TDK

MULTILAYER CERAMIC CHIP CAPACITORS

CGA Series
Automotive Grade Capacitors

Type:

CGA2 [EIA CC0402]
CGA3 [EIA CC0603]
CGA4 [EIA CC0805]
CGA5 [EIA CC1206]
CGA6 [EIA CC1210]

Issue date: April 2011

TDK MLCC
US Catalog

Version B11

REMINDERS

Please read before using this product

SAFETY REMINDERS

REMINDERS

1. If you intend to use a product listed in this catalog for a purpose that may cause loss of life or other damage, you must contact our company's sales window.
2. We may modify products or discontinue production of a product listed in this catalog without prior notification.
3. We provide "Delivery Specification" that explain precautions for the specifications and safety of each product listed in this catalog. We strongly recommend that you exchange these delivery specifications with customers that use one of these products.
4. If you plan to export a product listed in this catalog, keep in mind that it may be a restricted item according to the "Foreign Exchange and Foreign Trade Control Law". In such cases, it is necessary to acquire export permission in harmony with this law.
5. Any reproduction or transferring of the contents of this catalog is prohibited without prior permission from our company.
6. We are not responsible for problems that occur related to the intellectual property rights or other rights of our company or a third party when you use a product listed in this catalog. We do not grant license of these rights.
7. This catalog only applies to products purchased through our company or one of our company's official agencies. This catalog does not apply to products that are purchased through other third parties.

CGA Series

Automotive Grade Capacitors

Type: CGA2 (C1005), CGA3 (C1608), CGA4 (C2012), CGA5 (C3216), CGA6 (C3225)

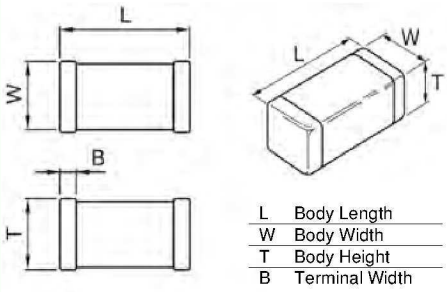
Features

- The CGA series consists of products that can be used for the power train, safety equipment, etc. of a vehicle
- Qualified to AEC Q200 test standard
- Parts are manufactured using tested and stable manufacturing processes and are subjected to increased inspections to guarantee a higher level of reliability
- A monolithic structure ensures superior mechanical strength and reliability
- Available in X8R temperature characteristic for up to 150ºC operating temperature
- High capacitance has been achieved through precision technologies that enable the use of multiple thinner ceramic dielectric layers
- High-accuracy automatic mounting is facilitated through the maintenance of very precise dimensional tolerances
- Low stray capacitance ensures high conformity with nominal values, thereby simplifying the circuit design process

Applications

- Automotive applications
- High reliability requirement applications
- Harsh environment requirement applicatior
- Smart meter
- Base stations
- Noise bypass in automotive

Shape & Dimensions



L	Body Length
W	Body Width
T	Body Height
B	Terminal Width

Dimensions in mm

Part Number Construction

CGA 5 L 2 X8R 1E 105 K T XXXX

Series Name

Dimensions L x W (mm)

Symbol	Length	Width
2	1.00 ± 0.05	0.50 ± 0.05
3	1.60 ± 0.10	0.80 ± 0.10
4	2.00 ± 0.20	1.25 ± 0.20
5	3.20 ± 0.20	1.60 ± 0.20
6	3.20 ± 0.40	2.50 ± 0.30

Thickness T (mm)

Symbol	Thickness	Symbol	Thickness
B	0.50 mm	K	1.30 mm
C	0.60 mm	L	1.60 mm
E	0.80 mm	M	2.00 mm
F	0.85 mm	N	2.30 mm
H	1.15 mm	P	2.50 mm
J	1.25 mm		

Voltage Condition for Life Test

Symbol	Condition	Symbol	Condition
1	1 × R.V.	3	1.5 × R.V.
2	2 × R.V.	4	1.2 × R.V.

Temperature Characteristic

Temperature Characteristics	Capacitance Change	Temperature Range
C0G	0±30 ppm/ºC	-55 to +125ºC
X5R	± 15%	-55 to +85ºC
X7R	± 15%	-55 to +125ºC
X7S	± 22%	-55 to +125ºC
X7T	+22/-33%	-55 to +125ºC
X8R	± 15%	-55 to +150ºC

Internal Codes

Packaging Style

Packaging Code	Style
T	Tape & Reel

Capacitance Tolerance

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

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.

Capacitance Code	Capacitance
0R5	0.5pF
010	1pF
102	1,000pF (1nF)
105	1,000,000pF (1µF)

Rated Voltage (DC)

Voltage Code	Voltage (DC)	Voltage Code	Voltage (DC)
0J	6.3V	1H	50V
1A	10V	2A	100V
1C	16V	2E	250V
1E	25V	2W	450V
1V	35V	2J	630V

Capacitance Range Chart

CGA4 [EIA CC0805]

Capacitance Range Chart

Temperature Characteristics: X7R (± 15%), X7S (± 22%), X8R (±15%), X5R (±15%)

Rated Voltage: 450V (2W), 250V (2E), 100V (2A), 50V (1H), 35V (1V), 25V (1E),16V (1C), 6.3V (0J)

Capacitance (pF)	Cap Code	Tolerance	X7R						
			2E (250V)	2A (100V)	1H (50V)	1V (35V)	1E (25V)	1C (16V)	0J (6.3V)
1,000	102	K: ± 10%							
1,500	152								
2,200	222								
3,300	332								
4,700	472								
6,800	682								
10,000	103								
15,000	153								
22,000	223								
33,000	333								
47,000	473								
68,000	683								
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
1,500,000	155								
2,200,000	225								
3,300,000	335								
4,700,000	475								
10,000,000	106								

Capacitance (pF)	Cap Code	Tolerance	X8R			X7S	X7T		X5R
			2A (100V)	1H (50V)	1E (25V)	2A (100V)	2W (450V)	2E (250V)	0J (6.3V)
10,000	103	K: ± 10%							
15,000	153								
22,000	223								
33,000	333								
47,000	473								
68,000	683								
100,000	104								
150,000	154								
220,000	224								
330,000	334								
470,000	474								
680,000	684								
1,000,000	105								
10,000,000	106								

Standard Thickness

- 0.60 mm
- 0.85 mm
- 1.25 mm

Capacitance Range Table

CGA4 [EIA CC0805]

Class 2 (Temperature Stable)

Temperature Characteristics: X7R (-55 to +125ºC, ±15%), X6S (-55 to +105ºC, ±22%), X5R (-55 to +85ºC, ±15%), Y5V(-30 to +85ºC, +22/-82%)

TDK Part Number (Ordering Code)	Temperature Characteristics	Rated Voltage	Capacitance (pF)	Capacitance Tolerance	Thickness (mm)
CGA4C2X7R1H102K	X7R	50V	1,000	± 10%	0.60 ± 0.10
CGA4C2X7R1H103K	X7R	50V	10,000	± 10%	0.60 ± 0.10
CGA4F2X7R1H104K	X7R	50V	100,000	± 10%	0.85 ± 0.10
CGA4J2X7R1H104K	X7R	50V	100,000	± 10%	1.25 ± 0.20
CGA4J2X7R1H104KT5	X7R	50V	100,000	± 10%	1.25 ± 0.20
CGA4J2X7R1H154K	X7R	50V	150,000	± 10%	1.25 ± 0.20
CGA4J2X7R1H224K	X7R	50V	220,000	± 10%	1.25 ± 0.20
CGA4J2X7R1H334K	X7R	50V	330,000	± 10%	1.25 ± 0.20
CGA4J3X7R1H474K	X7R	50V	470,000	± 10%	1.25 ± 0.20
CGA4J3X7R1H684K	X7R	50V	680,000	± 10%	1.25 ± 0.20
CGA4J3X7R1H105K	X7R	50V	1,000,000	± 10%	1.25 ± 0.20
CGA4J3X7R1V105K	X7R	35V	1,000,000	± 10%	1.25 ± 0.20
CGA4J1X7R1V225K	X7R	35V	2,200,000	± 10%	1.25 ± 0.20
CGA4J2X7R1E224K	X7R	25V	220,000	± 10%	1.25 ± 0.20
CGA4J2X7R1E474K	X7R	25V	470,000	± 10%	1.25 ± 0.20
CGA4J3X7R1E684K	X7R	25V	680,000	± 10%	1.25 ± 0.20
CGA4J3X7R1E105K	X7R	25V	1,000,000	± 10%	1.25 ± 0.20
CGA4J3X7R1E225K	X7R	25V	2,200,000	± 10%	1.25 ± 0.20
CGA4J1X7R1E335K	X7R	25V	3,300,000	± 10%	1.25 ± 0.20
CGA4J1X7R1E475K	X7R	25V	4,700,000	± 10%	1.25 ± 0.20
CGA4J2X7R1C474K	X7R	16V	470,000	± 10%	1.25 ± 0.20
CGA4J2X7R1C684K	X7R	16V	680,000	± 10%	1.25 ± 0.20
CGA4J2X7R1C105K	X7R	16V	1,000,000	± 10%	1.25 ± 0.20
CGA4J3X7R1C155K	X7R	16V	1,500,000	± 10%	1.25 ± 0.20
CGA4J3X7R1C225K	X7R	16V	2,200,000	± 10%	1.25 ± 0.20
CGA4J3X7R1C475K	X7R	16V	4,700,000	± 10%	1.25 ± 0.20
CGA4J3X5R1A106K	X5R	10V	10,000,000	± 10%	1.25 ± 0.20
CGA4J1X7R0J106K	X7R	6.3V	10,000,000	± 10%	1.25 ± 0.20
CGA4F2X7R2A102K	X7R	100V	1,000	± 10%	0.85 ± 0.10
CGA4F2X7R2A152K	X7R	100V	1,500	± 10%	0.85 ± 0.10
CGA4F2X7R2A222K	X7R	100V	2,200	± 10%	0.85 ± 0.10
CGA4F2X7R2A332K	X7R	100V	3,300	± 10%	0.85 ± 0.10
CGA4F2X7R2A472K	X7R	100V	4,700	± 10%	0.85 ± 0.10
CGA4F2X7R2A682K	X7R	100V	6,800	± 10%	0.85 ± 0.10
CGA4F2X7R2A103K	X7R	100V	10,000	± 10%	0.85 ± 0.10
CGA4J2X7R2A153K	X7R	100V	15,000	± 10%	1.25 ± 0.20
CGA4J2X7R2A223K	X7R	100V	22,000	± 10%	1.25 ± 0.20
CGA4J2X7R2A333K	X7R	100V	33,000	± 10%	1.25 ± 0.20
CGA4J2X7R2A473K	X7R	100V	47,000	± 10%	1.25 ± 0.20
CGA4F2X7R2A683K	X7R	100V	68,000	± 10%	0.85 ± 0.10
CGA4J2X7R2A104K	X7R	100V	100,000	± 10%	1.25 ± 0.20
CGA4F3X7R2E102K	X7R	250V	1,000	± 10%	0.85 ± 0.10
CGA4F3X7R2E152K	X7R	250V	1,500	± 10%	0.85 ± 0.10
CGA4F3X7R2E222K	X7R	250V	2,200	± 10%	0.85 ± 0.10

General Specifications

CGA Series – Automotive Grade Capacitors

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 the item below, 10,000 MΩ or 100MΩ•μF min.), whichever is smaller.	Apply rated voltage for 60s. As for the rated voltage 630V DC, apply 500V DC.
3	**Voltage Proof**	Withstand test voltage without insulation breakdown or other damage.	See table below.
4	**Capacitance**	Within the specified tolerance.	See table below.
5	**Q (Class 1)**	See table below.	See No.4 in this table for measuring condition.
6	**Dissipation Factor (Class 2)**	See table below.	See No.4 in this table for measuring condition.
7	**Temperature Characteristics of Capacitance (Class1)**	See table below.	

No. 3 – Voltage Proof

Class	Rated Voltage	Apply voltage
Class 1	100V and under	3 ×rated voltage
	Over 100V	1.5 ×rated voltage
Class 2	100V and under	2.5 ×rated voltage
	Over 100V	1.5 ×rated voltage

Above DC voltage shall be applied for 1 to 5s. Charge / discharge current shall not exceed 50mA.

No. 4 – Capacitance

Class	Rated Capacitance	Measuring Frequency	Measuring voltage
Class 1	≤ 1000pF	1MHz±10%	0.5 - 5 V_{rms}
	> 1000pF	1kHz±10%	
Class 2	≤ 10uF	1kHz±10%	1.0±0.2 V_{rms}
	> 10uF	120Hz±20%	0.5±0.2 V_{rms}

No. 5 – Q (Class 1)

Rated Capacitance	Q
C ≥ 30pF	1,000 min.
C < 30pF	400+20×C min.

C : Rated capacitance (pF)

No. 6 – Dissipation Factor (Class 2)

T.C.	D.F.
X8R	0.03 max.
X7R	0.05 max.
C0G	0.075 max.
	0.1 max.

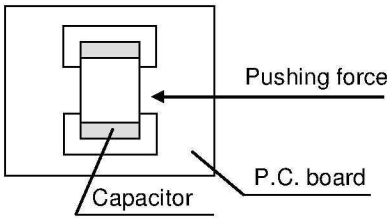
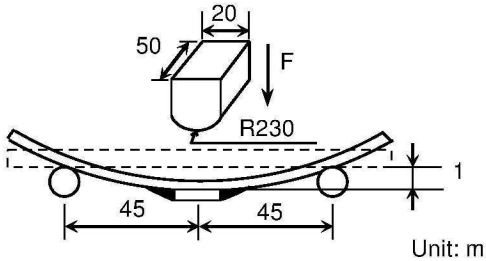
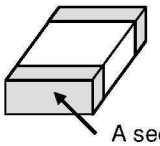
No. 7 – Temperature Characteristics of Capacitance (Class1)

T.C.	Temperature Coefficient
C0G	0 ± 30 ppm/ºC

Capacitance drift within ± 0.2% or ± 0.05pF, whichever larger.

General Specifications

CGA Series – Automotive Grade Capacitors

No.	Item	Performance	Test or Inspection Method
8	**Temperature Characteristics of Capacitance (Class 2)**	Capacitance Change (%) **No Voltage Applied** X7R: ± 15% X8R: ± 15%	Capacitance shall be measured by the steps shown in the following table after thermal equilibrium is obtained for each step. ΔC be calculated ref. STEP 3 reading **Step** / **Temperature (ºC)** 1 / Reference temp. ± 2 2 / Min. operating temp. ± 3 3 / Reference temp. ± 2 4 / Max. operating temp. ± 2 Measuring voltage: 0.1, 0.2, 0.5, 1.0V_{rms}.
9	**Robustness of Terminations**	No sign of termination coming off, breakage of ceramic, or other abnormal signs.	Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) and apply a pushing force of 2N (CGA2) or 17.7N (CGA3, CGA4, CGA5, CGA6) with 10±1s. 
10	**Bending**	No mechanical damage.	Reflow solder the capacitors on P.C. board (shown in Appendix 2a or Appendix 2b) and bend it for 1mm.  Unit: mm
11	**Solderability**	New solder to cover over 75% of termination. 25% may have pinholes or rough spots but not concentrated in one spot. Ceramic surface of A sections shall not be exposed due to melting or shifting of termination material. 	Completely soak both terminations in solder at 235±5ºC for 2±0.5s. Solder: H63A (JIS Z 3282) Flux: Isopropyl alcohol (JIS K 8839) Rosin (JIS K 5902) 25% solid solution.

General Specifications

CGA Series – Automotive Grade Capacitors

<table>
<tr><th>No.</th><th>Item</th><th>Performance</th><th>Test or Inspection Method</th></tr>
<tr><td>12</td><td>Resistance to solder heat</td><td></td><td>Completely soak both terminations in solder at 260±5ºC for 5±1s.
Preheating condition
Temp. : 150±10ºC
Time : 1 to 2min.
Flux : Isopropyl alcohol (JIS K 8839)
Rosin (JIS K 5902) 25% solid solution.
Solder : H63A (JIS Z 3282)
Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.</td></tr>
<tr><td></td><td>External appearance</td><td>No cracks are allowed and terminations shall be covered at least 60% with new solder</td><td></td></tr>
<tr><td></td><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within ±2.5% or ±0.25pF, whichever larger.</td></tr><tr><td>Class 2</td><td>X7R
X8R</td><td>± 7.5 %</td></tr></table></td><td></td></tr>
<tr><td></td><td>Q (Class 1)</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></td></tr>
<tr><td></td><td>D.F. (Class 2)</td><td>Meet the initial spec.</td><td></td></tr>
<tr><td></td><td>Insulation Resistance</td><td>Meet the initial spec.</td><td></td></tr>
<tr><td></td><td>Voltage Proof</td><td>No insulation breakdown or other damage.</td><td></td></tr>
<tr><td>13</td><td>Vibration</td><td></td><td>Reflow solder the capacitor on a P.C. board (shown in Appendix 1a or Appendix 1b) before testing.
Vibrate the capacitor with following conditions:
Applied force: 5G max.
Frequency: 10-2000Hz
Duration: 20 min.
Cycle : 12 cycles</td></tr>
<tr><td></td><td>External appearance</td><td>No mechanical damage.</td><td></td></tr>
<tr><td></td><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within ±2.5% or ±0.25pF, whichever larger.</td></tr><tr><td>Class 2</td><td>X7R
X8R</td><td>± 7.5 %</td></tr></table></td><td></td></tr>
<tr><td></td><td>Q (Class 1)</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></td></tr>
<tr><td></td><td>D.F. (Class 2)</td><td>Meet the initial spec.</td><td></td></tr>
</table>

General Specifications

CGA Series – Automotive Grade Capacitors

14 Temperature cycle

Test or Inspection Method

Reflow solder the capacitors on a P.C. board (shown in Appendix 1a or Appendix 1b) before testing.

Expose the capacitor in the conditions step1 through step 4, and repeat 5 times consecutively.

Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.

Step	Temperature (ºC)	Time (min.)
1	Min. operating temp. ±3	30 ± 3
2	Reference Temp. ±2	2 – 5
3	Max. operating temp. ± 2	30 ± 2
4	Reference Temp. ± 2	2 - 5

No.	Item	Performance
14	External appearance	No mechanical damage.
	Capacitance	Characteristics: Class 1 C0G; Class 2 X7R X8R Change from the value before test: Class 1: Capacitance drift within ±2.5% or ±0.25pF, whichever larger. Class 2: ± 7.5 %
	Q (Class 1)	Rated Capacitance: 30pF and over — Q: 1,000 min. Rated Capacitance: Under 30pF — Q: 400+20×C min. C : Rated capacitance (pF)
	D.F. (Class 2)	Meet the initial spec.
	Insulation Resistance	Meet the initial spec.
	Voltage proof	No insulation breakdown or other damage.

15 Moisture Resistance

Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing.

Apply the rated voltage at temperature 85ºC and 85%RH for 1000 +24,0h.

Charge/discharge current shall not exceed 50mA.

Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.

Voltage conditioning (only for Class 2):
Voltage treat the capacitor under testing temperature and voltage for 1 hour.

Leave the capacitor in ambient conditions for 24±2h before measurement.

Use this measurement for initial value.

No.	Item	Performance
15	External appearance	No mechanical damage.
	Capacitance	Characteristics: Class 1 C0G; Class 2 X7R X8R Change from the value before test: Class 1: Capacitance drift within ±7.5% or ±0.75pF, whichever larger. Class 2: ± 12.5 %
	Q (Class 1)	Rated Capacitance: 30pF and over — Q: 1,000 min. Rated Capacitance: Under 30pF — Q: 100+10/3×C min. C : Rated capacitance (pF)
	D.F. (Class 2)	Characteristics X7R: 200% of initial spec. max. X8R: 200% of initial spec. max
	Insulation Resistance	500MΩ or 25MΩ•μF min. (As for the capacitors of rated voltage 16V DC and item below, 500MΩ or 5MΩ•μF min.,) whichever smaller.

General Specifications

CGA Series – Automotive Grade Capacitors

<table>
<tr><th>No.</th><th>Item</th><th>Performance</th><th>Test or Inspection Method</th></tr>
<tr><td>16</td><td>Life</td><td></td><td rowspan="5">Reflow solder the capacitor on P.C. board (shown in Appendix 1a or Appendix 1b) before testing.
Test condition : maximum operating temperature ±2ºC for 1,000 +48,0h.
Please refer to each part number for test voltage.
Charge/discharge current shall not exceed 50mA.
Leave the capacitor in ambient conditions for 6 to 24h (Class 1) or 24±2h (Class 2) before measurement.
Voltage conditioning:
Voltage treat the capacitors under testing temperature and voltage for 1 hour.
Leave the capacitor in ambient conditions on for 24±2h before measurement.
Use this measurement for initial value.</td></tr>
<tr><td></td><td>External appearance</td><td>No mechanical damage.</td></tr>
<tr><td></td><td>Capacitance</td><td><table><tr><th colspan="2">Characteristics</th><th>Change from the value before test</th></tr><tr><td>Class 1</td><td>C0G</td><td>Capacitance drift within ±7.5% or ±0.75pF, whichever larger.</td></tr><tr><td>Class 2</td><td>X7R
X8R</td><td>± 15 %</td></tr></table></td></tr>
<tr><td></td><td>Q
(Class 1)</td><td><table><tr><th>Rated Capacitance</th><th>Q</th></tr><tr><td>C ≥ 30pF</td><td>350 min.</td></tr><tr><td>10pF ≤ C < 30pF</td><td>275 + 5/2×C min.</td></tr><tr><td>C < 10pF</td><td>200 + 10×C min.</td></tr></table>C : Rated capacitance (pF)</td></tr>
<tr><td></td><td>D.F.
(Class 2)</td><td>Characteristics
X7R: 200% of initial spec. max.
X8R: 200% of initial spec. max</td></tr>
<tr><td></td><td>Insulation Resistance</td><td>1,000MΩ or 50MΩ•μF min. , whichever smaller.
(As for the capacitors of rated voltage 16 DC, 1,000 MΩ or 10MΩ•μF min.,)</td></tr>
</table>

***As for the initial measurement of capacitors (Class 2) on number 8, 12, 13 and 14, leave capacitors at 150 –10, 0°C for 1 hour and measure the value after leaving capacitor for 24±2h in ambient conditions.**

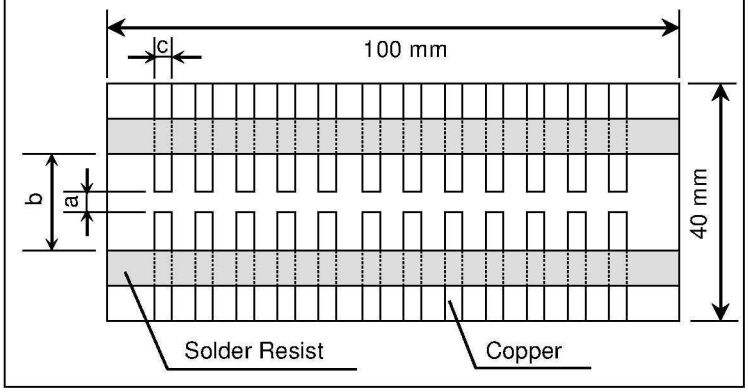
General Specifications

CGA Series – Automotive Grade Capacitors

Appendix - 1a

P.C. Board for reliability test

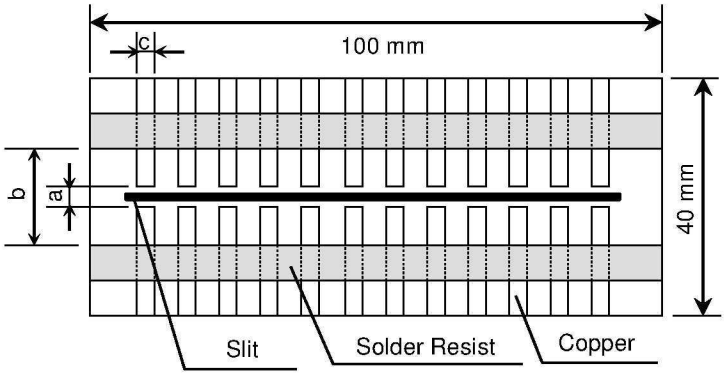
Applied for CGA2, CGA3, CGA4, CGA5



Appendix - 1b

P.C. Board for reliability test

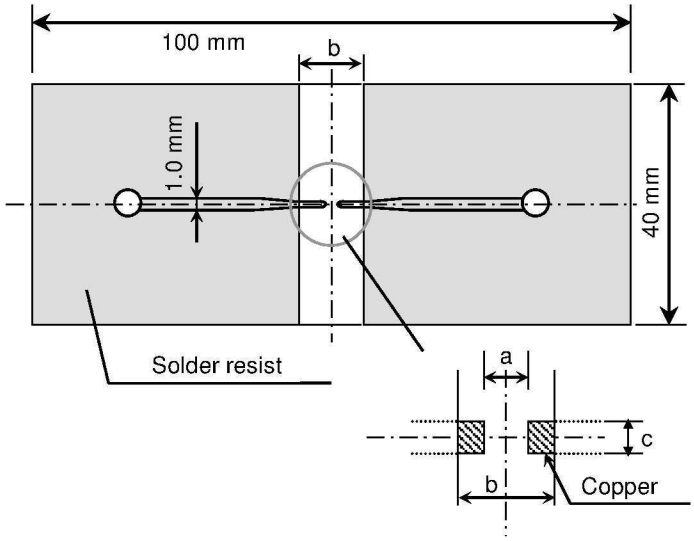
Applied for CGA6



Appendix - 2a

P.C. Board for bending test

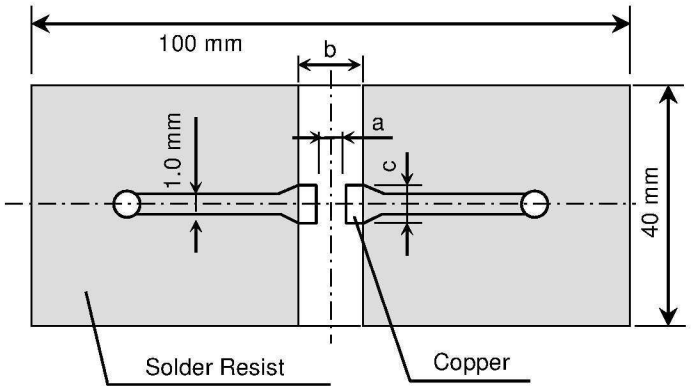
Applied for CGA2



Appendix - 2b

P.C. Board for bending test

Applied for CGA3, CGA4, CGA5, CGA6



Material : Glass Epoxy (As per JIS C6484 GE4)

P.C. Board thickness : Appendix-2a 0.8mm

Appendix-1a, 1b, 2b 1.6mm

Copper (thickness 0.035mm)

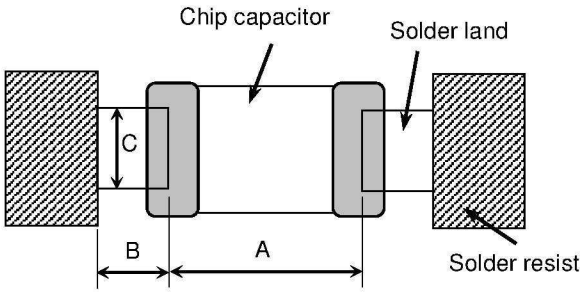
Solder resist

Case Code			Dimensions (mm)		
Series	JIS	EIA	a	b	c
CGA2	C1005	CC0402	0.4	1.5	0.5
CGA3	C1608	CC0603	1.0	3.0	1.2
CGA4	C2012	CC0805	1.2	4.0	1.65
CGA5	C3216	CC1206	2.2	5.0	2.0
CGA6	C3225	CC1210	2.2	5.0	2.9

Soldering Information

CGA Series – Automotive Grade Capacitors

• Recommended Soldering Land Pattern



Wave Soldering Unit: mm

Symbol \ Type	CGA3 [CC0603]	CGA4 [CC0805]	CGA5 [CC1206]
A	0.7 - 1.0	1.0 - 1.3	2.1 - 2.5
B	0.8 - 1.0	1.0 - 1.2	1.1 - 1.3
C	0.6 - 0.8	0.8 - 1.1	1.0 - 1.3

Reflow Soldering Unit: mm

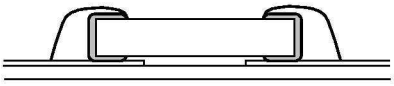
Symbol \ Type	CGA2 [CC0402]	CGA3 [CC0603]	CGA4 [CC0805]
A	0.3 - 0.5	0.6 - 0.8	0.9 - 1.2
B	0.35 - 0.45	0.6 - 0.8	0.7 - 0.9
C	0.4 - 0.6	0.6 - 0.8	0.9 - 1.2

Reflow Soldering Unit: mm

Symbol \ Type	CGA5 [CC1206]	CGA6 [CC1210]
A	2.0 - 2.4	2.0 - 2.4
B	1.0 - 1.2	1.0 - 1.2
C	1.1 - 1.6	1.9 - 2.5

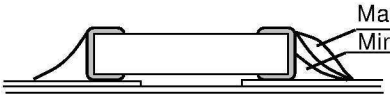
• Recommended Solder Amount

Excessive solder

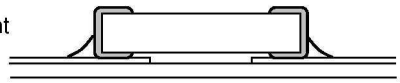


Higher tensile force on the chip capacitor may cause cracking.

Adequate solder

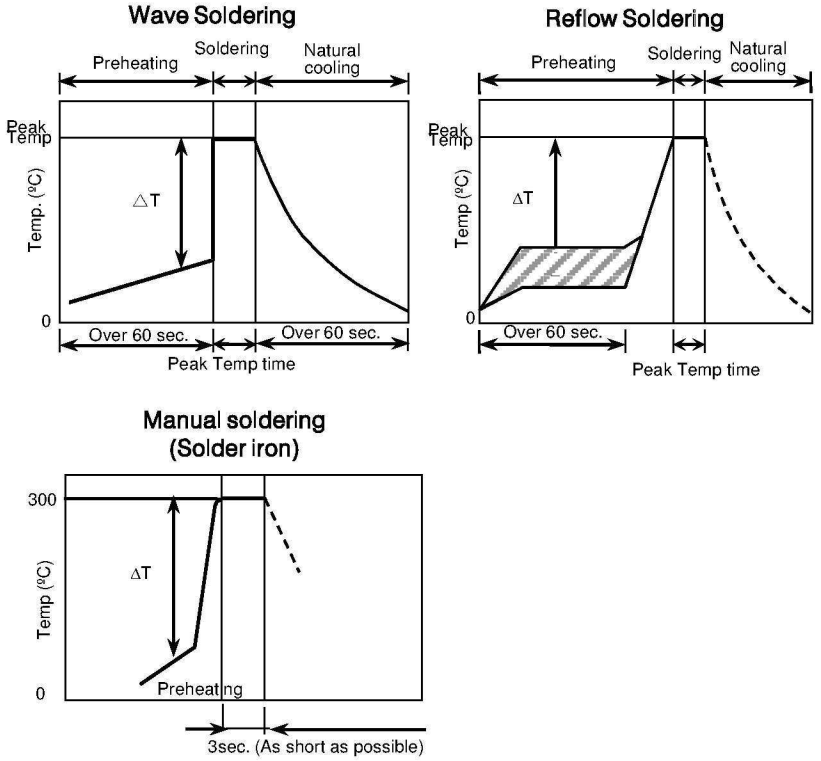


Insufficient solder



Small solder fillet may cause contact failure or failure to hold the chip capacitor to the P.C. board.

• Recommended Soldering Profile



Recommended soldering duration

Solder \ Temp./Dura.	Wave Soldering		Reflow Soldering	
	Peak temp (°C)	Duration (sec.)	Peak temp (°C)	Duration (sec.)
Sn-Pb Solder	250 max.	3 max.	230 max.	20 max.
Lead-Free Solder	260 max.	5 max.	260 max.	10 max.

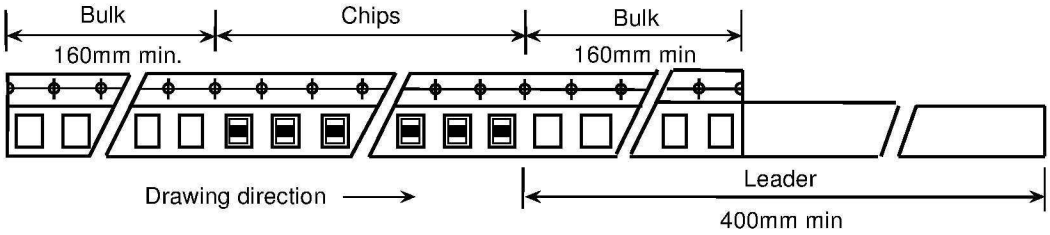
Recommended solder compositions
Sn-37Pb (Sn-Pb solder)
Sn-3.0Ag-0.5Cu (Lead Free Solder)

Preheating Condition

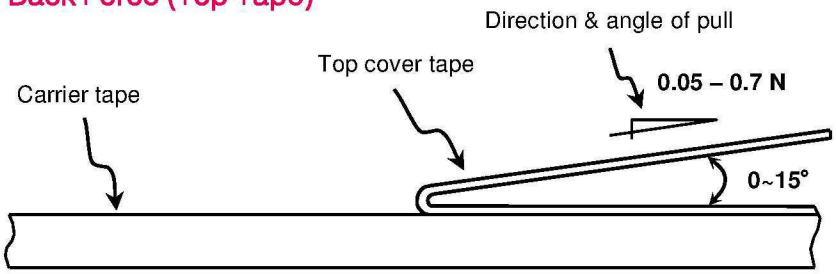
Soldering	Case Size - JIS (EIA)	Temp. (°C)
Wave soldering	CGA3(CC0603), CGA4(CC0805), CGA5(CC1206)	ΔT ≤ 150
Reflow soldering	CGA2(CC0402), CGA3(CC0603), CGA4(CC0805), CGA5(CC1206)	ΔT ≤ 150
	CGA6(CC1210)	ΔT ≤ 130
Manual soldering	CGA2(CC0402), CGA3(CC0603), CGA4(CC0805), CGA5(CC1206)	ΔT ≤ 150
	CGA6(CC1210)	ΔT ≤ 130

Packaging Information — CGA Series – Automotive Grade Capacitors

• Carrier Tape Configuration



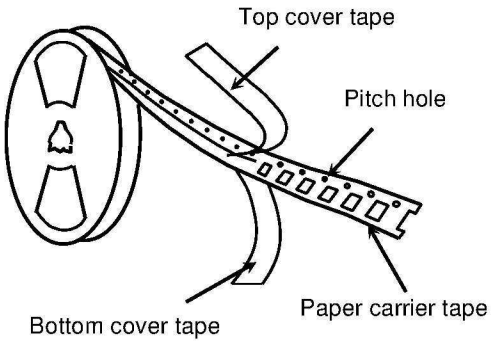
• Peel Back Force (Top Tape)



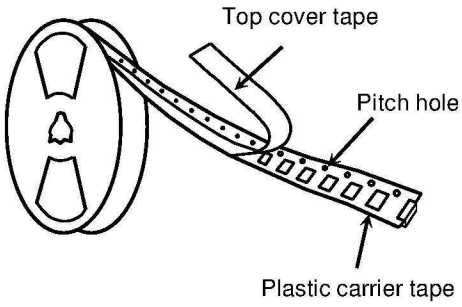
- Carrier tape shall be flexible enough to be wound around a minimum radius of 30mm with components in tape.
- The missing of components shall be less than 0.1%
- Components shall not stick to the cover tape.
- The cover tape shall not protrude beyond the edges of the carrier tape and shall not cover the sprocket holes.

• Chip Quantity Per Reel and Structure of Reel (Paper & Plastic)

Paper Carrier Tape & Reel



Plastic Carrier Tape & Reel

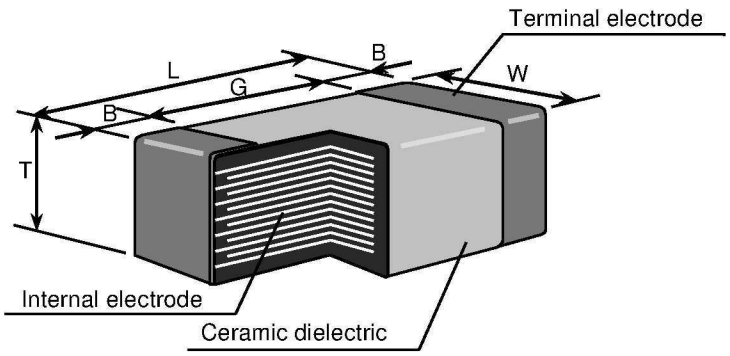


Case Code			Chip Thickness (mm)	Taping Material	Chip quantity (pcs.)	
Series	JIS	EIA			φ178mm (7") reel	φ330mm (13") reel
CGA2	C1005	CC0402	0.50	Paper	10,000	50,000
CGA3	C1608	CC0603	0.80	Paper	4,000	10,000
CGA4	C2012	CC0805	0.60	Paper	4,000	20,000
CGA4	C2012	CC0805	0.85	Paper	4,000	10,000
CGA4	C2012	CC0805	1.25	Plastic	2,000	10,000
CGA5	C3216	CC1206	0.60	Paper	4,000	10,000
CGA5	C3216	CC1206	0.85	Paper	4,000	10,000
CGA5	C3216	CC1206	1.15	Plastic	2,000	8,000
CGA5	C3216	CC1206	1.60	Plastic	2,000	8,000
CGA6	C3225	CC1210	1.25	Plastic	2,000	8,000
CGA6	C3225	CC1210	1.60	Plastic	2,000	8,000
CGA6	C3225	CC1210	2.00	Plastic	1,000	5,000
CGA6	C3225	CC1210	2.30	Plastic	1,000	5,000
CGA6	C3225	CC1210	2.50	Plastic	1,000	5,000

Additional Information

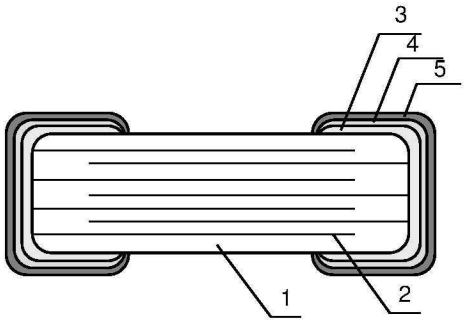
CGA Series – Automotive Grade Capacitors

• Shape & Dimensions



Case Code			Dimensions (mm)				
Series	JIS	EIA	L	W	T	B	G
CGA2	C1005	CC0402	1.00	0.50	0.50	0.25	0.30 min.
CGA3	C1608	CC0603	1.60	0.80	0.80	0.30	0.50 min.
CGA4	C2012	CC0805	2.00	1.25	0.60	0.50	0.50 min.
					0.85	0.20 min.	
					1.25		
CGA5	C3216	CC1206	3.20	1.60	0.60	0.30 min.	1.00 min.
					0.85		
					1.15	0.20 min.	
					1.60		
CGA6	C3225	CC1210	3.20	2.50	1.25	0.30 min.	1.00 min.
					1.60	0.20 min.	
					2.00		
					2.30		
					2.50	0.30 min.	

• Inside Structure & Material System



No.	NAME	MATERIAL	
		Class 1	Class 2
(1)	Ceramic Dielectric	$CaZrO_3$	$BaTiO_3$
(2)	Internal Electrode	Nickel (Ni)	
(3)	Termination	Copper (Cu)	
(4)		Nickel (Ni)	
(5)		Tin (Sn)	

• Environmental Information

TDK Corporation established internal product environmental assurance standards that include the six hazardous substances banned by the EU RoHS Directive[1] enforced on July 1, 2006 along with additional substances independently banned by TDK and has successfully completed making general purpose electronic components conform to the RoHS Directive[2].

1. Abbreviation for Restriction on Hazardous Substances, which refers to the regulation EU Directive 2002/95/EC on hazardous substances by the European Union (EU) effective from July 1, 2006. The Directive bans the use of six specific hazardous substances in electric and electronic devices and products handled within the EU. The six substances are lead, mercury, cadmium, hexavalent chromium, PBB (polybrominated biphenyls), and PBDE (polybrominated diphenyl ethers).

2. This means that, in conformity with the EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

For REACH (SVHC : 15 substances according to ECHA / October 2008) : All TDK MLCC do not contain these 15 substances.

For European Directive 2000/53/CE and 2005/673/CE : Cadmium, Hexavalent Chromium, Mercury, Lead are not contained in all TDK MLCC.

For European Directive 2003/11/CE : Pentabromodiphenyl-ether, Octabromodiphenyl-ether are not contained in all TDK MLCC.