

DELIVERY SPECIFICATION

SPEC. No. A-Glue-d

D A T E : Aug, 2020

To

Non-Controlled Copy

CUSTOMER'S PRODUCT NAME

TDK PRODUCT NAME

MULTILAYER CERAMIC CHIP CAPACITORS (Conductive glue)
 Bulk and Tape packaging 【RoHS compliant】
 CGA2, CGA3, CGA4, CGA5, CGA6 Type
 C0G, NP0, X7R, X8R 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

Test conditions in this specification based on AEC-Q200 for automotive application.

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

CGA	6	P	1	X8R	1E	106	K	250	A	D
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)

(1) Series

(2) Dimensions L x W (mm)

Code	EIA	Length	Width	Terminal width
2	CC0402	1.00	0.50	0.10
3	CC0603	1.60	0.80	0.20
4	CC0805	2.00	1.25	0.20
5	CC1206	3.20	1.60	0.20
6	CC1210	3.20	2.50	0.20

(3) Thickness code

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

(4) Voltage condition for life test

Symbol	Condition
1	1 x R.V.
2	2 x R.V.
3	1.5 x R.V.

(5) Temperature characteristics

Temperature characteristics	Temperature coefficient or capacitance change	Temperature range
C0G	0±30ppm/°C	-55 to +125°C
X7R	±15%	-55 to +125°C
X8R	±15%	-55 to +150°C

(6) Rated voltage (DC)

Code	Voltage (DC)
0J	6.3V
1C	16V
1E	25V
1V	35V
1H	50V
2A	100V

(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
C	±0.25pF
D	±0.50pF
J	±5%
K	±10%
M	±20%

(9) Thickness

Code	Thickness
050	0.50mm
060	0.60mm
080	0.80mm
085	0.85mm
115	1.15mm
125	1.25mm
160	1.60mm
200	2.00mm
250	2.50mm

(10) Packaging style

Code	Style
A	178mm reel, 4mm pitch
B	178mm reel, 2mm pitch

(11) Special reserved code

Code	Description
D	Conductive epoxy application

SCOPE

This delivery specification shall be applied to Multilayer ceramic chip capacitors to be delivered to

PRODUCTION PLACES

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

PRODUCT NAME

The name of the product to be defined in this specifications shall be CGA◇◇◇○○○△△□□□×◎※※※B.

REFERENCE STANDARD

JIS C 5101-1 : 2010	Fixed capacitors for use in electronic equipment-Part 1: Generic specification
C 5101-21 : 2014	Fixed capacitors for use in electronic equipment-Part21 : Sectional specification : Fixed surface mount multilayer capacitors of ceramic dielectric,Class1
C 5101-22 : 2014	Fixed capacitors for use in electronic equipment-Part22 : Sectional specification : Fixed surface mount multilayer capacitors of ceramic dielectric,Class 2
C 0806-3 : 2014	Packaging of components for automatic handling - Part 3: Packaging of surface mount components on continuous tapes
JEITA RCR-2335 C 2014	Safety application guide for fixed ceramic capacitors for use in electronic equipment

COONTENTS

1. CODE CONSTRUCTION
2. COMBINATION OF RATED CAPACITANCE AND TOLERANCE
3. OPERATING TEMPERATURE RANGE
4. STORING CONDITION AND TERM
5. CAUTION FOR CONDUCTIVE GLUE MOUNTING PRODUCTS
6. INDUSTRIAL WASTE DISPOSAL
7. PERFORMANCE
8. INSIDE STRUCTURE AND MATERIAL
9. PACKAGING
10. CAUTION
11. TAPE PACKAGING SPECIFICATION

<EXPLANATORY NOTE>

When the mistrust in the spec arises, this specification is given priority. And it will be confirmed by written spec change after conference of both posts involved.

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

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

Division	Date	SPEC. No.
Ceramic Capacitors Business Group	Aug, 2020	A-Glue-d

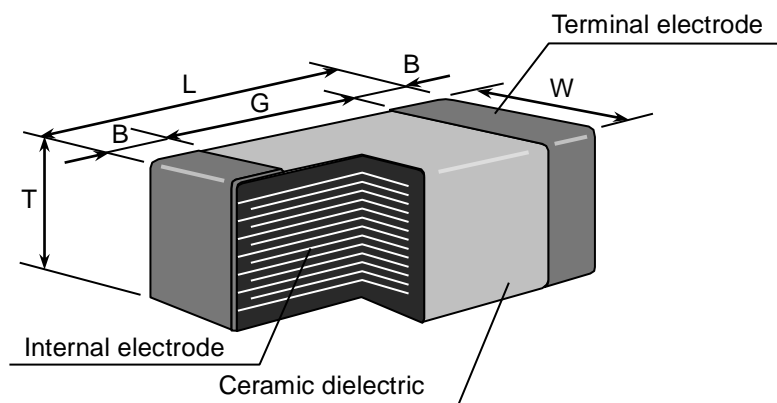
1. CODE CONSTRUCTION

(Example) $\frac{\text{CGA}}{(1)}$ $\frac{3}{(2)}$ $\frac{\text{E}}{(3)}$ $\frac{2}{(4)}$ $\frac{\text{X8R}}{(5)}$ $\frac{1\text{H}}{(6)}$ $\frac{103}{(7)}$ $\frac{\text{K}}{(8)}$ $\frac{\text{T}}{(9)}$ $\frac{\text{***B}}{(10)}$

(1) Series

Symbol	Series
CGA	For automotive application

(2) Case size



Case size Symbol	Case size (EIA style)	Dimensions (Unit : mm)				
		L	W	T	B	G
2	CGA2 (CC0402)	1.00±0.15	0.50±0.10	0.50±0.10	0.10 min.	0.30 min.
3	CGA3 (CC0603)	1.60±0.15	0.80±0.15	0.80±0.15	0.20 min.	0.30 min.
4	CGA4 (CC0805)	2.00±0.25	1.25±0.25	0.60±0.15	0.20 min.	0.50 min.
				0.85±0.15		
				1.25±0.25		
		2.00 ^{+0.35} _{-0.25}	1.25 ^{+0.30} _{-0.25}	1.25 ^{+0.30} _{-0.25}		
5	CGA5 (CC1206)	3.20 ^{+0.30} _{-0.10}	1.60 ^{+0.30} _{-0.10}	0.60±0.15	0.20 min.	1.00 min.
				0.85±0.15		
				1.15±0.15		
				1.60 ^{+0.30} _{-0.10}		
6	CGA6 (CC1210)	3.20±0.45	2.50±0.30	1.60±0.20	0.20 min.	—
				2.00±0.20		
				2.50±0.30		

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

(3) Thickness

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

(4) Voltage condition in the life test

* Details are shown in table1 No.13 at 8.PERFORMANCE.

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

(5) Temperature Characteristics

* Details are shown in table 1 No.6 and No.7 at 8.PERFORMANCE.

(6) 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

(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.
R is designated for a decimal point.

(Example)

Symbol	Rated Capacitance
2R2	2.2 pF
106	10,000,000 pF

(8) Capacitance tolerance

* M tolerance shall be standard for over 10uF.

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

(9) Packaging

Symbol	Packaging
B	Bulk
T	Taping

(10) TDK internal code

※※※ B

B : For conductive glue mounting

These TDK internal codes are subject to change without notice.

2. COMBINATION OF RATED CAPACITANCE AND TOLERANCE

Class	Temperature Characteristics	Capacitance tolerance		Rated capacitance
1	C0G NP0	10pF and under	C ($\pm 0.25\text{pF}$)	1, 1.5, 2, 2.2, 3, 3.3, 4, 4.7, 5
			D ($\pm 0.5\text{pF}$)	6, 6.8, 7, 8, 9, 10
		Over 10pF	J ($\pm 5\%$) K ($\pm 10\%$)	E – 12 series
2	X7R X8R	K ($\pm 10\%$) M ($\pm 20\%$)		E – 6 series

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

3. OPERATING TEMPERATURE RANGE

T.C.	Min. operating Temperature	Max. operating Temperature	Reference Temperature
C0G	-55°C	125°C	25°C
NP0	-55°C	150°C	25°C
X7R	-55°C	125°C	25°C
X8R	-55°C	150°C	25°C

4. STORING CONDITION AND TERM

Storing temperature	Storing humidity	Storing term
5~40°C	20~70%RH	Within 6 months upon receipt.

5. INDUSTRIAL WASTE DISPOSAL

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

6. CAUTION FOR CONDUCTIVE GLUE MOUNTING PRODUCTS

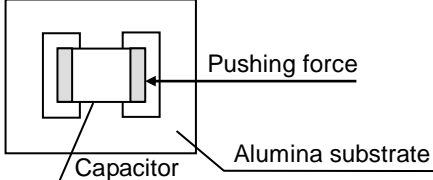
This product is to be mounted by glue including Ag (Silver) as a conductive material. To avoid electromigration of Ag and failures caused by corrosive gas, chip capacitors on P.C boards should be protected by moisture proof-sealing, such as silicon or equivalent, and/or a sealed package.

7. 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. (As for the capacitors of rated voltage 16V DC and lower, 100MΩ·μF min.,) whichever smaller.	Measuring voltage : Rated voltage Voltage application time : 60s.												
3	Voltage Proof	Withstand test voltage without insulation breakdown or other damage.	Class 1 : 3 times of rated voltage Class 2 : 2.5 times of rated voltage Voltage application time : 1s. Charge / discharge current : 50mA or lower												
4	Capacitance	Within the specified tolerance.	《Class 1》 <table border="1"> <thead> <tr> <th>Capacitance</th> <th>Measuring frequency</th> <th>Measuring voltage</th> </tr> </thead> <tbody> <tr> <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> </tbody> </table> 《Class 2》 <table border="1"> <thead> <tr> <th>Measuring frequency</th> <th>Measuring voltage</th> </tr> </thead> <tbody> <tr> <td>1kHz±10%</td> <td>1.0±0.2Vrms</td> </tr> </tbody> </table> As for the capacitors of rated voltage 6.3V DC, 0.5Vrms is applied.	Capacitance	Measuring frequency	Measuring voltage	1000pF and under	1MHz±10%	0.5 ~ 5 Vrms.	Over 1000pF	1kHz±10%	Measuring frequency	Measuring voltage	1kHz±10%	1.0±0.2Vrms
Capacitance	Measuring frequency	Measuring voltage													
1000pF and under	1MHz±10%	0.5 ~ 5 Vrms.													
Over 1000pF	1kHz±10%														
Measuring frequency	Measuring voltage														
1kHz±10%	1.0±0.2Vrms														
5	<table border="1"> <tr> <td>Q</td> <td>Class1</td> </tr> <tr> <td>Dissipation Factor</td> <td>Class2</td> </tr> </table>	Q	Class1	Dissipation Factor	Class2	Please refer to detail page on TDK web.	See No.4 in this table for measuring condition.								
Q	Class1														
Dissipation Factor	Class2														
6	Temperature Characteristics of Capacitance (Class1)	<table border="1"> <thead> <tr> <th>T.C.</th> <th>Temperature Coefficient (ppm/°C)</th> </tr> </thead> <tbody> <tr> <td>C0G</td> <td>0 ± 30</td> </tr> <tr> <td>NP0</td> <td>0 ± 30</td> </tr> </tbody> </table> <table border="1"> <tr> <td>Capacitance drift</td> <td>Within ± 0.2% or ± 0.05pF, whichever larger.</td> </tr> </table>	T.C.	Temperature Coefficient (ppm/°C)	C0G	0 ± 30	NP0	0 ± 30	Capacitance drift	Within ± 0.2% or ± 0.05pF, whichever larger.	Temperature coefficient shall be calculated based on values at 25°C and 85°C temperature. Measuring temperature below 25°C shall be -10°C and -25°C.				
T.C.	Temperature Coefficient (ppm/°C)														
C0G	0 ± 30														
NP0	0 ± 30														
Capacitance drift	Within ± 0.2% or ± 0.05pF, whichever larger.														

(continued)

No.	Item		Performance	Test or inspection method										
7	Temperature Characteristics of Capacitance (Class2)		Capacitance Change (%) <hr/> No voltage applied <hr/> X7R : ± 15 X8R : ± 15 <hr/>	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 border="1"> <thead> <tr> <th>Step</th> <th>Temperature(°C)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Reference temp. ± 2</td> </tr> <tr> <td>2</td> <td>Min. operating temp. ± 3</td> </tr> <tr> <td>3</td> <td>Reference temp. ± 2</td> </tr> <tr> <td>4</td> <td>Max. operating temp. ± 2</td> </tr> </tbody> </table> As for Min./ Max. operating temp. and Reference temp., please refer to "3.OPERATING TEMPERATURE RANGE". As for measuring voltage, please contact with our sales representative.	Step	Temperature(°C)	1	Reference temp. ± 2	2	Min. operating temp. ± 3	3	Reference temp. ± 2	4	Max. operating temp. ± 2
Step	Temperature(°C)													
1	Reference temp. ± 2													
2	Min. operating temp. ± 3													
3	Reference temp. ± 2													
4	Max. operating temp. ± 2													
8	Robustness of Terminations		No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue. Apply a pushing force gradually at the center of a specimen in a horizontal direction of P.C.board. Pushing force : 5N (2N is applied for CGA2 type.) Holding time : 10 \pm 1s. 										
9	Vibration	External appearance	No mechanical damage.	Applied force : 5G max. Frequency : 10~2,000Hz Reciprocating sweep time : 20 min. Cycle : 12 cycles in each 3 mutually perpendicular directions. Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing.										
Capacitance		<table border="1"> <thead> <tr> <th colspan="2">Characteristics</th> <th>Change from the value before test</th> </tr> </thead> <tbody> <tr> <td>Class1</td> <td>C0G NP0</td> <td>$\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.</td> </tr> <tr> <td>Class2</td> <td>X7R X8R</td> <td>$\pm 7.5\%$</td> </tr> </tbody> </table>	Characteristics		Change from the value before test	Class1	C0G NP0	$\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.	Class2	X7R X8R	$\pm 7.5\%$			
Characteristics		Change from the value before test												
Class1		C0G NP0	$\pm 2.5\%$ or $\pm 0.25\text{pF}$, whichever larger.											
Class2	X7R X8R	$\pm 7.5\%$												
Q (Class1)	Meet the initial spec.													
D.F. (Class2)	Meet the initial spec.													

(continued)

No.	Item	Performance	Test or inspection method															
10	Temperature cycle	External appearance	No mechanical damage.															
		Capacitance	<table border="1"> <thead> <tr> <th colspan="2">Characteristics</th> <th>Change from the value before test</th> </tr> </thead> <tbody> <tr> <td>Class1</td> <td>C0G NP0</td> <td rowspan="2">Please contact with our sales representative.</td> </tr> <tr> <td>Class2</td> <td>X7R X8R</td> </tr> </tbody> </table>	Characteristics		Change from the value before test	Class1	C0G NP0	Please contact with our sales representative.	Class2	X7R X8R							
			Characteristics		Change from the value before test													
			Class1	C0G NP0	Please contact with our sales representative.													
		Class2	X7R X8R															
Q (Class1)	Meet the initial spec.																	
D.F. (Class2)	Meet the initial spec.																	
Insulation Resistance	Meet the initial spec.																	
	Voltage proof	No insulation breakdown or other damage.																
			<p>Expose the capacitors in the condition step1 through step 4 listed in the following table.</p> <p>Temp. cycle : 1,000 cycles</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>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> </tbody> </table> <p>As for Min./ Max. operating temp. and Reference temp., please refer to "3.OPERATING TEMPERATURE RANGE".</p> <p>Leave the capacitors in ambient condition for Class 1 : 6~24h Class 2 : 24\pm2h before measurement.</p> <p>Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing.</p>	Step	Temperature(°C)	Time(min.)	1	Min. operating temp. ± 3	30 ± 3	2	Reference Temp.	2 ~ 5	3	Max. operating temp. ± 2	30 ± 2	4	Reference Temp.	2 ~ 5
Step	Temperature(°C)	Time(min.)																
1	Min. operating temp. ± 3	30 ± 3																
2	Reference Temp.	2 ~ 5																
3	Max. operating temp. ± 2	30 ± 2																
4	Reference Temp.	2 ~ 5																
11	Moisture Resistance (Steady State)	External appearance	No mechanical damage.															
		Capacitance	<table border="1"> <thead> <tr> <th colspan="2">Characteristics</th> <th>Change from the value before test</th> </tr> </thead> <tbody> <tr> <td>Class1</td> <td>C0G NP0</td> <td rowspan="2">Please contact with our sales representative.</td> </tr> <tr> <td>Class2</td> <td>X7R X8R</td> </tr> </tbody> </table>	Characteristics		Change from the value before test	Class1	C0G NP0	Please contact with our sales representative.	Class2	X7R X8R							
			Characteristics		Change from the value before test													
			Class1	C0G NP0	Please contact with our sales representative.													
		Class2	X7R X8R															
Q (Class1)	<table border="1"> <thead> <tr> <th>Capacitance</th> <th>Q</th> </tr> </thead> <tbody> <tr> <td>30pF and over</td> <td>350 min.</td> </tr> <tr> <td>10pF and over under 30pF</td> <td>$275+5/2 \times C$ min.</td> </tr> <tr> <td>Under 10pF</td> <td>$200+10 \times C$ min.</td> </tr> </tbody> </table> <p>C : Rated capacitance (pF)</p>	Capacitance	Q	30pF and over	350 min.	10pF and over under 30pF	$275+5/2 \times C$ min.	Under 10pF	$200+10 \times C$ min.									
Capacitance	Q																	
30pF and over	350 min.																	
10pF and over under 30pF	$275+5/2 \times C$ min.																	
Under 10pF	$200+10 \times C$ min.																	
D.F. (Class2)	200% of initial spec. max.																	
Insulation Resistance	1,000M Ω or 50M Ω · μ F min. (As for the capacitors of rated voltage 16V DC and lower, 10M Ω · μ F min.,) whichever smaller.																	
			<p>Test temp. : 40\pm2°C Test humidity : 90~95%RH</p> <p>Test time : 500 +24,0h</p> <p>Leave the capacitors in ambient condition for Class 1 : 6~24h Class 2 : 24\pm2h before measurement.</p> <p>Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing.</p>															

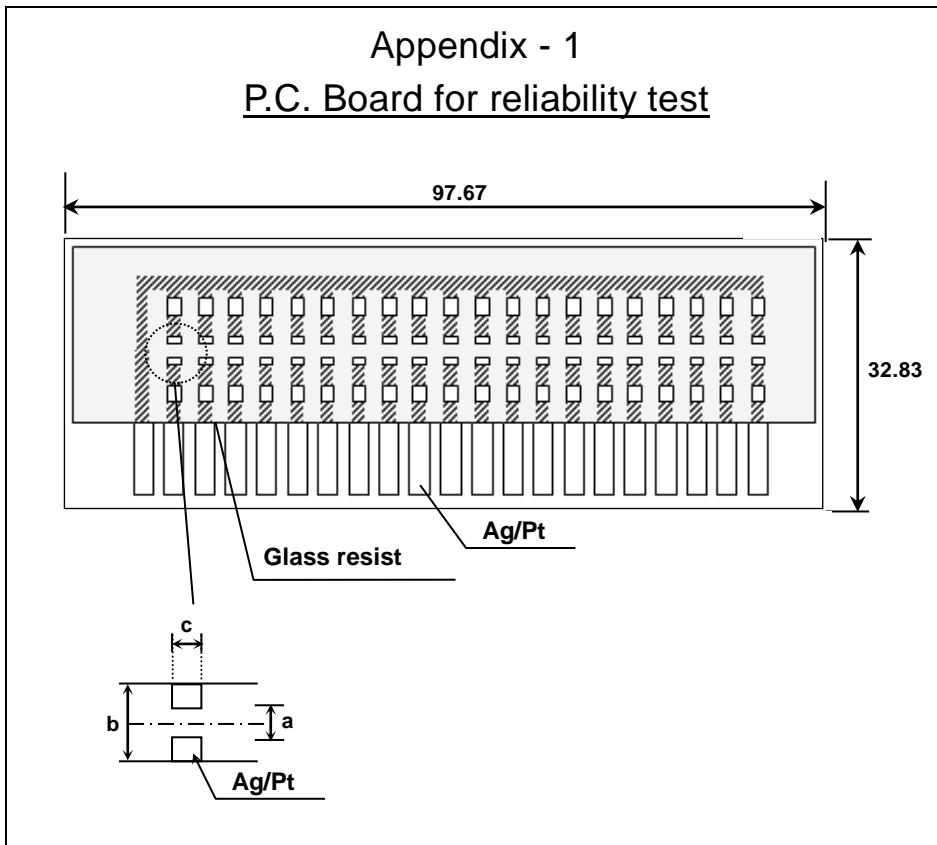
(continued)

No.	Item		Performance		Test or inspection method	
12	Moisture Resistance	External appearance	No mechanical damage.		Test temp. : 85±2°C Test humidity : 85%RH Applied voltage : Rated voltage Test time : 1,000 +48,0h Charge/discharge current : 50mA or lower Leave the capacitors in ambient condition for Class 1 : 6~24h Class 2 : 24±2h before measurement. Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing. Initial value setting (only for class 2) Voltage conditioning 《After voltage treat the capacitors under testing temperature and voltage for 1 hour,》 leave the capacitors in ambient condition for 24±2h before measurement. Use this measurement for initial value.	
		Capacitance	Characteristics			Change from the value before test
			Class1	C0G NP0		Please contact with our sales representative.
			Class2	X7R X8R		
		Q (Class1)	Capacitance	Q		
30pF and over	200 min.					
Under 30pF	100+10/3×C min.					
C : Rated capacitance (pF)						
D.F. (Class2)	200% of initial spec. max.					
Insulation Resistance	500MΩ or 25MΩ·μF min. (As for the capacitors of rated voltage 16V DC and lower, 5MΩ·μF min.,) whichever smaller.					
13	Life	External appearance	No mechanical damage.		Test temp. : Maximum operating temperature±2°C Applied voltage : Please contact with our sales representative. Test time : 1,000 +48,0h Charge/discharge current : 50mA or lower Leave the capacitors in ambient condition for Class 1 : 6~24h Class 2 : 24±2h before measurement. Mount the capacitors on an Alumina substrate shown in Appendix 1 with conductive glue before testing. Initial value setting (only for class 2) Voltage conditioning 《After voltage treat the capacitors under testing temperature and voltage for 1 hour,》 leave the capacitors in ambient condition for 24±2h before measurement. Use this measurement for initial value.	
		Capacitance	Characteristics			Change from the value before test
			Class1	C0G NP0		Please contact with our sales representative.
			Class2	X7R X8R		
		Q (Class1)	Capacitance	Q		
30pF and over	350 min.					
10pF and over under 30pF	275+5/2×C min.					
Under 10pF		200+10×C min.				
C : Rated capacitance (pF)						
D.F. (Class2)	200% of initial spec. max.					
Insulation Resistance	1,000MΩ or 50MΩ·μF min. (As for the capacitors of rated voltage 16V DC and lower, 10MΩ·μF min.,) whichever smaller.					

*As for the initial measurement of capacitors (Class2) on number 7,9,10 and 11 leave capacitors at 150 0,-10°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

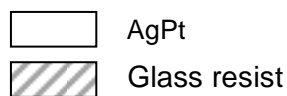


(Unit : mm)

Case size	Dimensions		
	a	b	c
TDK(EIA style)			
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

1. Material : Alumina substrate

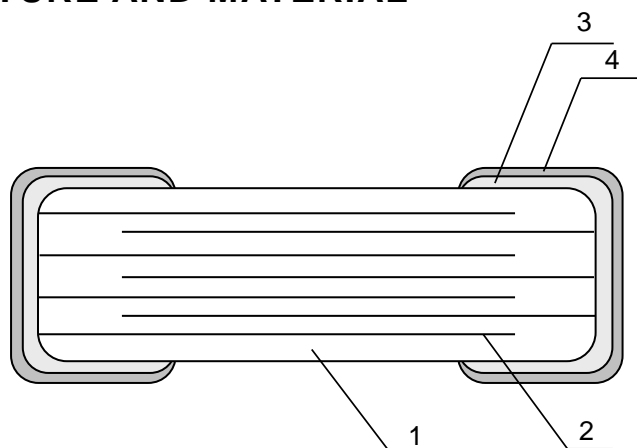
2. Thickness : 0.8mm



3. Caution for mounting with conductive glue

(Refer to the page 13.)

8. 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	

9. 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.

9.1 Each plastic bag for bulk packaging contains 1000pcs. And the minimum quantity for Bulk packaging is 1000pcs.

9.2 Tape packaging is as per 11. TAPE PACKAGING SPECIFICATION.

* CGA2 [CC0402] type is applicable to tape packaging only.

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

*Composition of Inspection No.

Example E 0 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.

(Implemented on and after May 1, 2019 in sequence)

Example

I	F	0	E	2	3	A	0	0	1
---	---	---	---	---	---	---	---	---	---


 (a) (b) (c) (d) (e) (f) (g)


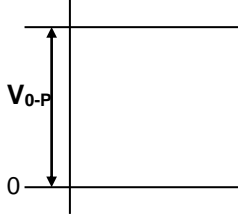
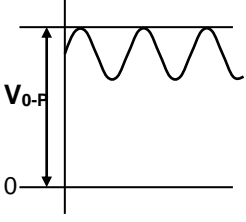
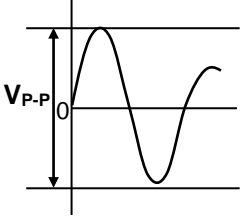
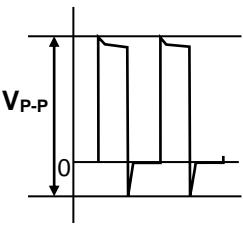
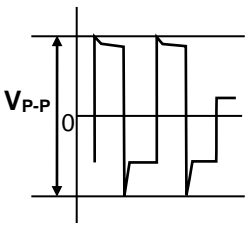
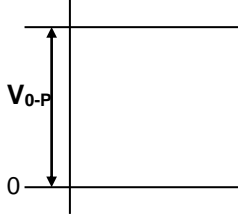
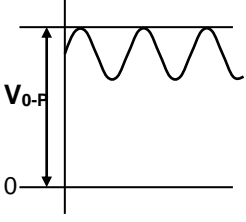
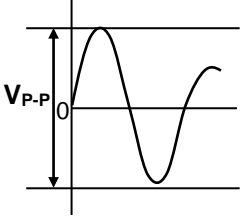
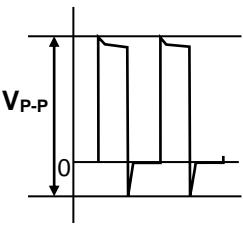
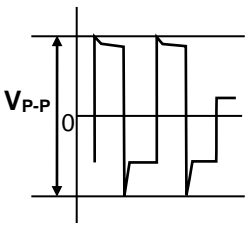
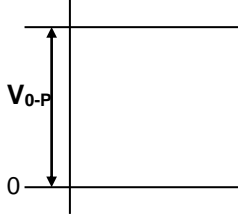
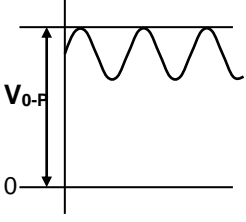
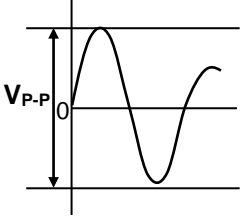
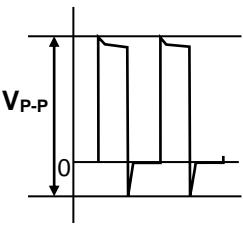
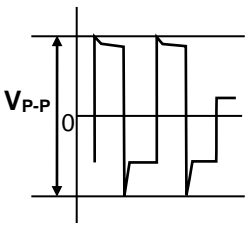
- (a) Prefix
- (b) Line code
- (c) Last digit of the year
- (d) Month and A for January and B for February and so on. (Skip I)
- (e) Inspection Date of the month.
- (f) Serial No. of the day(00 ~ ZZ)
- (g) Suffix(00 ~ ZZ)

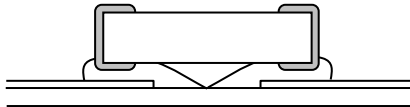
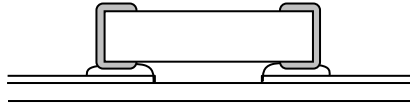
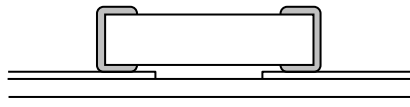
* It was shifted to the new inspection No. on and after May 2019, but the implementation timing may be different depending on shipment bases.

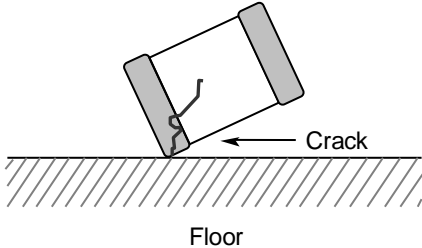
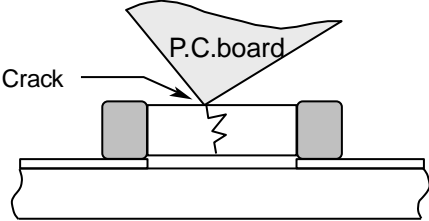
Until the shift is completed, either current or new composition of inspection No. will be applied.


10. CAUTION

No.	Process	Condition
1	Operating Condition (Storage, Use, Transportation)	<p>1-1. Storage, Use</p> <p>The capacitors must be stored in an ambient temperature of 5 to 40°C with a relative humidity of 20 to 70%RH. JIS C 60721-3-1 Class 1K2 should be followed for the other climatic conditions.</p> <ol style="list-style-type: none"> 1) High temperature and humidity environment may affect a capacitor's performance. Therefore, SMD capacitors shall be used within 6 months. For capacitors with terminal electrodes consisting of silver or silver-palladium which tend to become oxidized or sulfurized, use as soon as possible, such as within one month after opening the bag. 2) During storage, keep the minimum packaging unit in its original packaging without opening it. Do not deviate from the above temperature and humidity conditions even for a short term. 3) Corrosive gasses in the air or atmosphere may result in deterioration of the reliability. Do not store capacitors where they will be exposed to corrosive gas (e.g., hydrogen sulfide, sulfur dioxide, chlorine ammonia etc.) 4) Electrical performance may deteriorate due to photochemical change in the terminal electrode if stored in direct sunlight, or due to condensation from rapid changes in humidity. The capacitors especially which use resin material must be operated and stored in an environment free of dew condensation, as moisture absorption due to condensation may affect the performance. 5) Refer to JIS C 60721-3-1, class 1K2 for other climate conditions. <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> <ol style="list-style-type: none"> 1) Upper category temperature (maximum operating temperature) is specified. It is necessary to select a capacitor whose rated temperature is higher than the operating temperature. Also, it is necessary to consider the temperature distribution in the equipment and seasonal temperature variation. 2) Do not use capacitors above the maximum allowable operating temperature. 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. When overvoltage is applied</p> <p>Applying overvoltage to a capacitor may cause dielectric breakdown and result in a short circuit. The duration until dielectric breakdown depends on the applied voltage and the ambient temperature.</p>

No.	Process	Condition														
2	Circuit design  Caution	<p>2-3. Operating voltage</p> <p>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)</p> <p>AC or pulse with overshooting, V_{P-P} must be below the rated voltage. — (3), (4) and (5)</p> <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="472 506 1449 779"> <thead> <tr> <th data-bbox="472 506 663 551">Voltage</th> <th data-bbox="663 506 922 551">(1) DC voltage</th> <th data-bbox="922 506 1185 551">(2) DC+AC voltage</th> <th data-bbox="1185 506 1449 551">(3) AC voltage</th> </tr> </thead> <tbody> <tr> <td data-bbox="472 551 663 779">Positional Measurement (Rated voltage)</td> <td data-bbox="663 551 922 779">  </td> <td data-bbox="922 551 1185 779">  </td> <td data-bbox="1185 551 1449 779">  </td> </tr> </tbody> </table> <table border="1" data-bbox="472 801 1185 1079"> <thead> <tr> <th data-bbox="472 801 663 846">Voltage</th> <th data-bbox="663 801 922 846">(4) Pulse voltage (A)</th> <th data-bbox="922 801 1185 846">(5) Pulse voltage (B)</th> </tr> </thead> <tbody> <tr> <td data-bbox="472 846 663 1079">Positional Measurement (Rated voltage)</td> <td data-bbox="663 846 922 1079">  </td> <td data-bbox="922 846 1185 1079">  </td> </tr> </tbody> </table> <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>4) Abnormal voltage (surge voltage, static electricity, pulse voltage, etc.) shall not exceed the rated voltage.</p> <p>5) When capacitors are used in a series connection, it is necessary to add a balancing circuit such as voltage dividing resistors in order to avoid an imbalance in the voltage applied to each capacitor.</p> <p>2-4. Frequency</p> <p>When the capacitors (Class 2) are used in AC and/or pulse voltages, the capacitors may vibrate themselves and generate audible sound.</p>	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)		
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
3	Designing Alumina Substrate	<p>The amount of glue at the terminations has a direct effect on the reliability of the capacitors.</p> <ol style="list-style-type: none"> 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	<p>4-1. Stress from mounting head</p> <ol style="list-style-type: none"> 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. <p>4-2. Amount of conductive glue</p> <p>Excessive glue will make a electrical connection under the chip. In sufficient glue may detach the capacitor from the Alumina substrate.</p> <hr/> <div style="display: flex; justify-content: space-between; align-items: center;"> <div data-bbox="501 1016 624 1072" style="text-align: center;">Excessive glue</div> <div data-bbox="671 994 1082 1099" style="text-align: center;">  </div> <div data-bbox="1107 1016 1434 1072" style="text-align: center;">Electrical connection will be made under the chip.</div> </div> <hr/> <div style="display: flex; justify-content: center; align-items: center;"> <div data-bbox="501 1189 624 1218" style="text-align: center;">Adequate</div> <div data-bbox="671 1155 1082 1261" style="text-align: center;">  </div> </div> <hr/> <div style="display: flex; justify-content: space-between; align-items: center;"> <div data-bbox="501 1335 624 1391" style="text-align: center;">Insufficient glue</div> <div data-bbox="671 1317 1082 1422" style="text-align: center;">  </div> <div data-bbox="1107 1308 1434 1413" style="text-align: center;">Low robustness may cause contact failure or chip capacitor comes off the Alumina substrate.</div> </div> <hr/>

No.	Process	Condition
5	Coating and molding of the Alumina substrate	<p>1) When the Alumina substrate is coated, please verify the quality influence on the product.</p> <p>2) Please verify carefully that there is no harmful decomposing or reaction gas emission during curing which may damage the chip capacitors.</p> <p>3) Please verify the curing temperature.</p>
6	Handling of loose chip capacitors	<p>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.</p>  <p>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.</p> 
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	<p>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 life time and the estimated failure rate. (Voltage acceleration coefficient : 3 multiplication rule, Temperature acceleration coefficient : 10°C rule)</p> <p>The failure rate can be decreased by reducing the temperature and the voltage but they will not be guaranteed.</p>

No.	Process	Condition
9	Caution during operation of equipment	<ol style="list-style-type: none"> 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. 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 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. <ol style="list-style-type: none"> (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
10	Others  Caution	<p>The product listed in this specification is intended for use in automotive applications under-normal operation and usage conditions.</p> <p>The product is not designed or warranted to meet the requirements of application listed below, whose performance and/or quality requires a more stringent level of safety or reliability, or whose failure, malfunction or defect 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> <ol style="list-style-type: none"> (1) Aerospace/Aviation equipment (2) Transportation equipment (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>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> <p>In addition, although the product listed in this specification is intended for use in automotive applications as described above, it is not prohibited to use for general electronic equipment, whose performance and/or quality doesn't require a more stringent level of safety or reliability, or whose failure, malfunction or defect could not cause serious damage to society, person or property.</p> <p>Therefore, the description of this caution will be applied, when the product is used in general electronic equipment under a normal operation and usage conditions.</p>

11. TAPE PACKAGING SPECIFICATION

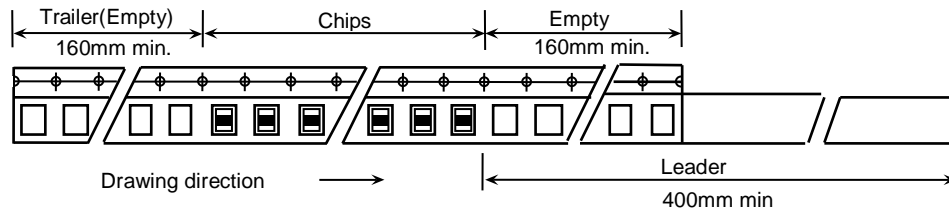
1. CONSTRUCTION AND DIMENSION OF TAPING

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

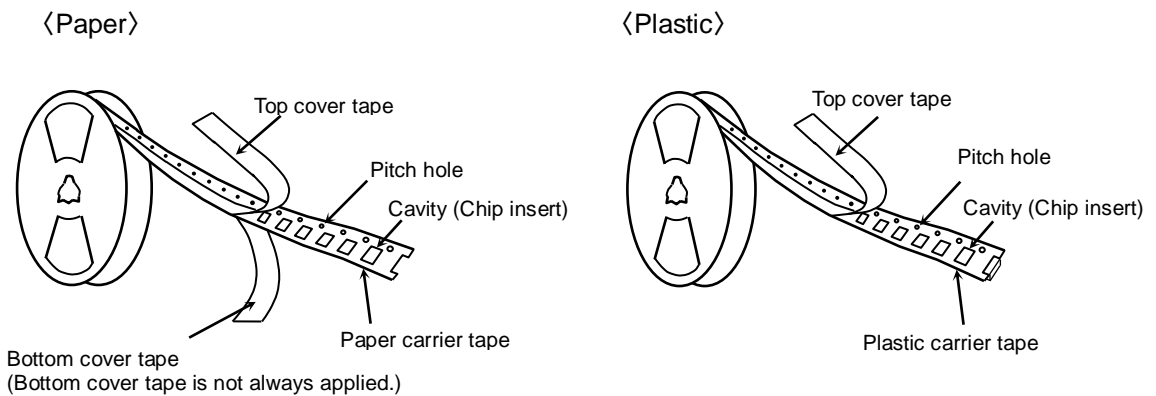


1-3. Dimensions of reel

Dimensions of $\varnothing 178$ reel shall be according to Appendix 5, 6.

Dimensions of $\varnothing 330$ reel shall be according to Appendix 7, 8.

1-4. Structure of taping



2. CHIP QUANTITY

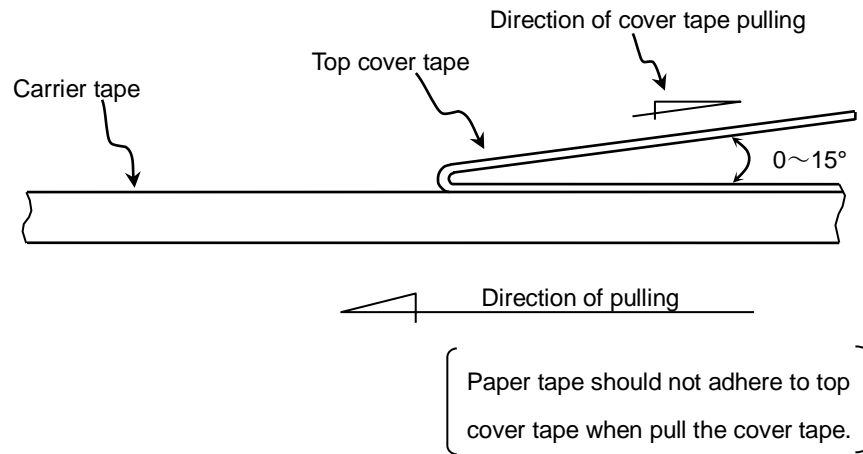
Please refer to detail page on TDK web.

3. PERFORMANCE SPECIFICATIONS

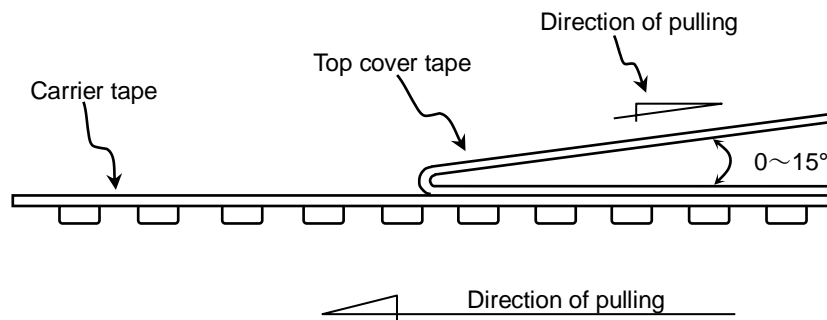
3-1. Fixing peeling strength (top tape)

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

〈Paper〉



〈Plastic〉



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

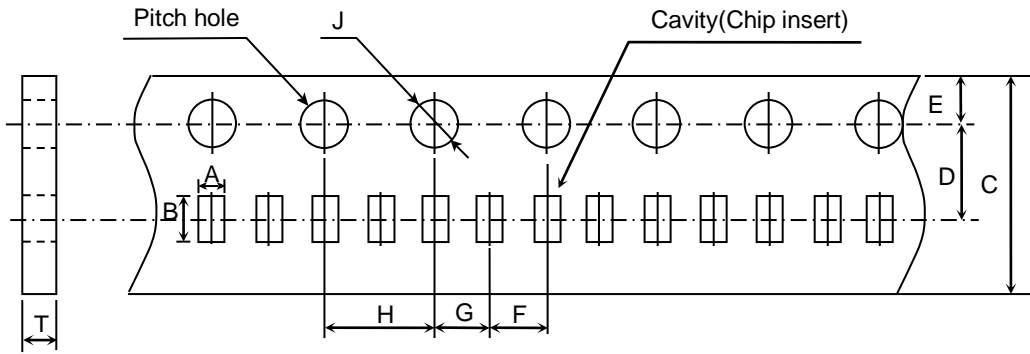
3-3. The missing of components shall be less than 0.1%

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

3-5. 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 2

Paper Tape



(Unit : mm)

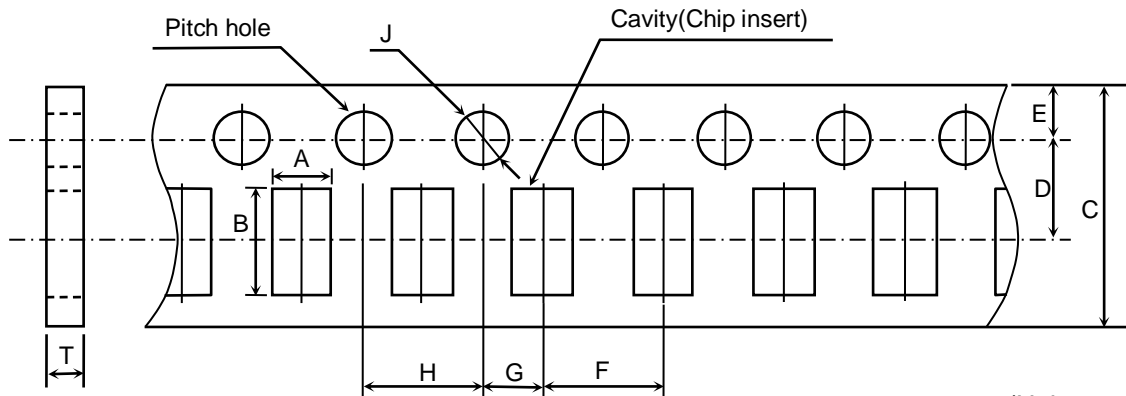
Symbol	A	B	C	D	E	F
Case size						
CGA2 (CC0402)	(0.65)	(1.15)	8.00 ± 0.30	3.50 ± 0.05	1.75 ± 0.10	2.00 ± 0.05

Symbol	G	H	J	T
Case size				
CGA2 (CC0402)	2.00 ± 0.05	4.00 ± 0.10	∅ 1.50 ^{+0.10} ₀	0.60 ± 0.15

() Reference value.

Appendix 3

Paper Tape



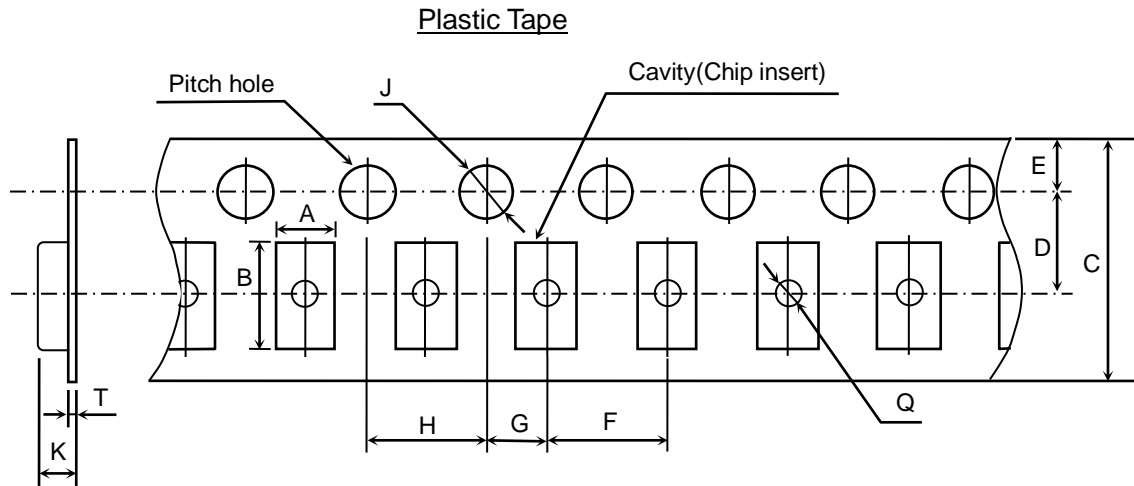
(Unit : mm)

Symbol	A	B	C	D	E	F
Case size						
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	G	H	J	T
Case size				
CGA3 (CC0603)	2.00 ± 0.05	4.00 ± 0.10	∅ 1.50 ^{+0.10} ₀	1.20 max.
CGA4 (CC0805)				
CGA5 (CC1206)				

() Reference value.

Appendix 4



(Unit : mm)

Symbol	A	B	C	D	E	F
Case size						
CGA3 (CC0603)	(1.10)	(1.90)				
CGA4 (CC0805)	(1.50)	(2.30)	8.00 ± 0.30	3.50 ± 0.05	1.75 ± 0.10	4.00 ± 0.10
CGA5 (CC1206)	(1.90)	(3.50)	* 12.0 ± 0.30	* 5.50 ± 0.05		
CGA6 (CC1210)	(2.90)	(3.60)				
Symbol	G	H	J	K	T	Q
Case size						
CGA3 (CC0603)				1.50 max.		
CGA4 (CC0805)	2.00 ± 0.05	4.00 ± 0.10	$\varnothing 1.50 \begin{smallmatrix} +0.10 \\ 0 \end{smallmatrix}$	2.50 max.	0.60 max.	$\varnothing 0.50$ min.
CGA5 (CC1206)						
CGA6 (CC1210)				3.40 max.		

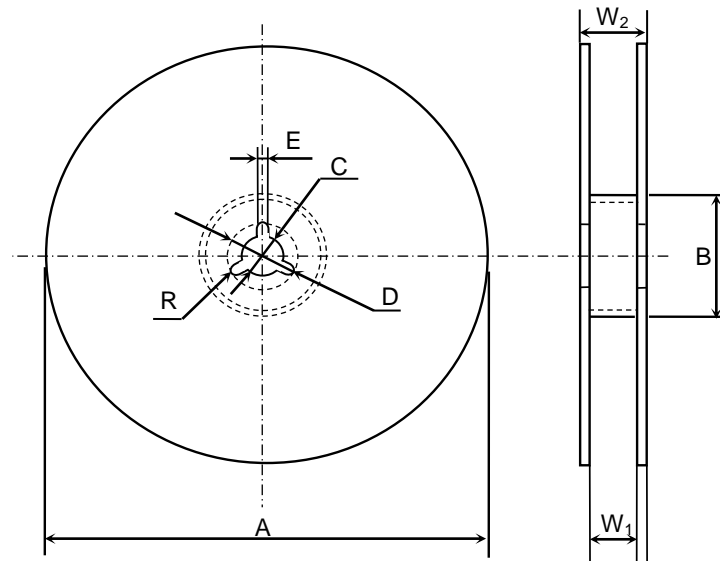
() Reference value.

Exceptionally no hole in the cavity is applied. Please inquire if hole in cavity is mandatory.

* Applied to thickness, 2.5mm products.

Appendix 5

Dimensions of reel (Material : Polystyrene)
CGA2, CGA3, CGA4, CGA5, CGA6

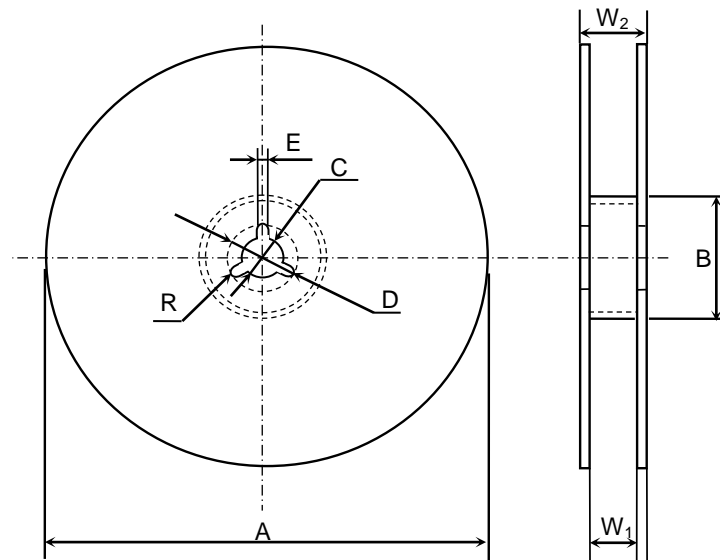


(Unit : mm)

Symbol	A	B	C	D	E	W ₁
Dimension	∅178 ± 2.0	∅60 ± 2.0	∅13 ± 0.5	∅21 ± 0.8	2.0 ± 0.5	9.0 ± 0.3
Symbol	W ₂	R				
Dimension	13.0 ± 1.4	1.0				

Appendix 6

Dimensions of reel (Material : Polystyrene)
CGA6(2.5mm thickness products)

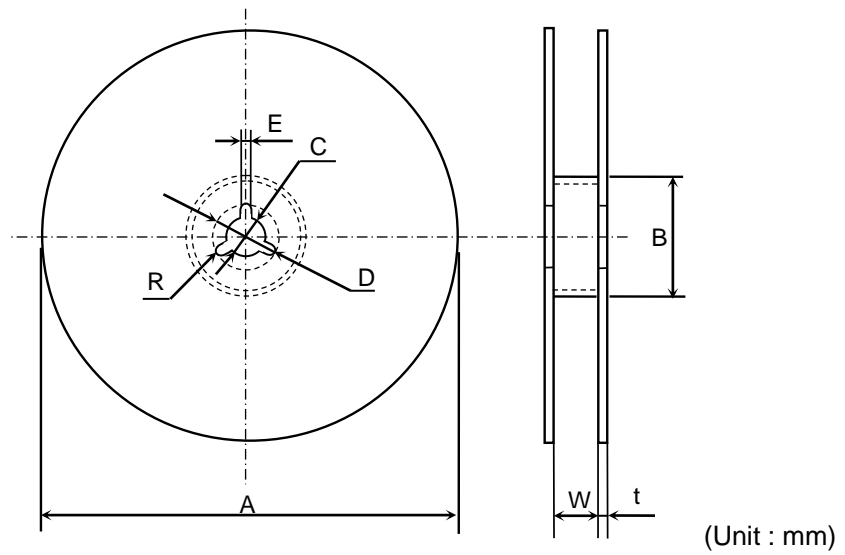


(Unit : mm)

Symbol	A	B	C	D	E	W ₁
Dimension	∅178 ± 2.0	∅60 ± 2.0	∅13 ± 0.5	∅21 ± 0.8	2.0 ± 0.5	13.0 ± 0.3
Symbol	W ₂	R				
Dimension	17.0 ± 1.4	1.0				

Appendix 7

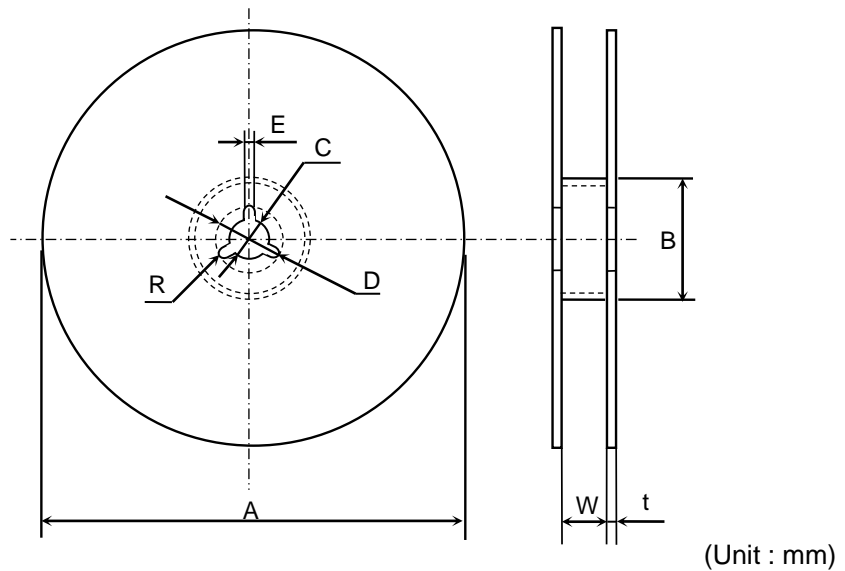
Dimensions of reel (Material : Polystyrene)
CGA2, CGA3, CGA4, CGA5, CGA6



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

Dimensions of reel (Material : Polystyrene)
CGA6(2.5mm thickness products)



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				