To Digi key	Issue No. : UCH2003421
	Date of Issue : April 25. 2003
	Classification: ■ New □ Changed □ Revised

PRODUCT SPECIFICATION FOR INFORMATION

Product Description	:	Multilayer Ceramic Chip Capacitors
Product Part Number	:	ECJCV50J106M (0805 VA Type, Temp.Char.X5R) ECJDV50J106M (1206 VA Type, Temp.Char.X5R) ECJDV50J226M (1206 VA Type, Temp.Char.X5R)
Classification of Spec	:	Specifications
Applications	:	Consumer Type Electric Equipment For other applications contact our person signed below.
Term of Validity	:	April 24. 2008 from the date of issue

CUSTOMER USE ONLY	Receipt Record # :
This was certainly received by us. 1(one) copy is being returned to you.	Date of Receipt : Received by : Title: Dept :

Ceramic Business Unit
LCR Device Company
Matsushita Electronic Components Co., Ltd.
〒571-8506 1006 Kadoma, Osaka, Japan
Tel : Osaka (06) 6908-1101
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Prepared by	: EngineeringSection
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·This product has not been manufactured with any ozone depleting chemical controlled under the Montreal Protocol.

·All the materials used in this part contain no brominated materials of PBBOs or PBBs as the flame retardant.

·All the materials used in this part are registered material under the Law Concerning the Examination and Regulation of Manufacture, etc. of Chemical Substances.

CLASSIFICATION	SPECIFICATIONS	No. 151S-ECJ-KBD38E
SUBJECT	Multilayer Ceramic Chip Capacitor "12" (EIA 0805) VA Type Individual Specification	PAGE 1 of 1 DATE 23th Apr. 2003

1.Scope

This specification applies to MATSUSHITA'S Multilayer Ceramic Chip Capacitor "0805 VA Type" Temp. Char:X5R Rated voltage DC6.3V Nominal Cap.10μF.

2.Style and Dimensions

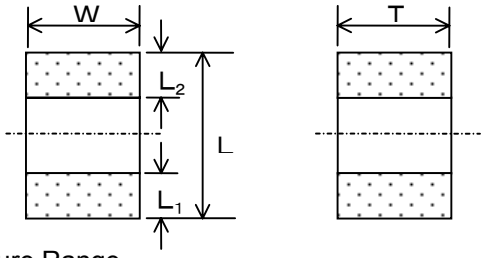


Table 1

Symbol	Dimensions(mm)
L	2.00±0.20
W	1.25±0.20
T	0.85±0.10
L1,L2	0.50±0.25

3. Operating Temperature Range

Table 2

	Temperature Characteristics	Operating Temp. Range.
Class2	X5R	-55 to +85°C

4. Individual Specification

Table 3

Part Number	Rated Voltage	Temp. Char.	Nominal Capacitance	Cap. Tolerance
ECJCV50J106M	D.C. 6.3V	X5R	10 μF	M : ±20%

5. Explanation of Part Numbers

E C J C V 5 0 J 1 0 6 M

E C J: Common Code

C: Size Code

Code	Size
C	0805 VA Type

V: Packaging Styles

Code	Packaging
V	φ180Reel Paper Taping 4000pcs

5: Temp. Char. (Show in Table 4)

0 J: Rated Voltage

Code	Voltage
0J	DC6.3V

1 0 6: Nominal Cap.

M: Cap. Tolerance Code (Show in Table 3)

6. Temperature Characteristics of Class 2 Capacitors

Table 4

Temp. Char. Code	Capacitance Change rate from Temperature.		Measurement Temperature Range	Reference Temperature
	Temp. Char.	Without voltage application		
5	X5R	+/-15%	-55 to +85°C	+25°C

7. Soldering method

Soldering method of Multilayer ceramic chip capacitor shall be reflow soldering.

Note :

Ceramic Business Unit LCR Device Company Matsushita Electronic Components Co.,Ltd. Kadoma, Osaka, Japan	APPROVAL	CHECK	DESIGN
	H.Itow	A.Omi	T.Senshu

CLASSIFICATION	SPECIFICATIONS	No. 151S-ECJ-KAD39E
SUBJECT	Multilayer Ceramic Chip Capacitor "13" (EIA 1206) VA Type Individual Specification	PAGE 1 of 1 DATE 23th Apr. 2003

1.Scope

This specification applies to MATSUSHITA'S Multilayer Ceramic Chip Capacitor "1206 VA Type" Temp. Char:X5R Rated voltage DC6.3V Nominal Cap.10μF,22μF.

2.Style and Dimensions

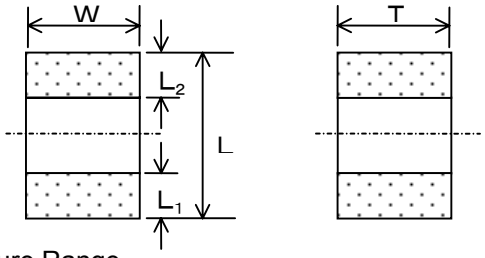


Table 1

Symbol	Dimensions(mm)
L	3.20±0.20
W	1.60±0.20
T	0.85±0.10
L1,L2	0.60±0.30

3. Operating Temperature Range

Table 2

	Temperature Characteristics	Operating Temp. Range.
Class2	X5R	-55 to +85°C

4. Individual Specification

Table 3

Part Number	Rated Voltage	Temp. Char.	Nominal Capacitance	Cap. Tolerance
ECJDV50J106M	D.C. 6.3V	X5R	10 μF	M : ±20%
ECJDV50J226M	D.C. 6.3V	X5R	22 μF	M : ±20%

5. Explanation of Part Numbers

E C J D V 5 0 J 1 0 6 M

E C J : Common Code

D : Size Code

Code	Size
D	1206 VA type

V : Packaging Styles

Code	Packaging
V	φ180Reel Paper Taping 4000pcs

5 : Temp. Char. (Show in Table 4)

0 J : Rated Voltage

Code	Voltage
0J	DC6.3V

1 0 6 : Nominal Cap.

M : Cap. Tolerance Code (Show in Table 3)

6. Temperature Characteristics of Class 2 Capacitors

Table 4

Temp. Char. Code	Capacitance Change rate from Temperature.		Measurement Temperature Range	Reference Temperature
	Temp. Char.	Without voltage application		
5	X5R	+/-15%	-55 to +85°C	+25°C

7. Soldering method

Soldering method of Multilayer ceramic chip capacitor shall be reflow soldering.

Note :

Ceramic Business Unit LCR Device Company Matsushita Electronic Components Co.,Ltd. Kadoma, Osaka, Japan	APPROVAL	CHECK	DESIGN
	H.Itow	A.Omi	T.Senshu

CLASSIFICATION	SPECIFICATIONS	No. 151S-ECJ-KZD38E
SUBJECT	Multilayer Ceramic Chip Capacitor	PAGE 1 of 7
	Common Specifications (Class2 Large Capacitance)	DATE 23th. Apr. 2003

1. Scope

This specification applies to MATSUSHITA'S Multilayer Ceramic Chip Capacitor "0805 ,1206 VA Type" Temp. Char: X5R Rated voltage DC6.3V.

If there is a difference between this common specification and any individual specifications, priority shall be given to the individual specifications

2. Applications

2.1 This product shall be used for general purpose applications required of consumer-type-electronic(audio visual, household, office, information & communication) equipment.

However, depending on ways of application there might be possibilities to accelerate the life-end as in failure modes of performance deterioration or short/open circuits.

Especially for such product design needed a high level of safety, a careful pre-study about how a single trouble with this product affects end product shall be recommended ;

Ex. ①ensure safety as a system by adding protective devices or circuits.

Ex. ②ensure safety as a system by adding a redundant-design circuits not to become unsafe because of a single trouble with this product..

Such failsafe-design considerations shall be practiced for a higher level of safety.

2.2 Whenever a doubt about safety arises from this product, please inform us immediately for technical consultation without fail.

2.3 For the following applications, please consult us for a different specification from this specification.

2.3.1 When it is considered hard to follow the instructions below for safety or handling.

2.3.2 Any applications where a trouble or erroneous operation with this product may cause directly or indirectly hazardous situations which could result in death or injury ;

Ex. ①Aircraft Equipment, Aerospace Equipment (artificial satellite, rocket, etc.)
②Submarine Equipment (submarine repeating equipment, etc.)
③The defense agency
④Transport Equipment (motor vehicles, airplane, trains, ship, traffic signal controllers)
⑤Power generation control Equipment
(atomic power, hydroelectric power, thermal power plant control system)
⑥Medical Equipment (life-support equipment, a pacemaker for the heart, dialysis controllers)
⑦Information processing Equipment (a large scale computer system)
⑧Electric Heating Appliances, Burning Apparatus
⑨Rotary Motion Equipment
⑩Security Systems
⑪an equivalent equipment above and so forth

3. Part Number Code

E C J	C	V	5	0 J	1 0 6	M
①	②	③	④	⑤	⑥	⑦

3.1 Common Code ①

ECJ : Multilayer Ceramic Chip Capacitors

3.2 Size②, Packaging Styls③. Temperature Characteristic④, Rated Voltage⑤, Capacitance Tolerance⑦

Shown in Individual Specification.

3.3 Nominal Capacitance⑥

The Nominal Capacitance value is expressed in Pico farads(pF) and is identified by a three-digit number ; the first two digit represent significant figures and the last digit specifies the number of zero to follow.

Symbol (Ex.)	Nominal Cap.
104	0.1μF
105	1μF
106	10μF

Note ;

Ceramic Business Unit LCR Device Company Matsushita Electronic Components Co.,Ltd. Kadoma, Osaka, Japan	APPROVAL	CHECK	DESIGN
	H.Itow	A.Omi	T.Senshu

4. Operating Temperature Range
Shown in Individual Specification.

5. Performance
The performance of the capacitor and its test condition shall be specified in Table 2.

5.1 Pretreatment
Before test and measurements, the following pretreatment shall be applied when necessary.

5.1.1 Heat Treatment
The capacitors shall be kept in a temperature of 150+0/−10℃ for 1 hour and then shall be stored in a room temperature for 48±4 hours, before initial measurement.

5.1.2 Voltage Treatment
A D. C. voltage shall be applied for 1 hour in the specified test condition and then shall be stored in a room temperature for 48±4 hours, before initial measurement.

6. Test
Unless otherwise specified, all test and measurements shall be made at a temperature of 15～35℃ and at a relative humidity of 45～75%.
If results obtained are doubted a further test should be carried out at a temperature of 20±2℃ and a relative humidity of 60～70%.

7. Structure
The structure shall be in a monolithic form as shown in Fig. 1.

Fig. 1

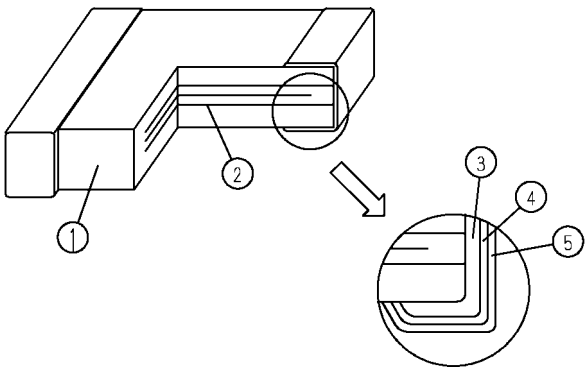


Table 1

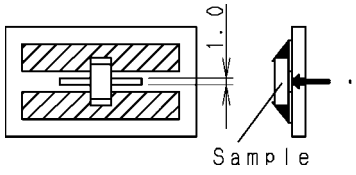
No.	Name
①	Dielectric
②	Inner electrode
③	Substrate electrode
④	Intermediate electrode
⑤	External electrode

8. Product Place
- Hokkaido Matsushita Electric Co., Ltd. / 1037−2, Kamiosatsu, Chitose−shi, Hokkaido, Japan
- Matsushita Electric Devices (M) Sdn. Bhd. / No.1 Jalan Pelga 16/13, 4000 Shah Alam, Selanger, MALAYSIA
- Tianjin Matsushita Electronic Component Co., Ltd. / S9 4TH Sub−street west Xiqing Economic Development Zone Tianjin

9. Receipt and Effective term of Specifications
(1) Please send back one copy of this specification after you stamp your company stamp in this specification. If you do not it back even if three months have passed after the issue date mentioned in the cover of this specification, we assume that the specification would be received.
(2) When either your company or our company has no offer by document until three months before the termination of the expiry date mentioned in the cover of this specification, the expiry date of this specification shall be continuously extended one more year every year.
In addition to the above, if revision is performed during effective term and you have confirmed, old specification shall be invalidity

Note ;

Table 2

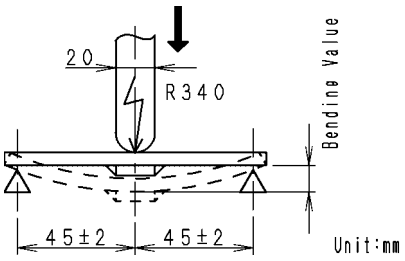
<table>
<tr><th>No.</th><th colspan="2">Contents</th><th>Performance</th><th>Test Method</th></tr>
<tr><td>1</td><td colspan="2">Appearance</td><td>There shall be no defects which affect the life and use.</td><td>With a magnifying glass (3 times).</td></tr>
<tr><td>2</td><td colspan="2">Dimensions</td><td>Shown in Individual Specification.</td><td>With slide calipers and a micrometer.</td></tr>
<tr><td>3</td><td colspan="2">Dielectric Withstanding voltage</td><td>There shall be no dielectric breakdown or damage.</td><td>Test voltage :
250% of rated voltage
Apply a D. C. voltage of the above value for 1 to 5 seconds.
Charge/discharge current shall be within 50mA.</td></tr>
<tr><td>4</td><td colspan="2">Insulation Resistance(I.R.)</td><td>More than 100/C MΩ.
(C : Rated Cap. in μF)</td><td>Measuring voltage : Rated voltage
Measuring voltage time : 60±5s
Charge/discharge current shall be within 50mA.</td></tr>
<tr><td>5</td><td colspan="2">Capacitance</td><td>Shall be within the specified tolerance.</td><td rowspan="2"><table><tr><th>Cap.</th><th>Measuring Frequency</th><th>Measuring Voltage</th></tr><tr><td>C≦10μF</td><td>1kHz±10%</td><td>1.0±0.2Vr.m.s.</td></tr><tr><td>C＞10μF</td><td>120Hz±20%</td><td>0.5±0.1Vr.m.s.</td></tr></table>For the class2 Capacitors, perform the heat treatment in par. 5. 1. 1.
Our Measurement instrument is shown in the Table 3.</td></tr>
<tr><td>6</td><td colspan="2">Dissipation Factor (tan δ)</td><td>0.15 max.</td></tr>
<tr><td>7</td><td>Temperature Characteris-tics</td><td>Without Voltage Appli-cation</td><td>Temp. Char. X5R : Within ±15%</td><td>Measure the capacitance at each stage by changing the temperature in the order of step 1 to 4 shown in the table below. Calculate the rate of change regarding the capacitance at stage 3 as the reference.<table><tr><th>Temp. Char.</th><th>X5R</th></tr><tr><td>Stage1</td><td>25±2</td></tr><tr><td>Stage2</td><td>-55±3</td></tr><tr><td>Stage3</td><td>25±2</td></tr><tr><td>Stage4</td><td>85±2</td></tr><tr><td>Stage5</td><td>25±2</td></tr></table><table><tr><th>Cap.</th><th>Measuring Frequency</th><th>Measuring Voltage</th></tr><tr><td>C≦10μF</td><td>1kHz±10%</td><td>0.5±0.1Vr.m.s.</td></tr><tr><td>C＞10μF</td><td>120Hz±20%</td><td>0.5±0.1Vr.m.s.</td></tr></table></td></tr>
<tr><td>8</td><td colspan="2">Adhesion</td><td>The terminal electrode shall be free from peeling or signs of peeling.</td><td>Solder the specimen to the testing jig shown in the figure., and apply a 5N force in the arrow direction for 10 seconds.
 

Material : Alumina board (95% min.) or glass epoxy board.
Thickness : 1.0mm min.</td></tr>
</table>

(continue)

Note ;

Table 2

No.	Contents		Performance		Test Method
9	Bending Strength	Appea-rance	There shall be no cracks and other mechanical damage.		After soldering capacitor on the substrate 1mm of bending shall be applied for 5 seconds. Bending speed : 1mm/s (shown in Fig. 3) 
		Capac-itance	X5R	Within ±12.5%	
10	Vibration Proof	Appea-rance	There shall be no cracks and other Mechanical damage.		For the class 2 Capacitors, perform the heat treatment in par. 5.1.1. Solder the specimen to the testing jig shown in Fig 2. Apply a variable vibration of 1.5mm total amplitude in the 10～55～10Hz vibration frequency range swept in 1 min. in 3 mutually perpendicular directions for 2 hours each, a total of 6 hours.
		Capac-itance	Shall be within the specified tolerance.		
		tan δ	Shall meet the specified initial value.		
11	Resistance to Solder Heat	Appea-rance	There shall be no cracks and other Mechanical damage.		(1)Solder both method Preconditioning : Heat Temperature (See 5.1.1)/Class2 Solder temperature : 270±5℃ Dipping period : 3±0.5s Preheat condition
		Capac-itance	Characteristic	Change from the value before test.	
			X5R	Within ±12.5%	
		tan δ	Shall meet the specified initial value.		
		I.R.	Shall meet the specified initial value.		
		With-stand voltage	There shall be no dielectric breakdown or damage.		Use solder H63A(JIS-Z-3282).For the flux, use rosin (JIS-K-5902) ethanol solution of a concentration of about 25% by weight. Use tweezers for the holder to dip the specimen. Recovery : 48±4 hours

Order	Temp. (℃)	Period(s)	
		Type"12"	Type"13"
1	80 to 100	120 to 180	300 to 360
2	150 to 200	120 to 180	300 to 360

(continue)

Note ;

Table 2

No.	Contents		Performance		Test Method
12	Solderability		More than 75% of the soldered area of both terminal electrodes shall be covered with fresh solder.		Solder temperature : 230±5℃ Dipping period : 4±1s Dip the specimen in solder so that both terminal electrodes are completely submerged. Use solder H63A(JIS-Z-3282). For the flux use rosin (JIS-K-5902) of ethanol solution of a concentration of about 25% by weight. Use tweezers for the holder to dip the specimen.
13	Temperature cycle	Appea-rance	There shall be no mechanical damage.		Solder the specimen to the testing jig shown in Fig.2. Condition the specimen to each temperature from step 1 to 4 in this order for the period shown in the table below. Regard-ing this conditioning as one cycle, perform 5 cycles continuously.
		Capac-itance	Temp. Char.	Change from the value before test.	
			X5R	Within ±12.5%	
		tanδ	Shall meet the specified initial value.		
		I.R.	Shall meet the specified initial value.		
		With-stand voltage	There shall be no dielectric breakdown or damage.		

STEP	TEMPERATURE (℃)	PERIOD (min)
1	Minimum operation temperature±3	30±3
2	Room temperature	3 max.
3	Maximum operation temperature±5	30±3
4	Room temperature	3 max.

For the class2 capacitors, perform the heat treatment in par. 5.1.1.
Before the measurement after test, the specimen shall be left to stand at room temperature for the following period :
48±4 h

14	Moisture Resistance	Appea-rance	There shall be no mechanical damage.		For the class2 capacitors, perform the heat treatment in par. 5. 1. 1. Solder the specimen to the testing jig shown in Fig.2. Test temperature : 40±2℃ Relative humidity : 90 to 95% Test period : 500+24/0 h Before the measurement after test, the specimen shall be left to stand at room temperature for the following period : 48±4 h
		Capac-itance	Characteristic	Change from the value before test	
			X5R	Within ±20%	
		tanδ	0.25 max.		
		I.R.	More than 10/C MΩ. (C : Rated Cap. in μF)		

(continue)

Note ;

Table 2

No.	Contents		Perfomance		Test Method
15	Moisture Resistant Loading	Appea-rance	There shall be no mechanical damage.		For the class2 capacitors, perform the voltage reatment in par. 5. 1. 2. Solder the specimen to the testing jig shown in Fig 2. Test temperature : 40±2℃ Relative humidity : 90 to 95% Applied voltage : Rated Voltage (D. C. Voltage) Charge/discharge current shall be within 50mA Test period : 500+24/0 h Before the measurement after test, the specimen shall be left to stand at room temperature for the following period : 48±4 h
		Capac-itance	Characteristic	Change from the value before test.	
			X5R	Within ±20%	
		tan δ	0.25 max.		
		I.R.	More than 5/C MΩ. (C : Rated Cap. in μF)		
16	High Temperature Resistant Loading	Appea-rance	There shall be no mechanical damage.		For the class2 capacitors, perform the voltage treatment in par. 5.1.2. Solder the specimen to the testing jig shown in Fig 2. Test temperature : Max. Rated temp.±3℃ Applied voltage : Rated Voltage (D. C. Voltage) Charge/discharge current shall be within 50mA. Test period : 1000+48/0 h Before the measurement after test, the specimen shall be left to stand at room temperature for the following period : 48±4 h
		Capac-itance	Characteristic	Change from the value before test.	
			X5R	Within ±20%	
		tan δ	0.25 max.		
		I.R.	More than 10/C MΩ. (C : Rated Cap. in μF)		

When uncertainty occurs in the weather resistance characteristic tests (temperature cycle, moisture resistance, moisture resistant loading, high temperature resistant loading), the same tests shall be performed for the capacitor itself.

Note ;

Table 3

	OUR STANDARD MEASURING INSTRUMENT
MEASURING INSTRUMENT	・C≦10μF 4278A 1kHz/1MHz CAPACITANCE METER (Hewlett-Packard Co.) ・C＞10μF 4284A PRECISION LCR METER (Hewlett-Packard Co.)
MEASURING MODE	PARALLEL MODE
RECOMMENDED MEASURING JIG (Note)	HP 16034E TEST FIXTURE (Hewlett-Packard Co.)

Note : A sample capacitor shall be fitted with a measuring jig terminal center shaft.

Fig. 2 Testing jig

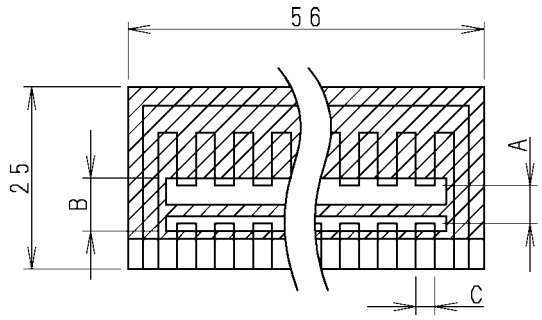


Table 4

SHAPE [EIA]	A	B	C
Type 13 [1206]	2.2	5.0	2.0
Type 12 [0805]	1.2	4.0	1.65

Unit : mm

Material : Glass epoxy board

Thickness : 1.6mm

: Copper foil (0.035mm thick)

: Solder resist

Fig. 3 Testing jig

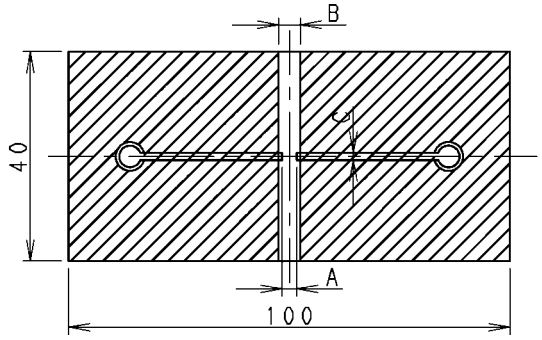


Table 5

SHAPE [EIA]	A	B	C	BOARD THICK-NESS
Type 13 [1206]	2.2	5.0	2.0	1.6
Type 12 [0805]	1.2	4.0	1.65	1.6

Unit : mm

Material : Glass epoxy board

: Copper foil (0.035mm thick)

: Solder resist

Note ;

1. Cautions on Operation

⚠ If a chip stacked ceramic capacitor (hereafter referred to as capacitor) is troubled by its peripheral conditions Such as use environment, design requirements, and installation requirements, it will be short-circuited at worst. If it is used in the shorted state, a large current will flow through it when a voltage is applied which will heat the capacitor body, and possibly burn the circuit board out .

Design and assembly cautions are described below. Confirm them sufficiently before use.

1. 1 Design Cautions

1. 1. 1 Design of Circuit

1. 1. 1. 1 Working temperature

The working temperature must be within the range specified in the delivery specification.
The working temperatures must not exceed the maximum working temperature

1. 1. 1. 2 Working voltage

The voltage across the terminals of the capacitor must be equal to or less than the rated voltage. Do not use the capacitor in a circuit where an abnormal voltage exceeding the rated voltage (surge voltage, pulse voltage, electrostatic voltage) may be applied to the capacitor. The capacitor may be shorted. If a DC voltage is superimposed with an AC voltage, take care that the peak voltage (Vp – p) is equal to or less than the rated voltage.

Even if the voltage is equal to or less than the rated voltage, when the capacitor is used in a circuit where a high frequency voltage or a steep pulse voltage is applied continuously to it, closely examine the reliability of the capacitor.

If such a voltage is applied continuously to the capacitor, the service life of it will be affected.

1. 1. 1. 3 Working current

If the capacitor causes a short-circuit at the secondary side of the power supply circuit, a large current will flow through it to heat the capacitor body, and the circuit board may be burnt out. Sufficiently examine the safety of use, and install a protective circuit if required.

1. 1. 1. 4 Self-heating

When self-heating is caused by an AC voltage or a pulse voltage circuit, if the ambient temperature around the capacitor in use is room temperature (about 25℃), take care so that a temperature rise (a difference between the surface temperature of the capacitor and the ambient temperature around it) comes within 20℃ or below.

The surface temperature of the capacitor including an amount increased by the self-heating must be equal to or less than the maximum working temperature specified in the delivery specification.

For the temperature rise of the capacitor according to the use circuit conditions, check the actual operating conditions of the equipment in use.

1. 1. 1. 5 Limitation of use places

Do not use the capacitor in the places indicated below. It may cause a short-circuit.

(1) Peripheral environmental (weatherproofness) conditions
  (a) Places where water or salt water is applied directly
  (b) Places where dewatering state occurs
  (c) Places where corrosive gases (hydrogen sulfide, sulfurous acid, chlorine, and ammonia) are filled out
(2) Places for which the requirements of vibration or impact are so severe as to exceed the range specified in the delivery specification.

Note ;

1．1．1．6 Piezoelectricity

A dielectric used for the capacitor (type 2) causes a piezoelectricity (or an electrostriction). As a result, the following events may occur.

(1) If a signal with a specified frequency is applied to the capacitor, the natural frequency of the capacitor determined by the size of the capacitor may cause resonance and generate noise. To prevent this problem, it is effective to change the size of the capacitor to change its resonance frequency.
An alternative method is to change the material of the capacitor to a low loss material without causing (or with small) piezoelectricity or to use a type 1 capacitor.

(2) If vibration or impact is applied to the capacitor, a mechanical force is converted to electric signals, which may produce noise. (Particularly, care must be taken when the capacitor is used near an amplifier.)
To prevent this problem, the alternative method of changing the material of the capacitor to a low loss material without causing (or with small) piezoelectricity or the use of a type 1 capacitor may be used.

(3) Even if a beating sound occurs, it does not cause any problem with the performance and reliability of products. However, the equipment manufacturer is worried about the sound. Since it may lead to the occurrence of noise, check the equipment for operation. To solve the problem, it is effective to change to a capacitor with a different shape, size, and characteristics of the capacitors indicated in items (1) and (2) above. It may also be effective to change the direction of installation of the capacitor to suppress the resonance with the cabinet of a printed circuit board or fix the capacitor with the cabinet of the printed circuit board with adhesive agent.

1．1．2 Design of Circuit Board

1．1．2．1 Selection of circuit board

When a capacitor is used on an alumina board, it is expected to deteriorate in performance due to thermal impact (temperature cycle).
Before using the capacitor on a board, sufficiently examine the actual board to check that the quality of the capacitor is not affected..

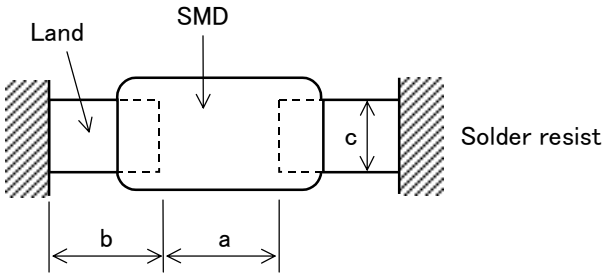
1．1．2．2 Setting of land dimensions

(1) As the amount of solder increases, stress applied to the capacitor increases, which may lead to cracking. To prevent this problem, when designing the land of a circuit board, set the shape and size thereof so that the amount of solder is of appropriate volume.

(2) When two or more parts are installed on a common land, separate them from each other so that the land can be used exclusively for both parts at the solder resist.

The recommended land pattern dimensions not causing an excessive amount of solder, cases that should be avoided, and recommended cases are shown below.

Recommended land dimensions(Ex.)
For General Electronic Equipment , High Value Capacitance
Low Thickness Type , 100V・200V series

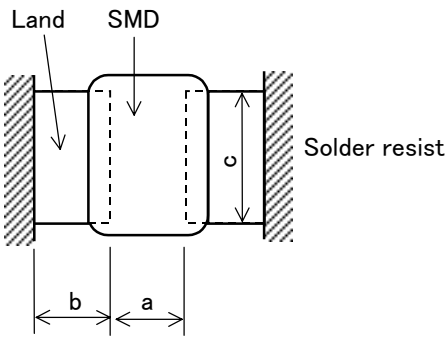


Note ;

Unit: : mm

Size Code	Component Dimension			a	b	c
	L	W	T			
"06" (0201)	0.6	0.3	0.3	0.2～0.3	0.25～0.3	0.2～0.3
"10" (0402)	1.0	0.5	0.5	0.4～0.5	0.4～0.5	0.5～0.6
"11" (0603)	1.6	0.8	0.8	0.8～1.0	0.6～0.8	0.6～0.8
"12" (0805)	2.0	1.25	0.6～1.25	0.8～1.2	0.8～1.0	0.8～1.0
"13" (1206)	3.2	1.6	0.6～1.6	1.8～2.2	1.0～1.2	1.0～1.3
"23" (1210)	3.2	2.5	1.4～2.5	1.8～2.2	1.0～1.2	1.8～2.3
"34" (1812)	3.2	2.5	2.5～3.2	3.0～3.5	1.2～1.6	2.3～3.0

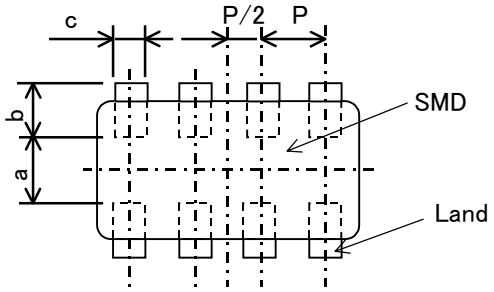
〔 Wide-Width Type 〕



Unit: : mm

Size Code	Component Dimension			a	b	c
	L	W	T			
"21" (0508)	1.25	2.0	0.85	0.5～0.7	0.5～0.6	1.4～1.9
"31" (0612)	1.6	3.2	0.85	0.8～1.0	0.6～0.7	2.5～3.0

〔 Array Type 〕

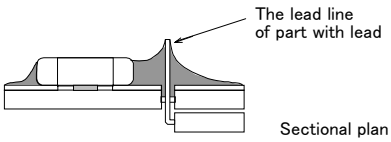
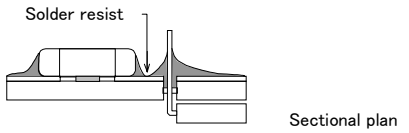
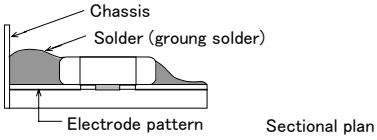
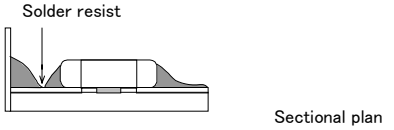
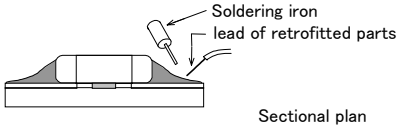
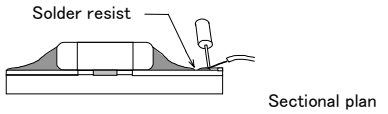
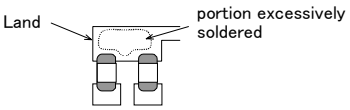
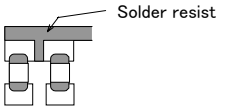


Unit: : mm

Size Code	Component Dimension			a	b	c	P
	L	W	T				
"12" (0805)	2.0	1.25	0.85	0.55～0.75	0.5～0.6	0.2～0.3	0.4～0.6
"13" (1206)	3.2	1.6	0.85	0.9～1.1	0.7～0.9	0.35～0.45	0.7～0.9

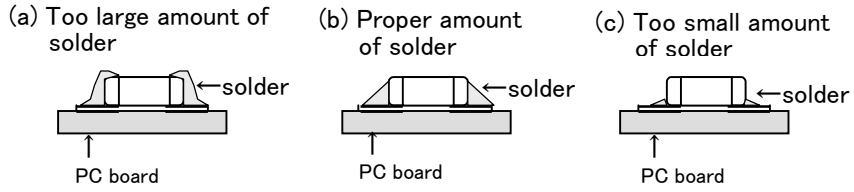
Note ;

Cases that should be avoided and recommended cases

Item	Cases that should be avoided	Case of improvement by pattern division
mixed mounting together with parts with lead		
arrangement near chassis		
retrofitting of parts with lead		
lateral arrangement		

(3) Design the land so that its lengths to the right and left are identical to each other.
If the amount of solder on the land on the right side is different from that on the left side, stress will act on one side of a part, and a crack may occur since an area with a larger amount of solder will set later at the time of cooling.

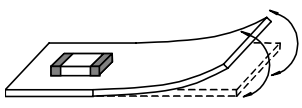
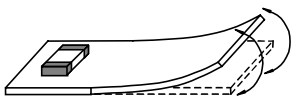
Recommended amount of solder



1．1．2．3 Arrangement of part

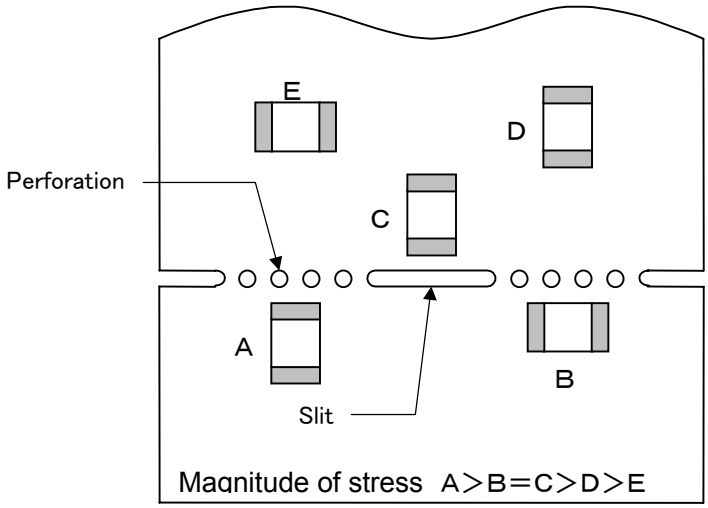
If a circuit board is bent in the process or during handling after the capacitor is welded to it, the capacitor may cause a crack. To prevent this problem, arrange the part so that stress caused by the deflection of the circuit board can be minimized.

(1) The recommended example of arrangement of the capacitor in which mechanical stress caused by warpage or deflection of a circuit board can be minimized.

	Cases that should be avoided	Recommended cases
Warpage of circuit board		 Dispose the part sideways relative to the stress acting direction

Note ;

(2) Refer to the following drawings since mechanical stress near the split board varies depending on the installation position of the capacitor.



(3) The magnitude of the mechanical stress applied to the capacitor when the circuit board is divided is in the order of those in push back < slit < V-groove < perforation. Consider also the arrangement of the capacitor and the dividing method into account.

1．1．2．4 Installation density and part intervals

If the parts are arranged too densely, the parts will be affected by bridges and solder balls. Carefully determine the part intervals.

1．2 Cautions on Assembly

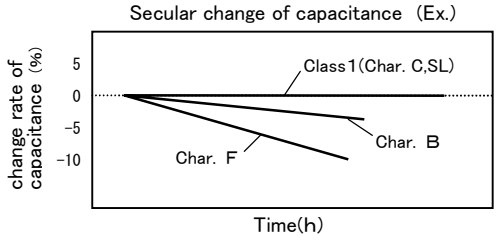
1．2．1 Storage

(1) Avoid storing parts in hot and humid places. Store them in an environment of 5 to 40℃ in temperature and 20 to 70% RH in humidity.

(2) If parts are stored in a place where moisture, dust, and/or harmful gas (hydrogen sulfide, sulfurous acid, chlorine, and ammonia) is present, the solderability of external electrodes will deteriorate. Also, if they are stored in a place subjected to heating or exposed to direct sunshine, the tape of taped packages may deform or a part may adhere to the tape, which may cause trouble at the time of installation.

(3) The storage period before use must be within six months. If the products are stored for six months or longer, check them for solderability before use.

(4) The products (characteristic symbols: B, F) of high dielectric constant system (type 2) cause a secular change in capacitance depending on the specific characteristics of ceramic dielectric materials. This secular change returns to the capacitance at the time of shipping from the plant at the soldering temperature in the soldering process.



(5) When measuring the initial capacitance, perform the heat treatment at a temperature of 150+0/−10℃ for one hour, leave it in a normal temperature and humidity environment for 48 ± 4 hours, and measure the initial value.

Note ;

1．2．2 Amount and curing of adhesive agent

(1) To determine the amount of application of adhesive agent, carefully examine the amount and viscosity so that the adhesive agent does not expand to the land due to a flow at the time of heating

(2) If the amount is too small, the capacitor may fall during flow-soldering.

(3) If the viscosity is too low, the installation position of the capacitor may be displaced.

(4) Heat hardening is made by ultraviolet and far infrared radiation. To prevent the terminal electrode from being oxidized, perform the heat hardening at a temperature of 160℃ for within two minutes

(5) If the hardening is not sufficient, the capacitor may fall during flow soldering. Also, insulation resistance between the terminal electrodes may deteriorate due to moisture absorption. To prevent these problems, sufficiently examine the hardening conditions.

1．2．3 Installation on circuit board

(1) When installing a capacitor on a circuit board, take care so that the pressure and displacement of absorbing nozzles at the time of installation do not occur on the capacitor body and that an excessive impact load such as a mechanical impact and stress, at the time of positioning, is not applied to the capacitor body.

(2) The maintenance and inspections of the mounting machine must be performed regularly.

(3) If the bottom dead center of the adsorbing nozzles is too low, an excessive force will be applied to the capacitor at the time of installation causing cracking. Use the following cautions for your reference.

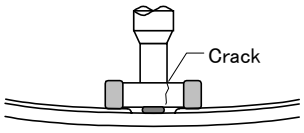
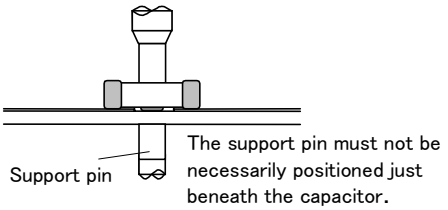
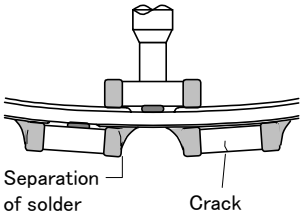
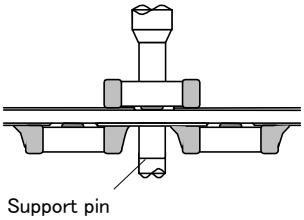
1) Set and adjust the bottom dead center of the adsorbing nozzles to the upper surface of the circuit board after correcting the warpage of the circuit board.

2) Set the nozzle pressure at the time of installation to 1 to 3 N or below in static load.

3) For double surface installation, to minimize the impact of the adsorbing nozzles, apply a support pin on the rear surface of the circuit board to suppress the deflection of the circuit board. A typical example is shown in the following.

4) Adjust the adsorbing nozzles so that their bottom dead center at the time of installation is not lowered excessively.

(4) If the positioning claw becomes worn, at the time of positioning, the mechanical impact applied to the capacitor will be applied locally, which may cause chipping or cracking on the capacitor. To prevent these problems, control the closed dimension of the positioning claw, and perform the maintenance, inspections, and the replacement of the positioning claw at regular intervals.

	Cases that should be avoided	recommended cases
One surface installation		
Double surface installation		

Note ;

1．2．4 Selection of Flux

Flux may seriously affect the performance of the capacitor. Therefore, check the following before use.

(1) Use flux having a halogen based content of 0.1 wt. % (converted to chlorine) or below.
Do not use flux with strong acid.

(2) The coated amount of flux when the capacitor is soldered to the circuit board must be confirmed.

(3) When using soluble flux, wash clean the capacitor sufficiently.

1．2．5 Soldering

1．2．5．1 Flow Soldering

By flow-soldering, stress due to an abrupt temperature change is applied directly to the part body. Therefore, take sufficient care to control the solder temperature.

Capacitors particularly dislike abrupt heating and cooling. If the capacitor is abruptly heated or cooled, a strain will be produced inside the capacitor due to a large temperature difference, which may cause thermal cracking. To prevent this problem, take sufficient care of the temperature difference.

(1) Coating of flux: Apply a thin coat of flux uniformly. For flow-soldering, the coating of flux using the foaming method is generally used.

(2) Preheating: Sufficiently preheat the capacitor so that a difference between the solder temperature and the surface temperature of the capacitor is 150℃ or below (100 to 130℃).

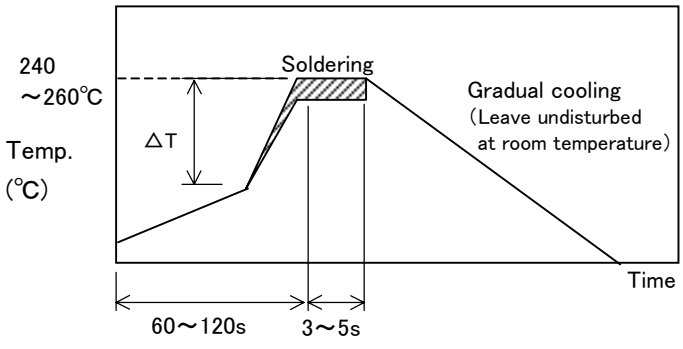
(3) Immersion into solder: Immerse the capacitor in a molten solder bath of 240 to 260℃ for 3 to 5 seconds.

(4) After soldering, gradually cool the capacitor. Avoid cooling it abruptly (forcibly). Failure to do so may cause thermal cracking.

(5) Cleaning: If the capacitor is immersed into the cleaning solvent immediately after soldering, confirm that the surface temperature of the capacitor is 100℃ or below beforehand.

(6) The one time of flow-soldering in the conditions shown in the figure below [recommended profile of flow-soldering (example)] do not cause any problems.
However, take sufficient care with regards to warpage and possible deflection of the circuit board.

Recommended profile of Flow Soldering [Ex.]



〈Allowable temperature difference ΔT〉

Size	Temp. Tol.
0603 to 1206	ΔT≦150℃
0508 , 0612	

Note ;

1．2．5．2 Reflow Soldering

The temperature conditions for reflow soldering are formed of the temperature curves of the preheat section, temperature rise section, heating section, and gradual cooling section.

If heat is abruptly applied to a capacitor, a strain will be produced inside a capacitor due to the large temperature difference, which may cause thermal cracking. To prevent this problem, take sufficient care with the temperature difference.

The preheat section is a critical area for prevention of tombstone (chip standing) and, therefore, control the temperature with sufficient care.

(1) Preheat: Increase the surface temperature of the circuit board to 140 to 160℃.

(2) Temperature increasing stage : 150 to 220℃ at a rate of 2 to 5℃/sec.

(3) Heating section: 220℃ or above within 20 sec.

(4) Gradual cooling section: Leave undisturbed at room temperature

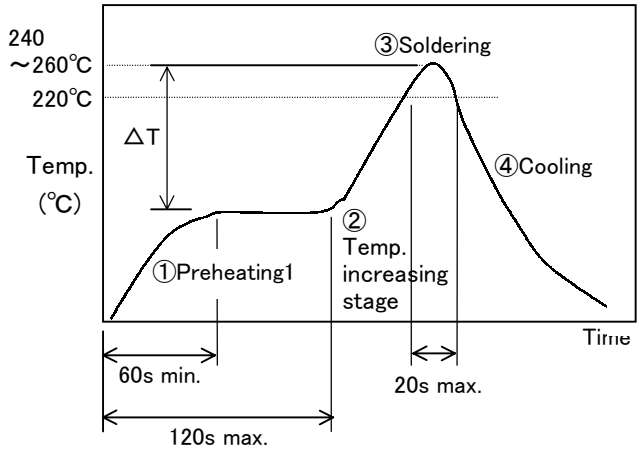
Avoid cooling the gradual cooling section abruptly (forcibly). Failure to do so may cause thermal cracking.

230 to 100℃ at a rate of 1 to 4℃/sec.

(5) Cleaning: If the capacitor is immersed into cleaning solvent immediately after soldering, confirm that the surface temperature of the capacitor is 100℃ or below beforehand.

(6) The two times of flow-soldering in the conditions shown in the figure below [Recommended profile of reflow-soldering (example)] do not cause any problem.

However, take sufficient care with regards to warpage and the possible deflection of the circuit board.



〈Allowable temperature difference △T〉

Size	Temp. Tol.
0201 to 1206	△T≦150℃
0508 , 0612	
1210 to 2220	△T≦130℃

1．2．5．3 Soldering with soldering iron

In soldering with a soldering iron, stress due to an abrupt temperature change is applied directly to the capacitor body. Accordingly, carefully control the temperature of the soldering iron tip.

Take care that the soldering iron tip does not come directly into contact with the capacitor body and the terminal electrode.

Note ;

Capacitors particularly dislike abrupt heating and cooling. If the capacitor is abruptly heated or cooled, a strain will be produced inside the capacitor due to the large temperature difference, which may cause thermal cracking. To prevent this problem, take sufficient care of the temperature difference.

Solder with the soldering iron taking care so as not to heat or cool abruptly before and after the soldering.

The product once removed with the soldering iron cannot be re-used.

(1) Condition 1 (with preheating)

1) Solder: Use a wire solder requiring a smaller amount of flux chlorine for precision electronic equipment (wire diameter: 1.0 mm dia. or less).

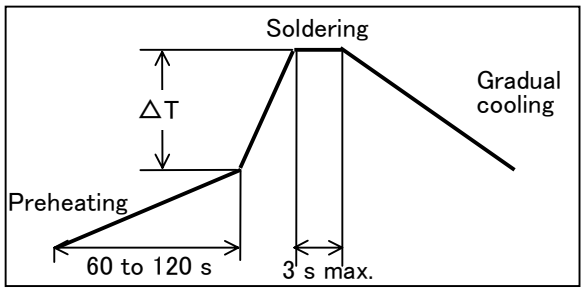
2) Preheating: Preheat sufficiently so that the difference between the solder temperature and the surface temperature of the capacitor is 150℃ or below.

3) Iron tip temperature: 300℃ or below

(Fuse the required amount of solder at the tip of the soldering iron beforehand.)

4) Gradual cooling: After soldering, leave the capacitor undisturbed at room temperature to allow it to cool gradually.

Recommended profile for soldering with a soldering iron[Ex.]



〈Allowable temperature difference △T〉

Size	Temp. Tol.
0201 to 1206	△T≦150℃
0508 , 0612	
1210 to 2220	△T≦130℃

(2) Condition 2 (without preheating)

Without preheating, the soldering iron can be corrected within the range specified below.

1) The soldering iron tip must not directly touch the ceramic dielectric of the capacitor.

2) After preheating the land section sufficiently with the soldering iron tip, slide the soldering iron tip to the terminal electrode of the capacitor for soldering.

Conditions of soldering iron tip without preheating

	Condition	
Chip size	0201 to 0805 , 0508	1206 to 2220 , 0612
Temperature of soldering iron	270℃ Max.	250℃ Max.
Wattage	20W Max.	
Shape of soldering iron tip	φ3mm Max.	
Soldering time with soldering iron	3s Max.	

Note ;

1．2．6 Cleaning

(1) If the cleaning solvent is not appropriate, residue and other foreign matter of the flux may adhere to the surface of the capacitor and deteriorate the performance (particularly, insulation resistance) of the capacitor.

(2) If the cleaning conditions are not appropriate (insufficient cleaning, excessive cleaning), the performance of the capacitor may be impaired.

1) If cleaning is insufficient:

① The metal of the terminal electrode may be corroded by the halogen substance contained in the residue of the flux.

② The halogen substance contained in the residue of the flux may adhere to the surface of the capacitor and lower the insulation resistance.

③ The tendencies of items 1) and 2) above may be remarkable for soluble flux more than those for rosin flux.

2) If cleaning is excessive:

① For ultrasonic cleaning, if output is too large, the circuit board may cause resonance to develop cracking in the body of the capacitor or solder, which will lower the strength of the terminal electrode.

To prevent these problems, perform cleaning as follows.

Ultrasonic wave output: 20 W/L or below

Ultrasonic wave frequency: 40 kHz or below

Ultrasonic wave cleaning time: 5 min. or shorter

3) If the cleaning solvent is contaminated, the density of liberated halogen may be increased to induce the same results as those obtained when the cleaning is insufficient.

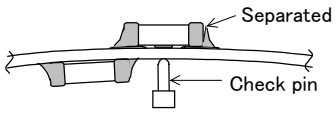
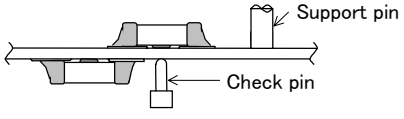
1．2．7 Inspections

When inspecting a capacitor on the circuit board after installation, check whether the circuit board is fixed by a support pin or a dedicated jig.

(1) Take care so that the circuit board is not deflected by the pressure of the check pin.

(2) Take care so that the circuit board is not vibrated by the impact at the time of contact.

When the operational check of the circuit board is performed, the pressing force of the check pin may be increased to prevent poor contact of the check pin of the board checker.
By the force, the circuit board may be deflected, and the capacitor may be broken or the solder at the terminal electrode may be separated by the stress due to the deflection. Accordingly, referring to the following figure, take an appropriate measure against possible deflection of the circuit board.

	Cases that should be avoided	Recommended cases
Deflect of circuit board		

1．2．8 Protective Coat

(1) When resin is coated on the installation surface for moistureproofing and dustproofing after the capacitor is installed on the circuit board, check the actual equipment that the quality of the capacitor is not affected by the protective coat.

Note ;

(2) Select those materials which do not generate cracked gas nor reaction gas that may affect the members forming the capacitor.

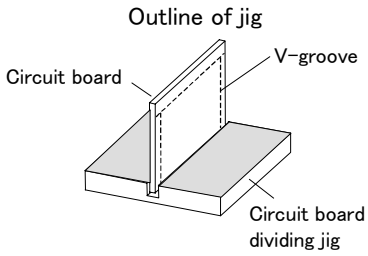
(3) If large stress is applied to the capacitor due to thermal expansion or thermal contraction at the time of curing the resin, cracking may occur in the capacitor.

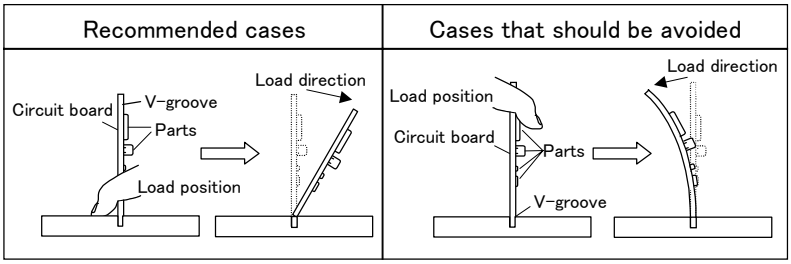
1．2．9 Division of multiple printed circuit board

(1) During the circuit board dividing operation after the installation of the parts including the capacitor, take care not to provide deflective or torsional stress to the circuit board.
If stress such as deflection or torsion, shown in the following figure, is applied to the circuit board when the circuit board is divided, cracking may occur in the capacitor. To prevent this problem, take care not to apply any stress to it.

(2) When dividing a circuit board, avoid dividing manually, but use a dedicated jig to prevent mechanical stress from being applied to the circuit board.

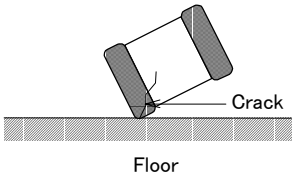
(3) Example of circuit board dividing jig
The outline of the circuit board dividing jig is shown below. It is recommended that you hold the circuit board at the portion near the jig so that the board is not deflected and divide the stress caused so that only compressive stress is applied to the part such as the capacitor.
Avoid holding the circuit board at any position apart from the jig, as the board will be easily deflected, and divide it so that tensile stress is not applied to the capacitor, which may cause cracking in the capacitor





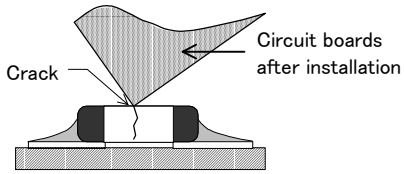
1．2．10 Mechanical Impact

(1) Take care not to apply any excessive mechanical impact to the capacitor.
Since the capacitor body is made of ceramics, it may become damaged or cracked by a drop impact. The quality of the dropped capacitor may already be lost, and its failure level of significance may be increased. Never use it.
Particularly, capacitors of a large size tend to be damaged or cracked more easily.



Note ;

(2) When handling a circuit board with a capacitor, take care that another circuit board does not collide with the capacitor.
When circuit boards after installation are stored in a stacked state or handled, the corners of them may collide with a capacitor causing damage or cracking in the capacitor by the impact, which may lead to a deterioration of the withstand voltage and a reduction in insulation resistance.



1．3 Remarks

The above cautions are typical ones.
For special installation conditions, contact us.

Cautions of Operations above are from

The Technical Report EIAJ RCR-2333 Caution Guide Line for Operation of Fixed Multilayer Ceramic Capacitors for Electronic Equipment by Electronic Industries Association of Japan. (March 1995 issued)

The Technical Report EIAJ RCR-2335 Caution Guide Line for Operation of Fixed Multilayer Ceramic Capacitors for Electronic Equipment by Japan Electronics & Information Technology Industries Association (New enactment in 2002)

Please refer to above technical report for details.

Note ;

CLASSIFICATION	SPECIFICATIONS	No. 151S-ECJ-SV020E
SUBJECT	Multilayer Ceramic Chip Capacitor Taped and Reeled Packaging Specifications	PAGE 1 of 6 DATE 1st. Apr. 2002

1. Scope

This specification applies to taped and reeled packing for MATSUSHITA's multilayer ceramic chip capacitors.

2. Applicable Standards

EIAJ (Electric Industries Association of Japan) Standard EIAJ RC-1009B

JIS (Japanese Industrial Standard) Standard JIS C 0806

3. Packing Specification

3. 1 Structure and Dimensions

Paper taping packaging is carried out according the following diagram

(1) Carrier tape : Shown in Fig. 5.

(2) Reel : Shown in Fig. 6.

(3) Packaging : We shall pack suitably in order prevent damage during transportation or storage.

3. 2 Packing Quantity

Type	Thickness of Capacitor(mm)	Carrier-Tape		Quantity (pcs./reel)			
				φ180mm Reel		φ330mm Reel	
		Material	Taping Pitch	Packaging Code	Quantity	Packaging Code	Quantity
"06"(0201)	0.30 ± 0.03	Paper Taping	2mm	E	15000	——	——
"10"(0402)	0.50 ± 0.05	Paper Taping	2mm	E	10000	W	50000
"11"(0603)	0.8 ± 0.1	Paper Taping	4mm	V	4000	Z	10000
"12"(0805)	0.6 ± 0.1	Paper Taping	4mm	V	5000	Z	20000
	0.85 ± 0.10	Paper Taping	4mm	V	4000	Z	10000
	1.25 ± 0.10 1.25 ± 0.15 1.25 ± 0.20	Embossed Tap.	4mm	F	3000	——	——
"13"(1206)	0.6 ± 0.1	Paper Taping	4mm	V	5000	Z	20000
	0.85 ± 0.10	Paper Taping	4mm	V	4000	Z	10000
	1.15 ± 0.10	Embossed Tap.	4mm	F	3000	——	——
	1.15 ± 0.10	Embossed Tap.	4mm	Y	2000	——	——
	1.6 ± 0.2	Embossed Tap.	4mm	Y	2000	——	——
"23"(1210)	2.0 ± 0.2	Embossed Tap.	4mm	Y	2000	——	——
	2.5 ± 0.3	Embossed Tap.	4mm	Y	1000	——	——
"34"(1812)	2.5 ± 0.3	Embossed Tap.	8mm	Y	500	——	——
	3.2 ± 0.3	Embossed Tap.	8mm	Y	500	——	——

※ Explanation of Part Numbers (Example)

ECJ 1 V B 1C 104 K

Packaging Code

Note :

Ceramic Business Unit LCR Device Company Matsushita Electronic Components Co.,Ltd. Kadoma, Osaka, Japan	APPROVAL	CHECK	DESIGN
	H.Itow	A.Omi	T.Shinriki

3. 3 Marking on the Reel

The following items are described in the side of a reel in English at least.

(1) Part Number

(2) Quantity

(3) Lot Number

(4) Country or origin

3. 4 Structure of Taping

(1) The direction of winding of taping on the reel shall be in accordance with the following diagram.

Fig. 1 Paper Taping

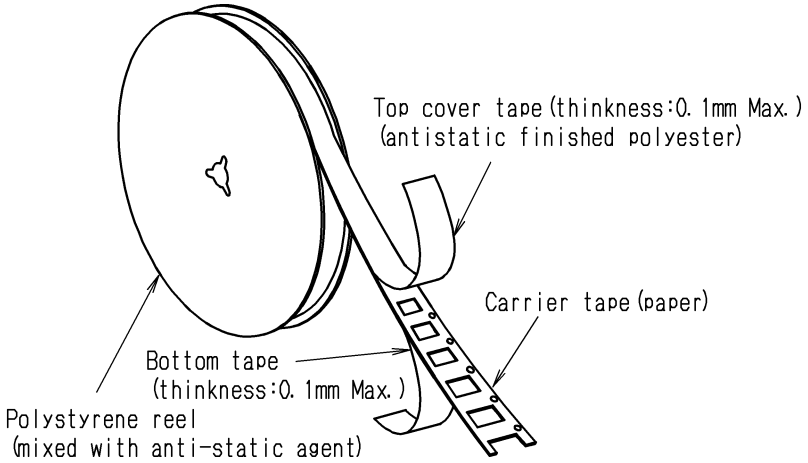
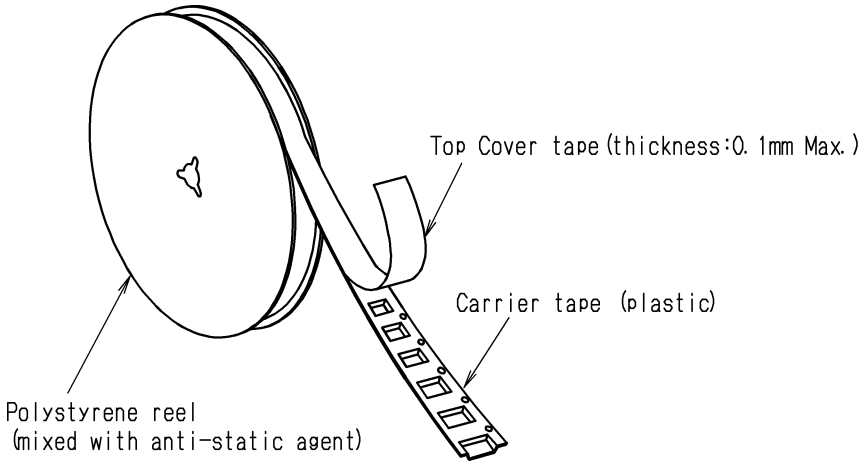


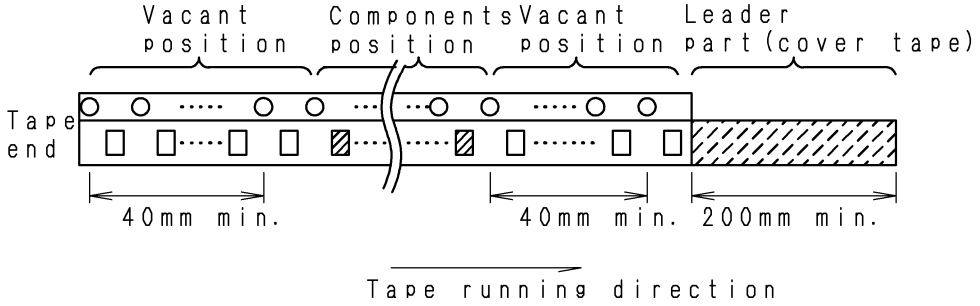
Fig. 2 Embossed Taping



Note :

(2) The specification of the leader and empty portion shall be in accordance with the following diagram.

Fig. 3 Leader Part and Taped End



4. Efficiency

4. 1 Breakage strength of the tape : 10N or more.

4. 2 Peel strength of the cover tape (refer to the following figure).

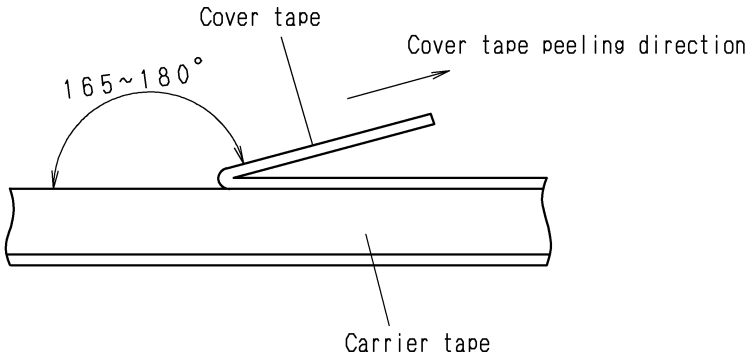
(1) Peel angle : 165 to 180 degree from the tape adhesive face.

(2) Peel velocity : 300mm per min.

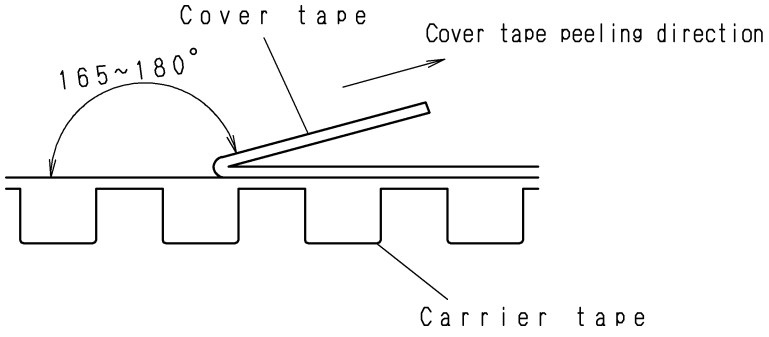
(3) Peel strength : 0.1 to 0.7N

Fig. 4 Peel strength of the cover tape

(a) Paper Taping



(b) Embossed Taping



Note :

4．3 Barrs on tape

There shall be no barrs preventing suction when products are taken out.

4．4 Missing of products

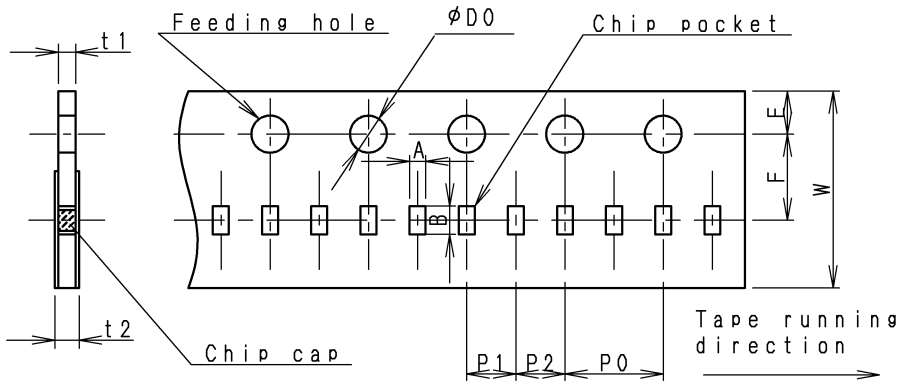
The missing of products shall be 0.1% or less per reel and there shall be no continuous missing of products.

4．5 Adherence to the tape

Products shall not be stuck to the cover tape or bottom tape.

Fig. 5 Carrier Tape Dimension

(a)"06" and "10"type : 2mm taping pitch for Paper taping

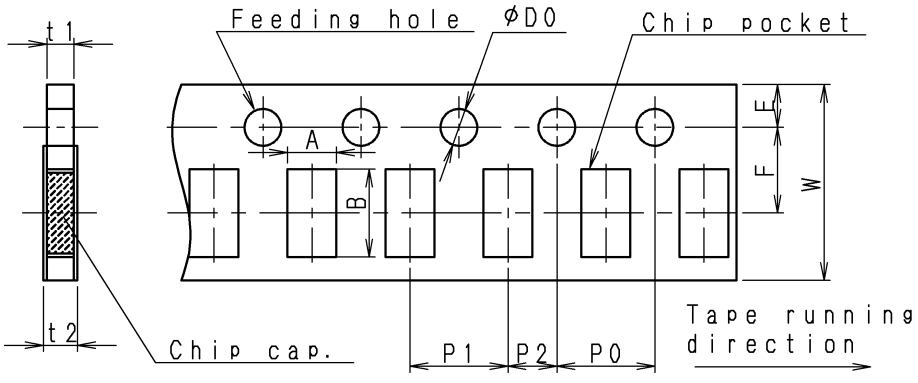


Code \ Type	"06"	"10"
A	0.37 ± 0.03	0.65 ± 0.05
B	0.67 ± 0.05	1.15 ± 0.05

記号	寸 法	
W	8.0 ± 0.2	
F	3.50 ± 0.05	
E	1.75 ± 0.10	
P_1	2.00 ± 0.05	
P_2	2.00 ± 0.05	
P_0	4.00 ± 0.05	
D_0	φ1.5 +0.1/−0	
t_1	"06" Type	0.5 max.
	"10" Type	0.7 max.
t_2	"06" Type	0.8 max.
	"10" Type	1.0 max.

Unit : mm

(b)"11" and "12" and "13" type : 4mm taping pitch for Paper taping.



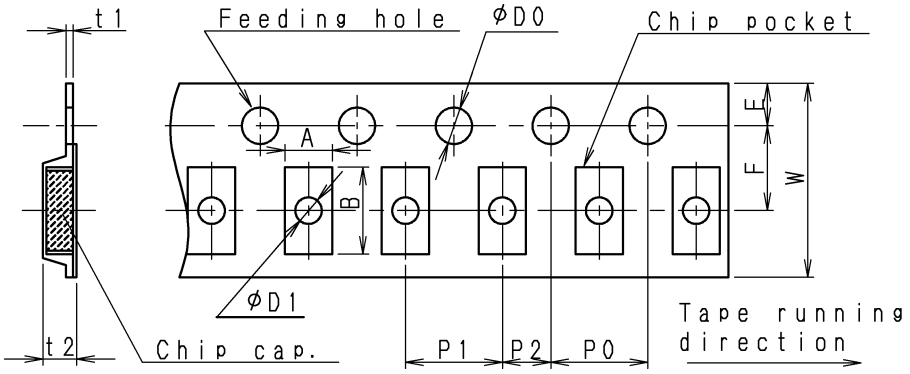
Code	Dimension
W	8.0 ± 0.2
F	3.50 ± 0.05
E	1.75 ± 0.10
P_1	4.0 ± 0.1
P_2	2.00 ± 0.05
P_0	4.0 ± 0.1
D_0	φ1.5 +0.1/−0
t_1	1.1 max.
t_2	1.4 max.

Unit : mm

Code \ Type	"11"(0603)	"12"(0805)	"13"(1206)
A	1.1 ± 0.1	1.65 ± 0.20	2.0 ± 0.2
B	1.9 ± 0.1	2.4 ± 0.2	3.6 ± 0.2

Note :

(c)"12" and "13" and "23" type : 4mm chip taping pitch for Embossed taping.

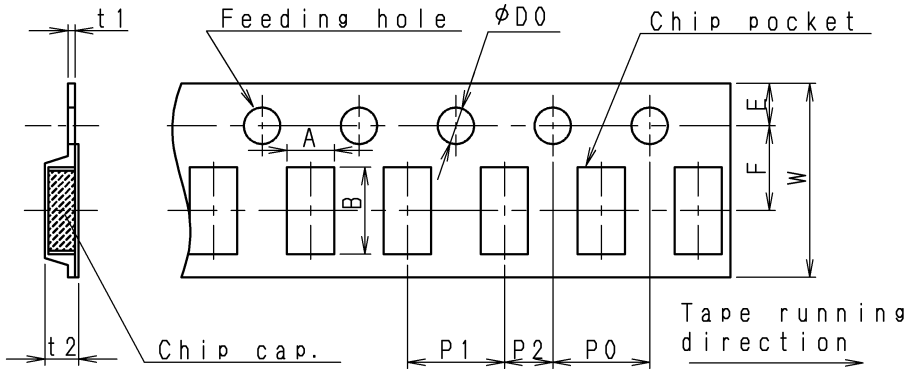


Code	Dimension	
W	8.0 ± 0.2	
F	3.50 ± 0.05	
E	1.75 ± 0.10	
P_1	4.0 ± 0.1	
P_2	2.00 ± 0.05	
P_0	4.0 ± 0.1	
D_0	φ1.5 +0.1/−0	
D_1	φ1.1± 0.1	
t_1	0.6 max.	
t_2	"12""13" type	2.5 max.
	"23"type	3.5 max.

Unit : mm

Code \ Type	"12" (0805)	"13" (1206)	"23" (1210)
A	1.55 ± 0.20	1.95 ± 0.20	2.9 ± 0.2
B	2.35 ± 0.20	3.6 ± 0.2	3.6 ± 0.2

(d)"34"type : 8mm chip taping pitch for Embossed taping.



Code	Dimension
W	12.0 ± 0.3
F	5.50 ± 0.05
E	1.75 ± 0.10
P_1	8.0 ± 0.1
P_2	2.00 ± 0.05
P_0	4.0 ± 0.1
D_0	φ1.5 +0.1/−0
t_1	0.6 max.
t_2	4.0max.

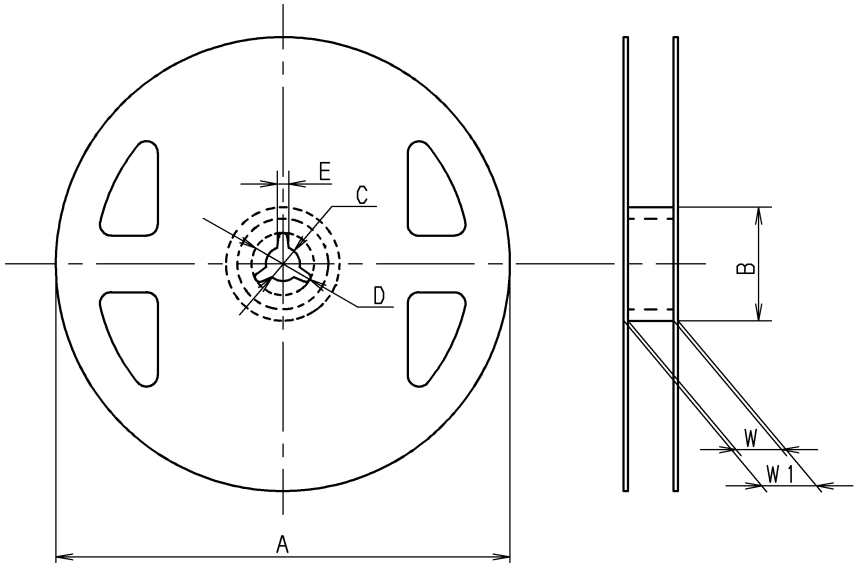
Unit : mm

Code \ Type	"34" (1812)
A	3.6 ± 0.3
B	4.9 ± 0.3

Note :

Fig. 6 Reel Dimension

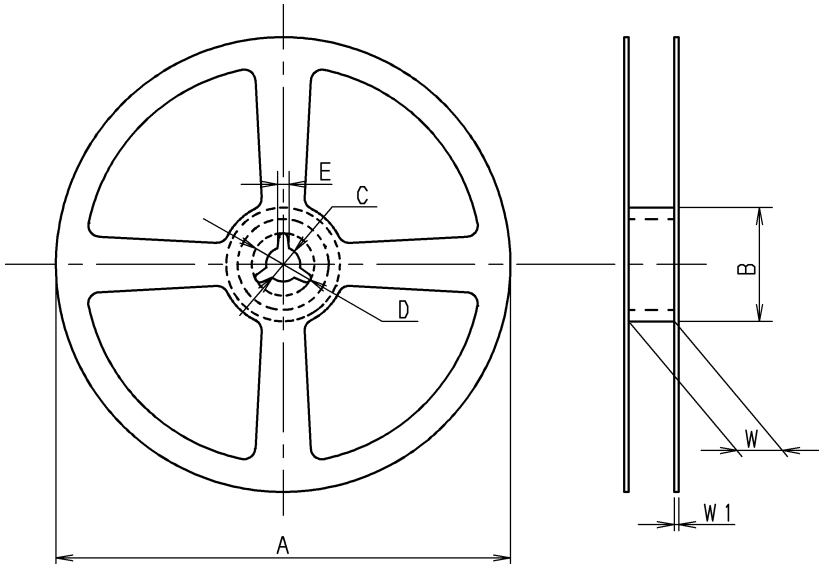
(a) ϕ180mm Reel (Standard Reel)



Code	Dimension
A	ϕ180+0/−3.0
B	ϕ60 ± 0.5
C	13.0 ± 0.5
D	21.0 ± 0.8
E	2.0 ± 0.5
W	9.0 ± 0.3
W_1	11.4 ± 0.1

Unit : mm

(b) ϕ330mm Reel (Large size Reel)



Code	Dimension
A	ϕ330 ± 5.0
B	ϕ50 min.
C	13.0 ± 0.5
D	20 min.
E	2.0 ± 0.5
W	9.5 ± 1.0
W_1	2.0 ± 0.5

Unit : mm

Note :