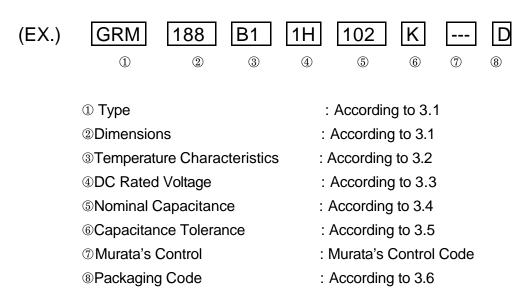
FOR FLOW AND REFLOW SOLDERING CHIP MONOLITHIC CERAMIC CAPACITOR GRM SERIES

1.SCOPE

This product specification is applied to CHIP MONOLITHIC CERAMIC CAPACITOR used for General Electronic equipment.

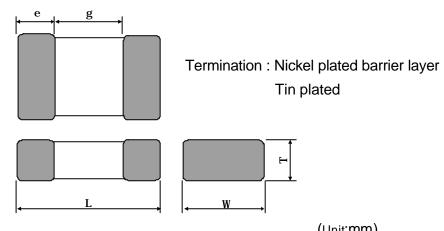
2.MURATA PART NO. SYSTEM

2.1 NEW PART NO.



3.TYPE

3.1 TYPE & DIMENSIONS



| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | | | • | (Unit:I | nm) | |
|------------------------------------------------------------------------------------------------------------------------|---------|----|------------|------------|-------------|--------------|----------|--|
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | TYF | ΡE | L | W | т | е | g | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | GRM03 | 3 | 0.6+/-0.03 | 0.3+/-0.03 | 0.3+/-0.03 | 0.1 to 0.2 | 0.2 min. | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | GRM15 | 5 | 1.0+/-0.05 | 0.5+/-0.05 | 0.5+/-0.05 | 0.15 to 0.35 | 0.3 min. | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | GRM188 | 8 | 1.6+/-0.1 | 0.8+/-0.1 | 0.8+/-0.1 | 0.2 to 0.5 | 0.5 min. | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | | | | | | | | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | GRM21 | | 2.0+/-0.1 | 1.25+/-0.1 | | 0.2 to 0.7 | 0.7 min. | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | | | •••• | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | 2.2.1.0.45 | 4.0./0.45 | | | | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | CDM21 | | 3.2+/-0.15 | 1.6+/-0.15 | | 0.2 to 0.9 | 1 E min | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | GRIVIST | | | | | 0.3 10 0.8 | 1.5 mm. | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | 3.2+/-0.2 | 1.6+/-0.2 | | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | | | | | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | 9 | 3.2+/-0.3 | | | | | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | | М | | | | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | Ν | | 05./00 | 1.35+/-0.15 | | 1.0 min | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | GRIVI32 | С | | 2.3+/-0.2 | 1.6+/-0.2 | 0.3 min. | 1.0 min. | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | | R | | | 1.8+/-0.2 | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | D | | | 2.0+/-0.2 | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | Е | | | 2.5+/-0.2 | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | Ν | | | 1.35+/-0.15 | | | |
| $\begin{array}{c ccccccccccccccccccccccccccccccccccc$ | | С | | | 1.6+/-0.2 | | | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | GRM43 | R | 4.5+/-0.4 | 3.2+/-0.3 | 1.8+/-0.2 | 0.3 min. | 2.0 min. | |
| $GRM55 \frac{M}{D} = 5.7 + -0.4 = 5.0 + -0.4 = \frac{1.15 + -0.1}{1.35 + -0.15} = 0.3 \text{ min.} = 2.0 \text{ min.}$ | | D | | | 2.0+/-0.2 | | | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | | Е | | | 2.5+/-0.2 | | | |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | | М | | | 1.15+/-0.1 | | | |
| GRM55 C R D 5.0+/-0.4 5.0+/-0.4 1.6+/-0.2 1.3 min. 2.0 min. 2.0 min. | | Ν | | | 1.35+/-0.15 | | | |
| R 1.8+/-0.2 D 2.0+/-0.2 | | С | | 50 / 0 / | | | | |
| | GRM55 | R | 5.7+/-0.4 | 5.0+/-0.4 | 1.8+/-0.2 | 0.3 min. | 2.0 min. | |
| | | D | | | | | | |
| | | Е | | | 2.5+/-0.2 | | | |

1. Thickness dimensions(T) : According to appendix.

2.GRM18 Series Bulk case packaging is L:1.6+/-0.07mm W/T:0.8+/-0.07mm.

3.GRM21 Series B1 0J 335/475K is L:2.0+/-0.15mm W/T:1.25+/-0.15mm.

4.GRM31 Series B3/R1 1E 225K/M, B1/R1 1C 105/155/225K/M, B1 1A 335K/M,

B1 0J 475K/M, R7 2A 474/684K/M is L:3.2+/-0.2mm, W:1.6+/-0.2 mm.

FUKUI MURATA MFG.CO.,LTD

3.2 TEMPERATURE CHARACTERISTICS (1)Temperature Compensating Type

| Code | TEMPERATURE CHARACTERISTICS | Temp. Range | Temp. coeff.(ppm/°C) |
|------|--------------------------------|--------------|----------------------|
| 2C | СН | | 0 +/-60 |
| 3C | CJ | | 0 +/-120 |
| 4C | СК | -55 to 125°C | 0 +/-250 |
| 5C | C0G | | 0+/-30 |
| 6C | COH | | 0+/-60 |
| 2P | PH | -25 to 85°C | -150 +/-60 |
| 3P | PJ | -25 10 65 °C | -150 +/-120 |
| 6P | P2H | -55 to 85°C | -150+/-60 |
| 2R | RH | | -220 +/-60 |
| 3R | RJ | -25 to 85°C | -220 +/-120 |
| 4R | RK | | -220+/-250 |
| 6R | R2H | -55 to 85°C | -220+/-60 |
| 2S | SH | | -330 +/-60 |
| 3S | SJ | -25 to 85°C | -330 +/-120 |
| 4S | SK | | -330+/-250 |
| 6S | S2H | -55 to 85°C | -330+/-60 |
| 2T | TH | | -470 +/-60 |
| 3T | TJ | -25 to 85°C | -470 +/-120 |
| 4T | TK | | -470+/-250 |
| 6T | T2H | -55 to 85°C | -470+/-60 |
| 3U | UJ | -25 to 85°C | -750 +/-120 |
| 4U | UK | -25 10 65 C | -750 +/-250 |
| 7U | U2J | -55 to 85°C | -750+/-120 |
| 1X | SL | 20 to 85°C | +350 to -1000 |

(2) High Dielectric Constant Type

| Code | TEMPERATURE | Temp. Range | Cap. Change(Within%) | Standard Temp. | | |
|------|-----------------|-------------------|-----------------------|----------------|--|--|
| COUE | CHARACTERISTICS | Temp. Range | Cap. Change(Within %) | Standard Temp. | | |
| B1* | В | -25 to 85°C | +/-10 | | | |
| B3 | В | -25 to 85°C +/-10 | | 20°C | | |
| R1* | R | -55 to 125°C | +/-15 | 20 0 | | |
| F1* | F | -25 to 85°C | +30/-80 | | | |
| R7 | X7R | -55 to 125°C | +/-15 | | | |
| R6 | X5R | -55 to 85°C | +/-15 | | | |
| C7 | X7S | -55 to 125°C | +/-22 | 25°C | | |
| C8 | X6S | -55 to 105°C | +/-22 | | | |
| F5 | Y5V | -30 to 85°C | +22/-82 | | | |

 * : Add 50% of the rated voltage.

3.3 DC RATED VOLTAGE

| Code | 0J | 1A | 1C | 1E | 1H | 2A |
|------------------|------|-----|-----|-----|-----|------|
| DC Rated voltage | 6.3V | 10V | 16V | 25V | 50V | 100V |

3.4 NOMINAL CAPACITANCE

Nominal Capacitance shall be expressed by three digits. The first two digits represents significant figures. The last specifies the number of zero to follow. The letter R is used as the decimal point. According to appendix.

(EX.)

| Code | Capacitance |
|------|-------------|
| R50 | 0.5pF |
| 5R0 | 5.0pF |
| 220 | 22pF |
| 221 | 220pF |

3.5 CAPACITANCE TOLERANCE

| Code | Туре | Temperature Characteristics | Capaci | tance Tolerance | Capacitance Step |
|------|---------------|--------------------------------|--------|-----------------|---------------------|
| С | Tomporatura | | <10pF | +/-0.25pF | 0.5,1,2,3,4,5,7(pF) |
| D | Temperature | ΔC to ΔX | < TOPF | +/-0.5pF | 5,6,7,8,9(pF) |
| R | Compensating | | ≧10pF | +/-2.5% | 10(pF) |
| J | Туре | | ≡TOPF | +/-5% | E24 Step |
| К | High | B1/B3/R6/R1/R7 | | +/-10% | E12 Step |
| М | Dielectric | D1/D3/R0/R1/R1 | | +/-20% | |
| Z | Constant Type | F1/F5 | - | +80/-20% | E6 Step |

*E24 step is also available for GRM03/15/18 1 to 9.1pF.

E Step

| E24 | 1 | 1.1 | 1.2 | 1.3 | 1.5 | 1.6 | 1.8 | 2 | 2.2 | 2.4 | 2.7 | 3 | 3.3 | 3.6 | 3.9 | 4.3 | 4.7 | 5.1 | 5.6 | 6.2 | 6.8 | 7.5 | 8.2 | 9.1 |
|-----|---|-----|-----|-----|-----|-----|-----|---|-----|-----|-----|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| E12 | | 1 | 1. | 2 | 1. | 5 | 1. | 8 | 2. | .2 | 2. | 7 | 3.3 | 3 | 3. | 9 | 4 | .7 | 5. | 6 | 6. | 8 | 8. | 2 |
| E6 | | | 1 | | | 1. | .5 | | | 2. | 2 | | | 3. | .3 | | | 4. | 7 | | | 6. | 8 | |

3.6 PACKAGING

Packaging is the following method. According to Packaging Methods.

| Packaging Code | Specification | Packaging Unit |
|-------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| В | Bulk Packaging in a bag | 1000pcs/bag (Only GRM43S,GRM55E/F: 500pcs./bag) |
| D | \$\$\overline{178mm}\$ Paper Tape Carrier Packaging \$\$\$ \$\$\$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ | |
| L | \$\$\overline{178mm}\$\$ Plastic Tape Carrier Packaging \$\$\$ \$\$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ | |
| E | | |
| J | \$\$\overline{330mm} Paper Tape Carrier Packaging \$\$\$ \$\$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ \$\$\$ | According to Capacitance Value and Tolerance |
| К | \$\$\overline{330mm}\$\$ Plastic Tape Carrier Packaging \$\$\$ \$\$\$ \$\$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ \$\$ | |
| F | | |
| С | Bulk Case Packaging | |

4.SPECIFICATIONS

Refer to P10 to P13 for Appendix 1 to 3. Refer to P14 to P16 for Appendix 4. Refer to P17 to P19 for Appendix 5. Refer to P20 to P21 for Appendix 6.

| | 50 | | | | Jiyhe | | | ! - 4! | | | 1470 |
|---------|----------------|-----------|--------------------------------|-------------------------------------|----------------------------|----------------|--------------------------|----------------------|--------------------------------------------|----------------------------------------------|-----------------------------------|
| | DC RATED | | Т | | Iem | perature | Charact | eristics ai | nd Capacitance(p | F) | φ178 Desker |
| Туре | VOLTAGE (V) | Code | Thickness (mm) | ΔC | ΔP | ΔR | ΔS | ΔT | ΔU | 1X | Packag- ing Unit (pcs/Reel) |
| | 50 | | | - | - | - | - | - | 1 to 15 | - | |
| GRM03 | 25 | 3 | 0.3+/-0.03 | 0.5 to 100 | - | 1to 100 | 1to 100 | 1to 100 | 16 to 100 | - | 15000 |
| GRM15 | 50 | 5 | 0.5+/-0.05 | 0.5 to 1000 | 3to 30 | 3to 33 | 3to 39 | 3to 100 | 3 to 200 | 0.5 to 200 | 10000 |
| • | 25 | Ū | | 180 to 270 | - | - | - | - | - | 220 to 390 | |
| GRM18 | 50 | 8 | 0.8 +/-0.1 | 0.5to 2700 | 3to 160 | 3to 180 | 3to 220 | 3to 470 | 3 to 750 1000 to 10000 | 0.5 to 750 1000 to 10000 | 4000 |
| | 25 | | | 560 to 1500 | - | - | - | - | - | 820 to 1500 | |
| | | 6 | 0.6 +/-0.1 | 0.5 to 4700 | 3to 160 | 3to 180 | 3to 240 | 3to 130 | 3 to 1300 10000, 12000, 15000, 18000 | 0.5 to 1300 10000, 12000, 15000, 18000 | 4000 |
| GRM21 | 50 | 9 | 0.85+/-0.1 | 1000, 5100 to 15000 | 180 to 360 | 200 to 470 | 270 to 470 | 150 to 390 | 1500 to 2200 22000 to 27000 | 1500 to 2200 22000 to 27000 | |
| | | Α | 1.0+0/-0.2 | - | - | - | - | - | 33000 | 33000 | 3000 |
| | | В | 1.25+/-0.1 | 18000 to 22000 | 390 to 620 | 510 to 750 | 510 to 820 | 430 to 1800 | 2400 to 3300 39000 to 47000 | 2400 to 3300 39000 to 47000 | 3000 |
| | 25 | 9 | 0.85+/-0.1 | - | - | - | - | - | - | 3600 to 4700 | 4000 |
| | | В | 1.25+/-0.1 | - | - | - | - | - | - | 5100 to 6800 | 3000 |
| | | 6 | 0.6+/-0.1 | 0.5 to 750 | 3 to 330 | 3 to 390 | 3 to 510 | 3 to 390 | 3 to 1800 | 0.5 to 1800 | |
| CDM24 | 50 | 9 | 0.85+/-0.1 | 820 to 22000, 27000, 33000 | 360 to 910 | 430 to 820 | 560 to 1100 | 430 to 750 | 2000 to 6200 56000 | 2000 to 6200 56000 | 4000 |
| GRM31 | | М | 1.15+/-0.1 | 39000 to 47000 | 1000 to 1600 | 910 to 1600 | 1200 to 2000 | 820 to 4300 | 6800 to 8200 68000to100000 | 6800 to 8200 68000to100000 | 3000 |
| | | С | 1.6+/-0.2 | 56000 to 82000 | - | - | - | - | - | - | 2000 |
| | 25 | М | 1.15+/-0.1 | - | - | - | - | - | - | 9100 to 16000 | 3000 |
| | | С | 1.6+/-0.2 | 100000 | - | - | - | - | - | - | 2000 |
| GRM32 | 50 | Ν | 1.35+/- 0.15 | - | - | - | - | - | - | 9100 to 12000 | 2000 |
| GRM43 | 50 | R | 1.8+/-0.2 | - | - | - | - | - | - | 13000 to 16000 | 1000 |
| | | М | 1.15+/-0.1 | - | - | - | - | - | - | 18000 | |
| GRM55 | 50 | N | 1.35+/- 0.15 | - | - | - | - | - | - | 20000 to 22000 | 1000 |
| Capacit | ance Tolera | R ance | 1.8+/-0.2 (0.5 tc C:+/-0 | - 7.0pF) .25pF | - (5.0 to 9 D:+/-0.5 | • • | - (More tl J:+/-5% | <u>-</u> nan 10pF | -) (10pF) R:+/-2.5% | 24000 to 39000 | |

Appendix 1. CAPACITANCE VALUE AND TOLERANCE 50V max. <Temperature Compensating Type>

1. Inner electrode : Nickel , Palladium or Silver/Palladium

Appendix 2-1. CAPACITANCE VALUE AND TOLERANCE 50V max. <High Dielectric Constant Type>

| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | F5 - - - - - - - - - - - - - - - - - - - | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------|
| GRM03 16 10 3 10 0.3+/-0.03 100 to 1000 1200 to 10000 1200 to 10000 1200 to 10000 1200 to 10000 1200 to 10000 GRM15 25 5 0.5+/-0.05 220 to 47000 - 220 to 47000 - 2200 to 100000 - 1200 to 10000 - 1500 to 10000 - 1500 to 10000 - 1200 to 10000 - 2200 to 47000 - 2200 to 10000 - 22000 to 10000 - 1000 to 22000 - 1000 to 220000 - 1000 to 22000 - 220 to 10000 - 1000 to 20000 - 1000 to 22000 - 22000 to 10000 - - - - - - - - - - - - - - - - - - - - - | - - - - - - - - - - - - - - - - - - - | 10000 4000 4000 |
| GRM03 16 3 0.3+/-0.03 100 fo 1000 1000 fo 3300 - - 63 - 1200 to 10000 - 1200 to 10000 - 1200 to 10000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | - - - - - - - - - - - - - - - - - - - | 10000 4000 4000 |
| 6.3 1200 to 10000 - 1200 to 10000 - - GRM15 25 5 0.5+/-0.05 220 to 4700 - 220 to 4700 - 100 to 15000 10 560 220 to 4700 5600 to 22000 47000 - 1000 to 10000 - 50 25 5 0.5+/-0.05 5600 to 100000 27000 to 47000 - 15000 to 100000 - 33000 to 100000 - 25 7 25 8 220 to 47000 5600 to 22000 - 15000 to 100000 - 15000 to 100000 - 15000 to 100000 15000 to 100000 15000 to 100000 12000 to 22000 - 220 to 47000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - <t< td=""><td>- - - - - - - - - - - - - - - - - - -</td><td>10000 4000 4000</td></t<> | - - - - - - - - - - - - - - - - - - - | 10000 4000 4000 |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | - - - - - - - - - - - - - - - - - - - | 4000 |
| GRM15 25 0.5+/-0.05 5600 to 22000 470000 5600 to 47000 - 22000 to 100000 10 10 27000 to 47000 56000 to 100000 - 33000 to 100000 - 33000 to 100000 - 33000 to 100000 - 33000 to 100000 - 15000 to 47000 - 15000 to 47000 - 15000 to 47000 - 15000 to 100000 - 15000 to 100000 - 12000 to 47000 - 15000 to 100000 - 12000 to 470000 - 12000 to 220000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | - - - - - - - - - - - - - - - - - - - | 4000 |
| GRM15 5 0.5+/-0.05 | - - - - - - - - - - - - - - - - - - - | 4000 |
| 16 2/000 to 4/000 100000 15000 to 470000 - 33000 to 100000 10 5600 to 100000 - 2700 to 47000 - 15000 to 470000 - 25 25 - 220 to 47000 56000 to 22000 - 15000 to 100000 220000 to 470000 10 25 8200 to 150000 180000 8200 to 220000 - 15000 to 100000 220000 to 470000 10 6.3 0.8 +/-0.1 12000 to 220000 470000 12000 to 470000 - 33000 to 1000000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | - - - - - - - - - - - - - - - - - - - | 4000 |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - - - - - - - - - - - - - - - - - - - | 4000 |
| 30 220 is 37000 220 is 47000 220 is 100000 - 100000 220000 is 220000 10 25 8 0.8 +/-0.1 12000 is 33000 390000 is 220000 - 15000 is 1000000 220000 is 220000 - 15000 is 1000000 220000 is 220000 - 15000 is 1000000 12000 is 220000 - 33000 is 1000000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - 10000 is 220000 - 10000 is 220000 220000 - 10000 is 220000 - 10000 is 220000 220000 is 20000 1000000 | - 70000 to 1000000 - | 4000 |
| 25 GRM18 25 16 8 0.8 +/-0.1 8200 to 150000 (12000 to 330000) (12000 to 330000) (12000 to 470000) (12000 to 220000) (12000 to 33000) (12000 to 130000) (12000 to 13000) (12000 to 13000) (12000 to 13000) (12000 to 13000) (12000 to 13000) (12000 to 127000) (12000 to 1270000) (12000 to 12 | - 70000 to 1000000 - | 4000 |
| GRM18 16 8 0.8 +/-0.1 12000 to 330000 12000 to 470000 - 220000 to 470000 - 10 -6.3 12000 to 220000 470000 12000 to 470000 - 33000 to 1000000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | - 70000 to 1000000 - | 4000 |
| Instruct | - 70000 to 1000000 - | 4000 |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - 70000 to 1000000 - | |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - 70000 to 1000000 - | |
| $ \begin{tabular}{ c c c c c c c c c c c c c c c c c c c$ | - 70000 to 1000000 - | |
| 50 9 0.85+/-0.1 27000 is 39000 330000 27000 is 39000 330000 100000 is 150000 100 B 1.25+/-0.1 47000 to 100000 470000 470000 150000to 220000 220000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 20000 <t< td=""><td>-</td><td></td></t<> | - | |
| B 1.25+/-0.1 47000 to 100000 470000 470000 to 100000 150000to 220000 25 6 0.6+/-0.1 10000 to 33000 - 10000 to 33000 - 33000 to 68000 9 0.85+/-0.1 39000 to 68000 470000, 39000 to 68000 - 220000, to 270000 - 220000, to 470000 - 220000, to 470000 - 220000, to 470000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | - | 3000 |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - | 3000 |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - | 0000 |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | - | |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | | 4000 |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - | 0000 |
| $ \begin{array}{c c c c c c c c c c c c c c c c c c c $ | - | 3000 |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - | |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - | 4000 |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - | 3000 |
| $ \begin{array}{ c c c c c c c c c c c c c c c c c c c$ | - | 4000 |
| B 1.25+/-0.1 100000,2200000 - 680000 to 1000000 - 4700000 6.3 B 1.25+/-0.1 2200000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - <td>-</td> <td>4000</td> | - | 4000 |
| 6.3 B 1.25+/-0.15 330000.4700000 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - </td <td>-</td> <td>3000</td> | - | 3000 |
| 6 0.6+/-0.1 220 to 15000 - 220 to 15000 - 1000 to 47000 50 M 1.15+/-0.1 220 to 100000 - 220 to 100000 - 1000 to 47000 50 M 1.15+/-0.1 120000 to 220000 1000000 120000 to 220000 390000 to 470000 | - | 3000 |
| 9 0.85+/-0.1 220 to 100000 - 220 to 100000 270000 to 330000 68000 to 330000 50 M 1.15+/-0.1 120000 to 220000 1000000 120000 to 220000 390000 to 470000 470000 | - | |
| 50 M 1.15+/-0.1 12000 to 22000 100000 120000 to 22000 330000 68000 to 330000 50 M 1.15+/-0.1 120000 to 220000 120000 to 220000 390000 to 470000 470000 | - | 4000 |
| M 1.15+/-0.1 120000 to 220000 1000000 120000 to 220000 470000 470000 | - | |
| 1500000 | - | 3000 |
| | _ | 2000 |
| 220000 | | 2000 |
| 6 0.6+/-0.1 18000 to 33000 - 18000 to 33000 - 68000 to 150000 0 0.95+/-0.4 39000 to 150000 39000 to 150000 39000 to 150000 39000 to 150000 | - | 4000 |
| 9 0.85+/-0.1 270000 to 680000 - 270000 to 680000 - 220000 to 470000 | - | |
| 25 M 1.15+/-0.1 180000 to 220000 - 180000 to 220000 - 680000 to 4700000 | - | 2000 |
| 1.15+/-0.15 - 2200000 2200000 | - | 3000 |
| C 1.6+/0.2 3300000, 6800000000 | - | 2000 |
| 4700000 | - 1 | |
| GRM31 6 0.6+/-0.1 47000 to 56000 - 47000 to 56000 - 220000 68000 to 220000 68000 to 220000 | - | |
| 9 0.85+/-0.1 330000, - 330000, - 330000, - 330000 to 470000 470000 to 560000 - 1000000 - 1000000 | - | 4000 |
| 16 115+/01 270000 270000 680000 to 1700000 | - | |
| M 680000 to 820000 680000 to 820000 | - 1 | 3000 |
| 1.15+/-0.15 1500000, 2200000 - 1500000, 2200000 - - C 1.6, / 0.2 4700000 3300000, 2300000 4700000 - - | | |
| C 1.6+/-0.2 4700000 3300000, 4700000 - 9 0.85+/-0.1 820000 to 1000000 2200000, 3300000 - 820000 to 1000000 - 2200000 to 3300000 | - | 4000 |
| 40 4700000 to | - | 4000 |
| M 1.15+/-0.1 220000 - 1000000 | - | |
| C 1.6 +/-0.2 4700000, 10000000 - 10000000 - - - - - - 10000000 - - - - - - 10000000 - - - - - - - 10000000 - - - - - 10000000 - - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - - 10000000 - - 10000000 - - - 100000000 - | | 3000 |
| 6.3 C 1.6 +/-0.2 4700000 | - | 3000 2000 |
| Capacitance Tolerance K:+/-10%, M +/-20% Z : +80/-20% | | 3000 |

1.Inner electrode : Nickel , Palladium , or Silver/Palladium

JEMCG0-4240B

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Appendix 2-2. CAPACITANCE VALUE AND TOLERANCE 50V max.

<High Dielectric Constant Type>

| | DC | | Т | Te | emperature | Characteristics and | Capacitance | e (pF) | | φ178 |
|---------|-------------------------|------|-------------------|------------------------------------|------------|------------------------------------|-------------|--------------------------|---------|-----------------------------------|
| Туре | RATED VOLTAGE (V) | Code | Thickness (mm) | B1 | B3/R6 | R1/R7 | R7 | F1/F5 | F5 | Packag- ing Unit (pcs/Reel) |
| | | М | 1.15+/-0.1 | 390000 to 470000 | - | 390000 to470000 | - | - | - | 3000 |
| | 50 | Ν | 1.35+/-0.15 | 180000 to220000 560000 to680000 | - | 180000 to220000 560000 to680000 | - | 680000 | - | 2000 |
| | 50 | R | 1.8 +/-0.2 | 820000 to1000000 | - | 820000 to1000000 | - | 1000000 | - | 1000 |
| | | D | 2.0+/-0.2 | - | 3300000 | - | - | - | 1000000 | 1000 |
| | | Е | 2.5+/-0.2 | - | 4700000 | - | - | - | - | 1000 |
| | | 9 | 0.85+/-0.1 | - | - | - | - | 4700000 | - | 4000 |
| | 25 | Ν | 1.35+/-0.15 | - | - | - | 1500000 | 10000000 | - | 2000 |
| GRM32 | 25 | R | 1.8 +/-0.2 | 2200000 | - | - | 2200000 | - | - | 1000 |
| 0 | | D | 2.0+/-0.2 | 3300000,4700000 | - | 3300000,4700000 | | - | - | 1000 |
| | | М | 1.15+/-0.1 | 2200000 | - | 2200000 | - | - | - | 3000 |
| | 16 | Ν | 1.35+/-0.15 | 3300000 | - | 3300000 | - | 1000000 | - | 2000 |
| | 10 | R | 1.8 +/-0.2 | 4700000 | - | 4700000 | - | - | - | 1000 |
| | | D | 2.0+/-0.2 | 1000000 | 10000000 | 1000000 | - | - | - | 1000 |
| | | 9 | 0.85+/-0.1 | - | - | - | - | 1000000 | - | 4000 |
| | 10 | D | 2.0+/-0.2 | - | - | - | 10000000 | - | - | 1000 |
| | 10 | Е | 2.5 +/-0.2 | 1000000 | - | - | - | - | - | 1000 |
| GRM43 | 50 | R | 1.8 +/-0.2 | 270000 to 680000 | - | 270000 to 680000 | - | 1000000 to 2200000 | - | 1000 |
| GRIVI43 | | D | 2.0 +/-0.2 | - | - | 1500000 | - | - | - | 500 |
| | | Е | 2.5 +/-0.2 | - | - | 2200000 | - | - | - | 500 |
| | 25 | Е | 2.5 +/-0.2 | - | - | 4700000 | - | - | - | 500 |
| GRM55 | 50 | R | 1.8 +/-0.2 | 560000 to1500000 | - | 560000 to1500000 | - | 3300000 to 4700000 | - | 1000 |
| GRIVDD | | D | 2.0+/-0.2 | - | 10000000 | 3300000 | - | - | - | 1000 |
| | | Е | 2.5+/-0.2 | - | - | 4700000 | - | - | - | 500 |
| | 25 | D | 2.0+/-0.2 | 1000000 | - | 1000000 | - | - | - | 1000 |
| C | apacitance | Tole | rance | | K:+/-10%, | M:+/-20% | | Z:+80 |)/-20% | |

1.Inner electrode : Nickel , Palladium , or Silver/Palladium

Appendix 3. CAPACITANCE VALUE AND TOLERANCE(100V)

| | DC | | | Tempe | erature Characteris | tics and Capacitanc | e | φ178 |
|-------|-------------|----------|-------------------|---------------------------|----------------------------------------|----------------------------------|------------------|-------------|
| Turne | RATED | | Т | Tempe | erature | | electric | Packag- |
| Туре | VOLTAGE | | | Compensa | ating Type | Consta | nt Type | ing Unit |
| | (V) | Code | Thickness (mm) | ΔC | 1X | R7 | F5 | (pcs/Reel) |
| GRM15 | 100 | 5 | 0.5+/-0.05 | - | - | 220 to 4700 | - | 10000 |
| GRM18 | 100 | 8 | 0.8+/-0.1 | 0.5 to 1000 | 0.5 to 430 | 220 to 3300, 100000 | 1500 to 4700 | 4000 |
| | | 6 | 0.6+/-0.1 | 100 to 560 | - | - | - | |
| GRM21 | 100 | 9 | 0.85+/-0.1 | 0.5 to 91, 620 to 1500 | 0.5 to 750 | 220 to 6800 | 680 to 6800 | 4000 |
| | | В | 1.25+/-0.1 | - | 820 to 2000 | 8200 to 47000 | 10000 to 22000 | 3000 |
| | | 9 | 0.85+/-0.1 | 0.5 to 5600 | 0.5 to 1800 | 220 to 15000, 100000 | 1000 to 22000 | 4000 |
| GRM31 | 100 | М | 1.15+/-0.1 | - | 2000 to 4700 | 18000 to 82000 150000, 220000 | 33000 to 47000 | 3000 |
| | | | 1.15+/-0.15 | - | - | 470000, 680000 | - | |
| | | С | 1.6+/-0.2 | - | - | 1000000 | - | 2000 |
| | | Μ | 1.15+/-0.1 | - | - | 47000 | 68000 | 3000 |
| | | Ν | 1.35+/-0.15 | - | 5100 to 6800 | 56000 to 100000 | 68000 to 100000 | 2000 |
| GRM32 | 100 | С | 1.6+/-0.2 | - | - | 680000,1000000 | - | 2000 |
| | | D | 2.0+/-0.2 | - | - | 1500000 | - | 1000 |
| | | Ш | 2.5+/-0.2 | - | - | 1000000,2200000 | - | 1000 |
| | | N | 1.35+/-0.15 | - | 7500 to 8200 | - | - | |
| | | R | 1.8+/-0.2 | 6200 to 12000 | 9100 to 16000 | | 150000 to 330000 | 1000 |
| GRM43 | 100 | D | 1.6+/-0.2 | - | - | 390000 to 470000 1500000 | - | 1000 |
| | | Е | 2.5+/-0.2 | - | - | 2200000 | - | 500 |
| | | Μ | 1.15+/-0.1 | - | 18000 | - | - | |
| | | Ν | 1.35+/-0.15 | 13000 to 16000 | 20000 to 22000 | 270000 | - | |
| | | R | 1.8+/-0.2 | 18000 to 30000 | 24000 to 39000 | 330000 to 560000 | 470000 to 680000 | 1000 |
| GRM55 | 100 | D | 1.6+/-0.2 | - | - | 820000 to 1000000 3300000 | - | 1000 |
| | | E | 2.5+/-0.2 | - | - | 4700000 | - | 500 |
| C | Capacitance | e Tolera | nce | | C:+/-0.25pF D:+/-0.5pF) J:+/-5% | K:+/-10% M:+/-20% | Z:+80/-20% | |

1.Inner electrode : Nickel , Palladium , or Silver/Palladium

Appendix 4. CAPACITANCE VALUE

| | DC | | Т | | Temperature | Characte | ristics and (| Canacita | nce (uF) | | φ178 |
|-----------------------------------------|----------------|---------|--------------------------|--------------------------|-----------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------|--------------------------------------------------|----------|----------------|------------------------|
| Туре | RATED | | Thickness | | | | | | | I | Packag- |
| .,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | VOLTAGE (V) | Code | (mm) | B1 | B3/R6 | R7 | R1/R7 | C8 | C7 | F1/F5 | ing Unit (pcs/Reel) |
| GRM03 | 6.3 | 3 | 0.3+/-0.03 | 0.015 to 0.033 | 0.047 to 0.10 | - | - | - | - | - | 15000 |
| GRM15 | 10 | 5 | 0.5+/-0.05 | - | 0.15to 1.0 | - | - | - | - | 0.22to 1.0 | 10000 |
| | 6.3 | | | 0.15to 0.33 | 0.47, 1.0 | - | - | - | - | 1.0 | |
| | 16 | 5 | 0.5+0/-0.1 | - | 1.0 | - | - | - | - | - | - |
| | 25 | | | - | 0.47, 1.0 0.47 | - | - | - | - | - | _ |
| GRM18 | 16 | | 0.8+/-0.1 | - | 1.0, 2.2 | - | - | - | 1.0 | - | 4000 |
| | 10 | 8 | 0.8+/-0.1 | - | 2.2 | - | - | - | 1.0 | 2.2, 4.7 | |
| | 6.3 | | | 2.2 | 2.2, 4.7 | - | - | - | 2.2 | 2.2, 4.7 | |
| | 4 | 6 | 0.6+/-0.1 | - | - 1.0 | - | - | 4.7 | 2.2 | - | 4000 |
| | 25 | ь В | 1.25+/-0.15 | - | 2.2, 3.3, | - 2.2 | - | - | | - | 3000 |
| | | Б 6 | 0.6+/-0.1 | | 4.7 | | | | - | | 3000 |
| | | 9 | 0.85+/-0.1 | - | 2.2 | - | - | - | - | - | 4000 |
| | 16 | | | - | 2.2, 3.3, | - | - | | | - | |
| GRM21 | | В | 1.25+/-0.1 | - | 4.7 | - | - | - | - | - | 3000 |
| | | 6 | 0.6+/-0.1 | 1.0 | 2.2 | - | - | - | - | - | 4000 |
| | 10 | 9 | 0.85+/-0.1 1.25+/-0.1 | 2.2 | <u>3.3, 4.7</u> 10 | - | - | - | - | - | |
| | | В | 1.25+/-0.15 | - | 3.3, 4.7 | - | - | - | 3.3,4.7 | - | 3000 |
| | | 9 | 0.85+/-0.1 | 4.7 | 4.7, 10 | - | - | - | - | - | 4000 |
| | 6.3 | В | 1.25+/-0.1 | 10 | 10 | - | - | - | - | 10 | 3000 |
| | | | 1.25+/-0.15 0.6+/-0.1 | - | 22 2.2 | - | - | - | - | - | |
| | 25 | 6 9 | 0.85+/-0.1 | - | 4.7 | - | - | - | - | - | 4000 |
| | 20 | Č | 1.6+/-0.2 | - | 10 | - | - | - | - | - | 3000 |
| | 16 | 6 | 0.6+/-0.1 | - | 2.2 | - | - | - | - | - | 4000 |
| | | 9 | 0.85+/-0.1 | - | 4.7 | - | - | - | - | - | |
| GRM31 | | 6 9 | 0.6+/-0.1 0.85+/-0.1 | - 4.7 | 3.3, 4.7 10 | - | - | - | - | - | 4000 |
| | 10 | M | 1.15+/-0.1 | - | 10 | - | - | - | - | - | 3000 |
| | | С | 1.6+/-0.2 | - | - | - | - | - | - | 22 | 2000 |
| | | 9 | 0.85+/-0.1 | 10 | 10 | - | - | - | - | - | 4000 |
| | 6.3 | M | 1.15+/-0.1 | - | 10 | - | - | - | - | - | 3000 |
| | 25 | С | 1.6+/-0.2 | - | 15, 22, 47 | - | - | - | - | 22 | 2000 |
| | 25 | E C | 2.5+/-0.2 1.6+/-0.2 | - | - 22 | - | - | - | - | - 22 | 1000 2000 |
| | 16 | Ē | 2.5+/-0.2 | - | 22, 47 | - | - | - | - | - | 1000 |
| | | N | 1.35+/-0.15 | - | 22 | - | - | - | - | - | 2000 |
| GRM32 | 10 | C E | 1.6+/-0.2 2.5+/-0.2 | - 22 | - 47 | - | - 22 | - | - | 22 | 2000 1000 |
| | | D | 2.0+/-0.2 | 22 | 33 | - | - | - | - | - | 1000 |
| | 6.3 | E | 2.5+/-0.2 | - | 47, 100 | - | - | - | - | 100 | 1000 |
| | 4 | Е | 2.5+/-0.2 | - | - | - | - | 100 | - | - | 1000 |
| | 16 | Е | 2.5+/-0.2 | 22 | - | - | - | - | - | - | 500 |
| | 10 | D | 2.0+/-0.2 | - | 33 | - | - | - | - | - | 1000 |
| GRM43 | | E D | 2.5+/-0.2 2.0+/-0.2 | 22 33 | 47 | - | 22 | - | - | - | 500 1000 |
| | 6.3 | E | 2.0+/-0.2 | 47 | - | - | - | - | - | - | 500 |
| | | S | 2.8+/-0.2 | - | 100 | - | - | - | - | - | 500 |
| GRM55 | 6.3 | F | 3.2+/-0.2 | 100 | - | - | - | - | - | - | 300 |
| C | Capacitanc | e Toler | ance | K : +/-10% M : +/-20% | Not apply to | GRM2 GRM3 GRM3 GRM3 GRM3 GRM3 | 21BB3/R60 21BB3/R60 31CB3/R60 32DB3/R60 32EB3/R60 32EB3/R60 32EC80G10 43SB3/R60 | G226M J476M J336M J476M J107M D7M | | Z: +80/-20% | |

Appendix 5. CAPACITANCE VALUE

| No | MURATA New P/N | SIZE | (mm) | T(mm) | | DC RATED VOLTAGE | CAP. | | CAP.TOL. |
|----|---------------------------|------|------|------------|----|---------------------|------|----|----------|
| | | L | W | ~ / | | (V) | | | |
| 1 | GRM 31M F5 1C 106 Z A12 L | 3.2 | 1.6 | 1.15+/-0.1 | F5 | 16 | 10 | μF | +80/-20% |

| No | MURATA New P/N | CUSTOMER P/N | φ178 PACKAGING Q'TY (pcs/Reel) |
|----|---------------------------|--------------|--------------------------------------|
| 1 | GRM 31M F5 1C 106 Z A12 L | | 3000 |

1. Inner electrode : Nickel, Palladium, or Silver/Palladium.

Appendix 6. CAPACITANCE VALUE

| No | MURATA New P/N | SIZE | (mm) | T(mm) | T.C. | DC RATED VOLTAGE | | | CAP.TOL. |
|----|---------------------------|------|------|-----------|------|---------------------|----|----|----------|
| _ | | L | W | | | (V) | - | | |
| 1 | GRM 188 R6 0J 106 M E47 D | 1.6 | 0.8 | 0.8+/-0.1 | R6 | 6.3 | 10 | μF | +/-20% |

| No | MURATA New P/N | CUSTOMER P/N | φ178 PACKAGING Q'TY (pcs/Reel) |
|----|--------------------------|--------------|--------------------------------------|
| 1 | GRM 188 R6 0J 106 ME47 D | | 4000 |

1. Inner electrode : Nickel, Palladium, or Silver/Palladium.

| | | | DNS AND TEST | Specific | | Γ | | | | |
|--------|-----------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| No | Iten | n | Temperature Compensating T | | High Dielectric Constant Type | ĺ | | Test Met | hod | |
| 1 | Operating Tempo Range | erature | $\Delta C, 1X = 55^{\circ}C$ to $125^{\circ}C$ Other := 25^{\circ}C to $85^{\circ}C$ | | B1,B3,F1:-25°C to 85°C R1,R7:-55°C to 125°C R6:-55°C to 85°C C8:-55°C to 105°C F5:-30°C to 85°C | | | emperature : 20 °C F5 : 25 °C) | | |
| 2 | Rated Voltage | | See the previous pages. | | | m W V | nay be app Vhen AC v | voltage is defined as blied continuously to the oltage is superimposed ever is larger, shall be ge. | capacitor. I on DC vol | tage, V ^{P-P} or |
| 3 | Appearance | | No defects or abnormalitie | | | | 'isual inspe | | | |
| 4 | Dimension | | Within the specified dimer | nsions | | | lsing calipe GRM02 siz | ers. e is based on Microsco | npe) | |
| 5 | Dielectric Streng | ıth | No defects or abnormalitie | es. | | N (tr (h te cu | lo failure s emperatur high diele erminations urrent is le | shall be observed whe e compensating type) ectric constant type) s for 1 to 5 seconds, pl ess than 50mA. | n 300% of or 250% of is applie rovided the | the rated voltaged between th charge/discharg |
| 6 | Insulation Resis | tance | $C \stackrel{=}{=} 0.047 \mu$ F:More than 10 C > 0.047 μ F:500 $\Omega \cdot$ F | | C:Nominal Capacitance | no m | ot exceedi nax. and | on resistance shall be ing the rated voltage a within 2 minutes harge current is less th | at 20°C /25 of chargin | 5°C and 75%R |
| 7 8 | Capacitance Q/Dissipation Fa | ctor (D F) | Within the specified toleral | nce. [B1,B3,R1,F | 26 R7 C8 | | | ance/D.F. shall be mea ency and voltage show | | |
| 0 | | | 30pF and over: $Q \stackrel{>}{=} 1000$ 30pF and below: $Q \stackrel{>}{=} 400+20C$ C:NominalCapacitance | W.V.:100V: : 0.05 W.V.:25/50\ W.V.:16/10\ | 0.025max.(C< 0. 068μF) max.(C [≥] 0.068μF) / :0.025max. / :0.035max. V :0.05max.(C<3.3μF) | | ltem Freque | Char. ∆C to 3U,1X (1000pF and below) ncv 1±0.1MHz | ∆C t (more th B1,R1,R 1± | o 3U,1X aan 1000pF) 86,R7,F1,F5 0.1kHz |
| | | Γ | (pF) | [F1,F5] W.V.:25Vmi :0.05max :0.09max W.V.:16/10\ W.V.:6.3V:0 | κ. (C<0.1μF) κ.(C ≟0.1μF) /:0.125max. .15max. | | Voltac | ae 0.5 to 5Vrms | | .2Vrms |
| 9 | Capacitance Temperature Characteristics | No bias | Within the specified tolerance.(Table A-1) | R1,R7 : Wit (R6 : With (C8 : With (F1 : With | -25°C to +85°C) | sp (1 TI m S ca te TI be | pecified te 1)Tempera he temper neasured in Vhen cyclir (+20°C to apacitance emperature he capacit etween the | | be ermind usin uentially fro effs.:+20°C ecified toler tance chan d by dividin um measur | g the capacitanc om step 1 through to +85°C) the ance for the ge as Table A-1. g the differences |
| | | | | | n +22/-82% | | Step | Tempera | ture(°C) | |
| | | 50% of | | B1: Within + | -30°C to +85°C) -10/-30% | | 1 | 20: | | |
| | | the rated | | R1: Within - | | | 2 | -55±3(for ÄC)/-25±3(for 20: | , | |
| | | voltage | | F1: Within + | -30/-95% | | 4 | 125±3(for ÄC)/85 | | er TC) |
| | | Capacitance | Within±0.2% or±0.05pF | | | ŤI Va | he ranges alue over t | 20: electric Constant Type of capacitance changes the temperature ranges pecified ranges.* | ge compar | |
| | | Drift | (Whichever is larger.) *Not apply to 1X/25V | | | m | neasured a | pplying voltage, the ca fter 1 more min. with a n of each temp. stage. Temperature(°C | pplying volt | |
| | | | | | | ╟ | | · · · | <i>'</i> | voltage(V) |
| | | | | type | surement for high dielectric constant | | 1 2 | 20±2/25±2 -55±3(for R1,R7,R6,C -25±3(for B1,B3,F1)/ -30±3(for F5) | , | No bias |
| | | | | one hour an temperature | d then set for 48±4 hours at room | | 3 4 | 20±2/25±2 125±3(for R1,R7)/ 105±3(for C8) 85±3(for B1,B3,R6,,F | -1,F5) | |
| | | | | | | | 5 6 7 | 20±2 -55±3(for R1)/ -25±3(for B1,F1) 20±2 | | 50% of the rated |
| | | | | | | ľ | 8 | 125±3(for R1)/ 85±3(for B1,F1) | | voltage |

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| | | | | Specific | ation | | | | | | |
|----|---------------------------------|---------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------|-------------------------------------|
| No | Iter | n | Temperature Compensating Ty | /pe | High Dielectric Constant Type | | | Test M | lethod | | |
| 10 | Adhesive Strer Termination | ngth of | No removal of the terminat | ions or other | defect shall occur. | Fig witl The me uni | der the capacito .1a using an eute in the test jig for 1 e soldering shall be form and free I(GRM02),2N(GR Type GRM02 GR□3 GR□15 GRM18 GRM21 GRM31 GRM32 GRM33 GRM55 | ectic solder. T 0±1sec. De done eithe e conducted v e of defe | hen apply 10 r with an iror vith care so t cts such | N ★ force in n or using the that the sold as heat | i parallel e reflow dering is |
| 11 | Resistance | | No defects or abnormalitie Within the specified tolerar | | | sar | der the capacito ne manner and u e capacitor shall | nder the sam | e conditions | as (10). | |
| | c | λ/D.F. | 30pF and over:Q [≥] 1000 30pF and beloow: Q ≧400+20C C:Nominal Capacitance (pF) | : 0.05r W.V.:25/50V W.V.:16/10V W.V.:6.3V/4' :0.1r [F1,F5] W.V.:25Vmir :0.05max | 0.025max. (C< 0. 068 μ F) max. (C ² 0.068 μ F) \prime :0.025max. \prime :0.035max. V :0.05max. (C<3.3 μ F) max. (C ² 3.3 μ F) n c. (C <0.1 μ F) k. (C ² 0.1 μ F) \prime :0.125max. | uni frec trav for | ring a total ampl formly between t quency range, fro versed in approxi a period of 2 actions(total of 6 | the approxim form 10 to 55H mately 1 minu hours in e | ate limits of Iz and retur ute. This mo | 10 and 55 n to 10Hz, tion shall be | Hz. The shall be applied |
| 12 | Deflection | | No crack or marked defect | shall occur. | | Fig dire dor cor | der the capacitor .2a using an erection shown in he either with an inducted with care ects such as hea | utectic solde Fig 3a for 5 iron or using so that the | r. Then app ≟1 sec. The the reflow n | oly a force soldering s nethod and | in the shall be shall be |
| | | | | | | | | | \$4.5 | | |
| | | | R230_ | Press | sunzing d:1.0mm/sec. sunze | | (Type GRM02 GR⊡03 GR⊡15 | Fig.2 GRP15,GRM 0.2 0.3 0.4 | 18 : t:0.8mm b 0.56 0.9 1.5 | t:1.6mm) 0.23 0.3 0.5 | |
| | | | 45 | citance me 45 ig.3a | Flexure: ≦ 1 ter | | GRM18 GRM21 GRM31 GRM32 GRM43 GRM55 | 1.0 1.2 2.2 2.2 3.5 4.5 | 3.0 4.0 5.0 5.0 7.0 8.0 | 1.2 1.65 2.0 2.9 3.7 5.6 (in mi | m) |
| 13 | Solderability of Termination | | 75% of the terminations is and continuously. | to be soldere | d evenly | ros Pre Afte | nerse the capacit in (JIS-K-5902) (2 heat at 80 to 120 er preheating, im 0.5 seconds at 23 | 25% rosin in v) ° for 10-to 3 merse in an e | weight propo 0 seconds. | (JIS-K-8101 tion) . | I) and |

| | | | | Cassifi | ention | | | | | | PT |
|----|---------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|-----------------------------|---------------|
| No | | Item | Temperature Compensating Ty | Specifi pe | High Dielectric Constant Type | | | T | Fest Metho | bd | |
| | Resista Solderin | | The measured and observed the specifications in the follo | d characteri | stics shall satisfy | Ir | mmerse th | e capacitor at 12 ne capacitor in a C for 10±0.5 se | n eutectic s | solder Solution | perature f |
| | [| Appearance | No defects or abnormalities. | | | | | s (temperature | | | • |
| ĺ | | Capacitance | Within ±2.5% or± 0.25pF | B1.B3.R1 | ,R6,R7,C8:Within ±7.5% | | • | ctric constant typ | | | |
| | | Change | (Whichever is larger) | F1,F5 | :Within ±20% | ተ | | Soldering metho er type: SnAgCu | | soldering | |
| | | Q/D.F. | 30pF and over:Q≧ 1000 30pF and beloow: Q≧ 400+20C C:Nominal Capacitance (pF) | W.V.:100\ : 0.0 W.V.:25/5 W.V.:16/1 W.V.:6.3V | I,R6,R7,C8] /: 0.025max.(C< 0. 068 μ F))5max.(C $\stackrel{?}{=}$ 0.068 μ F) 0V :0.025max. 0V :0.035max. /4V:0.05max. (C<3.3 μ F) 1max.(C $\stackrel{?}{=}$ 3.3 μ F) | P s P | Initial mea Perform a et at room Perform the *Preheati Step | surement for hig heat treatment a h temperature for e initial measure ng for GRM32/43 | h dielectric at 150+0/-1 r 48±4 hou ment. 3/55 erature | 10°C for one ho irs. | ne |
| | | | | :0.05m :0.09m | ax. (C <0.1μF) nax. (C <u>=</u> 0.1μF) 0V:0.125max. | ł | 1 2 | | to 120°C to 200°C | 1 m | |
| | | I.R. | More than 10,000MΩ or 500 (Whichever is smaller) | Ω·F | | | | | | | |
| | | Dielectric Strength | No defects. | | | | | | | | |
| 15 | Tempera | ature Cycle | The measured and observed the specifications in the follo | | stics shall satisfy | n P | nanner an Perform the | acitor to the sup d under the sam e five cycles acc | e condition ording to th | ns as (10). he four heat | |
| | | Appearance | No defects or abnormalities. | | | | | shown in the foll | • | | 20) 12 |
| | | Capacitance | Within ±2.5% or± 0.25pF | B1,B3,R1 | ,R6,R7,C8 :Within ±7.5% | | | ±2 hours (temp dielectric consta | | | be) or 48 |
| | | Change | (Whichever is larger) | 1 | :Within ±20% | | | e, then measure | | | |
| | | | > | - · · | I,R6,R7,C8] | | Step | 1 | 2 | 3 | 4 |
| | | | 30pF and over: $Q = 1000$ | | /: 0.025max.(C< 0. 068µF) 05max.(C ≟ 0.068µF) | | | Min. | Deem | Max. | Deem |
| | | Q/D.F. | 30pF and beloow: Q = 400+20C | W.V.:25/5 | 0V :0.025max. | | Temp. | Operating | Room Temp. | Operating | Room Temp. |
| | | | C:Nominal Capacitance | W.V.:6.3V | 0V :0.035max. /4V :0.05max.(C<3.3μF) 1max.(C ≟ 3.3μF) | | Time (min) | Temp.+0/-3 30±3 | 2 to 3 | Temp.+3/-0 30±3 | 2 to 3 |
| | | | (pF) | :0.09m | ax. (C <0.1μF) nax. (C≕ 0.1μF) 0V:0.125max. | P | Perform a et at room | asurement for hig heat treatment a h temperature for e initial measure | at 150+0/-1 r 48±4 hou | 0.°C for one ho | |
| | | 1.0 | Mana (han 40.000MO an 500 | | | | | | | | |
| | | I.R. | More than 10,000MΩ or 500 (Whichever is smaller) | 27.L | | | | | | | |
| ĵ | | Dielectric | No defects. | | | —————————————————————————————————————— | | | | | |
| | | Strength | | | | | | | | | |
| 16 | Humidity | | The measured and observed | | stics shall satisfy | | | acitor at 40±2°C | and in 90 |) to 95% humidu | ty |
| | (Steady | Appearanc | the specifications in the follo No defects or abnormalities. | | | R | | hours. nd set for 24±2 h pe) or 48±4 hou | · · | | |
| | | Capacitan ce | Within ±5% or± 0.5pF (Whichever is larger) | | R6,R7,C8:Within ±12.5% Within ±30% | | 0 71 | erature, then me | | | ···· ·9P0) |
| | | Change Q/D.F. | 30pF and over: $Q \ge 350$ 10pF and over 30pF and below: $Q \ge 275+2.5C$ 10pF and below: $Q \ge 200+10C$ C:Nominal Capacitance | W.V.:100V : 0.07 W.V.:25/50 W.V.:16/10 W.V.:6.3V | ,R6,R7,C8] (: 0.05max.(C < 0.068μF) 75max.(C ≥ 0.068μF) DV :0.05max. 0V :0.05max. (4V:0.075max.(C<3.3μF) 25max.(C ≥ 3.3μF) | | | | | | |
| | | | (pF) | :0.125n W.V.:16/10 W.V.:6.3V | nax. (C<0.1μF) nax. (C ≟ 0.1μF) 0V:0.15max. | | | | | | |
| | | I.R. | More than 1,000M Ω or 50 Ω (Whichever is smaller) | ۰F | | | | | | | |
| | | | | | | | | | | | |

FUKUI MURATA MFG. CO., LTD.

| No | | | | Specification | | | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|
| - | l | tem | Temperature | | High Dielectric Constant Type | | Test Metho | d | | |
| 17 H | lumidity Lo | ad | Compensating Type The measured and observed | | · · · · | | - | and 90 to 95% hum | | |
| | | Appearance | the specifications in the follo No defects or abnormalities. | | | | | for 24±2 hours (temperation of the second seco | | |
| | | Capacitance | Within ±7.5% or±0.75pF | | R6,F7,C8:Within ±12.5% | at room tempra is less than 50r | | ne charge/discharge cu | | |
| | | Change | (Whichever is larger) | F1,F5 :W [W.V.:10Vm | Vithin ±30% ıax.] | Initial measure | ement for F1/10Vmax. | | | |
| | | | 30pF and over: $Q \ge 200$ | F1 :Within+ | | Apply the rated | DC voltage for 1 hour | | | |
| | | Q/D.F. | 30pF and below: Q = 100+10C/3 C:Nominal Capacitance (pF) | $\begin{array}{l} W.V.:25/50V:0.05max.\\ W.V.:16/10V:0.05max.\\ W.V.:16.3V:0.075max.(C<3.3\mu F)\\ :0.125max.(C \geqq 3.3\mu F)\\ [F1,F5]\\ W.V.:25Vmin\\ :0.075max.(C<0.1\mu F)\\ :0.125max.(C \geqq 0.1\mu F)\\ \end{array}$ | | | | m temperature. | | |
| | | | | :0.125ma W.V.:16/10\ | ax. (C ≧ 0.1µF) √:0.15max. | | | | | |
| | | I.R. | More than 500M Ω or 25 Ω ·F | W.V.:6.3V:0 | | | | | | |
| 18 Hi | ligh Tempe | | The measured and observed | | , | Apply 200% c | of the rated voltage | atThe maximum oper | | |
| - | oad | latare | the specifications in the follo | | es shall satisfy | | for 1000±12 hours. | attine maximum oper | | |
| | | Appearance | No defects or abnormalities. | | | | ours (temperature comp | | | |
| | | Capacitance Change | Within ±3% or ±0.3pF (Whichever is larger) | F1,F5 :W [Except 10) C= | R6,R7,C8:Within ±12.5% Vithin ±30% (max and = 1.0. μF] hin+30/-40% | temperature, th The charge/disc | charge current is less t | han 50mA. | | |
| | c | | | Initial measurement for high dielectric constant type. Apply 200% of the rated DC voltage at the maximun operturbative ±3°C for one hour. Remove and set for 48±4 | | | | | | |
| Ī | | | 30pF and over:Q \ge 350 | [B1,B3,R1,F | · · · | at room temperature. | | | | |
| | | Q/D.F. | 10pF and over 30pF and below: $Q \stackrel{>}{=} 275+2.5C$ 10pF and below: | : 0.075 W.V.:25/50 W.V.:16/10 | $0.05max.(C < 0.068\mu F)$ $5max.(C \ge 0.068\mu F)$ $\vee :0.04max.$ $\vee :0.05max.$ $\vee :0.075max.(C < 3.3\mu F)$ | Perform initial r | Perform initial measurement. | | | |
| | | I.R. | Q≧200+10C C:Nominal Capacitance (pF) More than 1,000MΩor 50Ω · | :0.12 [F1,F5] W.V.:25Vmi :0.075ma :0.125ma W.V.:16/10\ W.V.:6.3V:0 | 25max.(C [≥] 3.ậµF) in ax. (C <0.1µF) ax. (C ≥ 0.1µF) V:0.15max. 0.2max. | _ | | | | |
| | | | | | Canacitanas Chan | • | | | | |
| e A-1 | 1 | | | | Capacitance Chang | | | | | |
| A-1 Char. | | nal Values | -55 | | -2 | 5 | - | 10 | | |
| Char. | | /) Note 1 | Max. | Min. | Max. | Min. | Max. | Min. | | |
| Char. 2C | (ppm | /) Note 1 0± 60 | Max. 0.82 | -0.45 | Max. 0.49 | Min. -0.27 | Max. 0.33 | Min. -0.18 | | |
| Char. | (ppm | /) Note 1 | Max. | | Max. | Min. | Max. | Min. | | |
| Char. 2C 3C 4C 2P | (ppm. | /) Note 1 0± 60 0±120 0±250 50± 60 | Max. 0.82 1.37 | -0.45 -0.90 | Max. 0.49 0.82 1.54 1.32 | Min. -0.27 -0.54 -1.13 0.41 | Max. 0.33 0.55 1.02 0.88 | Min. -0.18 -0.36 -0.75 0.27 | | |
| Char. 2C 3C 4C 2P 3P | (ppm) | /) Note 1 0± 60 0±120 0±250 50± 60 50± 120 | Max. 0.82 1.37 2.56 - - | -0.45 -0.90 -1.88 | Max. 0.49 0.82 1.54 1.32 1.65 | Min. -0.27 -0.54 -1.13 0.41 0.14 | Max. 0.33 0.55 1.02 0.88 1.10 | Min. -0.18 -0.36 -0.75 0.27 0.09 | | |
| Char. 2C 3C 4C 2P 3P 4P | (ppm) | /) Note 1 0± 60 0±120 0±250 50± 60 50±120 50±250 | Max. 0.82 1.37 2.56 - - - - | -0.45 -0.90 -1.88 - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 | | |
| Char. 2C 3C 4C 2P 3P 4P 2R | (ppm) | /) Note 1 0±60 0±120 0±250 50±60 50±120 50±250 20±60 | Max. 0.82 1.37 2.56 - - | -0.45 -0.90 -1.88 | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 | | |
| Char. 2C 3C 4C 2P 3P 4P | (ppm | /) Note 1 0± 60 0±120 0±250 50± 60 50±120 50±250 | Max. 0.82 1.37 2.56 - - - - - - - | -0.45 -0.90 -1.88 - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 | | |
| Char. 2C 3C 4C 2P 3P 3P 4P 2R 3R | (ppm) | /) Note 1 0± 60 0±120 0±250 50± 60 50± 120 50± 250 20± 60 20± 120 | Max. 0.82 1.37 2.56 - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4R 2S 3S | (ppm) | /) Note 1 0± 60 0±120 0±250 50± 60 50±250 20± 60 20±120 20±250 30± 60 30± 120 | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 -0.14 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 1.76 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4R 2S 3S 4S | (ppm) | $ \begin{array}{c} \ / \) \ Note \ 1 \\ \hline 0 \pm 60 \\ 0 \pm 120 \\ 0 \pm 250 \\ \hline 50 \pm 60 \\ \hline 50 \pm 120 \\ \hline 50 \pm 250 \\ 20 \pm 60 \\ 20 \pm 120 \\ 20 \pm 250 \\ \hline 30 \pm 60 \\ \hline 30 \pm 120 \\ \hline 30 \pm 250 \\ \end{array} $ | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 1.76 2.23 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4R 2S 3S 4S 2T | (ppm -1 -1 -1 -1 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -3 -3 -3 -3 -3 -4 | /) Note 1 0 ± 60 0 ± 120 0 ± 250 50 ± 60 50 ± 250 20 ± 250 20 ± 120 20 ± 250 30 ± 250 30 ± 250 70 ± 60 | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - < | -0.45 -0.90 -1.88 - - - - - - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 | Min. -0.27 -0.54 -1.13 0.41 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.76 2.23 2.05 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 | | |
| Char. 2C 3C 2P 3P 4P 2R 3R 4R 2S 3S 4S 2T 3T | (ppm -1 -1 -1 -1 -1 -1 -1 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 | /) Note 1 0± 60 0±120 0±250 50± 60 50±250 20± 60 20±120 20±250 30± 60 30±120 30±120 30±250 70± 60 70±120 | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 1.76 2.23 2.05 2.27 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 | | |
| Char. 2C 3C 2P 3P 4P 2R 3R 4R 2S 3S 4S 2T 3T 4T | (ppm -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 | $ \begin{array}{c} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$ | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 | Min. -0.27 -0.54 -1.13 0.41 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 2.23 2.05 2.27 2.74 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4R 2S 3S 4S 2T 3T 4T 3U | (ppm -1 -1 -1 -1 -1 -1 -1 -1 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 -2 | /) Note 1 0± 60 0±120 0±250 50± 60 50±250 20± 60 20±120 20±250 30± 60 30±120 30±250 70±60 70±120 70±250 50±120 | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 4.94 | Min. -0.27 -0.54 -1.13 0.41 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 2.84 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 2.23 2.05 2.27 2.74 3.29 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 1.89 | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4P 2R 3R 4P 2R 3R 4P 2R 3R 4T 3T 4T 3U 4U 1X | (ppm) | $ \begin{array}{c} \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$ | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 | Min. -0.27 -0.54 -1.13 0.41 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 2.23 2.05 2.27 2.74 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4R 2S 3S 4S 2T 3T 4T 3U 4U | (ppm) | $ \begin{array}{c} \ \) \ \ Note \ 1 \\ \hline 0 \pm 60 \\ 0 \pm 120 \\ 0 \pm 250 \\ 50 \pm 60 \\ 50 \pm 120 \\ 20 \pm 250 \\ 20 \pm 120 \\ 20 \pm 120 \\ 20 \pm 120 \\ 20 \pm 120 \\ 30 \pm 250 \\ 30 \pm 120 \\ 30 \pm 250 \\ 70 \pm 120 \\ 70 \pm 120 \\ 70 \pm 120 \\ 70 \pm 250 \\ 50 \pm 120 \\ 50 \ 250 \\ \end{array} $ | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 4.94 5.65 | Min. -0.27 -0.54 -1.13 0.41 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 2.84 2.25 - | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.54 1.54 1.76 2.23 2.05 2.27 2.74 3.29 3.77 - | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 1.89 1.50 - | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4P 2R 3R 4P 2R 3R 4P 2R 3R 4T 3T 4T 3U 4U 1X | (ppm -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 | /) Note 1 0± 60 0±120 0±250 50± 60 50±120 20± 250 20± 60 20±120 20±250 30± 120 30±250 70± 60 70±120 70±250 50±120 50 250 0 -1000 mal Values | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 4.94 5.65 - Capacitance Chance -3 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 2.84 2.25 - | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 1.76 2.23 2.05 2.27 2.74 3.29 3.77 - | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 1.89 1.50 - - | | |
| Char. 2C 3C 2P 3P 4P 2R 3R 4R 2S 3R 4R 2S 3S 4S 2T 3T 4T 3U 4U 1X A-2 Char. | (ppm) -11 -11 -11 -12 -22 -22 -22 -33 -33 -33 -33 -3 | /) Note 1 0± 60 0±120 0±250 50± 60 50±120 20± 200 20± 120 20± 120 20± 120 30± 60 30± 120 30± 250 70± 60 70± 120 50 250 0 -1000 mal Values 2C) Note 1 | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 4.94 5.65 - Capacitance Chance -3 Max | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 2.84 2.25 - - be from 25 °C (%) 0 Min | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 1.76 2.23 2.05 2.27 2.74 3.29 3.77 - | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 1.89 1.50 - - 10 Min | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4P 2R 3R 4P 2R 3R 4P 2R 3R 4T 3T 4T 3U 4U 1X A-2 | (ppm) 1 1 1 1 1 1 1 | /) Note 1 0± 60 0±120 0±250 50± 60 50±120 20± 250 20± 60 20±120 20±250 30± 120 30±250 70± 60 70±120 70±250 50±120 50 250 0 -1000 mal Values | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 4.94 5.65 - Capacitance Chance -3 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 2.84 2.25 - - the from 25 °C (%) | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 1.76 2.23 2.05 2.27 2.74 3.29 3.77 - | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 1.89 1.50 - - | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4P 2R 3P 4P 2R 3P 4P 2R 3P 4P 2R 3R 4P 2R 3R 4P 2R 3R 4S 2T 3T 4T 4U 4C 4C 4C 4C 4C 4C 4C 4C 4C 4C | (ppm) -11 -11 -11 -12 -22 -22 -22 -22 | /) Note 1 0± 60 0±120 0±250 50± 60 50±250 20±250 20±120 20±250 30± 60 30±120 30±250 70± 60 70±250 50±120 50±250 0 -1000 mal Values 2C) Note 1 0± 30 | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 4.94 5.65 - Capacitance Chance - Max 0.40 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 2.84 2.25 - - the from 25 °C (%) 0 Min -0.17 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.35 1.83 1.54 2.05 2.05 2.27 2.74 3.29 3.77 - Max 0.25 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 1.89 1.50 - - 10 Min -0.11 | | |
| Char. 2C 3C 2P 4P 2P 3P 4P 2R 3R 4R 2S 3S 4S 4S 4S 4S 4T 3U 4U 1X A-2 Char. 6C 6R | (ppm 1 1 1 1 1 1 1 2 2 2 | /) Note 1 0± 60 0±120 0±250 50± 60 50±120 20± 60 20± 200 20± 200 20± 250 30± 120 30± 120 30± 250 70± 120 70± 120 70± 250 50± 120 50± 250 0 -1000 mal Values ² C) Note 1 0± 60 50± 60 20± 60 | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 4.94 5.65 - Capacitance Chance -3 Max 0.40 0.59 1.61 2.08 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 2.84 2.25 - - the from 25 °C (%) 0 Min -0.17 -0.33 0.50 0.88 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.57 1.13 1.35 1.83 1.54 1.76 2.23 2.05 2.27 2.74 3.29 3.77 - Max 0.25 0.38 1.02 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 1.89 1.50 - - 10 Min -0.21 0.32 0.56 | | |
| Char. 2C 3C 4C 2P 3P 4P 2R 3R 4P 2R 3R 4P 2R 3R 4T 3S 4S 2T 3T 4T 3U 4T 3U 4T 3U 4T 5C 6C 6P | (ppm) 1 1 1 1 1 1 1 | /) Note 1 0± 60 0±120 0±250 50± 60 50±120 20± 250 20± 60 20± 120 20± 250 30± 60 30± 120 30± 250 70± 60 70± 120 50± 120 50± 50 50± 120 50± 50 100 100 100 100 100 100 100 1 | Max. 0.82 1.37 2.56 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - | -0.45 -0.90 -1.88 - - - - - - - - - - - - - | Max. 0.49 0.82 1.54 1.32 1.65 2.36 1.70 2.03 2.74 2.30 2.63 3.35 3.07 3.40 4.12 4.94 5.65 - Capacitance Chance .3 Max 0.40 0.59 1.61 | Min. -0.27 -0.54 -1.13 0.41 0.14 -0.45 0.72 0.45 -0.14 1.22 0.95 0.36 1.85 1.58 0.99 2.84 2.25 - - me from 25 °C (%) 0 Min -0.17 -0.33 0.50 | Max. 0.33 0.55 1.02 0.88 1.10 1.57 1.13 1.57 1.13 1.57 1.13 1.57 2.23 2.05 2.27 2.74 3.29 3.77 - Max 0.25 0.38 1.02 | Min. -0.18 -0.36 -0.75 0.27 0.09 -0.30 0.48 0.30 -0.09 0.81 0.63 0.24 1.23 1.05 0.66 1.89 1.50 - - 10 Min -0.21 0.32 | | |

| - | | AND TEST METHODS | Test Method |
|---------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No 1 | Item Operating Temperature | Specification B1,B3,F1,F5 :-25°C to 85°C | Test Method Standard Temperature : 20°C |
| 1 | Range | B1,B3,F1,F5 :-25°C to 85°C R1,R7:-55°C to 125°C C6,R6:-55°C to 85°C C7:-55°C to 125°C C8:-55°C to 105°C | (R6,R7,C6,C7,C8,F5 : 25°C) |
| 2 | Rated Voltage | See the previous pages. | 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, shall be maintained within the rated voltage range. |
| 3 | Appearance | No defects or abnormalities. | Visual inspection.(GRM02 size is based on Microscope) |
| <u>4</u> 5 | Dimension Dielectric Strength | Within the specified dimensions No defects or abnormalities. | Using calipers. No failure shall be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. |
| 6 | Insulation Resistance | More than 50Ω · F | The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at Standard Temperature and 75%RH max. and within 1 minutes of charging, provided the charge/discharge current is less than 50mA. |
| 7 | Capacitance | *Table 1 GRM155 B3/R6 1A 124 to 105 GRM185 B3/R6 1C/1A 105 GRM188 B3/R6 1C/1A 225 GRM219 B3/R6 1A 475 GRM21B B3/R6 1C/1A 106 GRM319 B3/R6 1A 106 | The capacitance shall be measured at Standard Temperature at the frequency and voltage shown in the table. Capacitance Frequency Voltage *1 C $\leq 10\mu$ F (10V min) 1+/-0.1kHz 1.0+/-0.2Vrms C $\leq 10\mu$ F (6.3V max.) 1+/-0.1kHz 0.5+/-0.1Vrms C > 10\muF 120+/-24Hz 0.5+/-0.1Vrms *1 However the Voltage is 0.5+/-0.1Vrms about Table 1 items on the left side. |
| 8 | Dissipation Factor (D.F.) | B1,B3,R1,R6,R7,C7,C8 : 0.1 max. C6 :0.125 max F1,F5 : 0.2 max *Table 1 GRM155 B3/R6 1A 124 to 105 GRM185 B3/R6 1C/1A 105 GRM188 B3/R6 1C/1A 225 GRM219 B3/R6 1A 475 GRM21B B3/R6 1A 106 | The D.F. shall be measured at Standard Temperature at the Frequency and voltage shown in the table.CapacitanceFrequencyVoltage*1 C $\leq 10\mu$ F (10V min)1+/-0.1kHz1.0+/-0.2VrmsC $\leq 10\mu$ F (6.3V max.)1+/-0.1kHz0.5+/-0.1VrmsC > 10\muF120+/-24Hz0.5+/-0.1Vrms*1 However the Voltage is 0.5+/-0.1Vrms about Table 1 items on the left side. |
| 9 | Capacitance Temperature Characteristics 50% of the rated voltage | B1,B3 : Within +/-10% (-25°C to +85°C) R1,R7 : Withn ±15% (-55°C to +125°C) F1,F5 : Within +30/-80% (-25°C to +85°C) R6 : Within +/-15% (-55°C to +85°C) C6 : Within +/-22% (-55°C to +85°C) C7 : Within +/-22% (-55°C to +125°C) C8 : Within +1-22% (-55°C to +105°C) B1: Within +10/-30% R1: Within +15/-40% F1: Within +30/-95% | The capacitance change shall be measured after 5min. at each specified temp.stage. The ranges of capacitance change compared with the Standard Temperature value over the temperature ranges shown in the table shall be within the specified ranges.* In case of applying voltage, the capacitance change shall be measured after 1 more min. with applying voltage in equilibration of each temp. stage.*GRM43 B1/R6 0J/1A 336/476 only : $1.0\pm 0.2Vrms$ StepTemperature(°C)Applying voltage(V)1 $20+/-2$ * $-25+/-3(for R1,R6,R7,C6,C7,C8)$ $-25+/-3(for B1,B3,F1,F5,R6,C6)$ 4 2 $-55+/-3(for B1,B3,F1,F5,R6,C6)$ 4 4 $125+/-3(for R1,R7,C7)$ $105+/-3(for R1)$ 5 5 $20+/-2$ 6 $-55\pm 3(for R1)$ $-25+/-3(for B1,F1,F5)$ 7 $20+/-2$ 8 $125\pm 3(for R1)$ $85\pm 3(for B1,F1,F5)$ 7 $20+/-2$ 8 $125\pm 3(for R1)$ $85\pm 3(for B1,F1,F5)$ *Initial measurement for high dielectric constant type Perform a heat treatment at 150 +0/-10°C for one hour |
| | | | Perform a neat treatment at $150 + 0/-10^{\circ}$ C for one hour and then set for 48 ± 4 hours at room temprature. Perform the initial measure-ment. |

| No | Item | | Specification | Test Method | |
|----|-------------------------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 10 | Adhesive Strength of Termination | No removal of the te | erminations or other defect shall occur. | Solder the capacitor on the test jig board)shown in Fig.1a using an eutectic sol 10N* force in parallel with the test jig for 10- The soldering shall be done either with an in | lder. Then apply +/-1sec. iron or using the care so that the h as heat shock. |
| 11 | Vibration Resistance | Appearance Capacitance Q/D.F. | No defects or abnormalities. Within the specified tolerance. B1,B3,R1,R6,R7,C7,C8:0.1max. C6 : 0.125 max F1,F5 : 0.2 max | Solder the capacitor on the test jig (glass of the same manner and under the same cond The capacitor shall be subjected to a s motion having a total amplitude of 1.5mm being varied uniformly between the approxir and 55Hz. The frequency range, from 10 return to 10Hz, shall be traversed in a minute. This motion shall be applied for a per in each 3 mutually perpendicular direct hours). | litions as (10). simple harmonic n, the frequency mate limits of 10 0 to 55Hz and approximately 1 eriod of 2 hours |
| 12 | Deflection | No crack or marked | defect shall occur. | Solder the capacitor on the test jig (glass shown in Fig.2a using an eutectic solder. force in the direction shown in Fig 3a for soldering shall be done either with an irc reflow method and shall be conducted with soldering is uniform and free of defects such | . Then apply a 5+/-1 sec. The on or using the care so that the |
| | | 45 | 20 50 Pressunzing Pressunze Flexure:≤1 aoitance meter 45 Fig.3a | (GRM02,GR□03/15 : t:0 Type a b GRM02 0.2 0.56 GR□03 0.3 0.9 GR□15 0.4 1.5 GRM18 1.0 3.0 GRM21 1.2 4.0 GRM31 2.2 5.0 GRM32 2.2 5.0 GRM32 2.2 5.0 GRM43 3.5 7.0 GRM55 4.5 8.0 | 1.8mm) C 0.23 0.3 0.5 1.2 1.65 2.0 2.9 3.7 5.6 (in mm) |
| 13 | Solderability of Termination | 75% of the terminat and continuously. | ions is to be soldered evenly | Immerse the capacitor in a solution of ethan and rosin (JIS-K-5902) (25% rosin in weight Preheat at 80 to 120°C for 10-to 30 second After preheating, immerse in an eutectic sole 2+/-0.5 seconds at 230+/-5°C. | t propotion) . ds. |

| 14 | Item | | Specification | | | t Method | - | | |
|----|---------------------------------------------|------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|--|
| 14 | Resistance to Soldering Heat | Appearance | No defects or abnormalities. | Immerse | the capacitor at the capacitor in | an euteo | ctic solder sol | ution at | |
| | | Capacitance Change | B1,B3,R1,R6,R7,C6,C7,C8:Within+/-7.5% F1,F5 : Within +/-20% | tempera | | +/-2 ł | nours (tem | at room perature | |
| | | Q/D.F. | B1,B3,R1,R6,R7,C7,C8: 0.1 max. C6 : 0.125 max F1,F5 : 0.2 max | constan *GRM02 | t type), then mea 2- Soldering meth | sure. od:Reflo | hours (high o | ulelectri | |
| | | I.R. | More than $50\Omega \cdot F$ | Initial n | older type: SnAgC neasurement for a heat treatment | high diel | ectric constar | it type | |
| | | Dielectric Strength | No defects . | and ther | the initial measu | perature | | | |
| | | | | *Preheating for GRM32/43/55 Step Temperature Time | | | | | |
| | | | | Step 1 2 | 100°C to 170°C to | o 120°C | 1 m 1 m | nin. | |
| 15 | Temperature Sudden Change | Appearance | No defects or abnormalities. | manner Perform | and under the sa the five cycles a | ame conc ccording | to the four he | | |
| | - | Capacitance Change | B1,B3,R1,R6,R7,C6,C7,C8:Within+/-7.5% F1,F5 : Within +/-20% | Set for 2 | 24+/-2 hours (ter | nperatur | e compensat | | |
| | | Q/D.F. | B1,B3,R1,R6,R7,C7,C8: 0.1 max. C6 : 0.125 max F1,F5 : 0.2 max | | 4 hours (high die ture, then measu | a the supporting jig in the same the same conditions as (10). cles according to the four heat in the following table. ins (temperature compensating type gh dielectric constant type) at room measure. 2 3 4 ing Room Temp. Operating Temp. | | | |
| | | I.R. | More than $50\Omega \cdot F$ | Step | 1 | 2 | 3 | 4 | |
| | | Dielectric Strength | No defects . | Temp. (°C) | Min. Operating | Room | Max. | Room | |
| | | | | Time (min) | Temp.+0/-3 30+/-3 | 2 to 3 | 30+/-3 | 2 to3 | |
| | | | | | | | | | |
| | | | | Perform and ther Perform | neasurement for a heat treatment n set at room tem the initial measu | t at 150 perature rement. | +0/-10℃ for (e for 48+/-4 hc | one hou ours. | |
| 16 | High Temperature | | No defects or abnormalities. | Perform and ther Perform Apply th humidity | a heat treatment o set at room term the initial measu e rated voltage a for 500+/-12 hor | t at 150 perature rement. t 40+/-2° urs. The | +0/-10°C for (e for 48+/-4 hc °C and 90 to 9 | one hou ours. | |
| 16 | Temperature High Humidity | | | Perform and ther Perform Apply th humidity currentis | a heat treatmen n set at room tem the initial measu e rated voltage a for 500+/-12 hor s less than 50mA | t at 150 perature rement. t 40+/-2° urs. The | +0/-10°C for (e for 48+/-4 hc °C and 90 to 9 | one hou ours. | |
| 16 | Temperature High | Capacitance Change Q/D.F. | B1,B3,R1,R6,R7,C6,C7,C8:Within +/-12.5% | Perform and ther Perform Apply th humidity currentis . Initial r Perform and the | a heat treatmen n set at room tem the initial measu e rated voltage a for 500+/-12 hous s less than 50mA measurement a heat treatmen n let sit for 48+/- | t at 150 perature rement. it 40+/-2° urs. The it at 150- 4 hours | +0/-10°C for (e for 48+/-4 hc ?C and 90 to 9 o charge/disch +0/-10°C for (| 5% arge | |
| 16 | Temperature High Humidity | Capacitance Change Q/D.F. | B1,B3,R1,R6,R7,C6,C7,C8:Within +/-12.5% F1,F5 : Within +/-30% B1,B3,R1,R6,R7,C6,C7,C8: 0.2 max. | Perform and ther Perform Apply th humidity currentis • Initial r Perform and ther Perform | a heat treatmen n set at room tem the initial measu e rated voltage a for 500+/-12 hous s less than 50mA measurement a heat treatmen n let sit for 48+/- the initial measu | t at 150 perature rement. tt 40+/-2° urs. The urs. The t at 150 4 hours rement. | +0/-10°C for (e for 48+/-4 hc ?C and 90 to 9 o charge/disch +0/-10°C for (| 5% arge | |
| 16 | Temperature High Humidity | Capacitance Change Q/D.F. | B1,B3,R1,R6,R7,C6,C7,C8:Within +/-12.5% F1,F5 : Within +/-30% B1,B3,R1,R6,R7,C6,C7,C8: 0.2 max. F1,F5 : 0.4 max | Perform and ther Perform Apply th humidity currentis · Initial r Perform and ther Perform · Measu Perform | a heat treatmenn n set at room tem the initial measu e rated voltage a for 500+/-12 hous s less than 50mA measurement a heat treatment n let sit for 48+/- the initial measu urement after test a heat treatment n let sit for 48+/- | t at 150 perature rement. t 40+/-2° urs. The t at 150- t hours rement. t t at 150+ | +0/-10°C for (e for 48+/-4 hc ?C and 90 to 9 o charge/disch +0/-10°C for (at room temp | 5% arge one hou berature | |
| | Temperature High Humidity | Capacitance Change Q/D.F. | B1,B3,R1,R6,R7,C6,C7,C8:Within +/-12.5% F1,F5 : Within +/-30% B1,B3,R1,R6,R7,C6,C7,C8: 0.2 max. F1,F5 : 0.4 max | Perform and ther Perform Apply th humidity currentis - Initial r Perform and ther Perform and ther then me Apply 15 the max | a heat treatmenn n set at room tem the initial measu e rated voltage a for 500+/-12 hor s less than 50mA measurement a heat treatmenn n let sit for 48+/- the initial measu rrement after test a heat treatmenn n let sit for 48+/- asure. | t at 150 perature rement. tt 40+/-2° urs. The urs. The t at 150- t hours rement. t at 150+ 4 hours t at 150+ 4 hours | +0/-10°C for 6 e for 48+/-4 hc °C and 90 to 9 o charge/disch +0/-10°C for 6 at room temp -0/-10 °C for 6 at room temp -0/-10 °C for 6 at room temp | 5% arge one hou perature one hou perature hours a et sit for | |
| | Temperature High Humidity (Steady) | Capacitance Change Q/D.F. I.R. Appearance | B1,B3,R1,R6,R7,C6,C7,C8:Within +/-12.5% F1,F5 : Within +/-30% B1,B3,R1,R6,R7,C6,C7,C8: 0.2 max. F1,F5 : 0.4 max More than 12.5Ω · F | Perform and ther Perform Apply th humidity currentis - Initial r Perform and ther Perform and ther then me Apply 15 the max 48+/-4 h The cha | a heat treatmenn n set at room tem the initial measu e rated voltage a for 500+/-12 hors s less than 50mA measurement a heat treatmenn n let sit for 48+/- the initial measu rement after test a heat treatmenn n let sit for 48+/- asure. | t at 150 perature rement. tt 40+/-2° urs. The tt at 150- 4 hours rement. tt at 150+ 4 hours t at 150+ 4 hours voltage fe emperature | +0/-10°C for 6 e for 48+/-4 hc PC and 90 to 9 o charge/disch +0/-10°C for 6 at room temp -0/-10 °C for 6 at room temp -0/-10 °C for 6 at room temp | 5% arge one hou perature one hou perature hours a et sit for re. | |
| | Temperature High Humidity (Steady) | Capacitance Change Q/D.F. I.R. Appearance Capacitance Change Q/D.F. | B1,B3,R1,R6,R7,C6,C7,C8:Within +/-12.5% F1,F5 : Within +/-30% B1,B3,R1,R6,R7,C6,C7,C8: 0.2 max. F1,F5 : 0.4 max More than 12.5Ω · F No defects or abnormalities. B1,B3,R1,R6,R7,C6,C7,C8:Within +/-12.5% | Perform and ther Perform Apply th humidity currentis · Initial r Perform and ther Perform and ther then me Apply 15 the max 48+/-4 h The cha · Initial r Perform and ther | a heat treatmenn set at room tem the initial measu e rated voltage a for 500+/-12 hors a less than 50mA measurement a heat treatmenn n let sit for 48+/- the initial measu rement after test a heat treatmenn n let sit for 48+/- asure. | t at 150 perature rement. tt 40+/-2° urs. The tt at 150- 4 hours rement. tt at 150- 4 hours voltage fe emperature urrent is tt at 150- 4 hours | +0/-10°C for 6 e for 48+/-4 hc PC and 90 to 9 o charge/disch +0/-10°C for 6 at room temp -0/-10 °C for 6 at room temp -0/-10°C for 6 e, then measu less than 50m +0/-10°C for 6 | 5% arge one hou perature one hou perature hours a et sit for re. nA. | |

JEMCGS-0052U

| No | Item | Specification | Test Method |
|----|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Operating Temperature | R7/C7 :-55°C to +125°C | Standard Temperature:25 °C |
| | Range | R6 :-55°C to +85°C F5 :-30°C to +85°C | |
| 2 | Rated Voltage | See the previous pages. | 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, shall be maintained within th |
| 3 | A ======= | No defecto en obrecumeditico | rated voltage range. |
| 3 | Appearance Dimension | No defects or abnormalities. Within the specified dimensions. | Visual inspection. Using calipers. |
| | Dielectric Strength | No defects or abnormalities. | No failure shall be observed when 250% of the rated |
| U | | | voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. |
| 6 | Insulation Resistance | $\label{eq:constraint} \begin{array}{l} C \stackrel{\leq}{=} 0.047 \mu F: More than 10000 M\Omega \\ (GRM188R61C334-105K:100\Omega \cdot F) \\ C > 0.047 \mu F: 500\Omega \cdot F \\ C : Nominal Capacitance \end{array}$ | The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25 °C and 75%RH max. and within 2 minutes of charging, provided the charge/discharge current is less than 50mA. * 5 minutes (GRM188R6/334-105K) |
| 7 | Capacitance | Within the specified tolerance. | The capacitance/D.F. shall be measured at 25 °C at the frequency and voltage shown in the table. |
| 8 | Q/Dissipation Factor | [R6,R7,C7] | |
| | (D.F.) | W.V.:100V :0.05max. W.V.:35/25/16V :0.035max. W.V.:10V :0.05max.(C< 3.3μ F) :0.1max.(C $\leq 3.3\mu$ F) [F5] W.V.:50V :0.07max.(C < 0.1 μ F) :0.09max.(C $\geq 0.1\mu$ F) W.V.:35/25/16V.:0.125max. | Char. Item Frequency Voltage 1±0.1kHz Voltage 1±0.2Vrms |
| 9 | Capacitance Temperature Characteristics | R7 : Withn ±15% (-55°C to +125°C) R6 : Withn ±15% (-55°C to +85°C) F5 : Within +22/-82% (-30°C to +85°C) C7 : Withn ±22% (-55°C to +125°C) | The capacitance change shall be measured after 5min. at each specified temp.stage. The ranges of capacitance change compared with the 25 °C value over the temperature ranges shown in the table shall be within the specified ranges.* $\underbrace{\begin{array}{ c c c c c c c c c c c c c c c c c c $ |
| 10 | Adhesive Strength of Termination | No removal of the terminations or other defect shall occur. | Solder the capacitor on the test jig (glass epoxy board) shown in Fig.1a using a n eutectic solder. Then apply *10N force in parallel with the test jig for 10± 1sec.The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heal shock.*5N (GRP/M15, GRM18) 2N (GRP/M03)Type a b c GRP/M03GRP/M030.30.90.30.90.3GRM181.03.01.2GRM181.2GRM211.24.01.65GRM312.25.02.9 |
| | | | GRM43 3.5 7.0 3.7 |
| | 1 | | GRM55 4.5 8.0 5.6 |
| | | | (in:mm) |

| 11 Vibration Resistance | e | No defects or abnormalities. Within the specified tolerance. [R6,R7,C7] W.V.:100V :0.05max. W.V.:35/25/16V :0.035max. W.V.:35/25/16V :0.035max. W.V.:10V :0.05max. (C< 3.3 μ F) :0.1max.(C \ge 3.3 μ F) [F5] W.V.:50V :0.07max.(C< 0.1 μ F) :0.09max.(C \ge 0.1 μ F) W.V.:35/25/16V.:0.125max. No crack or marked defect shall occur. | Solder the capacitor on the test jig (glass epoxy board) in thesame manner and under the same conditions a (10). The capacitor shall 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, shall be traversed inapproximately 1 minute. This motion shall be appliedfor a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours). Solder the capacitor on the test jig (glass epoxy board) shown in Fig.2a using an eutectic solder. Then apply a force in the direction shown in Fig 3a for 5±1 sec. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. |
|---------------------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | e Capacitance | Within the specified tolerance. [R6,R7,C7] W.V.:100V :0.05max. W.V.:35/25/16V :0.035max. W.V.:10V :0.05max. (C< 3.3μ F) :0.1max.(C \geq 3.3μ F) [F5] W.V.:50V :0.07max.(C< 0.1μ F) :0.09max.(C \geq 0.1μ F) W.V.:35/25/16V.:0.125max. | in thesame manner and under the same conditions a (10). The capacitor shall 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, shall be traversed inapproximately 1 minute. This motion shall be appliedfor a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours). Solder the capacitor on the test jig (glass epoxy board) shown in Fig.2a using an eutectic solder. Then apply a force in the direction shown in Fig 3a for 5±1 sec. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. |
| 12 Deflection | | No crack or marked defect shall occur. | shown in Fig.2a using an eutectic solder. Then apply a force in the direction shown in Fig 3a for 5 ± 1 sec. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. |
| | | 20, 50 Pressunzing speed:1.0mm/sec. Pressunze | Image: constraint of the second state of the second sta |
| 13 Solderability of Terminat | | Flexure:≤1 Capacitance meter 45 45 Fig.3 75% of the terminations is to be soldered evenly and continuously. | GRM18 1.0 3.0 1.2 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 |
| | | | Preheat at 80 to 120 °C for 10-to 30 seconds. After preheating, immerse in an eutectic solder solution for 2 ± 0.5 seconds at 230 ± 5 °C. |
| 14 Resistance Soldering H | Heat | The measured and observed characteristics shall satisfy the specifications in the following table. | Preheat the capacitor at 120 to 150 ° C for 1 minute. Immerse the capacitor in a n eutectic solder solution at $270\pm5^{\circ}$ C for 10 ± 0.5 seconds. Set at room temperature |
| | opearance | No defects or abnormalities. | for 48± 4 hours (high dielectric constant type), then measure. |
| Cr | apacitance nange D.F. | $\begin{array}{l} \text{R6,R7:Within } \pm 7.5\% \\ \text{F5} ::Within \pm 20\% \\ \hline [\text{R6,R7,C7]} \\ \text{W.V.:100V : 0.05max} \\ \text{W.V.:35/25/16V : 0.035max.} \\ \text{W.V.:10V:0.05max. (C< 3.3\muF)} \\ & :0.1max.(\text{C} \stackrel{>}{=} 3.3\mu\text{F}) \\ \hline [\text{F5]} \end{array}$ | Initial measurement for high dielectric constant type Perform a heat treatment at 150 +0/-10°C for one hour and then set at room temperature for 48± 4 hours. Perform the initial measurement. |
| | | W.V.:50V | *Preheating for GRM32/43/55 |
| | | :0.07max.(C < 0.1μF) :0.09max.(C ≟ 0.1μF) | Step Temperature Time |
| I.R | ۶. | W.V.:35/25/16V.:0.125max. More than 10.000MΩ or 500Ω · F | 1 100°C to 120°C 1 min. |
| Die | electric rength | (Whichever is smaller) No defects . | 2 170°C to 200°C 1 min. |

| No | - | Item | Specification | | | Test Meth | | | |
|----|----------|------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------|-----------------------------------|------------|--|
| 15 | I empera | ature Cycle | The measured and observed characteristics shall satisfy the specifications in the following table. | | pacitor to the s | | | | |
| | | Appearance | No defects or abnormalities. | manner and under the same conditions as (10). Perform the five cycles according to the four heat | | | | | |
| | | Capacitance | R6,R7,C7 :Within ±7.5% | treatment | s shown in the | following t | able. | | |
| | | Change | F5 :Within $\pm 20\%$ | | | | ic constant type | e) | |
| | | <u>-</u> | [R6,R7,C7] | | emperature, the | en measu | re. | | |
| | | | W.V.:100V :0.05max | Step | 1 | 2 | 3 | 4 | |
| | | Q/D.F. | W.V.:35/25/16V :0.035max. W.V.:10V :0.05max.(C< 3.3μF) | Temp. | Min. | Room | Max. | Room | |
| | | G/D.1 . | $(C \ge 3.3F)$ | (°C) | Operating Temp.+0/-3 | Temp. | Operating Temp.+3/-0 | Temp. | |
| | | | [F5] | Time | 30±3 | 2to3 | 30±3 | 2to3 | |
| | | | Ŵ.V.:50V :0.07max.(C < 0.1μF) | (min) | 30±3 | 2105 | 30±3 | 2105 | |
| | | | (0.07 max) (0.09 max) (0.1 max) | | | | | | |
| | | | W.V.:35/25/16Vmax.:0.125max. | · Initial me | easurement for | high diele | ctric constant ty | ре | |
| | | I.R. | More than 10,000 MΩ or $500\Omega \cdot F$ | Perform a | a heat treatmen | t at 150 +0 |)/-10°C for one l | hour | |
| | | Dielectric | (Whichever is smaller) No defects. | and then | set at room ten he initial measu | perature f | or 48± 4 hours. | | |
| | | Strength | | Penomit | ne miliai measu | rement. | | | |
| 16 | Humidity | | The measured and observed characteristics shall satisfy | | | ^o C and in | 90 to 95% humi | iduty | |
| | (Steady | | the specifications in the following table. | for 500±1 | | 4 hours a | t room tempera | ture | |
| | | Appearance | No defects or abnormalities. | then mea | | + nours a | i iooni tempera | ure, | |
| | | Capacitance Change | R6,R7,C7:Within ±12.5% F5 :Within ±30% | | · - | | | | |
| | | Change | [R6,R7,C7] | 1 | | | | | |
| | | | W.V.:100V :0.075max | | | | | | |
| | | | W.V.:35/25/16V :0.05max. | | | | | | |
| | | Q/D.F. | W.V.:10V:0.075max.(C< 3.3µF) :0.125max.(C ≧ 3.3µF) | | | | | | |
| | | | [F5] | | | | | | |
| | | | W.V.:50V | | | | | | |
| | | | :0.1max.(C < 0.1μF) :0.125max.(C ≧ 0.1μF) | | | | | | |
| | | | W.V.:35/25/16V.:0.15max. | | | | | | |
| | | I.R. | More than 1,000 MΩ or $50\Omega \cdot F$ | | | | | | |
| | | Dielectric | (Whichever is smaller) No defects | | | | | | |
| | | Strength | | | | | | | |
| 17 | Humidity | / Load | The measured and observed characteristics shall satisfy the specifications in the following table. | Apply the rated voltage * at 40±2°C and 90 to 95% humidi for 500±12 hours. Remove and set for 48±4 hours at roo | | | | | |
| | | Appearance | No defects or abnormalities. | tempratu | e, then muasur | e. | | | |
| | | Capacitance | R6,F7,C7:Within ±12.5% | The charge | ge/discharge cu R61A105K:6.3 | irrent is le | ss than 50mA. | | |
| | | Change | F5 :Within ±30% | | 0.01A1051.0.5 | v | | | |
| | | | [R6,R7,C7] | | easurement for | | | | |
| | | | Ŵ.V.:100V :0.075max | | rated DC volta | | our at 40± 2ºC. room temperatu | ire | |
| | | 005 | W.V.:35/25/16V :0.05max. W.V.:10V:0.075max(C< 3.3μF) | | nitial measurem | | | | |
| | | Q/D.F. | :0.125max.(C ≟ 3.3µF) | | | | | | |
| | | | [F5] W.V.:50V | | | | | | |
| | | | :0.1max.(C < 0.1uF) | | | | | | |
| | | | $:0.125 \text{max.}(\text{C} \stackrel{>}{=} 0.1 \mu\text{F})$ | | | | | | |
| | | I.R. | W.V.:35/25/16Vmax.:0.15max. More than 500MΩ or 25Ω · F | 1 | | | | | |
| | | | (Whichever is smaller) | | | | | | |
| | | Dielectric Strength | No defects . | | | | | | |
| 18 | | mperature | The measured and observed characteristics shall satisfy | Apply 12 | 5% of the rated | voltage at | the maximum | | |
| | Load | • | the specifications in the following table. | operating | temperature ±3 | 3ºC for 100 | 00±12 hours. | <i>```</i> | |
| | | Appearance | No defects or abnormalities. | | 48±4 hours (hi | | ic constant type | e) at | |
| | | Capacitance | R6,R7,C7:Within $\pm 12.5\%$ | | ge/discharge cu | | ss than 50mA. | | |
| | | Change | F5 :Within $\pm 30\%$ [Except 25Vmax and C $\stackrel{\geq}{=} 1.0. \mu$ F] [R6.R7.C7] | l | | and the second | anta a second | | |
| | | | W.V.:100V :0.075max | | easurement for 5% of the rated | | ectric constant ty e at the | /pe. | |
| | | Q/D.F. | W.V.:35/25/16V :0.05max. W.V.:10V:0.075max.(C< 3.3μF) | maximun | operating temp | erature ± | 3°C for one hou | ur. Remo | |
| | | | :0.125max.(C ≧3.3μF) | and set for | or 48±4 hours a | t room ten | | | |
| | | | [F5] W.V.:50V | Performi | nitial measurem | ient. | | | |
| | | | :0.1max.(C < 0.1µF) | | | | | | |
| | | | :0.125màx.(C≟ 0.1μF) W.V.:35/25/16Vmax.:0.15max. | | | | | | |
| | | I.R. | More than 1,000M Ω or 50 $\Omega \cdot F$ |] | | | | | |
| | | Dialactria | (Whichever is smaller) No defects . | 1 | | | | | |
| | | Dielectric | | | | | | | |

| | | SPECIFICATION S AND TEST METH | ODS P 20 |
|----|-------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| No | Item | Specification | Test Method |
| 1 | Operating Temperature Range | R6: -55°C to +85°C | |
| 2 | Rated Voltage | See the previous pages. | 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, shall be maintained within the rated voltage range. |
| | Appearance | No defects or abnormalities. | Visual inspection. |
| | Dimensions | Within the specified dimension. | Using calipers. |
| | | No defects or abnormalities. | No failure shall be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, provided the charge/discharge current is less than 50mA. |
| 6 | Insulation Resistance | 50Ω· F min. | The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25 °C and 75%RH max. and within 1 minutes of charging. |
| | Capacitance | Within the specified tolerance. | The capacitance/D.F. shall be measured at 25 °C at the frequency and voltage shown in the table. |
| ð | Dissipation Factor (D.F.) | 0.125 max. | $\begin{tabular}{ c c c c c } \hline Capacitance & Frequency & Voltage \\ \hline C &\leq 10 \mu F (10 V min.) & 1 \pm 0.1 \text{kHz} & 1.0 \pm 0.2 \text{ Vrms} \\ \hline C &\leq 10 \mu F (6.3 V max.) & 1 \pm 0.1 \text{kHz} & 0.5 \pm 0.1 \text{ Vrms} \\ \hline \end{tabular}$ |
| | | | C > 10µF 120± 24Hz 0.5± 0.1 Vrms |
| ٥ | Capacitance | | The capacitance change shall be measured affter 5 min.at each |
| 9 | Temperature | Char. Temp.Range Referenc Cap.Change | specified temperature stage. |
| | Characteristics | e Temp. | The ranges of capacitance change compared with the 25 °C value |
| | | R6 -55°C to +85°C 25°C Within ±15% | over the temperature ranges shown in the table shall be within the specified ranges. |
| 10 | Adhesive Strength of Termination | No removal of the terminations or other defects shall occur. | 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±1 sec. The soldering shall be done either with an iron or using the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. *5N (GR □15, GRM18)/2N (GR □03) |
| | | °┵┍┍┍┍┼┿╸ | Type a b c |
| | | | GR□03 0.3 0.9 0.3 GR□15 0.4 1.5 0.5 |
| | | Solder resist | GR□15 0.4 1.5 0.5 GRM18 1.0 3.0 1.2 (in mm) |
| | | Fig.1 Baked electrode or copper foil | 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 |
| | | | |
| 11 | Vibration | Appearance No defects or abnormalities. | Solder the capacitor to the test jig (glass epoxy board) in |
| | | CapacitanceWithin the specified tolerance.D.F0.125 max. | the same manner and under the same conditions as (10). The capacitor shall be subjected to a simple harmonic motion having a |
| | | D.F 0.125 max. | 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, shall be traversed in approximately |
| | | | minute. |
| | | | This motion shall be applied for a period of 2 hours in each 3 mutually perpendicular directions (total of 6 hours). |
| | | | |
| | | | |
| | | | |
| | | | |

| | | SPECI | FICATIONS AND TEST MET | HOI | DS | | | P 2' | 1 | |
|----|---------------------------------|-------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------|----------------------------------------------------|------------|-------------|
| No | ltem | | Specification | | | Tes | t Method | ł | | |
| 12 | Deflection | No cracking | or marking defects shal occur. 150 Pressunzing speed:1.0mm/sec. | usi Fig ref | Ider the capaci ng a eutectic s .3. The solderi low method an uniformand fre | older. Then ap ng shall be dor d shall be cond | ply a for ne either ducted w | ce in the dire with an iron c ith care so th | ction show | wn in ne |
| | | _R230_// | Pressunze | | | Туре | | a b | c | : |
| | | V | | | | GR □03 | 0 | 0.3 0.9 | 0. | 3 |
| | | | | | | GR □15 | 0 | .4 1.5 | 0. | 5 |
| | | Capaci | tance meter | | ¢4.5 | GRM18 | 1 | .0 3.0 | 1. | 2 |
| | | 45 | _45 | | | GRM21 | 1 | .2 4.0 | 1.6 | 65 |
| | | | | -ø | 40 | GRM31 | 2 | .2 5.0 | 2. | 0 |
| | | Fig | | | <u> </u> _ | GRM32 | 2 | .2 5.0 | 2. | 9 |
| | | | r | | | GRM43 | 3 | 5.5 7.0 | 3. | 7 |
| | | | Fig2 | i | | GRM55 | 4 | .5 8.0 | 5. | 6 |
| | | | | | | | | (in:mm) | | |
| 13 | Solderability of Termination | 75% of the te and continuc | erminations is to be soldered evenly busly. | (JI ℃ for | merse the capa S-K-5902) (25 10 to 30 secor | % rosin in wei nds. After prehe | ght prope | ortion). Prehe | eat at 80 | to 120 |
| 14 | Pagistanga | Appoarance | No marking defects | | ution for2 ±0.5 | | | r 1 minuto Im | moreo | |
| 14 | Resistance to Soldering Heat | | No marking defects. R6 : Within ± 15% | | eheat the capac capacitor in a | | | | | 0.5 |
| | to condening riedt | Capacitance | NO . WIUHHT 1370 | | conds. Let sit a | | | | | |
| | | - | 0.125 max. | the √Ini | n measure. tial measureme | nt | 0 | | | |
| | | I.R. | 50Ω·F min. | | erform a heat tr en let sit for 48 | | | | | |
| | | Dielectric Strength | No failure | th | e initial measur | ement. | | | | |
| 15 | Temperature | Appearance | No marking defects. | Fix | the capacitor t | o the supportin | g jig in th | e same manr | ner | |
| | Sudden Change | Capacitance Change | R6 : Within ±7.5% | ano aco | d under the sar cording to the fo | ne conditions a our heat treatm | as (10). P ients liste | Perform the fived in the | e cycles | |
| | | D.F. | 0.125 max. | following table. Let sit for 48 ±4 hours at room tempera | | ature, | _ | | | |
| | | I.R. | 50Ω·F min. | Temp.(°C) | 1 Min. | 2 Room | 3 Max. | 4 Room | | |
| | | Dielectric | No failure | | Operating Temp.± ⁰ 3 | Temp. | Operating Temp. $\pm \begin{array}{c} 3\\ 0 \end{array}$ | Temp. | | |
| | | Strength | | | Time(min.) | 30±3 | 2 to 3 | 30±3 | 2 to 3 | |
| | | | | F | itial measureme Perform a heat hen let sit for 4 leasurement. | treatment at 15 | | | | nitial |
| 16 | High | Appearance | No marking defects. | Ap | ply the rated vo | oltage at 40 ± 2 | ² °C and | 90 to 95% hu | midityfor | |
| | Temperature High Humidity | Capacitance Change | R6 : Within ±12.5% | | 0 ±12hours. e charge/disch | arge current is | less thar | n 50mA. | | |
| | (Steady) | D.F. | 0.25max. | F | · Initial measurement $_{0}^{0}$ Perform a heat treatment at 150 \pm 10 °C for one hour and then let sit for 48 \pm 4 hours at room temperature. Perform | | | | | |
| | | I.R. | 12.5Ω·F min. | th | e initial measur | ement. | | | | |
| | | Dielectric | No failure | ┨ | | an tact | | | | |
| | | Strength | | Р | leasurement aff erform a heat tr ien let sit for 48 | eatment at 150 | | | | |
| 17 | Durability | | No marking defects. | ma | ply 100% of the ximum operatir | ig temperature | ± 3°C. | | t the | |
| | | Capacitance Change | R6 : Within ±12.5% | | The charge/ discharge current is less than 50mA. | | | | | |
| | | D.F. | 0.25max. | Р | itial measureme erform a heat tr | eatment at 150 | | | | |
| | | I.R. | 25Ω·F min. | th | en let sit for 48 e initial measur | ement. | | erature. Perf | orm | |
| | | Dielectric Strength | No failure | Р | easurement aft erform a heat tr en let sit for 48 | eatment at 150 | - | | | |

There are three type of packaging for chip monolithic ceramic capacitor. Please specify the packaging code.

1.Bulk Packaging(Packaging Code=B) : In a bag.

Minimum Quantity:1000(pcs./bag), Only GRM43S, GRM55E/F : 500(pcs./bag)

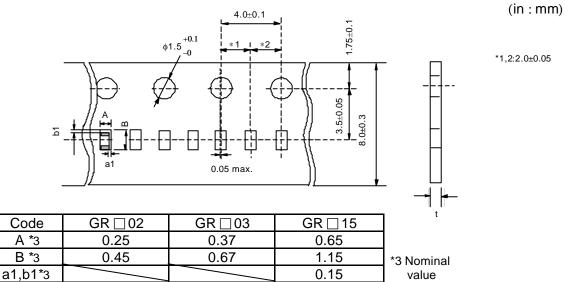
2.Tape Carrier Packaging(Packaging Code:D/E/F/L/J/K)

2.1 Minimum Quantity(pcs./reel)

| Туре | | φ178 | s reel | φ330 | reel |
|---------|-------|------------|--------------|------------|--------------|
| | | Paper Tape | Plastic Tape | Paper Tape | Plastic Tape |
| | | Code:D/E | Code:L | Code:F/J | Code:K |
| GR □ 02 | | 20000 | | | |
| GR 🗌 03 | | 15000 | | 50000 | |
| GR 🗌 15 | | 10000 | | 50000 | |
| GR 🗆 18 | | 4000 | | 10000 | |
| GR□21 | 5/6/9 | 4000 | | 10000 | |
| | A/B | | 3000 | | 10000 |
| | 6/9 | 4000 | | 10000 | |
| GR⊡31 | M/X | | 3000 | | 10000 |
| | С | | 2000 | | 6000 |
| | 5/6/9 | 4000 | | 10000 | |
| | A/M | | 3000 | | 10000 |
| GR□32 | Ν | | 2000 | | 8000 |
| GR_JJZ | С | | 2000 | | 6000 |
| | R/D/E | | 1000 | | 4000 |
| | М | | 1000 | | 5000 |
| | N/C/R | | 1000 | | 4000 |
| GR□43 | D | | 1000 | | 4000 |
| | E | | 500 | | 2000 |
| | S | | 500 | | 1500 |
| | М | | 1000 | | 5000 |
| | N/C/R | | 1000 | | 4000 |
| GR⊡55 | D | | 1000 | | 4000 |
| | E | | 500 | | |
| | F/X | | 300 | | 1500 |

2.2 Dimensions of Tape

(1)GR 02/03/15

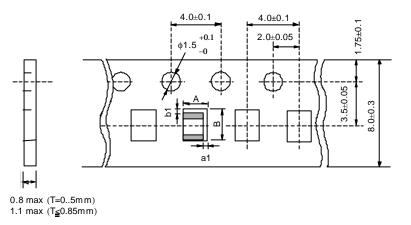


0.8 max.

(2)GR[18/21/31/32 T:0.85 max.

t

0.4 max.



0.5 max.

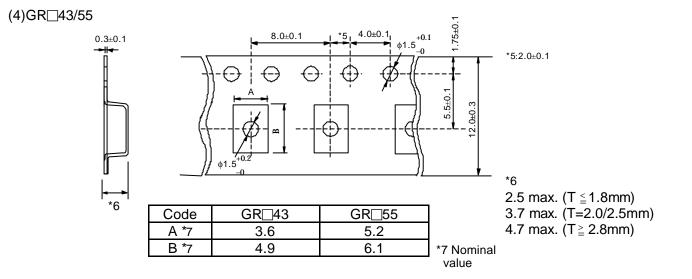
| Code | GR⊡18 | GR <u></u> 21 | GR <u></u> 31 | GR <u></u> 32 |
|-------|----------|---------------|---------------|---------------|
| А | 1.05±0.1 | 1.55±0.15 | 2.0±0.2 | 2.8±0.2 |
| В | 1.85±0.1 | 2.3±0.15 | 3.6±0.2 | 3.6±0.2 |
| a1,b1 | 0.25±0.2 | 0.4±0.2 | 0.4±0.2 | 0.4+0.3/-0.2 |

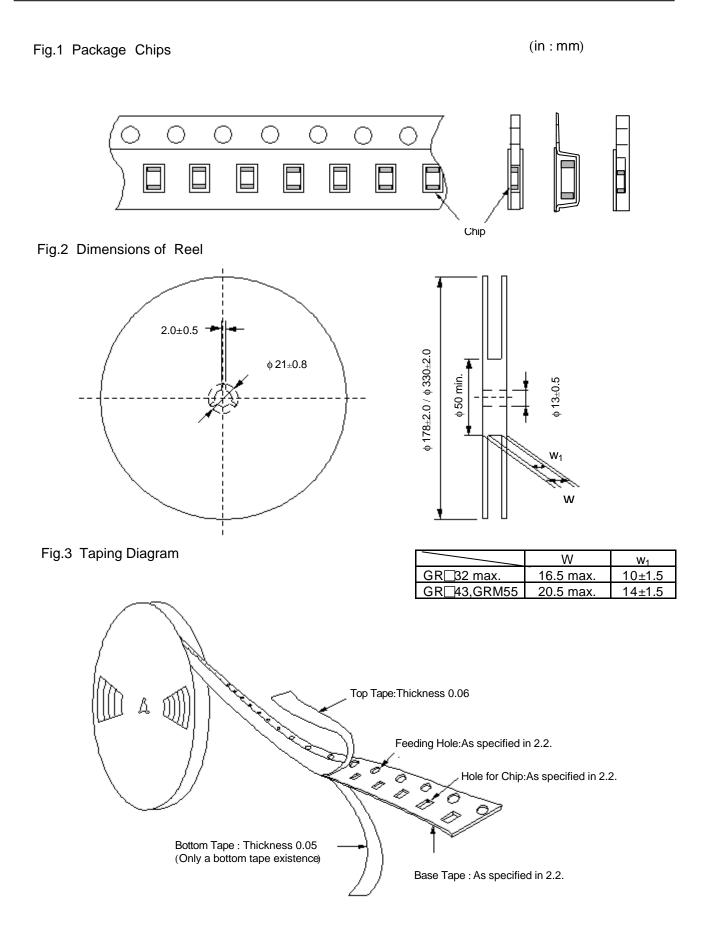
(3)GR^{21/31/32} T:1.0 min.

| Code | GR <u></u> 21 | GR <u></u> 31 | GR <u></u> 32 |
|------|---------------|---------------|---------------|
| А | 1.45±0.2 | 1.9±0.2 | 2.8±0.2 |
| В | 2.25±0.2 | 3.5±0.2 | 3.5±0.2 |

| *4 |
|-------------------------|
| 1.7 max. (T ≦1.25mm) |
| 2.5 max. (T:1.35/1.6mm) |
| 3.0 max. (T:1.8/2.0mm) |
| 3.7 max. (T≧ 2.5mm) |
| |

(in : mm)



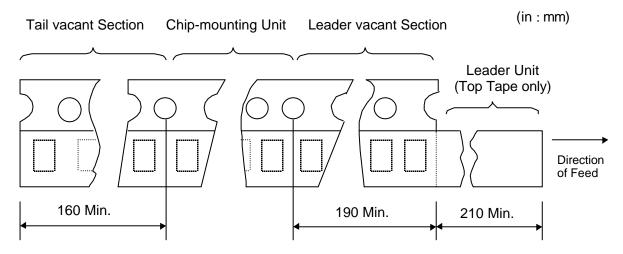


FUKUI MURATA MFG. CO., LTD.

2.3 Tapes for capacitors are wound clockwise shown in Fig.3.

(The sprocket holes are to the right as the tape is pulled toward the user.)

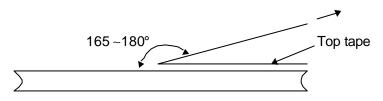
- 2.4 Part of the leader and part of the vacant section are attached
 - as follows.



- 2.5 Accumulate pitch : 10 of sprocket holes pitch = 40 ± 0.3 mm
- 2.6 Chip in the tape is enclosed by top tape and bottom tape as shown in Fig.1.
- 2.7 The top tape and base tape are not attached at the end of the tape for a minimum of 5 pitches.
- 2.8 There are no jointing for top tape and bottom tape.
- 2.9 There are no fuzz in the cavity.
- 2.10 Break down force of top tape : 5N min.

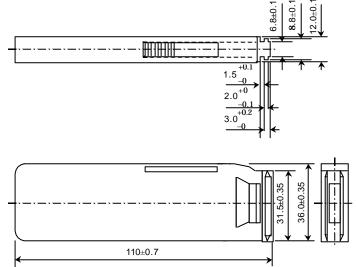
Break down force of bottom tape : 5N min. (Only a bottom tape existence)

- 2.11 Reel is made by resin and appeaser and dimension is shown in Fig 2. There are possibly to change the material and dimension due to some impairment.
- 2.12 Peeling off force : 0.1 to 0.6N^{*8} in the direction as shown below.
 - *8 GR [] 03:0.05N~0.5N



2.13 Label that show the customer parts number, our parts number, our company name, inspection number and quantity, will be put in outside of reel.

3.Bulk Case Packaging (Packaging Code=C) Fig.4 Dimensions of Bulk case



3.1 Minimum Quantity(pcs./case)

| GR | 2.4 | 50000 |
|----|-----|-------|
| GR | | 15000 |
| GR | 6 | 10000 |
| | В | 5000 |

3.2 Case is made by resin of transparence or semitransparency, and appeaser and dimension is shown in Fig.4.

There are possibility to change the material and dimension due to some impairment.

3.3 Case must be marked in Customer 's part number, MURATA part number, MURATA name, Inspection number and quantity(pcs.).

Limitation of use

Please contact our sales representatives or product engineers before using our products for the applications listed below which require of our products for other applications than specified in this product.

① Aircraft equipment② Aerospace equipment③ Undersea equipment④ Power plant control equipment⑤ Medical equipment⑥ Transportation equipment(vehicles,trains,ships,etc.)⑦ Traffic signal equipment⑧ Disaster prevention / crime prevention equipment⑨ Data-processing equipment

[®]Application of similar complexity and/or requirements to the applications listed in the above

Storage and Operating Conditions

Chip monolithic ceramic capacitors(chips) can experience degradation of termination solderability when subjected to high temperature or humidity, or if exposed to sulfur or chlorine gases.

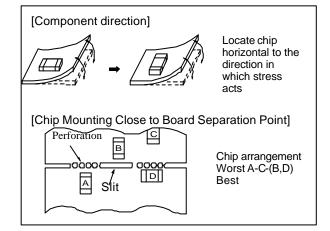
Storage environment must be at an ambient temperature of 5-40 C. and an ambient humidity of 20-70%RH. Use chip within 6 months. If 6 months or more have elapsed, check solderability before use. (Reference Data 1/ Solderability) Insulation Resistance shall be deteriorated on specific condition of high humidity or incorrosion gas such as hydrogen sulfide, sulfurous acid gas, cholorine. Those condition are not suitable for use.

■Handling

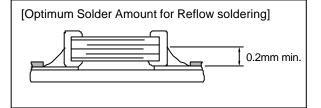
- 1.Inspection
- Thrusting force of the test probe can flex the PCB, resulting in cracked chips or open solder joints. Provide support pins on the back side of the PCB to prevent warping or flexing.
- 2.Board Separation (or Depane-lization)
- \cdot Board flexing at the time of separation causes cracked chips or broken solder.
- · Severity of stresses imposed on the chip at the time of board break is in the order of: Pushback<Slitter<V Slot<Perforator.
- · Board separation must be performed using special jigs, not with hands.
- 3.Reel and bulk case
- · In the handling of reel and case, please pay attention not to drop it. Please do not use chip of the case which dropped.

- Soldering and Mounting
- 1. Mounting Position

Choose a mounting position that minimizes the stress imposed on the chip during flexing or bending of the board.



- 2.Solder Paste Printing
- •Overly thick application of solder paste results in excessive fillet height solder. This makes the chip more susceptible to mechanical and thermal stress on the board and may cause cracked chips.
- •Too little solder paste results in a lack of adhesive strength on the outer electrode, which may result in chips breaking loose from the PCB.
- Make sure the solder has been applied smoothly to the end surface to a height of 0.2mm min.



3.Chip Placing

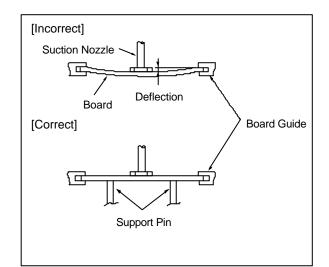
- An excessively low bottom dead point of the suction nozzle imposes great force on the chip during mounting, causing cracked chips. So adjust the suction nozzle's bottom dead point by correcting warp in the board.
 Normally, the suction bottom dead point must be set on the upper surface of the board. Nozzle pressure for chip mounting must be a 1 to 3N static load.
- •Dirt particles and dust accumulated between the suction nozzle and the cylinder inner wall prevent the nozzle from moving smoothly. This imposes great force on the chip during, causing cracked chips. And 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.
- 4.Reflow Soldering
 - •Sudden heating of the chip results in distortion due to excessive expansion and construction forces within the chip causing cracked chips. So when preheating, keep temperature differential, ΔT , within the range shown in Table 1. The smaller the ΔT , the less stress on the chip.
 - Solderability of Tin plating termination chip might be deteriorated when low temperature soldering profile where peak solder temperature is below the Tin melting point is used.

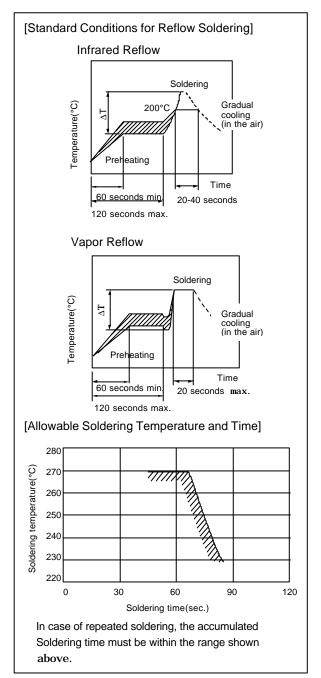
Please confirm the solderability of Tin plating termination chip before use.

•When components are immersed in solvent after mounting, be sure to maintain the temperature difference (ΔT) between the component and solvent within the range shown in the above table.

Table 1

| Part Number | Temperature Differential |
|-------------|-----------------------------------------|
| GR□02/03/15 | Δ T |
| GR□18/21/31 | = |
| GR口32/43/55 | $\Delta T \stackrel{<}{=} 130^{\circ}C$ |





Inverting the PCB

Make sure not to impose an abnormal mechanical shock on the PCB.

If the PCB is flexed when leaded components (such as transformers and ICs) are being mounted, chips may crack and solder joints may break.

Before mounting leaded components, support the PCB using backup pins or special jigs prevent warping.

6.Flow Soldering

- •Sudden heating of the chip results in thermal distortion causing cracked chips. And an excessively long soldering time or high soldering temperature results in leaching of the outer electrodes, causing poor adhesion or a reduction in capacitance value due to loss of contact between electrodes and end termination.
- •When preheating, keep temperature differential between solder temperature and chip surface temperature, ΔT , within the range shown in Table 2. The smaller the ΔT , the less stress on the chip.

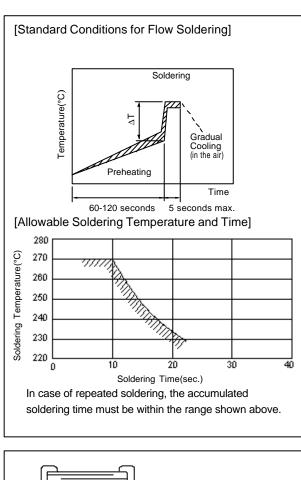
When components are immersed in solvent after mounting, be sure to maintain the temperature difference between the component and solvent within the range shown in Table 2.

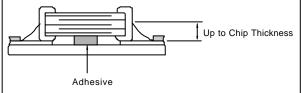
Don't apply flow soldering to chips not listed in Table 2.

Table 2

| Part Number | Temperature Differential |
|-------------|-----------------------------------------|
| GR□18/21/31 | $\Delta T \stackrel{<}{=} 150^{\circ}C$ |

Optimum Solder Amount for Flow Soldering





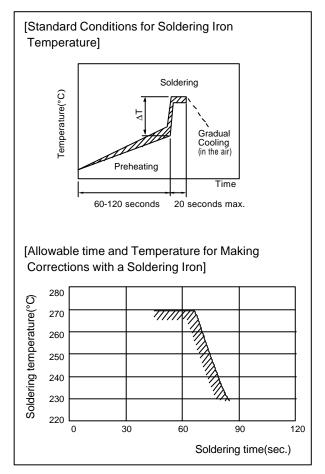
7.Correction with a Soldering Iron

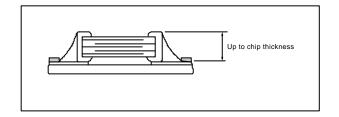
(1) For Chip Type Capacitors

•Sudden heating of the chip results in distortion due to a high internal temperature differential, causing cracked chips. When preheating, keep temperature differential, ΔT , within the range shown in Table 3. The smaller the ΔT , the less stress on the chip.

| Table 3 |
|---------|
|---------|

| Part Number | Temperature Differential | | | |
|-------------------------|-----------------------------------------|--|--|--|
| GR□03/15 GR□18/21/31 | $\Delta T \stackrel{<}{=} 190^{\circ}C$ | | | |
| GR□32/43/55 | $\Delta T \stackrel{<}{=} 130^{\circ}C$ | | | |





 Optimum Solder Amount when Corrections Are Made Using a Soldering Iron

8.Washing

Excessive output of ultrasonic oscillation during cleaning causes PCBs to resonate, resulting in cracked chips or broken solder. Take note not to vibrate PCBs.

Failure to follow the above cautions may result, worst case, in a short circuit and fuming when the products is use.

NOTICE

Soldering and Mounting

1.PCB Design

(1)Notice for Pattern Forms

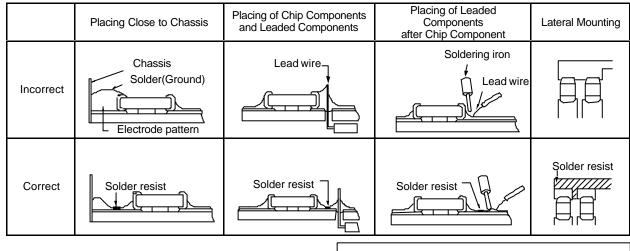
Unlike leaded components, chip components are susceptible to flexing stresses since they are mounted directly on the substrate.

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.

It has a possibility to happen the chip crack by the expansion and shrinkage of metal board. Please contact us if you want to use the ceramic capacitor on metal board such as Aluminum.

Pattern Forms



(2)Land Dimensions

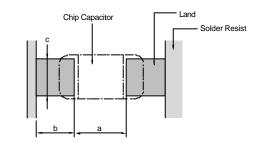


Table 1 Flow Soldering Method

| Dimensions Part Number | Dimensions(L X W) | а | b | с |
|---------------------------|-------------------|---------|---------|-----------|
| GR□18 | 1.6 X 0.8 | 0.6-1.0 | 0.8-0.9 | 0.6-0.8 |
| GR□21 | 2.0 X 1.25 | 1.0-1.2 | 0.9-1.0 | 0.8-1.1 |
| GR□31 | 3.2 X 1.6 | 2.2-2.6 | 1.0-1.1 | 1.0-1.4 |
| | | | | (in : mm) |

Table 2 Reflow Soldering Method

| Colocial Colocia Colocial Colocial Colocial Colocial Colocial Colocial Colo | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------|-----------|----------|
| Dimensions Part Number | Dimensions(L X W) | а | b | с |
| | | | | |
| GR□02 | 0.4 X 0.2 | 0.16-0.2 | 0.12-0.18 | 0.2-0.23 |
| GR□03 | 0.6 X 0.3 | 0.2-0.3 | 0.2-0.35 | 0.2-0.4 |
| GR□15 | 1.0 X 0.5 | 0.3-0.5 | 0.35-0.45 | 0.4-0.6 |
| GR□18 | 1.6 X 0.8 | 0.6-0.8 | 0.6-0.7 | 0.6-0.8 |
| GR□21 | 2.0 X 1.25 | 1.0-1.2 | 0.6-0.7 | 0.8-1.1 |
| GR□31 | 3.2 X 1.6 | 2.2-2.4 | 0.8-0.9 | 1.0-1.4 |
| GR□32 | 3.2 X 2.5 | 2.0-2.4 | 1.0-1.2 | 1.8-2.3 |
| GR□43 | 4.5 X 3.2 | 3.0-3.5 | 1.2-1.4 | 2.3-3.0 |
| GR□55 | 5.7 X 5.0 | 4.0-4.6 | 1.4-1.6 | 3.5-4.8 |

(in : mm)

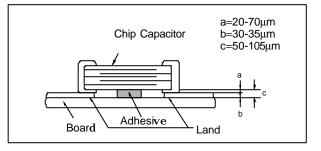
P33

2.Adhesive Application

 Thin or insufficient adhesive causes chips to loosen or become disconnected when flow soldered. The amount of adhesive must be more than dimension c shown in the drawing below to obtain enough bonding strength.

The chip's electrode thickness and land thickness must be taken into consideration.

 Low viscosity adhesive causes chips to slip after mounting. Adhesive must have a viscosity of 5000pa-s(500ps)min. (at 25°C)



3.Adhesive Curing

Insufficient curing of the adhesive causes chips to disconnect during flow soldering and causes deteriorated insulation resistance between outer electrodes due to moisture absorption. Control curing temperature and time in order to prevent insufficient hardening.

Inverting the PCB

Make sure not to impose an abnormal mechanical shock on the PCB.

4.Flux Application

•An excessive amount of flux generates a large quantity of flux gas, causing deteriorated solderability. So apply flux thinly and evenly throughout. (A foaming system is generally used for flow soldering).

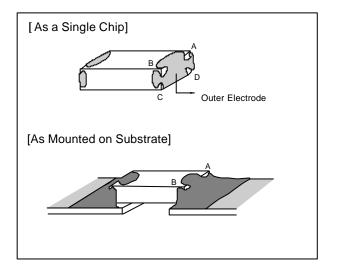
•Flux containing too high a percentage of halide may cause corrosion of the outer electrodes unless sufficiently cleaned. Use flux with a halide content of 0.2% max.

But do not use strongly acidic flux.

Wash thoroughly because water-soluble flux causes deteriorated insulation resistance between outer electrodes unless sufficiently cleaned.

5.Flow Soldering

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



Others

1.Resin Coating

When selecting resin materials, select those with low contraction.

- 2.Circuit Design
 - These capacitors on this catalog are not safety recognized products.
- 3.Remarks

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.

MNOTE

- 1. Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.
- 2. Your are requested not to use our product deviating from this product specification.
- Please return one copy of these specifications upon your acceptance. If the copy is not returned by a day mentioned in a cover the specifications will be deemed to have been accepted.
- 4. We consider it not appropriate to include any terms and conditions with regard to the business transaction in the product specifications, drawings or other technical documents. Therefore, if your technical documents as above include such terms and conditions such as warranty clause, product liability clause, or intellectual property infringement liability clause, they will be deemed to be invalid.

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