

SPECIFICATION

SPEC. No. S15CJ-90A

DATE : Dec. 2015

To

Non-Controlled Copy

CUSTOMER'S PRODUCT NAME

TDK'S PRODUCT NAME

Ceramic insulated capacitors disc type safety standard

TYPE : CD45△△2GA○○○□-◇KA

RECEIPT CONFIRMATION

DATE: _____ YEAR _____ MONTH _____ DAY _____

TDK Corporation

Sales

Electronic Components Sales &
Marketing Group

Engineering

Ceramic Capacitors Business Group .

APPROVED	Person in charge

APPROVED	CHECKED	Person in charge

Handling precautions for High voltage ceramic capacitors

Please read the following closely before using these products.

Safety precautions

The following precautions should be observed strictly to ensure safety design.

Misuse of the product may lead to smoking of the product.



Cautions

1. Operating voltage

Use within the rated voltage of capacitor between terminals. For DC rated voltage application, you should control the peak voltage (V_{0-P}) under the rated voltage in case the AC voltage is superimposed on the DC voltage. Use within the rated voltage includes peak voltage (V_{P-P}) when AC voltage or impulse voltage applied in a circuit. Confirm irregular voltage (surge voltage, static electricity, switching noise, etc) occurs in the equipment used, and use within the rated voltage containing the irregular voltage.

When the capacitor is used as a noise suppressor in the AC primary circuit, the voltage proof test should be within the specified conditions (voltage, time, wave form, etc).

Connect by confirmation of non lose contact, and the voltage is started to apply to the circuit from zero to the specified voltage and it is stopped applying from the voltage to zero.

Voltage	(1) DC voltage	(2) DC+AC voltage	(3) AC voltage	(4) Pulse voltage
Voltage Measuring position				

2. Operating temperature

Be sure to use only those operating temperature described in our catalogue or specification.

Keep the surface temperature under the maximum temperature, which includes the maximum self-heat temperature of 20 degree C.

3. Self-exothermal

Self-exothermal temperature should be within 20 degree C on the condition of atmosphere temperature 25 degree C without the influence of wind such as the cooling fan. Be sure to use a capacitor in a circuit of current increase by AC voltage or pulse voltage applied.

When high frequency voltage or impulse voltage applied in a circuit, reliability should be influenced. Take into considerations the load reduction and self-exothermal temperature, even if voltage should be within the rated voltage.

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Cautions

4. Capacitance change of capacitors

For some of the capacitors, capacitance value may change considerably in the temperature range, or by applied DC voltage. And capacitor has aging characteristic (capacitance decreases by keeping as it is). When you use the capacitor in the time constant circuit, consult TDK whether the capacitor is available or not.

5. Vibration of capacitors

When the capacitor class 2 is used in the AC circuit, or pulse circuit, the capacitor might vibrate or noise might occur in the specified frequency. Be sure to confirm the conditions before using the capacitor.

6. Usage of capacitance and storage

Don't use capacitors in the following environments:

- * Direct sunshine
- * Areas directly exposed to water or salty water
- * Areas that become dewy
- * Areas filled with toxic gases (such as hydrogen sulfide, sulfur dioxide, chlorine, ammonia, etc)
- * Areas exposed to excess vibrations or shock conditions described in our catalogue or specification.

Store capacitors in an environment from -10 to 40 degree C, with 15 to 70%RH for 6 months maximum and use within the period after receiving the capacitors.

7. Inserting precautions

When inserting capacitors into the PC board by automatic insertion machine, confirm the conditions (such as pressure of pusher, adjustment of clinching portion) and minimize the impact force by chucking the body, or clinching the lead terminals.

Distances between the hole position onto a PC board should be equal to the pitch of capacitors.

When stretching the lead terminal, any force may load the bottom of the capacitor body and result in damage to the insulation coating. Severe damages may cause poor reliability.

8. Soldering

Don't immerse the capacitor body into the molten solder, and don't solder the terminals by reflow soldering. Use PC board, and solder the terminals in the opposite side of the body. Soldering conditions, such as pre-heat temperature, soldering temperature, and soldering time, should be followed by the descriptions in our catalogue or specification. (refer to Fig.-1)

Adjust the amount of solder within the proper volume. Select an appropriate soldering material.

When using soldering iron for installing capacitors or reworking onto the PC board, sufficient pre-heating and temperature control should be used. We recommend that the iron condition is 350 ± 10 degree C / 3.5 ± 0.5 s. as 1 time, and you should use an adequate tip diameter ($\phi 3$ mm Max.) with the soldering iron as well as a proper wattage (50W Max.). Don't touch the capacitor body directly with soldering tip, except for the terminals of capacitor.

9. Flux

When using flux for soldering capacitors onto the PC board, spread it thinly and uniformly.

Flux will be composed of halogenated material less than 0.1 wt% (cl conversion).

Don't use a strong acid grade of flux. When using water-soluble flux, sufficient cleansing should be done.

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Cautions

10. Cleansing

When the cleansing should not be sufficient, the cleansing liquid or any residue might leave on the capacitor body, they may deteriorate the insulation coating or performance (insulation resistance, etc.). When using ultrasonic cleansing, avoid transmitting vibrations onto the PC board. Conditions of ultrasonic cleansing, such as output frequency and time of the method, should be taken into considerations.

After cleansing capacitors, dry them well. Cleansing liquid should not contain electrolyte, nor leave any residue. Through the result of the cleansing method, confirm whether the quality of the capacitors have been affected due to the conditions.

11. Coating or molding

When coating or molding capacitors after installing components onto the PC board, confirm whether the performance of capacitors may not be damaged by the work.

12. Mechanical stress

Don't submit to excessive mechanical shock. Don't use capacitors which may have been damaged due to dropping, etc.

If possible, avoid bending the terminals of capacitors. In an unavoidable case of bending, use a small jig to decrease the mechanical stress on the capacitors.

13. Others

Please contact TDK before using our capacitors listed in this catalogue or specifications for the applications listed below which require especially high reliability for the prevention of defects which might directly cause damage to the third party's life, body or property, or when intending to use one of our capacitors for other applications than specified in this catalog or specifications.

- * Medical equipment
- * Aerospace equipment
- * Power plant equipment
- * Aircraft equipment
- * Transportation equipment (vehicles, trains, ships, etc)
- * Undersea equipment
- * Traffic signal equipment
- * Disaster prevention, crime prevention equipment
- * Data processing equipment exerting influence on public
- * Application of similar complexity and, or reliability requirements to the applications listed in the above.

Please refer to the guideline of notabilia for fixed ceramic capacitors issued by JEITA (Japan Electronics and Information Technology Association, EIAJ RCR-2335).

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Scope

This specification applies to ceramic insulated capacitors disc type used in circuits of electromagnetic interference suppression in electronic and equipment and approved by IEC60384-14, EN60384-14, UL60384-14 and relative safety standards.

Mention item

1. Applicable safety standard approval
2. Acquired safety standard approval
3. Part Name
4. Operating temperature range
5. Test condition
6. Performance
7. Marking
8. Figure & Dimension
9. Label & Transport
10. Notification before the modification

We do not use the following material (1),(2) in these products.

- (1) PBBOs (Poly Bromo Biphenyl Oxides)
- (2) PBBs (Poly Bromo Biphenyls)

We do not use Class I and II ODS (Ozone depleting substances) in all our process of these products.

These products shall conform to RoHS Directive.

These products are Halogen-free.(Br \leq 900ppm, Cl \leq 900ppm, Br+Cl \leq 1500ppm)

Manufacturing place

Manufacturing site should be TDK Taiwan & TDK Xiamen

Division	Date Issued	SPEC No.
Ceramic Capacitors Business Group	Dec. 2015	S15CJ-90A

1. Applicable safety standard

This is specification applies the ENEC, UL, CSA,SAA, CQC and KTL approved ceramic capacitor disc type.

2. Acquired safety standard approval and Approval report No.

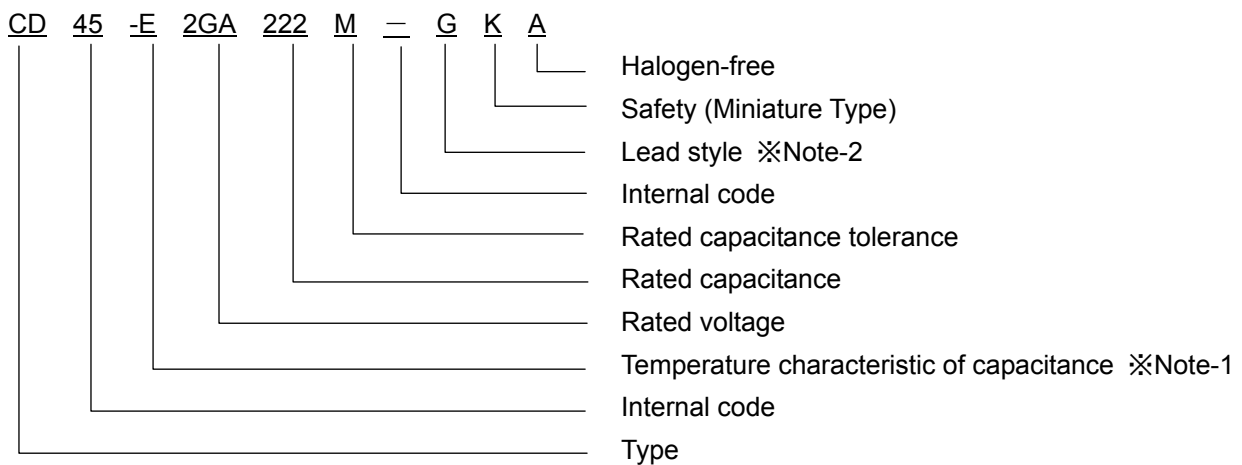
Safety Standard	Standard No. of IEC	Standard No.	T.C.	Subclass	W.V	Approval report No.		
						Taiwan	Xiamen	
ENEC	IEC 60384-14	EN 60384-14	SL, B,E	X1, Y1	X1:440VAC Y1:400VAC	ENEC-01048		
UL		UL60384-14				E37861		
cUL/CSA		AS3250				CS6268		
SAA		IEC 60384-14				CQC140011 12767	CQC140011 12447	
CQC		K60384-14			X1	440V AC	SZ03001- 12002	SU03047- 12002
KTL					Y1	400V AC	SZ03001- 12004	SU03047- 12004

* T.C.: Temperature Characteristic.

* Certificate No(s) shall be changed owing to the revisions of the related standards and renewal of certificate.

3. Part name

(Example)



※Note-1

Temperature characteristic of capacitance : SL:TC SL, -B:TC B, - E:TC E

※ Note-2

- Lead style G : Vertical kink long lead (Bulk)
- N : Vertical kink short lead (Bulk)
- V : Vertical kink long lead (Taping)

4. Operating Temperature range : -25 °C to +125 °C

Operating temperature range max. is +125 °C
(Including capacitor's self-heating max. +20 °C)

5. Test condition

Test and measurement shall be made at the standard condition, (Temperature 15 to 35 °C, relative humidity 45 to 75 % and atmospheric pressure 860 to 1060 Pa.), Unless otherwise specification herein. If doubt occurred on the value of measurement, and remeasurement was requested by customer capacitors shall be measured at the reference condition (Temperature 20 ±2 °C ,relative humidity 60 to 70 % and atmospheric pressure 860 to 1060 Pa.)

6. Performance

The performances shall comply with Table-1

Table-1

No.	Items		Performance	Test method
1	Appearance and dimension		The appearance and dimension shall be as given in paragraph 8 and Table-2 to 5	Visual check and measuring with calipers.
2	Marking		The marking shall be easily legible (Paragraph 7)	Visual check
3	Withstand voltage	Between terminals	No failure	Voltage: 4000V AC (50 or 60 Hz) Test time: 60 s Charge and discharge current shall be 50 mA or less.
		Between terminal and exterior cladding	No failure	4000VAC (50 or 60Hz) shall be applied for 60 s between the terminal connected together and the enclosure of capacitor with metal foil from the distance 2.6mm of the body.
4	Insulation resistance	Between terminals	10000 MΩ or more	60±5 sec. after application with 500±50V DC.
5	Capacitance		With the tolerances specified with Table-3 to 5	SL: Measuring frequency : 1MHz ±10 % Measuring voltage : 5Vrms. or less
6	Dissipation factor (tan δ)		SL : 0.5 % or less B, E : 2.5 % or less	B,E: Measuring frequency : 1kHz ±20 % Measuring voltage : 5Vrms. or less
7	Capacitance temperature characteristic (No voltage application)		SL : Within -1000 to +350ppm/°C B : Within ±10 % E : Within - 55% to + 20%	Standard temperature: 20°C Temperature range: SL: +20 to +85°C B,E: -25 to +85°C Initial :pre-heat 125±2°C, 1h, Leaving room temp. for 24±2h.
8	Strength of terminal	Tensile strength	Lead wire shall not be disconnected, and capacitor shall not be damaged.	The force of 10N shall be applied to the axial direction of the termination.
		Bending strength	Lead wire shall not be disconnected, and capacitor shall not be damaged.	The force of 5N shall be applied to the axial direction of the terminal and the body shall be inclined through an angle of 90 degrees, then the body shall be returned to the original position. Furthermore the body shall be inclined to the other direction of 90 degrees. This operation shall be carried out two times.
9	Vibration resistance	Appearance	No marked defect	Vibration frequency range: 10 to 55Hz. Displacement: 0.75mm Total duration: 6 hours (2 hours for each direction: X,Y,Z)
		Capacitance change	Within the tolerances specified with No.5	
		Dissipation factor (tan δ)	Within the value specified with No.6	
10	Resistance to soldering heat	Appearance	No marked defect	Soldering temperature: 350±10°C/3.5±0.5 s or 260±5°C/10±1 s Dipping depth: 1.5 to 2.0mm from the bottom of lead terminal. (shielding board shall be used.) Initial :pre-heat 125± 2°C, 1h. Leaving room temp. for 24± 2h. After test: leaving room temp. for 24± 2h.
		Capacitance change	Within ± 10 %	
		Withstand voltage (Between terminals)	No failure	

Table-1 Continue

No.	Items	Performance	Test method
11	Solder ability	At least 3/4 of circumferential dipped into solder shall be covered with new solder.	Soldering temperature : 245 ±5 °C Dipping time : 2 ±0.5 sec. Concentration of solution shall be about 25 % colophonium in weight ratio.
12	Temperature cycle and dipping cycle	Appearance	No marked defect.
Capacitance change		SL,B: Within ± 10% E : Within ± 20%	
Dissipation factor (tan δ)		SL : 1.0% or less B, E : 5.0% or less	
Insulation resistance		1000 MΩ or more	
Withstand voltage (Between terminals)		No failure	
			Temperature cycles first, then dipping cycle should be tested. Temperature cycle: 5 cycles Step 1: - 25°C, 30 min. Step 2: room temp., 3 min. Step 3: + 125°C, 30 min. Step 4: room temp., 3 min. Dipping cycle: 2 cycle Step 1: + 65°C, 15 min. Step 2: 0°C, 15 min. (saturated aqueous solution of salt) Initial :pre-heat 125±2°C, 1h. Leaving room temp. for 24± 2h. After test: leaving room temp. for 24± 2h
13	Moisture resistance (Steady state)	Appearance	No marked defect
Capacitance change		Within ±15 %	
Insulation resistance		3000 MΩ or more	
Withstand voltage		No failure	
			Test temperature : 40 ±2 °C Relative humidity : 90 to 95 % Test time : 500 +12, -0 hours Capacitors shall be measured after leaving it under room temperature for 1 to 2 hours.
14	Moisture resistance loading	Appearance	No marked defect
Capacitance change		Within ± 15%	
Insulation resistance		3000 MΩ or more	
Withstand voltage		No failure	
			Test temperature : 40± 2 °C Relative humidity: 90 to 95% Test time : 500+ 12,-0 hours 440V AC applied. Capacitors shall be measured after leaving it under room temperature for 1 to 2 hours. Charging and discharging current shall be 50mA or less.
15	High temperature loading	Appearance	No marked defect
Capacitance change		Within ± 20%	
Insulation resistance		3000 MΩ or more	
Withstand Voltage		No failure	
			1)Impulse voltage test 1.2/50µs 8kVpeak/3times. 2)High temperature loading Test temperature : 125± 3 °C Test time: 1,000+24,-0 hours 680VAC applied. (The voltage is increased to 1000Vrms for 0.1sec. once every hour) Initial :pre-heat 125±2°C, 1h. Leaving room temp. for24±2h. After test: leaving room temp. for 24±2h Charge and discharge current shall be 50mA or less.

7. Marking

Marking on one side.

(1) Type : CD

(2) Rated capacitance tolerance

Example 470 pF : 471

± 10% : K

(3) Subclass

Sub class	Rated voltage	Marking
X1	440 V AC	440~X1
Y1	400 V AC	400~Y1

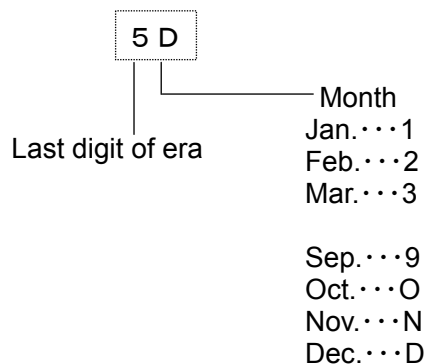
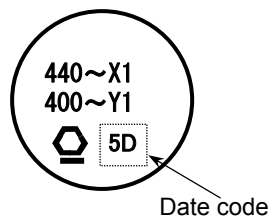
(4) Manufacture's trade mark

	Taiwan
	Xiamen

※Note-1 Date code

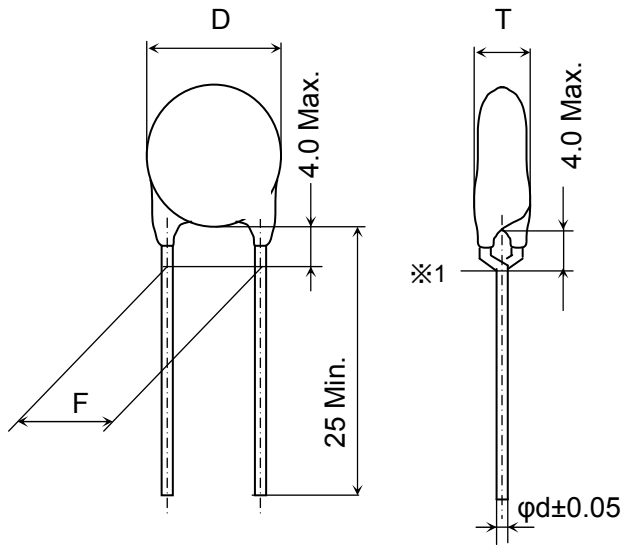
(5) Date code : 5 D ※ Note-1

Example

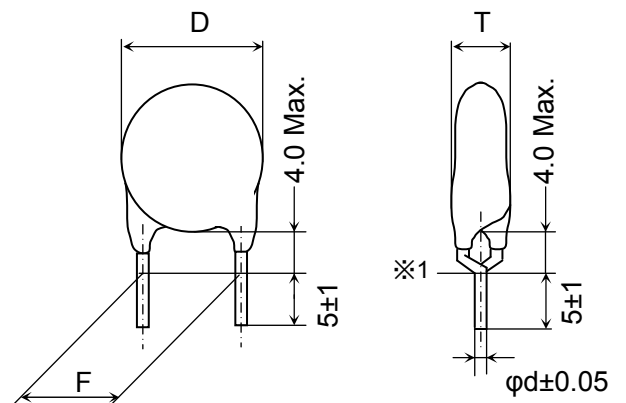


8. Figure & dimension

8.1 Vertical kink long lead (Lead style: G /Bulk)



8.2 Vertical kink short lead (Lead style: N / Bulk)

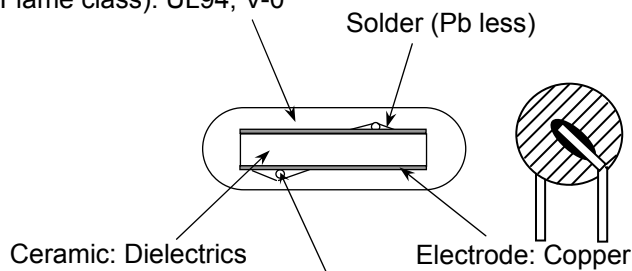


※1 Coating on lead shall not extend beyond the bottom of vertical kink.

Unit : mm

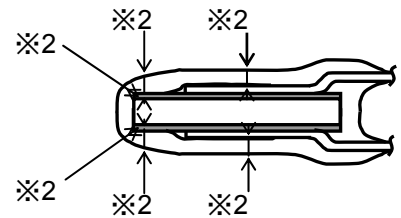
Coating material: Epoxy resin (Color: Blue)

(Flame class): UL94, V-0



Lead wire: CP wire (Tin plated copper covers steel wire, Pb less)

※2 Coating thickness is 0.4mm Min. from the live part.



8.3 Vertical kink long lead (lead style: V / Taping)

(F=7.5mm, Pitch: 15.0mm)

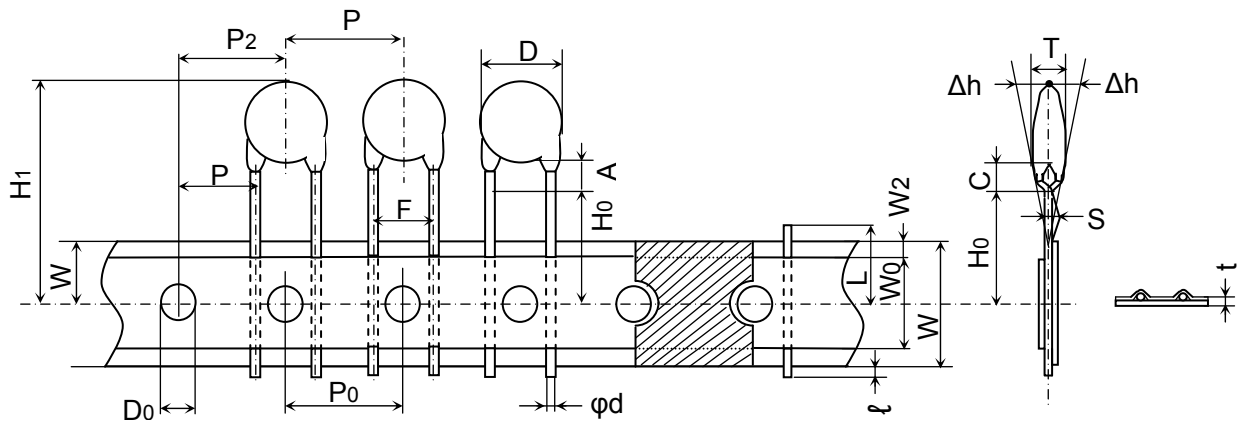


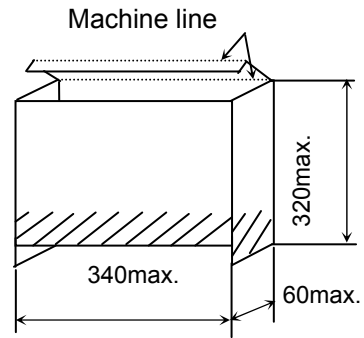
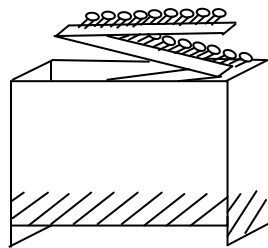
Table-2

Unit: mm

Item Name	Symbol	Dimension	Remarks
Body diameter	D	Table-5	
Body thickness	T	Table-5	
Lead-wire diameter	ϕd	0.6 ± 0.05	
Pitch of component	P	15.0 ± 1.0	Including the slant of body
Feed hole pitch	P_0	15.0 ± 0.3	Excepting the tape splicing part
Feed hole center to lead	P_1	10 ± 0.7	
Feed hole center to component	P_2	15.0 ± 1.3	Including the slanting body due to bending lead-wire
Lead-to lead distanc	F	10 ± 1	Measuring point is bottom kink
Component alignment, F-R	Δh	0 ± 2.0	Including the slanting body due to bending lead-wire
Tape width	W	$18 + 1.0, -0.5$	
Adhesive tape width	W_0	10.0 Min.	
Hole position	W_1	9.0 ± 0.5	
Adhesive tape position	W_2	4.0 Max.	Adhesive tape do not stick out the tape
Bottom of kink from tape center	H_0	$16 + 1.5, -0.5$	
Height of body from tape center	H_1	46.0 Max.	
Lead-wire protrusion	ℓ	1.0 Max.	
Feed hole diameter	D_0	4.0 ± 0.2	
Total tape thickness	t	0.6 ± 0.3	Including adhesive tape
Length of snapped lead	L	11.0 Max.	
Coating on lead	C	4.0 Max.	
Height of kink	A	4.0 Max.	Measuring point is bottom of kink
Spring action	S	2.0 Max.	

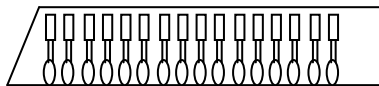
- Note-1 Use the gummed tape to connect two ends of broken tape.
- Note-2 Dropouts of parts shall be limited to no more than three consecutive parts.
- Note-3 Packaging method and dimensions see below.
- Note-4 Quantity Pitch: 15.0mm 1000 pcs. /Box.

Packaging : Ammo pack



Unit:mm

Note-5 Package of shipment
Capacitors pack in downward

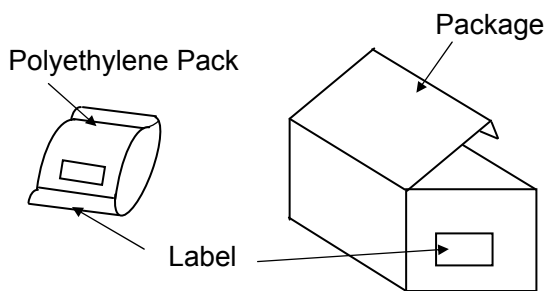


9. Label and transport

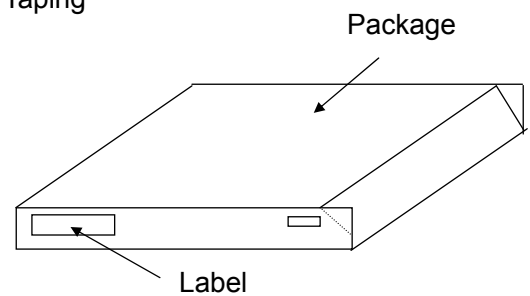
Capacitors shall be packaged prior to shipment so as to prevent damage during transportation and storage. Shipping carton contains the following information on the label.

- a) TDK item name
- b) Quantity
- c) TDK inspection number
- d) Manufacturer's name
- e) Country of origin

Bulk



Taping



10. Notification before the modification

We'll previously notify the modified place of manufacture, manufactured articles and materials.

Type : CD
 T.C : SL, B, E

Vertical kink long lead (lead style: G / bulk)

Table-3

Your part No.	TDK part No.	T.C.	Cap. (pF)	C-Tol. (%)	Dimension (Unit : mm)			
					D Max.	T Max.	F	φd
	CD45SL2GA100J-GKA	SL	10	± 5	7.0	6.0	10+2,-1	0.6
	CD45SL2GA150J-GKA	SL	15	± 5	7.0	6.0	10+2,-1	0.6
	CD45SL2GA220J-GKA	SL	22	± 5	7.0	6.0	10+2,-1	0.6
	CD45SL2GA330J-GKA	SL	33	± 5	7.0	6.0	10+2,-1	0.6
	CD45SL2GA470J-GKA	SL	47	± 5	8.0	6.0	10+2,-1	0.6
	CD45SL2GA680J-GKA	SL	68	± 5	9.0	6.0	10+2,-1	0.6
	CD45-B2GA101K-GKA	B	100	± 10	6.5	6.0	10+2,-1	0.6
	CD45-B2GA151K-GKA	B	150	± 10	6.5	6.0	10+2,-1	0.6
	CD45-B2GA221K-GKA	B	220	± 10	6.5	6.0	10+2,-1	0.6
	CD45-B2GA331K-GKA	B	330	± 10	7.0	6.0	10+2,-1	0.6
	CD45-B2GA471K-GKA	B	470	± 10	8.0	6.0	10+2,-1	0.6
	CD45-E2GA681M-GKA	E	680	± 20	6.5	6.0	10+2,-1	0.6
	CD45-E2GA102M-GKA	E	1000	± 20	7.0	6.0	10+2,-1	0.6
	CD45-E2GA152M-GKA	E	1500	± 20	8.0	6.0	10+2,-1	0.6
	CD45-E2GA222M-GKA	E	2200	± 20	9.0	6.0	10+2,-1	0.6
	CD45-E2GA332M-GKA	E	3300	± 20	11.0	6.0	10+2,-1	0.6
	CD45-E2GA472M-GKA	E	4700	± 20	13.0	6.0	10+2,-1	0.6

Type : CD
 T.C : SL, B, E

Vertical kink short lead (lead style: N / bulk)

Table-4

Your part No.	TDK part No.	T.C.	Cap. (pF)	C-Tol. (%)	Dimension (Unit : mm)			
					D Max.	T Max.	F	φd
	CD45SL2GA100J-NKA	SL	10	± 5	7.0	6.0	10+2,-1	0.6
	CD45SL2GA150J-NKA	SL	15	± 5	7.0	6.0	10+2,-1	0.6
	CD45SL2GA220J-NKA	SL	22	± 5	7.0	6.0	10+2,-1	0.6
	CD45SL2GA330J-NKA	SL	33	± 5	7.0	6.0	10+2,-1	0.6
	CD45SL2GA470J-NKA	SL	47	± 5	8.0	6.0	10+2,-1	0.6
	CD45SL2GA680J-NKA	SL	68	± 5	9.0	6.0	10+2,-1	0.6
	CD45-B2GA101K-NKA	B	100	± 10	6.5	6.0	10+2,-1	0.6
	CD45-B2GA151K-NKA	B	150	± 10	6.5	6.0	10+2,-1	0.6
	CD45-B2GA221K-NKA	B	220	± 10	6.5	6.0	10+2,-1	0.6
	CD45-B2GA331K-NKA	B	330	± 10	7.0	6.0	10+2,-1	0.6
	CD45-B2GA471K-NKA	B	470	± 10	8.0	6.0	10+2,-1	0.6
	CD45-E2GA681M-NKA	E	680	± 20	6.5	6.0	10+2,-1	0.6
	CD45-E2GA102M-NKA	E	1000	± 20	7.0	6.0	10+2,-1	0.6
	CD45-E2GA152M-NKA	E	1500	± 20	8.0	6.0	10+2,-1	0.6
	CD45-E2GA222M-NKA	E	2200	± 20	9.0	6.0	10+2,-1	0.6
	CD45-E2GA332M-NKA	E	3300	± 20	11.0	6.0	10+2,-1	0.6
	CD45-E2GA472M-NKA	E	4700	± 20	13.0	6.0	10+2,-1	0.6

Type : CD
T.C : SL, B, E

Vertical kink long lead (lead style: V / taping)

Table-5

Your part No.	TDK part No.	T.C.	Cap. (pF)	C-Tol. (%)	Dimension (Unit : mm)			
					D Max.	T Max.	F	φd
	CD45SL2GA100J-VKA	SL	10	± 5	7.0	6.0	10±1	0.6
	CD45SL2GA150J-VKA	SL	15	± 5	7.0	6.0	10±1	0.6
	CD45SL2GA220J-VKA	SL	22	± 5	7.0	6.0	10±1	0.6
	CD45SL2GA330J-VKA	SL	33	± 5	7.0	6.0	10±1	0.6
	CD45SL2GA470J-VKA	SL	47	± 5	8.0	6.0	10±1	0.6
	CD45SL2GA680J-VKA	SL	68	± 5	9.0	6.0	10±1	0.6
	CD45-B2GA101K-VKA	B	100	± 10	6.5	6.0	10±1	0.6
	CD45-B2GA151K-VKA	B	150	± 10	6.5	6.0	10±1	0.6
	CD45-B2GA221K-VKA	B	220	± 10	6.5	6.0	10±1	0.6
	CD45-B2GA331K-VKA	B	330	± 10	7.0	6.0	10±1	0.6
	CD45-B2GA471K-VKA	B	470	± 10	8.0	6.0	10±1	0.6
	CD45-E2GA681M-VKA	E	680	± 20	6.5	6.0	10±1	0.6
	CD45-E2GA102M-VKA	E	1000	± 20	7.0	6.0	10±1	0.6
	CD45-E2GA152M-VKA	E	1500	± 20	8.0	6.0	10±1	0.6
	CD45-E2GA222M-VKA	E	2200	± 20	9.0	6.0	10±1	0.6
	CD45-E2GA332M-VKA	E	3300	± 20	11.0	6.0	10±1	0.6
	CD45-E2GA472M-VKA	E	4700	± 20	13.0	6.0	10±1	0.6

Flow soldering recommended condition

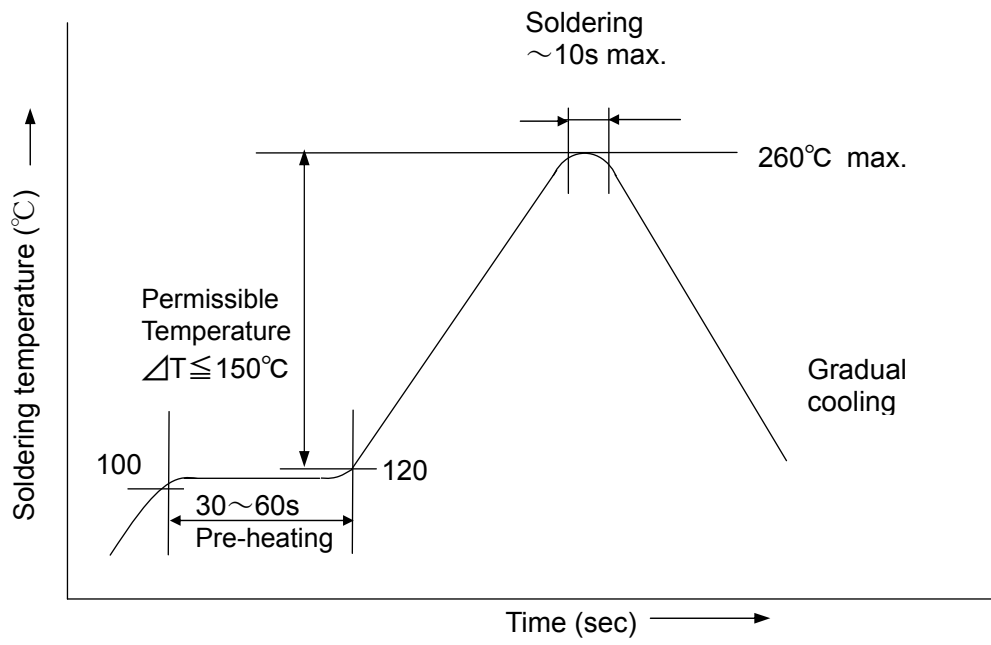


Fig-1