

Document No.

MLCEE08043

Specifications

Date : 19.NOV.2007

Multilayer Ceramic Chip Capacitor NICKEL BASED ELECTRODES

Item

Multilayer Ceramic Capacitor Class II
(Equivalent to EIA : X7S) (CC1210)

1. Scope

This specification covers multilayer chip type ceramic capacitor (Pb-Free) for use (for reflow soldering) in electronic appliances and electric communication equipment.

2. Part Numbering System

Part number is indicated as follows:

Ni based electrodes: $\frac{T}{①}$ MK $\frac{325}{②}$ $\frac{C7}{③}$ Capacitance $\frac{226}{④}$ $\frac{M}{⑤}$ $\frac{-T}{⑥}$

① Rated voltage

Code	Voltage
T	25V

② Size (mm)

Code	Size
325	3.2×2.5

④ Tolerance

Code	Tolerance
M	±20%

⑥ Packaging

Packaging	Code
	-T
Taping	-P : 2.50(M) thickness products - 1000 pcs per reel.

Table—1③ Temperature Characteristic

Class II	Capacitance change rate	Temperature range	Reference temperature
C7(X7S)	±22%	-55~+125°C	25°C

⑤ Thickness code (Ni based electrodes)

Type	Thickness rank (mm)	Code
325	2.50	M

Multilayer Ceramic Chip Capacitor

3. Test Conditions

Standard test conditions shall be temperature of 5 to 35°C, relative humidity of 45 to 85% and air pressure of 86 to 106kPa. Test shall be conducted at temperature of 25±3°C, relative humidity of 60 to 70% and air pressure of 86 to 106kPa if test result is suspectable.

Unless otherwise specified, all tests shall be conducted under standard test conditions.

4. Construction, Dimensions and Performance

Details of construction, dimensions and performance shall be specified in the following pages.

5. Packaging

Packaging shall be made to avoid damages of capacitors during transportation or storage. And it shall be marked with part number, quantity, lot number and manufacturer's name on its appropriate position.

6. Manufacturing site

TAIYO YUDEN CO., LTD. (JAPAN)

TAIYO YUDEN (SARAWAK) SDN, BHD. (MALAYSIA)

KOREA KYONG NAM TAIYO YUDEN CO., LTD. (KOREA)

TAIYO YUDEN (GUANG DONG) CO., LTD. (CHINA)

TAIYO YUDEN (PHILIPPINES) INC. (PHILIPPINES)

7. Precautions

•Please refer to precautions in our general catalog prior to product usage.

If you need further information, please contact us.

•CAUTION: Contents of this specification cannot be assured with Sn-Zn lead-free solder usage.

Multilayer Ceramic Chip Capacitor

8. Storage conditions

- To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible.

- Recommended conditions

Ambient temperature: Below 30°C

Humidity: Below 70% RH

The ambient temperature must be kept below 40°C. Even under ideal storage conditions, capacitor electrode solderability decreases with time. Therefore ceramic chip capacitors should be used within 6 months from the time of delivery. If exceeding the above period, please check solderability before using the capacitors.

- The packaging material should be kept where no chlorine or sulfur exists in the air.

9. RoHS compliance

- This product conform to RoHS.
- "RoHS compliance" means that the product does not contain lead, cadmium, mercury, hexavalent chromium, PBB or PBDE referring to EU Directive 2002/95/EC, except other non-restricted substances or impurities which cannot be technically removed at refining process.

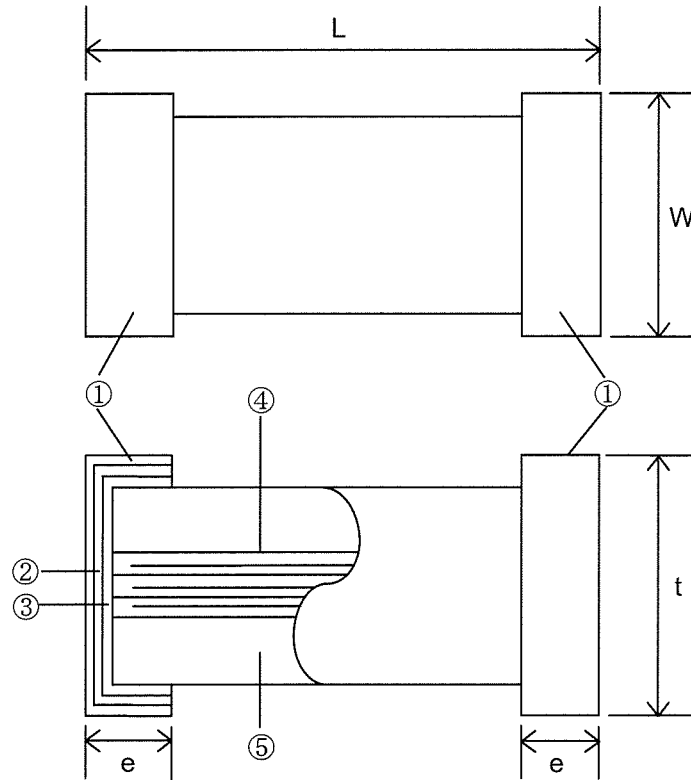
No.	Item	Specified Value	Remarks				
1	Operating Temperature Range	Capable of continuous operation under these conditions.	C7(X7S) : -55~+125°C				
2	Highest Operating Temperature	C7(X7S) : +125°C	Highest operation temperature shall be the highest ambient temperature of which component is capable of continuous operation under rated voltage application.				
3	Shape and Dimensions	Per Fig.1					
4	Heat Treatment		Initial value shall be measured after test sample is heat-treated at 150 +0/-10°C for an hour and kept at room temperature for 24±2hours.				
5	Voltage Treatment		Initial value shall be measured after test sample is voltage-treated for an hour at temperature and voltage which are specified as test conditions, and kept at room temperature for 24±2hours.				
6	Dielectric Withstanding Voltage (between terminals)	No abnormality	Conforming to EIA RS-198-D (1991). 250% of DC rated voltage shall be applied for 1 to 5 seconds. Charging and discharging current shall be 50mA or less.				
7	Insulation Resistance	500MΩ · μF min.	Conforming to EIA RS-198-D (1991). Voltage for the measurement shall be rated voltage and voltage applying time shall be 1 minute±5 seconds. Charging and discharging current shall be 50mA or less.				
8	Capacitance and Tolerance	22.0 μF M(±20%)	Conforming to EIA RS-198-D (1991). Heat treatment specified in No.4 of the specification shall be conducted prior to measurement. Measuring frequency and voltage shall conform to the table shown below. <table border="1" data-bbox="874 1189 1477 1261"> <thead> <tr> <th>Measuring Frequency</th> <th>Measuring Voltage</th> </tr> </thead> <tbody> <tr> <td>120Hz±10Hz</td> <td>0.5±0.1Vrms</td> </tr> </tbody> </table>	Measuring Frequency	Measuring Voltage	120Hz±10Hz	0.5±0.1Vrms
Measuring Frequency	Measuring Voltage						
120Hz±10Hz	0.5±0.1Vrms						
9	Dissipation Factor (DF)	5.0%max	Conforming to EIA RS-198-D (1991). Heat treatment specified in No.4 of the specification shall be conducted prior to measurement. Measuring frequency and voltage shall conform to the table shown below. <table border="1" data-bbox="874 1570 1477 1641"> <thead> <tr> <th>Measuring Frequency</th> <th>Measuring Voltage</th> </tr> </thead> <tbody> <tr> <td>120Hz±10Hz</td> <td>0.5±0.1Vrms</td> </tr> </tbody> </table>	Measuring Frequency	Measuring Voltage	120Hz±10Hz	0.5±0.1Vrms
Measuring Frequency	Measuring Voltage						
120Hz±10Hz	0.5±0.1Vrms						

No.	Item	Specified Value	Remarks
10	Temperature Characteristic	Within $\pm 22\%$	Conforming to EIA RS-198-D (1991). Heat treatment specified in No.4 of the specification shall be conducted prior to measurement. Maximum capacitance deviation in both (+) and (-) sides in range of lowest temperature to highest temperature for capacitor shall be indicated in ratio of variation in reference to capacitance value at reference temperature.
11	Adhesive Force of Terminal Electrodes	Terminal electrodes shall be no exfoliation or a sign of exfoliation.	Test sample shall be soldered to test board shown in Fig.2 and a force of 5N{0.51kgf} shall be applied in arrow direction for 30 ± 5 seconds.
12	Vibration	Initial performance shall be satisfied.	Conforming to EIA RS-198-D (1991). Test sample shall be soldered to board shown in Fig.2. Heat treatment specified in No.4 of the specification shall be conducted prior to test. Test conditions: Frequency range: 10~55Hz Overall amplitude: 1.5mm Sweeping method: 10~55~10Hz for 1 min. Each two hours in X,Y,Z direction: 6 hours in total

No.	Item		Specified Value	Remarks															
13	Resistance to Soldering Heat	Appearance	No abnormality	<p>Conforming to EIA RS-198-D (1991). Test sample shall be completely submerged in molten solder of $270 \pm 5^\circ\text{C}$ for 3 ± 0.5 seconds. Preheating as shown in the table below shall be continuously conducted before submersion and test sample shall be kept at normal temperature after test.</p> <table border="1"> <thead> <tr> <th>Sequence</th> <th>Temperature ($^\circ\text{C}$)</th> <th>Time (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>80~100</td> <td>5 to 10</td> </tr> <tr> <td>2</td> <td>150~200</td> <td>5 to 10</td> </tr> </tbody> </table> <p>Heat treatment specified in No.4 of the specification shall be conducted prior to test. Measurement shall be conducted after test sample is kept at room temperature for 24 ± 2 hours.</p>	Sequence	Temperature ($^\circ\text{C}$)	Time (min)	1	80~100	5 to 10	2	150~200	5 to 10						
		Sequence	Temperature ($^\circ\text{C}$)		Time (min)														
		1	80~100		5 to 10														
		2	150~200		5 to 10														
		Capacitance Change	Within $\pm 7.5\%$																
Dissipation Factor	Initial value shall be satisfied.																		
Insulation Resistance	Initial value shall be satisfied.																		
	Dielectric Withstanding Voltage (between terminals)	No abnormality																	
14	Solderability		More than 95% of terminal electrode shall be covered with fresh solder.	<p>【Eutectic】 Used solder shall be [JIS Z 3282 H60A or H63A]. Test sample shall be completely submerged in molten solder of $230 \pm 5^\circ\text{C}$ for 4 ± 1 seconds.</p>															
				<p>【Pb free】 Used solder shall be [Sn/3.0Ag/0.5Cu]. Test sample shall be completely submerged in molten solder of $245 \pm 3^\circ\text{C}$ for 4 ± 1 seconds.</p>															
15	Thermal Shock	Appearance	No abnormality	<p>Conforming to EIA RS-198-D (1991). Test sample shall be soldered to board shown in Fig.2. Heat treatment specified in No.4 of the specification shall be conducted prior to test. Test sample shall be kept for specified time at each of temperature in steps 1 to 4 shown below in sequence.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature ($^\circ\text{C}$)</th> <th>Time (min)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Lowest operating temperature</td> <td>30 ± 3</td> </tr> <tr> <td>2</td> <td>Normal temperature</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Highest operating temperature</td> <td>30 ± 3</td> </tr> <tr> <td>4</td> <td>Normal temperature</td> <td>2~3</td> </tr> </tbody> </table> <p>Temperature cycle shall be repeated five times in this method, and measurement shall be conducted after test sample is kept for 24 ± 2 hours.</p>	Step	Temperature ($^\circ\text{C}$)	Time (min)	1	Lowest operating temperature	30 ± 3	2	Normal temperature	2~3	3	Highest operating temperature	30 ± 3	4	Normal temperature	2~3
		Step	Temperature ($^\circ\text{C}$)		Time (min)														
		1	Lowest operating temperature		30 ± 3														
		2	Normal temperature		2~3														
		3	Highest operating temperature		30 ± 3														
4	Normal temperature	2~3																	
Capacitance Change	Within $\pm 7.5\%$																		
Dissipation Factor	Initial value shall be satisfied.																		
Insulation Resistance	Initial value shall be satisfied.																		
	Dielectric Withstanding Voltage (between terminals)	No abnormality																	

No.	Item	Specified Value	Remarks	
16	Humidity (Steady State)	Appearance	No abnormality	Conforming to EIA RS-198-D (1991). Test sample shall be at $40 \pm 2^{\circ}\text{C}$ with relative humidity of 90 to 95% for 500 +24/-0 hours. Heat treatment specified in No.4 of the specification shall be conducted prior to test. Measurement shall be conducted after test sample is kept for 24 ± 2 hours.
		Capacitance Change	Within $\pm 12.5\%$	
		Dissipation Factor	7.5%max	
		Insulation Resistance	$50\text{M}\Omega \cdot \mu\text{F min.}$	
17	High Temperature Loading	Appearance	No abnormality	Conforming to EIA RS-198-D (1991). Test sample shall be put in thermostatic oven with maximum temperature and 150% of DC rated voltage shall be continuously applied for 1000 +48/-0 hours Charging and discharging current shall be 50mA or less. Voltage treatment specified in No.5 of the specification shall be conducted prior to test. Measurement shall be conducted after test sample is kept for 24 ± 2 hours.
		Capacitance Change	Within $\pm 12.5\%$	
		Dissipation Factor	7.5%max	
		Insulation Resistance	$50\text{M}\Omega \cdot \mu\text{F min.}$	
18	Humidity Loading	Appearance	No abnormality	Conforming to EIA RS-198-D (1991). Test sample shall be put in thermostatic oven with $40 \pm 2^{\circ}\text{C}$ and relative humidity 90 to 95% and DC rated voltage shall be continuously applied for 500 +24/-0 hours. Charging and discharging current shall be 50mA or less. Voltage treatment specified in No.5 of the specification shall be conducted prior to test. Measurement shall be conducted after test sample is kept for 24 ± 2 hours.
		Capacitance Change	Within $\pm 15.0\%$	
		Dissipation Factor	7.5%max	
		Insulation Resistance	$25\text{M}\Omega \cdot \mu\text{F min.}$	
19	Bending Strength	Appearance	No abnormality	Test sample shall be soldered to test board as shown in Fig.3. Soldering shall be conducted with care of avoiding an abnormality such as heat shock. Deflection test is such that force to cause deflection as much as 1.0mm is applied for 10 seconds in method shown in Fig.4. Measurement shall be conducted with deflection of 1.0mm.
		Capacitance Change	Within $\pm 12.5\%$	

※ Fig.1 Shape and Dimensions



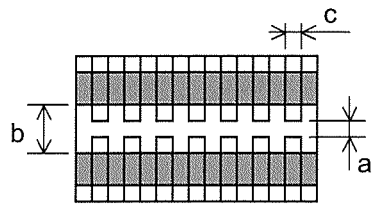
Ni Based Electrodes[Class II]

No.	Name	Material
①	Terminal Electrodes (Surface)	Sn Plating
②	Terminal Electrodes	Ni Plating
		Cu Plating
③	External Electrodes	Ni
④	Internal Electrodes	Ni
⑤	Dielectric	Barium titanate

Type	L	W	t	e
325	3.2 ± 0.3	2.5 ± 0.2	2.5 ± 0.2	0.6 ± 0.3

[Unit: mm]

Fig.2 Board / Test Jig of Adhesive Force of Terminal Electrodes, Vibration and Thermal Shock

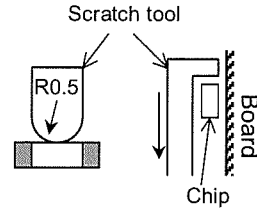


Size (L×W)	a	b	c
3.2×2.5	2.2	5.0	3.2

[Unit: mm]

Material: Glass epoxy board [JIS C 6484]

- Copper foil (Thickness: 0.035mm)
- Solder resist

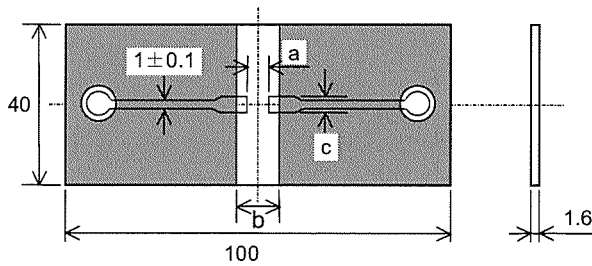


Cross Section

Remarks: Uniform soldering shall be conducted with solder (H60A or H63A in JIS Z 3282) by using an iron or soldering oven.

Soldering shall be conducted with care of avoiding abnormality such as heat shock.

Fig.3 Test Board



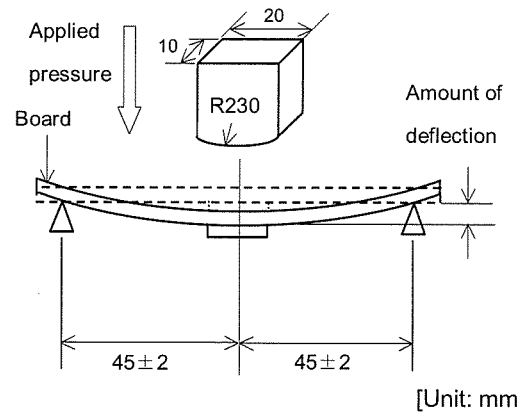
Material: Glass epoxy board [JIS C 6484]

- Copper foil (Thickness: 0.035mm)
- Solder resist

Size (L×W)	a	b	c
3.2×2.5	2.2	5.0	3.2

[Unit: mm]

Fig.4

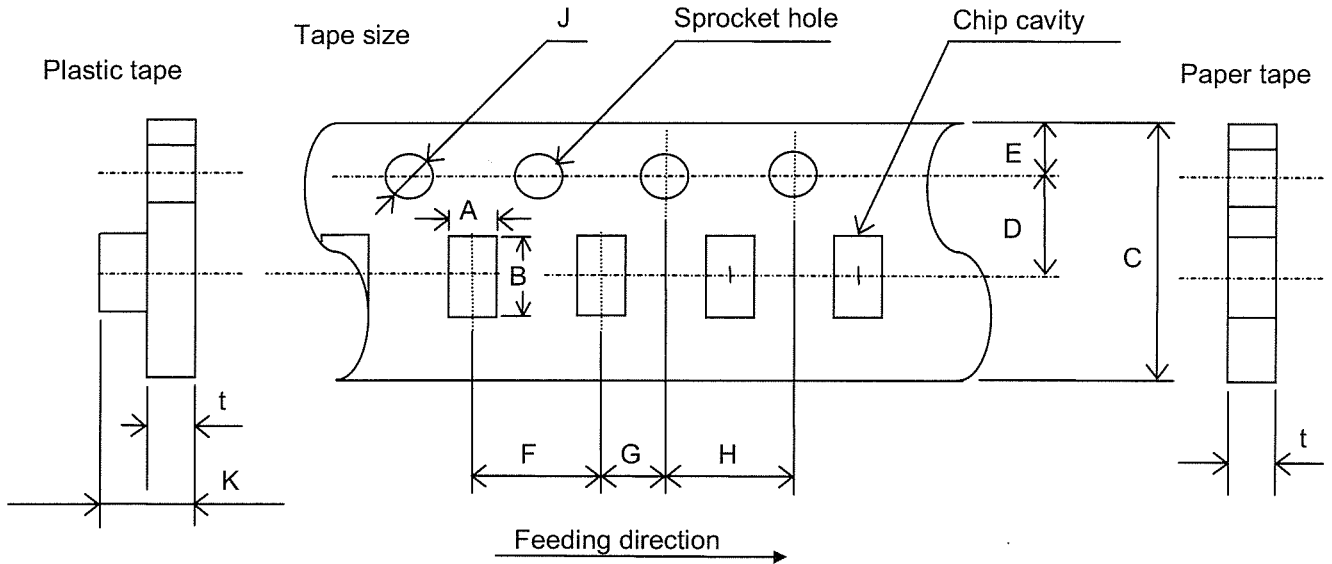


[Unit: mm]

Apply pressure at the rate of 0.5mm/sec. until amount of deflection reaches 1.0mm.

Tape Packaging (T) 107 · 212 · 316 · 325Type

◎In case of taping packing, paper tapes shall be used for 107 type product and product with 0.85mm thickness, plastic tapes shall be used for product with thickness rank of 1.15mm, 1.25mm, 1.5mm, 1.6mm, 1.9mm, 2.5mm 325 Type with 0.85mm rank thickness.



Dimensions※

Type	A	B
107	1.0±0.2	1.8±0.2
212	1.65±0.2	2.4±0.2
316	2.0±0.2	3.6±0.2
325	2.8±0.2	3.6±0.2

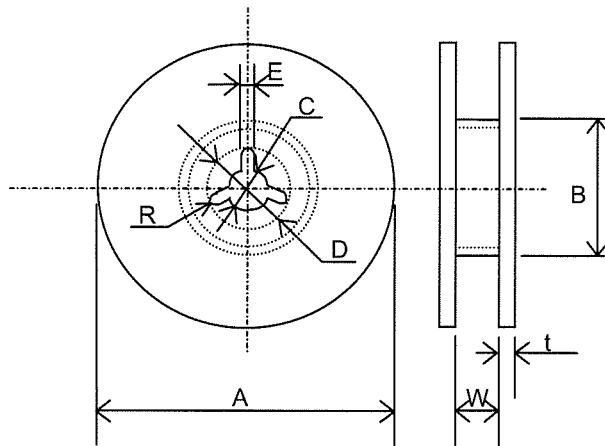
[Unit: mm]

Dimensions

Type	C	D	E	F	G	H	J	K※	t※
107~325	8.0±0.3	3.5±0.05	1.75±0.1	4.0±0.1	2.0±0.05	4.0±0.1	φ 1.5 +0.1/-0	- (Paper tape) 3.4 max	1.1 max (Paper tape) 0.6 max

※A, B, K, t : Sufficient clearance.

[Unit: mm]



Dimensions of Reel [Unit: mm]

Type	A	B	C	D	E	W	t	R
107~325	φ 178±2.0	φ 50 min	φ 13.0±0.2	φ 21.0±0.8	2.0±0.5	10.0±1.5	2.5max.	1.0

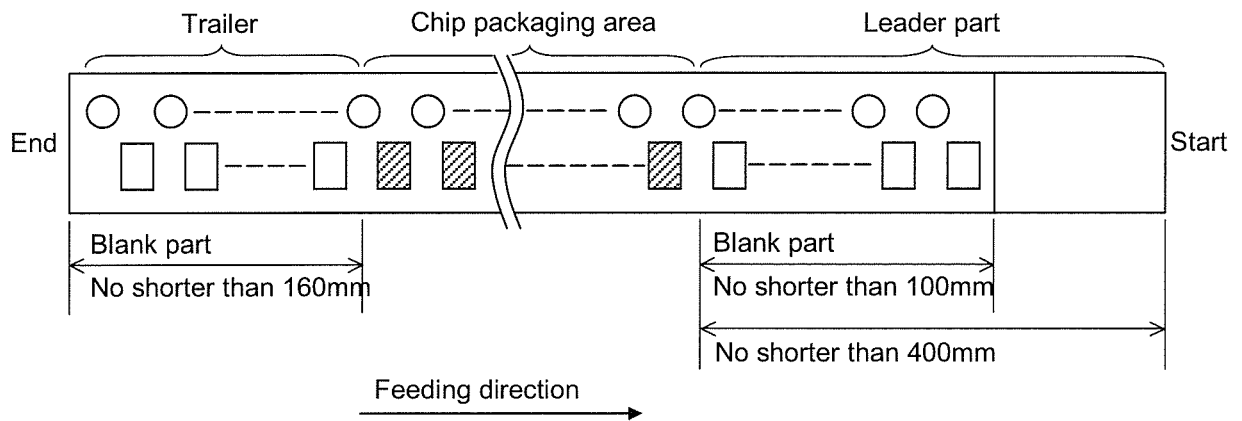
Tape Packaging (T) 107,212,316,325TYPE

1. Taping shall be right-sided wound. When the end is pulled out, sprocket hole will be at the right-hand side.
2. The "t" dimension axis and "W" dimension axis of the following components inserted in chip cavity shall be randomly perpendicular to tape face.

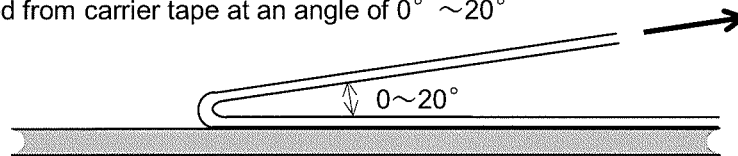
107(0603) type with 0.8mm rank thickness, 212(0805) type with 1.25mm rank thickness, 316(1206) type with 1.6mm rank thickness, 325(1210) type with 2.5mm rank thickness

3. For packaging chips by taping, blank spaces are provided on taping as shown in the figure.

- Leader part 400mm min.
- Leader part (Blank part) 100mm min.
- Trailer (Blank part) 160mm min.



4. Top tape, bottom tape of paper taping and the seal tape of plastic taping shall not be crossed over sprocket holes.
5. There shall no seam on paper tape and plastic tape.
6. Tensile strength of the tape shall be 5N(0.51kgf) or over.
7. Number of the chip missing at Chip packaging area shall be 1 piece maximum per reel.
8. Standard number of chips contained in a reel shall be per Table shown below.
9. Label indicating part No., quantity and control No. shall be attached to the outside of reel.
10. Peeling strength of seal tape (or top tape) shall be 0.1~0.7N (10.2~71.4gf) when seal tape (or top tape) is peeled from carrier tape at an angle of 0° ~20°



Quantity of taping package

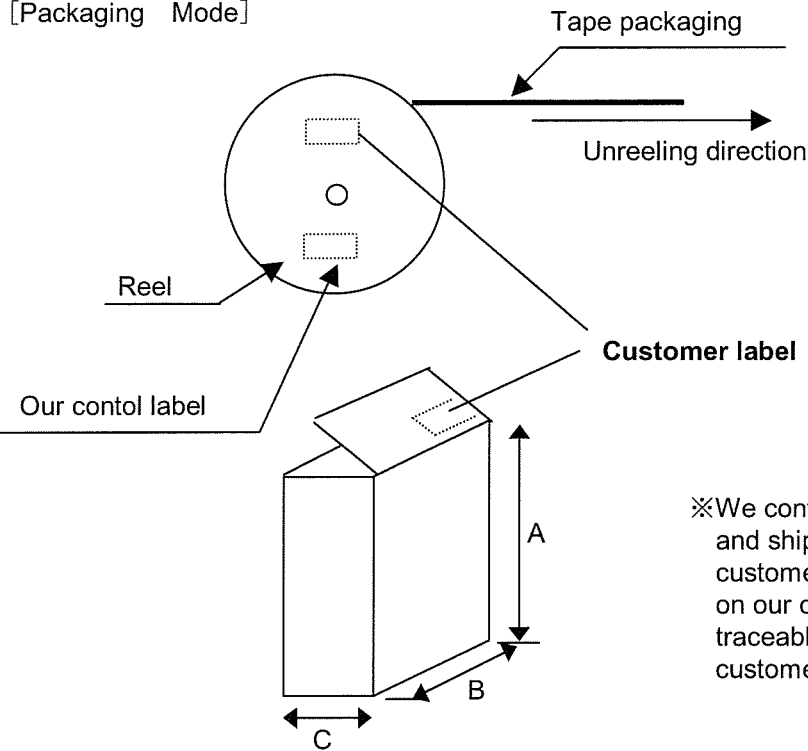
Type	Thickness (rank) Unit: mm	Quantity (pcs/reel)	Carrier tape
107	0.45(K)	4,000	paper
	0.80(A)		
212	0.45(K)	3,000	plastic
	0.85(D)		
316	1.25(G)	4,000	paper
	0.85(D)		
	1.15(F)		
	1.25(G)	3,000	plastic
	1.60(L)		
		2,000	

Type	Thickness rank Unit: mm	Quantity (pcs/reel)	Carrier tape
325	0.85(D)	2,000	plastic
	1.15(F)		
	1.50(H)		
	1.90(N)		
	1.9+0.1/-0.2(Y)		
	2.50(M)※	500or1000	

※For 325 type/2.50(M) thickness products, "-T" means 500 pcs per reel and "-P" means 1000 pcs per reel.

Tape Packaging (T) 107,212,316,325TYPE

[Packaging Mode]



Customer Label contents

1. Manufacture Name
2. Customer Parts No.
3. Our parts no.
4. Quantity
5. Control No.
(Shipping lot number) ※
6. Manufacturing site
MADE IN ○○○

※We control our products by control number, and shipping lot numbering is not marked on customer label. Shipping lot number is marked on our control label. Shipping lot number is traceable from our control number marked on customer label

[107,212,316,325]

Code	A	B	C	Reel
Size	190	185	70	5 reels max.
			140	10 reels max.

Material: Paper

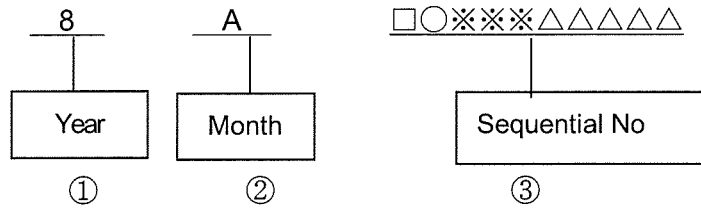
[Unit: mm]

(The size is only for reference.)

Packaging unit: Maximum 5 reels or 10 reels in a box

• To attach labels means that all products are passed.

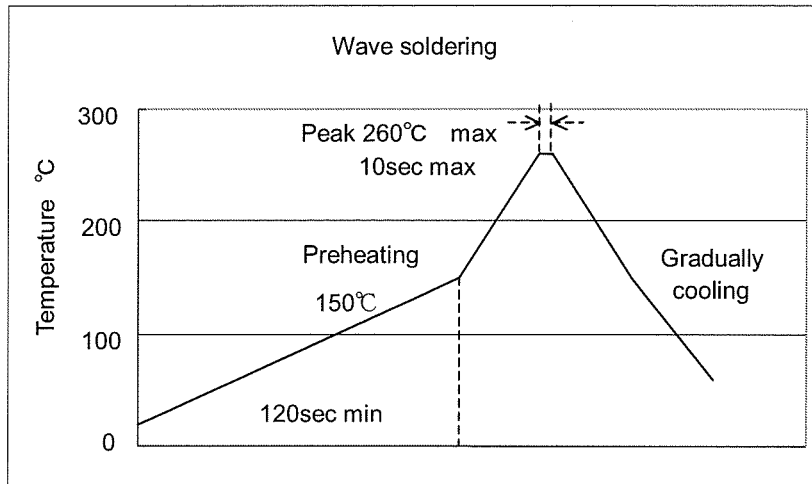
Shipping Lot No.



- ① First digit of manufactured year Example: 2008year → 8
- ② Manufactured month and its symbol are described in below table.
- ③ Sequential number is consist of alphabet, numeric and space.

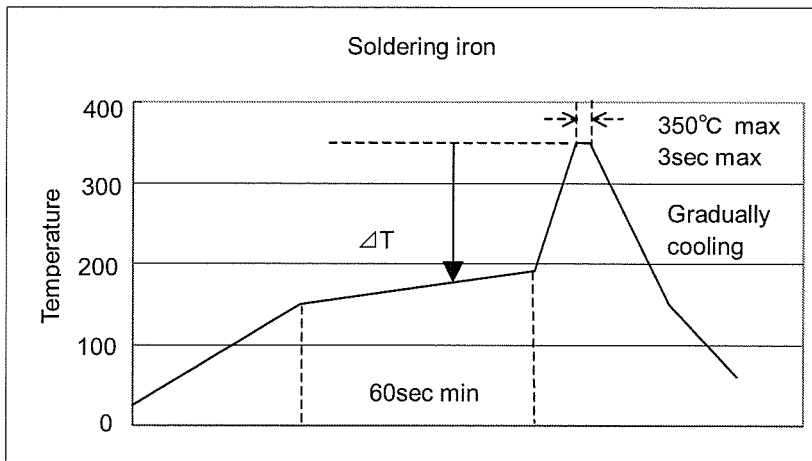
Month	1	2	3	4	5	6	7	8	9	10	11	12
Code	A	B	C	D	E	F	G	H	J	K	L	M

Recommended Soldering Profiles for Lead-free Solder Paste



※Ceramic chip components should be preheated to within **100 to 130°C** from the soldering temperature.

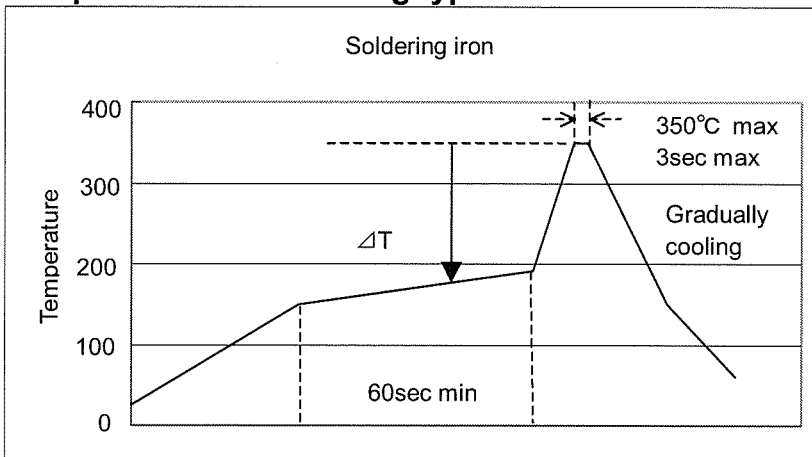
※Assured to be reflow soldering for **2 times**.



※Ceramic chip components should be preheated to within **100 to 130°C** from the soldering temperature.

※Assured to be wave soldering for **1 time**.

※**Except for reflow soldering type.**



※ $\Delta T \leq 190^\circ\text{C}$ (3216Type max) , $\Delta T \leq 130^\circ\text{C}$ (3225Type min)

※It is recommended to use 20W soldering iron and the tip is 1 ϕ or less.

※The soldering iron should not directly touch the components.

※Assured to be soldering iron for **1 time**.

Note: The above profiles are the maximum allowable soldering condition, therefore these profiles are not always recommended.

Operating conditions for guarantee of this product are as shown in the specification.

Please note that Taiyo Yuden Co., Ltd. shall not be responsible for a failure and/or abnormality which are caused by use under the conditions other than aforesaid operating conditions.

This product is developed, designed and intended for use in general electronics equipments. (for AV, household, office supply, information service, telecommunications, etc.). Before incorporating the components into any equipments in the field such as aerospace, aviation, nuclear control, submarine, transportation, (automotive driving and control, passenger protection, train control, ship control), transportation signal, disaster prevention, medical, public information network etc.

where higher safety and reliability are especially required, please contact Taiyo Yuden Co., Ltd. for more detail in advance.

And before incorporating the components or devices into the equipments not mentioned in the above, if there is possibility of direct damage or injury to human body, please contact Taiyo Yuden Co., Ltd. for more detail in advance.