±20% | NFM21HC102R1H3# |  |
|        |               | 2200pF  | ±20% | NFM21HC222R1H3# |  |
|        |               | 22000pF | ±20% | NFM21HC223R1H3# |  |
|        | 16Vdc         | 1.0μF   | ±20% | NFM21HC105R1C3# |  |
|        | 10Vdc         | 0.10μF  | ±20% | NFM21HC104R1A3# |  |
|        |               | 0.22μF  | ±20% | NFM21HC224R1A3# |  |
|        |               | 0.47μF  | ±20% | NFM21HC474R1A3# |  |

### 3.2×1.6mm

| T max. | Rated Voltage | Cap.    | Tol. | Part Number     |           |
|--------|---------------|---------|------|-----------------|-----------|
| 1.5mm  | 100Vdc        | 10000pF | ±20% | NFM31HK103R2A3# | <b>D3</b> |
|        | 50Vdc         | 10000pF | ±20% | NFM31HK103R1H3# | <b>D3</b> |
|        |               | 15000pF | ±20% | NFM31HK153R1H3# | <b>D3</b> |
|        |               | 22000pF | ±20% | NFM31HK223R1H3# | <b>D3</b> |
|        |               | 0.10μF  | ±20% | NFM31HK104R1H3# |           |

## Metal Terminal Type Multilayer Ceramic Capacitors for Automotive

# KCM Series

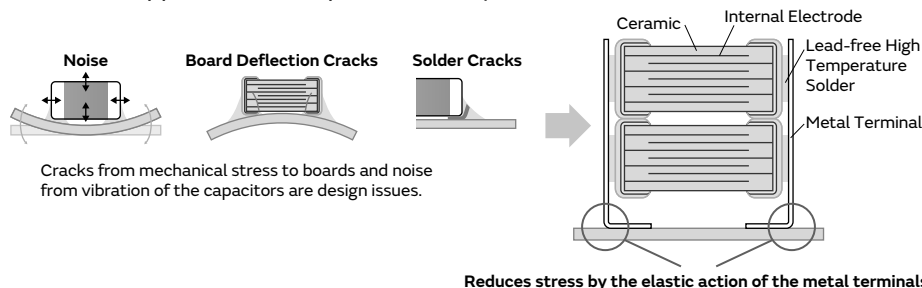


**Bonding the metal terminals to external electrodes solves design issues by mounting large size MLCC!**

### Features

#### ① Bond metal terminals to the external electrodes of chips.

The stress applied to the chip is relieved by the elastic action of the metal terminal.

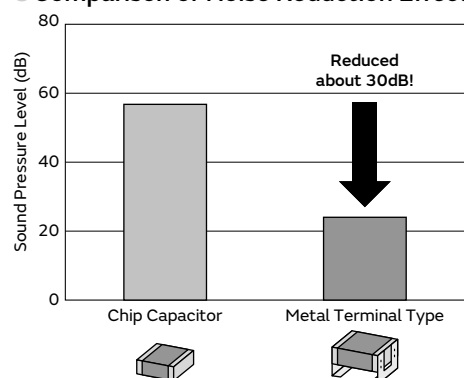


#### ② Substantially reduces noise, board deflection cracks and soldering cracks.

This product is not damaged even with a board deflection of 6 mm.

Solder cracks do not occur even with 2,000 cycles of heat stress.

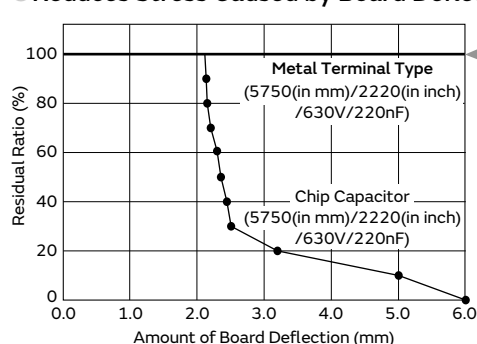
##### ● Comparison of Noise Reduction Effects



Evaluation Items: 5750 (in mm)/2220 (in inch) size/DC630V/220nF  
Test Method: DC50V, AC10Vp-p/3kHz  
Test Board: Glass Epoxy Board (T=1.6mm)  
Test Quantity: 3pc  
Distance Between Microphone and Board: 5mm

Note: Results Using Murata's Evaluation Board

##### ● Reduces Stress Caused by Board Deflection



##### ● Suppresses Solder Cracks Caused by Heat Stress

| Chip Size   | Chip Only<br>(5750 (in mm)/2220 (in inch) size) |  | Metal Terminal Type<br>(5750 (in mm)/2220 (in inch) size) |  |
|-------------|-------------------------------------------------|--|-----------------------------------------------------------|--|
| 1000 Cycles |                                                 |  |                                                           |  |
| 2000 Cycles |                                                 |  |                                                           |  |

Test Condition: -55 to +125°C, 5min., (Liquid Phase)  
Board Used: Glass Epoxy Board (FR-4)

Compared with chips only, this product is excellent in solder cracking resistance.

GRT Series

GCM Series

GC3 Series

GCJ Series

GCD Series

GCE Series

NMF Series

KCM Series

KC3 Series

KCA Series

GCG Series

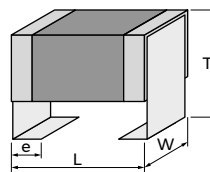
⚠Caution/  
Notice

### ③ 2 chips can be stacked.

Realize large capacity by stacking 2 capacitors.

## Specifications

|                   |                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------|
| Size              | 6.1×5.3mm                                                                                    |
| Rated Voltage     | 25Vdc to 100Vdc                                                                              |
| Capacitance       | 4.7μF to 100μF                                                                               |
| Main Applications | For drive system control of engine ECU<br>For other drive system controls and safety devices |



<Dimensions>

# KCM Series High Dielectric Constant Type Part Number List

## 6.1×5.3mm

| T max. | Rated Voltage | TC Code | Cap.  | Tol. | Part Number        |  |
|--------|---------------|---------|-------|------|--------------------|--|
| 3.0mm  | 100Vdc        | X7R     | 4.7μF | ±10% | KCM55LR72A475KH01# |  |
|        | 63Vdc         | X7R     | 4.7μF | ±10% | KCM55LR71J475KH01# |  |
|        | 50Vdc         | X7R     | 4.7μF | ±10% | KCM55LR71H475KH01# |  |
|        |               |         | 10μF  | ±10% | KCM55LR71H106KH01# |  |
|        | 35Vdc         | X7R     | 10μF  | ±10% | KCM55LR7YA106KH01# |  |
|        |               |         | 15μF  | ±10% | KCM55LR7YA156KH01# |  |
| 3.9mm  | 25Vdc         | X7R     | 15μF  | ±10% | KCM55LR71E156KH01# |  |
|        | 100Vdc        | X7R     | 6.8μF | ±10% | KCM55QR72A685KH01# |  |
|        |               |         | 10μF  | ±10% | KCM55QR72A106KH01# |  |
|        | 63Vdc         | X7R     | 10μF  | ±10% | KCM55QR71J106KH01# |  |
|        | 50Vdc         | X7R     | 17μF  | ±10% | KCM55QR71H176KH01# |  |
|        | 35Vdc         | X7R     | 17μF  | ±10% | KCM55QR7YA176KH01# |  |
|        |               |         | 22μF  | ±10% | KCM55QR7YA226KH01# |  |
|        | 25Vdc         | X7R     | 22μF  | ±10% | KCM55QR71E226KH01# |  |
|        |               |         | 33μF  | ±10% | KCM55QR71E336KH01# |  |
|        |               | X7S     | 47μF  | ±10% | KCM55QC71E476KH13# |  |
| 5.0mm  | 100Vdc        | X7R     | 10μF  | ±20% | KCM55TR72A106MH01# |  |
|        | 50Vdc         | X7R     | 22μF  | ±20% | KCM55TR71H226MH01# |  |
|        | 35Vdc         | X7R     | 22μF  | ±20% | KCM55TR7YA226MH01# |  |
|        |               |         | 33μF  | ±20% | KCM55TR7YA336MH01# |  |
|        | 25Vdc         | X7R     | 33μF  | ±20% | KCM55TR71E336MH01# |  |
| 6.7mm  | 100Vdc        | X7R     | 15μF  | ±20% | KCM55WR72A156MH01# |  |
|        |               |         | 22μF  | ±20% | KCM55WR72A226MH01# |  |
|        | 63Vdc         | X7R     | 22μF  | ±20% | KCM55WR71J226MH01# |  |
|        | 50Vdc         | X7R     | 33μF  | ±20% | KCM55WR71H336MH01# |  |
|        | 35Vdc         | X7R     | 47μF  | ±20% | KCM55WR7YA476MH01# |  |
|        | 25Vdc         | X7R     | 47μF  | ±20% | KCM55WR71E476MH01# |  |
|        |               |         | 68μF  | ±20% | KCM55WR71E686MH01# |  |
|        |               | X7S     | 100μF | ±20% | KCM55WC71E107MH13# |  |

High Effective Capacitance & High Allowable Ripple Current Metal Terminal Type Multilayer Ceramic Capacitors for Automotive

## KC3 Series

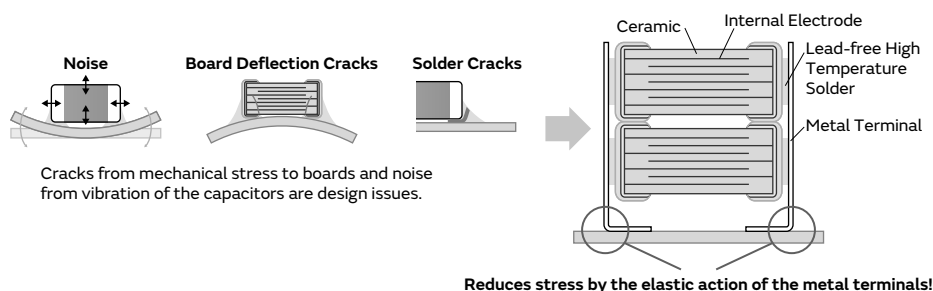


**Bonding the metal terminals to external electrodes solves design issues by mounting large size MLCC!**

### Features

#### 1 Bond Metal Terminals to External Electrodes of Chips

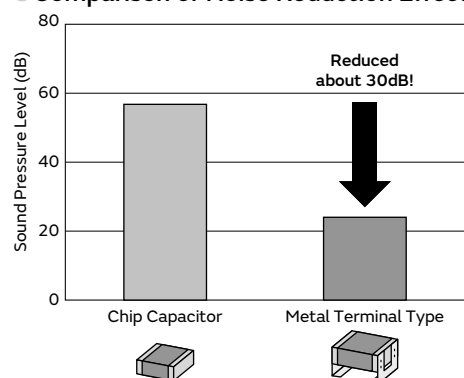
This product has high resistance to heat and mechanical impact and greatly reduces acoustic noise of boards by ceramics.



#### 2 Stacking of Chips

Achieve high capacity by stacking 2 capacitors.

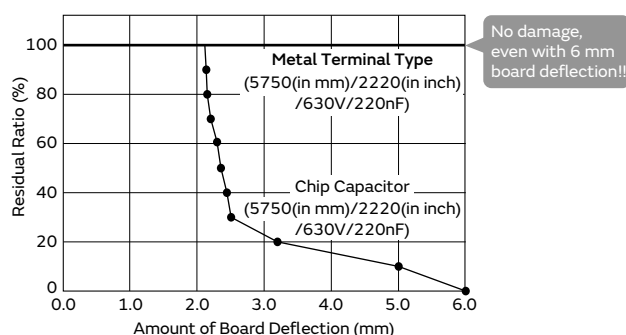
##### Comparison of Noise Reduction Effects



Evaluation Items: 5750 (in mm)/2220 (in inch) size/DC630V/220nF  
Test Method: DC50V, AC10Vp-p/3kHz  
Test Board: Glass Epoxy Board (T=1.6mm)  
Test Quantity: 3pc  
Distance Between Microphone and Board: 5mm

Note: Results Using Murata's Evaluation Board

##### Reduces Stress Caused by Board Deflection



##### Suppresses Solder Cracks Caused by Heat Stress

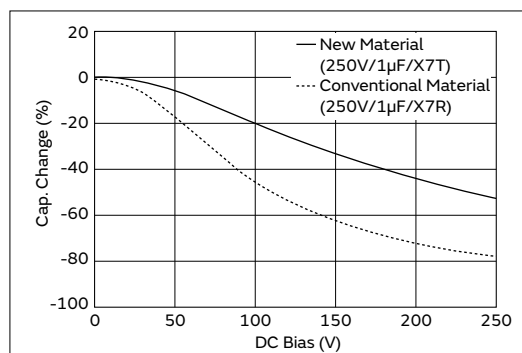
| Chip Size   | Chip Only<br>(5750 (in mm)/2220 (in inch) size) |  | Metal Terminal Type<br>(5750 (in mm)/2220 (in inch) size) |  |
|-------------|-------------------------------------------------|--|-----------------------------------------------------------|--|
| 1000 Cycles |                                                 |  |                                                           |  |
| 2000 Cycles |                                                 |  |                                                           |  |

Test Condition: -55 to +125°C, 5min., (Liquid Phase)  
Board Used: Glass Epoxy Board (FR-4)

Compared with chips only, this product is excellent in solder cracking resistance.

### ③ Adopted Low Dielectric Constant Materials

Improved effective capacity and ripple resistant performance, compared to conventional products (X7R characteristics).

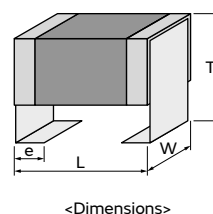


### ④ 2 chips can be stacked

Realize large capacity by stacking 2 capacitors.

## Specifications

|                   |                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------|
| Size              | 6.1×5.3mm                                                                                    |
| Rated Voltage     | 250Vdc to 630Vdc                                                                             |
| Capacitance       | 0.10μF to 2.2μF                                                                              |
| Main Applications | For drive system control of engine ECU<br>For other drive system controls and safety devices |



<Dimensions>

# KC3 Series High Dielectric Constant Type Part Number List

## 6.1×5.3mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 3.0mm  | 630Vdc        | X7T     | 0.10μF | ±10% | KC355LD72J104KH01# |  |
|        |               |         | 0.15μF | ±10% | KC355LD72J154KH01# |  |
|        |               |         | 0.33μF | ±10% | KC355LD7LQ334KV01# |  |
|        |               |         | 0.47μF | ±10% | KC355LD7LQ474KV01# |  |
|        | 450Vdc        | X7T     | 0.22μF | ±10% | KC355LD72W224KH01# |  |
|        |               |         | 0.33μF | ±10% | KC355LD72W334KH01# |  |
|        |               |         | 0.47μF | ±10% | KC355LD72W474KH01# |  |
|        |               |         | 0.68μF | ±10% | KC355LD7LP684KV01# |  |
|        | 250Vdc        | X7T     | 0.47μF | ±10% | KC355LD72E474KH01# |  |
|        |               |         | 0.68μF | ±10% | KC355LD72E684KH01# |  |
| 3.9mm  | 630Vdc        | X7T     | 0.22μF | ±10% | KC355QD72J224KH01# |  |
|        |               |         | 0.27μF | ±10% | KC355QD72J274KH01# |  |
|        |               |         | 0.56μF | ±10% | KC355QD7LQ564KV01# |  |
|        | 450Vdc        | X7T     | 0.56μF | ±10% | KC355QD72W564KH01# |  |
|        |               |         | 1μF    | ±10% | KC355QD7LP105KV01# |  |
|        | 250Vdc        | X7T     | 1.0μF  | ±10% | KC355QD72E105KH01# |  |
| 5.0mm  | 630Vdc        | X7T     | 0.68μF | ±20% | KC355TD7LQ684MV01# |  |
|        |               |         | 1μF    | ±20% | KC355TD7LQ105MV01# |  |
|        | 450Vdc        | X7T     | 0.68μF | ±20% | KC355TD72W684MH01# |  |
|        |               |         | 1.0μF  | ±20% | KC355TD72W105MH01# |  |
|        |               |         | 1.5μF  | ±20% | KC355TD7LP155MV01# |  |
|        | 250Vdc        | X7T     | 1.5μF  | ±20% | KC355TD72E155MH01# |  |
| 6.7mm  | 630Vdc        | X7T     | 0.47μF | ±20% | KC355WD72J474MH01# |  |
|        |               |         | 0.56μF | ±20% | KC355WD72J564MH01# |  |
|        |               |         | 1.2μF  | ±20% | KC355WD7LQ125MV01# |  |
|        | 450Vdc        | X7T     | 1.2μF  | ±20% | KC355WD72W125MH01# |  |
|        |               |         | 2.2μF  | ±20% | KC355WD7LP225MV01# |  |
|        | 250Vdc        | X7T     | 2.2μF  | ±20% | KC355WD72E225MH01# |  |

## Safety Standard Certified Metal Terminal Type Multilayer Ceramic Capacitors for Automotive

# KCA Series



## For Automotive IEC60384-14 X1/Y2 Class Certified Product (Basic insulation product)

### Features

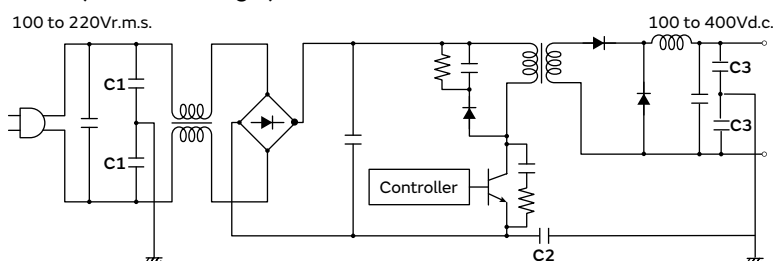
#### ① International Standard (IEC60384-14) certified product: Rated voltage AC250V (r.m.s.).

Please down load Safety Standard Certification (Type MF: X1,Y2) from Web site.

#### ② Best suitable for class Y2 capacitors.

AC250V (r.m.s.)-rated voltage, withstand voltage of AC2000V (r.m.s.) guaranteed for 60 seconds.

##### ● OBC (On Board Charger)

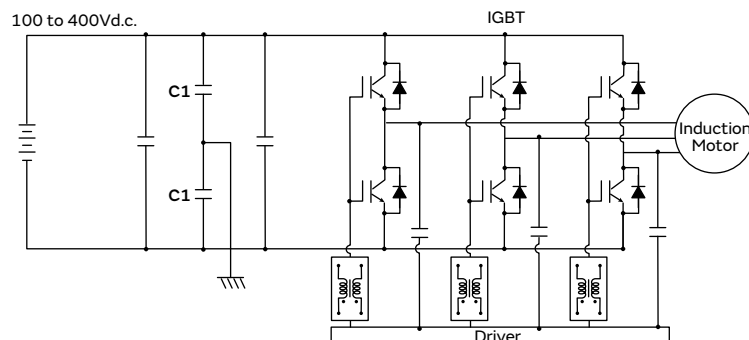


| No. | Application                |
|-----|----------------------------|
| C1  | Y Cap (Primary)            |
| C2  | Primary-Secondary Coupling |
| C3  | Y Cap (Secondary)          |

#### ③ Best suitable for DC input common mode noise filters.

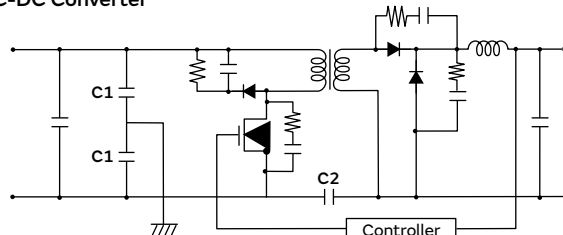
DC630V-rated voltage, withstand voltage of DC2700V guaranteed for 60 seconds.

##### ● Inverter



| No. | Application               |
|-----|---------------------------|
| C1  | Common mode noise filters |

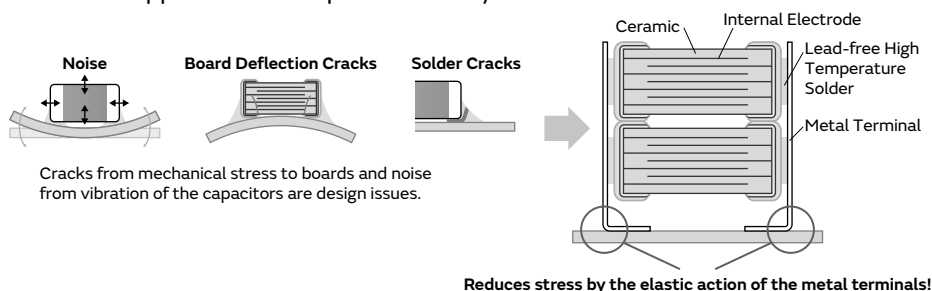
##### ● DC-DC Converter



| No. | Application                |
|-----|----------------------------|
| C1  | Common mode noise filters  |
| C2  | Primary-Secondary Coupling |

#### 4 Bond metal terminals to the external electrodes of chips.

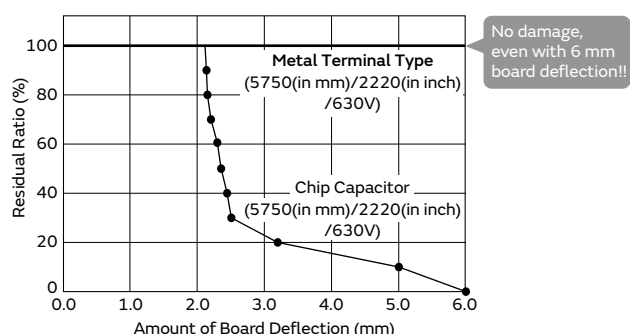
The stress applied to the chip is relieved by the elastic action of the metal terminal.



#### 5 Substantially reduces board deflection cracks and soldering cracks.

This product is not damaged even with a board deflection of 6 mm.  
Solder cracks do not occur even with 2,000 cycles of heat stress.

##### ● Reduces Stress Caused by Board Deflection



##### ● Suppresses Solder Cracks Caused by Heat Stress

| Chip Size   | Chip Only<br>(5750 (in mm)/2220 (in inch) size) |  | Metal Terminal Type<br>(5750 (in mm)/2220 (in inch) size) |  |
|-------------|-------------------------------------------------|--|-----------------------------------------------------------|--|
| 1000 Cycles |                                                 |  |                                                           |  |
| 2000 Cycles |                                                 |  |                                                           |  |

Test Condition: -55 to +125°C, 5min., (Liquid Phase)  
Board Used: Glass Epoxy Board (FR-4)

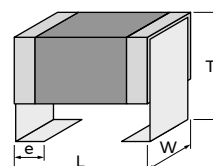
Compared with chips only, this product is excellent in solder cracking resistance.

#### 6 2 chips can be stacked.

Realize large capacity by stacking 2 capacitors.

### Specifications

|                   |                                              |
|-------------------|----------------------------------------------|
| Size              | 6.1×5.3mm                                    |
| Rated Voltage     | 250Vac (r.m.s.)                              |
| Capacitance       | 100pF to 10000pF                             |
| Main Applications | Battery chargers, Inverter, DC-DC converters |



<Dimensions>

# KCA Series Temperature Compensating Type Part Number List

## 6.1×5.3mm

| T max. | Rated Voltage  | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|----------------|---------|---------|------|--------------------|--|
| 3.0mm  | 250Vac(r.m.s.) | U2J     | 100pF   | ±10% | KCA55L7UMF101KH01# |  |
|        |                |         | 150pF   | ±10% | KCA55L7UMF151KH01# |  |
|        |                |         | 220pF   | ±10% | KCA55L7UMF221KH01# |  |
|        |                |         | 330pF   | ±10% | KCA55L7UMF331KH01# |  |
|        |                |         | 470pF   | ±10% | KCA55L7UMF471KH01# |  |
|        |                |         | 680pF   | ±10% | KCA55L7UMF681KH01# |  |
|        |                |         | 1000pF  | ±10% | KCA55L7UMF102KH01# |  |
|        |                |         | 1500pF  | ±10% | KCA55L7UMF152KH01# |  |
|        |                |         | 2200pF  | ±10% | KCA55L7UMF222KH01# |  |
|        |                |         | 3300pF  | ±10% | KCA55L7UMF332KH01# |  |
| 3.9mm  | 250Vac(r.m.s.) | U2J     | 4700pF  | ±10% | KCA55Q7UMF472KH01# |  |
| 5.0mm  | 250Vac(r.m.s.) | U2J     | 6800pF  | ±20% | KCA55T7UMF682MH01# |  |
| 6.7mm  | 250Vac(r.m.s.) | U2J     | 10000pF | ±20% | KCA55W7UMF103MH01# |  |

GRT Series

GCM Series

GC3 Series

GCM Series

GCD Series

GCE Series

NMF Series

KCM Series

KC3 Series

KCA Series

GCG Series

△Caution /Notice

## AgPd Termination Conductive Glue Mounting Chip Multilayer Ceramic Capacitors for Automotive

### GCG Series

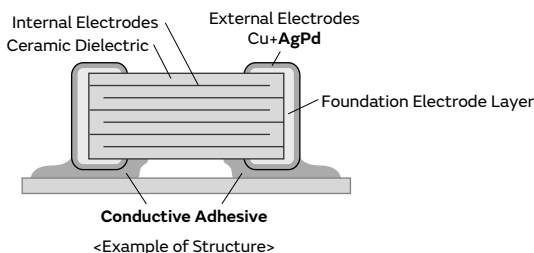


**Improved mechanical and thermal strength by adopting AgPd external electrodes, which can be mounted with a conductive glue!**

### Features

#### ① Limited to Conductive Glue Mounting

This capacitor can be mounted with a conductive adhesive\* in powertrains and safety devices of automotive.



#### ② Adopted AgPd external electrodes

Adopted AgPd, which is excellent in bonding strength with a conductive adhesive.

#### ③ Compatible up to 150°C

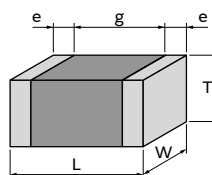
This capacitor lineup with X8L and X8R characteristics can be used in high temperature environments, such as in ABS and transmission control.

\* This product is for use exclusively with conductive glue mounting. It cannot be used with any mounting methods other than conductive glue mounting.

Using solder to mount the product can result in insufficient wetting, insufficient bonding strength, and/or leaching of the Ag/Pd External Electrodes (terminations), which can cause quality problems such as the chip coming loose.

### Specifications

|                   |                                       |
|-------------------|---------------------------------------|
| Size              | 1.0×0.5mm to 3.2×2.5mm                |
| Rated Voltage     | 6.3Vdc to 100Vdc                      |
| Capacitance       | 1.0pF to 47μF                         |
| Main Applications | For automotive, power trains, sensors |



<Dimensions>

# GCG Series Temperature Compensating Type Part Number List

## 1.0×0.5mm

| T max. | Rated Voltage | TC Code | Cap.  | Tol. | Part Number        |  |
|--------|---------------|---------|-------|------|--------------------|--|
| 0.55mm | 50Vdc         | X8G     | 120pF | ±5%  | GCG1555G1H121JA01# |  |
|        |               |         | 150pF | ±5%  | GCG1555G1H151JA01# |  |
|        |               |         | 180pF | ±5%  | GCG1555G1H181JA01# |  |
|        |               |         | 220pF | ±5%  | GCG1555G1H221JA01# |  |
|        |               |         | 270pF | ±5%  | GCG1555G1H271JA01# |  |
|        |               |         | 330pF | ±5%  | GCG1555G1H331JA01# |  |
|        |               |         | 390pF | ±5%  | GCG1555G1H391JA01# |  |
|        |               |         | 470pF | ±5%  | GCG1555G1H471JA01# |  |

| T max. | Rated Voltage | TC Code | Cap.    | Tol. | Part Number        |  |
|--------|---------------|---------|---------|------|--------------------|--|
| 0.7mm  | 50Vdc         | X8G     | 2700pF  | ±5%  | GCG2165G1H272JA01# |  |
|        |               |         | 3300pF  | ±5%  | GCG2165G1H332JA01# |  |
|        |               |         | 3900pF  | ±5%  | GCG2165G1H392JA01# |  |
|        |               |         | 4700pF  | ±5%  | GCG2165G1H472JA01# |  |
| 0.95mm | 50Vdc         | X8G     | 5600pF  | ±5%  | GCG2195G1H562JA01# |  |
|        |               |         | 6800pF  | ±5%  | GCG2195G1H682JA01# |  |
|        |               |         | 8200pF  | ±5%  | GCG2195G1H822JA01# |  |
|        |               |         | 10000pF | ±5%  | GCG2195G1H103JA01# |  |

## 1.6×0.8mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 0.9mm  | 50Vdc         | X8G     | 10pF   | ±5%  | GCG1885G1H100JA01# |  |
|        |               |         | 12pF   | ±5%  | GCG1885G1H120JA01# |  |
|        |               |         | 15pF   | ±5%  | GCG1885G1H150JA01# |  |
|        |               |         | 18pF   | ±5%  | GCG1885G1H180JA01# |  |
|        |               |         | 22pF   | ±5%  | GCG1885G1H220JA01# |  |
|        |               |         | 27pF   | ±5%  | GCG1885G1H270JA01# |  |
|        |               |         | 33pF   | ±5%  | GCG1885G1H330JA01# |  |
|        |               |         | 39pF   | ±5%  | GCG1885G1H390JA01# |  |
|        |               |         | 47pF   | ±5%  | GCG1885G1H470JA01# |  |
|        |               |         | 56pF   | ±5%  | GCG1885G1H560JA01# |  |
|        |               |         | 68pF   | ±5%  | GCG1885G1H680JA01# |  |
|        |               |         | 82pF   | ±5%  | GCG1885G1H820JA01# |  |
|        |               |         | 100pF  | ±5%  | GCG1885G1H101JA01# |  |
|        |               |         | 120pF  | ±5%  | GCG1885G1H121JA01# |  |
|        |               |         | 150pF  | ±5%  | GCG1885G1H151JA01# |  |
|        |               |         | 180pF  | ±5%  | GCG1885G1H181JA01# |  |
|        |               |         | 220pF  | ±5%  | GCG1885G1H221JA01# |  |
|        |               |         | 270pF  | ±5%  | GCG1885G1H271JA01# |  |
|        |               |         | 330pF  | ±5%  | GCG1885G1H331JA01# |  |
|        |               |         | 390pF  | ±5%  | GCG1885G1H391JA01# |  |
|        |               |         | 470pF  | ±5%  | GCG1885G1H471JA01# |  |
|        |               |         | 560pF  | ±5%  | GCG1885G1H561JA01# |  |
|        |               |         | 680pF  | ±5%  | GCG1885G1H681JA01# |  |
|        |               |         | 820pF  | ±5%  | GCG1885G1H821JA01# |  |
|        |               |         | 1000pF | ±5%  | GCG1885G1H102JA01# |  |
|        |               |         | 1200pF | ±5%  | GCG1885G1H122JA01# |  |
|        |               |         | 1500pF | ±5%  | GCG1885G1H152JA01# |  |
|        |               |         | 1800pF | ±5%  | GCG1885G1H182JA01# |  |
|        |               |         | 2200pF | ±5%  | GCG1885G1H222JA01# |  |

## 2.0×1.25mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 0.7mm  | 50Vdc         | X8G     | 1000pF | ±5%  | GCG2165G1H102JA01# |  |
|        |               |         | 1200pF | ±5%  | GCG2165G1H122JA01# |  |
|        |               |         | 1500pF | ±5%  | GCG2165G1H152JA01# |  |
|        |               |         | 1800pF | ±5%  | GCG2165G1H182JA01# |  |
|        |               |         | 2200pF | ±5%  | GCG2165G1H222JA01# |  |

Part number # indicates the package specification code.





# GCG Series High Dielectric Constant Type Part Number List

(→ 2.0×1.25mm)

| T max. | Rated Voltage | TC Code | Cap.  | Tol. | Part Number        |  |
|--------|---------------|---------|-------|------|--------------------|--|
| 1.45mm | 16Vdc         | X7R     | 4.7μF | ±10% | GCG21BR71C475KA12# |  |
|        | 10Vdc         | X7R     | 10μF  | ±10% | GCG21BR71A106KE01# |  |
|        | 6.3Vdc        | X8L     | 10μF  | ±10% | GCG21BL8EC106KE07# |  |
|        |               | X7R     | 10μF  | ±10% | GCG21BR70J106KE01# |  |

3.2×1.6mm

| T max. | Rated Voltage | TC Code | Cap.   | Tol. | Part Number        |  |
|--------|---------------|---------|--------|------|--------------------|--|
| 1.35mm | 50Vdc         | X8R     | 0.22μF | ±10% | GCG31MR91H224KA03# |  |
|        |               |         | 0.33μF | ±10% | GCG31MR91H334KA03# |  |
|        |               | X8R     | 0.15μF | ±10% | GCG31MR91E154KA01# |  |
|        |               |         | 0.22μF | ±10% | GCG31MR91E224KA01# |  |
|        | 25Vdc         | X8R     | 0.33μF | ±10% | GCG31MR91E334KA01# |  |
|        |               |         | 1.0μF  | ±10% | GCG31MR71E105KA01# |  |
|        |               |         | 1.2μF  | ±10% | GCG31MR71E125KA01# |  |
|        |               |         | 1.5μF  | ±10% | GCG31MR71E155KA01# |  |
|        |               | X7R     | 2.2μF  | ±10% | GCG31MR71E225KA12# |  |
|        |               |         | 1.0μF  | ±10% | GCG31ML81C105KA01# |  |
|        |               |         | 1.5μF  | ±10% | GCG31ML81C155KA01# |  |
|        |               |         |        |      |                    |  |
| 1.9mm  | 25Vdc         | X8R     | 0.68μF | ±10% | GCG31CR91E684KA03# |  |
|        |               | X7R     | 3.3μF  | ±10% | GCG31CR71E335KA01# |  |
|        |               |         | 3.9μF  | ±10% | GCG31CR71E395KA01# |  |
|        |               |         | 4.7μF  | ±10% | GCG31CR71E475KA01# |  |
|        | 16Vdc         | X8L     | 3.3μF  | ±10% | GCG31CL81C335KA01# |  |
|        |               |         | 4.7μF  | ±10% | GCG31CL81C475KA01# |  |
|        |               | X8R     | 0.68μF | ±10% | GCG31CR91C684KA01# |  |
|        |               |         | 1.0μF  | ±10% | GCG31CR91C105KA01# |  |
|        |               | X7R     | 22μF   | ±10% | GCG31CR70J226KE01# |  |
|        |               |         |        |      |                    |  |

3.2×2.5mm

| T max. | Rated Voltage | TC Code | Cap.  | Tol. | Part Number        |  |
|--------|---------------|---------|-------|------|--------------------|--|
| 2.3mm  | 25Vdc         | X7R     | 3.3μF | ±10% | GCG32DR71E335KA01# |  |
| 2.8mm  | 50Vdc         | X8L     | 10μF  | ±10% | GCG32EL8EH106KA07# |  |
|        |               | X7S     | 10μF  | ±10% | GCG32EC71H106KA01# |  |
|        | 35Vdc         | X8L     | 10μF  | ±10% | GCG32EL8EG106KA07# |  |
|        |               | X7S     | 10μF  | ±10% | GCG32EC7YA106KA01# |  |
|        | 25Vdc         | X7R     | 4.7μF | ±10% | GCG32ER71E475KA01# |  |
|        |               |         | 10μF  | ±10% | GCG32ER71E106KA12# |  |
|        | 16Vdc         | X8R     | 6.8μF | ±10% | GCG32ER91C685KE01# |  |
|        |               |         | 10μF  | ±10% | GCG32ER91C106KE01# |  |
|        | 6.3Vdc        | X7R     | 47μF  | ±10% | GCG32ER70J476KE01# |  |

**GRT, GCM, GC3, GCJ, GCD, GCE,  
NFM, KCM, KC3, KCA, GCG**

**⚠Caution/Notice**

WEB 

**⚠Caution**

**Notice**

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GRT Series

GCM Series

GC3 Series

GCJ Series

GCD Series

GCE Series

NFM Series

KCM Series

KC3 Series

KCA Series

GCG Series

⚠Caution  
/Notice

## ⚠Caution

### Storage and Operation Conditions

1. The performance of chip multilayer ceramic capacitors and chip EMIFIL<sup>®</sup> NFM series (henceforth just “capacitors”) may be affected by the storage conditions.
    - 1-1. Store the capacitors in the following conditions:  
Room Temperature of +5°C to +40°C and a Relative Humidity of 20% to 70%.
    - (1) High temperature and humidity conditions may accelerate the deterioration of solderability due to oxidation of the terminal electrodes and deterioration of taping/packaging performance. Therefore, maintain the appropriate storage temperature and humidity.
    - (2) Prolonged storage may cause oxidation of the electrodes and deterioration of the packaging materials. If more than six months have elapsed since delivery, check the mounting before use. If more than one year has elapsed since delivery, also check the solderability before use.
  - (3) Store the capacitors in the original packaging without opening the smallest packing unit. Do not exceed the above atmospheric conditions for any length of time.
    - 1-2. Corrosive gas can react with the termination (external) electrodes or lead wires of capacitors, and result in poor solderability. Do not store the capacitors in an atmosphere consisting of corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas, etc.).
    - 1-3. Due to moisture condensation caused by rapid humidity changes, or the photochemical change caused by direct sunlight on the terminal electrodes and/or the resin/epoxy coatings, the solderability and electrical performance may deteriorate. Do not store capacitors under direct sunlight or in high humidity conditions.
- <Applicable to GCG Series>
- 1-4. After unpacking, immediately reseal, or store in a desiccator containing a desiccant.

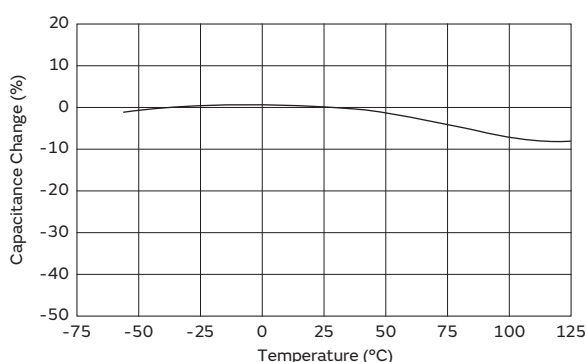
### Rating

#### 1. Temperature Dependent Characteristics

1. The electrical characteristics of a capacitor can change with temperature.
  - 1-1. For capacitors having larger temperature dependency, the capacitance may change with temperature changes.  
The following actions are recommended in order to ensure suitable capacitance values.
    - (1) Select a suitable capacitance for the operating temperature range.
    - (2) The capacitance may change within the rated temperature.  
When you use a high dielectric constant type capacitor in a circuit that needs a tight (narrow) capacitance tolerance (e.g., a time-constant circuit), please carefully consider the temperature characteristics, and carefully confirm the various characteristics in actual use conditions and the actual system.

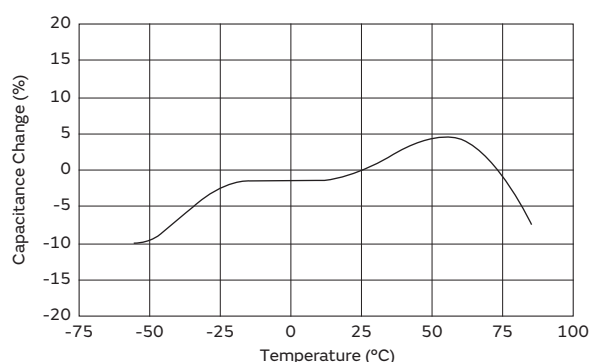
[Example of Temperature Characteristics X7R(R7)]

Sample: 0.1μF, Rated Voltage 50VDC



[Example of Temperature Characteristics X5R (R6)]

Sample: 22μF, Rated Voltage 4VDC



#### 2. Measurement of Capacitance

1. Measure capacitance with the voltage and frequency specified in the product specifications.
  - 1-1. The output voltage of the measuring equipment may decrease occasionally when capacitance is high. Please confirm whether a prescribed measured voltage is impressed to the capacitor.
  - 1-2. The capacitance values of high dielectric constant type capacitors change depending on the AC voltage applied. Please consider the AC voltage characteristics when selecting a capacitor to be used in an AC circuit.

Continued on the following page. ↗

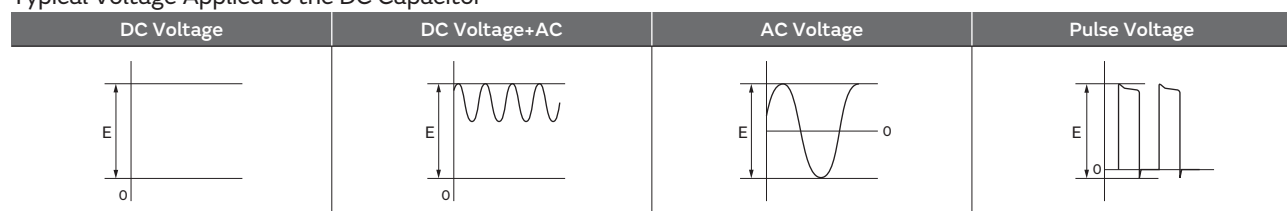


Continued from the preceding page. ↘

### 3. Applied Voltage and Applied Current

1. Do not apply a voltage to the capacitor that exceeds the rated voltage as called out in the specifications.
  - 1-1. Applied voltage between the terminals of a capacitor shall be less than or equal to the rated voltage.
    - (1) When AC voltage is superimposed on DC voltage, the zero-to-peak voltage shall not exceed the rated DC voltage.  
When AC voltage or pulse voltage is applied, the peak-to-peak voltage shall not exceed the rated DC voltage.
    - (2) Abnormal voltages (surge voltage, static electricity, pulse voltage, etc.) shall not exceed the rated DC voltage.

Typical Voltage Applied to the DC Capacitor



(E: Maximum possible applied voltage.)

- 1-2. Influence of over voltage  
Over voltage that is applied to the capacitor may result in an electrical short circuit caused by the breakdown of the internal dielectric layers.  
The time duration until breakdown depends on the applied voltage and the ambient temperature.
2. Use a safety standard certified capacitor in a power supply input circuit (AC filter), as it is also necessary to consider the withstand voltage and impulse withstand voltage defined for each device.

#### <Applicable to NFM Series>

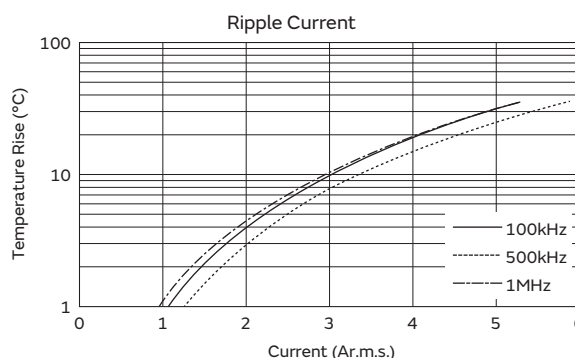
3. The capacitors also have rated currents.  
The current flowing between the terminals of a capacitor shall be less than or equal to the rated current. Using the capacitor beyond this range could lead to excessive heat.

### 4. Type of Applied Voltage and Self-heating Temperature

1. Confirm the operating conditions to make sure that no large current is flowing into the capacitor due to the continuous application of an AC voltage or pulse voltage.  
When a DC rated voltage product is used in an AC voltage circuit or a pulse voltage circuit, the AC current or pulse current will flow into the capacitor; therefore check the self-heating condition.  
Please confirm the surface temperature of the capacitor so that the temperature remains within the upper limits of the operating temperature, including the rise in temperature due to self-heating. When the capacitor is used with a high-frequency voltage or pulse voltage, heat may be generated by dielectric loss.  
<Applicable to Rated Voltage of less than 100VDC>
  - 1-1. The load should be contained so that the self-heating of the capacitor body remains below 20°C, when measuring at an ambient temperature of 25°C.

[Example of Temperature Rise (Heat Generation) in Chip Multilayer Ceramic Capacitors in Contrast to Ripple Current]

Sample: R(R1) characteristics 10μF,  
Rated voltage: DC10V



Continued on the following page. ↗

## ⚠Caution

Continued from the preceding page. ↘

### <Applicable to Temperature Characteristics X7R(R7), X7T(D7) beyond Rated Voltage of 250VDC>

1-2. The load should be contained so that the self-heating of the capacitor body remains below 20°C, when measuring at an ambient temperature of 25°C. In addition, use a K thermocouple of  $\phi 0.1\text{mm}$  with less heat capacity when measuring, and measure in a condition where there is no effect from the radiant heat of other components or air flow caused by convection. Excessive generation of heat may cause deterioration of the characteristics and reliability of the capacitor. (Absolutely do not perform measurements while the cooling fan is operating, as an accurate measurement may not be performed.)

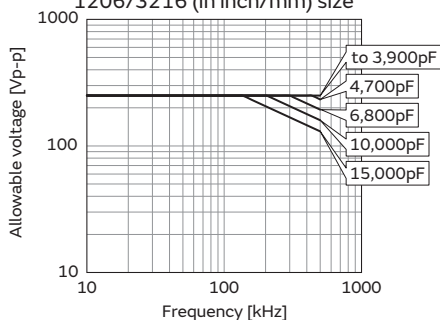
### <Applicable to Temperature Characteristics U2J(7U), COG(5C) beyond Rated Voltage of 250VDC>

1-3. Since the self-heating is low in the low loss series, the allowable power becomes extremely high compared to the common X7R(R7) characteristics. However, when a load with self-heating of 20°C is applied at the rated voltage, the allowable power may be exceeded. When the capacitor is used in a high-frequency voltage circuit of 1kHz or more, the frequency of the applied voltage should be less than 500kHz sine wave (less than 100kHz for a product with rated voltage of DC3.15kV), to limit the voltage load so that the load remains within the derating shown in the following figure. In the case of non-sine wave, high-frequency components exceeding the fundamental frequency may be included. In such a case, please contact Murata. The excessive generation of heat may cause deterioration of the characteristics and reliability of the capacitor. (Absolutely do not perform measurements while the cooling fan is operating, as an accurate measurement may not be performed.)

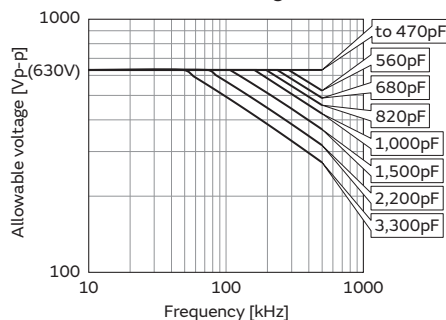
#### [Sine-wave frequency VS allowable voltage]

The surface temperature of the capacitor: 125°C or less (including self-heating)

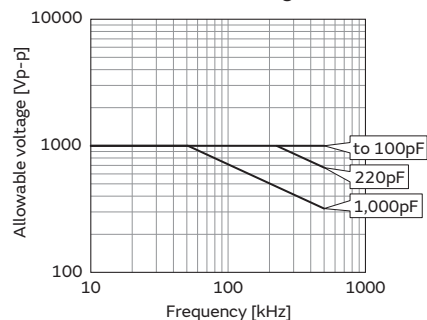
COG (5C) char., Rated Voltage: DC250V  
1206/3216 (in inch/mm) size



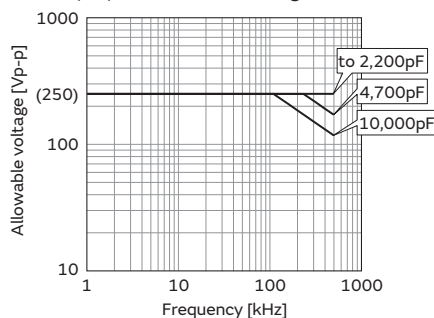
COG char., Rated Voltage: DC630V



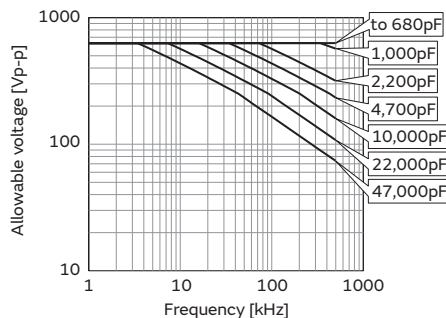
COG char., Rated Voltage: DC1kV



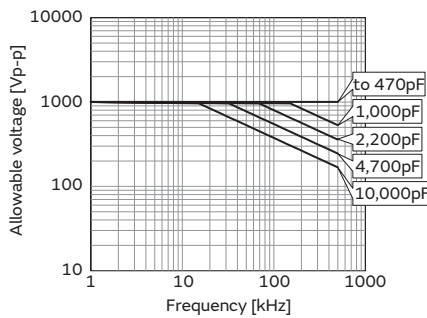
U2J(7U) char., Rated Voltage: DC250V



U2J(7U) char., Rated Voltage: DC630V



U2J(7U) char., Rated Voltage: DC1kV



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## 5. DC Voltage and AC Voltage Characteristics

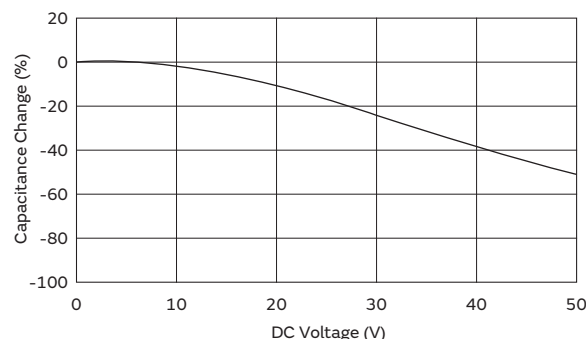
1. The capacitance value of a high dielectric constant type capacitor changes depending on the DC voltage applied. Please consider the DC voltage characteristics when a capacitor is selected for use in a DC circuit.

1-1. The capacitance of ceramic capacitors may change sharply depending on the applied voltage (see figure). Please confirm the following in order to secure the capacitance.

- (1) Determine whether the capacitance change caused by the applied voltage is within the allowed range.
- (2) In the DC voltage characteristics, the rate of capacitance change becomes larger as voltage increases, even if the applied voltage is below the rated voltage. When a high dielectric constant type capacitor is used in a circuit that requires a tight (narrow) capacitance tolerance (e.g., a time constant circuit), please carefully consider the voltage characteristics, and confirm the various characteristics in the actual operating conditions of the system.

[Example of DC Voltage Characteristics]

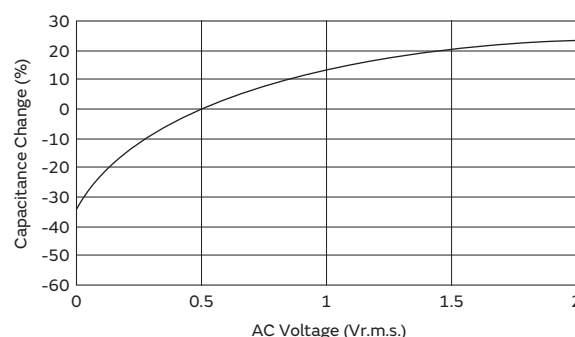
Sample: R(R1) Characteristics 0.1 $\mu$ F,  
Rated Voltage 50VDC



2. The capacitance values of high dielectric constant type capacitors changes depending on the AC voltage applied. Please consider the AC voltage characteristics when selecting a capacitor to be used in an AC circuit.

[Example of AC Voltage Characteristics]

Sample: X7R(R7) Characteristics 10 $\mu$ F,  
Rated Voltage 6.3VDC

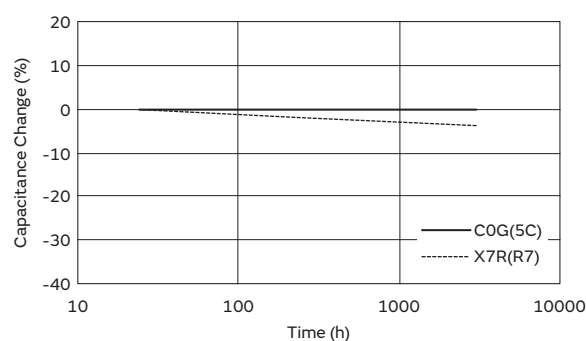


## 6. Capacitance Aging

1. The high dielectric constant type capacitors have the Characteristics in which the capacitance value decreases with the passage of time.

When you use high dielectric constant type capacitors in a circuit that needs a tight (narrow) capacitance tolerance (e.g., a time-constant circuit), please carefully consider the characteristics of these capacitors, such as their aging, voltage, and temperature characteristics. In addition, check capacitors using your actual appliances at the intended environment and operating conditions.

[Example of Change Over Time (Aging Characteristics)]



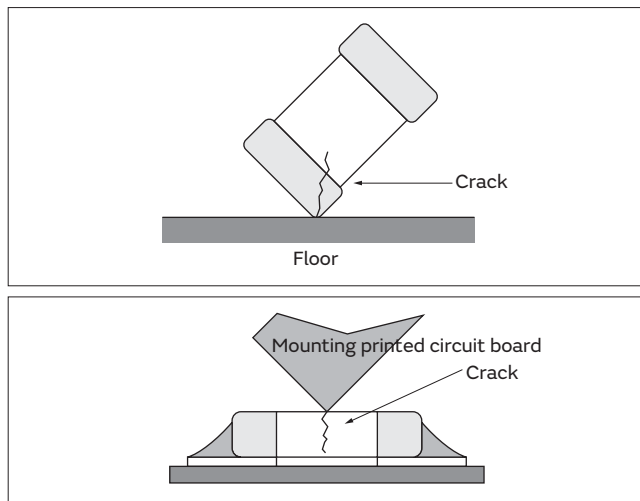
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## ⚠Caution

Continued from the preceding page. ↘

### 7. Vibration and Shock

1. Please confirm the kind of vibration and/or shock, its condition, and any generation of resonance.  
Please mount the capacitor so as not to generate resonance, and do not allow any impact on the terminals.
2. Mechanical shock due to being dropped may cause damage or a crack in the dielectric material of the capacitor.  
Do not use a dropped capacitor because the quality and reliability may be deteriorated.
3. When printed circuit boards are piled up or handled, the corner of another printed circuit board should not be allowed to hit the capacitor, in order to avoid a crack or other damage to the capacitor.



## Soldering and Mounting

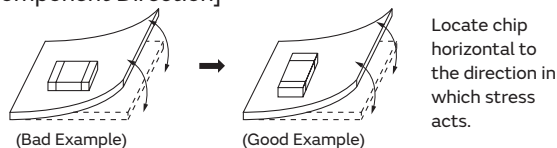
### 1. Mounting Position

1. Confirm the best mounting position and direction that minimizes the stress imposed on the capacitor during flexing or bending the printed circuit board.
- 1-1. Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.

#### <Applicable to NFM Series>

2. If you mount the capacitor near components that generate heat, take note of the heat from the other components and carefully check the self-heating of the capacitor before using.  
If there is significant heat radiation from other components, it could lower the insulation resistance of the capacitor or produce excessive heat.

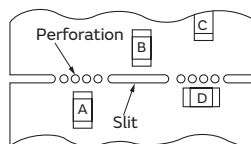
#### [Component Direction]



#### [Chip Mounting Close to Board Separation Point]

It is effective to implement the following measures, to reduce stress in separating the board.  
It is best to implement all of the following three measures; however, implement as many measures as possible to reduce stress.

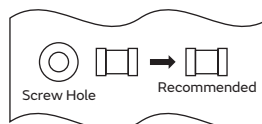
| Contents of Measures                                                                       | Stress Level |
|--------------------------------------------------------------------------------------------|--------------|
| (1) Turn the mounting direction of the component parallel to the board separation surface. | A > D *1     |
| (2) Add slits in the board separation part.                                                | A > B        |
| (3) Keep the mounting position of the component away from the board separation surface.    | A > C        |



\*1 A > D is valid when stress is added vertically to the perforation as with Hand Separation.  
If a Cutting Disc is used, stress will be diagonal to the PCB, therefore A > D is invalid.

#### [Mounting Capacitors Near Screw Holes]

When a capacitor is mounted near a screw hole, it may be affected by the board deflection that occurs during the tightening of the screw. Mount the capacitor in a position as far away from the screw holes as possible.



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## 2. Information before Mounting

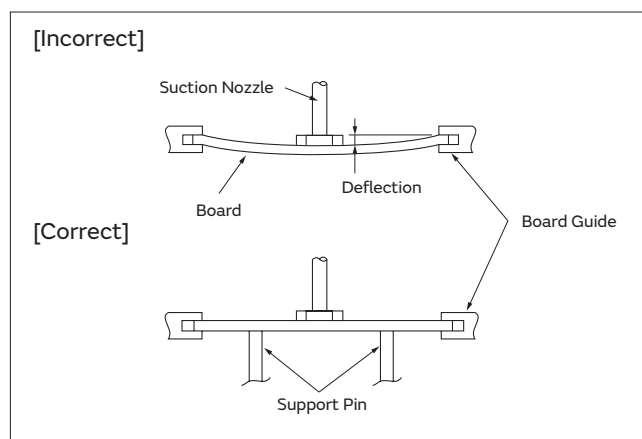
1. Do not re-use capacitors that were removed from the equipment.
2. Confirm capacitance characteristics under actual applied voltage.
3. Confirm the mechanical stress under actual process and equipment use.
4. Confirm the rated capacitance, rated voltage and other electrical characteristics before assembly.
5. Prior to use, confirm the solderability of capacitors that were in long-term storage.
6. Prior to measuring capacitance, carry out a heat treatment for capacitors that were in long-term storage.
7. The use of Sn-Zn based solder will deteriorate the reliability of the MLCC.

Please contact our sales representative or product engineers on the use of Sn-Zn based solder in advance.

8. We have also produced a DVD which shows a summary of our recommendations, regarding the precautions for mounting. Please contact our sales representative to request the DVD.

## 3. Maintenance of the Mounting (pick and place) Machine

1. Make sure that the following excessive forces are not applied to the capacitors. Check the mounting in the actual device under actual use conditions ahead of time.
  - 1-1. In mounting the capacitors on the printed circuit board, any bending force against them shall be kept to a minimum to prevent them from any damage or cracking. Please take into account the following precautions and recommendations for use in your process.
    - (1) Adjust the lowest position of the pickup nozzle so as not to bend the printed circuit board.
2. Dirt particles and dust accumulated in the suction nozzle and suction mechanism prevent the nozzle from moving smoothly. This creates excessive force on the capacitor during mounting, causing cracked chips. Also, the locating claw, when worn out, imposes uneven forces on the chip when positioning, causing cracked chips. The suction nozzle and the locating claw must be maintained, checked, and replaced periodically.



Continued on the following page. ↗

GRT Series

GCM Series

GC3 Series

GCJ Series

GCD Series

GCE Series

NMF Series

KCM Series

KC3 Series

KCA Series

GCG Series

⚠Caution

## ⚠Caution

Continued from the preceding page. ↘

### 4-1. Reflow Soldering

- When sudden heat is applied to the components, the mechanical strength of the components will decrease because a sudden temperature change causes deformation inside the components. In order to prevent mechanical damage to the components, preheating is required for both the components and the PCB. Preheating conditions are shown in table 1. It is required to keep the temperature differential between the solder and the components surface ( $\Delta T$ ) as small as possible.
- When components are immersed in solvent after mounting, be sure to maintain the temperature difference ( $\Delta T$ ) between the component and the solvent within the range shown in table 1.

Table 1

| Series                      | Chip Dimension Code (L/W) | Temperature Differential          |
|-----------------------------|---------------------------|-----------------------------------|
| GRT/GCM/GC3/GCD/GCE/GCJ/NFM | 03/15/18/21/31            | $\Delta T \leq 190^\circ\text{C}$ |
| GRT/GCM/GCJ                 | 32/43/55                  | $\Delta T \leq 130^\circ\text{C}$ |
| KCM/KC3/KCA                 | 55                        |                                   |

#### Recommended Conditions

|                  | Pb-Sn Solder | Lead Free Solder      |
|------------------|--------------|-----------------------|
| Peak Temperature | 230 to 250°C | 240 to 260°C          |
| Atmosphere       | Air          | Air or N <sub>2</sub> |

Pb-Sn Solder: Sn-37Pb

Lead Free Solder: Sn-3.0Ag-0.5Cu

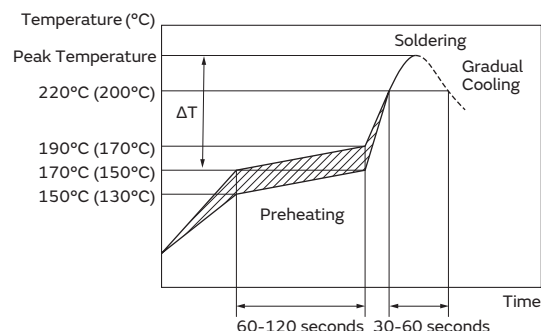
- When a capacitor is mounted at a temperature lower than the peak reflow temperature recommended by the solder manufacturer, the following quality problems can occur. Consider factors such as the placement of peripheral components and the reflow temperature setting to prevent the capacitor's reflow temperature from dropping below the peak temperature specified. Be sure to evaluate the mounting situation beforehand and verify that none of the following problems occur.

- Drop in solder wettability
- Solder voids
- Possible occurrence of whiskering
- Drop in bonding strength
- Drop in self-alignment properties
- Possible occurrence of tombstones and/or shifting on the land patterns of the circuit board

#### 4. Optimum Solder Amount for Reflow Soldering

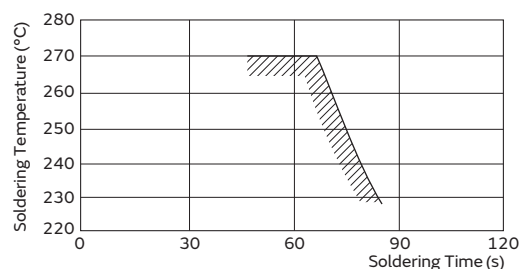
- 4-1. Overly thick application of solder paste results in a excessive solder fillet height. This makes the chip more susceptible to mechanical and thermal stress on the board and may cause the chips to crack.

#### [Example of Temperature Conditions for Reflow Soldering]



Temperature  
In case of Lead Free Solder  
( ): In case of Pb-Sn Solder

#### [Allowable Reflow Soldering Temperature and Time]



In the case of repeated soldering, the accumulated soldering time must be within the range shown above.

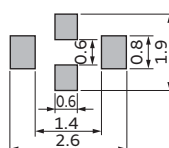
- 4-2. Too little solder paste results in a lack of adhesive strength on the termination, which may result in chips breaking loose from the PCB.
- 4-3. Please confirm that solder has been applied smoothly to the termination.

#### <Applicable to NFM Series>

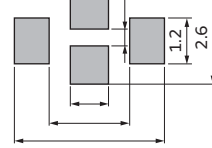
##### [Guideline of solder paste thickness]

100-150μm: NFM21HC/31HK

NFM21HC



NFM31HK



### Inverting the PCB

Make sure not to impose any abnormal mechanical shocks to the PCB.

Continued on the following page. ↗



Continued from the preceding page. ↘

## 4-2. Flow Soldering

1. Do not apply flow soldering to chips not listed in table 2.

Table 2

| Series                                                                             | Chip Dimension Code (L/W) | Temperature Differential          |
|------------------------------------------------------------------------------------|---------------------------|-----------------------------------|
| GRT/GCM/GC3/GCD (Except for characteristics of X8L(L8), X8G(5G), CHA(0C), X8R(R9)) | 18/21/31                  | $\Delta T \leq 150^\circ\text{C}$ |
| GCJ (Rated Voltage 250VDC or more)                                                 |                           |                                   |
| NFM                                                                                |                           |                                   |

- When sudden heat is applied to the components, the mechanical strength of the components will decrease because a sudden temperature change causes deformation inside the components. In order to prevent mechanical damage to the components, preheating is required for both of the components and the PCB. Preheating conditions are shown in table 2. It is required to keep the temperature differential between the solder and the components surface ( $\Delta T$ ) as low as possible.
- Excessively long soldering time or high soldering temperature can result in leaching of the terminations, causing poor adhesion or a reduction in capacitance value due to loss of contact between the inner electrodes and terminations.
- When components are immersed in solvent after mounting, be sure to maintain the temperature differential ( $\Delta T$ ) between the component and solvent within the range shown in the table 2.

### Recommended Conditions

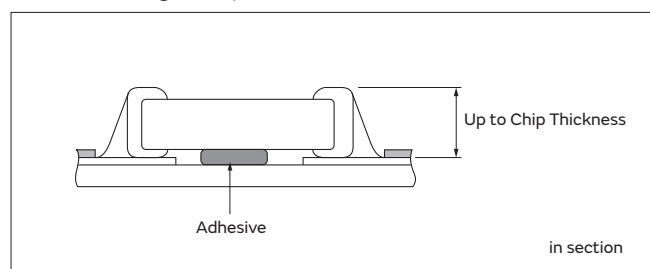
|                             | Pb-Sn Solder | Lead Free Solder                   |
|-----------------------------|--------------|------------------------------------|
| Preheating Peak Temperature | 90 to 110°C  | 100 to 120°C<br>140 to 160°C (NFM) |
| Soldering Peak Temperature  | 240 to 250°C | 250 to 260°C                       |
| Atmosphere                  | Air          | Air or N <sub>2</sub>              |

Pb-Sn Solder: Sn-37Pb

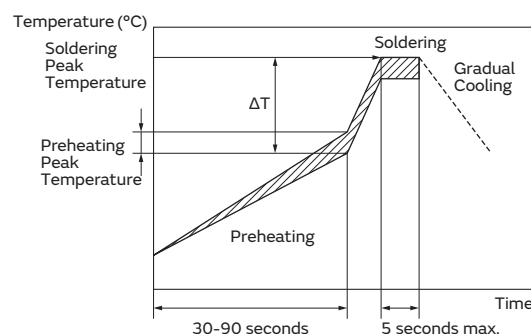
Lead Free Solder: Sn-3.0Ag-0.5Cu

### 5. Optimum Solder Amount for Flow Soldering

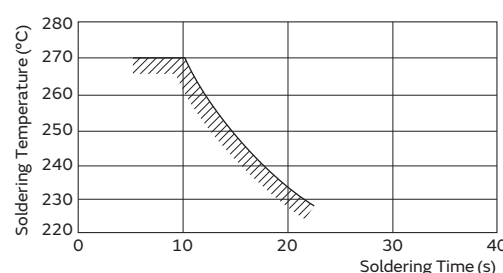
- The top of the solder fillet should be lower than the thickness of the components. If the solder amount is excessive, the risk of cracking is higher during board bending or any other stressful condition.



### [Example of Temperature Conditions for Flow Soldering]



### [Allowable Flow Soldering Temperature and Time]

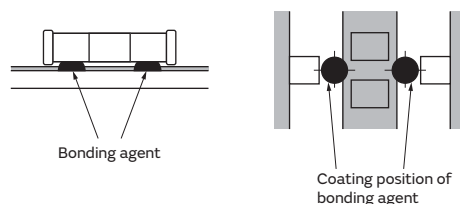


In the case of repeated soldering, the accumulated soldering time must be within the range shown above.

### <Applicable to NFM Series>

#### [NFM31HK Series]

Apply 0.06mg of bonding agent at each chip.  
Do not cover electrodes.



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## ⚠Caution

Continued from the preceding page. ↘

### 4-3. Correction of Soldered Portion

When sudden heat is applied to the capacitor, distortion caused by the large temperature difference occurs internally, and can be the cause of cracks. Capacitors also tend to be affected by mechanical and thermal stress depending on the board preheating temperature or the soldering fillet shape, and can be the cause of cracks. Please refer to "1. PCB Design" or "3. Optimum solder amount" for the solder amount and the fillet shapes.

#### 1. Correction with a Soldering Iron

- 1-1. In order to reduce damage to the capacitor, be sure to preheat the capacitor and the mounting board. Preheat to the temperature range shown in Table 3. A hot plate, hot air type preheater, etc. can be used for preheating.

Table 3

| Series                  | Chip Dimension Code (L/W) | Temperature of Soldering Iron Tip | Preheating Temperature | Temperature Differential ( $\Delta T$ ) | Atmosphere |
|-------------------------|---------------------------|-----------------------------------|------------------------|-----------------------------------------|------------|
| GRT/GCM/GC3/GCD/GCE/GCJ | 03/15/18/21/31            | 350°C max.                        | 150°C min.             | $\Delta T \leq 190^\circ\text{C}$       | Air        |
| GRT/GCM/GCJ             | 32/43/55                  | 280°C max.                        | 150°C min.             | $\Delta T \leq 130^\circ\text{C}$       | Air        |
| NFM                     | 21/31                     | 350°C max.                        | 150°C min.             | $\Delta T \leq 190^\circ\text{C}$       | Air        |

\*Applicable for both Pb-Sn and Lead Free Solder.

Pb-Sn Solder: Sn-37Pb

Lead Free Solder: Sn-3.0Ag-0.5Cu

\*Please manage  $\Delta T$  in the temperature of soldering iron and the preheating temperature.

#### 2. Correction with Spot Heater

Compared to local heating with a soldering iron, hot air heating by a spot heater heats the overall component and board, therefore, it tends to lessen the thermal shock. In the case of a high density mounted board, a spot heater can also prevent concerns of the soldering iron making direct contact with the component.

- 2-1. If the distance from the hot air outlet of the spot heater to the component is too close, cracks may occur due to thermal shock. To prevent this problem, follow the conditions shown in Table 4.

- 2-2. In order to create an appropriate solder fillet shape, it is recommended that hot air be applied at the angle shown in Figure 1.

#### 3. Optimum solder amount when re-working with a soldering iron

- 3-1. If the solder amount is excessive, the risk of cracking is higher during board bending or any other stressful condition.

Too little solder amount results in a lack of adhesive strength on the outer electrode termination, which may result in chips breaking loose from the PCB. Please confirm that solder has been applied smoothly and rising to the end surface of the chip.

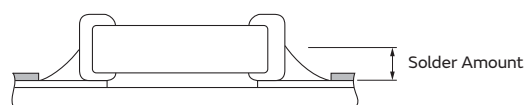
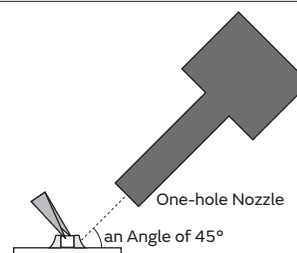
- 1-2. After soldering, do not allow the component/PCB to cool down rapidly.

- 1-3. Perform the corrections with a soldering iron as quickly as possible. If the soldering iron is applied too long, there is a possibility of causing solder leaching on the terminal electrodes, which will cause deterioration of the adhesive strength and other problems.

Table 4

|                                   |                                                             |
|-----------------------------------|-------------------------------------------------------------|
| Distance                          | 5mm or more                                                 |
| Hot Air Application Angle         | 45° *Figure 1                                               |
| Hot Air Temperature Nozzle Outlet | 400°C max.                                                  |
| Application Time                  | Less than 10 seconds<br>(1206 (3216 in mm) size or smaller) |
|                                   | Less than 30 seconds<br>(1210 (3225 in mm) size or larger)  |

[\*Figure 1]



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3-2. A soldering iron with a tip of  $\phi 3\text{mm}$  or smaller should be used. It is also necessary to keep the soldering iron from touching the components during the re-work.

3-3. Solder wire with  $\phi 0.5\text{mm}$  or smaller is required for soldering.

#### <Applicable to KCM/KC3/KCA Series>

4. For the shape of the soldering iron tip, refer to the figure on the right.

Regarding the type of solder, use a wire diameter of  $\phi 0.5\text{mm}$  or less (rosin core wire solder).

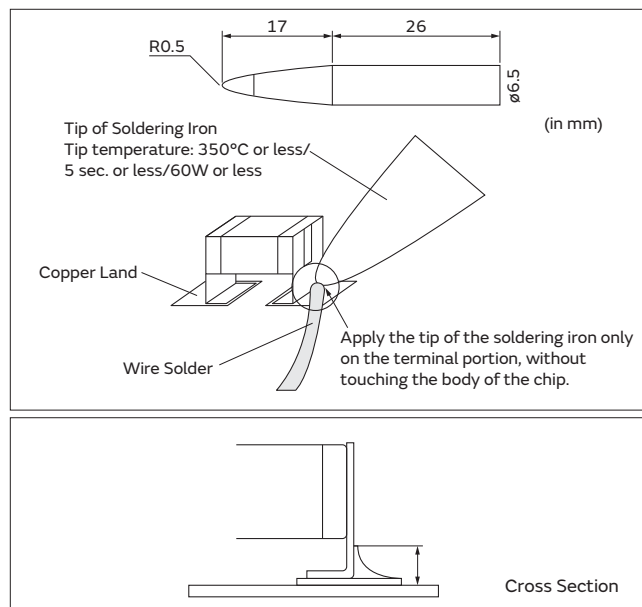
##### 4-1. How to Apply the Soldering Iron

Apply the tip of the soldering iron against the lower end of the metal terminal.

- 1) In order to prevent cracking caused by sudden heating of the ceramic device, do not touch the ceramic base directly.
- 2) In order to prevent deviations and dislocating of the chip, do not touch the junction of the chip and the metal terminal, and the metal portion on the outside directly.

##### 4-2. Appropriate Amount of Solder

The amount of solder for corrections by soldering iron, should be lower than the height of the lower side of the chip.



## 5. Washing

Excessive ultrasonic oscillation during cleaning can cause the PCBs to resonate, resulting in cracked chips or broken solder joints. Before starting your production process, test your cleaning equipment/process to insure it does not degrade the capacitors.

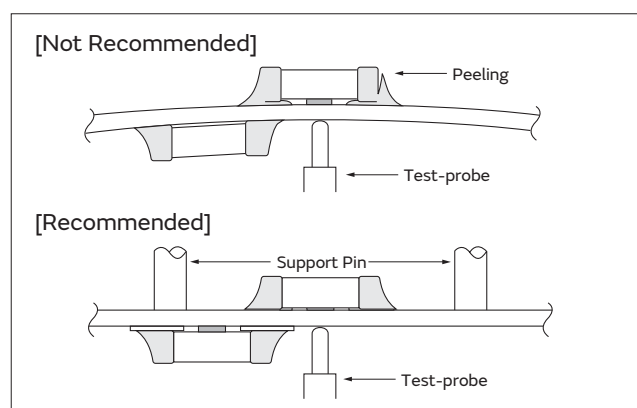
## 6. Electrical Test on Printed Circuit Board

1. Confirm position of the support pin or specific jig, when inspecting the electrical performance of a capacitor after mounting on the printed circuit board.

1-1. Avoid bending the printed circuit board by the pressure of a test-probe, etc.

The thrusting force of the test probe can flex the PCB, resulting in cracked chips or open solder joints. Provide support pins on the back side of the PCB to prevent warping or flexing. Install support pins as close to the test-probe as possible.

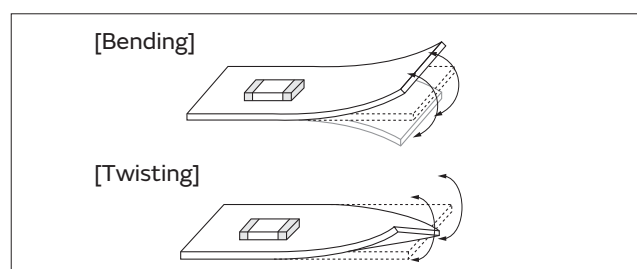
1-2. Avoid vibration of the board by shock when a test-probe contacts a printed circuit board.



## 7. Printed Circuit Board Cropping

1. After mounting a capacitor on a printed circuit board, do not apply any stress to the capacitor that causes bending or twisting the board.

1-1. In cropping the board, the stress as shown at right may cause the capacitor to crack. Avoid this type of stress to a capacitor.



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## ⚠Caution

Continued from the preceding page. ↘

### 2. Check the cropping method for the printed circuit board in advance.

2-1. Printed circuit board cropping shall be carried out by using a jig or an apparatus (Disc separator, router type separator, etc.) to prevent the mechanical stress that can occur to the board.

| Board Separation Method  | Hand Separation<br>Nipper Separation                                            | (1) Board Separation Jig                                                                                                        | Board Separation Apparatus                                                                                                                                                           |                           |
|--------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
|                          |                                                                                 |                                                                                                                                 | (2) Disc Separator                                                                                                                                                                   | (3) Router Type Separator |
| Level of stress on board | High                                                                            | Medium                                                                                                                          | Medium                                                                                                                                                                               | Low                       |
| Recommended              | ×                                                                               | △*                                                                                                                              | △*                                                                                                                                                                                   | ○                         |
| Notes                    | Hand and nipper separation apply a high level of stress.<br>Use another method. | <ul style="list-style-type: none"> <li>Board handling</li> <li>Board bending direction</li> <li>Layout of capacitors</li> </ul> | <ul style="list-style-type: none"> <li>Board handling</li> <li>Layout of slits</li> <li>Design of V groove</li> <li>Arrangement of blades</li> <li>Controlling blade life</li> </ul> | Board handling            |

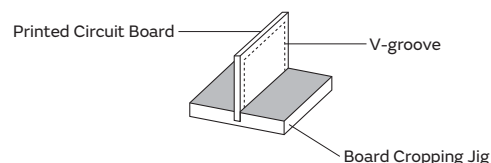
\* When a board separation jig or disc separator is used, if the following precautions are not observed, a large board deflection stress will occur and the capacitors may crack. Use router type separator if at all possible.

#### (1) Example of a suitable jig

[In the case of Single-side Mounting]

An outline of the board separation jig is shown as follows. Recommended example: Stress on the component mounting position can be minimized by holding the portion close to the jig, and bend in the direction towards the side where the capacitors are mounted. Not recommended example: The risk of cracks occurring in the capacitors increases due to large stress being applied to the component mounting position, if the portion away from the jig is held and bent in the direction opposite the side where the capacitors are mounted.

#### [Outline of Jig]



#### Hand Separation

| Recommended | Not Recommended |
|-------------|-----------------|
|             |                 |

[In the case of Double-sided Mounting]

Since components are mounted on both sides of the board, the risk of cracks occurring can not be avoided with the above method. Therefore, implement the following measures to prevent stress from being applied to the components.

(Measures)

- (1) Consider introducing a router type separator. If it is difficult to introduce a router type separator, implement the following measures. (Refer to item 1. Mounting Position)
- (2) Mount the components parallel to the board separation surface.
- (3) When mounting components near the board separation point, add slits in the separation position near the component.
- (4) Keep the mounting position of the components away from the board separation point.

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## (2) Example of a Disc Separator

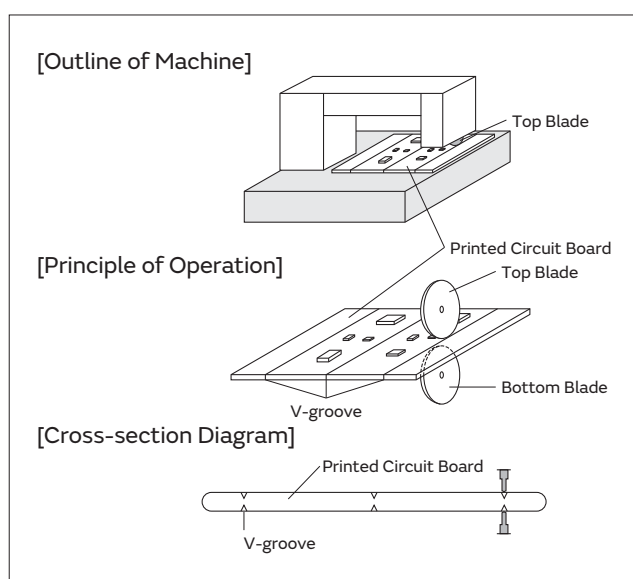
An outline of a disc separator is shown as follows.  
As shown in the Principle of Operation, the top blade and bottom blade are aligned with the V-grooves on the printed circuit board to separate the board.

In the following case, board deflection stress will be applied and cause cracks in the capacitors.

(1) When the adjustment of the top and bottom blades are misaligned, such as deviating in the top-bottom, left-right or front-rear directions

(2) The angle of the V groove is too low, depth of the V groove is too shallow, or the V groove is misaligned top-bottom

IF V groove is too deep, it is possible to brake when you handle and carry it. Carefully design depth of the V groove with consideration about strength of material of the printed circuit board.



## Disc Separator

| Recommended                          | Not Recommended                      |                                      |                                      |
|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
|                                      | Top-bottom Misalignment              | Left-right Misalignment              | Front-rear Misalignment              |
| <p>Top Blade</p> <p>Bottom Blade</p> | <p>Top Blade</p> <p>Bottom Blade</p> | <p>Top Blade</p> <p>Bottom Blade</p> | <p>Top Blade</p> <p>Bottom Blade</p> |

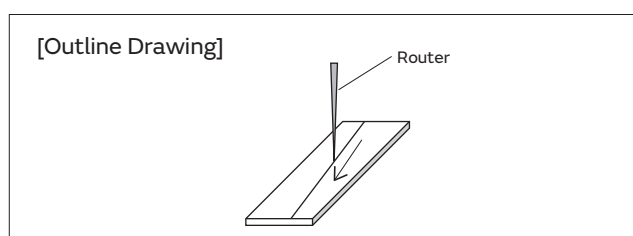
## V-groove Design

| Example of Recommended V-groove Design | Not Recommended         |           |                   |                |
|----------------------------------------|-------------------------|-----------|-------------------|----------------|
|                                        | Left-right Misalignment | Low-Angle | Depth too Shallow | Depth too Deep |
|                                        |                         |           |                   |                |

## (3) Example of Router Type Separator

The router type separator performs cutting by a router rotating at a high speed. Since the board does not bend in the cutting process, stress on the board can be suppressed during board separation.

When attaching or removing boards to/from the router type separator, carefully handle the boards to prevent bending.



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## ⚠Caution

Continued from the preceding page. ↘

### 8. Assembly

#### 1. Handling

If a board mounted with capacitors is held with one hand, the board may bend. Firmly hold the edges of the board with both hands when handling.

If a board mounted with capacitors is dropped, cracks may occur in the capacitors.

Do not use dropped boards, as there is a possibility that the quality of the capacitors may be impaired.

#### 2. Attachment of Other Components

##### 2-1. Mounting of Other Components

Pay attention to the following items, when mounting other components on the back side of the board after capacitors have been mounted on the opposite side. When the bottom dead point of the suction nozzle is set too low, board deflection stress may be applied to the capacitors on the back side (bottom side), and cracks may occur in the capacitors.

- After the board is straightened, set the bottom dead point of the nozzle on the upper surface of the board.

- Periodically check and adjust the bottom dead point.

##### 2-2. Inserting Components with Leads into Boards

When inserting components (transformers, IC, etc.) into boards, bending the board may cause cracks in the capacitors or cracks in the solder.

Pay attention to the following.

- Increase the size of the holes to insert the leads, to reduce the stress on the board during insertion.
- Fix the board with support pins or a dedicated jig before insertion.
- Support below the board so that the board does not bend. When using support pins on the board, periodically confirm that there is no difference in the height of each support pin.

##### 2-3. Attaching/Removing Sockets and/or Connectors

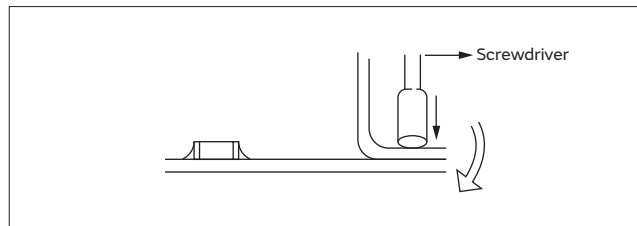
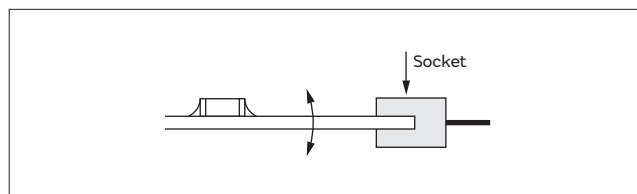
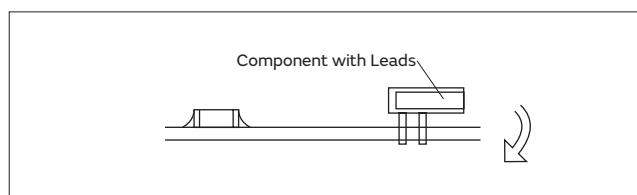
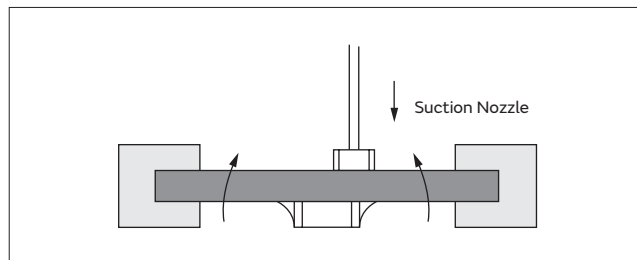
Insertion and removal of sockets and connectors, etc., might cause the board to bend. Please insure that the board does not warp during insertion and removal of sockets and connectors, etc., or the bending may damage mounted components on the board.

##### 2-4. Tightening Screws

The board may be bent, when tightening screws, etc. during the attachment of the board to a shield or chassis.

Pay attention to the following items before performing the work.

- Plan the work to prevent the board from bending.
- Use a torque screwdriver, to prevent over-tightening of the screws.
- The board may bend after mounting by reflow soldering, etc. Please note, as stress may be applied to the chips by forcibly flattening the board when tightening the screws.



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<Applicable to GCG Series>

## 9. Selection of Conductive Adhesive, Mounting Process, and Bonding Strength

The acquired bonding strength may change greatly depending on the conductive adhesive to be used.

Be sure to confirm if the desired performance can be acquired in the assumed mounting process with the conductive adhesive to be used.

## 10. Moisture Proof Process

In order to prevent the occurrence of migration, perform a moisture proof process, such as applying a resin coating or enclosing with a dry inert gas.

## 11. Application

This product is limited to conductive glue mounting. When performing solder mounting, contact Murata in advance.

## Other

### 1. Under Operation of Equipment

- 1-1. Do not touch a capacitor directly with bare hands during operation in order to avoid the danger of an electric shock.
- 1-2. Do not allow the terminals of a capacitor to come in contact with any conductive objects (short-circuit). Do not expose a capacitor to a conductive liquid, including any acid or alkali solutions.
- 1-3. Confirm the environment in which the equipment will operate is under the specified conditions. Do not use the equipment under the following environments.
  - (1) Being splattered with water or oil.
  - (2) Being exposed to direct sunlight.
  - (3) Being exposed to ozone, ultraviolet rays, or radiation.
  - (4) Being exposed to toxic gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine, ammonia gas, etc.)
  - (5) Any vibrations or mechanical shocks exceeding the specified limits.
  - (6) Moisture condensing environments.
- 1-4. Use damp proof countermeasures if using under any conditions that can cause condensation.

### 2. Other

- 2-1. In an Emergency
  - (1) If the equipment should generate smoke, fire, or smell, immediately turn off or unplug the equipment. If the equipment is not turned off or unplugged, the hazards may be worsened by supplying continuous power.
  - (2) In this type of situation, do not allow face and hands to come in contact with the capacitor or burns may be caused by the capacitor's high temperature.

### 2-2. Disposal of Waste

When capacitors are disposed of, they must be burned or buried by an industrial waste vendor with the appropriate licenses.

### 2-3. Circuit Design

- (1) Addition of Fail Safe Function  
Capacitors that are cracked by dropping or bending of the board may cause deterioration of the insulation resistance, and result in a short. If the circuit being used may cause an electrical shock, smoke or fire when a capacitor is shorted, be sure to install fail-safe functions, such as a fuse, to prevent secondary accidents.
- (2) Capacitors used to prevent electromagnetic interference in the primary AC side circuit, or as a connection/insulation, must be a safety standard certified product, or satisfy the contents stipulated in the Electrical Appliance and Material Safety Law. Install a fuse for each line in case of a short.
- (3) The GC3, GCD, GCE, GCG, GCJ, GCM, KC3, and KCM series are not safety standard certified products.

### 2-4. Remarks

Failure to follow the cautions may result, worst case, in a short circuit and smoking when the product is used.

The above notices are for standard applications and conditions. Contact us when the products are used in special mounting conditions.

Select optimum conditions for operation as they determine the reliability of the product after assembly.

The data herein are given in typical values, not guaranteed ratings.

## Notice

### Rating

#### 1. Operating Temperature

##### 1. The operating temperature limit depends on the capacitor.

- 1-1. Do not apply temperatures exceeding the upper operating temperature.

It is necessary to select a capacitor with a suitable rated temperature that will cover the operating temperature range.

It is also necessary to consider the temperature distribution in equipment and the seasonal temperature variable factor.

- 1-2. Consider the self-heating factor of the capacitor.

The surface temperature of the capacitor shall not exceed the maximum operating temperature including self-heating.

#### 2. Atmosphere Surroundings (gaseous and liquid)

##### 1. Restriction on the operating environment of capacitors.

- 1-1. Capacitors, when used in the above, unsuitable, operating environments may deteriorate due to the corrosion of the terminations and the penetration of moisture into the capacitor.

- 1-2. The same phenomenon as the above may occur when the electrodes or terminals of the capacitor are subject to moisture condensation.

- 1-3. The deterioration of characteristics and insulation resistance due to the oxidization or corrosion of terminal electrodes may result in breakdown when the capacitor is exposed to corrosive or volatile gases or solvents for long periods of time.

#### 3. Piezo-electric Phenomenon

1. When using high dielectric constant type capacitors in AC or pulse circuits, the capacitor itself vibrates at specific frequencies and noise may be generated.

Moreover, when the mechanical vibration or shock is added to the capacitor, noise may occur.

### Soldering and Mounting

#### 1. PCB Design

##### 1. Notice for Pattern Forms

- 1-1. Unlike leaded components, chip components are susceptible to flexing stresses since they are mounted directly on the substrate.

They are also more sensitive to mechanical and thermal stresses than leaded components.

Excess solder fillet height can multiply these stresses and cause chip cracking. When designing substrates, take land patterns and dimensions into consideration to eliminate the possibility of excess solder fillet height.

- 1-2. There is a possibility of chip cracking caused by PCB expansion/contraction with heat, because stress on a chip is different depending on PCB material and structure. When the thermal expansion coefficient greatly differs between the board used for mounting and the chip, it will cause cracking of the chip due to the thermal expansion and contraction. When capacitors are mounted on a fluorine resin printed circuit board or on a single-layered glass epoxy board, it may also cause cracking of the chip for the same reason.

##### <Applicable to NFM Series>

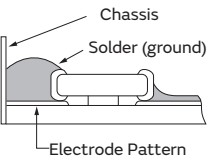
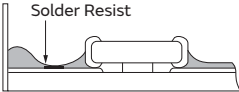
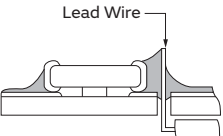
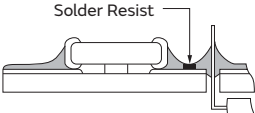
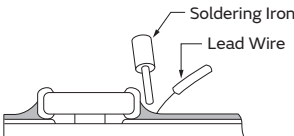
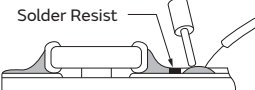
- 1-3. Because noise is suppressed by shunting unwanted high-frequency components to the ground, when designing a land for the NFM series, design the ground pattern to be as large as possible in order to better bring out this characteristic. As shown in the figure below, noise countermeasures can be made more effective by using a via to connect the ground pattern on the chip mounting surface to a larger ground pattern on the inner layer.

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## Notice

Continued from the preceding page. ↘

### Pattern Forms

|                                                   | Prohibited                                                                                      | Correct                                                                                           |
|---------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Placing Close to Chassis                          | <br>in section | <br>in section |
| Placing of Chip Components and Leaded Components  | <br>in section | <br>in section |
| Placing of Leaded Components after Chip Component | <br>in section | <br>in section |
| Lateral Mounting                                  |               |               |

## 2. Land Dimensions

- 2-1. Please refer to the land dimensions in table 1 for flow soldering, table 2 for reflow soldering.  
Please confirm the suitable land dimension by evaluating of the actual SET / PCB.

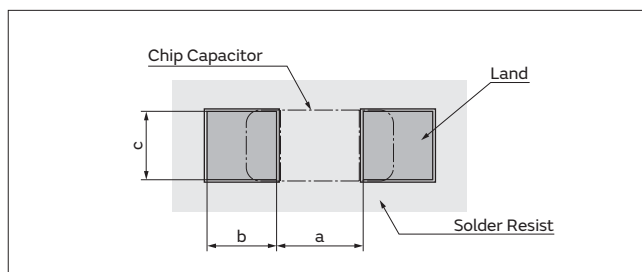


Table 1 Flow Soldering Method

| Series                                                                  | Chip Dimension Code (L/W) | Chip (L×W) | a          | b          | c          |
|-------------------------------------------------------------------------|---------------------------|------------|------------|------------|------------|
| GRT/GCM/GC3/GCD/GCJ<br>(Rated Voltage: above<br>250VDC (for GCJ alone)) | 18                        | 1.6×0.8    | 0.6 to 1.0 | 0.8 to 0.9 | 0.6 to 0.8 |
|                                                                         | 21                        | 2.0×1.25   | 1.0 to 1.2 | 0.9 to 1.0 | 0.8 to 1.1 |
|                                                                         | 31                        | 3.2×1.6    | 2.2 to 2.6 | 1.0 to 1.1 | 1.0 to 1.4 |

Flow soldering can only be used for products with a chip size from 1.6x0.8mm to 3.2x1.6mm.

(in mm)

Table 2 Reflow Soldering Method

| Series                      | Chip Dimension Code (L/W) | Chip (L×W) | a          | b            | c          |
|-----------------------------|---------------------------|------------|------------|--------------|------------|
| GRT/GCM/GC3/<br>GCD/GCE/GCJ | 03                        | 0.6×0.3    | 0.2 to 0.3 | 0.2 to 0.35  | 0.2 to 0.4 |
|                             | 15                        | 1.0×0.5    | 0.3 to 0.5 | 0.35 to 0.45 | 0.4 to 0.6 |
|                             | 18                        | 1.6×0.8    | 0.6 to 0.8 | 0.6 to 0.7   | 0.6 to 0.8 |
|                             | 21                        | 2.0×1.25   | 1.0 to 1.2 | 0.6 to 0.7   | 0.8 to 1.1 |
|                             | 31                        | 3.2×1.6    | 2.2 to 2.4 | 0.8 to 0.9   | 1.0 to 1.4 |
|                             | 32                        | 3.2×2.5    | 2.0 to 2.4 | 1.0 to 1.2   | 1.8 to 2.3 |
|                             | 43                        | 4.5×3.2    | 3.0 to 3.5 | 1.2 to 1.4   | 2.3 to 3.0 |
|                             | 55                        | 5.7×5.0    | 4.0 to 4.6 | 1.4 to 1.6   | 3.5 to 4.8 |

(in mm)

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## Notice

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### <Applicable to Part Number KCM/KC3/KCA>

| Series  | Chip Dimension Code (L/W) | Chip (L×W) | a   | b   | c   |
|---------|---------------------------|------------|-----|-----|-----|
| KCM/KC3 | 55                        | 5.7×5.0    | 2.6 | 2.7 | 5.6 |
| KCA     | 55                        | 5.7×5.0    | 3.2 | 2.7 | 5.6 |

(in mm)

### <Applicable to beyond Rated Voltage of 200VDC>

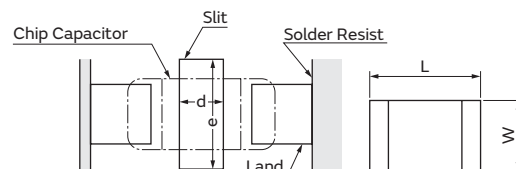
#### 2-2. Dimensions of Slit (Example)

Preparing the slit helps flux cleaning and resin coating on the back of the capacitor.

However, the length of the slit design should be as short as possible to prevent mechanical damage in the capacitor.

A longer slit design might receive more severe mechanical stress from the PCB.

Recommended slit design is shown in the Table.



| L×W      | d          | e          |
|----------|------------|------------|
| 1.6×0.8  | —          | —          |
| 2.0×1.25 | —          | —          |
| 3.2×1.6  | 1.0 to 2.0 | 3.2 to 3.7 |
| 3.2×2.5  | 1.0 to 2.0 | 4.1 to 4.6 |
| 4.5×2.0  | 1.0 to 2.8 | 3.6 to 4.1 |
| 4.5×3.2  | 1.0 to 2.8 | 4.8 to 5.3 |
| 5.7×2.8  | 1.0 to 4.0 | 4.4 to 4.9 |
| 5.7×5.0  | 1.0 to 4.0 | 6.6 to 7.1 |

(in mm)

### <Applicable to NFM Series>

Land Pattern + Solder Resist    Land Pattern    Solder Resist (in mm)

| Series  | Land Dimensions                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                             |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| NFM21HC | <p>● Reflow Soldering</p> <p>NFM21HC</p> <p>Small diameter thru hole ø0.4</p>                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                             |
|         | <p>● Reflow Soldering    Chip mounting side</p> <p>NFM31HK*1</p> <p>Small diameter thru hole ø0.4</p> <p>10mm or more (in case of 10A)</p> <p>*1 For large current design, width of signal land pattern should be wider not less than 1mm per 1A (1mm/A). For example, in case of 10A, signal land pattern width should be 10mm or more. (1mm/A*10A=10mm)</p> | <p>● Flow Soldering    Chip mounting side</p> <p>NFM31HK*1</p> <p>Small diameter thru hole ø0.4</p> <p>10mm or more (in case of 10A)</p> <p>*1 For large current design, width of signal land pattern should be wider not less than 1mm per 1A (1mm/A). For example, in case of 10A, signal land pattern width should be 10mm or more. (1mm/A*10A=10mm)</p> |

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## Notice

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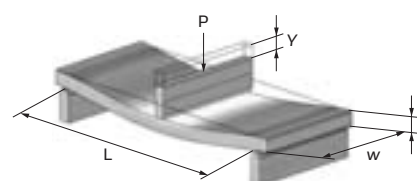
### 3. Board Design

When designing the board, keep in mind that the amount of strain which occurs will increase depending on the size and material of the board.

[Relationship with amount of strain to the board thickness, length, width, etc.]

$$\epsilon = \frac{3PL}{2Ewh^2} \quad \text{Relationship between load and strain}$$

$\epsilon$ : Strain on center of board ( $\mu\text{st}$ )  
 $L$ : Distance between supporting points (mm)  
 $w$ : Board width (mm)  
 $h$ : Board thickness (mm)  
 $E$ : Elastic modulus of board ( $\text{N/m}^2=\text{Pa}$ )  
 $Y$ : Deflection (mm)  
 $P$ : Load (N)



When the load is constant, the following relationship can be established.

- As the distance between the supporting points ( $L$ ) increases, the amount of strain also increases.  
→Reduce the distance between the supporting points.
  - As the elastic modulus ( $E$ ) decreases, the amount of strain increases.  
→Increase the elastic modulus.
  - As the board width ( $w$ ) decreases, the amount of strain increases.  
→Increase the width of the board.
  - As the board thickness ( $h$ ) decreases, the amount of strain increases.  
→Increase the thickness of the board.
- Since the board thickness is squared, the effect on the amount of strain becomes even greater.

## 2. Adhesive Application

If you want to temporarily attach the capacitor to the board using an adhesive agent before soldering the capacitor, first be sure that the conditions are appropriate for affixing the capacitor. If the dimensions of the land, the type of adhesive, the amount of coating, the contact surface area, the curing temperature, or other conditions are inappropriate, the characteristics of the capacitor may deteriorate.

### 1. Selection of Adhesive

- 1-1. Depending on the type of adhesive, there may be a decrease in insulation resistance. In addition, there is a chance that the capacitor might crack from contractile stress due to the difference in the contraction rate of the capacitor and the adhesive.
- 1-2. If there is not enough adhesive, the contact surface area is too small, or the curing temperature or curing time are inadequate, the adhesive strength will be insufficient and the capacitor may loosen or become disconnected during transportation or soldering. If there is too much adhesive, for example if it overflows onto the land, the result could be soldering defects, loss of electrical connection, insufficient curing, or slippage after the capacitor is mounted. Furthermore, if the curing temperature is too high or the curing time is too long, not only will the adhesive

strength be reduced, but solderability may also suffer due to the effects of oxidation on the terminations (outer electrodes) of the capacitor and the land surface on the board.

#### (1) Selection of Adhesive

Epoxy resins are a typical class of adhesive.

To select the proper adhesive, consider the following points.

- 1) There must be enough adhesive strength to prevent the component from loosening or slipping during the mounting process.
- 2) The adhesive strength must not decrease when exposed to moisture during soldering.
- 3) The adhesive must have good coatability and shape retention properties.
- 4) The adhesive must have a long pot life.
- 5) The curing time must be short.
- 6) The adhesive must not be corrosive to the exterior of the capacitor or the board.
- 7) The adhesive must have good insulation properties.
- 8) The adhesive must not emit toxic gases or otherwise be harmful to health.
- 9) The adhesive must be free of halogenated compounds.

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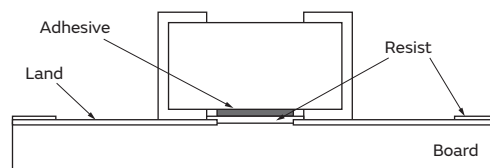
## Notice

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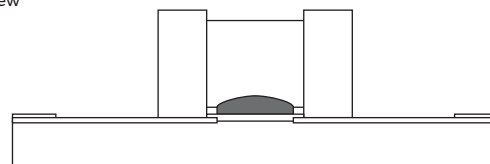
- (2) Use the following illustration as a guide to the amount of adhesive to apply.

[Sizes: 0603(1608M) / 0805(2012M) / 1206(3216M)]

Cross Sectional View



Side View



### 3. Adhesive Curing

1. Insufficient curing of the adhesive can cause chips to disconnect during flow soldering and causes deterioration in the insulation resistance between the terminations due to moisture absorption.  
Control curing temperature and time in order to prevent insufficient hardening.

### 4. Flux for Flow Soldering

1. An excessive amount of flux generates a large quantity of flux gas, which can cause a deterioration of solderability, so apply flux thinly and evenly throughout. (A foaming system is generally used for flow soldering.)
2. Flux containing too high a percentage of halide may cause corrosion of the terminations unless there is sufficient cleaning. Use flux with a halide content of 0.1% max.
3. Do not use strong acidic flux.

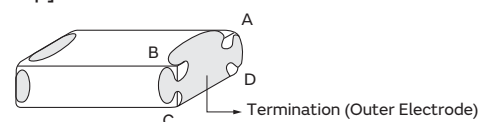
### 5. Flow Soldering

- Set temperature and time to ensure that leaching of the termination does not exceed 25% of the chip end area as a single chip (full length of the edge A-B-C-D shown at right) and 25% of the length A-B shown as mounted on substrate.

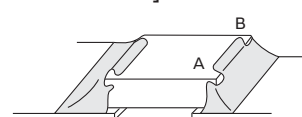
4. Do not use water-soluble flux.\*

(\*Water-soluble flux can be defined as non-rosin type flux including wash-type flux and non-wash-type flux.)

[As a Single Chip]



[As Mounted on Substrate]



### 6. Reflow Soldering

The halogen system substance and organic acid are included in solder paste, and a chip corrodes by this kind of solder paste.

Do not use strong acid flux.

Do not use water-soluble flux\*.

(\*Water-soluble flux can be defined as non-rosin type flux including wash-type flux and non-wash-type flux.)

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## Notice

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### 7. Washing

1. Please evaluate the capacitor using actual cleaning equipment and conditions to confirm the quality, and select the solvent for cleaning.
2. Unsuitable cleaning solvent may leave residual flux or other foreign substances, causing deterioration of electrical characteristics and the reliability of the capacitors.

### 8. Coating

1. A crack may be caused in the capacitor due to the stress of the thermal contraction of the resin during curing process.  
The stress is affected by the amount of resin and curing contraction.  
Select a resin with low curing contraction.  
The difference in the thermal expansion coefficient between a coating resin or a molding resin and the capacitor may cause the destruction and deterioration of the capacitor such as a crack or peeling, and lead to the deterioration of insulation resistance or dielectric breakdown.

3. Select the proper cleaning conditions.  
3-1. Improper cleaning conditions (excessive or insufficient) may result in deterioration of the performance of the capacitors.

Select a resin for which the thermal expansion coefficient is as close to that of the capacitor as possible.  
A silicone resin can be used as an under-coating to buffer against the stress.

2. Select a resin that is less hygroscopic.  
Using hygroscopic resins under high humidity conditions may cause the deterioration of the insulation resistance of a capacitor.  
An epoxy resin can be used as a less hygroscopic resin.
3. The halogen system substance and organic acid are included in coating material, and a chip corrodes by the kind of Coating material.  
Do not use strong acid type.

### Other

#### 1. Transportation

1. The performance of a capacitor may be affected by the conditions during transportation.
  - 1-1. The capacitors shall be protected against excessive temperature, humidity, and mechanical force during transportation.
    - (1) Climatic condition
      - low air temperature: -40°C
      - change of temperature air/air: -25°C/+25°C
      - low air pressure: 30 kPa
      - change of air pressure: 6 kPa/min.
    - (2) Mechanical condition  
Transportation shall be done in such a way that the boxes are not deformed and forces are not directly passed on to the inner packaging.
  - 1-2. Do not apply excessive vibration, shock, or pressure to the capacitor.
    - (1) When excessive mechanical shock or pressure is applied to a capacitor, chipping or cracking may occur in the ceramic body of the capacitor.
    - (2) When the sharp edge of an air driver, a soldering iron, tweezers, a chassis, etc. impacts strongly on the surface of the capacitor, the capacitor may crack and short-circuit.
  - 1-3. Do not use a capacitor to which excessive shock was applied by dropping, etc.  
A capacitor dropped accidentally during processing may be damaged.

#### 2. Characteristics Evaluation in the Actual System

1. Evaluate the capacitor in the actual system, to confirm that there is no problem with the performance and specification values in a finished product before using.
2. Since a voltage dependency and temperature dependency exists in the capacitance of high dielectric type ceramic capacitors, the capacitance may change depending on the operating conditions in the actual system. Therefore, be sure to evaluate the various characteristics, such as the leakage current and noise absorptivity, which will affect the capacitance value of the capacitor.
3. In addition, voltages exceeding the predetermined surge may be applied to the capacitor by the inductance in the actual system. Evaluate the surge resistance in the actual system as required.

#### <Applicable to NFM Series>

4. The effects of noise suppression can vary depending on the usage conditions, including differences in the circuit or IC to be used, the type of noise, the shape of the pattern to be mounted, and the mounting location. Be sure to verify the effect on the actual device in advance.

GRT Series

GCM Series

GC3 Series

GCJ Series

GCD Series

GCE Series

NMF Series

KCM Series

KC3 Series

KCA Series

GCG Series

Notice

[illegible]

# Design Support Tool "SimSurfing"

<http://www.murata.com/simsurfing/>

This is the latest tool to get the electrical characteristics for Capacitors, Inductors, and EMI Suppression Filters, and to simulate Thermistors' behavior !



**■ Characteristics viewer**  
You can easily search and download the following data for Multilayer Ceramic Capacitors, Polymer Capacitors, EMI Suppression Filters (Three-terminal Capacitors, Ferrite Beads) and Power/RF Inductors.

**■ Components performance simulator**  
You can search by the simulation on simple circuits for Thermistors.

**■ Selection tool**  
You can select Medium voltage Capacitors and Power Inductors according to conditions of use.  
\* Medium voltage: Rated Voltage 250V and over

**■ Search tool**  
You can search the Murata timing device (CERALOCK® and crystal units) that is most suitable for your IC and access information about the recommended circuit constant setting.

If you register as a "my Murata" user (<https://my.murata.com/en/web/mymurata/>), you can use Enhanced SimSurfing.

## ■ Usage example of "Multilayer Ceramic Capacitors"

### 1 Select the products

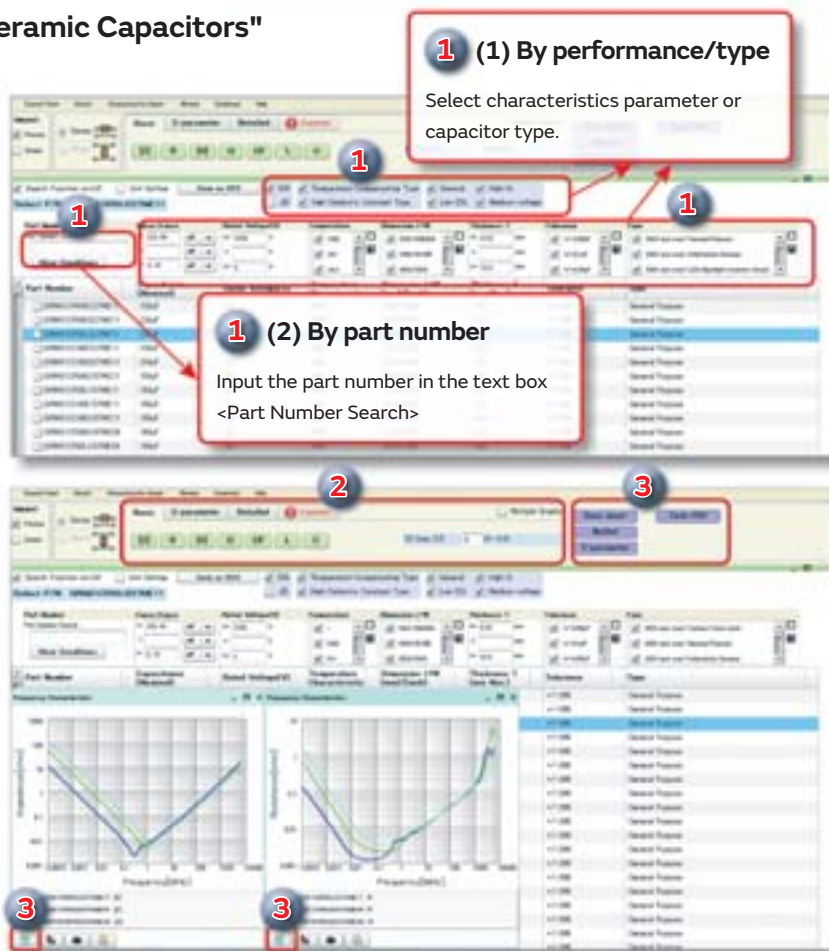
- (1) By performance/type
- (2) By part number

### 2 Show graph

Click each button on each tab of [Basic], [S-parameter] and [Detailed].

### 3 Data download

- Click each purple button in this area.
- Click "CSV output" button.



**1 (1) By performance/type**  
Select characteristics parameter or capacitor type.

**1 (2) By part number**  
Input the part number in the text box  
<Part Number Search>

**2**  
Click each button on each tab of [Basic], [S-parameter] and [Detailed].

**3**  
Click each purple button in this area. Click "CSV output" button.

\* Images are as of October 2015. Be assured that this software will be updated frequently.

<http://www.murata.com/simsurfing/>

# Web page Introduction

**muRata** Product Search

Search by Part Number

Search by Specifications

Search in the Lineups

1

## Search by Part Number

<http://psearch.en.murata.com/capacitor/partnumber/>



You can search for capacitors by specifying the alphanumeric characters in the part number. The packing codes shown contain the substitute character "#". If you enter the official packing code, part numbers that contain that packing code will be matched.

2

## Search by Specifications

<http://psearch.en.murata.com/capacitor/spec/smd/>



You can search for SMD, lead type, or screw termination type capacitors by indicating specifications such as application, capacitance, rated voltage, or temperature characteristics.

You can narrow your search by entering values of ranges, and by specifying product characteristics.

The items for narrowing searches are linked, so specifying one condition causes selectable options for the other items to allow input only of conditions that match the relevant part numbers.

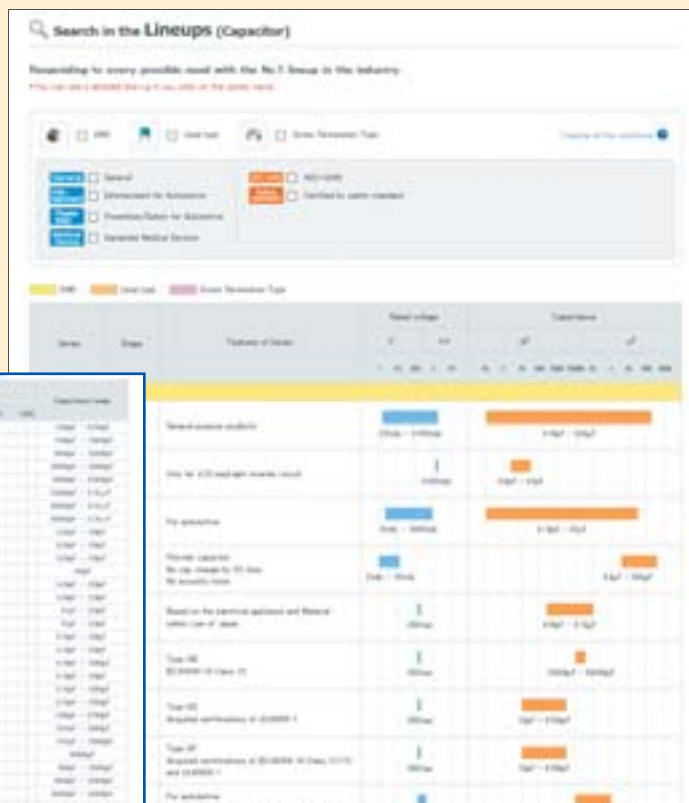


### Search in the Lineups

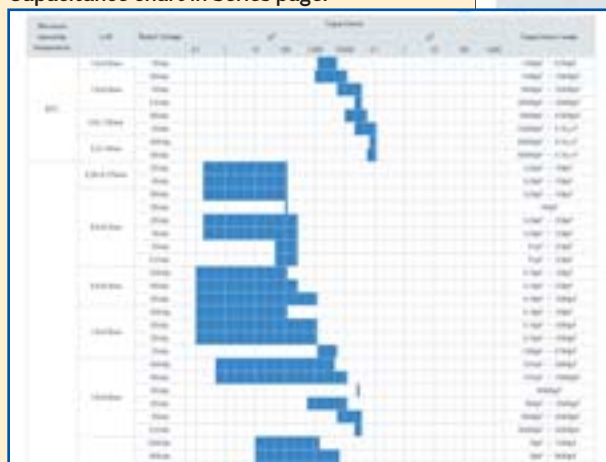
<http://psearch.en.murata.com/capacitor/lineup/>

You can search for capacitors by specifying the series lineup.

You can also confirm items such as characteristics and applications on each series page.



Capacitance chart in Series page.



### [Search result]

Compares the characteristics of the checked ☒ part numbers.

Displays the number of hits for the current search conditions in real time.

Clicking on each search condition button brings up a menu, allowing you to narrow the search results to match the selected condition in real time.

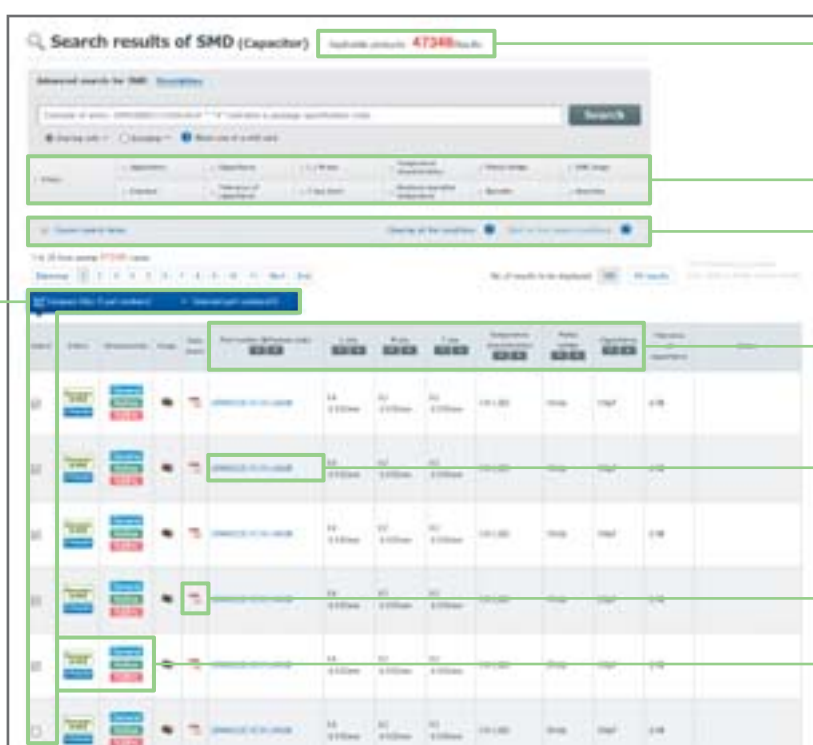
Click "Current search terms" to display a menu, from which you can confirm the current conditions for narrowing the search results.

Click the ▲ mark for each item to switch between ascending and descending display.

Click a product name to display a details page listing more in-depth information (→ P22).

You can download detailed spec sheets.

Icons enable you to check the status and characteristics of products at a glance.



# Global Locations

For details please visit [www.murata.com](http://www.murata.com)



## !Note

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- ① Aircraft equipment
- ② Aerospace equipment
- ③ Undersea equipment
- ④ Power plant equipment
- ⑤ Medical equipment
- ⑥ Transportation equipment (vehicles, trains, ships, etc.)
- ⑦ Traffic signal equipment
- ⑧ Disaster prevention / crime prevention equipment
- ⑨ Data-processing equipment
- ⑩ Application of similar complexity and/or reliability requirements to the applications listed above

3 Product specifications in this catalog are as of May 2017. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

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5 This catalog has only typical specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

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| <a href="#"><u>GCD188R72A472KA01D</u></a> | <a href="#"><u>GCD216R71H472KA01D</u></a> | <a href="#"><u>GCD21BR71H223KA01L</u></a> | <a href="#"><u>GCD21BR71H473KA01L</u></a> |
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| <a href="#"><u>GCD21BR72A223KA01K</u></a> | <a href="#"><u>GCD21BR72A273MA01K</u></a> | <a href="#"><u>GCD21BR72A822MA01K</u></a> | <a href="#"><u>GCD21BR71H683KA01L</u></a> |
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| <a href="#"><u>GCD21BR72A333KA01L</u></a> | <a href="#"><u>GCD21BR72A183KA01L</u></a> | <a href="#"><u>GCD21BR72A823MA01L</u></a> | <a href="#"><u>GCD219R72A272KA01J</u></a> |
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| <a href="#"><u>GCD21BR71H273MA01K</u></a> | <a href="#"><u>GCD21BR72A153KA01K</u></a> | <a href="#"><u>GCD21BR72A153MA01L</u></a> | <a href="#"><u>GCD21BR72A563MA01L</u></a> |
| <a href="#"><u>GCD21BR72A223MA01L</u></a> | <a href="#"><u>GCD21BR72A473MA01L</u></a> | <a href="#"><u>GCD21BR72A683KA01L</u></a> | <a href="#"><u>GCD21BR71H683KA01K</u></a> |
| <a href="#"><u>GCD21BR71H823MA01L</u></a> | <a href="#"><u>GCD21BR72A123KA01K</u></a> | <a href="#"><u>GCD21BR72A393MA01K</u></a> | <a href="#"><u>GCD219R72A182MA01J</u></a> |
| <a href="#"><u>GCD21BR71H473MA01K</u></a> | <a href="#"><u>GCD21BR72A103MA01K</u></a> | <a href="#"><u>GCD21BR72A153KA01L</u></a> | <a href="#"><u>GCD219R72A562MA01D</u></a> |
| <a href="#"><u>GCD21BR71H183KA01K</u></a> | <a href="#"><u>GCD21BR71H563MA01L</u></a> | <a href="#"><u>GCD21BR72A183KA01K</u></a> | <a href="#"><u>GCD219R72A102KA01D</u></a> |
| <a href="#"><u>GCD21BR71H563KA01K</u></a> | <a href="#"><u>GCD21BR71H823KA01L</u></a> | <a href="#"><u>GCD219R72A562KA01D</u></a> | <a href="#"><u>GCD21BR71H153MA01K</u></a> |