

DELIVERY SPECIFICATION

SPEC. No. C-iMEGA-b

D A T E : Jun, 2019

To

Non-Controlled Copy

CUSTOMER'S PRODUCT NAME

TDK PRODUCT NAME

Multilayer Ceramic Chip Capacitors
 (Mega cap CA series)
 Tape packaging 【RoHS compliant】
 CAA572,CAA573 type
 COG Characteristics

Please return this specification to TDK representatives with your signature.
 If orders are placed without returned specification, please allow us to judge that specification is accepted by your side.

RECEIPT CONFIRMATION

DATE: YEAR MONTH DAY

TDK Corporation
 Sales
 Electronic Components
 Sales & Marketing Group

Engineering
 Electronic Components Business Company
 Ceramic Capacitors Business Group

APPROVED	Person in charge

APPROVED	CHECKED	Person in charge

■ CATALOG NUMBER CONSTRUCTION

CA	A	57	3	C0G	2J	304	J	640	L	H
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

(1) Series

(2) Reserved code

(3) Dimensions L x W (mm), (4) Structure

Dimensions code	Structure code	EIA	Length	Width	Metal frame width
57	2	CC2220	6.10	5.60	1.20
57	3	CC2220	6.10	8.40	1.20

(5) Temperature characteristics

Temperature characteristics	Temperature coefficient	Temperature range
C0G	0±30ppm/°C	-55 to +125°C

(6) Rated voltage (DC)

Code	Voltage (DC)
2J	630V
3A	1000V

(7) Nominal capacitance (pF)

The capacitance is expressed in three digit codes and in units of pico Farads (pF). The first and second digits identify the first and second significant figures of the capacitance. The third digit identifies the multiplier. R designates a decimal point.

(Example) 0R5 = 0.5pF
 101 = 100pF
 225 = 2,200,000pF = 2.2μF

(8) Capacitance tolerance

Code	Tolerance
J	± 5%

(9) Thickness

Code	Thickness
640	6.40mm

(10) Packaging style

Code	Style
L	330mm reel, 12mm pitch

(11) Special reserved code

Code	Description
H	MEGACAP type

1. SCOPE

This specification is applicable to chip type multilayer ceramic capacitors with a priority over the other relevant specifications.

Production places defined in this specification shall be TDK Corporation Japan, TDK(Suzhou)Co.,Ltd, TDK Xiamen Co.,Ltd, and TDK Components U.S.A.Inc.

EXPLANATORY NOTE:

This specification warrants the quality of the ceramic chip capacitors. Capacitors should be evaluated or confirmed a state of mounted on your product.

If the use of the capacitors goes beyond the bounds of the specification, we can not afford to guarantee.

2. CODE CONSTRUCTION

(Example)	CA	A	57	2	C0G	3A	303	J	T	OOOO
	<u>CA</u>	<u>A</u>	<u>57</u>	<u>3</u>	<u>C0G</u>	<u>2J</u>	<u>304</u>	<u>J</u>	<u>T</u>	<u>OOOO</u>
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)

(1) Series

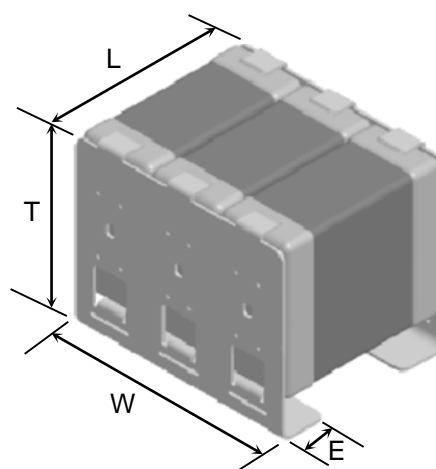
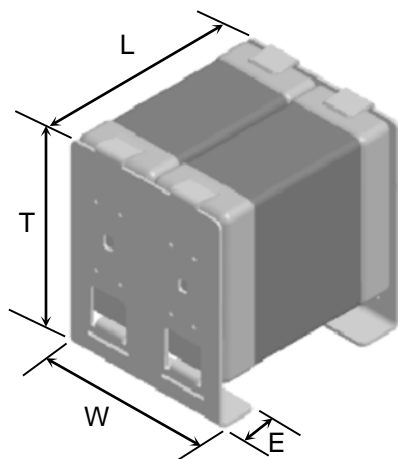
Symbol	Series
CA	Mega cap CA series

(2) TDK's auxiliary code

(3) Type

CAA572 : 2 side-by-side alignment type

CAA573 : 3 side-by-side alignment type



Type	Structure Symbol	Dimensions (Unit : mm)			
		L	W	T	E
57	2	6.10±0.30	5.60±0.30	6.40±0.30	1.20±0.10
57	3	6.10±0.30	8.40±0.30	6.40±0.30	1.20±0.10

*As for each item, please refer to detail page on TDK Web.

(4) Structure

Symbol	Structure
2	2 side-by-side alignment type
3	3 side-by-side alignment type

(5) Temperature Characteristics

Symbol	Temperature Characteristics
C0G	0 ± 30 ppm/°C (-55 ~ 125°C)

(6) Rated Voltage

Symbol	Rated Voltage
2 J	DC 630 V
3 A	DC 1 kV

(7) Rated Capacitance

Stated in three digits and in units of pico farads (pF). The first and second digits identify the first and second significant figures of the Capacitance, the third digit identifies the multiplier.

(Example)

Symbol	Rated Capacitance
303	30,000 pF
304	300,000 pF

(8) Capacitance tolerance

Symbol	Tolerance
J	± 5 %

(9) Packaging

Symbol	Packaging
T	Taping

(10) TDK internal code

3. OPERATING TEMPERATURE RANGE

Min. operating Temperature	Max. operating Temperature	Reference Temperature
-55°C	125°C	25°C

4. STORING CONDITION AND TERM

5 to 40°C at 20 to 70%RH

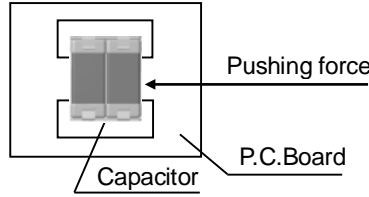
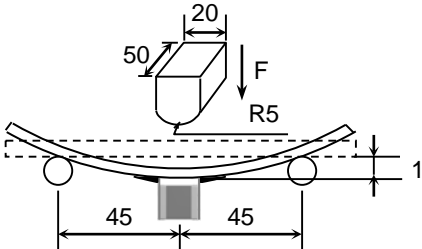
6 months Max. upon receipt.

5. INDUSTRIAL WASTE DISPOSAL

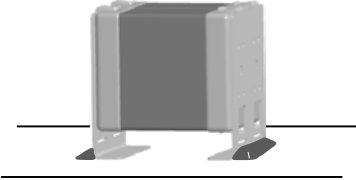
Dispose this product as industrial waste in accordance with the Industrial Waste Law.

6. PERFORMANCE

Table 1

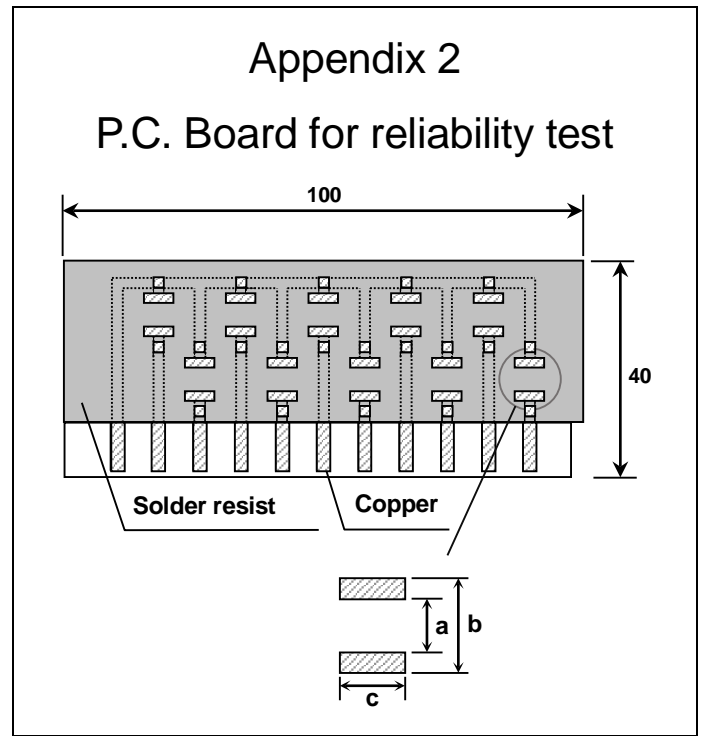
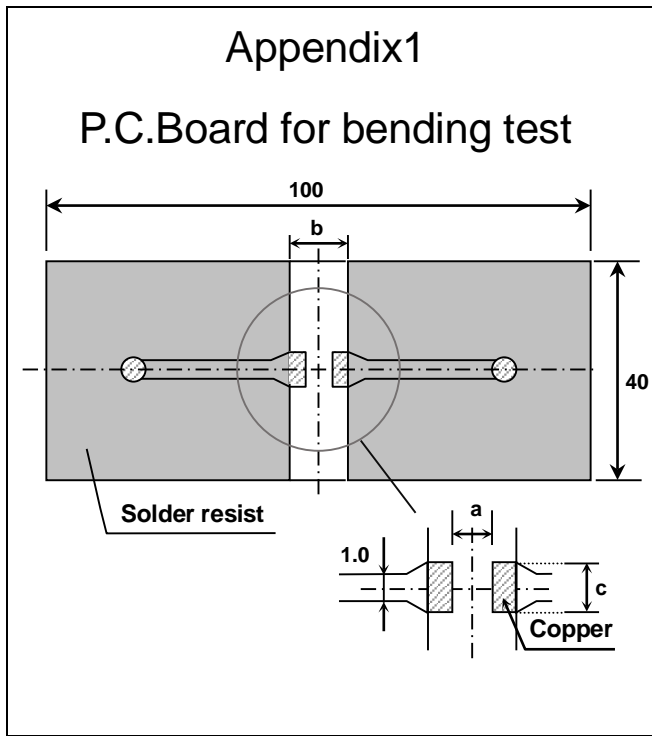
No.	Item	Performance	Test or inspection method						
1	External Appearance	No defects which may affect performance.	Inspect with magnifying glass(3×)						
2	Insulation Resistance	10,000MΩ or 500MΩ · μF min., whichever smaller.	Apply 500V DC for 60s.						
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	<table border="1"> <thead> <tr> <th>Rated voltage(RV)</th> <th>Apply voltage</th> </tr> </thead> <tbody> <tr> <td>630V</td> <td>1.3 × rated voltage</td> </tr> <tr> <td>1kV</td> <td>1.2 × rated voltage</td> </tr> </tbody> </table> <p>Above DC voltage shall be applied for 1s. Charge / discharge current shall not exceed 50mA.</p>	Rated voltage(RV)	Apply voltage	630V	1.3 × rated voltage	1kV	1.2 × rated voltage
Rated voltage(RV)	Apply voltage								
630V	1.3 × rated voltage								
1kV	1.2 × rated voltage								
4	Capacitance	Within the specified tolerance.	<table border="1"> <thead> <tr> <th>Measuring frequency</th> <th>Measuring voltage</th> </tr> </thead> <tbody> <tr> <td>1kHz±10%</td> <td>0.5 ~ 5V rms.</td> </tr> </tbody> </table>	Measuring frequency	Measuring voltage	1kHz±10%	0.5 ~ 5V rms.		
Measuring frequency	Measuring voltage								
1kHz±10%	0.5 ~ 5V rms.								
5	Q	Please refer to detail page on TDK Web.	See No.4 in this table for measuring condition.						
6	Temperature Characteristics of Capacitance	<table border="1"> <thead> <tr> <th>Temperature Coefficient (ppm/°C)</th> </tr> </thead> <tbody> <tr> <td>COG : 0 ± 30</td> </tr> </tbody> </table> <p>Capacitance drift Within ± 0.2%</p>	Temperature Coefficient (ppm/°C)	COG : 0 ± 30	<p>Temperature Coefficient shall be calculated based on values at 25°C and 85°C temperature.</p> <p>Measuring temperature below 25°C shall be -10°C and -25°C</p>				
Temperature Coefficient (ppm/°C)									
COG : 0 ± 30									
7	Robustness of Terminations	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	<p>Reflow solder the capacitors on a P.C.Board shown in Appendix 2 and apply a pushing force of 5N with 10±1s.</p> 						
8	Bending	No mechanical damage.	<p>Reflow solder the capacitor on a P.C.Board shown in Appendix 1.</p>  <p>(Unit : mm)</p>						

(continued)

No.	Item	Performance	Test or inspection method													
9	Solderability	<p>Both end faces and the contact areas shall be covered with a smooth and bright solder coating with no more than a small amount of scattered imperfections such as pinholes or un-wetted or de-wetted areas. These imperfections shall not be concentrated in one area.</p> 	<p>Reflow solder the capacitor on a P.C.Board shown in Appendix2.</p> <p>Solder : Sn-3.0Ag-0.5Cu or Sn-37Pb</p> <p>Please refer to No.5 Soldering in 11.CAUTION for soldering condition.</p>													
10	Vibration	External appearance	No mechanical damage.													
		Capacitance	<table border="1"> <thead> <tr> <th>Characteristics</th> <th>Change from the value before test</th> </tr> </thead> <tbody> <tr> <td>C0G</td> <td>± 2.5 %</td> </tr> </tbody> </table>	Characteristics	Change from the value before test	C0G	± 2.5 %									
		Characteristics	Change from the value before test													
C0G	± 2.5 %															
Q	1,000 min.															
11	Temperature cycle	External appearance	No mechanical damage.													
		Capacitance	<table border="1"> <thead> <tr> <th>Characteristics</th> <th>Change from the value before test</th> </tr> </thead> <tbody> <tr> <td>C0G</td> <td>Please contact with our sales representative.</td> </tr> </tbody> </table>	Characteristics	Change from the value before test	C0G	Please contact with our sales representative.									
		Characteristics	Change from the value before test													
		C0G	Please contact with our sales representative.													
		Q	1,000 min.													
		Insulation Resistance	Meet the initial spec.													
Voltage proof	No insulation breakdown or other damage.															
	<p>Reflow solder the capacitors on a P.C.Board shown in Appendix2 before testing.</p> <p>Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1min. Repeat this for 2h each in 3 perpendicular directions.</p> <p>Expose the capacitors in the condition step1 through 4 and repeat 100 times consecutively.</p> <p>Leave the capacitors in ambient condition for 6 to 24h before measurement.</p> <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> <th>Time(min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55 ± 3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Ambient Temp.</td> <td>2 ~ 5</td> </tr> <tr> <td>3</td> <td>125 ± 2</td> <td>30±2</td> </tr> <tr> <td>4</td> <td>Ambient Temp.</td> <td>2 ~ 5</td> </tr> </tbody> </table>	Step	Temperature(°C)	Time(min.)	1	-55 ± 3	30±3	2	Ambient Temp.	2 ~ 5	3	125 ± 2	30±2	4	Ambient Temp.	2 ~ 5
Step	Temperature(°C)	Time(min.)														
1	-55 ± 3	30±3														
2	Ambient Temp.	2 ~ 5														
3	125 ± 2	30±2														
4	Ambient Temp.	2 ~ 5														

(continued)

No.	Item		Performance	Test or inspection method	
12	Moisture Resistance (Steady State)	External appearance	No mechanical damage.	Reflow Solder the capacitors on a P.C.Board shown in Appendix2 before testing. Apply the rated voltage at temperature $40\pm 2^{\circ}\text{C}$ and 90 to 95%RH for 500 +24,0h. Charge/discharge current shall not exceed 50mA. Leave the capacitors in ambient condition for 6 to 24h before measurement.	
		Capacitance	Characteristics		Change from the value before test
			COG		Please contact with our sales representative.
		Q	350 min.		
Insulation Resistance	1,000M Ω or 50M Ω · μF min., whichever smaller.				
13	Life	External appearance	No mechanical damage.	Reflow Solder the capacitors on a P.C.Board shown in Appendix2 before testing. Test condition : $125 \pm 2^{\circ}\text{C}$ for 1,000 +48,0h As for applied voltage, please contact with our sales representative. Charge/discharge current shall not exceed 50mA. Leave the capacitors in ambient condition for 6 to 24h before measurement.	
		Capacitance	Characteristics		Change from the value before test
			COG		Please contact with our sales representative.
		Q	350 min.		
Insulation Resistance	1,000M Ω or 50M Ω · μF min., whichever smaller.				



(Unit : mm)

Type	Dimensions		
	a	b	c
TDK(EIA style)			
CAA572	4.5	8.0	5.6
CAA573	4.5	8.0	8.1

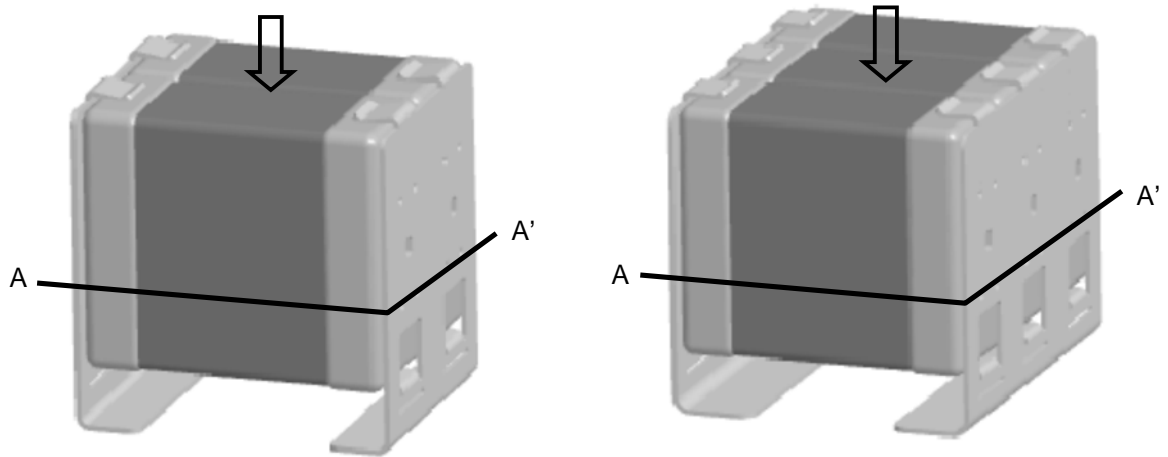
1. Material : Glass Epoxy(As per JIS C6484 GE4)

2. Thickness : 1.6mm

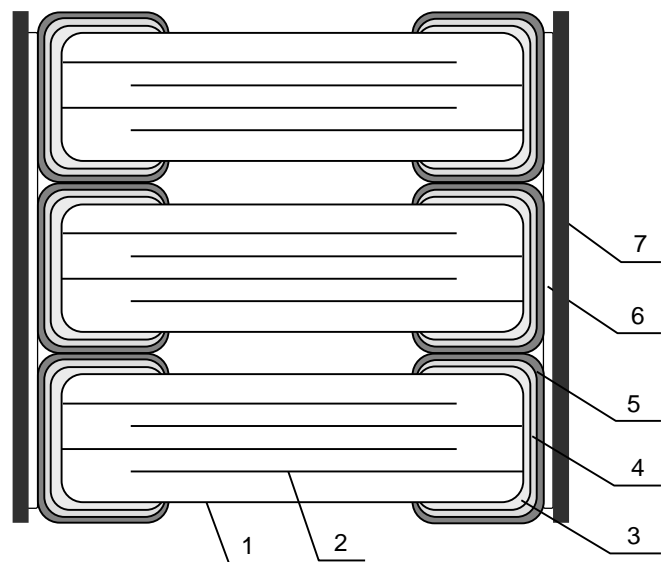
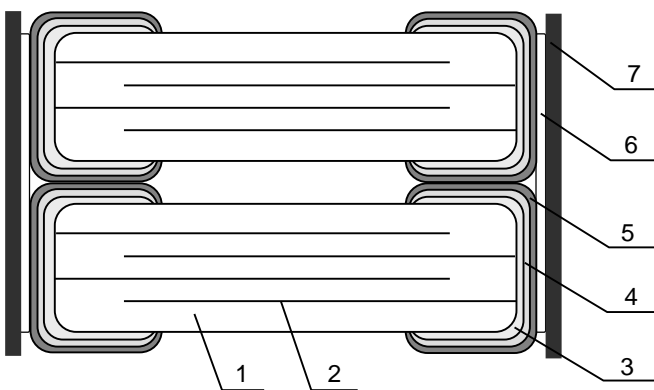
Copper(Thickness:0.035mm)

Solder resist

7. INSIDE STRUCTURE AND MATERIAL



A-A'



No.	NAME	MATERIAL
		Class1
1	Dielectric	CaZrO ₃
2	Electrode	Nickel (Ni)
3	Termination	Copper (Cu)
4		Nickel (Ni)
5		Tin (Sn)
6	Metal cap joint	High temp solder
7	Metal cap	Clad

8. PACKAGING

Packaging shall be done to protect the components from the damage during transportation and storing, and a label which has the following information shall be attached.

Tape packaging is as per 12. TAPE PACKAGING SPECIFICATION.

- 1) Inspection No.
- 2) TDK P/N
- 3) Customer's P/N
- 4) Quantity

*Composition of Inspection No.

Example F 8 A - 23 - 001
 (a) (b) (c) (d) (e)

- a) Line code
- b) Last digit of the year
- c) Month and A for January and B for February and so on. (Skip I)
- d) Inspection Date of the month.
- e) Serial No. of the day

*Composition of new Inspection No.

(Will be implemented on and after Jan. 1, 2019)

Example

I	F	9	A	2	3	A	0	0	1
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)

- (a) Prefix
- (b) Line code
- (c) Last digit of the year
- (d) Month and A for January and B for February and so on. (Skip I)
- (e) Inspection Date of the month.
- (f) Serial No. of the day(00 ~ ZZ)
- (g) Suffix(00 ~ ZZ)

* It is planned to shift to the new inspection No. on and after January 2019, but the implementation timing may be different depending on shipment bases.

Until the shift is completed, either current or new composition of inspection No. will be applied.

9. RECOMMENDATION

It is recommended to provide a slit (about 1mm wide) in the board under the components to improve washing Flux.


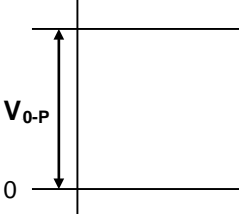
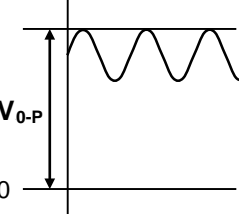
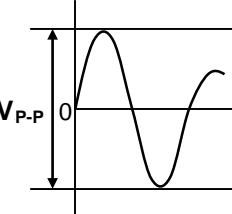
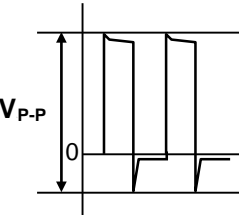
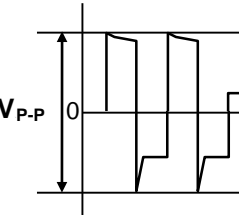
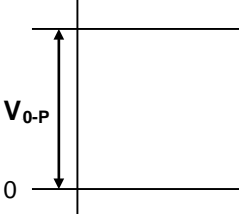
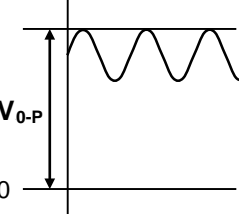
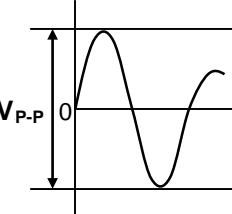
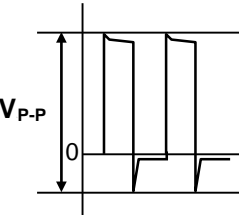
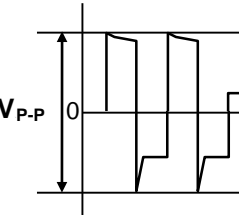
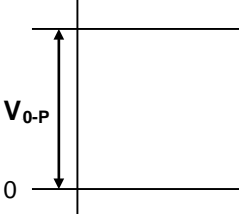
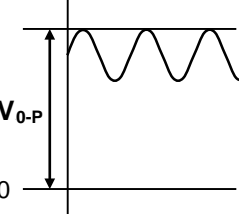
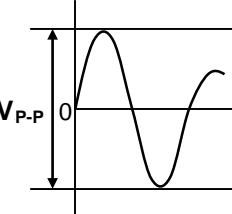
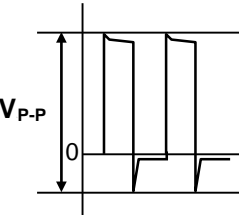
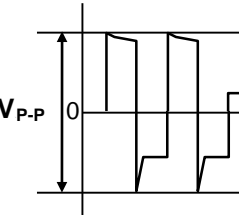
And please make sure to dry detergent up completely before.

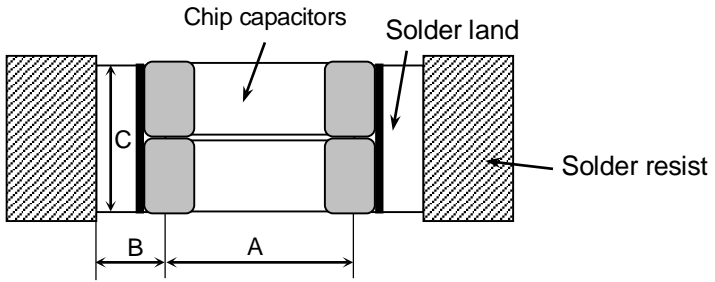
10. SOLDERING CONDITION

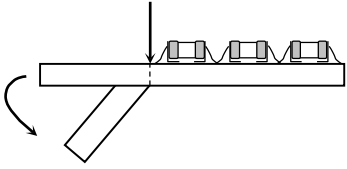
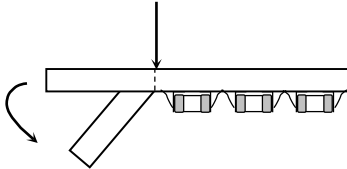
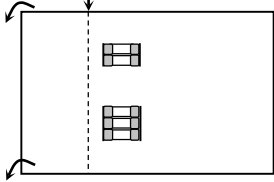
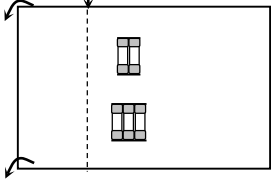
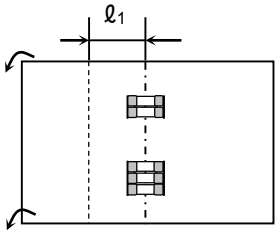
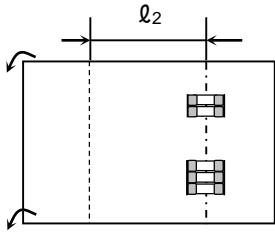
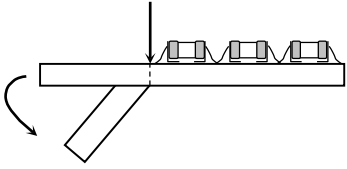
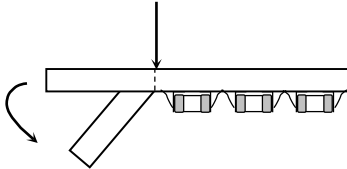
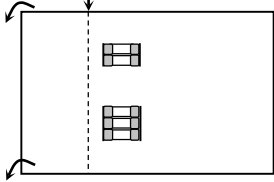
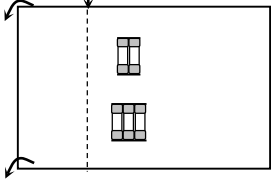
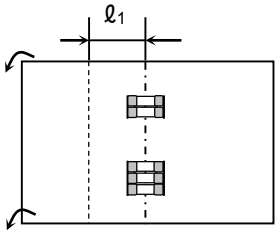
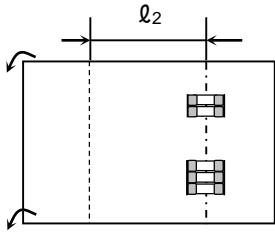
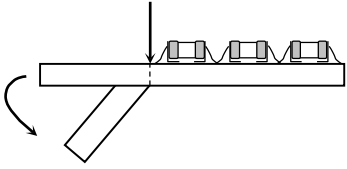
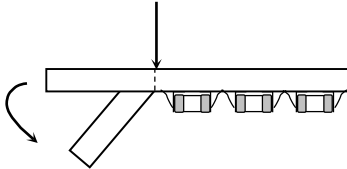
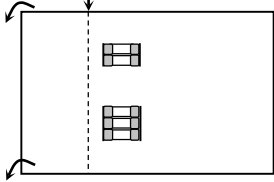
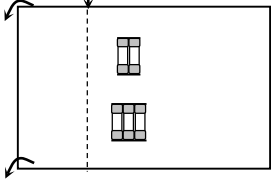
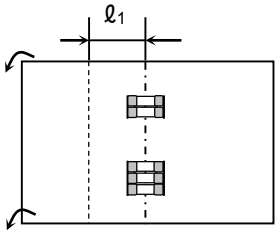
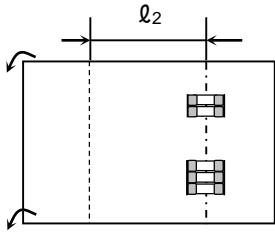
Reflow soldering only.

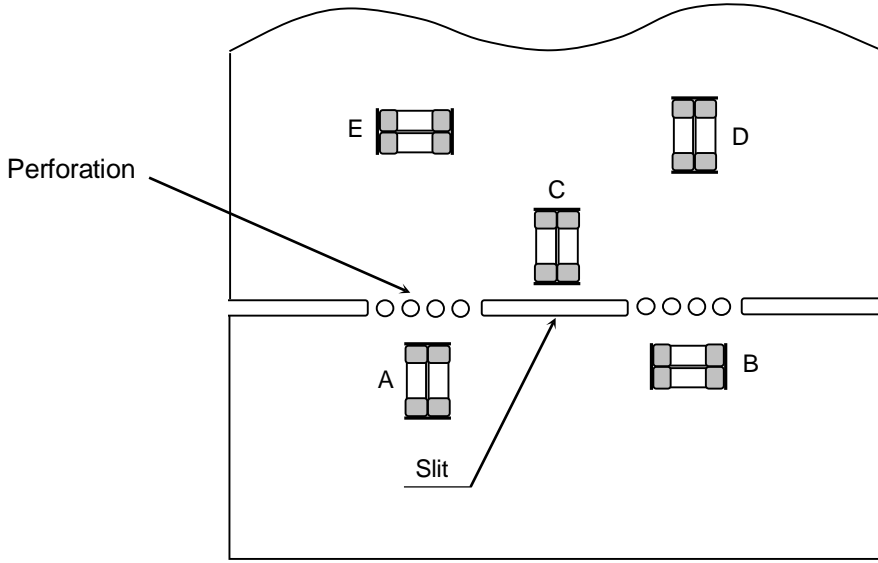
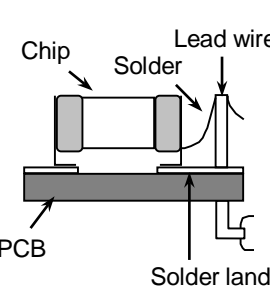
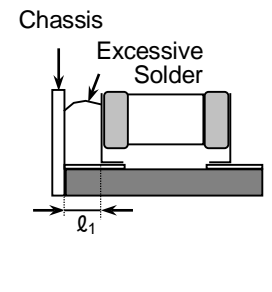
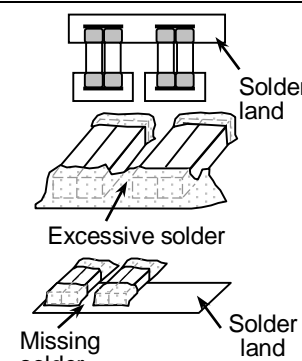
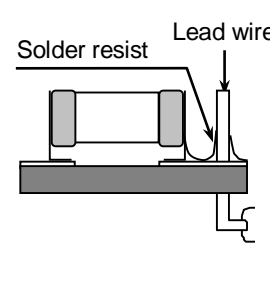
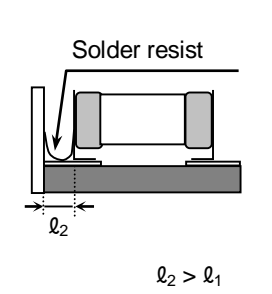
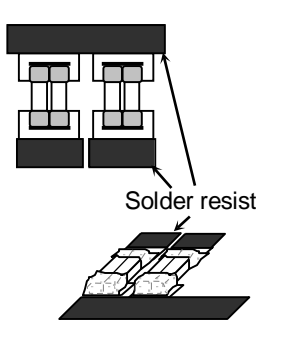
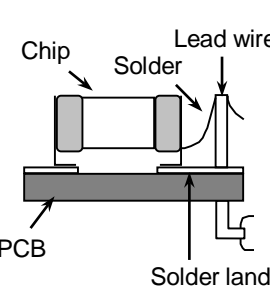
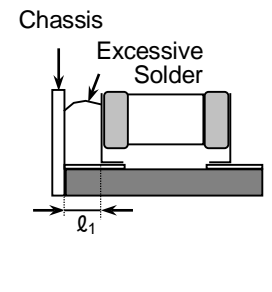
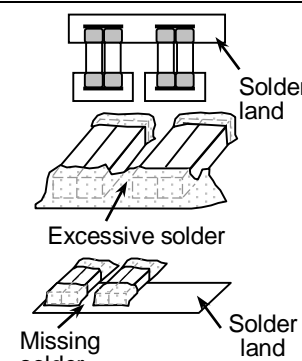
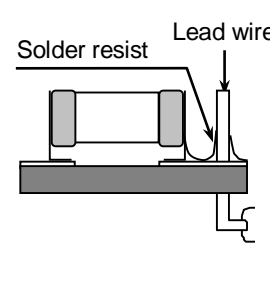
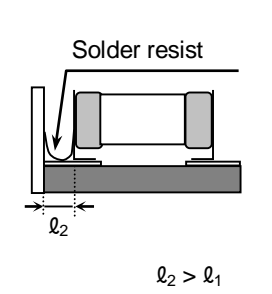
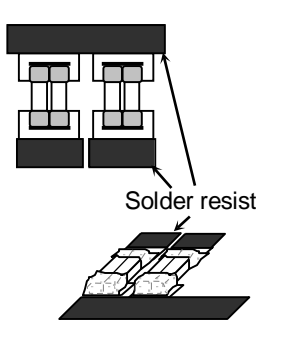
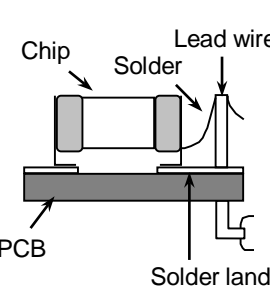
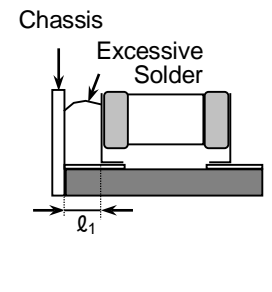
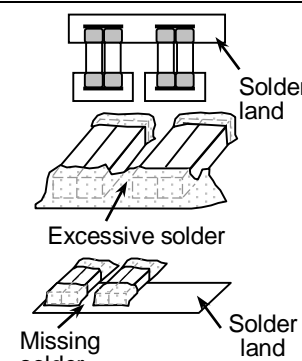
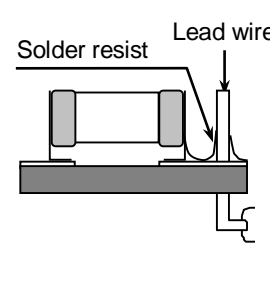
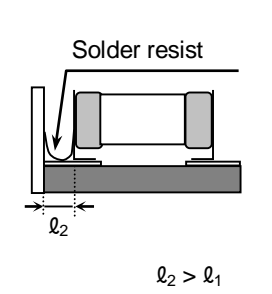
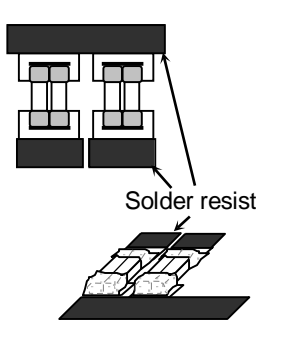
Please refer to No.5 Soldering in 11. CAUTION for recommended soldering condition.

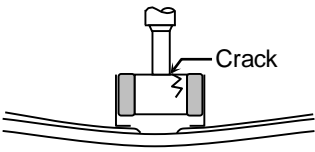
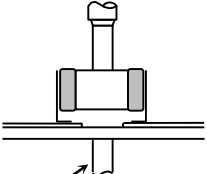
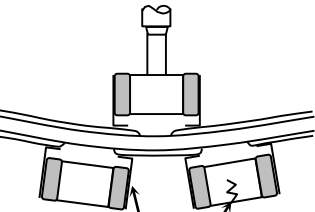
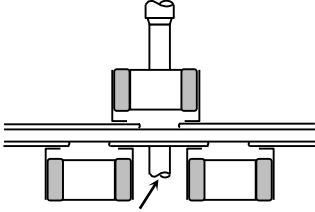
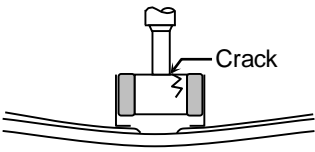
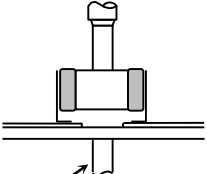
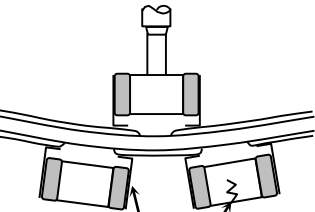
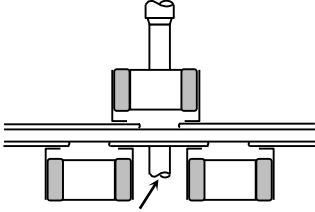
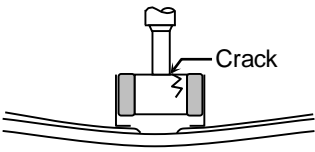
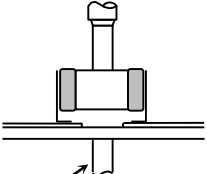
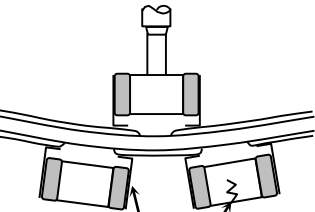
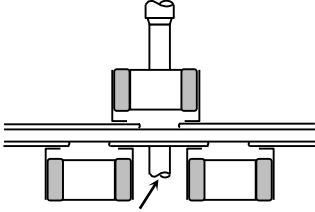
11. CAUTION

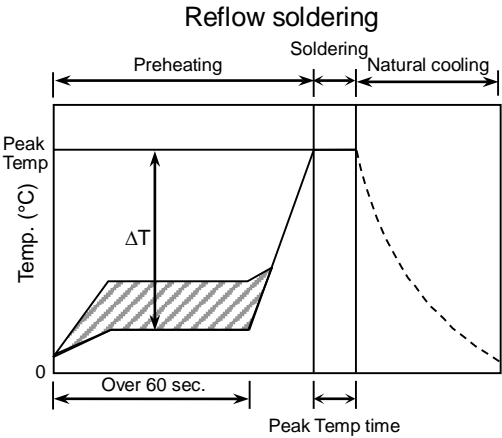
No.	Process	Condition																
1	Operating Condition (Storage, Use, Transportation)	<p>1-1. Storage, Use</p> <ol style="list-style-type: none"> 1) The capacitors must be stored in an ambient temperature of 5 to 40°C with a relative humidity of 20 to 70%RH. The products should be used within 6 months upon receipt. 2) The capacitors must be operated and stored in an environment free of dew condensation and these gases such as Hydrogen Sulphide, Hydrogen Sulphate, Chlorine, Ammonia and sulfur. 3) Avoid storing in sun light and falling of dew. 4) Do not use capacitors under high humidity and high and low atmospheric pressure which may affect capacitors reliability. 5) Capacitors should be tested for the solderability when they are stored for long time. <p>1-2. Handling in transportation</p> <p>In case of the transportation of the capacitors, the performance of the capacitors may be deteriorated depending on the transportation condition. (Refer to JEITA RCR-2335C 9.2 Handling in transportation)</p>																
2	Circuit design  Caution	<p>2-1. Operating temperature</p> <p>Operating temperature should be followed strictly within this specification, especially be careful with maximum temperature.</p> <ol style="list-style-type: none"> 1) Do not use capacitors above the maximum allowable operating temperature. 2) Surface temperature including self heating should be below maximum operating temperature. (Due to dielectric loss, capacitors will heat itself when AC is applied. Especially at high frequencies around its SRF, the heat might be so extreme that it may damage itself or the product mounted on. Please design the circuit so that the maximum temperature of the capacitors including the self heating to be below the maximum allowable operating temperature. Temperature rise at capacitor surface shall be below 20°C) 3) The electrical characteristics of the capacitors will vary depending on the temperature. The capacitors should be selected and designed in taking the temperature into consideration. <p>2-2. Operating voltage</p> <ol style="list-style-type: none"> 1) Operating voltage across the terminals should be below the rated voltage. When AC and DC are super imposed, V_{0-P} must be below the rated voltage. — (1) and (2) AC or pulse with overshooting, V_{P-P} must be below the rated voltage. — (3), (4) and (5) <p>When the voltage is started to apply to the circuit or it is stopped applying, the irregular voltage may be generated for a transit period because of resonance or switching. Be sure to use the capacitors within rated voltage containing these Irregular voltage.</p> <table border="1" data-bbox="475 1462 1449 2033"> <thead> <tr> <th data-bbox="475 1462 667 1507">Voltage</th> <th data-bbox="667 1462 930 1507">(1) DC voltage</th> <th data-bbox="930 1462 1193 1507">(2) DC+AC voltage</th> <th data-bbox="1193 1462 1449 1507">(3) AC voltage</th> </tr> </thead> <tbody> <tr> <td data-bbox="475 1507 667 1731">Positional Measurement (Rated voltage)</td> <td data-bbox="667 1507 930 1731">  </td> <td data-bbox="930 1507 1193 1731">  </td> <td data-bbox="1193 1507 1449 1731">  </td> </tr> <tr> <th data-bbox="475 1765 667 1809">Voltage</th> <th data-bbox="667 1765 930 1809">(4) Pulse voltage (A)</th> <th data-bbox="930 1765 1193 1809">(5) Pulse voltage (B)</th> <td></td> </tr> <tr> <td data-bbox="475 1809 667 2033">Positional Measurement (Rated voltage)</td> <td data-bbox="667 1809 930 2033">  </td> <td data-bbox="930 1809 1193 2033">  </td> <td></td> </tr> </tbody> </table>	Voltage	(1) DC voltage	(2) DC+AC voltage	(3) AC voltage	Positional Measurement (Rated voltage)				Voltage	(4) Pulse voltage (A)	(5) Pulse voltage (B)		Positional Measurement (Rated voltage)			
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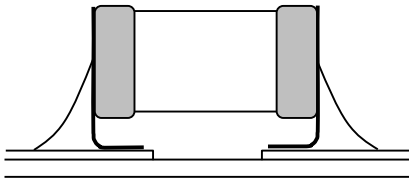
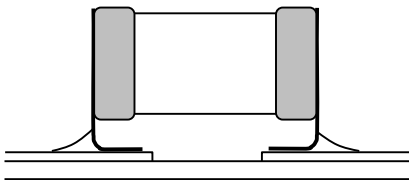
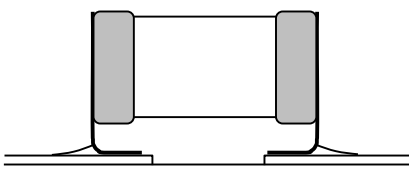
No.	Process	Condition															
2	Circuit design ⚠ Caution	<p>2) Even below the rated voltage, if repetitive high frequency AC or pulse is applied, the reliability of the capacitors may be reduced.</p> <p>3) The effective capacitance will vary depending on applied DC and AC voltages. The capacitors should be selected and designed in taking the voltages into consideration.</p> <p>2-3. Frequency When the capacitors (Class 2) are used in AC and/or pulse voltages, the capacitors may vibrate themselves and generate audible sound.</p>															
3	Designing P.C.board	<p>The amount of solder at the terminations has a direct effect on the reliability of the capacitor.</p> <ol style="list-style-type: none"> 1) The greater the amount of solder, the higher the stress on the chip capacitor, and the more likely that it will break. When designing a P.C.board, determine the shape and size of the solder lands to have proper amount of solder on the terminations. 2) Avoid using common solder land for multiple terminations and provide individual solder land for each terminations. 3) Size and recommended land dimensions. <div style="text-align: center;">  </div> <table border="1" style="margin-left: auto; margin-right: auto; text-align: center;"> <thead> <tr> <th colspan="3" data-bbox="606 1422 1316 1456">(Unit : mm)</th> </tr> <tr> <th data-bbox="606 1456 837 1534" style="text-align: left;">Type Symbol</th> <th data-bbox="837 1456 1077 1534">CAA572</th> <th data-bbox="1077 1456 1316 1534">CAA573</th> </tr> </thead> <tbody> <tr> <td data-bbox="606 1534 837 1612">A</td> <td data-bbox="837 1534 1077 1612">4.3 ~ 4.7</td> <td data-bbox="1077 1534 1316 1612">4.3 ~ 4.7</td> </tr> <tr> <td data-bbox="606 1612 837 1691">B</td> <td data-bbox="837 1612 1077 1691">1.5 ~ 2.0</td> <td data-bbox="1077 1612 1316 1691">1.5 ~ 2.0</td> </tr> <tr> <td data-bbox="606 1691 837 1769">C</td> <td data-bbox="837 1691 1077 1769">5.2 ~ 5.7</td> <td data-bbox="1077 1691 1316 1769">7.9 ~ 8.4</td> </tr> </tbody> </table>	(Unit : mm)			Type Symbol	CAA572	CAA573	A	4.3 ~ 4.7	4.3 ~ 4.7	B	1.5 ~ 2.0	1.5 ~ 2.0	C	5.2 ~ 5.7	7.9 ~ 8.4
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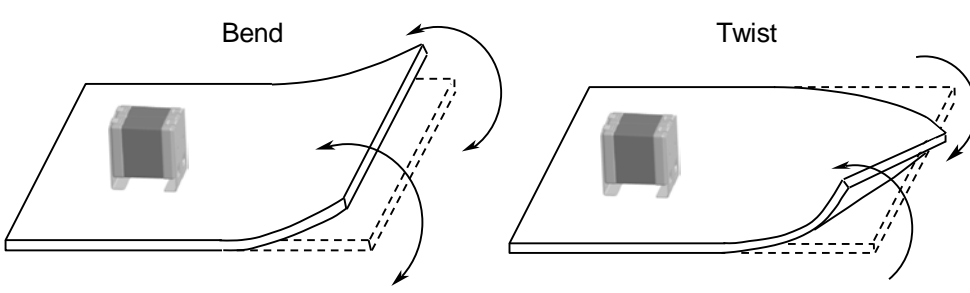
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3	Designing P.C.board	<p>5) Mechanical stress varies according to location of chip capacitors on the P.C.board.</p>  <p>The stress in capacitors is in the following order. $A > B = C > D > E$</p> <p>6) Layout recommendation</p> <table border="1" data-bbox="406 1048 1484 1960"> <thead> <tr> <th data-bbox="406 1048 544 1164">Example</th> <th data-bbox="544 1048 847 1164">Use of common solder land</th> <th data-bbox="847 1048 1153 1164">Soldering with chassis</th> <th data-bbox="1153 1048 1484 1164">Use of common solder land with other SMD</th> </tr> </thead> <tbody> <tr> <td data-bbox="406 1164 544 1545">Need to avoid</td> <td data-bbox="544 1164 847 1545">  </td> <td data-bbox="847 1164 1153 1545">  </td> <td data-bbox="1153 1164 1484 1545">  </td> </tr> <tr> <td data-bbox="406 1545 544 1960">Recommendation</td> <td data-bbox="544 1545 847 1960">  </td> <td data-bbox="847 1545 1153 1960">  <p>$l_2 > l_1$</p> </td> <td data-bbox="1153 1545 1484 1960">  </td> </tr> </tbody> </table>	Example	Use of common solder land	Soldering with chassis	Use of common solder land with other SMD	Need to avoid				Recommendation		 <p>$l_2 > l_1$</p>	
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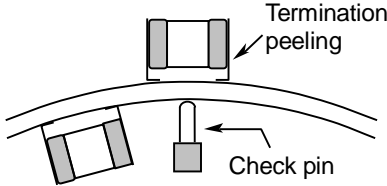
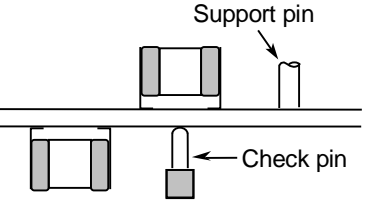
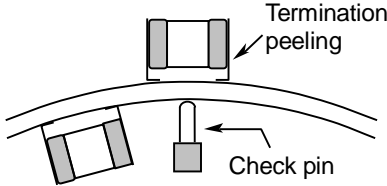
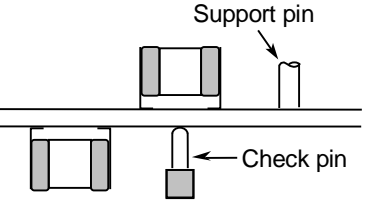
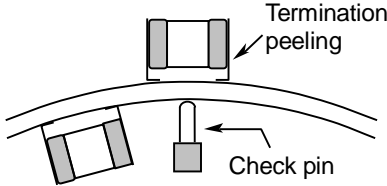
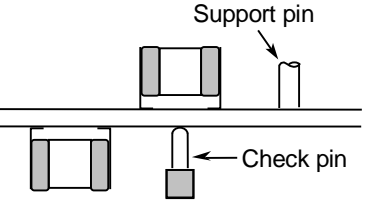
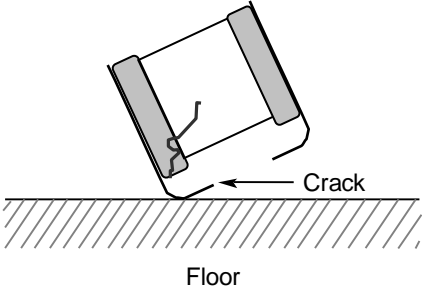
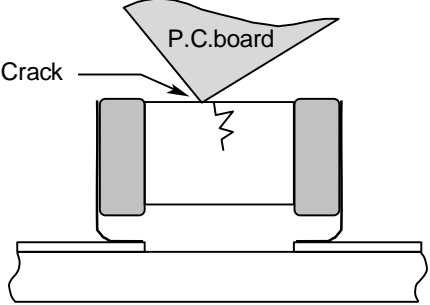
No.	Process	Condition									
4	Mounting	<p>4-1. Stress from mounting head If the mounting head is adjusted too low, it may induce excessive stress in the chip capacitor to result in cracking. Please take following precautions.</p> <ol style="list-style-type: none"> 1) Adjust the bottom dead center of the mounting head to reach on the P.C.board surface and not press it. 2) Adjust the mounting head pressure to be 1 to 3N of static weight. 3) To minimize the impact energy from mounting head, it is important to provide support from the bottom side of the P.C.board. <p>See following examples.</p> <table border="1" data-bbox="483 638 1437 1232"> <thead> <tr> <th data-bbox="483 638 687 689"></th> <th data-bbox="687 638 1058 689">Not recommended</th> <th data-bbox="1058 638 1437 689">Recommended</th> </tr> </thead> <tbody> <tr> <td data-bbox="483 689 687 943">Single sided mounting</td> <td data-bbox="687 689 1058 943">  <p>Crack</p> </td> <td data-bbox="1058 689 1437 943">  <p>Support pin</p> </td> </tr> <tr> <td data-bbox="483 943 687 1232">Double-sides mounting</td> <td data-bbox="687 943 1058 1232">  <p>Solder peeling Crack</p> </td> <td data-bbox="1058 943 1437 1232">  <p>Support pin</p> </td> </tr> </tbody> </table> <p>When the centering jaw is worn out, it may give mechanical impact on the capacitor to cause crack. Please control the close up dimension of the centering jaw and provide sufficient preventive maintenance and replacement of it.</p>		Not recommended	Recommended	Single sided mounting	 <p>Crack</p>	 <p>Support pin</p>	Double-sides mounting	 <p>Solder peeling Crack</p>	 <p>Support pin</p>
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No.	Process	Condition																		
5	Soldering	<p>5-1. Flux selection Flux can seriously affect the performance of capacitors. Confirm the following to select the appropriate flux.</p> <ol style="list-style-type: none"> 1) It is recommended to use a mildly activated rosin flux (less than 0.1wt% chlorine). Strong flux is not recommended. 2) Excessive flux must be avoided. Please provide proper amount of flux. 3) When water-soluble flux is used, enough washing is necessary. <p>5-2. Recommended soldering profile by various methods</p> <ol style="list-style-type: none"> 1) Soldering condition (Preheating temperature, soldering temperature and these times) is limited to reflow soldering method which is stipulated on the specification. 2) Chips should be mounted, shortly after a solder is on a P.C.Board. <div style="text-align: center;"> <p>Reflow soldering</p>  </div> <p>5-3. Recommended soldering peak temp and peak temp duration</p> <table border="1" data-bbox="502 1310 1204 1512"> <thead> <tr> <th rowspan="2">Temp./Duration</th> <th colspan="2">Reflow soldering</th> </tr> <tr> <th>Peak temp(°C)</th> <th>Duration(sec.)</th> </tr> </thead> <tbody> <tr> <td>Solder</td> <td></td> <td></td> </tr> <tr> <td>Sn-Pb Solder</td> <td>230 max.</td> <td>20 max.</td> </tr> <tr> <td>Lead Free Solder</td> <td>250 max.</td> <td>10 max.</td> </tr> </tbody> </table> <p>Recommended solder compositions Lead Free Solder : Sn-3.0Ag-0.5Cu Sn-Pb solder : Sn-37Pb</p> <p>5-4. Avoiding thermal shock</p> <ol style="list-style-type: none"> 1) Preheating condition <table border="1" data-bbox="534 1736 997 1848"> <thead> <tr> <th>Soldering</th> <th>Temp. (°C)</th> </tr> </thead> <tbody> <tr> <td>Reflow soldering</td> <td>$\Delta T \leq 130$</td> </tr> </tbody> </table> 2) Cooling condition Natural cooling using air is recommended. If the chips are dipped into a solvent for cleaning, the temperature difference (ΔT) must be less than 100°C. 	Temp./Duration	Reflow soldering		Peak temp(°C)	Duration(sec.)	Solder			Sn-Pb Solder	230 max.	20 max.	Lead Free Solder	250 max.	10 max.	Soldering	Temp. (°C)	Reflow soldering	$\Delta T \leq 130$
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No.	Process	Condition
5	Soldering	<p data-bbox="438 208 1465 320">5-5. Amount of solder Excessive solder will induce higher tensile force in chip capacitor when temperature changes and it may result in chip cracking. In sufficient solder may detach the capacitor from the P.C.board.</p> <hr/> <div data-bbox="499 421 624 481" style="display: inline-block; vertical-align: middle;">Excessive solder</div> <div data-bbox="676 376 1086 555" style="display: inline-block; vertical-align: middle; text-align: center;">  </div> <div data-bbox="1110 421 1426 481" style="display: inline-block; vertical-align: middle;">Higher tensile force in chip capacitor to cause crack</div> <hr/> <div data-bbox="499 663 619 696" style="display: inline-block; vertical-align: middle;">Adequate</div> <div data-bbox="676 600 1086 779" style="display: inline-block; vertical-align: middle; text-align: center;">  </div> <hr/> <div data-bbox="499 875 627 936" style="display: inline-block; vertical-align: middle;">Insufficient solder</div> <div data-bbox="676 824 1086 1003" style="display: inline-block; vertical-align: middle; text-align: center;">  </div> <div data-bbox="1110 846 1434 965" style="display: inline-block; vertical-align: middle;">Low robustness may cause contact failure or chip capacitor comes off the P.C.board.</div> <hr/> <p data-bbox="438 1093 1145 1189">5-6. Sn-Zn solder Sn-Zn solder affects product reliability. Please contact TDK in advance when utilize Sn-Zn solder.</p> <p data-bbox="438 1223 1465 1440">5-7. Countermeasure for tombstone The misalignment between the mounted positions of the capacitors and the land patterns should be minimized. The tombstone phenomenon may occur especially the capacitors are mounted (in longitudinal direction) in the same direction of the reflow soldering. (Refer to JEITA RCR-2335C Annex A (Informative) Recommendations to prevent the tombstone phenomenon)</p>

No.	Process	Condition
6	Cleaning	<p>1) If an unsuitable cleaning fluid is used, flux residue or some foreign articles may stick to chip capacitor surface to deteriorate especially the insulation resistance.</p> <p>2) If cleaning condition is not suitable, it may damage the chip capacitor.</p> <p>2)-1. Insufficient washing</p> <p>(1) Terminal electrodes may corrode by Halogen in the flux.</p> <p>(2) Halogen in the flux may adhere on the surface of capacitor, and lower the insulation resistance.</p> <p>(3) Water soluble flux has higher tendency to have above mentioned problems (1) and (2).</p> <p>2)-2. Excessive washing</p> <p>When ultrasonic cleaning is used, excessively high ultrasonic energy output can affect the connection between the ceramic chip capacitor's body and the terminal electrode. To avoid this, following is the recommended condition.</p> <p style="padding-left: 40px;">Power : 20W/l max. Frequency : 40kHz max. Washing time : 5 minutes max.</p> <p>2)-3. If the cleaning fluid is contaminated, density of Halogen increases, and it may bring the same result as insufficient cleaning.</p>
7	Coating and molding of the P.C.board	<p>1) When the P.C.board is coated, please verify the quality influence on the product.</p> <p style="padding-left: 40px;">Please verify carefully that there is no harmful decomposing or reaction gas</p> <p>2) emission during curing which may damage the chip capacitor.</p> <p>3) Please verify the curing temperature.</p>
8	Handling after chip mounted ⚠ Caution	<p>1) Please pay attention not to bend or distort the P.C.board after soldering in handling otherwise the chip capacitor may crack.</p> <div style="text-align: center;">  </div>

No.	Process	Condition															
8	Handling after chip mounted ⚠ Caution	<p>2) Printed circuit board cropping should not be carried out by hand, but by using the proper tooling. Printed circuit board cropping should be carried out using a board cropping jig as shown in the following figure or a board cropping apparatus to prevent inducing mechanical stress on the board.</p> <p>(1) Example of a board cropping jig</p> <p>Recommended example: The board should be pushed from the back side, close to the cropping jig so that the board is not bent and the stress applied to the capacitor is compressive.</p> <p>Unrecommended example: If the pushing point is far from the cropping jig and the pushing direction is from the front side of the board, large tensile stress is applied to the capacitor, which may cause cracks.</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="459 577 750 840"> <p>Outline of jig</p> </div> <div data-bbox="762 571 1444 840"> <table border="1"> <thead> <tr> <th data-bbox="762 571 1098 627">Recommended</th> <th data-bbox="1098 571 1444 627">Unrecommended</th> </tr> </thead> <tbody> <tr> <td data-bbox="762 627 1098 840"> </td> <td data-bbox="1098 627 1444 840"> </td> </tr> </tbody> </table> </div> </div> <p>(2) Example of a board cropping machine</p> <p>An outline of a printed circuit board cropping machine is shown below. The top and bottom blades are aligned with one another along the lines with the V-grooves on printed circuit board when cropping the board.</p> <p>Unrecommended example: Misalignment of blade position between top and bottom, right and left, or front and rear blades may cause a crack in the capacitor.</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="555 1153 965 1411"> <p>Outline of machine</p> </div> <div data-bbox="965 1153 1412 1400"> <p>Principle of operation</p> </div> </div> <div style="display: flex; justify-content: center; margin-top: 10px;"> <div data-bbox="1029 1444 1436 1590"> <p>Cross-section diagram</p> </div> </div> <table border="1" style="width: 100%; margin-top: 20px; text-align: center;"> <thead> <tr> <th data-bbox="641 1630 821 1713" rowspan="2">Recommended</th> <th colspan="3" data-bbox="821 1630 1353 1675">Unrecommended</th> </tr> <tr> <th data-bbox="821 1675 997 1758">Top-bottom misalignment</th> <th data-bbox="997 1675 1173 1758">Left-right misalignment</th> <th data-bbox="1173 1675 1353 1758">Front-rear misalignment</th> </tr> </thead> <tbody> <tr> <td data-bbox="641 1758 821 2056"> </td> <td data-bbox="821 1758 997 2056"> </td> <td data-bbox="997 1758 1173 2056"> </td> <td data-bbox="1173 1758 1353 2056"> </td> </tr> </tbody> </table>	Recommended	Unrecommended			Recommended	Unrecommended			Top-bottom misalignment	Left-right misalignment	Front-rear misalignment				
Recommended	Unrecommended																
Recommended	Unrecommended																
	Top-bottom misalignment	Left-right misalignment	Front-rear misalignment														

No.	Process	Condition						
8	Handling after chip mounted  Caution	<p data-bbox="491 226 1485 365">3) When functional check of the P.C.board is performed, check pin pressure tends to be adjusted higher for fear of loose contact. But if the pressure is excessive and bend the P.C.board, it may crack the chip capacitor or peel the terminations off. Please adjust the check pins not to bend the P.C.board.</p> <table border="1" data-bbox="491 387 1485 790"> <thead> <tr> <th data-bbox="491 387 644 450">Item</th> <th data-bbox="644 387 1066 450">Not recommended</th> <th data-bbox="1066 387 1485 450">Recommended</th> </tr> </thead> <tbody> <tr> <td data-bbox="491 450 644 790">Board bending</td> <td data-bbox="644 450 1066 790">  </td> <td data-bbox="1066 450 1485 790">  </td> </tr> </tbody> </table>	Item	Not recommended	Recommended	Board bending		
Item	Not recommended	Recommended						
Board bending								
9	Handling of loose chip capacitor	<p data-bbox="491 840 1485 936">1) If dropped the chip capacitor may crack. Once dropped do not use it. Especially, the large case sized chip capacitor is tendency to have cracks easily, so please handle with care.</p>  <p data-bbox="491 1238 1485 1305">2) Piling the P.C.board after mounting for storage or handling, the corner of the P.C. board may hit the chip capacitor of another board to cause crack.</p> 						
10	Capacitance aging	<p data-bbox="491 1675 1485 1765">The capacitors (Class 2) have aging in the capacitance. They may not be used in precision time constant circuit. In case of the time constant circuit, the evaluation should be done well.</p>						
11	Estimated life and estimated failure rate of capacitors	<p data-bbox="491 1794 1485 1989">As per the estimated life and the estimated failure rate depend on the temperature and the voltage. This can be calculated by the equation described in JEITA RCR-2335C Annex F (Informative) Calculation of the estimated lifetime and the estimated failure rate (Voltage acceleration coefficient : 3 multiplication rule, Temperature acceleration coefficient : 10°C rule) The failure rate can be decreased by reducing the temperature and the voltage but they will not be guaranteed.</p>						

No.	Process	Condition
12	Caution during operation of equipment	<p>1) A capacitor shall not be touched directly with bare hands during operation in order to avoid electric shock. Electric energy held by the capacitor may be discharged through the human body when touched with a bare hand. Even when the equipment is off, a capacitor may stay charged. The capacitor should be handled after being completely discharged using a resistor.</p> <p>2) The terminals of a capacitor shall not be short-circuited by any accidental contact with a conductive object. A capacitor shall not be exposed to a conductive liquid such as an acid or alkali solution. A conductive object or liquid, such as acid and alkali, between the terminals may lead to the breakdown of a capacitor due to short circuit</p> <p>3) Confirm that the environment to which the equipment will be exposed during transportation and operation meets the specified conditions. Do not to use the equipment in the following environments.</p> <p>(1) Environment where a capacitor is splattered with water or oil (2) Environment where a capacitor is exposed to direct sunlight (3) Environment where a capacitor is exposed to Ozone, ultraviolet rays or radiation (4) Environment where a capacitor exposed to corrosive gas(e.g. hydrogen sulfide, sulfur dioxide, chlorine. ammonia gas etc.) (5) Environment where a capacitor exposed to vibration or mechanical shock exceeding the specified limits. (6) Atmosphere change with causes condensation</p>
13	Others  Caution	<p>The products listed on this specification sheet are intended for use in general electronic equipment (AV equipment, telecommunications equipment, home appliances, amusement equipment, computer equipment, personal equipment, office equipment, measurement equipment, industrial robots) under a normal operation and use condition.</p> <p>The products are not designed or warranted to meet the requirements of the applications listed below, whose performance and/or quality require a more stringent level of safety or reliability, or whose failure, malfunction or trouble could cause serious damage to society, person or property. Please understand that we are not responsible for any damage or liability caused by use of the products in any of the applications below or for any other use exceeding the range or conditions set forth in this specification sheet. If you intend to use the products in the applications listed below or if you have special requirements exceeding the range or conditions set forth in this specification, please contact us.</p> <p>(1) Aerospace/Aviation equipment (2) Transportation equipment (cars, electric trains, ships, etc.) (3) Medical equipment (Excepting Pharmaceutical Affairs Law classification Class1,2) (4) Power-generation control equipment (5) Atomic energy-related equipment (6) Seabed equipment (7) Transportation control equipment (8) Public information-processing equipment (9) Military equipment (10) Electric heating apparatus, burning equipment (11) Disaster prevention/crime prevention equipment (12) Safety equipment (13) Other applications that are not considered general-purpose applications</p> <p>When designing your equipment even for general-purpose applications, you are kindly requested to take into consideration securing protection circuit/device or providing backup circuits in your equipment.</p>

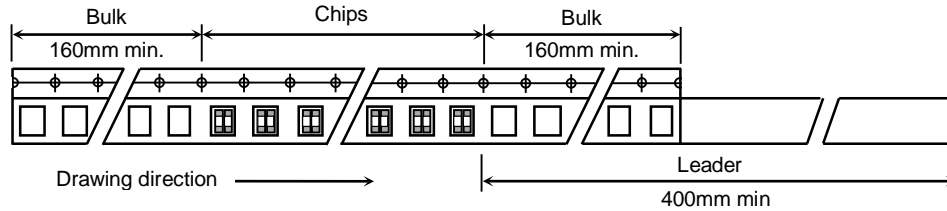
13. TAPE PACKAGING SPECIFICATION

1. CONSTRUCTION AND DIMENSION OF TAPING

1-1. Dimensions of carrier tape

Dimensions of plastic tape shall be according to Appendix 3.

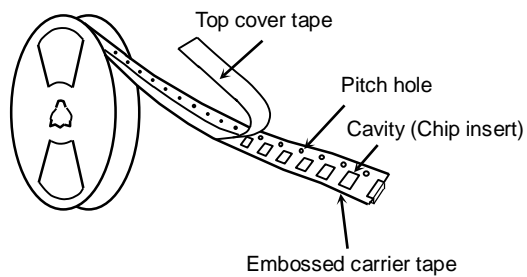
1-2. Bulk part and leader of taping



1-3. Dimensions of reel

Dimensions of $\phi 330$ reel shall be according to Appendix 4.

1-4. Structure of taping



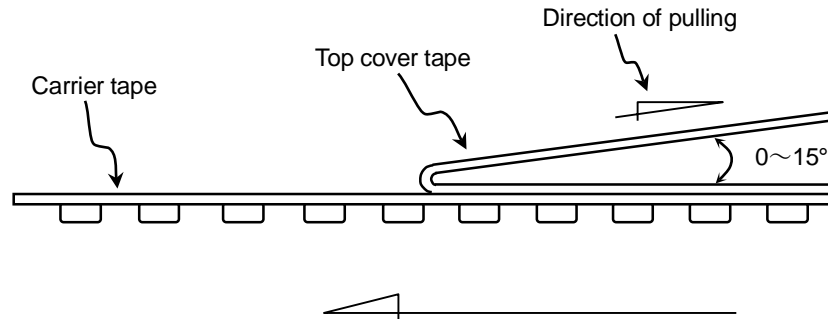
2. CHIP QUANTITY

Please refer to detail page on TDK Web.

3. PERFORMANCE SPECIFICATIONS

3-1. Fixing peeling strength (top cover tape)

$$0.05\text{N} < \text{Peeling strength} < 0.7\text{N}$$



3-2. Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.

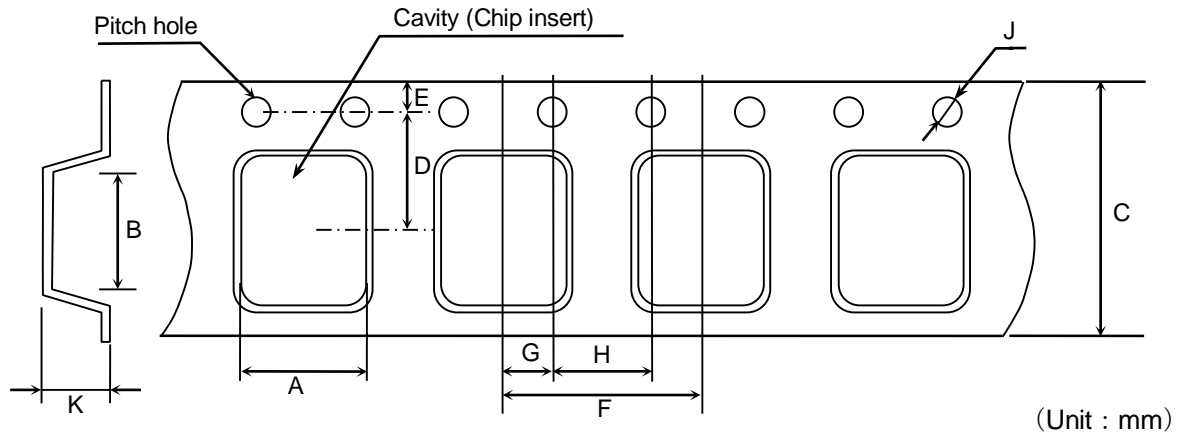
3-3. The missing of components shall be less than 0.1%

3-4. Components shall not stick to fixing tape.

3-5. When removing the cover tape, there shall not be difficulties by unfitting clearance gap, burrs and crushes of cavities. Also the sprocket holes shall not be covered by absorbing dust into the suction nozzle.

Appendix 3

Plastic Tape



(Unit : mm)

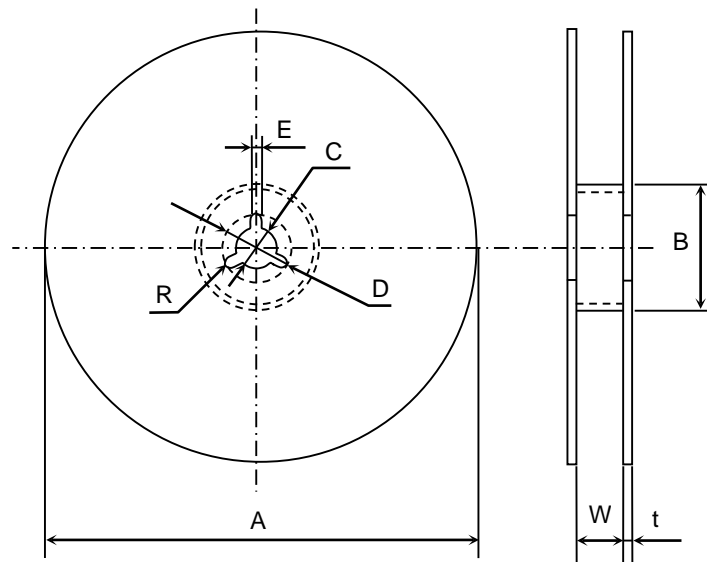
Symbol	A	B	C	D	E	F
CAA572	(5.90)	(6.40)	16.0±0.30	7.50±0.10	1.75±0.10	12.00±0.10
CAA573	(6.40)	(8.70)				

Symbol	G	H	J	K
CAA572	2.00±0.10	4.00±0.10	$\phi 1.50 \begin{smallmatrix} +0.1 \\ 0 \end{smallmatrix}$	6.80 max.
CAA573				

() Referenced value.

Appendix 4

(Material : Polystyrene)



(Unit : mm)

Symbol	A	B	C	D	E	W
Dimension	$\phi 382$ max. (Nominal $\phi 330$)	$\phi 50$ min.	$\phi 13 \pm 0.5$	$\phi 21 \pm 0.8$	2.0 ± 0.5	17.5 ± 1.5
Symbol	t	R				
Dimension	2.0 ± 0.5	1.0				