

(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.

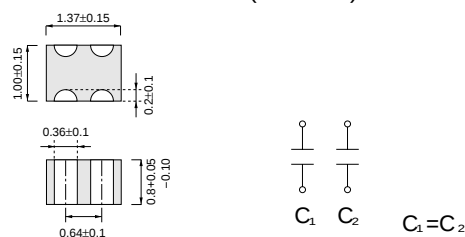
●Quick Reference

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		Operating temp. range (°C)	Rated voltage (V)	Capacitance(pF)	Capacitance tolerance	Thickness (mm)
		code						
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)



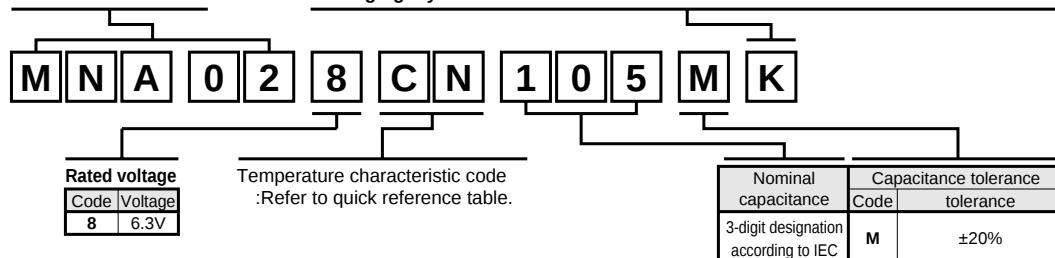
●Product designation

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

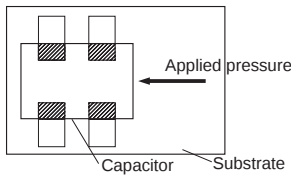


Ceramic capacitors

●Performance and test method

No.	Items	Performance	Test Method (As per JIS C 5101-1, JIS C 5101-10)																
1	Appearance and dimensions	No marked defects shall be allowed for appearance. Dimensions shall be as specified the clause 4.	As per 4.4 of JIS C 5101-1. As per 4.5 of JIS C 5101-10 Using a Magnifier.																
2	Withstanding voltage	No dielectrical breakdown or other damage shall be allowed.	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><td>Characteristic</td><td>Voltage</td></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.	Characteristic	Voltage	CN	250% Rated voltage												
Characteristic	Voltage																		
CN	250% Rated voltage																		
3	Insulation resistance	Not less than 100MΩ• μF	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.																
4	Capacitance	within +/-20%	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><td>Characteristic</td><td>Frequency • Voltage</td></tr><tr><td>CN</td><td>1+/-0.1kHz 1+/-0.1Vrms.</td></tr></table>	Characteristic	Frequency • Voltage	CN	1+/-0.1kHz 1+/-0.1Vrms.												
Characteristic	Frequency • Voltage																		
CN	1+/-0.1kHz 1+/-0.1Vrms.																		
5	Dielectric loss tangent	$\tan \delta \leq 10.0\%$	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.																
6	Temperature characteristic	<table><tr><td>Applied voltage</td><td>Capacitance</td><td>Temperature range</td></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>	Applied voltage	Capacitance	Temperature range	0Vdc	Within +/-15%	-55°C~+85°C	0Vdc	Within +/-10%	-25°C~+85°C	3.15 Vdc	Within +0/-30%	-25°C~+85°C	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><td>Characteristic</td><td>Frequency • Voltage</td></tr><tr><td>CN</td><td>1+/-0.1kHz 1+/-0.1Vrms.</td></tr></table>	Characteristic	Frequency • Voltage	CN	1+/-0.1kHz 1+/-0.1Vrms.
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Characteristic	Frequency • Voltage																		
CN	1+/-0.1kHz 1+/-0.1Vrms.																		
7	Solderability	More than 3/4 of each end termination shall be covered with new solder.	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.																

Ceramic capacitors

No.	Items		Performance	Test Method (As per JIS C 5101-1, JIS C 5101-10)				
8	Resistance to soldering heat	Appearance	Without mechanical damage.	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>	Characteristic	Time	CN	48+/-4 h
		Characteristic	Time					
		CN	48+/-4 h					
		Change rate from initial value	Within +/-7.5%					
		Dielectric loss tangent	Within specified initial value.					
Insulation resistance	Within specified initial value.							
Withstanding voltage	No defects shall be allowed.							
9	End termination adherence		Without peeling or sign of peeling shall be allowed on the end terminations.	As per 4.13 of JIS C 5101-1. As per 4.8 of JIS 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. 				
10	Bending strength	Appearance	Without mechanical damage.	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.				
11	Vibration	Appearance	Without mechanical damage.	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>	Characteristic	Time	CN	48+/-4 h
		Characteristic	Time					
		CN	48+/-4 h					
Change rate from initial value	Within +/-7.5%							
Dielectric loss tangent	Within specified initial value.							

Ceramic capacitors

No.	Items		Performance	Test Method (As per JIS C 5101-1, JIS C 5101-10)																					
12	Temperature cycling	Appearance	Without mechanical damage.	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><tr><th colspan="2">Table 3</th></tr><tr><th>Characteristic</th><th>Time</th></tr><tr><td>CN</td><td>48+/-4 h</td></tr></table>	Step	Temp. (°C)	Time (min)	1	Min operating temp.	30+/-3	2	Room temp.	≤3	3	Max operating temp.	30+/-3	4	Room temp.	≤3	Table 3		Characteristic	Time	CN	48+/-4 h
		Step	Temp. (°C)		Time (min)																				
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Table 3																									
Characteristic	Time																								
CN	48+/-4 h																								
Change rate from initial value	Within +/-15.0%																								
Dielectric loss tangent	Within specified initial value.																								
Insulation resistance	Within specified initial value.																								
Withstanding voltage	No defects shall be allowed.																								
13	Humidity (Steady)	Appearance	Without mechanical damage.	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>	Characteristic	Time	CN	48+/-4 h																	
		Characteristic	Time																						
		CN	48+/-4 h																						
		Change rate from initial value	Within +/-25%																						
Dielectric tangent	Less than 200% of initial spec.																								
Insulation resistance	Not less than 10MΩ.																								
14	Humidity life test	Appearance	Without mechanical damage.	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>	Characteristic	Time	CN	48+/-4 h																	
		Characteristic	Time																						
		CN	48+/-4 h																						
		Change rate from initial value	Within +/-25.0%																						
Dielectric loss tangent	Less than 200% of initial spec.																								
Insulation resistance	Not less than 5MΩ.																								

Ceramic capacitors

No.	Items		Performance	Test Method (As per JIS C 5101-1, JIS C 5101-10)										
15	Heat life test	Appearance	Without mechanical damage.	As per 4.23 of JIS C 5101-1. As per 4.15 of JIS C 5101-10 <table border="1"><tr><td>Test temperature</td><td>Voltage</td><td>Test time (h)</td></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 border="1"><tr><td>Characteristic</td><td>Time</td></tr><tr><td>CN</td><td>48+/-4 h</td></tr></table>	Test temperature	Voltage	Test time (h)	85°C	Rated voltage	1000 +48/-0	Characteristic	Time	CN	48+/-4 h
		Test temperature	Voltage		Test time (h)									
		85°C	Rated voltage		1000 +48/-0									
		Characteristic	Time											
		CN	48+/-4 h											
Change rate from initial value	Within +/-25.0%													
Dielectric loss tangent	Less than 200% of initial spec.													
Insulation resistance	Not less than 10MΩ.													

[Remarks]

Pre-conditioning

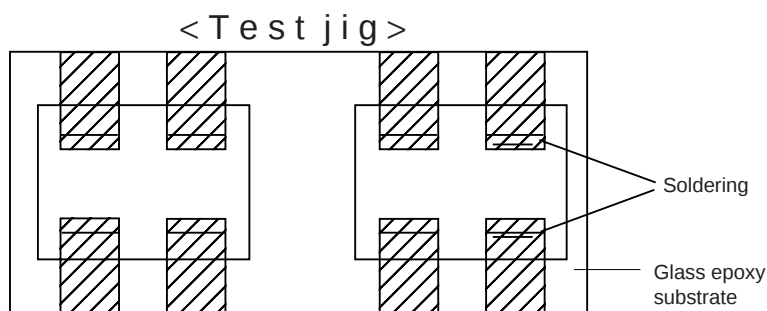
If specified in test method of as per 3(Performance and test method), capacitors of CN characteristics shall be pre-conditioned as follows.

(1) Thermal pre-conditioning

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

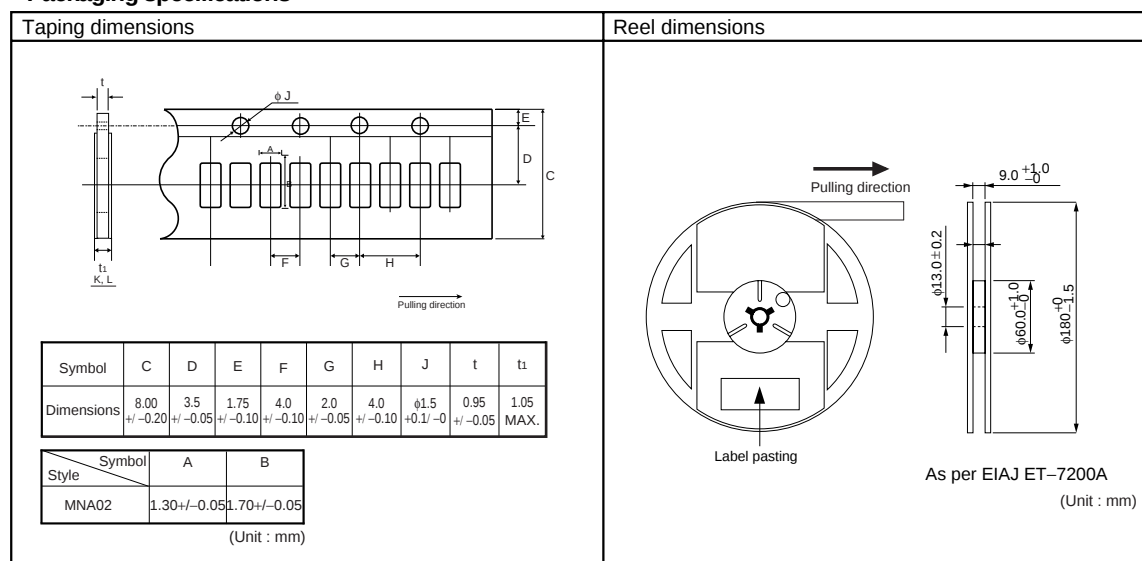
(2) Voltage pre-conditioning

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



Ceramic capacitors

●Packaging specifications



●Electrical characteristics curves

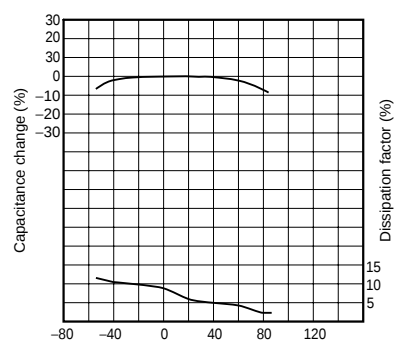


Fig.1 Temperature (°C)

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