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Disc type capacitors with leads
High voltage ceramic capacitors, commercial grade, low dissipation at high frequency

RoHS | REACH SVHC-Free | Halogen Free | Lead Free

CC45 series

Product Portal | Search | Selection Guide | Tech Note | Application Guides

FEATURES

- Low dissipation factor and decreased self-heating temperature in the high frequency and high voltage application.
- Rated voltage of 6kV is available.
- Conform to RoHS directive due to lead(Pb) free of lead-wire and internal solder material.
- Compatible with halogen-free external resin coating.

APPLICATION

Snubber circuit protection of power supplies

PART NUMBER CONSTRUCTION

CC45	SL	3AD	101	J	Y	□	N	A

Series name*: CC45

Temperature characteristic

SL	+350 to −1,000ppm/°C

Rated voltage

3AD	1kV DC
3DD	2kV DC
3FD	3kV DC
3JD	6kV DC

Nominal capacitance

030	3pF
220	22pF
471	470pF

Capacitance tolerance

C	±0.25pF
D	±0.5pF
J	±5%

Class: Y

Lead-wire type

G	Long lead
N	Short lead
V	Taping

Application classification

N	General

Internal code

A	Halogen-free

* Please refer to P-3 ～ 4 about the product dimensions.

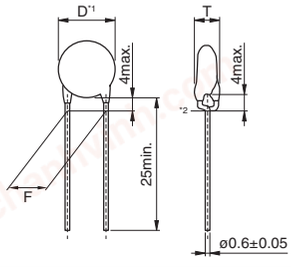
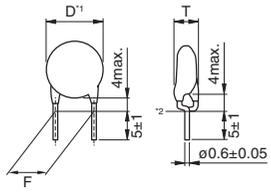
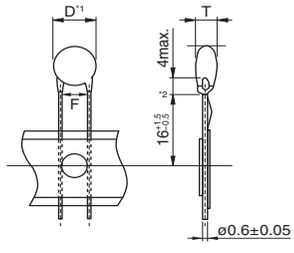
□OPERATING TEMPERATURE RANGE

Temperature characteristic	Operating temperature (°C)	Storage temperature (°C)*
SL	−25 to +125	−25 to +125

The maximum operating temperature of +125°C includes capacitor self-generated heat of up to 20°C.
* After capacitor is mounted on board, the storage temperature range is applied.

□STANDARD LEAD-WIRE SHAPES

Dimemsions in mm

	Symbol G : Bulk/long leads	Symbol N : Bulk/short leads	Symbol V : Taping
Vertical kink			

TDK's standard product is vertical kink. TDK recommends short leads for bulk products.
*1 Body diameter (D) is reference value if D is smaller than maximum dimension of lead to lead distance (F).
*2 Coating on leads shall not extend beyond the bottom of vertical kink.

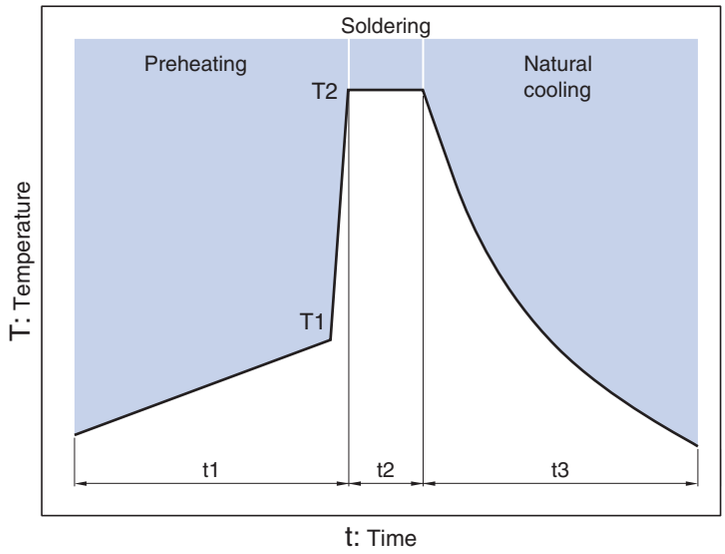
○RoHS Directive Compliant Product: See the following for more details. https://product.tdk.com/en/environment/rohs/index.html
○Halogen-free: Indicate that Cl content is less than 900ppm, Br content is less than 900ppm, and that the total Cl and Br content is less than 1500ppm.

⚠ Please be sure to request delivery specifications that provide further details on the features and specifications of the products for proper and safe use. Please note that the contents may change without any prior notice due to reasons such as upgrading.

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Overview of CC45 series

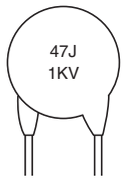
RECOMMENDED FLOW PROFILE



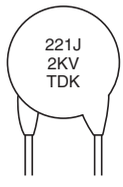
Preheating		Peak		Natural cooling
Temp.	Time	Temp.	Time	Time
T1	t1	T2	t2	t3
110°C min.	30 to 60s.	260°C	Within 10s.	Over 60s.

MARKINGS

D dimension: 6.0mm max.

Item	Markings	Description	Marking example
1. Nominal capacitance	47	47pF	
2. Capacitance tolerance	J	±5%	
3. Rated voltage	1KV	1kV DC	

D dimension: 6.5mm min.

Item	Markings	Description	Marking example
1. Nominal capacitance	221	220pF	
2. Capacitance tolerance	J	±5%	
3. Rated voltage	2KV	2kV DC	
4. Manufacturer	TDK	TDK	

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CC45 type

RATED VOLTAGE Edc: 1kV

CAPACITANCE AND DIMENSIONS

Temperature characteristic	Capacitance	Capacitance tolerance	Dimensions (mm)					Part numbers		
			Dmax. *	Tmax.	F (applied to bulk)	F (applied to taping)	Taping dimensions***	Bulk/long leads (Symbol: G)	Bulk/short leads (Symbol: N)	Taping (Symbol: V)
SL	10pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD100JYGNA	CC45SL3AD100JYNNA	CC45SL3AD100JYVNA
SL	12pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD120JYGNA	CC45SL3AD120JYNNA	CC45SL3AD120JYVNA
SL	15pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD150JYGNA	CC45SL3AD150JYNNA	CC45SL3AD150JYVNA
SL	18pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD180JYGNA	CC45SL3AD180JYNNA	CC45SL3AD180JYVNA
SL	22pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD220JYGNA	CC45SL3AD220JYNNA	CC45SL3AD220JYVNA
SL	27pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD270JYGNA	CC45SL3AD270JYNNA	CC45SL3AD270JYVNA
SL	33pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD330JYGNA	CC45SL3AD330JYNNA	CC45SL3AD330JYVNA
SL	39pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD390JYGNA	CC45SL3AD390JYNNA	CC45SL3AD390JYVNA
SL	47pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD470JYGNA	CC45SL3AD470JYNNA	CC45SL3AD470JYVNA
SL	56pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD560JYGNA	CC45SL3AD560JYNNA	CC45SL3AD560JYVNA
SL	68pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD680JYGNA	CC45SL3AD680JYNNA	CC45SL3AD680JYVNA
SL	82pF	±5%	6.0**	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD820JYGNA	CC45SL3AD820JYNNA	CC45SL3AD820JYVNA
SL	100pF	±5%	6.5**	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD101JYGNA	CC45SL3AD101JYNNA	CC45SL3AD101JYVNA
SL	120pF	±5%	7.0	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD121JYGNA	CC45SL3AD121JYNNA	CC45SL3AD121JYVNA
SL	150pF	±5%	7.5	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD151JYGNA	CC45SL3AD151JYNNA	CC45SL3AD151JYVNA
SL	180pF	±5%	8.0	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD181JYGNA	CC45SL3AD181JYNNA	CC45SL3AD181JYVNA
SL	220pF	±5%	8.5	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD221JYGNA	CC45SL3AD221JYNNA	CC45SL3AD221JYVNA
SL	270pF	±5%	9.0	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD271JYGNA	CC45SL3AD271JYNNA	CC45SL3AD271JYVNA
SL	330pF	±5%	10.0	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD331JYGNA	CC45SL3AD331JYNNA	CC45SL3AD331JYVNA
SL	390pF	±5%	10.5	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3AD391JYGNA	CC45SL3AD391JYNNA	CC45SL3AD391JYVNA
SL	470pF	±5%	11.5	5.0	7.5±1.5	7.5±0.8	V2	CC45SL3AD471JYGNA	CC45SL3AD471JYNNA	CC45SL3AD471JYVNA

* The values in parentheses "( )" are reference values.
Click the part number for details.
** Reference values are applied to bulk products.
***Please refer to p-5 about the taping dimemsions.

RATED VOLTAGE Edc: 2kV

CAPACITANCE AND DIMENSIONS

Temperature characteristic	Capacitance	Capacitance tolerance	Dimensions (mm)					Part numbers		
			Dmax. *	Tmax.	F (applied to bulk)	F (applied to taping)	Taping dimensions***	Bulk/long leads (Symbol: G)	Bulk/short leads (Symbol: N)	Taping (Symbol: V)
SL	10pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD100JYGNA	CC45SL3DD100JYNNA	CC45SL3DD100JYVNA
SL	12pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD120JYGNA	CC45SL3DD120JYNNA	CC45SL3DD120JYVNA
SL	15pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD150JYGNA	CC45SL3DD150JYNNA	CC45SL3DD150JYVNA
SL	18pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD180JYGNA	CC45SL3DD180JYNNA	CC45SL3DD180JYVNA
SL	22pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD220JYGNA	CC45SL3DD220JYNNA	CC45SL3DD220JYVNA
SL	27pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD270JYGNA	CC45SL3DD270JYNNA	CC45SL3DD270JYVNA
SL	33pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD330JYGNA	CC45SL3DD330JYNNA	CC45SL3DD330JYVNA
SL	39pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD390JYGNA	CC45SL3DD390JYNNA	CC45SL3DD390JYVNA
SL	47pF	±5%	(5.5)	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD470JYGNA	CC45SL3DD470JYNNA	CC45SL3DD470JYVNA
SL	56pF	±5%	6.0**	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD560JYGNA	CC45SL3DD560JYNNA	CC45SL3DD560JYVNA
SL	68pF	±5%	6.5**	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD680JYGNA	CC45SL3DD680JYNNA	CC45SL3DD680JYVNA
SL	82pF	±5%	7.0	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD820JYGNA	CC45SL3DD820JYNNA	CC45SL3DD820JYVNA
SL	100pF	±5%	7.5	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD101JYGNA	CC45SL3DD101JYNNA	CC45SL3DD101JYVNA
SL	120pF	±5%	8.0	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD121JYGNA	CC45SL3DD121JYNNA	CC45SL3DD121JYVNA
SL	150pF	±5%	8.5	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD151JYGNA	CC45SL3DD151JYNNA	CC45SL3DD151JYVNA
SL	180pF	±5%	9.0	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD181JYGNA	CC45SL3DD181JYNNA	CC45SL3DD181JYVNA
SL	220pF	±5%	10.0	5.0	5.0±1.5	5.0+0.8, –0.2	V1	CC45SL3DD221JYGNA	CC45SL3DD221JYNNA	CC45SL3DD221JYVNA
SL	270pF	±5%	10.5	5.0	7.5±1.5	7.5±0.8	V2	CC45SL3DD271JYGNA	CC45SL3DD271JYNNA	CC45SL3DD271JYVNA
SL	330pF	±5%	11.5	5.0	7.5±1.5	7.5±0.8	V2	CC45SL3DD331JYGNA	CC45SL3DD331JYNNA	CC45SL3DD331JYVNA

* The values in parentheses "( )" are reference values.
Click the part number for details.
** Reference values are applied to bulk products.
***Please refer to p-5 about the taping dimemsions.

• For more information about products with other capacitance or other data, please contact us.

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CC45 type

RATED VOLTAGE Edc: 3kV

CAPACITANCE AND DIMENSIONS

Temperature characteristic	Capacitance	Capacitance tolerance	Dimensions (mm)					Part numbers		
			Dmax. *	Tmax.	F (applied to bulk)	F (applied to taping)	Taping dimensions***	Bulk/long leads (Symbol: G)	Bulk/short leads (Symbol: N)	Taping (Symbol: V)
SL	10pF	±5%	(5.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD100JYGNA	CC45SL3FD100JYNNA	CC45SL3FD100JYVNA
SL	12pF	±5%	(5.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD120JYGNA	CC45SL3FD120JYNNA	CC45SL3FD120JYVNA
SL	15pF	±5%	(5.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD150JYGNA	CC45SL3FD150JYNNA	CC45SL3FD150JYVNA
SL	18pF	±5%	(5.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD180JYGNA	CC45SL3FD180JYNNA	CC45SL3FD180JYVNA
SL	22pF	±5%	(5.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD220JYGNA	CC45SL3FD220JYNNA	CC45SL3FD220JYVNA
SL	27pF	±5%	(5.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD270JYGNA	CC45SL3FD270JYNNA	CC45SL3FD270JYVNA
SL	33pF	±5%	(6.0)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD330JYGNA	CC45SL3FD330JYNNA	CC45SL3FD330JYVNA
SL	39pF	±5%	(6.0)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD390JYGNA	CC45SL3FD390JYNNA	CC45SL3FD390JYVNA
SL	47pF	±5%	(6.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD470JYGNA	CC45SL3FD470JYNNA	CC45SL3FD470JYVNA
SL	56pF	±5%	(7.0)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD560JYGNA	CC45SL3FD560JYNNA	CC45SL3FD560JYVNA
SL	68pF	±5%	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD680JYGNA	CC45SL3FD680JYNNA	CC45SL3FD680JYVNA
SL	82pF	±5%	(8.0)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD820JYGNA	CC45SL3FD820JYNNA	CC45SL3FD820JYVNA
SL	100pF	±5%	8.5**	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD101JYGNA	CC45SL3FD101JYNNA	CC45SL3FD101JYVNA
SL	120pF	±5%	9.5	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD121JYGNA	CC45SL3FD121JYNNA	CC45SL3FD121JYVNA
SL	150pF	±5%	10.0	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD151JYGNA	CC45SL3FD151JYNNA	CC45SL3FD151JYVNA
SL	180pF	±5%	11.0	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD181JYGNA	CC45SL3FD181JYNNA	CC45SL3FD181JYVNA
SL	220pF	±5%	12.0	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3FD221JYGNA	CC45SL3FD221JYNNA	CC45SL3FD221JYVNA

* The values in parentheses "( )" are reference values.
Click the part number for details.
** Reference values are applied to bulk products.
***Please refer to p-5 about the taping dimemsions.

RATED VOLTAGE Edc: 6kV

CAPACITANCE AND DIMENSIONS

Temperature characteristic	Capacitance	Capacitance tolerance	Dimensions (mm)					Part numbers		
			Dmax. *	Tmax.	F (applied to bulk)	F (applied to taping)	Taping dimensions***	Bulk/long leads (Symbol: G)	Bulk/short leads (Symbol: N)	Taping (Symbol: V)
SL	3pF	±0.25pF	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD030CYGNA	CC45SL3JD030CYNNA	CC45SL3JD030CYVNA
SL	5pF	±0.5pF	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD050DYGNA	CC45SL3JD050DYNNA	CC45SL3JD050DYVNA
SL	8pF	±0.5pF	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD080DYGNA	CC45SL3JD080DYNNA	CC45SL3JD080DYVNA
SL	10pF	±5%	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD100JYGNA	CC45SL3JD100JYNNA	CC45SL3JD100JYVNA
SL	12pF	±5%	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD120JYGNA	CC45SL3JD120JYNNA	CC45SL3JD120JYVNA
SL	15pF	±5%	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD150JYGNA	CC45SL3JD150JYNNA	CC45SL3JD150JYVNA
SL	18pF	±5%	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD180JYGNA	CC45SL3JD180JYNNA	CC45SL3JD180JYVNA
SL	22pF	±5%	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD220JYGNA	CC45SL3JD220JYNNA	CC45SL3JD220JYVNA
SL	27pF	±5%	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD270JYGNA	CC45SL3JD270JYNNA	CC45SL3JD270JYVNA
SL	33pF	±5%	(7.5)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD330JYGNA	CC45SL3JD330JYNNA	CC45SL3JD330JYVNA
SL	39pF	±5%	(8.0)	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD390JYGNA	CC45SL3JD390JYNNA	CC45SL3JD390JYVNA
SL	47pF	±5%	8.5**	6.0	7.5±1.5	7.5±0.8	V2	CC45SL3JD470JYGNA	CC45SL3JD470JYNNA	CC45SL3JD470JYVNA

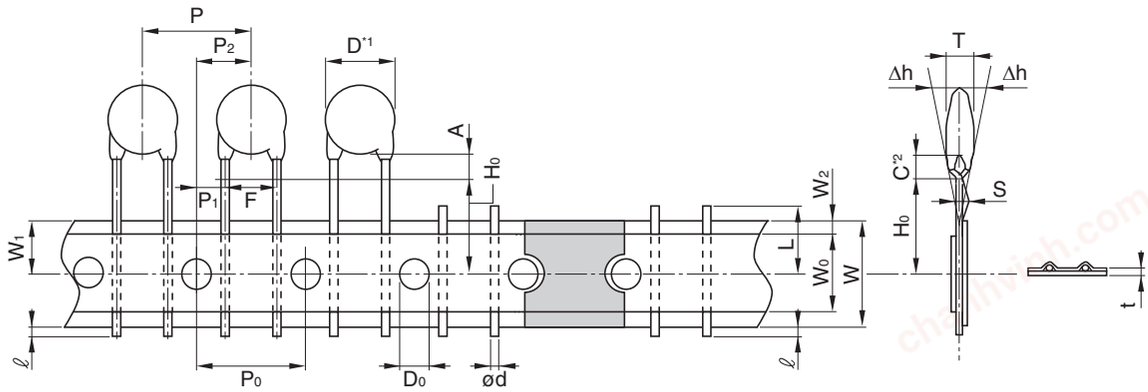
* The values in parentheses "( )" are reference values.
Click the part number for details.
** Reference values are applied to bulk products.
***Please refer to p-5 about the taping dimemsions.

• For more information about products with other capacitance or other data, please contact us.

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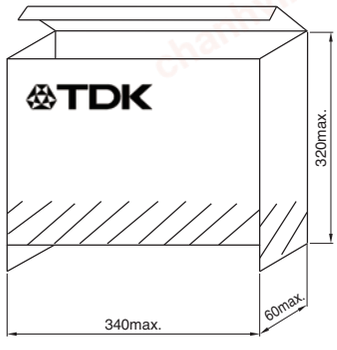
CC45 type

TAPING DIMENSIONS



Item	Symbols	Dimensions (mm)		Remarks
		V1	V2	
Body diameter	D	Refer to P-3~4		*1 Body diameter (D) is reference value if D is smaller than maximum dimension of lead to lead distance (F).
Body thickness	T	Refer to P-3~4		
Lead-wire diameter	ød	0.6±0.05	0.6±0.05	
Pitch of component	P	12.7±1.0	15.0±1.0	Including the slant of body
Feed hole pitch	P_0	12.7±0.3	15.0±0.3	Excepting the tape splicing part
Feed hole center to lead-wire	P_1	3.85±0.7	3.75±0.7	
Feed hole center to component center	P_2	6.35±1.3	7.5±1.3	Including the slanting body due to bending lead-wire
Lead-to lead distance	F	5+0.8, –0.2	7.5±0.8	Measuring point is bottom kink
Component alignment	Δh	0 ±2.0	0 ±2.0	Including the slanting body due to bending lead-wire
Carrier tape width	W	18.0+1.0,–0.5	18.0+1.0,–0.5	
Adhesive tape width	W_0	10.0 Min.	10.0 Min.	
Hole position	W_1	9.0±0.5	9.0±0.5	
Adhesive tape position	W_2	4.0 Max.	4.0 Max.	Adhesive tape do not stick out the tape
Bottom of kink from tape center	H_0	16.0+1.5,–0.5	16.0+1.5,–0.5	
Lead-wire protrusion	ℓ	1.0 Max.	1.0 Max.	
Feed hole diameter	D_0	4.0±0.2	4.0±0.2	
Carrier tape thickness (Including adhesive tape)	t	0.6±0.3	0.6±0.3	Including adhesive tape
Length of snipped lead-wire	L	11.0 Max.	11.0 Max.	
Coating on lead-wire	C	4.0 Max.	4.0 Max.	*2 Coating on leads shall not extend beyond the bottom of vertical kink.
Height of kink	A	4.0 Max.	4.0 Max.	Measuring point is bottom kink
Spring action	S	2.0 Max.	2.0 Max.	

AMMO PACK INNER BOX SIZE



Dimensions in mm

PACKAGE QUANTITY

Type	Package quantity	
	Bulk (pieces / bag)	Taping (pieces / box)
CC45	1000	1000

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REMINDERS FOR USING THESE PRODUCTS

Before using these products, be sure to request the delivery specifications.

SAFETY REMINDERS

Please pay sufficient attention to the warnings for safe designing when using this products.

⚠ REMINDERS

- Do not use or store in locations where there are conditions such as gas corrosion (salt, acid, alkali, etc.).
- Before soldering, be sure to preheat components.
  The preheating temperature should be set so that the temperature difference between the solder temperature and product temperature does not exceed 150°C.
- Soldering corrections after mounting should be within the range of the conditions determined in the specifications.
  If overheated, a short circuit, performance deterioration, or lifespan shortening may occur.
- Self heating (temperature increase) occurs when the power is turned ON, so the tolerance should be sufficient for the set thermal design.
- Do not use for a purpose outside of the contents regulated in the delivery specifications.
- The products listed on this catalog are intended for use in general electronic equipment (AV equipment, telecommunications equipment, home appliances, amusement equipment, computer equipment, personal equipment, office equipment, measurement equipment, industrial robots) under a normal operation and use condition.
  The products are not designed or warranted to meet the requirements of the applications listed below, whose performance and/or quality require a more stringent level of safety or reliability, or whose failure, malfunction or trouble could cause serious damage to society, person or property.
  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 the each catalog, please contact us.

  (1) Aerospace/aviation equipment
  (2) Transportation equipment (cars, electric trains, ships, etc.)
  (3) Medical equipment
  (4) Power-generation control equipment
  (5) Atomic energy-related equipment
  (6) Seabed equipment
  (7) Transportation control equipment
  (8) Public information-processing equipment
  (9) Military equipment
  (10) Electric heating apparatus, burning equipment
  (11) Disaster prevention/crime prevention equipment
  (12) Safety equipment
  (13) Other applications that are not considered general-purpose applications

- Please refer to the guideline of notabilia for fixed ceramic capacitors issued by JEITA(Japan Electronics and Information Technology Association, EIAJ RCR-2335).
  This guideline describes general precautions* for using fixed ceramic capacitors. Please carefully confirm it and use capacitors safely.
  * Items for check, explanation/reason/concrete example and failure examples, etc.

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.