SPECIFICATION

SPEC. No. A-Glue-b

D A T E : 2015 Jan.

To

Non-Controlled Copy

CUSTOMER'S PRODUCT NAME	TDK PRODUCT NAME MULTILAYER CERAMIC CHIP CAPACITORS CGA Series / Automotive Grade Conductive Epoxy Application

Please return this specification to TDK representatives.
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

TDK-EPC Corporation
Engineering
Ceramic Capacitors Business Group

APPROVED	Person in charge

APPROVED	CHECKED	Person in charge

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-EPC Corporation Japan, TDK(Suzhou)Co.,Ltd and TDK Components U.S.A. Inc.

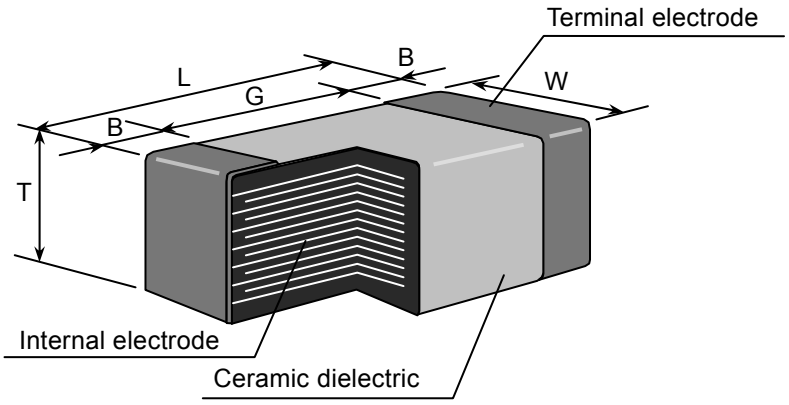
EXPLANATORY NOTE:
This specification warrants the quality of the ceramic chip capacitors. The chips should be evaluated or confirmed a state of mounted on your product.
If the use of the chips goes beyond the bounds of the specification, we can not afford to guarantee.

2. CODE CONSTRUCTION

(Example)

Catalog Number : (Web)	CGA4 (1)	J (2)	3 (3)	X7R (4)	1E (5)	105 (6)	K (7)	125 (8)	A (9)	D (10)
Item Description :	CGA4 (1)	J (2)	3 (3)	X7R (4)	1E (5)	105 (6)	K (7)	T (11)	*** B (12)	

(1) Type



Please refer to product list for the dimension of each product.

(2) Thickness

* As for dimension tolerance, please contact with our sales representative.

Thickness	Dimension(mm)
B	0.50
C	0.60
E	0.80
F	0.85
H	1.15
J	1.25
L	1.60
M	2.00
P	2.50

(3) Voltage condition in the life test (Max. Operating Temp./1000h)

Sign	Condition
1	Rated Voltage x 1
2	Rated Voltage x 2
3	Rated Voltage x 1.5

(4) Temperature Characteristics (Details are shown in table 1 No.7 and No.8 at page 5)

(5) Rated Voltage

Symbol	Rated Voltage
2 A	DC 100 V
1 H	DC 50 V
1 V	DC 35 V
1 E	DC 25 V
1 C	DC 16 V
0 J	DC 6.3 V

(6) 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.
R is designated for a decimal point.

Example 2R2 → 2.2pF
105 → 1,000,000pF

(7) Capacitance tolerance

Symbol	Tolerance	Capacitance
C	± 0.25 pF	10pF and under
D	± 0.5 pF	
J	± 5 %	Over 10 pF
K	± 10 %	
M	± 20 %	

(8) Thickness code (Only Catalog Number)

(9) Package code (Only Catalog Number)

(10) Special code (Only Catalog Number)

(11) Packaging (Only Item Description)
(Bulk is not applicable for CGA2 type.)

Symbol	Packaging
B	Bulk
T	Taping

(12) TDK Internal code (Only Item Description)

* * * B

B : For Conductive glue mounting

These TDK internal codes are subject to change without notice.

3. RATED CAPACITANCE AND CAPACITANCE TOLERANCE

3.1 Standard combination of rated capacitance and tolerances

Class	Temperature Characteristics	Capacitance tolerance		Rated capacitance
1	C0G	10pF and under	C (±0.25pF)	1, 1.5, 2, 2.2, 3, 3.3, 4, 4.7, 5
			D (±0.5pF)	6, 6.8, 7, 8, 9, 10
		Over 10pF	J (± 5 %) K (± 10 %)	E – 12 series
2	X7R X8R	K (± 10 %) M (± 20 %)		E – 6 series

3.2 Capacitance Step in E series

E series	Capacitance Step											
E- 6	1.0		1.5		2.2		3.3		4.7		6.8	
E-12	1.0	1.2	1.5	1.8	2.2	2.7	3.3	3.9	4.7	5.6	6.8	8.2

4. OPERATING TEMPERATURE RANGE

T.C.	Min. operating Temperature	Max. operating Temperature	Reference Temperature
C0G	-55°C	125°C	25°C
X7R	-55°C	125°C	25°C
X8R	-55°C	150°C	25°C

5. STORING CONDITION AND TERM

5 to 40°C at 20 to 70%RH

6 months Max.

6. INDUSTRIAL WASTE DISPOSAL

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

7. MEASURES FOR CORROSIVE GAS

In order to avoid the failures which are caused by corrosive gas, chip capacitors must be sealed with silicon resin or equivalent.

8. PERFORMANCE

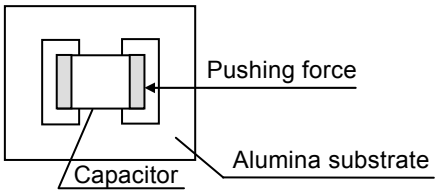
table 1

<table>
<tr><th>No.</th><th>Item</th><th>Performance</th><th>Test or inspection method</th></tr>
<tr><td>1</td><td>External Appearance</td><td>No defects which may affect performance.</td><td>Inspect with magnifying glass (3×).</td></tr>
<tr><td>2</td><td>Insulation Resistance</td><td>10,000MΩ or 500MΩ·μF min.
(As for the capacitors of rated voltage 16, 10 and 6.3V DC, 10,000 MΩ or 100MΩ·μF min.,)
whichever smaller.</td><td>Apply rated voltage for 60s.</td></tr>
<tr><td>3</td><td>Voltage Proof</td><td>Withstand test voltage without insulation breakdown or other damage.</td><td><table><tr><th>Class</th><th>Apply voltage</th></tr><tr><td>Class1</td><td>3 × rated voltage</td></tr><tr><td>Class2</td><td>2.5 × rated voltage</td></tr></table>Above DC voltage shall be applied for 1 to 5s.
Charge / discharge current shall not exceed 50mA.</td></tr>
<tr><td>4</td><td>Capacitance</td><td>Within the specified tolerance.</td><td><table><tr><th>Class</th><th>Rated Capacitance</th><th>Measuring frequency</th><th>Measuring voltage</th></tr><tr><td rowspan="2">Class1</td><td>1000pF and under</td><td>1MHz±10%</td><td rowspan="2">0.5 - 5 Vrms.</td></tr><tr><td>Over 1000pF</td><td>1kHz±10%</td></tr><tr><td rowspan="2">Class2</td><td rowspan="2">10uF and under</td><td rowspan="2">1kHz±10%</td><td>0.5±0.2Vrms.</td></tr><tr><td>1.0±0.2Vrms.</td></tr></table>For information which product has which measuring voltage, please contact with our sales representative.</td></tr>
<tr><td>5</td><td>Q
(Class1)</td><td><table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>1,000 min.</td></tr><tr><td>Under 30pF</td><td>400+20×C min.</td></tr></table>C : Rated capacitance (pF)</td><td>See No.4 in this table for measuring condition.</td></tr>
<tr><td>6</td><td>Dissipation Factor
(Class2)</td><td><table><tr><th>T.C.</th><th>D.F.</th></tr><tr><td>X7R
X8R</td><td>0.03 max.
0.05 max.
0.075 max.
0.1 max.</td></tr></table></td><td>See No.4 in this table for measuring condition.

For information which product has which Dissipation Factor, please contact with our sales representative.</td></tr>
</table>

(continued)

<table>
<tr><th>No.</th><th>Item</th><th>Performance</th><th>Test or inspection method</th></tr>
<tr><td>7</td><td>Temperature Characteristics of Capacitance (Class1)</td><td>
<table>
<tr><th>T.C.</th><th>Temperature Coefficient (ppm/°C)</th></tr>
<tr><td>C0G</td><td>0 ± 30</td></tr>
</table>
Capacitance drift within ± 0.2% or ±0.05pF, whichever larger.
</td><td>Temperature coefficient shall be calculated based on values at 25°C and 85°C temperature.

Measuring temperature below 20°C shall be -10°C and -25°C.</td></tr>
<tr><td>8</td><td>Temperature Characteristics of Capacitance (Class2)</td><td>
<table>
<tr><th>Capacitance Change (%)</th></tr>
<tr><td>No voltage applied</td></tr>
<tr><td>X7R : ±15
X8R : ±15</td></tr>
</table>
</td><td>Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step.
ΔC be calculated ref. STEP3 reading
<table>
<tr><th>Step</th><th>Temperature(°C)</th></tr>
<tr><td>1</td><td>Reference temp. ± 2</td></tr>
<tr><td>2</td><td>Min. operating temp. ± 2</td></tr>
<tr><td>3</td><td>Reference temp. ± 2</td></tr>
<tr><td>4</td><td>Max. operating temp. ± 2</td></tr>
</table>
Measuring voltage
As for the capacitor of rated voltage 10V DC(1A) and 6.3V DC(0J), 0.1Vrms shall be applied.
For information which product has which applied voltage, please contact with our sales representative.</td></tr>
<tr><td>9</td><td>Robustness of Terminations</td><td>No sign of termination coming off, breakage of ceramic, or other abnormal signs.</td><td>Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue and apply a pushing force of 5N with 10±1s.
(2N is applicable for CGA2 type)
 
</td></tr>
</table>

(continued)

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Performance</th><th>Test or inspection method</th></tr>
<tr><td rowspan="4">10</td><td rowspan="4">Vibration</td><td>External appearance</td><td>No mechanical damage.</td><td rowspan="4">Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing.

Vibrate the capacitor with following conditions.

Applied force : 5G max.
Frequency : 10-2000Hz
Duration : 20 min.
Cycle : 12 cycles in each 3 mutually perpendicular directions.</td></tr>
<tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class1</td><td>C0G</td><td>±2.5% or ±0.25pF, whichever larger.</td></tr><tr><td>Class2</td><td>X7R
X8R</td><td>± 7.5 %</td></tr></table></td></tr>
<tr><td>Q
(Class1)</td><td><table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>1,000 min.</td></tr><tr><td>Under 30pF</td><td>400+20×C min.</td></tr></table>C : Rated capacitance (pF)</td></tr>
<tr><td>D.F.
(Class2)</td><td>Meet the initial spec.</td></tr>
<tr><td rowspan="6">11</td><td rowspan="6">Temperature cycle</td><td>External appearance</td><td>No mechanical damage.</td><td rowspan="6">Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing.

Expose the capacitors in the condition step1 through step 4 and repeat 1,000 times consecutively.

Leave the capacitors in ambient condition for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.<table><tr><th>Step</th><th>Temperature(°C)</th><th>Time (min.)</th></tr><tr><td>1</td><td>Min. operating temp. ±3</td><td>30 ± 3</td></tr><tr><td>2</td><td>Reference Temp.</td><td>2 - 5</td></tr><tr><td>3</td><td>Max. operating temp. ±2</td><td>30 ± 2</td></tr><tr><td>4</td><td>Reference Temp.</td><td>2 - 5</td></tr></table></td></tr>
<tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class1</td><td>C0G</td><td>±2.5% or ±0.25pF, whichever larger.</td></tr><tr><td>Class2</td><td>X7R
X8R</td><td>± 7.5 %
± 12.5 %</td></tr></table></td></tr>
<tr><td>Q
(Class1)</td><td><table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>1,000 min.</td></tr><tr><td>Under 30pF</td><td>400+20×C min.</td></tr></table>C : Rated capacitance (pF)</td></tr>
<tr><td>D.F.
(Class2)</td><td>Meet the initial spec.</td></tr>
<tr><td>Insulation Resistance</td><td>Meet the initial spec.</td></tr>
<tr><td>Voltage proof</td><td>No insulation breakdown or other damage.</td></tr>
</table>

(continued)

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Performance</th><th>Test or inspection method</th></tr>
<tr><td rowspan="5">12</td><td rowspan="5">Moisture Resistance (Steady State)</td><td>External appearance</td><td>No mechanical damage.</td><td rowspan="5">Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing.

Leave at temperature 40±2°C, 90 to 95%RH for 500 +24,0h.

Leave the capacitors in ambient condition for 6 to 24h (Class1) or 24±2h (Class2) before measurement.</td></tr>
<tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class1</td><td>C0G</td><td>±5% or ±0.5pF, whichever larger.</td></tr><tr><td>Class2</td><td>X7R
X8R</td><td>± 12.5 %
± 25 %</td></tr></table></td></tr>
<tr><td>Q
(Class1)</td><td><table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>350 min.</td></tr><tr><td>10pF and over under 30pF</td><td>275+5/2×C min.</td></tr><tr><td>Under 10pF</td><td>200+10×C min.</td></tr></table>C : Rated capacitance (pF)</td></tr>
<tr><td>D.F.
(Class2)</td><td>Characteristics
200% of initial spec. max.</td></tr>
<tr><td>Insulation Resistance</td><td>1,000MΩ or 50MΩ·μF min.
(As for the capacitors of rated voltage 16, 10 and 6.3V DC, 1,000 MΩ or 10MΩ·μF min.,)
whichever smaller.</td></tr>
<tr><td rowspan="5">13</td><td rowspan="5">Moisture Resistance</td><td>External appearanc e</td><td>No mechanical damage.</td><td rowspan="5">Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing.

Apply the rated voltage at temperature 85°C and 85%RH for 1,000 +48,0h.

Charge/discharge current shall not exceed 50mA.

Leave the capacitors in ambient condition for 6 to 24h (Class1) or 24±2h (Class2) before measurement.

Voltage conditioning (only for class2)
Voltage treat the capacitor under testing temperature and voltage for 1hour.
Leave the capacitors in ambient condition for 24±2h before measurement.
Use this measurement for initial value.</td></tr>
<tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class1</td><td>C0G</td><td>±7.5% or ±0.75pF, whichever larger.</td></tr><tr><td>Class2</td><td>X7R
X8R</td><td>± 12.5 %
± 25 %</td></tr></table></td></tr>
<tr><td>Q
(Class1)</td><td><table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>200 min.</td></tr><tr><td>Under 30pF</td><td>100+10/3×C min.</td></tr></table>C : Rated capacitance (pF)</td></tr>
<tr><td>D.F.
(Class2)</td><td>Characteristics
200% of initial spec. max.</td></tr>
<tr><td>Insulation Resistance</td><td>500MΩ or 25MΩ·μF min.
(As for the capacitors of rated voltage 16, 10 and 6.3V DC, 500 MΩ or 5MΩ·μF min.,)
whichever smaller.</td></tr>
</table>

(continued)

<table>
<tr><th>No.</th><th colspan="2">Item</th><th>Performance</th><th>Test or inspection method</th></tr>
<tr><td rowspan="5">14</td><td rowspan="5">Life</td><td>External appearance</td><td>No mechanical damage.</td><td rowspan="5">Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing.

Below the voltage shall be applied at maximum operating temperature ±2°C for 1,000 +48, 0h.
<table><tr><th>Applied voltage</th></tr><tr><td>Rated voltage x2</td></tr><tr><td>Rated voltage x1.5</td></tr><tr><td>Rated voltage x1</td></tr></table>
For information which product has which 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 (Class1) or 24±2h (Class2) before measurement.

Voltage conditioning (only for class2) Voltage treat the capacitor under testing temperature and voltage for 1hour.

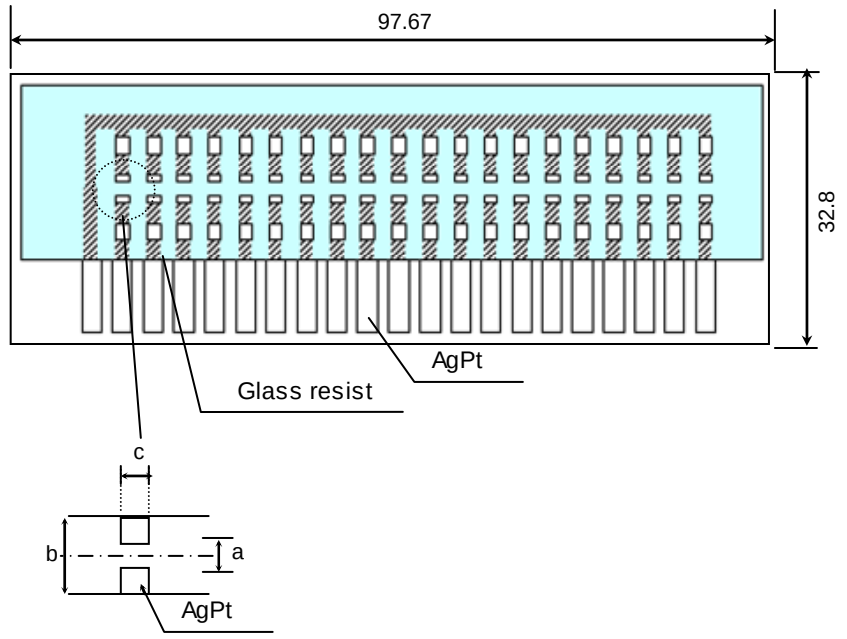
Leave the capacitors in ambient condition for 24±2h before measurement.
Use this measurement for initial value.</td></tr>
<tr><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class1</td><td>C0G</td><td>±3% or ±0.3pF, whichever larger.</td></tr><tr><td rowspan="2">Class2</td><td>X7R</td><td>± 15 %</td></tr><tr><td>X8R</td><td>± 25 %</td></tr></table></td></tr>
<tr><td>Q
(Class1)</td><td><table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>30pF and over</td><td>350 min.</td></tr><tr><td>10pF and over under 30pF</td><td>275+5/2×C min.</td></tr><tr><td>Under 10pF</td><td>200+10×C min.</td></tr></table>C : Rated capacitance (pF)</td></tr>
<tr><td>D.F.
(Class2)</td><td>Characteristics
200% of initial spec. max.</td></tr>
<tr><td>Insulation Resistance</td><td>1,000MΩ or 50MΩ·μF min.
(As for the capacitors of rated voltage 16, 10 and 6.3V DC, 1,000 MΩ or 10MΩ·μF min.,)
whichever smaller.</td></tr>
</table>

*As for the initial measurement of capacitors (Class2) on number 8,10,11 and 12, leave capacitors at 150 -10,0°C for 1 hour and measure the value after leaving capacitors for 24±2h in ambient condition.

Appendix - 1

P.C. Board for reliability test

Applied for CGA2, CGA3, CGA4, CGA5, CGA6



Material : Alumina substrate

Alumina substrate thickness : Appendix-1 0.8mm

TDK (EIA style)	Dimensions (mm)		
	a	b	c
CGA2 (CC0402)	0.5	1.4	0.5
CGA3 (CC0603)	0.9	2.7	1.2
CGA4 (CC0805)	0.9	2.7	1.9
CGA5 (CC1206)	1.8	4.0	2.0
CGA6 (CC1210)	1.8	4.4	3.0

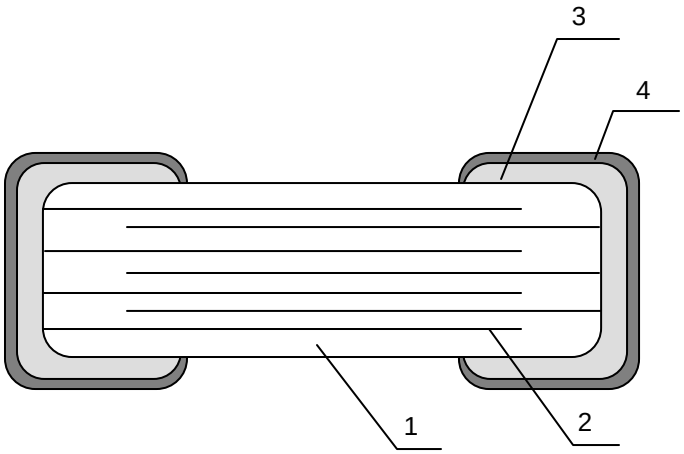
AgPt

Glass resist

Caution for mounting with conductive glue

(Refer to the page 12.)

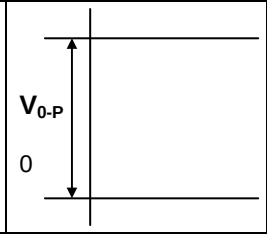
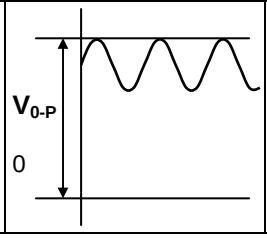
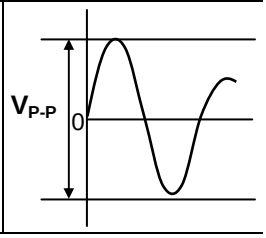
9. INSIDE STRUCTURE AND MATERIAL

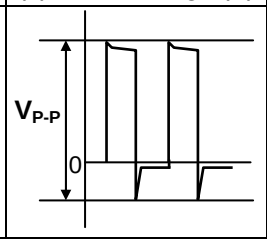
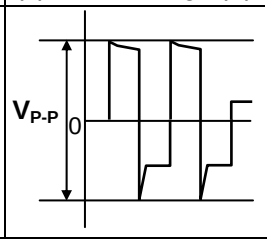


No.	NAME	MATERIAL	
		Class1	Class2
1	Dielectric	$CaZrO_3$	$BaTiO_3$
2	Electrode	Nickel (Ni)	
3	Termination	Copper (Cu)	
4		AgPdCu	

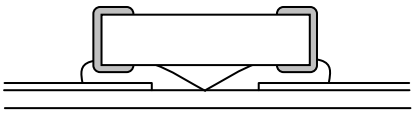
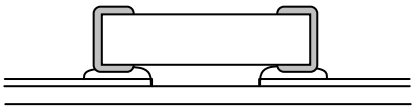
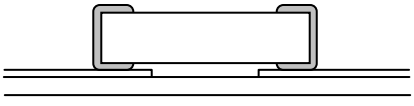
10. Caution

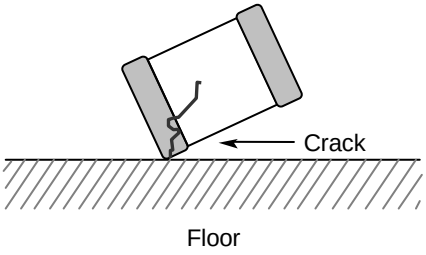
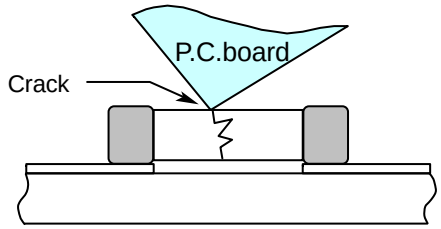
No.	Process	Condition
1	Operating Condition (Storage, Transportation)	1-1. Storage 1) The capacitors must be stored in an ambient temperature of 5 to 40°C with a relative humidity of 20 to 70%RH. The products should be used within 6 months upon receipt. 2) The capacitors must be operated and stored in 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. 1-2. Handling in transportation 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-2335B 9.2 Handling in transportation)
2	Circuit design ⚠ Caution	2-1. Operating temperature Operating temperature should be followed strictly within this specification, especially be careful with maximum temperature. 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. 2-2. Operating voltage 1) Operating voltage across the terminals should be below the rated voltage. When AC and DC are super imposed, $V_{0\text{-}P}$ must be below the rated voltage. ——— (1) and (2) AC or pulse with overshooting, $V_{P\text{-}P}$ must be below the rated voltage. ——— (3), (4) and (5) 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.

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)		

No.	Process	Condition
2	Circuit design ⚠ Caution	2) Even below the rated voltage, if repetitive high frequency AC or pulse is applied, the reliability of the capacitors may be reduced. 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. 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.
3	Designing Alumina Substrate	The amount of glue at the terminations has a direct effect on the reliability of the capacitors. 1) The greater the amount of glue with low thickness of land, the higher risk of electrical connection by conductive glue. Design of land and the amount of glue must be considered well. 2) Avoid using common land for multiple terminations and provide individual land for each terminations.
4	Mounting	4-1. Stress from mounting head 1) 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. 2) Adjust the bottom dead center of the mounting head to reach on the Alumina substrate surface and not press it. 3) Adjust the mounting head pressure to be 1 to 3N of static weight. 4-2. Amount of conductive glue Excessive glue will make a electrical connection under the chip. In sufficient glue may detach the capacitor from the Alumina substrate.

Excessive glue		Electrical connection will be made under the chip.
Adequate		
Insufficient glue		Low robustness may cause contact failure or chip capacitor comes off the Alumina substrate.

No.	Process	Condition
5	Coating and molding of the Alumina substrate	1) When the Alumina substrate is coated, please verify the quality influence on the product. 2) Please verify carefully that there is no harmful decomposing or reaction gas emission during curing which may damage the chip capacitors. 3) Please verify the curing temperature.
6	Handling of loose chip capacitors	1) If dropped the chip capacitors may crack. Once dropped do not use it. Especially, the large case sized chip capacitors are tendency to have cracks easily, so please handle with care.  2) Piling the Alumina substrate after mounting for storage or handling, the corner of the Alumina substrate may hit the chip capacitors of another board to cause crack. 
7	Capacitance aging	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.
8	Estimated life and estimated failure rate of capacitors	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-2335B Annex 6 (Informative) Calculation of the estimated life time 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.

No.	Process	Condition
9	Others ⚠ Caution	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. 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. (1) Aerospace/Aviation equipment (2) Transportation equipment (electric trains, ships, etc.) (3) Medical equipment (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 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.

11. Packaging label

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.

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

*Composition of Inspection No.

Example F 2 A – OO – OOO
(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

12. Bulk packaging quantity

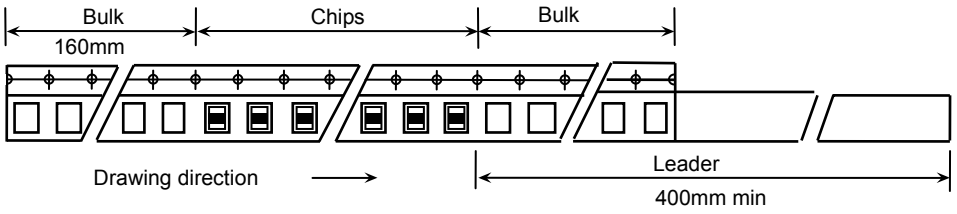
Total number of components in a plastic bag for bulk packaging : 1,000pcs.
As for CGA2 types, not available for bulk packaging.

13. TAPE PACKAGING SPECIFICATION

1. CONSTRUCTION AND DIMENSION OF TAPING

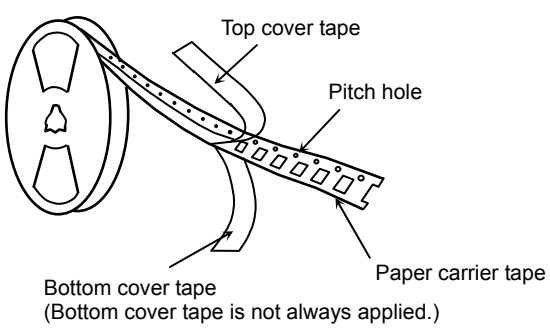
1-1. Dimensions of carrier tape
Dimensions of paper tape shall be according to Appendix 2, 3.
Dimensions of plastic tape shall be according to Appendix 4.

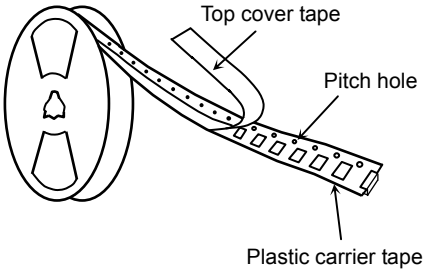
1-2. Bulk part and leader of taping



1-3. Dimensions of reel
Dimensions of Ø178 reel shall be according to Appendix 5, 6.
Dimensions of Ø330 reel shall be according to Appendix 7, 8.

1-4. Structure of taping





2. CHIP QUANTITY

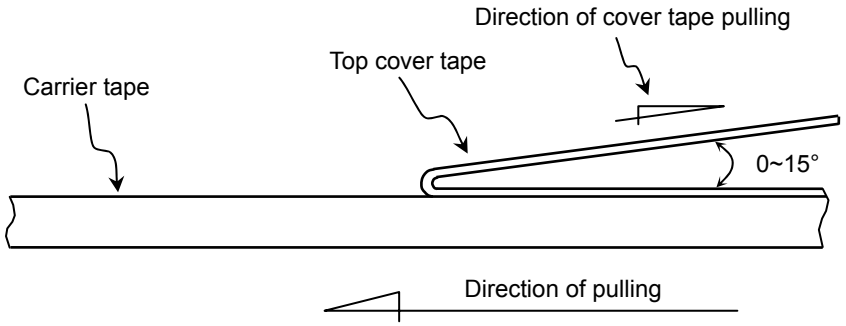
Type	Thickness of chip	Taping Material	Chip quantity(pcs.)	
			φ178mm reel	φ330mm reel
CGA2 (CC0402)	0.50 mm	Paper	10,000	50,000
CGA3 (CC0603)	0.80 mm	Paper or Plastic	4,000	10,000
CGA4 (CC0805)	0.85 mm	Paper or Plastic	4,000	10,000
	1.25 mm	Plastic	2,000	
CGA5 (CC1206)	0.85 mm	Paper or Plastic	4,000	10,000
	1.15 mm	Plastic	2,000	
	1.60 mm			8,000
CGA6 (CC1210)	1.60 mm	Plastic	2,000	8,000
	2.00 mm		1,000	5,000
	2.50 mm			

3. PERFORMANCE SPECIFICATIONS

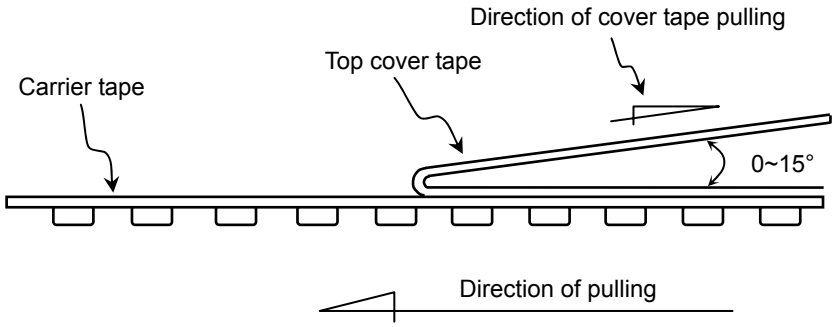
3-1. Fixing peeling strength (top tape)

0.05-0.7N. (See the following figure.)

TYPE 1 (Paper)



TYPE 2 (Plastic)



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

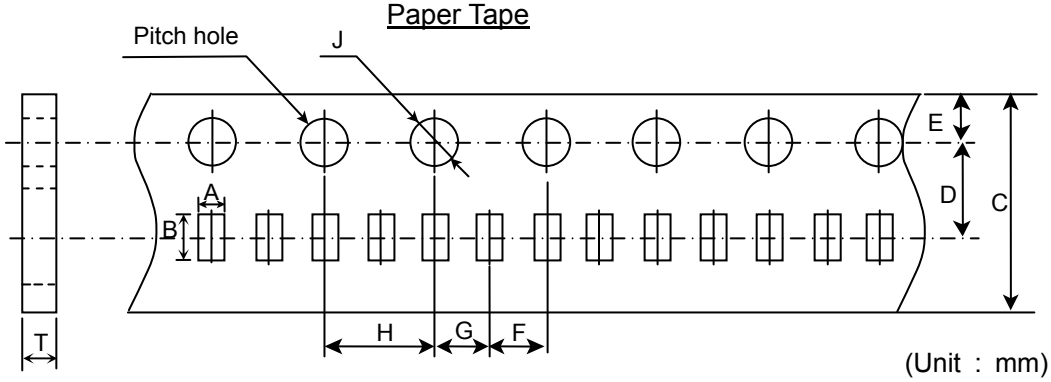
3-3. The missing of components shall be less than 0.1%

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

3-5. The fixing tapes shall not protrude beyond the edges of the carrier tape not shall cover the sprocket holes.

Appendix 2

Paper Tape



(Unit : mm)

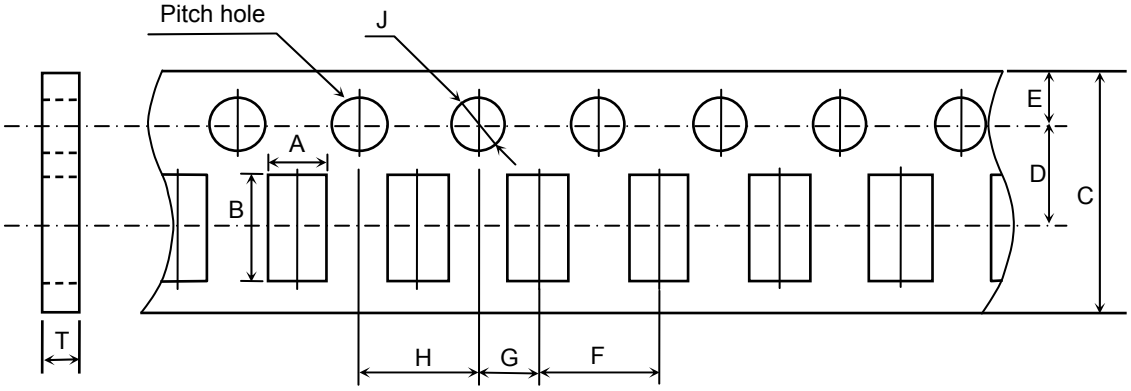
Symbol / Type	A	B	C	D	E	F
CGA2 (CC0402)	(0.65)	(1.15)	8.00 ± 0.30	3.50 ± 0.05	1.75 ± 0.10	2.00 ± 0.05

Symbol / Type	G	H	J	T
CGA2 (CC0402)	2.00 ± 0.05	4.00 ± 0.10	Ø 1.5 $^{+0.10}_{0}$	(0.60)

* The values in the parentheses ( ) are for reference.

Appendix 3

Paper Tape



(Unit : mm)

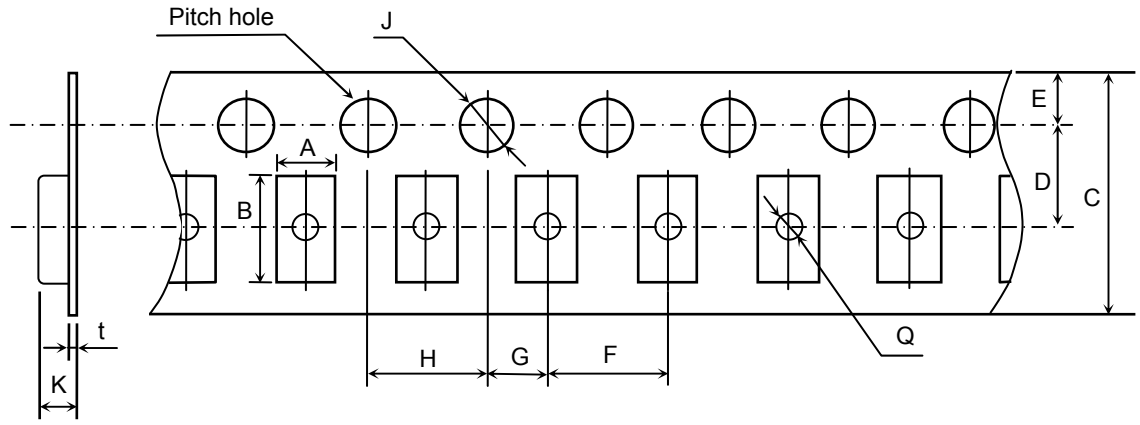
Symbol / Type	A	B	C	D	E	F
CGA3 (CC0603)	(1.10)	(1.90)	8.00 ± 0.30	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10
CGA4 (CC0805)	(1.50)	(2.30)				
CGA5 (CC1206)	(1.90)	(3.50)				

Symbol / Type	G	H	J	T
CGA3 (CC0603)	2.00 ± 0.05	4.00 ± 0.10	Ø 1.5 $^{+0.10}_{0}$	1.20 max.
CGA4 (CC0805)				
CGA5 (CC1206)				

* The values in the parentheses ( ) are for reference.

Appendix 4

Plastic Tape



(Unit : mm)

Symbol / Type	A	B	C	D	E	F
CGA3 (CC0603)	(1.10)	(1.90)	8.00 ± 0.30 [12.0 ± 0.30]	3.50 ± 0.05 [5.50 ± 0.05]	1.75 ± 0.10	4.00 ± 0.10
CGA4 (CC0805)	(1.50)	(2.30)				
CGA5 (CC1206)	(1.90)	(3.50)				
CGA6 (CC1210)	(2.90)	(3.60)				

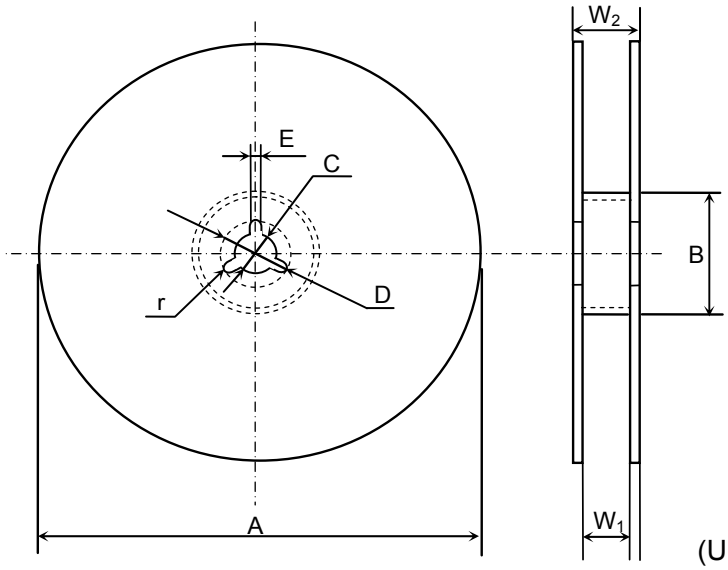
Symbol / Type	G	H	J	K	t	Q
CGA3 (CC0603)	2.00 ± 0.05	4.00 ± 0.10	Ø 1.5 +0.10 0	1.50 max.	0.60 max.	Ø 0.50 min.
CGA4 (CC0805)				2.50 max.		
CGA5 (CC1206)						
CGA6 (CC1210)				3.20 max.		

* The values in the parentheses ( ) are for reference.

* As for 2.5mm thickness products, apply values in the brackets [ ].

Appendix 5

CGA2, CGA3, CGA4, CGA5, CGA6
(As for CGA6 type, any thickness of the item except 2.5mm)
(Material : Polystyrene)



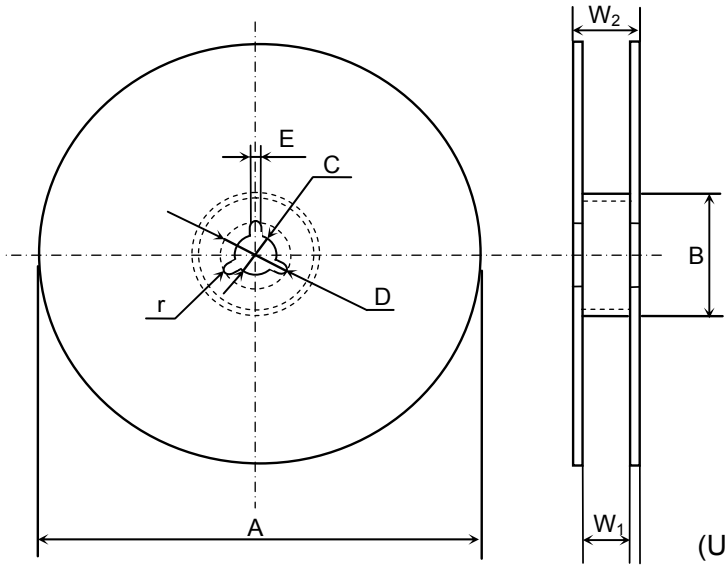
(Unit : mm)

Symbol	A	B	C	D	E	W_1
Dimension	Ø178 ± 2.0	Ø60 ± 2.0	Ø13 ± 0.5	Ø21 ± 0.8	2.0 ± 0.5	9.0 ± 0.3

Symbol	W_2	r
Dimension	13.0 ± 1.4	1.0

Appendix 6

CGA6 (As for CGA6 type, applied to 2.5mm thickness products)
(Material : Polystyrene)



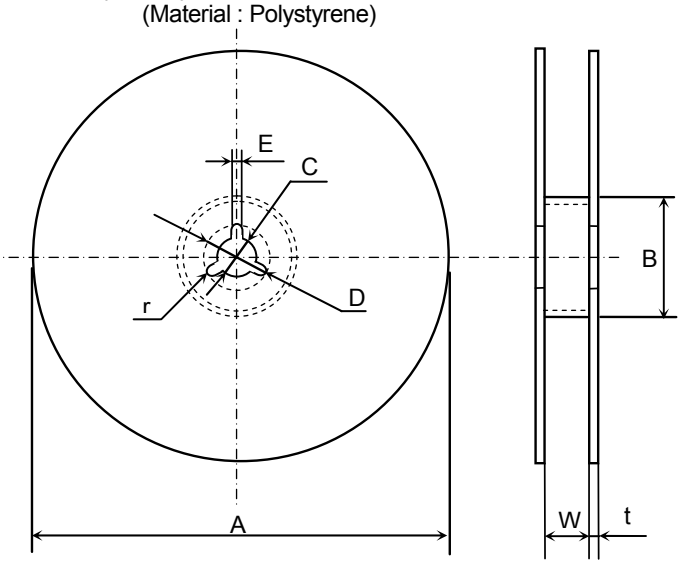
(Unit : mm)

Symbol	A	B	C	D	E	W_1
Dimension	Ø178 ± 2.0	Ø60 ± 2.0	Ø13 ± 0.5	Ø21 ± 0.8	2.0 ± 0.5	13.0 ± 0.3

Symbol	W_2	r
Dimension	17.0 ± 1.4	1.0

Appendix 7

CGA2, CGA3, CGA4, CGA5, CGA6
(As for CGA6 type, any thickness of the item except 2.5mm)
(Material : Polystyrene)



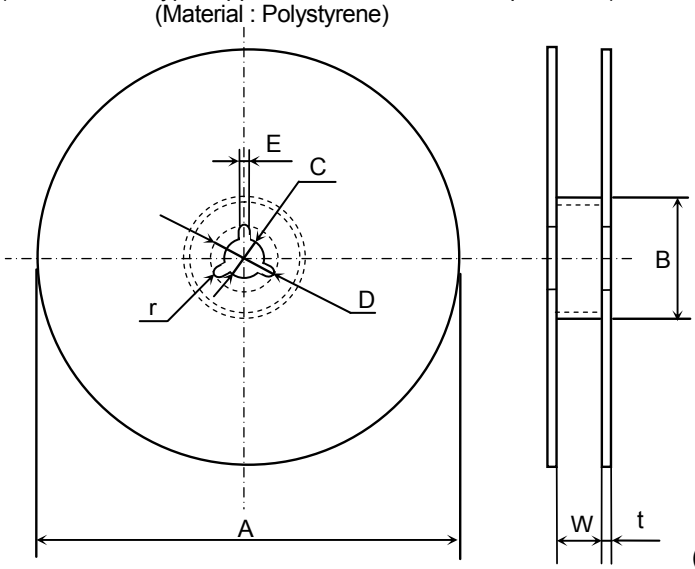
(Unit : mm)

Symbol	A	B	C	D	E	W
Dimension	Ø382 max. (Nominal Ø330)	Ø50 min.	Ø13 ± 0.5	Ø21 ± 0.8	2.0 ± 0.5	10.0 ± 1.5

Symbol	t	r
Dimension	2.0 ± 0.5	1.0

Appendix 8

CGA6 (As for CGA6 type, applied to 2.5mm thickness products)
(Material : Polystyrene)



(Unit : mm)

Symbol	A	B	C	D	E	W
Dimension	Ø382 max. (Nominal Ø330)	Ø50 min.	Ø13 ± 0.5	Ø21 ± 0.8	2.0 ± 0.5	14.0 ± 1.5

Symbol	t	r
Dimension	2.0 ± 0.5	1.0