(1005 (0402)×2 size, chip capacitor networks)

MNA02

●Features

Two multi-layer ceramic capacitors are integrated on a single chip providing reduced cost and mounting space.

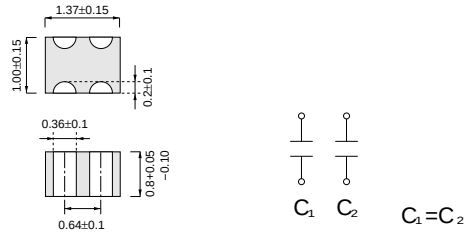
●Quick Reference

The design and specifications are subject to change without prior notice. Please check the most recent technical specifications prior to placing orders or using the product. For more detail information regarding packaging style code, please check product designation.

●High dielectric constant

Part No.	Size code	Temperature characteristics code		Operating temp. range (°C)	Rated voltage (V)	Capacitance(pF)	Capacitance tolerance	Thickness (mm)
MNA02	1005x2 (0402x2)	CN	±15% (X5R)	−25 to +85	6.3	1,000,000	M(±20%)	0.8+0.05 −0.10

●External dimensions (Unit : mm)



●Product designation

Code	Product thickness	Packaging specifications	Reel	Basic ordering unit(pcs.)
K	**0.8mm**	Paper tape(width 8 mm, pitch 4 mm)	φ180mm(7in.)	4,000

Reel(φ180mm) : compatible with EIAJ ET-7200A

Part No. **Packaging style**

M	N	A	0	2	8	C	N	1	0	5	M	K

Rated voltage

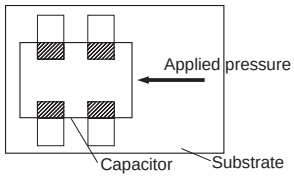
Code	Voltage
8	6.3V

Temperature characteristic code
:Refer to quick reference table.

Nominal capacitance	Capacitance tolerance	
	Code	tolerance
3-digit designation according to IEC	**M**	±20%

●Performance and test method

<table>
<tr><th>No.</th><th>Items</th><th>Performance</th><th>Test Method
(As per JIS C 5101-1, JIS C 5101-10)</th></tr>
<tr><td>1</td><td>Appearance and dimensions</td><td>No marked defects shall be allowed for appearance.
Dimensions shall be as specified the clause 4.</td><td>As per 4.4 of JIS C 5101-1.
As per 4.5 of JIS C 5101-10
Using a Magnifier.</td></tr>
<tr><td>2</td><td>Withstanding voltage</td><td>No dielectrical breakdown or other damage shall be allowed.</td><td>As per 4.6 of JIS C 5101-1.
As per 4.6.4 of JIS C 5101-10
Voltage shall be applied as per Table1.
Table 1
<table><tr><th>Characteristic</th><th>Voltage</th></tr><tr><td>CN</td><td>250% Rated voltage</td></tr></table>Voltage shall be applied for 1 to 5s with 50mA charging and discharging current.</td></tr>
<tr><td>3</td><td>Insulation resistance</td><td>Not less than 100MΩ・μF</td><td>As per 4.5 of JIS C 5101-1.
As per 4.6.3 of JIS C 5101-10
Measurements shall be made after 60+/–5s period of the rated voltage applied.</td></tr>
<tr><td>4</td><td>Capacitance</td><td>within +/–20%</td><td>As per 4.7 of JIS C 5101-1.
As per 4.6.1 of JIS C 5101-10
Measurements shall be made under the conditions specified in Table 2.
Table 2
<table><tr><th>Characteristic</th><th>Frequency・Voltage</th></tr><tr><td>CN</td><td>1+/–0.1kHz
1+/–0.1Vrms.</td></tr></table></td></tr>
<tr><td>5</td><td>Dielectric loss tangent</td><td>tan δ ≤ 10.0%</td><td>As per 4.8 of JIS C 5101-1.
As per 4.6.2 of JIS C 5101-10
Measurements shall be made under the conditions specified in Table 2.</td></tr>
<tr><td>6</td><td>Temperature characteristic</td><td><table><tr><th>Applied voltage</th><th>Capacitance</th><th>Temperature range</th></tr><tr><td>0Vdc</td><td>Within +/–15%</td><td>–55°C~ +85°C</td></tr><tr><td>0Vdc</td><td>Within +/–10%</td><td>–25°C~ +85°C</td></tr><tr><td>3.15 Vdc</td><td>Within +0/–30%</td><td>–25°C~ +85°C</td></tr></table></td><td>As per 4.24 of JIS C 5101-1.
As per 4.7 of JIS C 5101-10
If required, measurements shall be made at a given temperature.
Measurements shall be made under the conditions specified in Table 2.
Table 2
<table><tr><th>Characteristic</th><th>Frequency・Voltage</th></tr><tr><td>CN</td><td>1+/–0.1kHz
1+/–0.1Vrms.</td></tr></table></td></tr>
<tr><td>7</td><td>Solderability</td><td>More than 3/4 of each end termination shall be covered with new solder.</td><td>As per 4.15.2 of JIS C 5101-1.
As per 4.11 of JIS C 5101-10
The solder specified in JIS Z 3282 H63A shall be used. And the flux containing 25% rosin and ethanol solution shall be used.
The specimens shall be immersed into the solder at 235+/–5°C for 2+/–0.5s
So that both end terminations are completely under solder.</td></tr>
</table>

<table>
<tr><th>No.</th><th colspan="2">Items</th><th>Performance</th><th>Test Method
(As per JIS C 5101-1, JIS C 5101-10)</th></tr>
<tr><td rowspan="5">8</td><td rowspan="5">Resistance to soldering heat</td><td>Appearance</td><td>Without mechanical damage.</td><td rowspan="5">As per 4.14 of JIS C 5101-1.
As per 4.10 of JIS C 5101-10
The solder specified in JIS Z 3282. H63A shall be used.
The specimens shall be immersed into the solder at 260+/–5°C for 5+/–0.5s so that both end terminations are completely under the solder.
Pre-heating at 150+/–10°C for 1 to 2min
Initial measurements prior to test shall be performed after the thermal
Pre-conditioning specified in Remarks (1).
Final measurements shall be made after the specimens have been left at room temperature as per Table3.
Table 3
<table><tr><th>Characteristic</th><th>Time</th></tr><tr><td>CN</td><td>48+/–4 h</td></tr></table></td></tr>
<tr><td>Change rate from initial value</td><td>Within +/–7.5%</td></tr>
<tr><td>Dielectric loss tangent</td><td>Within specified initial value.</td></tr>
<tr><td>Insulation resistance</td><td>Within specified initial value.</td></tr>
<tr><td>Withstanding voltage</td><td>No defects shall be allowed.</td></tr>
<tr><td>9</td><td colspan="2">End termination adherence</td><td>Without peeling or sign of peeling shall be allowed on the end terminations.</td><td>As per 4.13 of JIS C 5101-1.
As per 4.8 ofJIS C 5101-10
A 2N weight for 10+/–1s shall be applied to the soldered specimens as shown by the arrow mark in the below sketch.
  </td></tr>
<tr><td>10</td><td>Bending strength</td><td>Appearance</td><td>Without mechanical damage.</td><td>As per 4.35 of JIS C 5101-1.
As per 4.9 of JIS C 5101-10
Glass epoxy board with soldered specimens shall be bent till 1mm by 1.0mm/s.</td></tr>
<tr><td rowspan="4">11</td><td rowspan="4">Vibration</td><td>Appearance</td><td>Without mechanical damage.</td><td rowspan="4">As per 4.17 of JIS C 5101-1.
The specimens shall be soldered on the specified test jig.
Initial measurements shall be made after the thermal pre-conditioning specified in Remarks(1).
Final measurements shall be made after the specimens have been left at room temperature as per Table3.
[Condition]
Directions : 2h each X, Y and Z directions
Total : 6h
Frequency range : 10 to 55 to 10Hz(1min)
Applitude : 1.5mm
(shall not exceed acceleration196m/s²)
Table 3
<table><tr><th>Characteristic</th><th>Time</th></tr><tr><td>CN</td><td>48+/–4 h</td></tr></table></td></tr>
<tr><td>Change rate from initial value</td><td>Within +/–7.5%</td></tr>
<tr><td>Dielectric loss tangent</td><td>Within specified initial value.</td></tr>
</table>

<table>
<tr><th>No.</th><th colspan="2">Items</th><th>Performance</th><th>Test Method
(As per JIS C 5101-1, JIS C 5101-10)</th></tr>
<tr><td rowspan="5">12</td><td rowspan="5">Temperature cycling</td><td>Appearance</td><td>Without mechanical damage.</td><td rowspan="5">As per 4.16 of JIS C 5101-1
As per 4.12 of JIS C 5101-10
The specimens shall be soldered on the test jig shown in Remarks.
Temperature cycle : 100cycles Initial measurements prior to test shall be performed after the thermal per-conditioning specified in Remarks (1).
Final measurements shall be made after the specimens have been left at room temperature as per Table3.
Test condition
<table><tr><th>Step</th><th>Temp. (°C)</th><th>Time (min)</th></tr><tr><td>1</td><td>Min operating temp.</td><td>30+/−3</td></tr><tr><td>2</td><td>Room temp.</td><td>≤3</td></tr><tr><td>3</td><td>Max operating temp.</td><td>30+/−3</td></tr><tr><td>4</td><td>Room temp.</td><td>≤3</td></tr></table>Table 3
<table><tr><th>Characteristic</th><th>Time</th></tr><tr><td>CN</td><td>48+/−4 h</td></tr></table></td></tr>
<tr><td>Change rate from initial value</td><td>Within +/−15.0%</td></tr>
<tr><td>Dielectric loss tangent</td><td>Within specified initial value.</td></tr>
<tr><td>Insulation resistance</td><td>Within specified initial value.</td></tr>
<tr><td>Withstanding voltage</td><td>No defects shall be allowed.</td></tr>
<tr><td rowspan="4">13</td><td rowspan="4">Humidity (Steady)</td><td>Appearance</td><td>Without mechanical damage.</td><td rowspan="4">As per 4.22 of JIS C 5101-1
As per JIS C 5101-10
Test temperature : 60+/−2°C
Relative humidity : 90 to 95%
Test time : 500 +24/−0 h
Initial measurements prior to test shall be made after the voltage pre-conditioning specified in Remarks (2).
Final measurements have been left at room temperature as per Table3.
Table 3
<table><tr><th>Characteristic</th><th>Time</th></tr><tr><td>CN</td><td>48+/−4 h</td></tr></table></td></tr>
<tr><td>Change rate from initial value</td><td>Within +/−25%</td></tr>
<tr><td>Dielectric tangent</td><td>Less than 200% of initial spec.</td></tr>
<tr><td>Insulation resistance</td><td>Not less than 10MΩ.</td></tr>
<tr><td rowspan="4">14</td><td rowspan="4">Humidity life test</td><td>Appearance</td><td>Without mechanical damage.</td><td rowspan="4">As per 4.22 of JIS C 5101-1
As per 4.14 of JIS C 5101-10
Test temperature : 60+/−2°C
Relative humidity : 90 to 95%
Voltage : Rated voltage
Test time : 500 +24/−0 h
Initial measurements prior to test shall be made after the voltage pre-conditioning specified in Remarks (2).
Final measurements shall be made after the specimens have been left at room temperature as per Table3.
Table 3
<table><tr><th>Characteristic</th><th>Time</th></tr><tr><td>CN</td><td>48+/−4 h</td></tr></table></td></tr>
<tr><td>Change rate from initial value</td><td>Within +/−25.0%</td></tr>
<tr><td>Dielectric loss tangent</td><td>Less than 200% of initial spec.</td></tr>
<tr><td>Insulation resistance</td><td>Not less than 5MΩ.</td></tr>
</table>

<table>
<tr><th>No.</th><th colspan="2">Items</th><th>Performance</th><th>Test Method
(As per JIS C 5101-1, JIS C 5101-10)</th></tr>
<tr><td rowspan="4">15</td><td rowspan="4">Heat life test</td><td>Appearance</td><td>Without mechanical damage.</td><td rowspan="4">As per 4.23 of JIS C 5101-1.
As per 4.15 of JIS C 5101-10

<table><tr><th>Test temperature</th><th>Voltage</th><th>Test time (h)</th></tr><tr><td>85°C</td><td>Rated voltage</td><td>1000 +48/–0</td></tr></table>
Initial measurements prior to test shall be made after the voltage pre-conditioning specified in Remarks (2).
Final measurements shall be made after the specimens have been left at room temperature

Table 3
<table><tr><th>Characteristic</th><th>Time</th></tr><tr><td>CN</td><td>48+/–4 h</td></tr></table></td></tr>
<tr><td>Change rate from initial value</td><td>Within +/–25.0%</td></tr>
<tr><td>Dielectric loss tangent</td><td>Less than 200% of initial spec.</td></tr>
<tr><td>Insulation resistance</td><td>Not less than 10MΩ.</td></tr>
</table>

[Remarks]

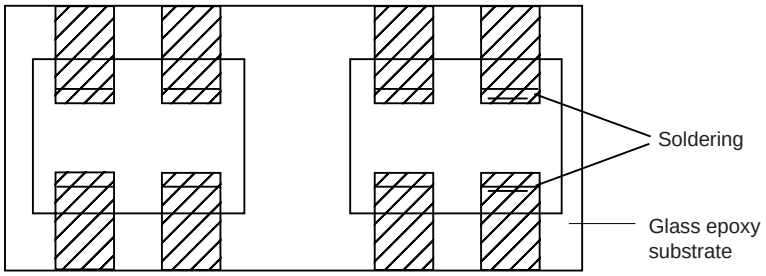
Pre-conditioning

If specified in test method of as per 3(Performance and test method), capacitors of CNcharacteristics shall be pre-conditionded as follows.

(1) Thermal pre-conditioning
Prior to initial measurements, specimens shall be conditioned at a temperature of 150 0/–10°C for a period of 1hr., and shall be allowed to stabilize at room temperature for 48+/–4h

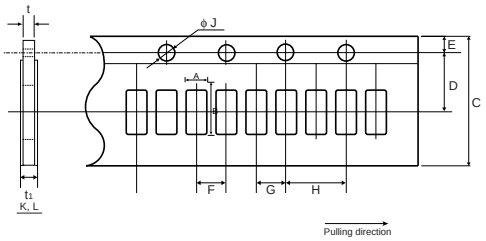
(2) Voltage pre-conditioning
Prior to initial measurements, voltage specified as a test condition shall be applied to specimens for a period of 1hr., and the specimens shall be allowed to stabilize at room temperature for 48+/–4h

<Test jig>



●Packaging specifications

Taping dimensions

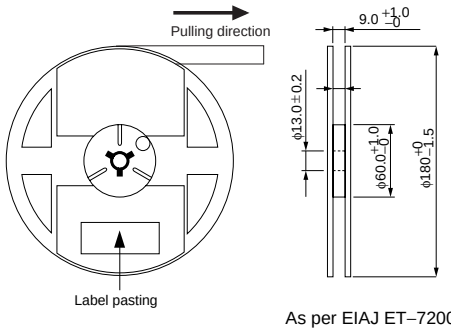


Symbol	C	D	E	F	G	H	J	t	t1
Dimensions	8.00 +/ −0.20	3.5 +/ −0.05	1.75 +/ −0.10	4.0 +/ −0.10	2.0 +/ −0.05	4.0 +/ −0.10	φ1.5 +0.1/ −0	0.95 +/ −0.05	1.05 MAX.

Style \ Symbol	A	B
MNA02	1.30+/−0.05	1.70+/−0.05

(Unit : mm)

Reel dimensions



As per EIAJ ET−7200A

(Unit : mm)

●Electrical characteristics curves

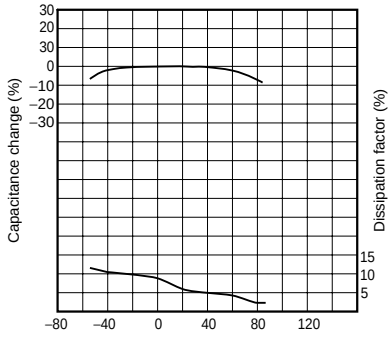


Fig.1 Temperature (°C)

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