

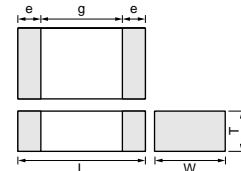
Chip Monolithic Ceramic Capacitors



for Flow/Reflow Soldering GRM15/18/21/31 Series

■ Features

1. Terminations are made of metal highly resistant to migration.
2. The GRM series is a complete line of chip ceramic capacitors in 6.3V, 10V, 16V, 25V, 50V, 100V, 200V and 500V ratings. These capacitors have temperature characteristics ranging from C0G to Y5V.
3. A wide selection of sizes is available, from the miniature LxWxT: 1.0x0.5x0.5mm to LxWxT: 3.2x1.6x1.15mm.
GRM18, 21 and GRM31 types are suited to flow and reflow soldering.
GRM15 type is applied to only reflow soldering.
4. Stringent dimensional tolerances allow highly reliable, high speed automatic chip placement on PCBs.
5. The GRM series is available in paper or plastic embossed tape and reel packaging for automatic placement. Bulk case packaging is also available for GRM15, GRM18 and GRM21.



| Part Number | Dimensions (mm) | | | | |
|----------------|-----------------|-----------|-------------|-------------|--------|
| | L | W | T | e | g min. |
| GRM155 | 1.0 ±0.05 | 0.5 ±0.05 | 0.5 ±0.05 | 0.15 to 0.3 | 0.4 |
| GRM188* | 1.6 ±0.1 | 0.8 ±0.1 | 0.8 ±0.1 | 0.2 to 0.5 | 0.5 |
| GRM216 | 2.0 ±0.1 | 1.25 ±0.1 | 0.6 ±0.1 | 0.2 to 0.7 | 0.7 |
| GRM219 | | | 0.85 ±0.1 | | |
| GRM21A | | | 1.0 +0/-0.2 | | |
| GRM21B | | | 1.25 ±0.1 | | |
| GRM316 | 3.2 ±0.15 | 1.6 ±0.15 | 0.6 ±0.1 | 0.3 to 0.8 | 1.5 |
| GRM319 | | | 0.85 ±0.1 | | |
| GRM31M | | | 1.15 ±0.1 | | |
| GRM31C | | | 1.6 ±0.2 | | |

* Bulk Case : 1.6 ±0.07(L) × 0.8 ±0.07(W) × 0.8 ±0.07(T)

■ Applications

General electronic equipment

Temperature Compensating Type GRM15 Series (1.0x0.5 mm) 50V/25V

| Part Number | GRM15 | | | | | | | |
|--|------------------|-------------|-------------|-------------|------------|------------|-------------|-------------|
| L x W [EIA] | 1.00x0.50 [0402] | | | | | | | |
| TC | C0G (5C) | P2H (6P) | R2H (6R) | S2H (6S) | SL (1X) | | T2H (6T) | U2J (7U) |
| Rated Volt. | 50 (1H) | 50 (1H) | 50 (1H) | 50 (1H) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | |
| 0.50pF (R50) | 0.50(5) | | | | | | | |
| 0.75pF (R75) | 0.50(5) | | | | | | | |
| 1.0pF (R10) | 0.50(5) | | | | | | | |
| 2.0pF (R20) | 0.50(5) | | | | | | | |
| 3.0pF (R30) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 4.0pF (R40) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 5.0pF (R50) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 6.0pF (R60) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 7.0pF (R70) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 8.0pF (R80) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 9.0pF (R90) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 10pF (R100) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 12pF (R120) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 15pF (R150) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 18pF (R180) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 22pF (R220) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 27pF (R270) | 0.50(5) | 0.50(5) | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 33pF (R330) | 0.50(5) | | 0.50(5) | 0.50(5) | | | 0.50(5) | 0.50(5) |

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| Part Number | GRM15 | | | | | | | | |
|--|------------------|------------|-------------|-------------|-------------|------------|------------|-------------|-------------|
| L x W [EIA] | 1.00x0.50 [0402] | | | | | | | | |
| TC | COG (5C) | | P2H (6P) | R2H (6R) | S2H (6S) | SL (1X) | | T2H (6T) | U2J (7U) |
| Rated Volt. | 50 (1H) | 50 (1H) | 50 (1H) | 50 (1H) | 50 (1H) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | |
| 39pF(390) | 0.50(5) | | | | 0.50(5) | | | 0.50(5) | 0.50(5) |
| 47pF(470) | 0.50(5) | | | | | 0.50(5) | | 0.50(5) | 0.50(5) |
| 56pF(560) | 0.50(5) | | | | | 0.50(5) | | 0.50(5) | 0.50(5) |
| 68pF(680) | 0.50(5) | | | | | 0.50(5) | | 0.50(5) | 0.50(5) |
| 82pF(820) | 0.50(5) | | | | | 0.50(5) | | 0.50(5) | 0.50(5) |
| 100pF(101) | 0.50(5) | | | | | 0.50(5) | | 0.50(5) | 0.50(5) |
| 120pF(121) | 0.50(5) | | | | | 0.50(5) | | | 0.50(5) |
| 150pF(151) | 0.50(5) | | | | | 0.50(5) | | | 0.50(5) |
| 180pF(181) | 0.50(5) | | | | | 0.50(5) | | | 0.50(5) |
| 220pF(221) | 0.50(5) | | | | | | 0.50(5) | | |
| 270pF(271) | 0.50(5) | | | | | | 0.50(5) | | |
| 330pF(331) | 0.50(5) | | | | | | 0.50(5) | | |
| 390pF(391) | 0.50(5) | | | | | | 0.50(5) | | |
| 470pF(471) | 0.50(5) | | | | | | | | |
| 560pF(561) | 0.50(5) | | | | | | | | |
| 680pF(681) | 0.50(5) | | | | | | | | |
| 820pF(821) | 0.50(5) | | | | | | | | |
| 1000pF(102) | 0.50(5) | | | | | | | | |

The part numbering code is shown in ().
Dimensions are shown in mm and Rated Voltage in Vdc.

Temperature Compensating Type GRM18 Series (1.60x0.80 mm) 200V/100V/50V/25V

| Part Number | GRM18 | | | | | | | | | | | |
|--|------------------|-------------|------------|-------------|-------------|-------------|-------------|-------------|------------|-------------|-------------|------------|
| L x W [EIA] | 1.60x0.80 [0603] | | | | | | | | | | | |
| TC | COG (5C) | | | P2H (6P) | R2H (6R) | S2H (6S) | SL (1X) | | | T2H (6T) | U2J (7U) | |
| Rated Volt. | 200 (2D) | 100 (2A) | 50 (1H) | 50 (1H) | 50 (1H) | 50 (1H) | 200 (2D) | 100 (2A) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | |
| 0.50pF(R50) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | | | | | |
| 0.75pF(R75) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | | | | | |
| 1.0pF(1R0) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | | | | | |
| 2.0pF(2R0) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | | | | | |
| 3.0pF(3R0) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) |
| 4.0pF(4R0) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) |
| 5.0pF(5R0) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) |
| 6.0pF(6R0) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) |
| 7.0pF(7R0) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) |
| 8.0pF(8R0) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) |
| 9.0pF(9R0) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) |
| 10pF(100) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) |
| 12pF(120) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | 0.80(8) | 0.80(8) |
| 15pF(150) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | 0.80(8) | 0.80(8) |
| 18pF(180) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | 0.80(8) | 0.80(8) |
| 22pF(220) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | 0.80(8) | 0.80(8) |
| 27pF(270) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | 0.80(8) | 0.80(8) |
| 33pF(330) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | 0.80(8) | 0.80(8) |
| 39pF(390) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | 0.80(8) | 0.80(8) |
| 47pF(470) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | 0.80(8) | 0.80(8) |
| 56pF(560) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | | | 0.80(8) | 0.80(8) |

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| Part Number | GRM18 | | | | | | | | | | | |
|--|------------------|----------|---------|----------|----------|----------|----------|----------|---------|---------|----------|----------|
| L x W [EIA] | 1.60x0.80 [0603] | | | | | | | | | | | |
| TC | COG (5C) | | | P2H (6P) | R2H (6R) | S2H (6S) | SL (1X) | | | | T2H (6T) | U2J (7U) |
| Rated Volt. | 200 (2D) | 100 (2A) | 50 (1H) | 50 (1H) | 50 (1H) | 50 (1H) | 200 (2D) | 100 (2A) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | |
| 68pF(680) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | 0.80(8) | | 0.80(8) | 0.80(8) |
| 82pF(820) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | 0.80(8) | | 0.80(8) | 0.80(8) |
| 100pF(101) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | 0.80(8) | | 0.80(8) | 0.80(8) |
| 120pF(121) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) |
| 150pF(151) | | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) |
| 180pF(181) | | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) |
| 220pF(221) | | 0.80(8) | 0.80(8) | | | 0.80(8) | | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) |
| 270pF(271) | | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) |
| 330pF(331) | | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) |
| 390pF(391) | | 0.80(8) | 0.80(8) | | | | | 0.80(8) | 0.80(8) | | 0.80(8) | 0.80(8) |
| 470pF(471) | | 0.80(8) | 0.80(8) | | | | | | 0.80(8) | | | 0.80(8) |
| 560pF(561) | | 0.80(8) | 0.80(8) | | | | | | 0.80(8) | | | 0.80(8) |
| 680pF(681) | | | 0.80(8) | | | | | | 0.80(8) | | | 0.80(8) |
| 820pF(821) | | | 0.80(8) | | | | | | | 0.80(8) | | |
| 1000pF(102) | | | 0.80(8) | | | | | | | 0.80(8) | | |
| 1200pF(122) | | | 0.80(8) | | | | | | | 0.80(8) | | |
| 1500pF(152) | | | 0.80(8) | | | | | | | 0.80(8) | | |
| 1800pF(182) | | | 0.80(8) | | | | | | | | | |
| 2200pF(222) | | | 0.80(8) | | | | | | | | | |
| 2700pF(272) | | | 0.80(8) | | | | | | | | | |

The part numbering code is shown in ().
Dimensions are shown in mm and Rated Voltage in Vdc.

Temperature Compensating Type GRM21 Series (2.00x1.25 mm) 200V/100V/50V/25V

| Part Number | GRM21 | | | | | | | | | | | | |
|--|------------------|----------|---------|----------|----------|----------|----------|----------|----------|---------|---------|----------|----------|
| L x W [EIA] | 2.00x1.25 [0805] | | | | | | | | | | | | |
| TC | COG (5C) | | | COH (6C) | P2H (6P) | R2H (6R) | S2H (6S) | SL (1X) | | | | T2H (6T) | U2J (7U) |
| Rated Volt. | 200 (2D) | 100 (2A) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) | 50 (1H) | 200 (2D) | 100 (2A) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | | |
| 12pF(120) | 0.85(9) | | | | | | | | | | | | |
| 15pF(150) | 0.85(9) | | | | | | | | | | | | |
| 18pF(180) | 0.85(9) | | | | | | | | | | | | |
| 22pF(220) | 0.85(9) | | | | | | | | | | | | |
| 27pF(270) | 0.85(9) | | | | | | | | | | | | |
| 33pF(330) | 0.85(9) | | | | | | | | | | | | |
| 39pF(390) | 0.85(9) | | | | | | | | | | | | |
| 47pF(470) | 0.85(9) | | | | | | | | | | | | |
| 56pF(560) | 0.85(9) | | | | | | | | | | | | |
| 68pF(680) | 1.25(B) | 0.85(9) | | | | | | | | | | | |
| 82pF(820) | 1.25(B) | 0.85(9) | | | | | | | | | | | |
| 100pF(101) | 1.25(B) | 0.60(6) | | | | | | | | | | | |
| 120pF(121) | 1.25(B) | 0.60(6) | | | | | | 0.85(9) | | | | | |
| 150pF(151) | 1.25(B) | 0.60(6) | | | | | | 1.25(B) | | | | | |
| 180pF(181) | 1.25(B) | 0.60(6) | | | 0.85(9) | | | 1.25(B) | | | | | |
| 220pF(221) | 1.25(B) | 0.60(6) | | | 0.85(9) | 0.85(9) | | 1.25(B) | | | | | |
| 270pF(271) | 0.60(6) | | | | 0.85(9) | 0.85(9) | 0.85(9) | 1.25(B) | | | | | |
| 330pF(331) | 0.60(6) | | | | 0.85(9) | 0.85(9) | 0.85(9) | 1.25(B) | | | | | |
| 390pF(391) | 0.60(6) | | | | 1.25(B) | 0.85(9) | 0.85(9) | 1.25(B) | | | | | |

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| Part Number | GRM21 | | | | | | | | | | | | |
|--|------------------|----------|---------|----------|----------|----------|----------|----------|----------|---------|---------|----------|----------|
| L x W [EIA] | 2.00x1.25 [0805] | | | | | | | | | | | | |
| TC | COG (5C) | | | COH (6C) | P2H (6P) | R2H (6R) | S2H (6S) | SL (1X) | | | | T2H (6T) | U2J (7U) |
| Rated Volt. | 200 (2D) | 100 (2A) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) | 50 (1H) | 200 (2D) | 100 (2A) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | | |
| 470pF(471) | | 0.60(6) | | | 1.25(B) | 0.85(9) | 0.85(9) | 1.25(B) | 0.85(9) | | | | |
| 560pF(561) | | 0.60(6) | | | 1.25(B) | 1.25(B) | 1.25(B) | | 0.85(9) | | | 1.25(B) | |
| 680pF(681) | | 0.85(9) | | | | 1.25(B) | 1.25(B) | | 0.85(9) | | | 1.25(B) | |
| 820pF(821) | | 0.85(9) | | | | | 1.25(B) | | 1.25(B) | 0.60(6) | | 1.25(B) | 0.60(6) |
| 1000pF(102) | | 0.85(9) | | | | | | | 1.25(B) | 0.60(6) | | 1.25(B) | 0.60(6) |
| 1200pF(122) | | | | | | | | | 1.25(B) | 0.60(6) | | 1.25(B) | 0.60(6) |
| 1500pF(152) | | | | | | | | | 1.25(B) | 0.85(9) | | 1.25(B) | 0.85(9) |
| 1800pF(182) | | | 0.60(6) | | | | | | 1.25(B) | 0.85(9) | | 1.25(B) | 0.85(9) |
| 2200pF(222) | | | 0.60(6) | | | | | | | 0.85(9) | | | 0.85(9) |
| 2700pF(272) | | | 0.60(6) | 1.25(B) | | | | | | 1.25(B) | | | 1.25(B) |
| 3300pF(332) | | | 0.60(6) | 1.25(B) | | | | | | 1.25(B) | | | 1.25(B) |
| 3900pF(392) | | | 0.60(6) | 1.25(B) | | | | | | | 0.85(9) | | |
| 4700pF(472) | | | 0.60(6) | | | | | | | | 0.85(9) | | |
| 5600pF(562) | | | 0.85(9) | | | | | | | | 1.25(B) | | |
| 6800pF(682) | | | 0.85(9) | | | | | | | | 1.25(B) | | |
| 8200pF(822) | | | 0.85(9) | | | | | | | | | | |
| 10000pF(103) | | | 0.85(9) | | | | | | | 0.60(6) | | | 0.60(6) |
| 12000pF(123) | | | | | | | | | | 0.60(6) | | | 0.60(6) |
| 15000pF(153) | | | | | | | | | | 0.60(6) | | | 0.60(6) |
| 18000pF(183) | | | | | | | | | | 0.60(6) | | | 0.60(6) |
| 22000pF(223) | | | | | | | | | | 0.85(9) | | | 0.85(9) |
| 27000pF(273) | | | | | | | | | | 0.85(9) | | | 0.85(9) |
| 33000pF(333) | | | | | | | | | | 1.00(A) | | | 1.00(A) |
| 39000pF(393) | | | | | | | | | | 1.25(B) | | | 1.25(B) |
| 47000pF(473) | | | | | | | | | | 1.25(B) | | | 1.25(B) |

The part numbering code is shown in ().
Dimensions are shown in mm and Rated Voltage in Vdc.

Temperature Compensating Type GRM31 Series (3.20x1.60 mm) 500V/200V/100V/50V/25V

| Part Number | GRM31 | | | | | | | | | | | | | |
|--|------------------|----------|---------|---------|----------|----------|----------|----------|----------|----------|---------|---------|----------|----------|
| L x W [EIA] | 3.20x1.60 [1206] | | | | | | | | | | | | | |
| TC | COG (5C) | | | | COH (6C) | P2H (6P) | R2H (6R) | S2H (6S) | SL (1X) | | | | T2H (6T) | U2J (7U) |
| Rated Volt. | 500 (2H) | 200 (2D) | 50 (1H) | 25 (1E) | 25 (1E) | 50 (1H) | 50 (1H) | 50 (1H) | 200 (2D) | 100 (2A) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | | | |
| 1.0pF(1R0) | 1.15(M) | | | | | | | | | | | | | |
| 2.0pF(2R0) | 1.15(M) | | | | | | | | | | | | | |
| 3.0pF(3R0) | 1.15(M) | | | | | | | | | | | | | |
| 4.0pF(4R0) | 1.15(M) | | | | | | | | | | | | | |
| 5.0pF(5R0) | 1.15(M) | | | | | | | | | | | | | |
| 6.0pF(6R0) | 1.15(M) | | | | | | | | | | | | | |
| 7.0pF(7R0) | 1.15(M) | | | | | | | | | | | | | |
| 8.0pF(8R0) | 1.15(M) | | | | | | | | | | | | | |
| 9.0pF(9R0) | 1.15(M) | | | | | | | | | | | | | |
| 10pF(100) | 1.15(M) | | | | | | | | | | | | | |
| 12pF(120) | 1.15(M) | | | | | | | | | | | | | |
| 15pF(150) | 1.15(M) | | | | | | | | | | | | | |
| 18pF(180) | 1.15(M) | | | | | | | | | | | | | |
| 22pF(220) | 1.15(M) | | | | | | | | | | | | | |

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| Part Number | GRM31 | | | | | | | | | | | | | |
|--|------------------|----------|---------|---------|----------|----------|----------|----------|----------|----------|---------|---------|----------|----------|
| L x W [EIA] | 3.20x1.60 [1206] | | | | | | | | | | | | | |
| TC | COG (5C) | | | | C0H (6C) | P2H (6P) | R2H (6R) | S2H (6S) | SL (1X) | | | | T2H (6T) | U2J (7U) |
| Rated Volt. | 500 (2H) | 200 (2D) | 50 (1H) | 25 (1E) | 25 (1E) | 50 (1H) | 50 (1H) | 50 (1H) | 200 (2D) | 100 (2A) | 50 (1H) | 25 (1E) | 50 (1H) | 50 (1H) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | | | |
| 27pF(270) | 1.15(M) | | | | | | | | | | | | | |
| 33pF(330) | 1.15(M) | | | | | | | | | | | | | |
| 39pF(390) | 1.15(M) | | | | | | | | | | | | | |
| 47pF(470) | 1.15(M) | | | | | | | | | | | | | |
| 56pF(560) | 1.15(M) | | | | | | | | | | | | | |
| 68pF(680) | 1.15(M) | | | | | | | | | | | | | |
| 82pF(820) | 1.15(M) | | | | | | | | | | | | | |
| 270pF(271) | | 1.15(M) | | | | | | | | | | | | |
| 330pF(331) | | 1.15(M) | | | | | | | | | | | | |
| 390pF(391) | | 1.15(M) | | | | | | | | | | | | |
| 470pF(471) | | 1.15(M) | | | | | | | | | | | | |
| 560pF(561) | | | | | | | | | 1.15(M) | | | | | |
| 680pF(681) | | | | | | 0.85(9) | | | 1.15(M) | | | | | |
| 820pF(821) | | | | | | 0.85(9) | 0.85(9) | | 1.15(M) | | | | | |
| 1000pF(102) | | | | | | 1.15(M) | 1.15(M) | 0.85(9) | 1.15(M) | | | | | |
| 1200pF(122) | | | | | | 1.15(M) | 1.15(M) | 1.15(M) | 1.15(M) | | | | | |
| 1500pF(152) | | | | | | 1.15(M) | 1.15(M) | 1.15(M) | | | | | | |
| 1800pF(182) | | | | | | | | 1.15(M) | | | | | | |
| 2200pF(222) | | | | | | | | | 1.15(M) | | | | 1.15(M) | |
| 2700pF(272) | | | | | | | | | 1.15(M) | | | | 1.15(M) | |
| 3300pF(332) | | | | | | | | | 1.15(M) | | | | 1.15(M) | |
| 3900pF(392) | | | | | | | | | 1.15(M) | 0.85(9) | | | 1.15(M) | 0.85(9) |
| 4700pF(472) | | | | | | | | | 1.15(M) | 0.85(9) | | | | 0.85(9) |
| 5600pF(562) | | | 0.85(9) | | | | | | | 0.85(9) | | | | 0.85(9) |
| 6800pF(682) | | | 0.85(9) | | 0.85(9) | | | | | 1.15(M) | | | | 1.15(M) |
| 8200pF(822) | | | 0.85(9) | | 1.15(M) | | | | | 1.15(M) | | | | 1.15(M) |
| 10000pF(103) | | | 0.85(9) | | | | | | | | | 1.15(M) | | |
| 12000pF(123) | | | | | | | | | | | | 1.15(M) | | |
| 15000pF(153) | | | | | | | | | | | | 1.15(M) | | |
| 27000pF(273) | | | 0.85(9) | | | | | | | | | | | |
| 33000pF(333) | | | 0.85(9) | | | | | | | | | | | |
| 47000pF(473) | | | 1.15(M) | | | | | | | | | | | |
| 56000pF(563) | | | | | | | | | | | 0.85(9) | | | 0.85(9) |
| 68000pF(683) | | | | | | | | | | | 1.15(M) | | | 1.15(M) |
| 82000pF(823) | | | | | | | | | | | 1.15(M) | | | 1.15(M) |
| 0.10μF(104) | | | | 1.60(C) | | | | | | | 1.15(M) | | | 1.15(M) |

The part numbering code is shown in ().
Dimensions are shown in mm and Rated Voltage in Vdc.

High Dielectric Constant Type X5R (R6) Characteristics

| TC | X5R (R6) | | | | | | | |
|--|------------------|---------|------------------|----------|------------------|----------|------------------|----------|
| Part Number | GRM15 | | GRM18 | | GRM21 | | GRM31 | |
| L x W [EIA] | 1.00x0.50 [0402] | | 1.60x0.80 [0603] | | 2.00x1.25 [0805] | | 3.20x1.60 [1206] | |
| Rated Volt. | 16 (1C) | 10 (1A) | 10 (1A) | 6.3 (0J) | 10 (1A) | 6.3 (0J) | 10 (1A) | 6.3 (0J) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | |
| 68000pF(683) | | 0.50(5) | | | | | | |
| 0.10μF(104) | 0.50(5) | 0.50(5) | | | | | | |
| 0.33μF(334) | | | 0.80(8) | | | | | |

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| TC | X5R (R6) | | | | | | | |
|--|------------------|------------|------------------|-------------|------------------|-------------|------------------|-------------|
| Part Number | GRM15 | | GRM18 | | GRM21 | | GRM31 | |
| L x W [EIA] | 1.00x0.50 [0402] | | 1.60x0.80 [0603] | | 2.00x1.25 [0805] | | 3.20x1.60 [1206] | |
| Rated Volt. | 16 (1C) | 10 (1A) | 10 (1A) | 6.3 (0J) | 10 (1A) | 6.3 (0J) | 10 (1A) | 6.3 (0J) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | |
| 0.47μF(474) | | | 0.80(8) | | | | | |
| 0.68μF(684) | | | 0.80(8) | | | | | |
| 1.0μF(105) | | | 0.80(8) | 0.80(8) | 0.85(9) | | | |
| 1.5μF(155) | | | | | | 0.85(9) | | |
| 2.2μF(225) | | | | | 1.25(B) | 1.25(B) | 0.85(9) | |
| 3.3μF(335) | | | | | | 1.25(B) | 1.30(X) | |
| 4.7μF(475) | | | | | | 1.25(B) | 1.60(C) | 1.15(M) |
| 10μF(106) | | | | | | | 1.60(C) | 1.60(C) |

The part numbering code is shown in each ().

3.3μF and 4.7μF, 6.3V rated are GRM21 series of L: 2±0.15, W: 1.25±0.15, T: 1.25±0.15.

T: 1.15±0.1mm is also available for GRM31 1.0μF for 16V.

L: 3.2±0.2, W: 1.6±0.2 for GRM31 16V 1.0μF type. Also L: 3.2±0.2, W: 1.6±0.2, T: 1.15±0.15 for GRM31 16V 1.5μF and 2.2μF type.

Dimensions are shown in mm and Rated Voltage in Vdc.

High Dielectric Constant Type X7R (R7) Characteristics

| TC | X7R (R7) | | | | | | | | | | | | | | | | | |
|--|------------------|-------------|-------------|-------------|------------------|-------------|-------------|------------|------------------|-------------|-------------|------------|------------------|-------------|------------|------------|------------|------------|
| Part Number | GRM15 | | | | GRM18 | | | | GRM21 | | | | GRM31 | | | | | |
| L x W [EIA] | 1.00x0.50 [0402] | | | | 1.60x0.80 [0603] | | | | 2.00x1.25 [0805] | | | | 3.20x1.60 [1206] | | | | | |
| Rated Volt. | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 100 (2A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 100 (2A) | 50 (1H) | 25 (1E) | 16 (1C) | 100 (2A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | | | | | | | |
| 220pF (221) | 0.50 (5) | | | | | 0.80 (8) | | | | | | | | | | | | |
| 330pF (331) | 0.50 (5) | | | | | 0.80 (8) | | | | | | | | | | | | |
| 470pF (471) | 0.50 (5) | | | | | 0.80 (8) | | | | | | | | | | | | |
| 680pF (681) | 0.50 (5) | | | | | 0.80 (8) | | | | | | | | | | | | |
| 1000pF (102) | 0.50 (5) | | | | | 0.80 (8) | | | | | | | | | | | | |
| 1500pF (152) | 0.50 (5) | | | | | 0.80 (8) | | | | | | | | | | | | |
| 2200pF (222) | 0.50 (5) | | | | 0.80 (8) | 0.80 (8) | | | | | | | | | | | | |
| 3300pF (332) | 0.50 (5) | | | | 0.80 (8) | 0.80 (8) | | | | | | | | | | | | |
| 4700pF (472) | 0.50 (5) | | | | | 0.80 (8) | | | | 0.85 (9) | | | | | | | | |
| 6800pF (682) | | 0.50 (5) | | | | 0.80 (8) | | | | 0.85 (9) | | | | | | | | |
| 10000pF (103) | | 0.50 (5) | | | | 0.80 (8) | | | | 1.25 (B) | | | | | | | | |
| 15000pF (153) | | | 0.50 (5) | | | 0.80 (8) | | | | | | | | | | | | |
| 22000pF (223) | | | 0.50 (5) | | | 0.80 (8) | | | | | | | | | | | | |
| 33000pF (333) | | | | 0.50 (5) | | 0.80 (8) | 0.80 (8) | | | | 0.85 (9) | | | 1.15 (M) | | | | |

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| TC | X7R (R7) | | | | | | | | | | | | | | | | | |
|--|------------------|------------|-------------|-------------|------------------|-------------|-------------|-------------|-------------|------------------|-------------|-------------|-------------|------------------|-------------|-------------|-------------|-------------|
| Part Number | GRM15 | | | | GRM18 | | | | | GRM21 | | | | GRM31 | | | | |
| L x W [EIA] | 1.00x0.50 [0402] | | | | 1.60x0.80 [0603] | | | | | 2.00x1.25 [0805] | | | | 3.20x1.60 [1206] | | | | |
| Rated Volt. | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 100 (2A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 100 (2A) | 50 (1H) | 25 (1E) | 16 (1C) | 100 (2A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | | | | | | | |
| 47000pF (473) | | | | 0.50 (5) | | 0.80 (8) | 0.80 (8) | | | | 1.25 (B) | | | 1.15 (M) | | | | |
| 68000pF (683) | | | | | | 0.80 (8) | 0.80 (8) | | | | 1.25 (B) | | | | | | | |
| 0.10μF (104) | | | 0.50 (5) | 0.50 (5) | | 0.80 (8) | 0.80 (8) | 0.80 (8) | | | 1.25 (B) | 1.25 (B) | | | | | | |
| 0.15μF (154) | | | | | | 0.80 (8) | | 0.80 (8) | | | 1.25 (B) | 1.25 (B) | | | | | | |
| 0.22μF (224) | | | | | | | | 0.80 (8) | 0.80 (8) | | 1.25 (B) | 0.85 (9) | | | | | | |
| 0.33μF (334) | | | | | | | | | | | 0.85 (9) | 1.25 (B) | | | 0.85 (9) | | | |
| 0.47μF (474) | | | | | | | | | | | 1.25 (B) | 1.25 (B) | 0.85 (9) | | 1.15 (M) | | | |
| 0.68μF (684) | | | | | | | | | | | | | 0.85 (9) | | | 0.85 (9) | | |
| 1.0μF (105) | | | | | | | | | | | | | 1.25 (B) | | 1.15 (M) | 1.15 (M) | 0.85 (9) | 0.85 (9) |
| 1.5μF (155) | | | | | | | | | | | | | | | 1.60 (C) | | 1.15 (M) | |
| 2.2μF (225) | | | | | | | | | | | | | | | 1.60 (C) | | 1.15 (M) | 0.85 (9) |
| 3.3μF (335) | | | | | | | | | | | | | | | | 1.60 (C) | | |
| 4.7μF (475) | | | | | | | | | | | | | | | | 1.60 (C) | | |

The part numbering code is shown in each ().

The tolerance will be changed to L: 3.2±0.2, W: 1.6±0.2 for GRM31 16V 1.0μF type. Also L: 3.2±0.2, W: 1.6±0.2, T: 1.15±0.15 for GRM31 16V 1.5μF and 2.2μF type.

Dimensions are shown in mm and Rated Voltage in Vdc.

High Dielectric Constant Type Y5V (F5) Characteristics

| TC | Y5V (F5) | | | | | | | | | | | | | | | | | |
|--|------------------|-------------|-------------|-------------|------------------|-------------|------------|------------|------------|------------------|------------|------------|------------|------------------|------------|------------|-------------|--|
| Part Number | GRM15 | | | | GRM18 | | | | | GRM21 | | | | GRM31 | | | | |
| L x W [EIA] | 1.00x0.50 [0402] | | | | 1.60x0.80 [0603] | | | | | 2.00x1.25 [0805] | | | | 3.20x1.60 [1206] | | | | |
| Rated Volt. | 50 (1H) | 25 (1E) | 16 (1C) | 100 (2A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 6.3 (0J) | |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | | | | | | | |
| 2200pF (222) | 0.50 (5) | | | | | | | | | | | | | | | | | |
| 4700pF (472) | 0.50 (5) | | | 0.80 (8) | | | | | | | | | | | | | | |
| 10000pF (103) | 0.50 (5) | | | | 0.80 (8) | | | | | | | | | | | | | |
| 22000pF (223) | | 0.50 (5) | | | 0.80 (8) | | | | | | | | | | | | | |
| 47000pF (473) | | | 0.50 (5) | | 0.80 (8) | | | | | | | | | | | | | |
| 0.10μF (104) | | 0.50 (5) | 0.50 (5) | | 0.80 (8) | 0.80 (8) | | | | 0.85 (9) | | | | | | | | |

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| TC | Y5V (F5) | | | | | | | | | | | | | | | | | |
|--|------------------|------------|------------|------------------|------------|------------|------------|-------------|------------------|-------------|-------------|-------------|------------------|-------------|-------------|-------------|-------------|-------------|
| Part Number | GRM15 | | | GRM18 | | | | | GRM21 | | | | GRM31 | | | | | |
| L x W [EIA] | 1.00x0.50 [0402] | | | 1.60x0.80 [0603] | | | | | 2.00x1.25 [0805] | | | | 3.20x1.60 [1206] | | | | | |
| Rated Volt. | 50 (1H) | 25 (1E) | 16 (1C) | 100 (2A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 50 (1H) | 25 (1E) | 16 (1C) | 10 (1A) | 6.3 (0J) | |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | | | | | | | | | | | | | |
| 0.22μF (224) | | | | | | | | 0.80 (8) | | 1.25 (B) | 0.85 (9) | | | | | | | |
| 0.47μF (474) | | | | | | | | 0.80 (8) | 0.80 (8) | | 1.25 (B) | | | 1.15 (M) | | | | |
| 1.0μF (105) | | | | | | | | 0.80 (8) | 0.80 (8) | | 0.85 (9) | 0.85 (9) | 0.85 (9) | | 1.15 (M) | 0.85 (9) | | |
| 2.2μF (225) | | | | | | | | | | | 1.25 (B) | 1.25 (B) | 1.25 (B) | | | 1.15 (M) | 0.85 (9) | |
| 4.7μF (475) | | | | | | | | | | | | | 1.25 (B) | | 1.15 (M) | 1.15 (M) | 1.15 (M) | |
| 10μF (106) | | | | | | | | | | | | | | | 1.60 (C) | | 1.15 (M) | 1.15 (M) |

The part numbering code is shown in each ().
T: 1.25±0.1mm is also available for GRM21 25V or 16V 1.0μF type.
Dimensions are shown in mm and Rated Voltage in Vdc.

High Dielectric Constant Type Z5U (E4) Characteristics

| TC | Z5U (E4) | | | | | |
|--|------------------|--|------------------|--|------------------|--|
| Part Number | GRM18 | | GRM21 | | GRM31 | |
| L x W [EIA] | 1.60x0.80 [0603] | | 2.00x1.25 [0805] | | 3.20x1.60 [1206] | |
| Rated Volt. | 50 (1H) | | 50 (1H) | | 50 (1H) | |
| Capacitance (Capacitance part numbering code) and T (mm) Dimension (T Dimension part numbering code) | | | | | | |
| 10000pF(103) | 0.80(8) | | | | | |
| 22000pF(223) | 0.80(8) | | | | | |
| 47000pF(473) | | | 0.60(6) | | | |
| 0.10μF(104) | | | 0.85(9) | | | |
| 0.22μF(224) | | | | | 0.85(9) | |

The part numbering code is shown in ().
Dimensions are shown in mm and Rated Voltage in Vdc.

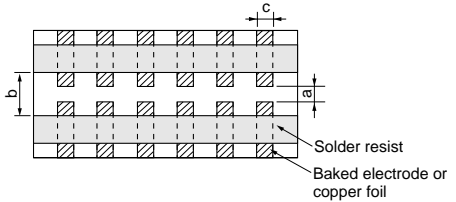
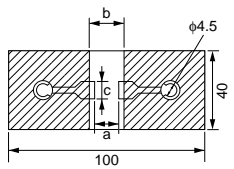
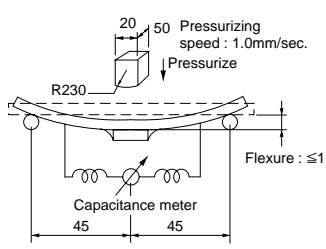
GRM Series Specifications and Test Methods

| No. | Item | Specifications | | Test Method | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---|---|--|-----------|-----------------|-----------|---------|------------------------------------|--|----------|--------------|------------------------------------|--|----------|-----------|--------------------------------|--|----------|-----------|--------------------------------|--|----------|-------------|----|--|----------|--------------|
| | | Temperature Compensating Type | High Dielectric Type | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | Operating Temperature | -55 to +125°C | R6 : -55 to +85°C R7 : -55 to +125°C E4 : +10 to +85°C F5 : -30 to +85°C | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Rated Voltage | See the previous page. | | The rated voltage is defined as the maximum voltage which may be applied continuously to the capacitor. When AC voltage is superimposed on DC voltage, V ^{P-P} or V ^{O-P} , whichever is larger, should be maintained within the rated voltage range. | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | Appearance | No defects or abnormalities | | Visual inspection | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | Dimensions | Within the specified dimensions | | Using calipers on micrometer | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | Dielectric Strength | No defects or abnormalities | | No failure should be observed when *300% of the rated voltage (C0Δ to U2J and SL) or *250% of the rated voltage (X5R, X7R, Z5U and Y5V) is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. *200% for 500V | | | | | | | | | | | | | | | | | | | | | | | | |
| 6 | Insulation Resistance | More than 10,000MΩ or 500Ω • F (Whichever is smaller) | | The insulation resistance should be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max. and within 2 minutes of charging. | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Capacitance | Within the specified tolerance | | The capacitance/Q/D.F. should be measured at 25°C at the frequency and voltage shown in the table. | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Q/ Dissipation Factor (D.F.) | 30pFmin. : Q≥1000 30pFmax. : Q≥400+20C C : Nominal Capacitance (pF) | [R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V 0.05max.(C<3.3μF) 0.1max.(C≥3.3μF) | <table border="1"> <thead> <tr> <th>Item</th> <th>Char.</th> <th>Frequency</th> <th>Voltage</th> </tr> </thead> <tbody> <tr> <td>ΔC to 7U, 1X (1000pF and below)</td> <td></td> <td>1±0.1MHz</td> <td>0.5 to 5Vrms</td> </tr> <tr> <td>ΔC to 7U, 1X (more than 1000pF)</td> <td></td> <td>1±0.1kHz</td> <td>1±0.2Vrms</td> </tr> <tr> <td>R6, R7, F5 (10μF and below)</td> <td></td> <td>1±0.1kHz</td> <td>1±0.2Vrms</td> </tr> <tr> <td>R6, R7, F5 (more than 10μF)</td> <td></td> <td>120±24Hz</td> <td>0.5±0.1Vrms</td> </tr> <tr> <td>E4</td> <td></td> <td>1±0.1kHz</td> <td>0.5±0.05Vrms</td> </tr> </tbody> </table> | Item | Char. | Frequency | Voltage | ΔC to 7U, 1X (1000pF and below) | | 1±0.1MHz | 0.5 to 5Vrms | ΔC to 7U, 1X (more than 1000pF) | | 1±0.1kHz | 1±0.2Vrms | R6, R7, F5 (10μF and below) | | 1±0.1kHz | 1±0.2Vrms | R6, R7, F5 (more than 10μF) | | 120±24Hz | 0.5±0.1Vrms | E4 | | 1±0.1kHz | 0.5±0.05Vrms |
| | | | Item | Char. | Frequency | Voltage | | | | | | | | | | | | | | | | | | | | | | |
| ΔC to 7U, 1X (1000pF and below) | | 1±0.1MHz | 0.5 to 5Vrms | | | | | | | | | | | | | | | | | | | | | | | | | |
| ΔC to 7U, 1X (more than 1000pF) | | 1±0.1kHz | 1±0.2Vrms | | | | | | | | | | | | | | | | | | | | | | | | | |
| R6, R7, F5 (10μF and below) | | 1±0.1kHz | 1±0.2Vrms | | | | | | | | | | | | | | | | | | | | | | | | | |
| R6, R7, F5 (more than 10μF) | | 120±24Hz | 0.5±0.1Vrms | | | | | | | | | | | | | | | | | | | | | | | | | |
| E4 | | 1±0.1kHz | 0.5±0.05Vrms | | | | | | | | | | | | | | | | | | | | | | | | | |
| [E4] W.V. : 25Vmin. : 0.025max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| [F5] W.V. : 25Vmin. : 0.05max.(C<0.10μF) : 0.09max.(C≥0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max. | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9 | Capacitance Temperature Characteristics | Capacitance Change | Within the specified tolerance (Table A) | <p>The capacitance change should be measured after 5 min. at each specified temperature stage.</p> <p>(1) Temperature Compensating Type The temperature coefficient is determined using the Capacitance measured in step 3 as a reference. When cycling the temperature sequentially from step 1 through 5 (C0Δ : +25°C to +125°C ; other temp. coeffs. : +25°C to +85°C) the capacitance should be within the specified tolerance for the temperature coefficient and capacitance change as Table A.</p> <p>The capacitance drift is calculated by dividing the differences between the maximum and minimum measured values in steps 1, 3 and 5 by the capacitance value in step 3.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25±2</td> </tr> <tr> <td>2</td> <td>-55±3 (for ΔC to 7U/1X/R6/R7) -30±3 (for F5) 10±3 (for E4)</td> </tr> <tr> <td>3</td> <td>25±2</td> </tr> <tr> <td>4</td> <td>125±3 (for ΔC/R7) 85±3 (for other TC)</td> </tr> <tr> <td>5</td> <td>25±2</td> </tr> </tbody> </table> <p>(2) High Dielectric Constant Type The ranges of capacitance change compared with the above 25°C value over the temperature ranges shown in the table should be within the specified ranges.</p> | Step | Temperature(°C) | 1 | 25±2 | 2 | -55±3 (for ΔC to 7U/1X/R6/R7) -30±3 (for F5) 10±3 (for E4) | 3 | 25±2 | 4 | 125±3 (for ΔC/R7) 85±3 (for other TC) | 5 | 25±2 | | | | | | | | | | | | |
| | | Step | Temperature(°C) | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 1 | 25±2 | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | -55±3 (for ΔC to 7U/1X/R6/R7) -30±3 (for F5) 10±3 (for E4) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 25±2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 125±3 (for ΔC/R7) 85±3 (for other TC) | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | 25±2 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Temperature Coefficient | Within the specified tolerance (Table A) | — | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Capacitance Drift | Within ±0.2% or ±0.05pF (Whichever is larger.) *Does not apply to 1X/25V | — | | | | | | | | | | | | | | | | | | | | | | | | | | |

Continued on the following page. 

GRM Series Specifications and Test Methods

Continued from the preceding page.

| No. | Item | Specifications | | Test Method | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------|----------------------------------|--|--|---|--|------|---|---|-------|-------|-----|-----|-------|-------|-----|-----|-------|-------|-----|-----|-------|-------|-----|------|-------|-------|-----|-----|-------|-------|-----|-----|-------|-------|-----|-----|-------|-------|-----|-----|
| | | Temperature Compensating Type | High Dielectric Type | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 | Adhesive Strength of Termination | No removal of the terminations or other defect should occur. | | <p>Solder the capacitor to the test jig (glass epoxy board) shown in Fig. 1 using a eutectic solder. Then apply 10N* force in parallel with the test jig for 10±1sec. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock. *2N (GR□03) 5N (GR□15, GRM18)</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Type</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr><td>GR□03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr> <tr><td>GR□15</td><td>0.4</td><td>1.5</td><td>0.5</td></tr> <tr><td>GRM18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr> <tr><td>GRM21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr> <tr><td>GRM31</td><td>2.2</td><td>5.0</td><td>2.0</td></tr> <tr><td>GRM32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr> <tr><td>GRM43</td><td>3.5</td><td>7.0</td><td>3.7</td></tr> <tr><td>GRM55</td><td>4.5</td><td>8.0</td><td>5.6</td></tr> </tbody> </table> <p style="text-align: right;">(in mm)</p> | Type | a | b | c | GR□03 | 0.3 | 0.9 | 0.3 | GR□15 | 0.4 | 1.5 | 0.5 | GRM18 | 1.0 | 3.0 | 1.2 | GRM21 | 1.2 | 4.0 | 1.65 | GRM31 | 2.2 | 5.0 | 2.0 | GRM32 | 2.2 | 5.0 | 2.9 | GRM43 | 3.5 | 7.0 | 3.7 | GRM55 | 4.5 | 8.0 | 5.6 |
| | | Type | a | | b | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GR□03 | 0.3 | 0.9 | 0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GR□15 | 0.4 | 1.5 | 0.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM18 | 1.0 | 3.0 | 1.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM21 | 1.2 | 4.0 | 1.65 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM31 | 2.2 | 5.0 | 2.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM32 | 2.2 | 5.0 | 2.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM43 | 3.5 | 7.0 | 3.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM55 | 4.5 | 8.0 | 5.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | Fig. 1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | Appearance | No defects or abnormalities | | <p>Solder the capacitor to the test jig (glass epoxy board) in the same manner and under the same conditions as (10). The capacitor should be subjected to a simple harmonic motion having a total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55Hz. The frequency range, from 10 to 55Hz and return to 10Hz, should be traversed in approximately 1 minute. This motion should be applied for a period of 2 hours in each of 3 mutually perpendicular directions (total of 6 hours).</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Capacitance | Within the specified tolerance | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 11 | Vibration Resistance | Q/D.F. | <p>30pFmin. : $Q \geq 1000$ 30pFmax. : $Q \geq 400+20C$ C : Nominal Capacitance (pF)</p> | <p>[R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≥3.3μF)</p> <p>[E4] W.V. : 25Vmin. : 0.025max.</p> <p>[F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≥0.10μF)</p> <p>W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | No crack or marked defect should occur. | | <p>Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.</p>  <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Type</th> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr><td>GR□03</td><td>0.3</td><td>0.9</td><td>0.3</td></tr> <tr><td>GR□15</td><td>0.4</td><td>1.5</td><td>0.5</td></tr> <tr><td>GRM18</td><td>1.0</td><td>3.0</td><td>1.2</td></tr> <tr><td>GRM21</td><td>1.2</td><td>4.0</td><td>1.65</td></tr> <tr><td>GRM31</td><td>2.2</td><td>5.0</td><td>2.0</td></tr> <tr><td>GRM32</td><td>2.2</td><td>5.0</td><td>2.9</td></tr> <tr><td>GRM43</td><td>3.5</td><td>7.0</td><td>3.7</td></tr> <tr><td>GRM55</td><td>4.5</td><td>8.0</td><td>5.6</td></tr> </tbody> </table> <p style="text-align: right;">(in mm)</p> | Type | a | b | c | GR□03 | 0.3 | 0.9 | 0.3 | GR□15 | 0.4 | 1.5 | 0.5 | GRM18 | 1.0 | 3.0 | 1.2 | GRM21 | 1.2 | 4.0 | 1.65 | GRM31 | 2.2 | 5.0 | 2.0 | GRM32 | 2.2 | 5.0 | 2.9 | GRM43 | 3.5 | 7.0 | 3.7 | GRM55 | 4.5 | 8.0 |
| Type | a | b | c | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GR□03 | 0.3 | 0.9 | 0.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GR□15 | 0.4 | 1.5 | 0.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM18 | 1.0 | 3.0 | 1.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM21 | 1.2 | 4.0 | 1.65 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM31 | 2.2 | 5.0 | 2.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM32 | 2.2 | 5.0 | 2.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM43 | 3.5 | 7.0 | 3.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GRM55 | 4.5 | 8.0 | 5.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12 | Deflection | | | <p>Solder the capacitor on the test jig (glass epoxy board) shown in Fig. 2 using a eutectic solder. Then apply a force in the direction shown in Fig. 3. The soldering should be done either with an iron or using the reflow method and should be conducted with care so that the soldering is uniform and free of defects such as heat shock.</p>  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | Fig. 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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GRM Series Specifications and Test Methods

Continued from the preceding page.

| No. | Item | Specifications | | Test Method | |
|-----|------------------------------|---|---|--|---|
| | | Temperature Compensating Type | High Dielectric Type | | |
| 13 | Solderability of Termination | 75% of the terminations are to be soldered evenly and continuously. | | Immerse the capacitor in a solution of ethanol (JIS-K-8101) and rosin (JIS-K-5902) (25% rosin in weight proportion). Preheat at 80 to 120°C for 10 to 30 seconds. After preheating, immerse in eutectic solder solution for 2±0.5 seconds at 230±5°C. | |
| 14 | Resistance to Soldering Heat | The measured and observed characteristics should satisfy the specifications in the following table. | | Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in a eutectic solder solution at 270±5°C for 10±0.5 seconds. Let sit at room temperature for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type), then measure. •Initial measurement for high dielectric constant type Perform a heat treatment at 150 ± ₁ 8°C for one hour and then let sit for 48±4 hours at room temperature. Perform the initial measurement. *Preheating for GRM32/43/55 | |
| | | Appearance | No marking defects | | |
| | | Capacitance Change | Within ±2.5% or ±0.25pF (Whichever is larger) | | R6, R7 : Within ±7.5% E4, F5 : Within ±20% |
| | | Q/D.F. | 30pFmin. : Q≥1000 30pFmax. : Q≥400+20C C : Nominal Capacitance (pF) | | [R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≥3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≥0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max. |
| | | I.R. | More than 10,000MΩ or 500Ω • F (Whichever is smaller) | | |
| | Dielectric Strength | No failure | | | |
| 15 | Temperature Cycle | The measured and observed characteristics should satisfy the specifications in the following table. | | Fix the capacitor to the supporting jig in the same manner and under the same conditions as (10). Perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2 hours (temperature compensating type) or 48±4 hour (high dielectric constant type) at room temperature, then measure. | |
| | | Appearance | No marking defects | | |
| | | Capacitance Change | Within ±2.5% or ±0.25pF (Whichever is larger) | | R6, R7 : Within ±7.5% E4, F5 : Within ±20% |
| | | Q/D.F. | 30pFmin. : Q≥1000 30pFmax. : Q≥400+20C C : Nominal Capacitance (pF) | | [R6, R7] W.V. : 25Vmin. : 0.025max. W.V. : 16/10V : 0.035max. W.V. : 6.3V : 0.05max. (C<3.3μF) 0.1max. (C≥3.3μF) [E4] W.V. : 25Vmin. : 0.025max. [F5] W.V. : 25Vmin. : 0.05max. (C<0.10μF) : 0.09max. (C≥0.10μF) W.V. : 16V/10V : 0.125max. W.V. : 6.3Vmax. : 0.15max. |
| | | I.R. | More than 10,000MΩ or 500Ω • F (Whichever is smaller) | | |
| | Dielectric Strength | No failure | | | |

| Step | Temperature | Time |
|------|----------------|--------|
| 1 | 100°C to 120°C | 1 min. |
| 2 | 170°C to 200°C | 1 min. |

| Step | 1 | 2 | 3 | 4 |
|-------------|----------------------------|------------|----------------------------|------------|
| Temp. (°C) | Min. Operating Temp. +0/-3 | Room Temp. | Max. Operating Temp. +3/-0 | Room Temp. |
| Time (min.) | 30±3 | 2 to 3 | 30±3 | 2 to 3 |

Continued on the following page. ↗

GRM Series Specifications and Test Methods

Continued from the preceding page.

| No. | Item | Specifications | | Test Method | |
|-----|-----------------------|---|---|--|---|
| | | Temperature Compensating Type | High Dielectric Type | | |
| 16 | Humidity Steady State | The measured and observed characteristics should satisfy the specifications in the following table. | | Let the capacitor sit at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. | |
| | | Appearance | No marking defects | | |
| | | Capacitance Change | Within ±5% or ±0.5pF (Whichever is larger) | | R6, R7 : Within ±12.5% E4, F5 : Within ±30% |
| | | Q/D.F. | 30pF and over : Q≥350 10pF and over 30pF and below : Q≥275+5C/2 10pF and below : Q≥200+10C C : Nominal Capacitance (pF) | | [R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≥3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≥0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max. |
| | | I.R. | More than 1,000MΩ or 50Ω • F (Whichever is smaller) | | |
| | | Dielectric Strength | No failure | | |
| 17 | Humidity Load | The measured and observed characteristics should satisfy the specifications in the following table. | | Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for F5/10V max. Apply the rated DC voltage for 1 hour at 40±2°C. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. | |
| | | Appearance | No marking defects | | |
| | | Capacitance Change | Within ±7.5% or ±0.75pF (Whichever is larger) | | R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% [W.V. : 10Vmax.] F5 : Within +30/-40% |
| | | Q/D.F. | 30pF and over : Q≥200 30pF and below : Q≥100+10C/3 C : Nominal Capacitance (pF) | | [R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V 0.075max. (C<3.3μF) 0.125max. (C≥3.3μF) [E4] W.V. : 25Vmin. : 0.05max. [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≥0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max. |
| | | I.R. | More than 500MΩ or 25Ω • F (Whichever is smaller) | | |
| | | Dielectric Strength | No failure | | |

Continued on the following page.

GRM Series Specifications and Test Methods

Continued from the preceding page.

| No. | Item | Specifications | | Test Method | |
|---------------------|-----------------------|---|--|--|---|
| | | Temperature Compensating Type | High Dielectric Type | | |
| 18 | High Temperature Load | The measured and observed characteristics should satisfy the specifications in the following table. | | | Apply 200% of the rated voltage for 1000±12 hours at the maximum operating temperature ±3°C. Let sit for 24±2 hours (temperature compensating type) or 48±4 hours (high dielectric constant type) at room temperature, then measure. The charge/discharge current is less than 50mA. •Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage for one hour at the maximum operating temperature ±3°C. Remove and let sit for 48±4 hours at room temperature. Perform initial measurement. *150% for 500V and C≥10μF |
| | | Appearance | No marking defects | | |
| | | Capacitance Change | Within ±3% or ±0.3pF (Whichever is larger) | R6, R7 : Within ±12.5% E4 : Within ±30% F5 : Within ±30% (Cap<1.0μF) F5 : Within +30/-40% (Cap≥1.0μF) | |
| | | Q/D.F. | 30pF and over : Q≥350 10pF and over : Q≥275+5C/2 30pF and below : 10pF and below : Q≥200+10C C : Nominal Capacitance (pF) | [R6, R7] W.V. : 25Vmin. : 0.05max. W.V. : 16/10V : 0.05max. W.V. : 6.3V : 0.075max. (C<3.3μF) 0.125max. (C≥3.3μF) [E4] W.V. : 25Vmin. : 0.05max [F5] W.V. : 25Vmin. : 0.075max. (C<0.10μF) : 0.125max. (C≥0.10μF) W.V. : 16V/10V : 0.15max. W.V. : 6.3Vmax. : 0.2max. | |
| | | I.R. | More than 1,000MΩ or 50Ω•F (Whichever is smaller) | | |
| Dielectric Strength | No failure | | | | |

Table A

| Char. Code | Nominal Values (ppm/°C)* | Capacitance Change from 25°C (%) | | | | | |
|------------|--------------------------|----------------------------------|-------|------|-------|------|-------|
| | | -55 | | -30 | | -10 | |
| | | Max. | Min. | Max. | Min. | Max. | Min. |
| 5C | 0 ± 30 | 0.58 | -0.24 | 0.40 | -0.17 | 0.25 | -0.11 |
| 6C | 0 ± 60 | 0.87 | -0.48 | 0.59 | -0.33 | 0.38 | -0.21 |
| 6P | -150 ± 60 | 2.33 | 0.72 | 1.61 | 0.50 | 1.02 | 0.32 |
| 6R | -220 ± 60 | 3.02 | 1.28 | 2.08 | 0.88 | 1.32 | 0.56 |
| 6S | -330 ± 60 | 4.09 | 2.16 | 2.81 | 1.49 | 1.79 | 0.95 |
| 6T | -470 ± 60 | 5.46 | 3.28 | 3.75 | 2.26 | 2.39 | 1.44 |
| 7U | -750 ± 120 | 8.78 | 5.04 | 6.04 | 3.47 | 3.84 | 2.21 |
| 1X | +350 to -1000 | - | - | - | - | - | - |

*Nominal values denote the temperature coefficient within a range of 25°C to 125°C (for ΔC)/85°C (for other TC).