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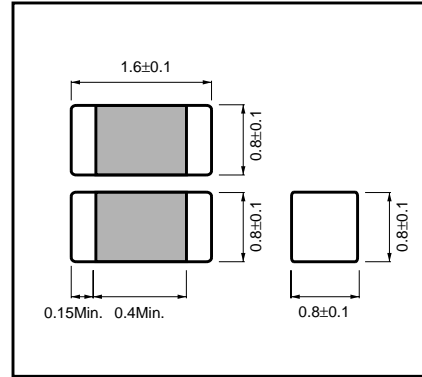
# Multi-layer ceramic chip capacitors

## MCH18 (1608 (0603) size, chip capacitor)

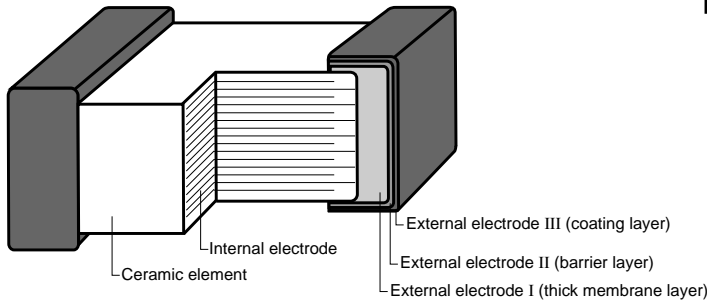
●Features

- 1) Small size (1.6 x 0.8 x 0.8 mm) makes it perfect for lightweight portable devices.
- 2) Comes packed either in tape to enable automatic mounting or in bulk cases.
- 3) Precise uniformity of shape and dimensions highly efficient automatic mounting.
- 4) Barrier layer and end terminations to improve solderability.

●External dimensions (Units : mm)



●Structure



●Product designation

| Code | Product thickness | Packaging specifications            | Reel           | Basic ordering (pcs.) |
|------|-------------------|-------------------------------------|----------------|-----------------------|
| K    | 0.8mm             | Paper tape (width 8 mm, pitch 4 mm) | φ180mm (7in.)  | 4,000                 |
| L    | 0.8mm             | Paper tape (width 8 mm, pitch 4 mm) | φ330mm (13in.) | 16,000                |
| C    | 0.8mm             | Bulk case                           | -              | 15,000                |

Reel I(φ180,φ330mm) : compatible with EIAJ ET-7200A  
 Bulk case :compatible with EIAJ ET-7201A

Part No.

Packaging style




























































| Rated voltage |         | Capacitance-temperature characteristics |         |                            | Nominal capacitance | Capacitance tolerance               |      |                     |
|---------------|---------|---|---------|----------------------------|---------------------|-------------------------------------|------|---------------------|
| Code          | Voltage | Code                                    | Code    | Operating temperature (°C) |                     | Temp. coefficient or percent change | Code | tolerance           |
| 2             | 25V     | A                                       | CG(C0G) | -55~+125                   |                     | ±30ppm/°C                           | C    | ±0.25pF (0.5 ~ 5pF) |
| 3             | 16V     | CN                                      | R       | -55~+125                   |                     | ±15%                                | D    | ±0.5pF (5.1 ~ 10pF) |
| 5             | 50V     |   | B (X7R) | -25~+85 (-55~+125)         |                     | ±10% (±15%)                         | J    | ±5% (11pF or more)  |
|               |         | FN                                      | F (Y5V) | -25~+85 (-30~+85)          |                     | +30%, -80% (+22%, -82%)             | K    | ±10%                |
|               |         |   | Z       |                            |                     |                                     |      | +80%, -20%          |

























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Ceramic capacitors

●Capacitance range

For thermal compensation

| Part number.    |   | MCH18   |
|-----------------|---|---|
| Capacitance(pF) | Temperature characteristics   | A (CG) (COG)  |
|                 | Rated voltage (V)   | 50  |
| Tolerance       |   |   |
| 0.5             | C (± 0.25pF)  |    |
| 0.75            |   |    |
| 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             | D (± 0.5pF)   |    |
| 3.9             |   |    |
| 4               |   |    |
| 4.3             |   |    |
| 4.7             |   |    |
| 5               |   |    |
| 5.1             |   |    |
| 5.6             |   |   |
| 6               |   |  |
| 6.2             |   |  |
| 6.8             |   |  |
| 7               |   |  |
| 7.5             |   |  |
| 8               |   |  |
| 8.2             |   |  |
| 9               | J (± 5%)  |  |
| 9.1             |   |  |
| 10              |   |  |
| 11              |   |  |
| 12              |   |  |
| 13              |   |  |
| 15              |   |  |
| 16              |   |  |
| 18              |   |  |
| 20              |   |  |
| 22              |   |  |
| 24              |   |  |
| 27              |   |  |
| 30              |   |  |
| 33              |   |  |
| 36              |  |   |
| 39              |  |   |
| 43              |  |   |
| 47              |  |   |
| 51              |  |   |
| 56              |  |   |
| 62              |  |   |
| 68              |  |   |
| 75              |  |   |
| 82              |  |   |
| 91              |  |   |
| 100             |  |   |

| Part number.     |                             | MCH18   |
|------------------|-----------------------------|---|
| Capacitance (pF) | Temperature characteristics | A (CG) (COG)  |
|                  | Rated voltage (V)           | 50  |
| Tolerance        |                             |   |
| 110              | J (± 5%)                    |    |
| 120              |                             |    |
| 130              |                             |    |
| 150              |                             |    |
| 160              |                             |    |
| 180              |                             |    |
| 200              |                             |    |
| 220              |                             |    |
| 240              |                             |    |
| 270              |                             |    |
| 300              |                             |    |
| 330              |                             |    |
| 360              |                             |    |
| 390              |                             |    |
| 430              |                             |    |
| 470              |                             |    |
| 510              |                             |    |
| 560              |                             |    |
| 620              |                             |    |
| 680              |                             |    |
| 750              |                             |    |
| 820              |                             |    |
| 910              |                             |   |
| 1,000            |                             |  |

 Product thickness (mm) 0.8 ± 0.1

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## Ceramic capacitors

High dielectric constant

| Part number                                   |                             | MCH18            |    |                |    |    |
|---|-----------------------------|------------------|----|----------------|----|----|
| Capacitance(pF)                               | Temperature characteristics | CN (R) (B) (X7R) |    | FN (F) (Y5V)   |    |    |
|   | Rated voltage (V)           | 50               | 25 | 50             | 25 | 16 |
|   | Tolerance                   | K ( $\pm 10\%$ ) |    | Z (+80%, -20%) |    |    |
| 220<br>270<br>330                             |                             | ☒                |    |                |    |    |
| 390<br>470<br>560                             |                             | ☒                |    |                |    |    |
| 680<br>820<br>1,000                           |                             | ☒                |    | ☒              |    |    |
| 1,200<br>1,500<br>1,800                       |                             | ☒                |    |                |    |    |
| 2,200<br>2,700<br>3,300                       |                             | ☒                |    | ☒              |    |    |
| 3,900<br>4,700<br>5,600                       |                             | ☒                |    | ☒              |    |    |
| 6,800<br>8,200<br>10,000 (0.01 $\mu$ F)       |                             | ☒                |    | ☒              |    |    |
| 12,000<br>15,000<br>18,000                    |                             | ☒                |    |                |    |    |
| 22,000<br>27,000<br>33,000                    |                             | ☒                |    | ☒              |    |    |
| 39,000<br>47,000<br>56,000                    |                             |                  | ☒  | ☒              |    |    |
| 68,000<br>82,000<br>100,000 (0.1 $\mu$ F)     |                             |                  | ☒  |                | ☒  |    |
| 120,000<br>150,000<br>180,000                 |                             |                  |    |                |    |    |
| 220,000<br>270,000<br>330,000                 |                             |                  |    |                |    | ☒  |
| 390,000<br>470,000<br>560,000                 |                             |                  |    |                |    |    |
| 680,000<br>1,000,000 (1 $\mu$ F)<br>1,200,000 |                             |                  |    |                |    |    |
| 1,500,000<br>1,800,000<br>2,200,000           |                             |                  |    |                |    |    |

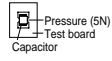

☒  
Product thickness (mm) 0.8  $\pm$  0.1

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## Ceramic capacitors

## ● Characteristics

Class 1 (For thermal compensation)

| Temperature characteristics  |                            | A (CG) (C0G)  | Test methods / conditions<br>(based on JIS C 5102)  |
|------------------------------|----------------------------|---|---|
| Item                         |                            |   |   |
| Operating temperature        |                            | -55°C ~ +125°C  | —   |
| Nominal capacitance (C)      |                            | Must be within the specified tolerance range.                                       | Based on paragraph 7.8 and paragraph 9<br>Measured at room temperature and standard humidity.<br>1000pF or less Measurement frequency : 1± 0.1MHz<br>Measurement voltage : 1± 0.1Vrms.  |
| Dissipation factor (tan δ)   |                            | 100 / (400 + 20C)% or less<br>(Less than 30 pF)<br>0.1% or less (30 pF or larger)   | Over 1000pF Measurement frequency : 1± 0.1kHz<br>Measurement voltage : 1± 0.1Vrms.  |
| Insulation resistance (IR)   |                            | 10,000MΩ or 500MΩ·μF, whichever is smaller  | Based on paragraph 7.6<br>Measurement is made after rated voltage is applied for 60 ± 5s.   |
| Withstanding voltage         |                            | The insulation must not be damaged.   | Based on paragraph 7.1<br>Apply 300% of the rated voltage for 1 to 5s then measure.   |
| Temperature characteristics  |                            | Within 0 ± 30ppm / °C   | The temperature coefficients in table 12, paragraph 7.12 are calculated at 20°C and high temperature.   |
| Terminal adherence           |                            | No detachment or signs of detachment.   | Based on paragraph 8.11.2<br>Apply 5N for 10 ± 1s in the direction indicated by the arrow.<br>   |
| Resistance to vibration      | Appearance                 | There must be no mechanical damage.   | Chip is mounted to a board in the manner shown on the right, subjected to vibration (type A in paragraph 8.2), and measured 24 ± 2 hrs. later.<br> |
|                              | Rate of capacitance change | Must be within initial tolerance.   |   |
|                              | Dissipation factor (tanδ)  | Must satisfy initial specified value.   |   |
| Solderability                |                            | At least 3 / 4 of the surface of the two terminals must be covered with new solder. | Based on paragraph 8.13<br>Soldering temperature : 235 ± 5°C<br>Soldering time : 2 ± 0.5s   |
| Resistance to soldering heat | Appearance                 | There must be no mechanical damage.   | Based on paragraph 8.14<br>Soldering temperature : 260 ± 5°C<br>Soldering time : 5 ± 0.5s<br>Preheating : 150 ± 10°C for 1 to 2 min.  |
|                              | Rate of capacitance change | ± 2.5% or ± 0.25 pF, whichever is larger.   |   |
|                              | Dissipation factor (tanδ)  | Must satisfy initial specified value.   |   |
|                              | Insulation resistance      | 10,000MΩ or 500MΩ·μF, whichever is smaller  |   |
|                              | Withstanding voltage       | The insulation must not be damaged.   |   |
| Temperature cycling          | Appearance                 | There must be no mechanical damage.   | Based on paragraph 9.3<br>Number of cycles : 5<br>Capacitance measured after 24 ± 2 hrs.  |
|                              | Rate of capacitance change | ± 2.5% ± 0.25 pF, whichever is larger.  |   |
|                              | Dissipation factor (tanδ)  | Must satisfy initial specified value.   |   |
|                              | Insulation resistance      | 10,000MΩ or 500MΩ·μF, whichever is smaller  |   |
| Humidity load test           | Appearance                 | There must be no mechanical damage.   | Based on paragraph 9.9<br>Test temperature : 40 ± 2°C<br>Relative humidity : 90% to 95%<br>Applied voltage : rated voltage<br>Test time : 500 to 524 hrs.<br>Capacitance measured after 24 ± 2 hrs.                                   |
|                              | Rate of capacitance change | ± 7.5% or ± 0.75 pF, whichever is larger.   |   |
|                              | Dissipation factor (tanδ)  | 0.5% or less  |   |
|                              | Insulation resistance      | 500MΩ or 25MΩ·μF, whichever is smaller  |   |
| High-temperature load test   | Appearance                 | There must be no mechanical damage.   | Based on paragraph 9.10<br>Test temperature : Max. operating temp.<br>Applied voltage : rated voltage × 200%<br>Test time : 1,000 to 1,048 hrs.<br>Capacitance measured after 24 ± 2 hrs.   |
|                              | Rate of capacitance change | ± 3.0% or ± 0.3 pF, whichever is larger.  |   |
|                              | Dissipation factor (tanδ)  | 0.3% or less  |   |
|                              | Insulation resistance      | 1,000MΩ or 50MΩ·μF, whichever is smaller  |   |

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## Ceramic capacitors

Class 2 (High dielectric constant)

| Temperature characteristics  |                            | CN (R) (B) (X7R)  | FN (F) (Y5V)  | Test methods/conditions<br>(based on JIS C 5102)  |
|------------------------------|----------------------------|---|---|---|
| Operating temperature        |                            | -55°C ~ +125°C  | -30°C ~ +85°C   | —   |
| Nominal capacitance (C)      |                            | Must be within the specified tolerance range.                                     |   | Based on paragraph 7.8<br>Measured at room temperature and standard humidity,<br>Measurement frequency: 1 ± 0.1 kHz<br>Measurement voltage : 1.0 ± 0.2 Vrms.  |
| Dissipation factor (tanδ)    |                            | 2.5% or less<br>(when rated voltage is 16V: 3.5% or less)                         | 5.0% or less<br>(when rated voltage is 16V: 7.5% or less) |   |
| Insulation resistance (IR)   |                            | 10,000 MΩ or 500 MΩ · μF, whichever is smaller                                    |   | Based on paragraph 7.6<br>Measurement is made after rated voltage is applied for 60 ± 5s.   |
| Withstanding voltage         |                            | The insulation must not be damaged.   |   | Based on paragraph 7.1<br>Apply 250% of the rated voltage for 1 to 5s then measure.   |
| Temperature characteristics  |                            | Within ± 15%  | + 22, + 82%   | The temperature coefficients in paragraph 7.12, table 8, condition B, are based on measurements carried out at 20°C, with no voltage applied.   |
| Terminal adherence           |                            | No detachment or signs of detachment  |   | Based on paragraph 8. 11. 2.<br>Apply 5N for 10 ± 1s<br>in the direction indicated by the arrow.<br>   |
| Resistance to vibration      | Appearance                 | There must be no mechanical damage.   |   | Chip is mounted to a board in the manner shown on the right, subjected to vibration (type A in paragraph 8.2), and measured 48 ± 4 hrs. later.<br> |
|                              | Rate of capacitance change | Must be within initial tolerance.   |   |   |
|                              | Dissipation factor (tanδ)  | Must satisfy initial specified value.   |   |   |
| Solderability                |                            | At least 3/4 of the surface of the two terminals must be covered with new solder. |   | Based on paragraph 8. 13<br>Soldering temperature: 235 ± 5°C<br>Soldering time : 2 ± 0.5s   |
| Resistance to soldering heat | Appearance                 | There must be no mechanical damage.   |   | Based on paragraph 8. 14.<br>Soldering temperature: 260 ± 5°C<br>Soldering time : 5 ± 0.5s<br>Preheating : 150 ± 10°C for 1 to 2 min.   |
|                              | Rate of capacitance change | Within ± 5.0%   | Within ± 20.0%  |   |
|                              | Dissipation factor (tanδ)  | Must satisfy initial specified value.   |   |   |
|                              | Insulation resistance      | 10,000MΩ or 500MΩ · μF, whichever is smaller                                      |   |   |
|                              | Withstanding voltage       | The insulation must not be damaged.   |   |   |
| Temperature cycling          | Appearance                 | There must be no mechanical damage.   |   | Based on paragraph 9.3<br>Number of cycles : 5<br>Capacitance measured after 48 ± 4 hrs.  |
|                              | Rate of capacitance change | Within ± 7.5%   | Within ± 20.0%  |   |
|                              | Dissipation factor (tanδ)  | Must satisfy initial specified value.   |   |   |
|                              | Insulation resistance      | 10,000MΩ or 500MΩ · μF, whichever is smaller                                      |   |   |
| Humidity load test           | Appearance                 | There must be no mechanical damage.   |   | Based on paragraph 9.9<br>Test temperature: 40 ± 2°C<br>Relative humidity: 90% to 95%<br>Applied voltage : rated voltage<br>Test time : 500 to 524 hrs.<br>Capacitance measured after 48 ± 4 hrs.                                     |
|                              | Rate of capacitance change | ± 12.5% or less   | Within ± 30.0%  |   |
|                              | Dissipation factor (tanδ)  | 5.0% or less  | 7.5% or less<br>(when rated voltage is 16V: 10.0%)        |   |
|                              | Insulation resistance      | 500MΩ or 25MΩ · μF, whichever is smaller  |   |   |
| High-temperature load test   | Appearance                 | There must be no mechanical damage.   |   | Based on paragraph 9.10<br>Test temperature: Max. operating temp.<br>Applied voltage : rated voltage × 200%<br>Test time : 1,000 to 1,048 hrs.<br>Capacitance measured after 48 ± 4 hrs.  |
|                              | Rate of capacitance change | Within ± 10.0%  | Within ± 30.0%  |   |
|                              | Dissipation factor (tanδ)  | 5.0% or less  | 7.5% or less<br>(when rated voltage is 16V: 10.0%)        |   |
|                              | Insulation resistance      | 1,000MΩ or 50MΩ · μF, whichever is smaller  |   |   |

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Ceramic capacitors

●Packaging specifications

(Units : mm)

| Taping     |             |              |              |             |              |             |  |              |             | Reel                        |  |
|------------|-------------|--------------|--------------|-------------|--------------|-------------|--|--------------|-------------|-----------------------------|--|
|            |             |              |              |             |              |             |  |              |             | <p>φ180 mm plastic reel</p> |  |
| Symbol     | C           | D            | E            | F           | G            | H           | J                                      | t            | t1          | φ330 mm plastic reel        |  |
| Dimensions | 8.0<br>±0.3 | 3.5<br>±0.05 | 1.75<br>±0.1 | 4.0<br>±0.1 | 2.0<br>±0.05 | 4.0<br>±0.1 | φ1.5<br><sup>+0.1</sup> / <sub>0</sub> | 1.05<br>MAX. | 1.2<br>MAX. |                             |  |
| Size       | Symbol      | A            | B            |             |              |             |  |              |             |                             |  |
|            | 1608        | 1.0 ± 0.1    | 1.8 ± 0.1    |             |              |             |  |              |             |                             |  |
|            |             |              |              |             |              |             |  |              |             | EIAJ ET-7200A compliant     |  |

| Bulk case               |  |              |                  |
|-------------------------|--|--------------|------------------|
|                         |  |              |                  |
| EIAJ ET-7201A compliant |  |              |                  |
|                         |  | <b>MCH18</b> | 15,000pcs / case |

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Ceramic capacitors

●Electrical characteristics

■ A (COG) Characteristics

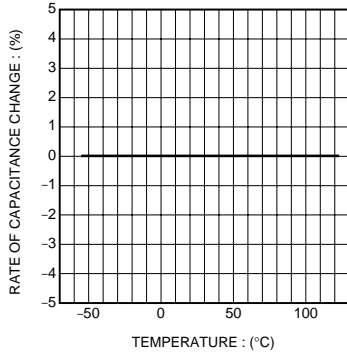


Fig.1 Capacitance - temperature characteristics

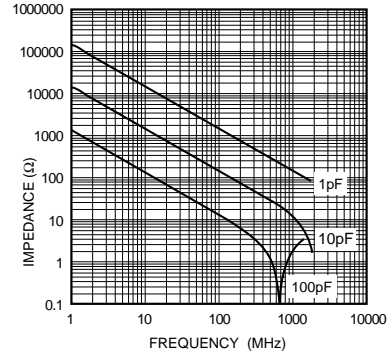


Fig.2 Impedance - frequency characteristics

■CN (X7R) Characteristics

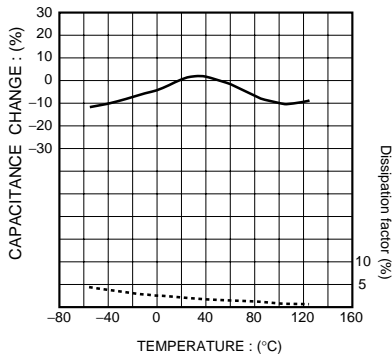


Fig.3 Capacitance - temperature characteristics

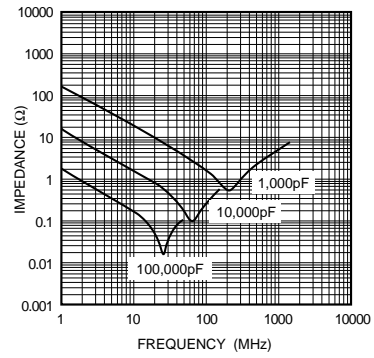


Fig.4 Impedance - frequency characteristics

■FN (Y5V) Characteristics

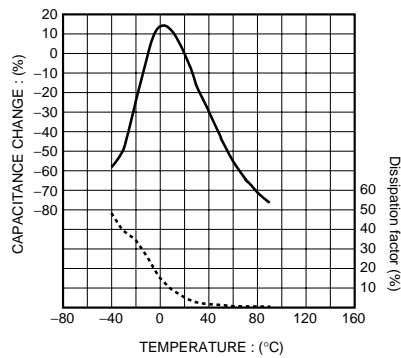


Fig.5 Capacitance - temperature characteristics

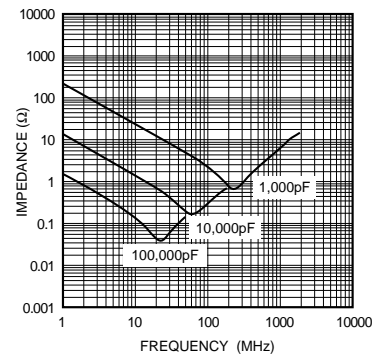


Fig.6 Impedance - frequency characteristics

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Ceramic capacitors

■ Temperature cycling test

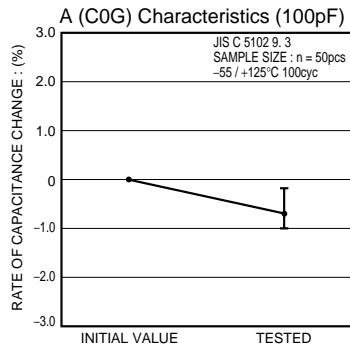


Fig.7 Rate of capacitance change

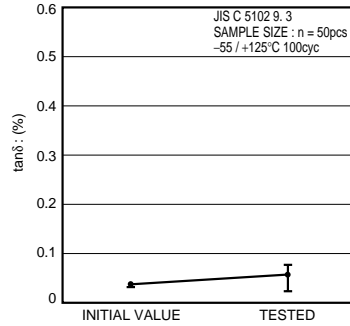


Fig.8 tanδ

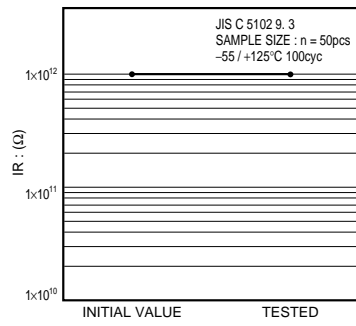


Fig.9 Insulation resistance

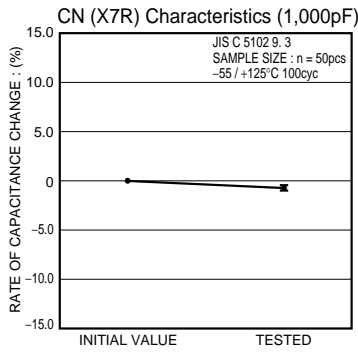


Fig.10 Rate of capacitance change

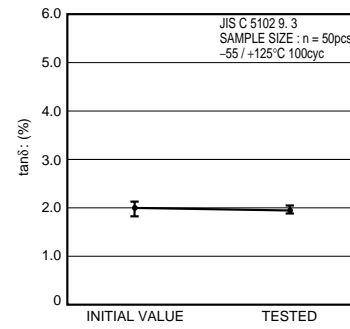


Fig.11 tanδ

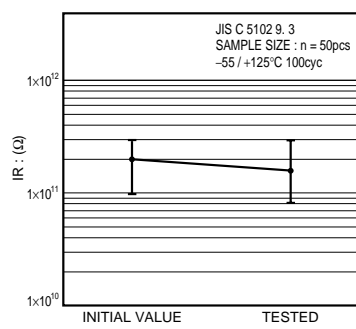


Fig.12 Insulation resistance

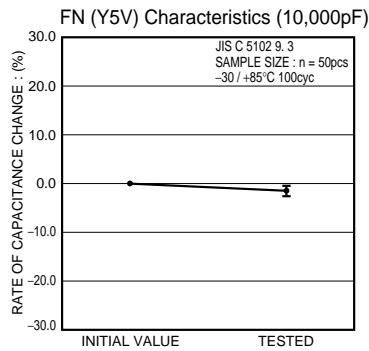


Fig.13 Rate of capacitance change

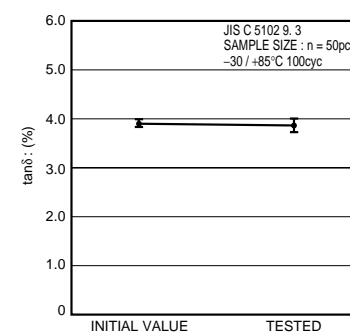


Fig.14 tanδ

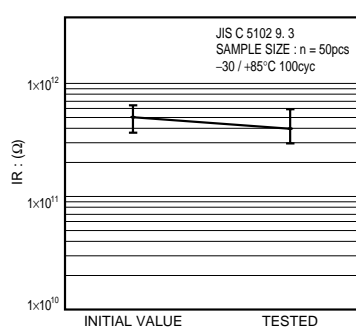


Fig.15 Insulation resistance

\*The design and specifications are subject to change without prior notice. Before ordering or using, please check the latest technical specification.

Ceramic capacitors

■ High-temperature load test

A (C0G) Characteristics (100pF)

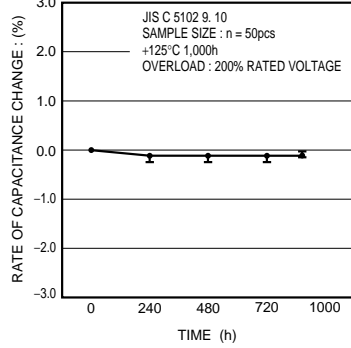


Fig.16 Rate of capacitance change

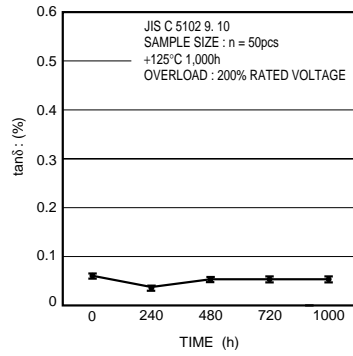


Fig.17 tanδ

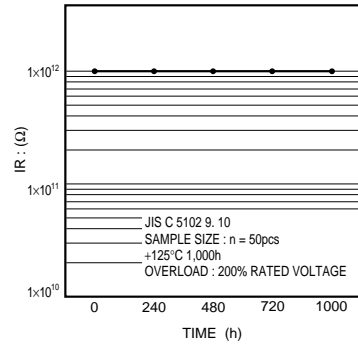


Fig.18 Insulation resistance

CN (X7R) Characteristics (1,000pF)

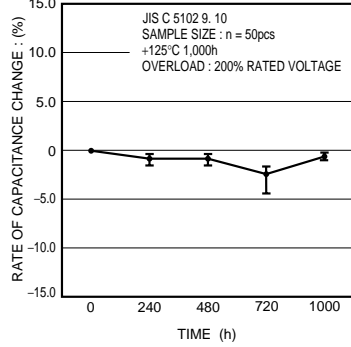


Fig.19 Rate of capacitance change

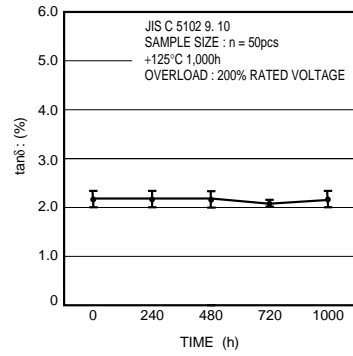


Fig.20 tan δ

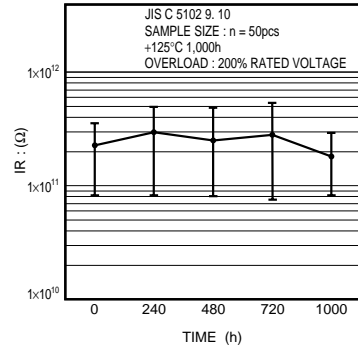


Fig.21 Insulation resistance

FN (Y5V) Characteristics (10,000pF)

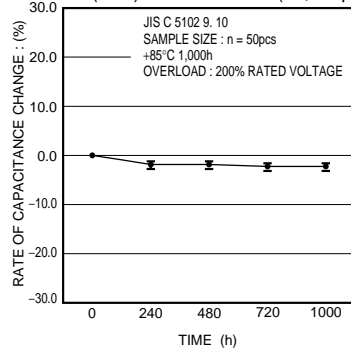


Fig.22 Rate of capacitance change

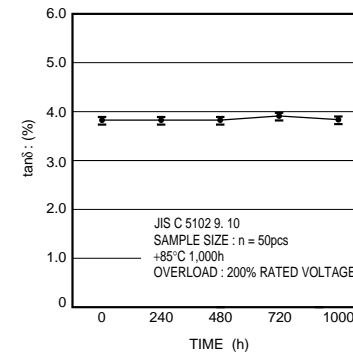


Fig.23 tanδ

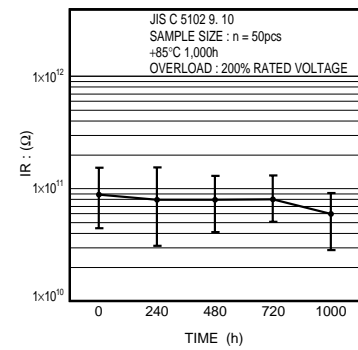


Fig.24 Insulation resistance

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Ceramic capacitors

■ Humidity load test

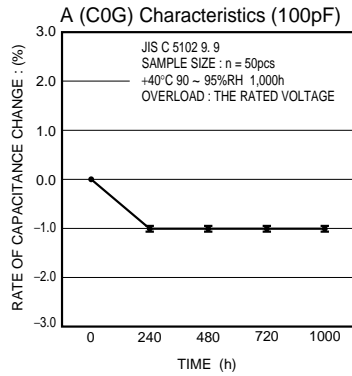


Fig.25 Rate of capacitance change

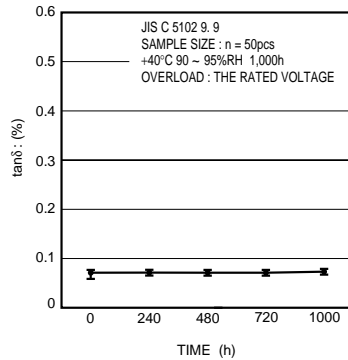


Fig.26 tan δ

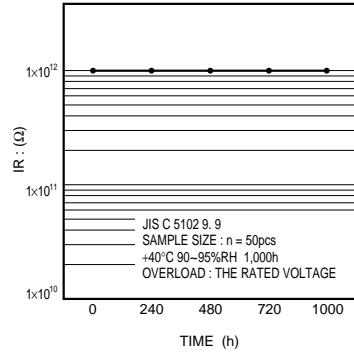


Fig.27 Insulation resistance

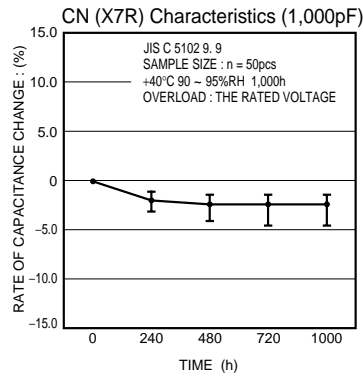


Fig.28 Rate of capacitance change

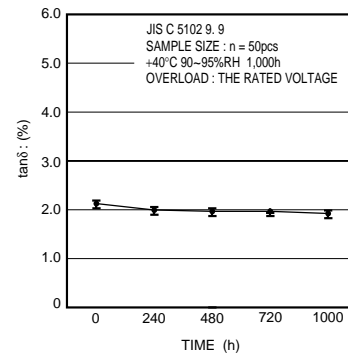


Fig.29 tan δ

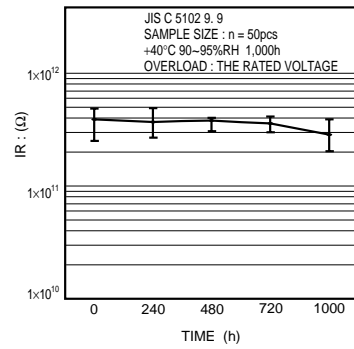


Fig.30 Insulation resistance

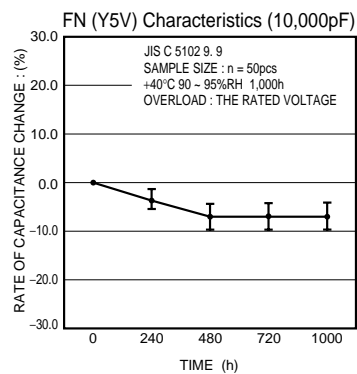


Fig.31 Rate of capacitance change

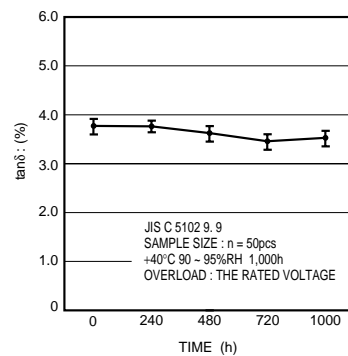


Fig.32 tan δ

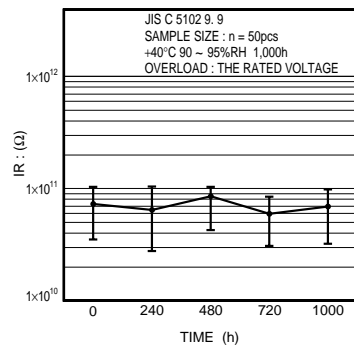


Fig.33 Insulation resistance

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