

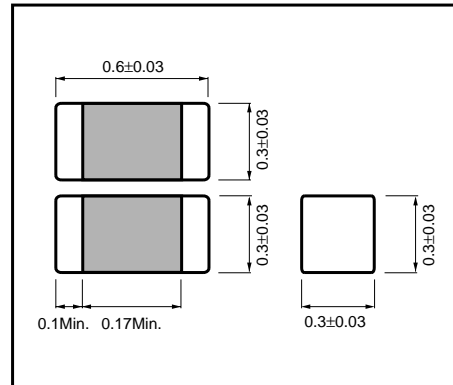
Multi-layer ceramic chip capacitors

MCH03 (0603 size, chip capacitor)

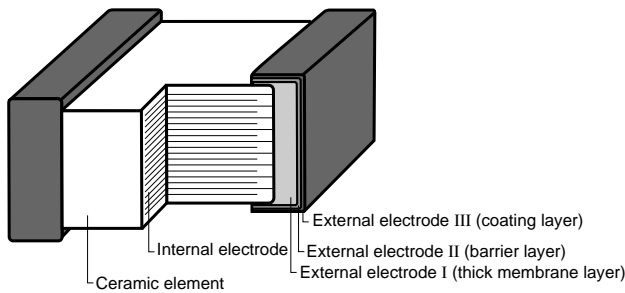
●Features

- 1) Small size (0.6 x 0.3 x 0.3 mm) makes it perfect for lightweight portable devices.
- 2) Comes packed either in tape to enable automatic mounting.
- 3) Precise uniformity of shape and dimensions facilitates 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 unit (pcs.) |
|------|-------------------|-------------------------------------|---------------|----------------------------|
| K | 0.3mm | Paper tape (width 8 mm, pitch 2 mm) | φ180mm (7in.) | 15,000 |

Reel (φ180, φ330mm) : compatible with EIAJ ET-7200A

Part No.

Packaging style



| Rated voltage | |
|---------------|---------|
| Code | Voltage |
| 2 | 25V |
| 3 | 16V |
| 5 | 50V |

| Capacitance-temperature characteristics | | | | Nominal capacitance | Capacitance tolerance | |
|---|---------|----------------------------|-------------------------------------|--------------------------------------|-----------------------|----------------------|
| Code | Code | Operating temperature (°C) | Temp. coefficient or percent change | | Code | tolerance |
| A | CG(C0G) | -55~+125 | 0±30ppm/°C | 3-digit designation according to IEC | C | ± 0.25pF (0.5 - 5pF) |
| CN | R | -55~+125 | ±15% | | D | ± 0.5pF (5.1 - 10pF) |
| | B | -25~+85 | ±10% | | J | ± 5% (11pF or more) |
| FN | (X7R) | (-55~+125) | (±15%) | | K | ± 10% |
| | F | -25~+85 | +30%, -80% | | Z | + 80%, -20% |
| | (Y5V) | (-30~+85) | (+22%, -82%) | | | |

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Ceramic capacitors

●Capacitance range

For thermal compensation

| Part number | | MCH03 |
|------------------|-----------------------------|--------------------------|
| Capacitance (pF) | Temperature characteristics | A (CG) (C0G) |
| | Rated voltage (V) | 25V |
| | Tolerance | |
| 0.5 | C (± 0.25pF) | <input type="checkbox"/> |
| 0.75 | | <input type="checkbox"/> |
| 1 | | <input type="checkbox"/> |
| 1.1 | | <input type="checkbox"/> |
| 1.2 | | <input type="checkbox"/> |
| 1.3 | | <input type="checkbox"/> |
| 1.5 | | <input type="checkbox"/> |
| 1.6 | | <input type="checkbox"/> |
| 1.8 | | <input type="checkbox"/> |
| 2 | | <input type="checkbox"/> |
| 2.2 | | <input type="checkbox"/> |
| 2.4 | | <input type="checkbox"/> |
| 2.7 | | <input type="checkbox"/> |
| 3 | | <input type="checkbox"/> |
| 3.3 | | <input type="checkbox"/> |
| 3.6 | D (± 0.5pF) | <input type="checkbox"/> |
| 3.9 | | <input type="checkbox"/> |
| 4 | | <input type="checkbox"/> |
| 4.3 | | <input type="checkbox"/> |
| 4.7 | | <input type="checkbox"/> |
| 5 | | <input type="checkbox"/> |
| 5.1 | | <input type="checkbox"/> |
| 5.6 | | <input type="checkbox"/> |
| 6 | | <input type="checkbox"/> |
| 6.2 | | <input type="checkbox"/> |
| 6.8 | | <input type="checkbox"/> |
| 7 | | <input type="checkbox"/> |
| 7.5 | | <input type="checkbox"/> |
| 8 | | <input type="checkbox"/> |
| 8.2 | | <input type="checkbox"/> |
| 9 | <input type="checkbox"/> | |
| 9.1 | <input type="checkbox"/> | |
| 10 | <input type="checkbox"/> | |

| Part number | | MCH03 |
|------------------|-----------------------------|--------------------------|
| Capacitance (pF) | Temperature characteristics | A (CG) (C0G) |
| | Rated voltage (V) | 25V |
| | Tolerance | |
| 11 | J (± 5%) | <input type="checkbox"/> |
| 12 | | <input type="checkbox"/> |
| 13 | | <input type="checkbox"/> |
| 15 | | <input type="checkbox"/> |
| 16 | | <input type="checkbox"/> |
| 18 | | <input type="checkbox"/> |
| 20 | | <input type="checkbox"/> |
| 22 | | <input type="checkbox"/> |
| 24 | | <input type="checkbox"/> |
| 27 | | <input type="checkbox"/> |
| 30 | | <input type="checkbox"/> |
| 33 | | <input type="checkbox"/> |
| 36 | | <input type="checkbox"/> |
| 39 | | <input type="checkbox"/> |
| 43 | | <input type="checkbox"/> |
| 47 | <input type="checkbox"/> | |

Product thickness (mm) 0.3±0.03

High dielectric constant

| Part number | | MCH03 | |
|------------------|-----------------------------|--------------------------|--------------------------|
| Capacitance (pF) | Temperature characteristics | CN (R) (B) (X7R) | FN (F) (Y5V) |
| | Rated voltage (V) | 25V | 25V |
| | Tolerance | K (±10%) | Z (+80, -20%) |
| 100 | | <input type="checkbox"/> | |
| 150 | | <input type="checkbox"/> | |
| 200 | | <input type="checkbox"/> | |
| 330 | | <input type="checkbox"/> | |
| 470 | | <input type="checkbox"/> | |
| 680 | | <input type="checkbox"/> | |
| 1,000 | | <input type="checkbox"/> | <input type="checkbox"/> |
| 1,500 | | <input type="checkbox"/> | |
| 2,200 | | | <input type="checkbox"/> |
| 4,700 | | | <input type="checkbox"/> |
| 10,000 | | | <input type="checkbox"/> |

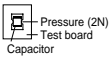

Product thickness (mm) 0.3±0.03

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Ceramic capacitors

● Characteristics

Class 1 (For thermal compensation)

| Temperature characteristics | | A (CG) (C0G) | Test methods/conditions (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 Measured at room temperature and standard humidity, 1000pF or less Measurement frequency : 1 ± 0.1MHz Measurement voltage : 1 ± 0.1Vrms. Over 1000pF Measurement frequency : 1 ± 0.1kHz Measurement voltage : 1 ± 0.1Vrms. |
| Dissipation factor (tanδ) | | 100/(400+20C)% or less: Less than 30 pF 0.1% or less : 30 pF or larger | |
| Insulation resistance (IR) | | 10,000MΩ or 500MΩ · μF, whichever is smaller | Based on paragraph 7.6 Measurement is made after rated voltage is applied for 60 ± 5s. |
| Withstanding voltage | | The insulation must not be damaged. | Based on paragraph 7.1 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. Apply 2N for 10 ± 1s in the direction indicated by the arrow.  |
| 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.  |
| | 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 Soldering temperature: 235 ± 5°C Soldering time : 2 ± 0.5s |
| Resistance to soldering heat | Appearance | There must be no mechanical damage. | Based on paragraph 8.14. Soldering temperature: 260 ± 5°C Soldering time : 5 ± 0.5s 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 Number of cycles : 5 Capacitance measured after 24 ± 2 hrs. |
| | 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 | |
| Humidity load test | Appearance | There must be no mechanical damage. | Based on paragraph 9.9 Test temperature: 40 ± 2°C Relative humidity: 90% to 95% Applied voltage : rated voltage Test time : 500 to 524 hrs. 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 Test temperature: Max. operating temp. Applied voltage : rated voltage × 200% Test time : 1,000 to 1,048 hrs. 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)

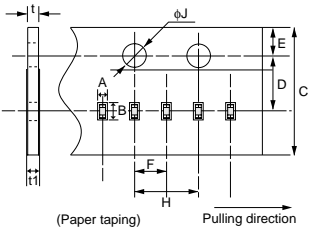
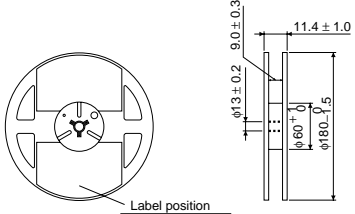
| Temperature characteristics | | CN (R) (B) (X7R) | FN (F) (Y5V) | Test methods/conditions (based on JIS C 5102) |
|------------------------------|----------------------------|---|---|---|
| Item | | | | |
| Operating temperature | | -55°C ~ +125°C | -30°C ~ +85°C | — |
| Nominal capacitance (C) | | Must be within the specified tolerance range. | | Based on paragraph 7.8 Measured at room temperature and standard humidity, Measurement frequency: 1 ± 0.1 kHz Measurement voltage : 1.0 ± 0.2 Vrms. |
| Dissipation factor (tanδ) | | 2.5% or less (when rated voltage is 16V: 3.5% or less) | 5.0% or less (when rated voltage is 16V: 7.5% or less) | |
| Insulation resistance (IR) | | 10,000MΩ or 500MΩ · μF, whichever is smaller | | Based on paragraph 7.6 Measurement is made after rated voltage is applied for 60 ± 5s. |
| Withstanding voltage | | The insulation must not be damaged. | | Based on paragraph 7.1 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. Apply 2N for 10 ± 1s in the direction indicated by the arrow.  |
| 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.  |
| | 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 Soldering temperature : 235 ± 5°C Soldering time : 2 ± 0.5s |
| Resistance to soldering heat | Appearance | There must be no mechanical damage. | | Based on paragraph 8. 14. Soldering temperature : 260 ± 5°C Soldering time : 5 ± 0.5s 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 Number of cycles : 5 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 Test temperature : 40 ± 2°C Relative humidity : 90% to 95% Applied voltage : rated voltage Test time : 500 to 524 hrs. 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 (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 Test temperature : Max. operating temp. Applied voltage : rated voltage × 200% Test time : 1,000 to 1,048 hrs. 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 (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 style="text-align: center;">(Paper taping) Pulling direction</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th>Symbol</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> <th>H</th> <th>J</th> <th>t</th> <th>t1</th> </tr> </thead> <tbody> <tr> <td>Dimensions</td> <td>8.0 ±0.3</td> <td>3.5 ±0.05</td> <td>1.75 ±0.1</td> <td>2.0 ±0.05</td> <td>4.0 ±0.1</td> <td>φ1.5 +0.1</td> <td>0.37 ±0.02</td> <td>0.5 MAX.</td> </tr> </tbody> </table> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th style="text-align: left;">Symbol</th> <th>A</th> <th>B</th> </tr> </thead> <tbody> <tr> <td>Size</td> <td></td> <td></td> </tr> <tr> <td>0603</td> <td>0.37±0.03</td> <td>0.67±0.03</td> </tr> </tbody> </table> | Symbol | C | D | E | F | H | J | t | t1 | Dimensions | 8.0 ±0.3 | 3.5 ±0.05 | 1.75 ±0.1 | 2.0 ±0.05 | 4.0 ±0.1 | φ1.5 +0.1 | 0.37 ±0.02 | 0.5 MAX. | Symbol | A | B | Size | | | 0603 | 0.37±0.03 | 0.67±0.03 | <p>φ180 mm plastic reel</p>  <p style="text-align: center;">Label position</p> |
| Symbol | C | D | E | F | H | J | t | t1 | | | | | | | | | | | | | | | | | | | | |
| Dimensions | 8.0 ±0.3 | 3.5 ±0.05 | 1.75 ±0.1 | 2.0 ±0.05 | 4.0 ±0.1 | φ1.5 +0.1 | 0.37 ±0.02 | 0.5 MAX. | | | | | | | | | | | | | | | | | | | | |
| Symbol | A | B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Size | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0603 | 0.37±0.03 | 0.67±0.03 | | | | | | | | | | | | | | | | | | | | | | | | | | |

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Ceramic capacitors

● Electrical characteristics

■ A (COG) Characteristics

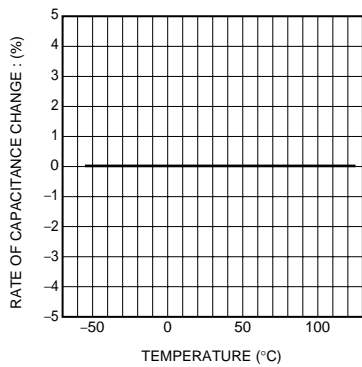


Fig.1 Capacitance-temperature characteristics

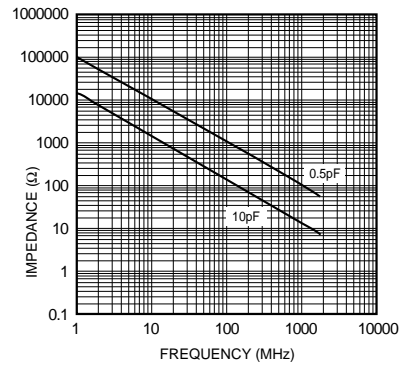


Fig.2 Impedance-frequency characteristics

■ CN (X7R) Characteristics

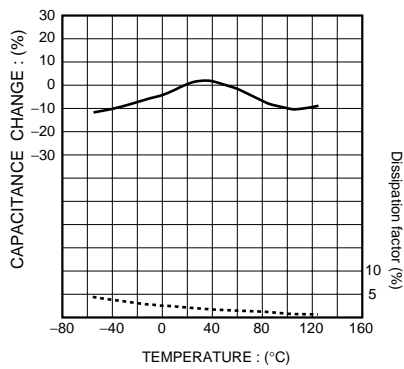


Fig.3 Capacitance-temperature characteristics

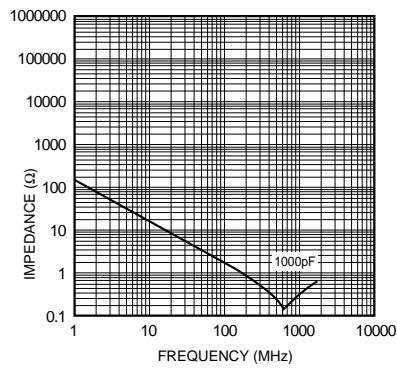


Fig.4 Impedance-frequency characteristics

■ FN (Y5V) Characteristics

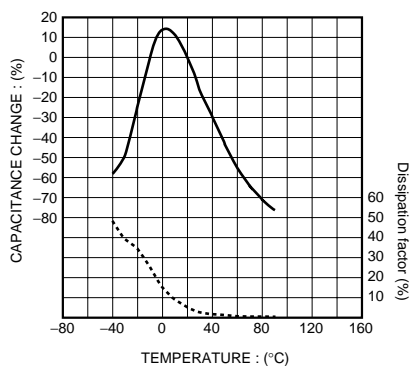


Fig.5 Capacitance-temperature characteristics

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