Issue date: Aug.3, 2007

Specification No.
G070250J0028Z1

Multilayer ceramic capacitors

Specifications

Customer part No.

Nippon chemi-con part No.

Global code
KCD250E106M76A0B00

(Previous part No.)
TCD41E1E106M

Customer specification No.

Nippon Chemi-Con Corporation

Ceramic Capacitor
Design Group

Manager H. Kuwayama

In charge F. Haga

Receipt Stamp

1. Scope

This specification applies to fixed ceramic capacitors of following type used in electronic components.

Type : Resin dipped radial lead type multilayer ceramic capacitor TCD series.

RoHS compliant series.

2. Part Numbering system

2.1 Global code

K	CD	250	E	106	M	76	A0	B	00
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩

①Category : K=Multilayer ceramic capacitor

②Series code : CD=TCD series

③Rated voltage code : 250=25Vdc

Significant digit (two columns)+index (one column) unit:Vdc

250=25Vdc,500=50Vdc,101=100Vdc,251=250Vdc

④Temperature characteristics code : E=Y5U(EIA code)

⑤Rated Capacitance code : 106=10μF

Significant digit (two columns)+index (one column) unit:pF

⑥Capacitance tolerance code : M = ±20%

⑦Size code : 76 size

⑧Terminal code : A0=Straight CP wire

⑨Taping code : B=Bulk package

T=Taping package

⑩Supplement code : 00=Standard

2.2 Previous part number (Just for your reference)

TCD	41	E	1E	106	M	__
①	②	③	④	⑤	⑥	⑦

① Series name : TCD

② Size code : 41size

③ Temperature characteristics : Y5U(EIA)

④ Rated voltage : 25Vdc(1E)

⑤ Capacitance : 106=10μF

⑥ Capacitance tolerance : M=±20%

⑦ Package code : T=Taping package

None=Bulk package

3. Ratings

3.1Part Number

Global code	Previous part number	Remark
KCD250E106M76A0B00	TCD41E1E106M	Bulk
KCD250E106M76A0T00	TCD41E1E106MT	Taping

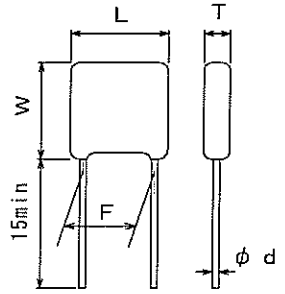
3.2Ratings

Rated voltage	25V d c (code:250)
Capacitance value	10μF (code:106)
Capacitance tolerance	M : ±20%
Temperature characteristics	Y5U(EIA)≒E(JIS) Maximum capacitance change -56 to +22% from the value at 20℃ over the temperature range -30～+85℃
Operating temperature	－55～＋125℃
Ripple current	1.5Arms 10kHz～1MHz、Sine wave Ripple voltage Vp+DC shall be less than the rated voltage

4. Dimensions

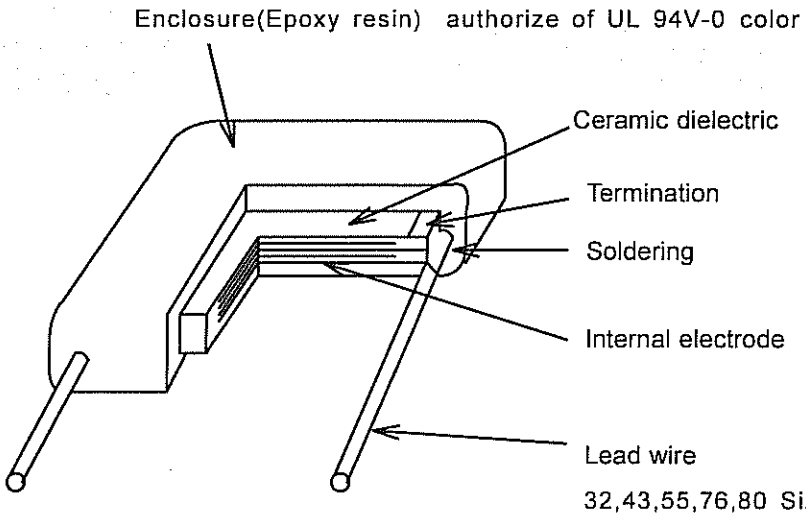
4.1 Capacitor dimensions (mm)

L	10.0 max.
W	11.5 max.
T	3.5 max.
F	5.0±0.8
φ d	0.5±0.05



5. Construction and Marking

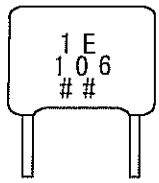
5.1 Construction



32,43,55,76,80 Size Tin plated CP wire
90,99 Size Tin plated Cu wire

5.2Marking

Marking to next subject on capacitors body

Rated voltage code: 1E	
Nominal capacitance code:106	
Lot number	

* Marking color: Black
* Rated voltage:1E=25Vdc,1H=50Vdc,2A=100Vdc,2E=250Vdc

6. Characteristics

Standard atmospheric condition

Unless otherwise specified. The standard range of atmospheric condition for making measurements and test is as follows:

Ambient temperature	15℃to 35℃
Relative humidity	45% to 75%
Air pressure	86kPa to 106kPa

If there are any doubt on the result, measurement shall be made within following limits.

Ambient temperature	25±2℃
Relative humidity	45% to 75%
Air pressure	86kPa to 106kPa

Preconditioning

Prior to measuring, the capacitor shall be subjected to the following preconditioning: 1 hour at 140 to 150℃ followed by 24±2 hours at standard atmospheric condition

<table>
<tr><th>No.</th><th>Items</th><th>Specifications</th><th>Conditions</th></tr>
<tr><td>1</td><td>Operating temperature</td><td>-55～+125℃</td><td></td></tr>
<tr><td>2</td><td>Withstanding Voltage between terminals</td><td>Without breakdown or other damage</td><td>250% of rated voltage for 1 to 5 seconds</td></tr>
<tr><td>3</td><td>Insulation resistance</td><td>More than 1000/C_R (MΩ) or 10000 (MΩ) whichever is less</td><td>Measurement shall be made after applying rated voltage for 1 minute</td></tr>
<tr><td>4</td><td>Capacitance and tolerance</td><td>Capacitance
±20% (M)
or +80,-20% (Z)</td><td>Measuring temperature 25±2℃
Measuring frequency 1 kHz±20%
Measuring voltage 1±0.2Vrms</td></tr>
<tr><td>5</td><td>Dissipation factor</td><td>Less than 2.5%</td><td>Same condition as those given for the measurement of capacitance</td></tr>
<tr><td>6</td><td>Temperature characteristic of capacitance</td><td>Capacitance change at -25℃and +85℃ shall be within +20% to -55% without DC bias, and +20% to -80% with applying 50% of rated voltage</td><td>Capacitance change is defined as following formula.
capacitance change = (c2-c1)/c1×100%
c1 :capacitance at 25℃
c2 :capacitance at -25℃and/or +85℃
The measurement shall be made only at the thermal equilibrium of each temperature steps</td></tr>
<tr><td>7</td><td>Robustness of Terminations</td><td>No visible damage</td><td>(1) Tension
The force applied shall be:
<table>
<tr><th>Lead Dia (mm)</th><th>Tensile(N)</th><th>Time (sec.)</th></tr>
<tr><td>0.5 max</td><td>5</td><td>10±1</td></tr>
<tr><td>0.6～0.8 max.</td><td>10</td><td>10±1</td></tr>
</table>
(2) Bending
Two consecutive bends shall be applied in each direction.
<table>
<tr><th>Lead Dia (mm)</th><th>Tensile(N)</th><th>Wait(kg)</th></tr>
<tr><td>0.5 max</td><td>2.5</td><td>0.25</td></tr>
<tr><td>0.6～0.8 max.</td><td>5</td><td>0.51</td></tr>
</table></td></tr>
</table>

※ C_R : Capacitance (μF)

No.	Items	Specification	Conditions
8	Vibration	Without damage such as break of the body and break or looseness of terminals. Capacitance and dissipation factor shall satisfy initial specified value.	Vibration frequency: 10Hz～55Hz 10Hz Vibration amplitude: 1.5mm Direction and time : 2 hours each to X,Y,Zaxis. Total 6 hours.
9	Solderability	More than 75% of terminals shall be covered with new solder	Temperature of solder: 235±5℃ Immersion time: 2±0.5 seconds Solder: H60A or H63A Flux: rosin of 25% ethanol solution Depth of immersion hrom the seating plane: 1.5~2mm
10	Resistance to soldering heat	Without mechanical damage. Disappearance of terminals shall not exceed 25% of sum of edge length. Capacitance change: compared with the value of before test shall be within ±15%. Dissipation factor:shall satisfy No.5. Insulation resistance:shall satisfy No.3. Withstanding voltage:shall satisfy No.2.	Temperature of solder: 350±10℃ Dipping time: 3±0.5 secondos Depth of immersion the seating Plane: 1.5~2mm, using a thermal Insulating screen of 1.5±0.5mm Thickness
11	Temperature cycle	Capacitance change: shall be within±20% between before and after test. Dissipation factor: less than 5%. Insulation resistance: More than 100/C_R (MΩ). or 1000(MΩ) whichever is less. Withstanding voltage: shall satisfy No.2.	The capacitor shall be subjected to 5 continuous cycles, each as shown in table below.

Step	Temp. (℃)	Time(min.)
1	-55±3	30 ± 3
2	standard condition	2 to 3
3	+125±3	30 ± 3
4	standard condition	2 to 3

12	Humidity (Steady state)	Appearance: without mechanical damage. Capacitance change: shall be within ±20% between before and after test. Dissipation factor: less than 5% Insulation resistance: more than 50/C_R (MΩ)or 1000(MΩ)whichever is less. Withstanding voltage: shall satisfy No.2	Temperature: 40±2℃ Humidity: 90 to 95%RH Testing time: 500+24,-0 hours Measurement shall be made, after specimen shall be subjected to standard condition for 2 to 24 hours.

※ C_R : Capacitance (μ F)

No.	Items	Specification	Conditions
13	Humidity load life	Appearance :without mechanical damage. Capacitance change : shall be within ±20% between before and after test. Dissipation factor : less than 5% Insulation resistance : more than 50/C_R (MΩ) or 1000 (MΩ) whichever is less. Withstanding voltage : shall satisfy No.2	Temperature: 40±2℃ Humidity: 90 to 95%RH Applying voltage: rated voltage Testing time: 500+24,-0 hours Measurement shall be made, after specimen shall be subjected to standard condition for 2 to 24 hours.
14	Load life (1) at 85℃	Appearance: without mechanical damage. Capacitance change: shall be within ±20% between before and after test. Dissipation factor: less than 5% Insulation resistance :more than 100/C_R (MΩ) or 1000 (MΩ) whichever is less. Withstanding voltage : shall satisfy No.2	Temperature: 85 ±2℃ Applying voltage: 200% of rated voltage Testing time: 1000 +48,-0 hours Measurement shall be made, after specimen shall be subjected to standard condition for 2 to 24 hours.
15	Load life (2) at 125℃	Same as No.14	Temperature: 125±3℃ Applying voltage: 100% of rated voltage Testing time: 1000 +48,-0 hours Measurement shall be made, after specimen shall be subjected to standard condition for 2 to 24 hours.
16	Solvent resistance of the marking	No visible damage.	Solvent : Isopropyl alcohol Temperature of solvent : 20~25℃ immersion time : 30±5sec.

※ C_R : Capacitance (μF)

7. Taping

Taping applied to 32,43,55 and 76 sizes. Ammo packaging.

7.1 Taping Construction and Dimensions

Refer to Attachment 1.

7.2 Tolerance of Packing Quantity

A tolerance of a packing quantity shall be within -0,+5 pieces.

7.3 Missing Parts

Missing parts shall not exceed three pieces, seven pitches, in series.

7.4 Patching of Pasteboard

A pasteboard may be connected when there are many missing parts or a pasteboard is broken. It may be with four pieces of staples as shown in figure 1, or patching tapes may be stuck to both sides of a pasteboard as shown in figure 2. A point of the connection shall be a position that a part shall exist, and the part shall be missing.

figure 1

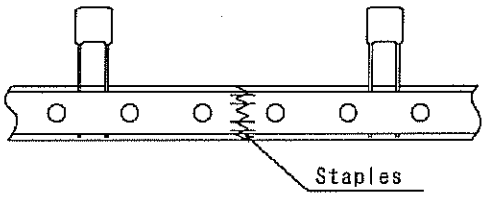
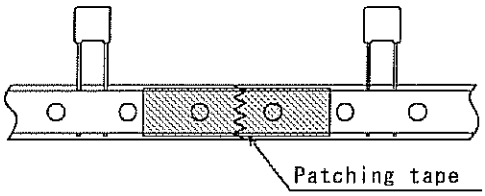


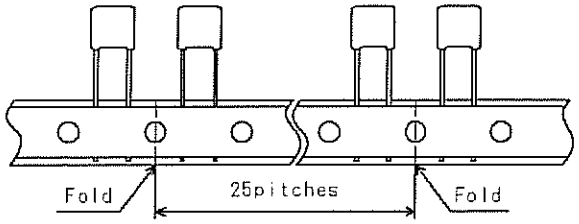
figure 2



7.5 Fold Position of Pasteboard

A fold position of a pasteboard shall be a center of a pitching hole as shown in figure 3.

figure 3



7.6 Packaging

7.6.1 Packing Method

(1) A pasteboard shall be made folds or dots in fixation interval, and it shall be packed into a carton.

(2) No insulation paper inserted.

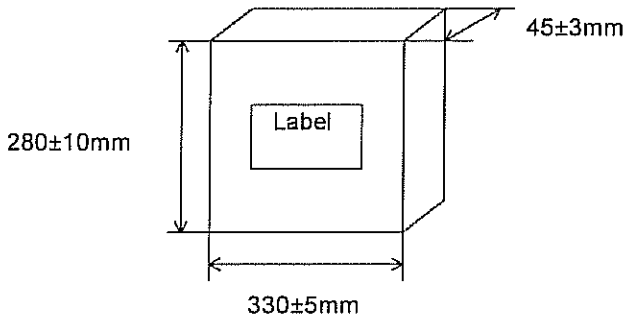
7.6.2 Termination of Taping

A pasteboard shall have 43±10 pitches of blanks at both termination.

7.6.3 Dimensions of Carton

Refer to figure 4

figure 4



7.6.4 Packing quantity

size code	Quantity per packaging
32	2000
43	2000
55	2000
76	1500

7.7 Others

Conform JIS C 0805

8 Labels

A label shall be stuck on a carton or bag with following information.

(1) Part number

(2) Lot number

(3) Quantity

(4) Company logotype

9. Storage

In order to maintain good solderability, the following matters should be kept.

(1) Avoid high temperature and humidity. The storage atmospheric conditions are as follows.

Temperature: lower than 40℃

Humidity : lower than 70%RH

(2) Do not store in the atmosphere containing sulphur or chlorine.

10. Cautions on handling ceramic capacitors.

Please do not apply excessive stress, especially to large size products as it may cause cracks in ceramic capacitor element.

It is recommended that possibly damaged capacitors caused by excessive stress are not be used.

11. Application information for soldering.

Due to the nature of ceramic, radical heating or cooling and partial heating may crack to the capacitor element. Please have enough pre-heating before soldering.

(1) Soldering flux: Please use rosin based flux. Do not use strong acid type.

(2) Cleaning : Cleaning solvents such as washing lotion.
Ultrasonic wave cleaning time shall be five minutes maximum.

12. Precautions to User for Multilayer Ceramic Capacitors

12.1 In designing device circuits

(1) Confirming the installation and operating environment of capacitors, use them within the rated performance limits prescribed in their product specifications.
Otherwise, excessive use conditions cause the capacitors to hove catastrophic failure such as short circuit, open circuit or firing.

(2) Consult us for devices that requires high reliability. For components which are used to the devices whose failure affects human life or causes social loss by serious damage, higher reliable designs than general purpose components are required.

(3) Some types of capacitors change in capacitance as time passes by, and they may be not suitable for time constant circuits etc.

12.2 In designing pc boards

(1) For a leaded capacitor, design the pc board with the correct terminal hole space equal to the lead space of the capacitor.

(2) Warping the pc boards where surface mount capacitors were soldered may crack the capacitors.

12.3 Installation

(1) When installing leaded capacitors in the pc boards by means of an automatic insertion machine, minimize the mechanical shock applied to the capacitors by the lead clinch unit of the machine.

(2) Do not apply shock to the bodies of capacitors when installing on pc boards.

(3) Periodically maintain and inspect installation machines.

12.4 Soldering

(1) Use flux with a halogen content of less than 0.1wt.%. Do not use strong acid flux.

(2) Minimize a volume of flux to coat the pc board with.

(3) In the case that water-soluble flux was used, sufficiently wash the assembly boards.

(4) The iron tip temperature should be kept at 300℃and 3 seconds maximum.
It is important that the solder iron tip not touch the body.

12.5 Cleaning

(1) In the case that the assembly boards are washed, choose the appropriate cleaning agent for the washing purpose.

(2) To determine the cleaning conditions, make sure by means of the actual washing equipment that the performance of the capacitors is not affected.

12.6 Coating materials

(1) Before setting up coating conditions, make sure that the capacitors and devices are not affected by the coating materials.

(2) Confirm that harmful resolution or formation gasses are not generated from the coating materials during the curing process or by spontaneously leaving the coated assembly boards.

(3) Because a dip type capacitor uses resin as its exterior covering, do not expose the capacitor to high temperature exceeding the curing temperature of the exterior resin. If a coating materials is cured at higher temperatures than curing temperature of the exterior resin, the exterior resin will deteriorate resulting in the capacitor damage.

12.7 Handling

(1) When cutting off a multi-board to make individual units, curving or twisting the board may crack the capacitors.
Appropriate tools should be used to cut it off.

(2) Excessive mechanical shock to capacitors or their assembly boards may make the capacitors crack.

(3) Use leaded capacitors without bending their lead wires as much as possible.

(3) When inspecting each assembly board, do not distort the board by the pressure of check pins etc. Also, hold the board with supporting pins or appropriate tools to prevent the board from vibrating.

12.8 Storage

(1) Do not store and use capacitors in the following environment.
Water or salt water splashes, dew wets or toxic gasses (hydrogen sulfide, sulfurous acid, chlorine, ammonium) fills.

(2) Vibration or mechanical shock exceeding the limits prescribed in the product specifications.

(3) Do not store capacitors in places that direct sunlight pours down or dewy places.

For the details, refer to Guideline of notabilia for fixed multilayer ceramic capacitors for use in electronic equipment, EIAJ RCR-2335 issued by Electronic Industries Association of Japan.

Export Trade Control Ordinance
(To be complied for multilayer ceramic capacitors to be exported from japan)

1. Section 1 through 15 of Appendix Table 1 in Export Trade Control Ordinance

Item 41-4 in Section 2 of Appendix Table 1 (Section 49 in Chapter 1 of METI's Ordinance) and Item 7 in Section 7 of Appendix Table 1 (Section 6 in Chapter 6 of METI's Ordinance) state export regulations on pulse use capacitors (750V or higher) and high voltage use capacitors (5,000V or higher).
However, Multilayer ceramic capacitors are less than 750V in their voltage range, so that the regulations do not apply to the Multilayer ceramic capacitors.

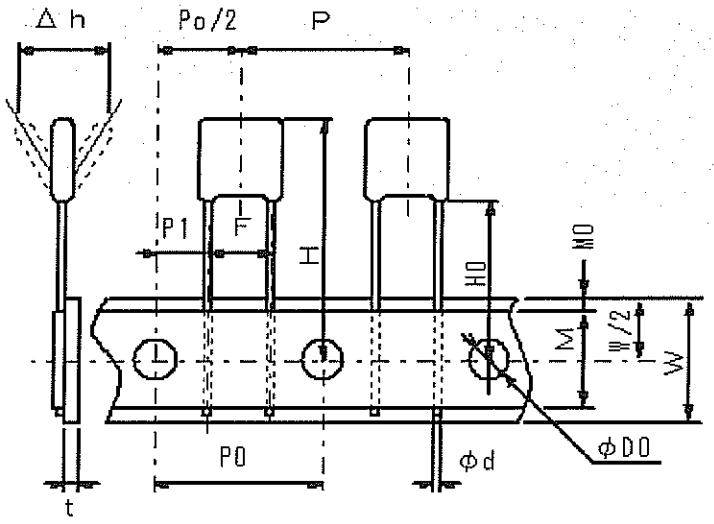
2. Section 16 of Appendix Table 1 in Export Trade Control Ordinance

Item 41 in Section 16 of Appendix Table 1 (Section 42 in Chapter 14 of METI's Ordinance) applies to pulse use capacitors or pulse generators. Since any capacitor, including Nippon Chemi-con's Multilayer ceramic capacitors, functions as pulse use, the Export Trade Control Ordinance applies export regulations to the Multilayer ceramic capacitors.

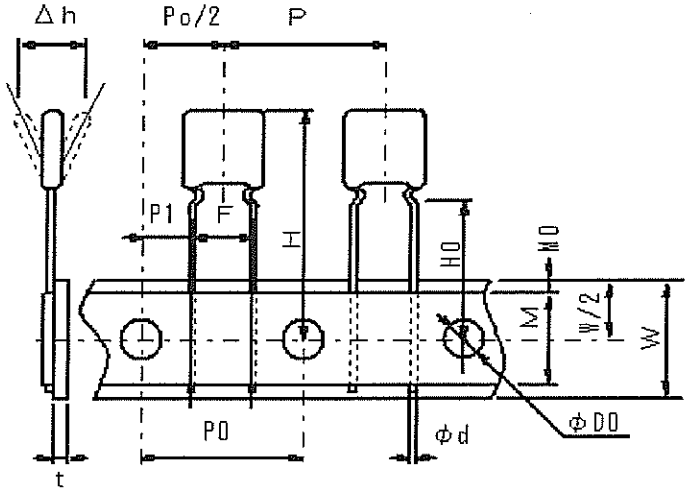
If an exporter has the information that his exporting goods are used to any development of extensive destructive weapons, the exporter must ask for exporting permission of the Ministry of Economy Trade and Industry (METI).
Regardless of the above, when the METI notified the exporter that his exporting goods are possibly used to any development of extensive destructive weapons and so forth, the exporter must ask for exporting permission of the METI. If receiving the notice form the METI, Nippon Chemi-con will inform your company of it.

Attachment 1

Straight lead



Crimped lead



code	P	P0	P1	P0/2	F	W	W/2	M	M0	H0	φD0
dim.	12.7	12.7	3.85	6.35	5.0	18.0	9.0	13.0	1.5	16.0	4.0
tol.	±1	±0.3	±0.7	±1.3	+0.8 -0.2	+1.0 −0.5	±0.5	±1	±1.5	min.	±0.2

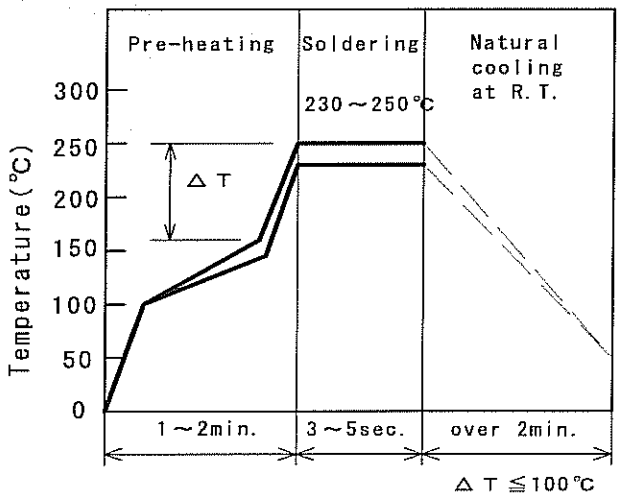
code	φ d	t	Δ h
dim.	0.5	0.6	0
tol.	±0.05	±0.2	±2

	H(mm)			
Size code	32	43	55	76
Straight	23max.	24max.	26max.	29max.
Crimped	25max.	26max.	28max.	30max.

Application information for soldering.

Due to the nature of ceramic, radical heating or cooling and partial heating may crack to the capacitor element. Please have enough pre-heating before soldering.

Flow soldering method : Recommended soldering profile is shown in the below figure.



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