Description

CNR C series metal oxide varistor are nonlinear resistors, consisting main of zinc oxide and several kinds of metal oxide additive.They are bilateral and symmetrical V-I characteristics curve and unparalleled large peak current capability are used for absorption of transient voltage, suppression of pulse noise and circuit voltage stabilization.

Agency Approvals

Agency	Agency Approval	Certificate No.
cULus	UL 1449 4th & cUL	VZCA2.E316325 VZCA8.E316325
VDE	IEC 61051-1:2007-04	-
	IEC 61051-2:2009-05	
	IEC 61051-2-2:1991-01	
	IEC 60950-1:2013 for 10 mm,14mm and 20mm only	
SP	CLASS 2221 01	-
CQC	GB/T 10193-1997	-
	GB/T 10194-1997	
	GB 4943.1-2011	
	GB 8898-2011	

Features

1. RoHS compliant
2. Halogen-free are available
3. AEC-Q200
4. High energy absorption, particularly for load dump
5. Jump-start stength
6. Stable protection level, minimum leakage current
7. High resistance to cyclic temperature stress

Applications

1. Automotive

Max. Rating

	C-Seires	Units
Operating Voltage Range(Vdc)	14 to 56	V
Peak Current for 8/20μS Current Wave	750 to 6000	A
Energy Range For Load Dump	12 to 100	J
Operation Ambient Temperature Range	-40 to +85 *	℃
Storage Tempersture Range	-40 to +125	℃
Varistor Voltage Range Vn(Vdc)	18 to 68	V
Insulation Resistance	>100	MΩ
Typical Response Time	<25	ns

*125℃ For Option

Revised: 17/04/11

Ratings and Characteristics								
Part No.	Max. Operating Voltage(Vdc)	Varistor Voltage@1mA DC(V)	Max. Clamping Ip (Vdc)	Max. Clamping @8/20,Ip (A)	Peak Current @8/20 (A)	Vjump （5min） (V)	Energy Load dump (J)	Related Standards Symbol
For 12Vdc System								
CNR-07C180K	14	18±10%	36	2.5	750	20	12	○
CNR-10C180K	14	18±10%	36	5	1500	20	25	○
CNR-14C180K	14	18±10%	36	10	3000	20	50	○
CNR-20C180K	14	18±10%	36	20	6000	20	100	○
CNR-07C220K	18	22±10%	43	2.5	750	25	12	○
CNR-10C220K	18	22±10%	43	5	1500	25	25	○
CNR-14C220K	18	22±10%	43	10	3000	25	50	○
CNR-20C220K	18	22±10%	43	20	6000	25	100	○
CNR-07C270K	22	27±10%	53	2.5	750	30	12	○
CNR-10C270K	22	27±10%	53	5	1500	30	25	○
CNR-14C270K	22	27±10%	53	10	3000	30	50	○
CNR-20C270K	22	27±10%	53	20	6000	30	100	○
For 24Vdc System								
CNR-07C330K	26	33±10%	65	2.5	750	37	12	○
CNR-10C330K	26	33±10%	65	5	1500	37	25	○
CNR-14C330K	26	33±10%	65	10	3000	37	50	○
CNR-20C330K	26	33±10%	65	20	6000	37	100	○
CNR-07C390K	31	39±10%	77	2.5	750	42	12	○
CNR-10C390K	31	39±10%	77	5	1500	42	25	○
CNR-14C390K	31	39±10%	77	10	3000	42	50	○
CNR-20C390K	31	39±10%	77	20	6000	42	100	○
CNR-07C470K	38	47±10%	93	2.5	750	50	12	○
CNR-10C470K	38	47±10%	93	5	1500	50	25	○
CNR-14C470K	38	47±10%	93	10	3000	50	50	○
CNR-20C470K	38	47±10%	93	20	6000	50	100	○
For 42Vdc System								
CNR-07C680K	56	68±10%	135	2.5	750	65	12	○
CNR-10C680K	56	68±10%	135	5	1500	65	25	○
CNR-14C680K	56	68±10%	135	10	3000	65	50	○
CNR-20C680K	56	68±10%	135	20	6000	65	100	○

Related Standards

Symbols	○
Approval	c UL us

Reliability

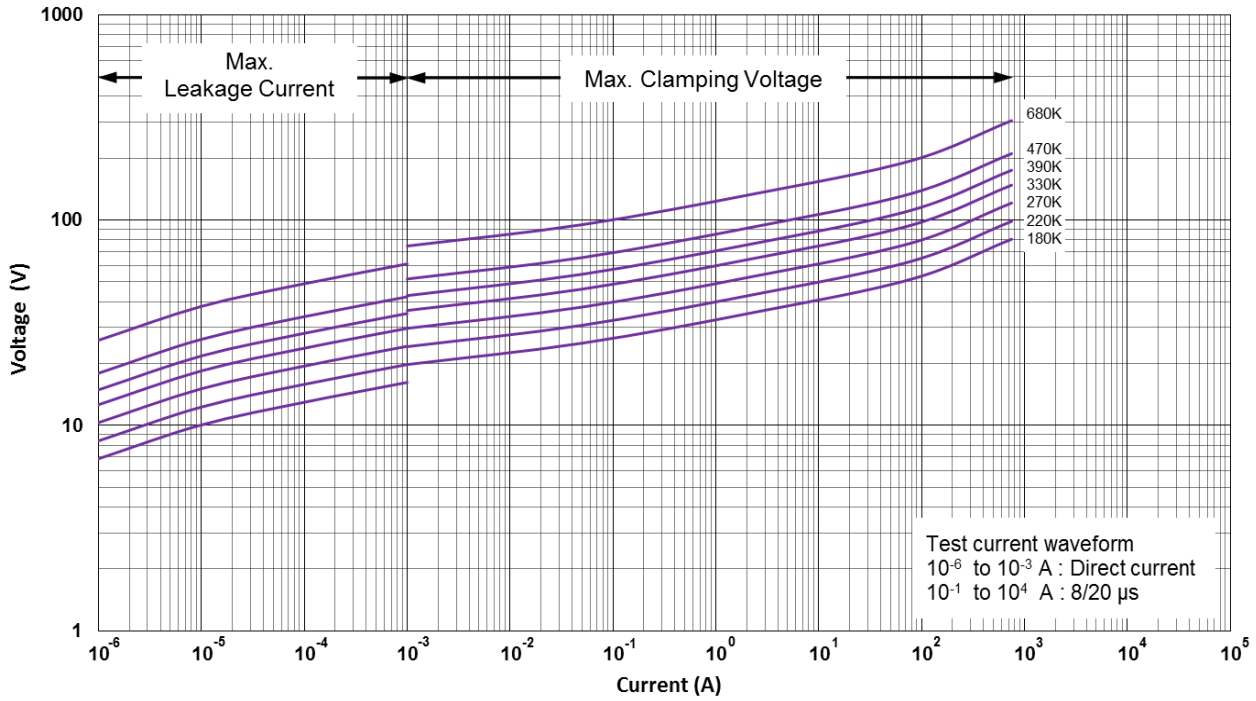
Characteristics	Standard	Test condition / Methods	Specifications
High Temperature Exposure(Storage)	MIL-STD-202 Method 108	Test Temp :125℃+3/-0℃ Duration:1000 h Unpowered Measurement at 24 ± 2 hours after test conclusion.	No visible damage $\lvert\triangle V_{1mA}/V_{1mA}\rvert \leqq \pm 10\%$ $\lvert\triangle$Vclamp/Vclamp$\rvert \leqq \pm 10\%$
Temperature Cycleing	JESD22 Method JA-104	Lower test temp : -40(+0/-10℃) Upper test temp : 125(+15/-0℃) Dwell Time : 30min transfer time : ≦1min Number of cycles : 100* Measurement at 24 ± 2 hours after test conclusion.	No visible damage $\lvert\triangle V_{1mA}/V_{1mA}\rvert \leqq \pm 10\%$ $\lvert\triangle$Vclamp/Vclamp$\rvert \leqq \pm 10\%$
Biased Humidity	MIL-STD-202 Method 103	Test Temp : 85℃ Rel.humidity of air : 85% Duration : 1000 h Test Power : Bias at 85%(+5%/-0%) of rated Varistor voltage Measurement at 24 ± 2 hours after test conclusion.	No visible damage $\lvert\triangle V_{1mA}/V_{1mA}\rvert \leqq \pm 10\%$ $\lvert\triangle$Vclamp/Vclamp$\rvert \leqq \pm 10\%$
Operational Life	MIL-STD-202 Method 108	Test Temp : 85℃ Duration:1000 h Test Power : Bias at 85%(+5%/-0%) of rated Varistor voltage Measurement at 24 ± 2 hours after test conclusion.	No visible damage $\lvert\triangle V_{1mA}/V_{1mA}\rvert \leqq \pm 10\%$ $\lvert\triangle$Vclamp/Vclamp$\rvert \leqq \pm 10\%$
External Visual	MIL-STD-883 Method 2009	Visual Inspection	No visible damage
Physical Dimension	JESD22 Method JA-100	Verify physcal dimensions to the applicable device specification.	Within the specified values
Terminal Strength	MIL-STD-202 Method 211	1. Pull test (2.27kg), 2. Wire-lead bend test (227g) Duration of the applied forces : 10 ±1sec	No visible damage $\lvert\triangle$V1mA/V1mA$\rvert \leqq 10\%$ $\lvert\triangle$Vclamp/Vclamp$\rvert \leqq 10\%$
Resistance to Solvents	MIL-STD-202 Method 215	Note: Add Aqueous wash chemical - OKEM Clean or quivalent. Do not use banned solvents.	No visible damage
Mechnical Shock	MIL-STD-202 Method 213	Peak value : 100g's Half sine Waveform Normal duration (D) : 6ms In 3 directions perpendicularly intersecting each other (total 18 times)	No visible damage $\lvert\triangle$V1mA/V1mA$\rvert \leqq 10\%$ $\lvert\triangle$Vclamp/Vclamp$\rvert \leqq 10\%$
Vibration	MIL-STD-202 Method 204	Acceleration : 5 g's Sweep time: 20 min Frequency range: 10Hz~2KHz~10Hz 3×12 cycles : 1	No visible damage $\lvert\triangle$V1mA/V1mA$\rvert \leqq 10\%$ $\lvert\triangle$Vclamp/Vclamp$\rvert \leqq 10\%$
Resistance to Soldering Heat	MIL-STD-202 Method 210	No pre-heat of samples. Temperature : 260 ±5℃,Time : 10 ± 1 s Depth : 1.5mm form Solder bath to body of the specimen Immersion and emersion rate : 25mm/s ±6 mm/s Number of heat cycles : 1	No visible damage $\lvert\triangle$V1mA/V1mA$\rvert \leqq 10\%$ $\lvert\triangle$Vclamp/Vclamp$\rvert \leqq 10\%$

*1000 cycles for option.

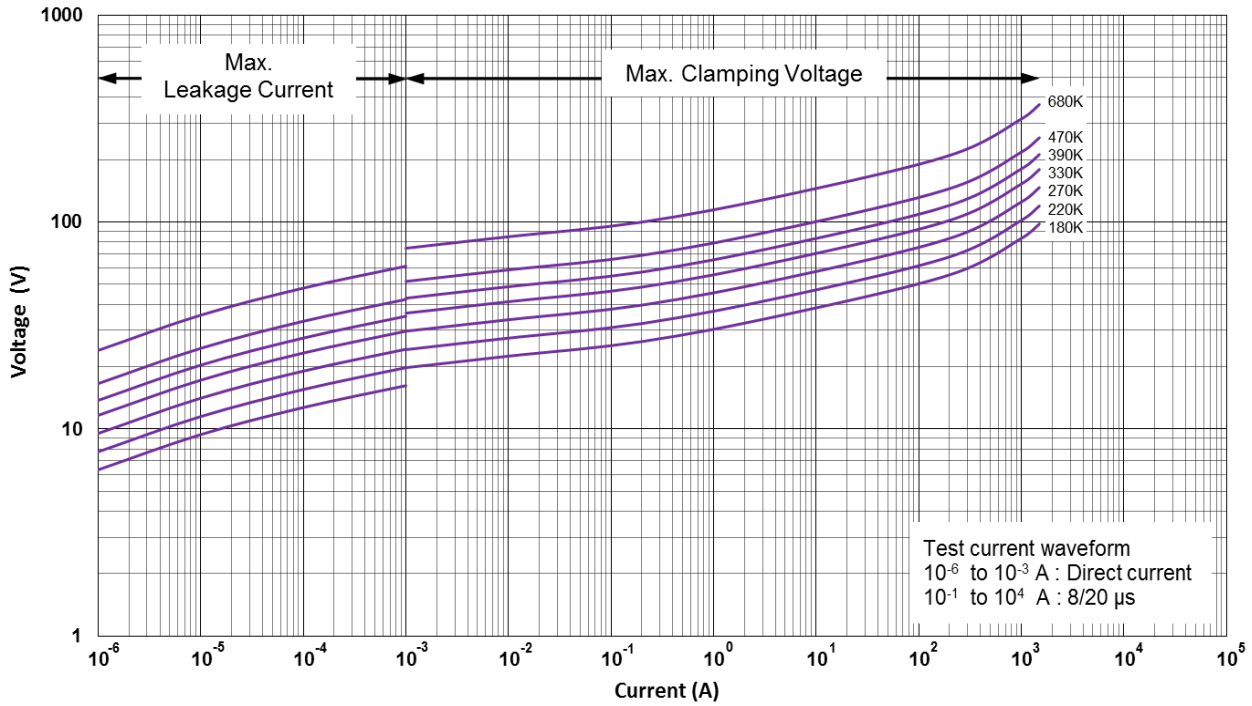
Reliability

Characteristics	Standard	Test condition / Methods	Specifications
Solderability	J-STD-002	Steam aging 8hr@93±3℃ 235±5℃ 5 +0/-0.5sec	95% of termination wetted
Electrical Characterization	Per Spec.	Varistor voltage and clapming voltage	Meet spec.
Flammability	UL-94	V - 0	UL Certified Coating
Load Dump	ISO-7637-2	Test pulses 5a	No visible damage $\lvert\triangle V_{1mA}/V_{1mA}\rvert \leqq 15\%$
Vjump	Specificatoin Standard	5 minutes duration , VDC (CNR**C180K);Vjump = 20 V (CNR**C220K);Vjump = 25 V (CNR**C270K);Vjump = 30 V (CNR**C330K);Vjump = 36 V (CNR**C390K);Vjump = 42 V (CNR**C470K);Vjump = 50 V (CNR**C560K);Vjump = 59 V (CNR**C680K);Vjump = 65 V	No visible damage $\lvert\triangle V_{1mA}/V_{1mA}\rvert \leqq 15\%$ $\lvert\triangle V_{clamp}/V_{clamp}\rvert \leqq 10\%$

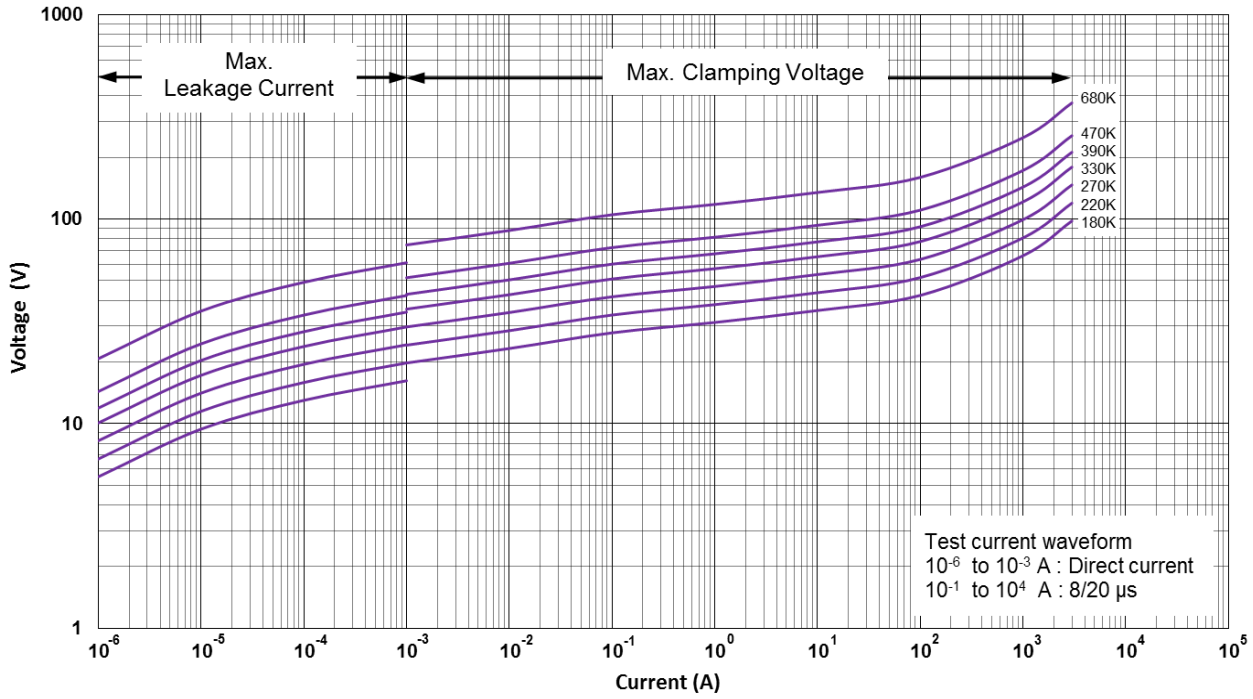
CNR-07C180K & CNR-07C680K V-I Curves



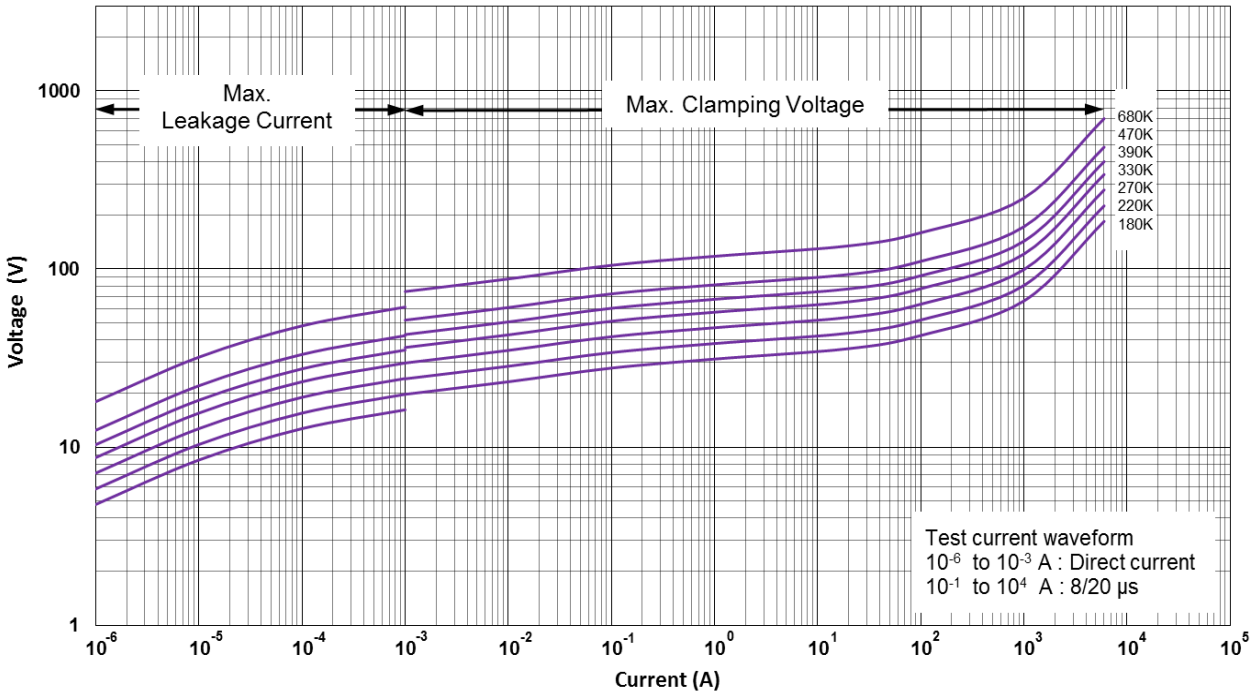
CNR-10C180K to CNR-10C680K V-I Curves



CNR-14C180K to CNR-14C680K V-I Curves

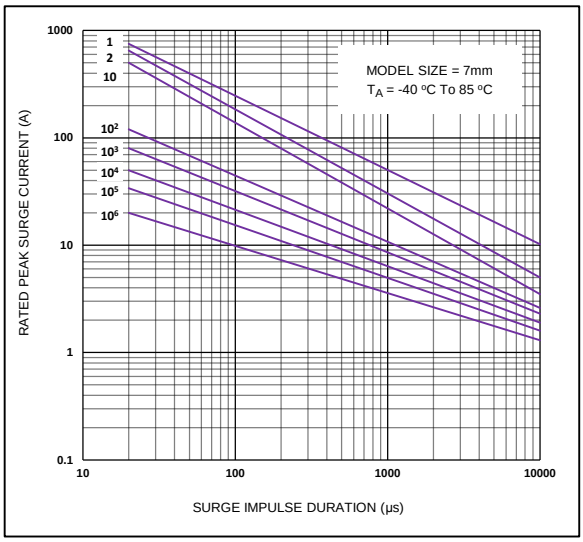


CNR-20C180K to CNR-20C680K V-I Curves

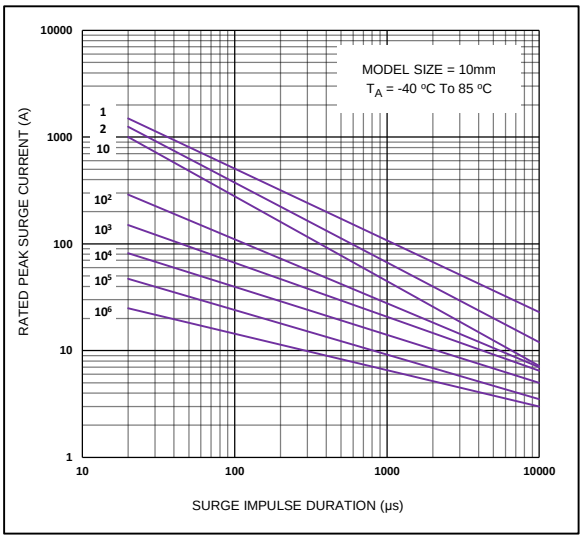


Impulse Life Time Rating Curves

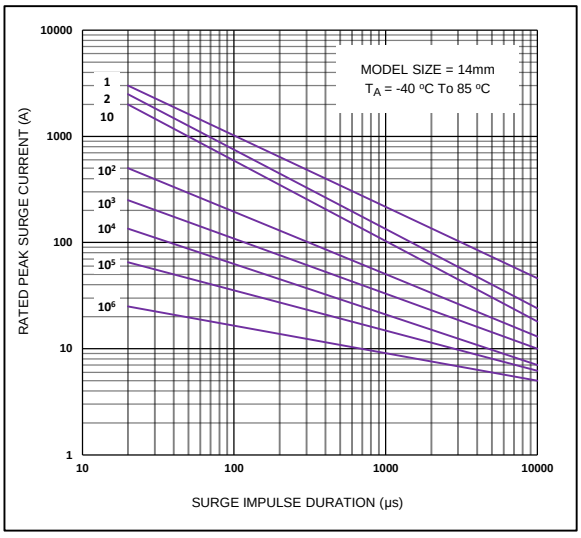
CNR-07C180K to CNR-07C680K



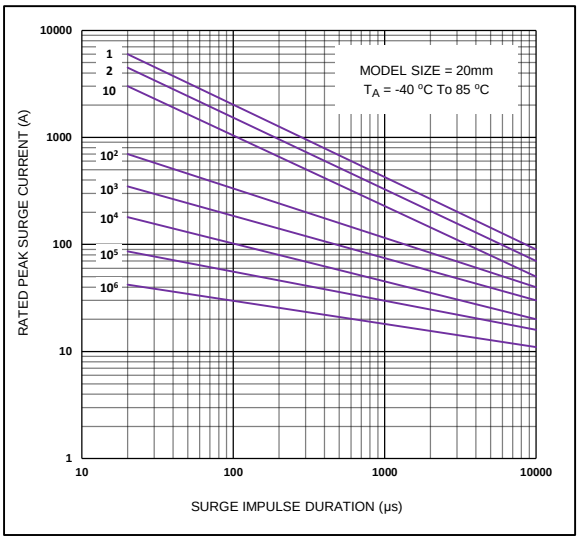
CNR-10C180K to CNR-10C680K



CNR-14C180K to CNR-14C680K

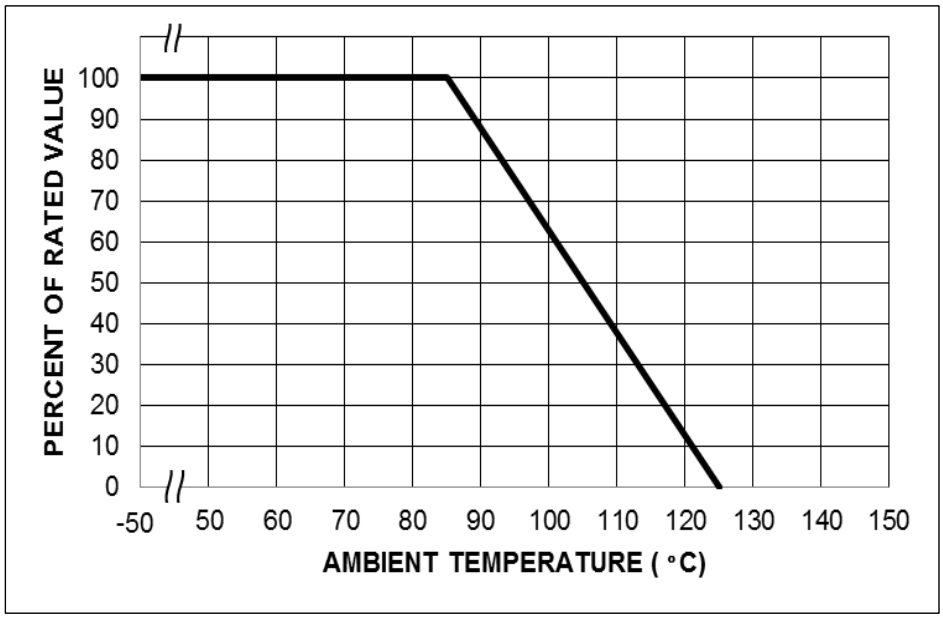


CNR-20C180K to CNR-20C680K

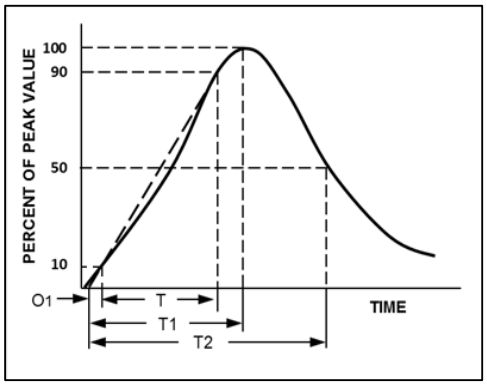


Power Derating Curve

Should transients occur in rapid succession, the average power dissipation is the energy (watt-seconds) per pulse times the number of pulses per second. The power so developed must be ithin the specifications shown on the Device Ratings and Specifications Table for the specific device.The operating values of a MOV need to be derated at high temperatures as shown bove. Because varistors only dissipate a relatively small amount of average power they are not suitable for repetitive applications that involve substantial amounts of average power dissipation.



Surge Current Standard Waveform



O1 = Virtual Origin of Wave
T = Time from 10% to 90% of Peak
T1 = Rise Time = 1.25 x T
T2 = Decay Time
Example - For an 8/20 μs Current Waveform:
8μs = T1 = Rise Time
20μs = T2 = Decay Time

Product Dimensions

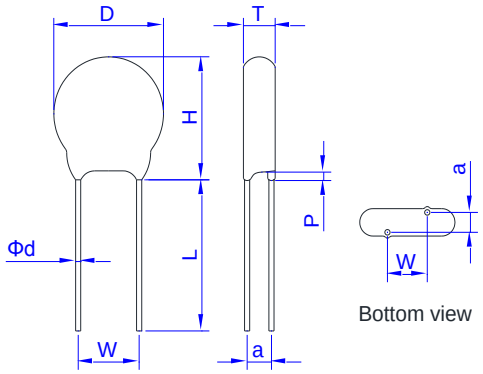


Fig 1. Straight Lead

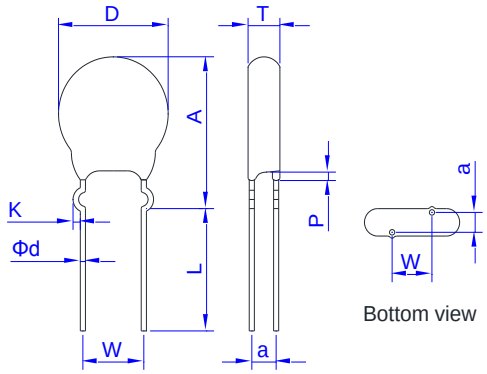


Fig 2. Outside Kink Lead

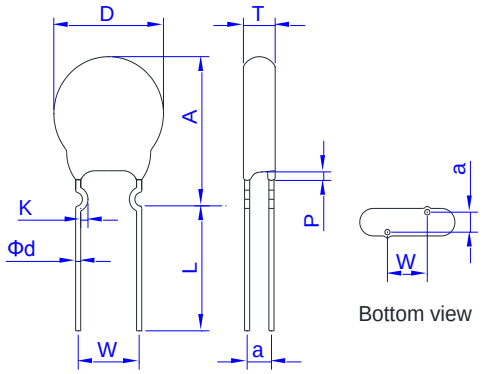


Fig 3. Inside Kink Lead

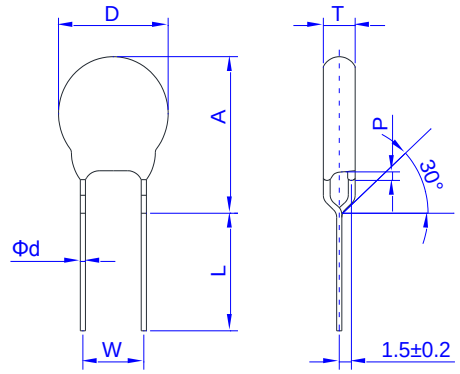


Fig 4. In Line Kink Lead

Dimension Table **Unit:mm**

Symbol \ Model		07C		10C		14C		20C	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
D		7.5	9.0	10.5	14.0	13.5	17.5	19.5	25.0
H		-	12.0	-	17.0	-	20.5	-	28.0
W		4.0	6.0	6.5	8.5	6.5	8.5	9.0	11.0
Φd		0.58	0.62	0.78	0.82	0.78	0.82	0.98	1.02
P(max.)		3							
L(min)		25							
K(±0.4)(Kink Lead)		0.8	1.6	1.0	1.8	1.0	1.8	1.0	1.8
A(max.)	180K-271K	-	15.0	-	19.5	-	22.5	-	30.0
	>271K	-	15.5	-	20.5	-	23.5	-	31.0
T		See Tmax table							

＊Short Cut Lead type TTXX the lead length (L) can 3.0~15mm (expect 20C dia <10mm), see Ordering Note.

＊＊a value see T max. table

T max. Table Unit:mm

Model	07C	10C	14C	20C	a(±1.0)
180K	3.5	3.8	3.9	4.1	1.6
220K	3.6	3.9	4.0	4.3	1.7
270K	3.7	4.0	4.1	4.4	1.8
330K	3.8	4.1	4.2	4.5	1.8
390K	3.9	4.2	4.3	4.6	1.9
470K	4.2	4.5	4.6	4.8	2.1
680K	4.8	5.1	5.2	5.3	2.6

Tape and Reel Specificstions

- Can be supplied to IEC Publication 286-2
- Radial devices on tape are supplied with straight leads or inline kink leads.

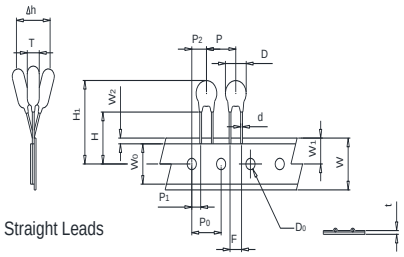


Figure: A

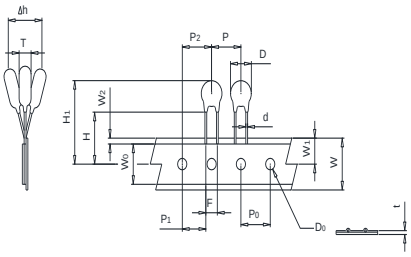


Figure: B

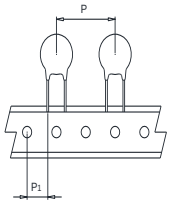


Figure: C

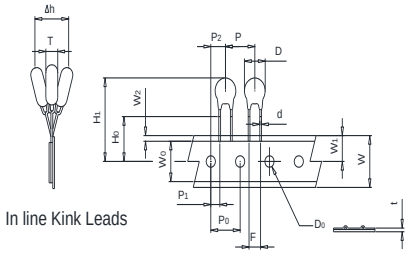


Figure: D

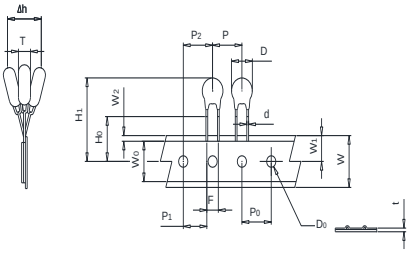


Figure: E

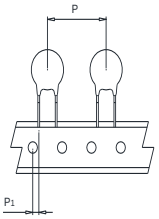


Figure: F

Symbol	Description	Model Size				
		07C	10C	10C	14C	14C
P	Pitch of Component	12.7±1.0	12.7±1.0	15.0±1.0	25.4±1.0	30.0±1.0
P_0	Feed Hole Pitch	12.7±0.2	12.7±0.2	15.0±0.2	12.7±0.2	15.0±0.2
P_1	Feed Hole Center to Pitch	3.85±0.7	8.95±0.7	3.75±0.7	8.95±0.7	3.75±0.7
P_2	Hole Center to Component Center	6.35±0.7	12.7±0.7	7.5±0.7	12.7±0.7	7.5±0.7
F	Lead to Lead Distance	5.0±0.8	7.5±0.8	7.5±0.8	7.5±0.8	7.5±0.8
△h	Component Alignment	2.0max	2.0max	2.0max	2.0max	2.0max
W	Tape Width	18.0+1.0	18.0+1.0	18.0+1.0	18.0+1.0	18.0+1.0
		18.0-0.5	18.0-0.5	18.0-0.5	18.0-0.5	18.0-0.5
W_0	Hold Down Tape Width	5.0 Min.	5.0 Min.	5.0 Min.	5.0 Min.	5.0 Min.
W_1	Hole Position	9.0+0.75	9.0+0.75	9.0+0.75	9.0+0.75	9.0+0.75
		9.0-0.5	9.0-0.5	9.0-0.5	9.0-0.5	9.0-0.5
W_2	Hold Down Tape Position	3.0 Max	3.0 Max	3.0 Max	3.0 Max	3.0 Max
H	Height from Tape Center to Component Base	18.0+2.0	18.0+2.0	18.0+2.0	18.0+2.0	18.0+2.0
		18.0-0.0	18.0-0.0	18.0-0.0	18.0-0.0	18.0-0.0
H_0	Seating Plane Height	16.0±0.5	16.0±0.5	16.0±0.5	16.0±0.5	16.0±0.5
H_1	Component Height	32.0 Max.	36.0 Max.	36.0 Max.	40.0 Max.	40.0 Max.
D_0	Feed Hole Diameter	4.0±0.2	4.0±0.2	4.0±0.2	4.0±0.2	4.0±0.2
t	Total Tape Thickness	0.7±0.2	0.7±0.2	0.7±0.2	0.7±0.2	0.7±0.2
L	Leagth Clipped Lead	11.0 Max	11.0 Max	11.0 Max	11.0 Max	11.0 Max
Figure		A , D	B , E	A , D	C	F

Tape and Reel Specificstions

- Can be supplied to IEC Publication 286-2
- Radial devices on tape are supplied with inside kink leads or outside kink leads.

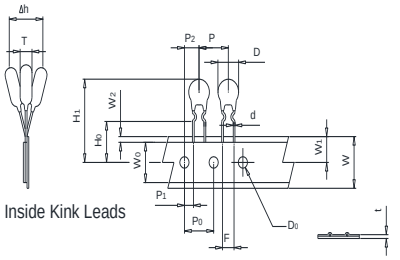


Figure: A

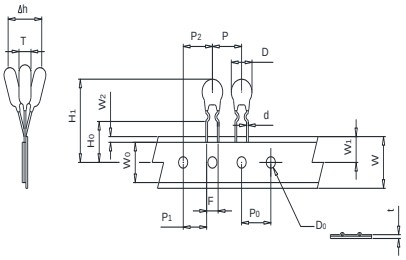


Figure: B

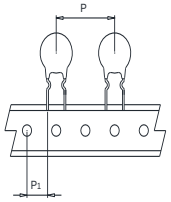


Figure: C

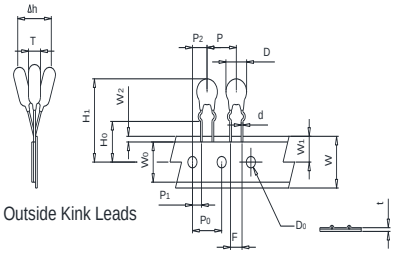


Figure: D

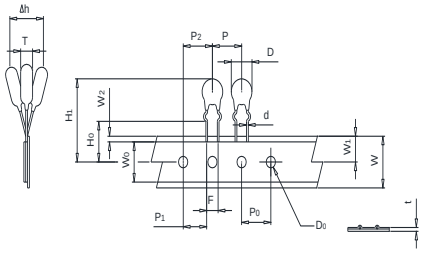


Figure: E

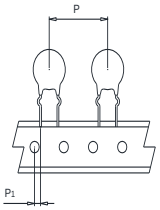


Figure: F

Symbol	Description	Model Size				
		07C	10C	10C	14C	14C
P	Pitch of Component	12.7±1.0	12.7±1.0	15.0±1.0	25.4±1.0	30.0±1.0
P_0	Feed Hole Pitch	12.7±0.2	12.7±0.2	15.0±0.2	12.7±0.2	15.0±0.2
P_1	Feed Hole Center to Pitch	3.85±0.7	8.95±0.7	3.75±0.7	8.95±0.7	3.75±0.7
P_2	Hole Center to Component Center	6.35±0.7	12.7±0.7	7.5±0.7	12.7±0.7	7.5±0.7
F	Lead to Lead Distance	5.0±0.8	7.5±0.8	7.5±0.8	7.5±0.8	7.5±0.8
△h	Component Alignment	2.0max	2.0max	2.0max	2.0max	2.0max
W	Tape Width	18.0+1.0	18.0+1.0	18.0+1.0	18.0+1.0	18.0+1.0
		18.0-0.5	18.0-0.5	18.0-0.5	18.0-0.5	18.0-0.5
W_0	Hold Down Tape Width	5.0 Min.	5.0 Min.	5.0 Min.	5.0 Min.	5.0 Min.
W_1	Hole Position	9.0+0.75	9.0+0.75	9.0+0.75	9.0+0.75	9.0+0.75
		9.0-0.5	9.0-0.5	9.0-0.5	9.0-0.5	9.0-0.5
W_2	Hold Down Tape Position	3.0 Max	3.0 Max	3.0 Max	3.0 Max	3.0 Max
H	Height from Tape Center to Component Base	18.0+2.0	18.0+2.0	18.0+2.0	18.0+2.0	18.0+2.0
		18.0-0.0	18.0-0.0	18.0-0.0	18.0-0.0	18.0-0.0
H_0	Seating Plane Height	16.0±0.5	16.0±0.5	16.0±0.5	16.0±0.5	16.0±0.5
H_1	Component Height	32.0 Max.	36.0 Max.	36.0 Max.	40.0 Max.	40.0 Max.
D_0	Feed Hole Diameter	4.0±0.2	4.0±0.2	4.0±0.2	4.0±0.2	4.0±0.2
t	Total Tape Thickness	0.7±0.2	0.7±0.2	0.7±0.2	0.7±0.2	0.7±0.2
L	Leagth Clipped Lead	11.0 Max	11.0 Max	11.0 Max	11.0 Max	11.0 Max
Figure		A , D	B , E	A , D	C	F

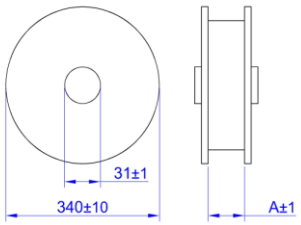
Packing information

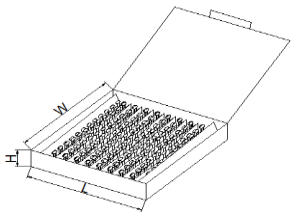
Bulk Packing

Series	Straight Lead Type Quantity(pcs/bag)	Cut Lead Type Quantity(pcs/bag)	Kink Type Quantity(pcs/bag)
CNR-07C	1000	1000	1000
CNR-10C	500	500	500
CNR-14C	500	500	500
CNR-20C	250	250	250

Tape & Reel product packing

Series	A (mm)	Quantity (pcs/reel)
CNR-07C(180K~680K)-TRXX	43	2000
CNR-10C(180K~680K)-TRXX	56	1000
CNR-14C(180K~680K)-TRXX		800



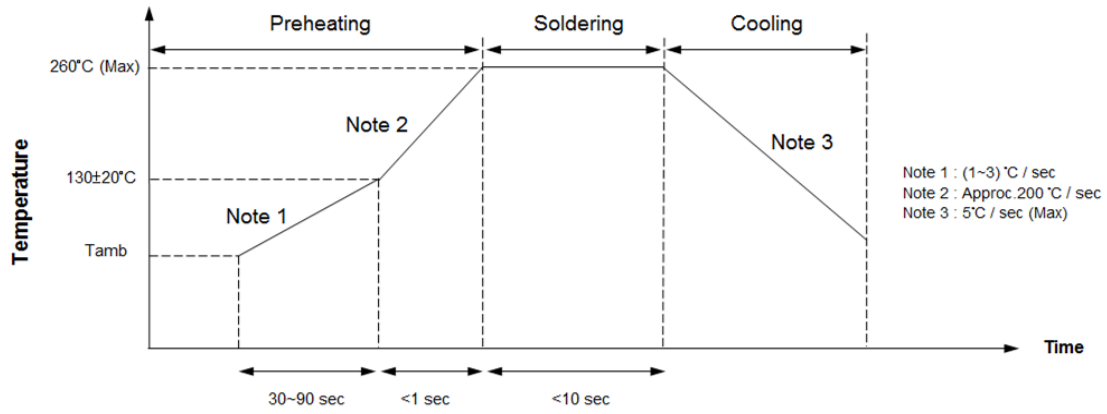


Flat Box product

Series	Quantity (pcs/box)
CNR-07C(180K~680K)-BTXX	1000
CNR-10C(180K~680K)-BTXX	1000
CNR-14C(180K~680K)-BTXX	500

Serise	L±5	W±5	N±5
CNR-07C	340	245	45
CNR-10~14C	340	245	50

Solder Recommendation



Note 1: (1~3℃)/sec

Note 2: Approx. 200℃/sec

Note 3: 5℃/sec Max

Recommendation Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of soldering Iron-tip	360℃(Max)
Soldering Time	3 sec(Max)
Distance from Varistor	2mm(Min)

RoHS Compliant Declaration

We hereby declare that the components delivered to your company are compliant with RoHS Directive 2002/95/EC

Storage Conditions of Products

(I) Storage Conditions:

1.Storage Temperature: -10℃~+40℃

2.Relative Humidity:≦75%RH

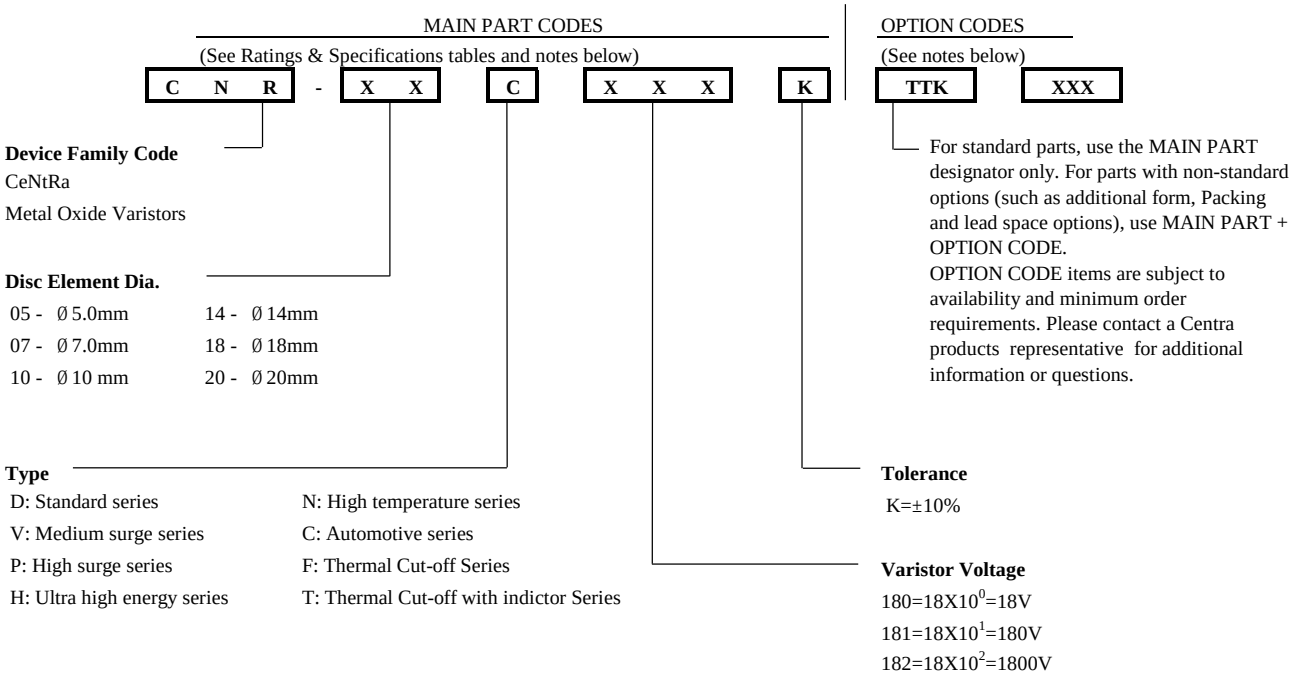
3.Keep away from corrosive atmosphere and sunlight

4.Solvent Resistance: MIL–STD–202, Method 215F

5.Moisture Sensitivity: Level 1, J-STD-020

(II) Period of Storage: 1 year

Explanation of Part Numbers



Ordering Notes:

MAIN PART CODES

Series + /Packaging/ Lead Style / Designators: + **Option Code**

Ordering examples:

Straight Lead Bulk Pack (Standard)	Straight Lead (Short Cut) Bulk Pack	Straight Lead Tape & Reel Pack	Straight Lead Flat Box Pack
CNR-10C470K	CNR-10C470KTTSXXX	CNR-10C470KTRSX	CNR-10C470KBTSX

Outside Kink Lead Bulk Pack	Outside Kink Lead (Short Cut) Bulk Pack	Outside Kink Lead Tape & Reel Pack	Outside Kink Lead Flat Box Pack
CNR-10C470SOK	CNR-10C470KTTKXXX	CNR-10C470KTRKX	CNR-10C470KBTKX

Inside Kink Lead Bulk Pack	Inside Kink Lead (Short Cut) Bulk Pack	Inside Kink Lead Tape & Reel Pack	Inside Kink Lead Flat Box Pack
CNR-10C470KSIK	CNR-10C470KTTIXXX	CNR-10C470KTRIX	CNR-10C470KBTIX

In Line Kink Lead Bulk Pack	In Line Kink Lead (Short Cut) Bulk Pack	In Line Kink Lead Tape& Reel Pack	In Line Kink Lead Flat Box Pack
CNR-10C470KSHK	CNR-10C470KTTHXXX	CNR-10C470KTRHX	CNR-10C470KBTHX

XXX

Short Cut Lead Length 10mm±1.0mm
CNR-10C470KTTS10

Tape & Reel Pack Feed Hole Pitch
CNR-10C470K**TRSA**
CNR-10D470K**TRSB**

A: P_0 → 12.7mm±0.2mm
B: P_0 → 15.0mm±0.2mm

CeNtRa C Series varistors are shipped standard in bulk pack with straight leads or Kink lead and lead spacing outlined in the Package Dimensions section of this data sheet. Contact your CeNtRa sales representative to discuss non-standard options.