

MOV Metal Oxide Varistors

Electrode Industrial varistors, High Energy, 32D series

Series/Type: VCRR32D***K****

Ordering code: VCRR32D***K

Date: January 2020

Version: 1

Construction

- Round varistor element, leaded
- Coating: epoxy resin, flame-retardant to UL 94 V-0
- Terminals: tinned wire

Features

- High performance with smaller disk diameter
- Wide operating voltage range 110... 1000V_{RMS}
- High surge current ratings up to 40KA
- No derating up to 105°C ambient temperature

Approvals

- UL
- VDE
- CQC

Delivery mode

- Bulk (standard), taped versions on reel or in Ammo pack upon request
- For further details refer to chapter "Taping, packaging and lead configuration" for leaded varistors.

General technical data

Climatic category	to IEC 60068-1	40/105/56	
Operating temperature	to IEC 61051	-40 ... +130	°C
Storage temperature		-40 ... +125	°C
Electric strength	to IEC 61051	≥ 2.5	kV _{RMS}
Insulation resistance	to IEC 61051	≥ 100	MΩ

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Electrical specifications and ordering codes

Maximum ratings ($T_A = 105\text{ °C}$)

Ordering code	Type	V_{RMS} [V]	V_{DC} [V]	i_{max} (8/20 μs) 1 time [kA]*	$I_n^{(1)}$ (8/20 μs) 15 times [kA]*	W_{max} (10/1000 μs) [J]	P_{max} [W]
VCRR32D181KA	32D181K	115	150	25	15	175	1.0
VCRR32D201KA	32D201K	130	170	25	15	190	1.0
VCRR32D221KA	32D221K	140	180	25	15	200	1.0
VCRR32D241KA	32D241K	150	200	25	15	220	1.0
VCRR32D271KA	32D271K	175	225	25	15	255	1.0
VCRR32D301KA	32D301K	190	250	25	15	275	1.0
VCRR32D331KA	32D331K	210	270	25	15	300	1.0
VCRR32D361KA	32D361K	230	300	25	15	330	1.0
VCRR32D391KA	32D391K	250	320	25	15	360	1.0
VCRR32D431KA	32D431K	275	350	25	15	380	1.0
VCRR32D471KA	32D471K	300	385	25	15	400	1.0
VCRR32D511KA	32D511K	320	420	25	15	420	1.0
VCRR32D561KA	32D561K	350	460	25	15	440	1.0
VCRR32D621KA	32D621K	385	505	25	15	450	1.0
VCRR32D681KA	32D681K	420	560	25	15	460	1.0
VCRR32D751KA	32D751K	460	615	25	15	510	1.0
VCRR32D821KA	32D821K	510	670	25	15	520	1.0
VCRR32D911KA	32D911K	550	745	25	15	620	1.0
VCRR32D951KA	32D951K	575	765	25	15	690	1.0
VCRR32D102KA	32D102K	625	825	25	15	760	1.0
VCRR32D112KA	32D112K	680	895	25	15	820	1.0
VCRR32D122KA	32D122K	750	980	25	15	830	1.0
VCRR32D152KA	32D152K	900	1200	25	15	850	1.0
VCRR32D182KA	32D182K	1000	1465	25	15	950	1.0

¹⁾ **Note:** Nominal discharge current is the specification defined in UL1449 4th edition and tested with 8/20 μs current waveform

Characteristics ($T_A=25\text{ °C}$):

Ordering code	Type	V_v (1 mA) [V]	ΔV_v (1 mA) [%]	Max clamping voltage		C_{typ} (1 kHz) [pF]
				V_c [V]	I_c [A]	
VCRR32D181KA	32D181K	180	± 10	300	150	3500
VCRR32D201KA	32D201K	200	± 10	340	150	3200
VCRR32D221KA	32D221K	220	± 10	360	150	2900
VCRR32D241KA	32D241K	240	± 10	395	150	2650
VCRR32D271KA	32D271K	270	± 10	455	150	2400
VCRR32D301KA	32D301K	300	± 10	500	150	2100
VCRR32D331KA	32D331K	330	± 10	550	150	1900
VCRR32D361KA	32D361K	360	± 10	595	150	1750
VCRR32D391KA	32D391K	390	± 10	650	150	1600

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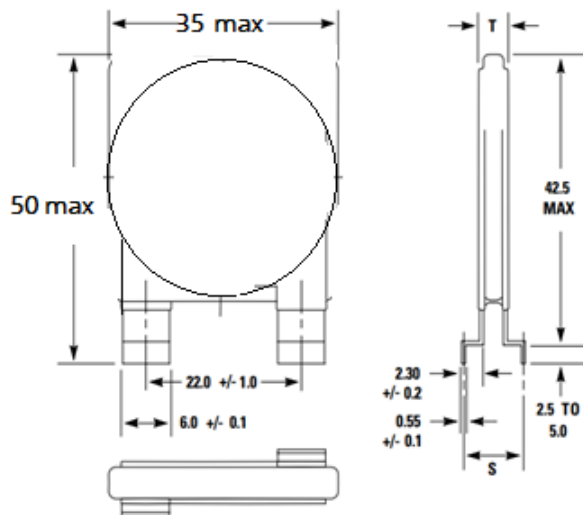
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VCRR32D431KA	32D431K	430	±10	710	150	1500
VCRR32D471KA	32D471K	470	±10	775	150	1400
VCRR32D511KA	32D511K	510	±10	840	150	1250
VCRR32D561KA	32D561K	560	±10	910	150	1150
VCRR32D621KA	32D621K	620	±10	1025	150	1050
VCRR32D681KA	32D681K	680	±10	1120	150	950
VCRR32D751KA	32D751K	750	±10	1240	150	850
VCRR32D821KA	32D821K	820	±10	1355	150	830
VCRR32D911KA	32D911K	910	±10	1500	150	730
VCRR32D951KA	32D951K	950	±10	1570	150	660
VCRR32D102KA	32D102K	1000	±10	1650	150	600
VCRR32D112KA	32D112K	1100	±10	1815	150	530
VCRR32D122KA	32D122K	1200	±10	2000	150	520
VCRR32D152KA	32D152K	1500	±10	2475	150	510
VCRR32D182KA	32D182K	1800	±10	2970	150	500

2) *Please refer to the suffix code

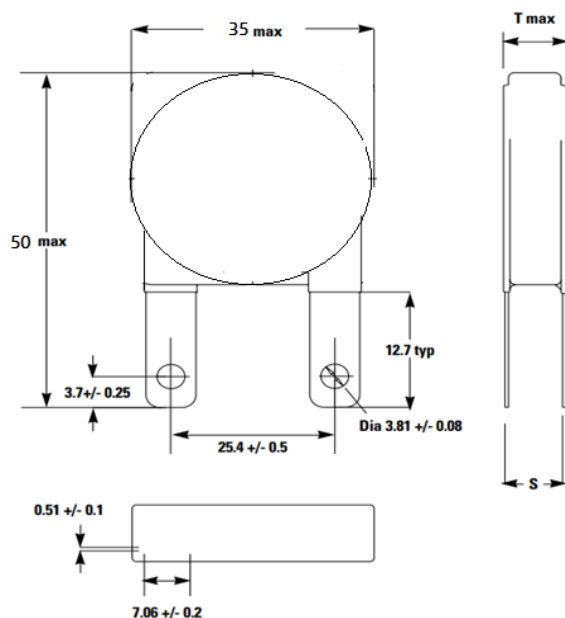
Dimensional drawings and Structure



Type1

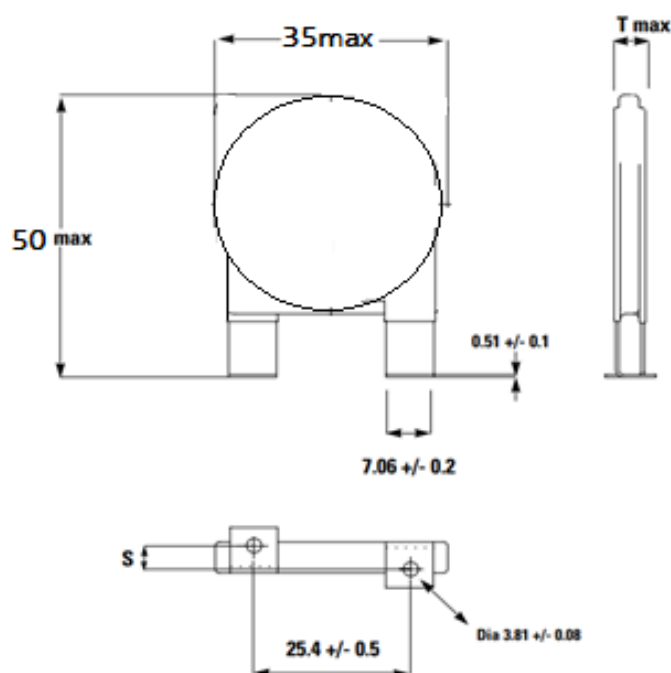
Type	T body Thickness(Max)	S Mounting Terminal offset
32D181KA	5.5	5.3±0.65
32D201KA	5.7	5.5±0.65
32D221KA	5.8	5.7±0.65
32D241KA	5.9	5.9±0.65
32D271KA	6.0	6.1±0.65
32D301KA	6.0	6.1±0.65
32D331KA	6.1	6.25±0.65
32D361KA	6.4	6.5±0.65
32D391KA	6.7	6.7±0.65
32D431KA	6.9	6.9±0.65
32D471KA	7.0	6.95±0.85
32D511KA	7.3	7.2±0.85
32D561KA	7.6	7.5±0.85
32D621KA	7.8	7.85±0.85
32D681KA	8.0	7.95±1
32D751KA	8.3	8.25±1
32D821KA	8.8	8.6±1
32D911KA	9.1	8.55±1.5
32D951KA	9.4	8.85±1.5
32D102KA	10.2	9.65±1.5
32D112KA	10.4	10.35±1.5
32D122KA	10.7	10.65±1.5
32D152KA	10.9	10.65±1.5
32D182KA	11.2	10.65±1.5

Dimensional drawings



Type2

Type	T body Thickness(Max)	S Mounting Terminal offset
32D181KB	5.5	2.0±0.65
32D201KB	5.7	2.1±0.65
32D221KB	5.8	2.2±0.65
32D241KB	5.9	2.4±0.65
32D271KB	6.0	2.5±0.65
32D301KB	6.0	2.6±0.65
32D331KB	6.1	2.7±0.65
32D361KB	6.4	2.9±0.65
32D391KB	6.7	3.2±0.65
32D431KB	6.9	3.4±0.65
32D471KB	7.0	3.5±0.85
32D511KB	7.3	3.9±0.85
32D561KB	7.6	4.2±0.85
32D621KB	7.8	4.4±0.85
32D681KB	8.0	4.5±0.85
32D751KB	8.3	4.8±1.0
32D821KB	8.8	5.2±1.0
32D911KB	9.1	5.5±1.0
32D951KB	9.4	5.7±1.5
32D102KB	10.2	6.5±1.5
32D112KB	10.4	6.7±1.5
32D122KB	10.7	7.3±1.5



Type3

Type	T body Thickness(Max)	S Mounting Terminal offset
32D181KC	5.5	6.0±0.65
32D201KC	5.7	5.8±0.65
32D221KC	5.8	5.6±0.65
32D241KC	5.9	5.5±0.65
32D271KC	6.0	5.4±0.65
32D301KC	6.0	5.4±0.65
32D331KC	6.1	5.2±0.65
32D361KC	6.4	4.9±0.65
32D391KC	6.7	4.7±0.65
32D431KC	6.9	4.5±0.65
32D471KC	7.0	4.4±0.85
32D511KC	7.3	4.1±0.85
32D561KC	7.6	3.8±0.85
32D621KC	7.8	3.5±0.85
32D681KC	8.0	3.3±0.85
32D751KC	8.3	3.1±1.0
32D821KC	8.8	2.7±1.0
32D911KC	9.1	2.4±1.0
32D951KC	9.4	2.2±1.5
32D102KC	10.2	1.4±1.5
32D112KC	10.4	1.2±1.5
32D122KC	10.7	0.6±1.5

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Weight

Nominal diameter mm	V _{RMS} V	Weight g
32	10...680	7.1...41

Different voltage levels result in differences in weight

2) *Please refer to the suffix code.

Reliability data

Test	Test methods/conditions	Requirement
Varistor voltage	The voltage between two terminals with the specified measuring current applied is called V _V (1 mA _{DC} @ 0.2 ... 2 s).	To meet the specified value
Clamping voltage	The maximum voltage between two terminals with the specified standard impulse current (8/20 μs) applied.	To meet the specified value
Endurance at upper category temperature	1000 h at UCT After having continuously applied the maximum allowable AC voltage at UCT ±2 °C for 1000 h, the specimen shall be stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of V _V shall be measured.	ΔV/V (1 mA) ≤10%
Surge current derating, 8/20 μs	10 surge currents (8/20 μs), unipolar, interval 30 s, amplitude corresponding to derating curve for 10 impulses at 20 μs	ΔV/V (1 mA) ≤10% (measured in direction of surge current) No visible damage
Surge current derating, 2 ms	10 surge currents (2 ms), unipolar, interval 120 s, amplitude corresponding to derating curve for 10 impulses at 2 ms	ΔV/V (1 mA) ≤10% (measured in direction of surge current) No visible damage
Electric strength	IEC 61051-1, test 4.9.2 Metal balls method, 2500 V _{RMS} , 60 s The varistor is placed in a container holding 1.6 ±0.2 mm diameter metal balls such that only the terminations of the varistor are protruding. The specified voltage shall be applied between both terminals of the specimen connected together and the electrode inserted between the metal balls.	No breakdown

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Test	Test methods/conditions	Requirement
Climatic sequence	The specimen shall be subjected to: a) dry heat at UCT, 16 h, IEC 60068-2-2, test Ba b) damp heat, 1st cycle: 55 °C, 93% r. H., 24 h, IEC 60068-2-30, test Db c) cold, LCT, 2 h, IEC 60068-2-1, test Aa d) damp heat, additional 5 cycles: 55 °C/25 °C, 93% r. H., 24 h/cycle, IEC 60068-2-30, test Db. Then the specimen shall be stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of V_V shall be measured. Thereafter, insulation resistance R_{ins} shall be measured at $V = 500$ V.	$ \Delta V/V (1 \text{ mA}) \leq 10\%$ $R_{ins} \geq 100 \text{ M}\Omega$
Rapid change of temperature	IEC 60068-2-14, test Na, LCT/UCT, dwell time 30 min, 5 cycles	$ \Delta V/V (1 \text{ mA}) \leq 5\%$ No visible damage
Damp heat, steady state	IEC 60068-2-78, test Ca The specimen shall be subjected to 40 ± 2 °C, 90 to 95% r. H. for 56 days without load / with 10% of the maximum continuous DC operating voltage V_{DC} . Then stored at room temperature and normal humidity for 1 to 2 h. Thereafter, the change of V_V shall be measured. Thereafter, insulation resistance R_{ins} shall be measured at $V = 500$ V (insulated varistors only).	$ \Delta V/V (1 \text{ mA}) \leq 10\%$ $R_{ins} \geq 100 \text{ M}\Omega$

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Test	Test methods/conditions	Requirement
Solderability	IEC 60068-2-20, test Ta, method 1 with modified conditions for lead-free solder alloys: 245 °C, 3 s: After dipping the terminals to a depth of approximately 3 mm from the body in a soldering bath of 245 °C for 3 s, the terminals shall be visually examined.	The inspection shall be carried out under adequate light with normal eyesight or with the assistance of a magnifier capable of giving a magnification of 4 to 10 times. The dipped surface shall be covered with a smooth and bright solder coating with no more than small amounts of scattered imperfections such as pinholes or un-wetted or de-wetted areas. These imperfections shall not be concentrated in one area.
Resistance to soldering heat	IEC 60068-2-20, test Tb, method 1A, 260 °C, 10 s: Each lead shall be dipped into a solder bath having a temperature of 260 ±5 °C to a point 2.0 to 2.5 mm from the body of the specimen, be held there for 10 ±1 s and then be stored at room temperature and normal humidity for 1 to 2 h. The change of VV shall be measured and the specimen shall be visually examined.	$ \Delta V/V (1 \text{ mA}) \leq 5\%$ No visible damage
Tensile strength	IEC 60068-2-21, test Ua1 After gradually applying the force specified below and keeping the unit fixed for 10 s, the terminal shall be visually examined for any damage. Force for wire diameter: 0.6 mm = 10 N 0.8 mm = 10 N 1.0 mm = 20 N	$ \Delta V/V (1 \text{ mA}) \leq 5\%$ No break of solder joint, no wire break

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Test	Test methods/conditions	Requirement
Vibration	IEC 60068-2-6, test Fc, method B4 Frequency range: 10 ... 55 Hz Amplitude: 0.75 mm or 98 m/s ² Duration: 6 h (3 · 2 h) Pulse: sine wave After repeatedly applying a single harmonic vibration according to the table above. The change of V _V shall be measured and the specimen shall be visually examined.	\Delta V/V (1 mA) ≤5% No visible damage
Bump	IEC 60068-2-29, test Eb Pulse duration: 6 ms Max. acceleration: 400 m/s ² Number of bumps: 4000 Pulse: half sine	\Delta V/V (1 mA) ≤5% No visible damage
Fire hazard	IEC 60695-11-5 (needle flame test) Severity: vertical 10 s	5 s max.

Note:

UCT = Upper category temperature

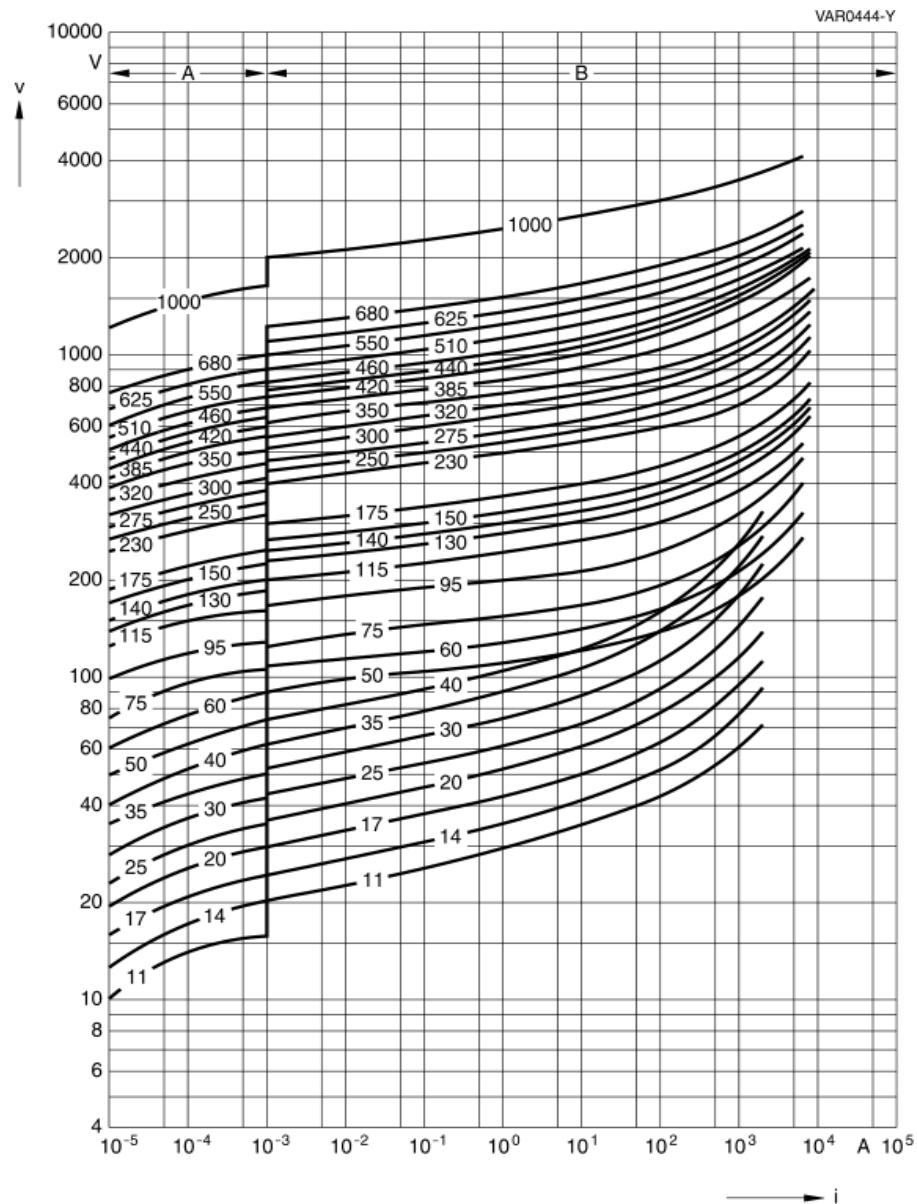
LCT = Lower category temperature

R_{ins} = Insulation resistance

v/i characteristics

$v = f(i)$ - for explanation of the characteristics refer to "General technical information",

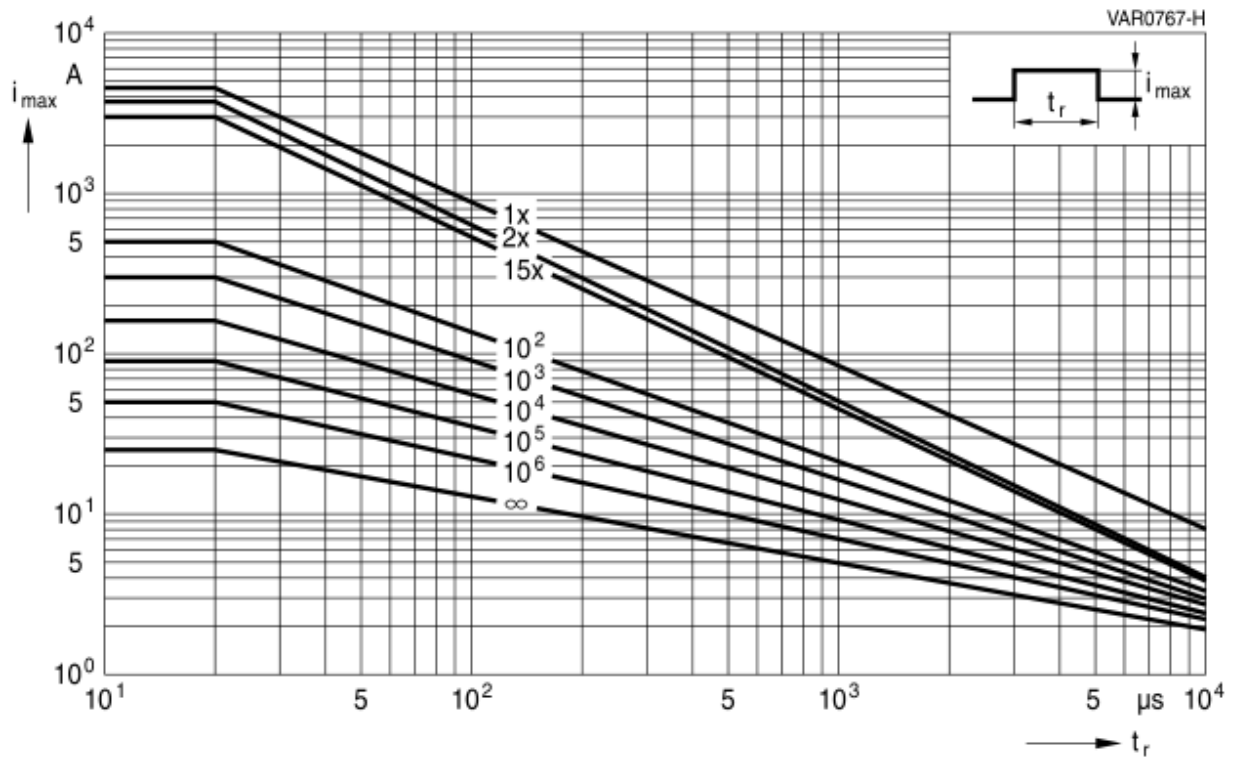
A = Leakage current, B = Protection level } for worst-case varistor tolerances



Derating curves

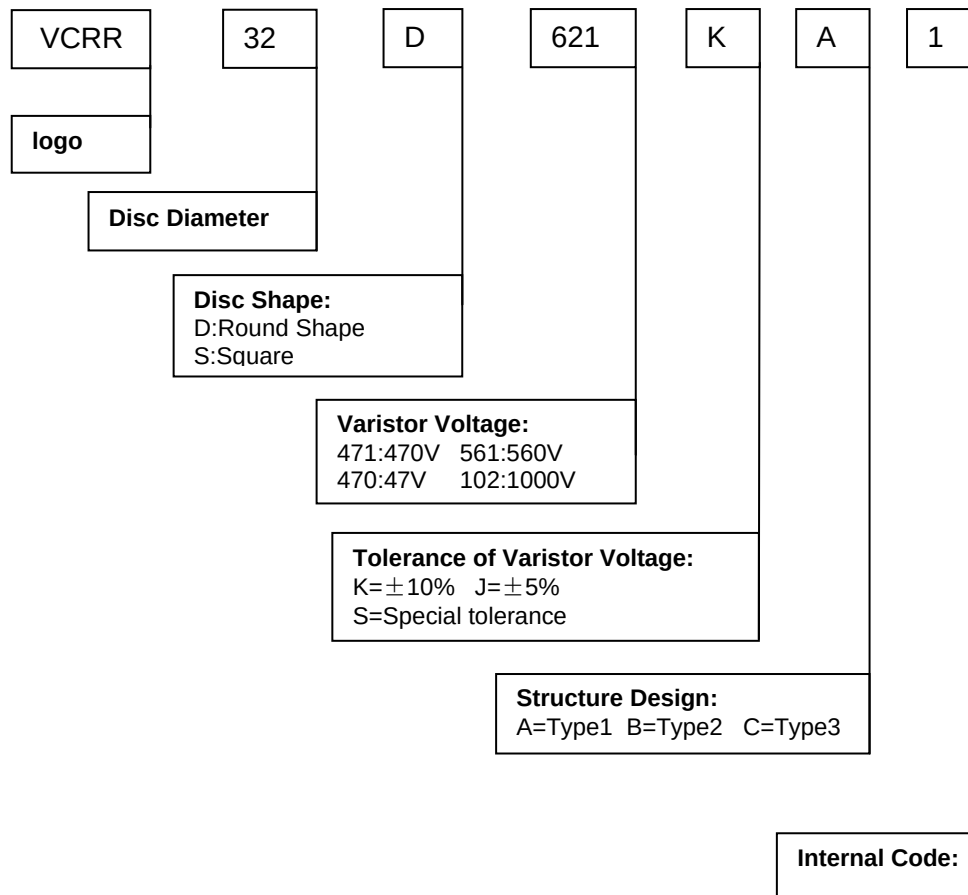
Maximum surge current $i_{\max} = f(t_r, \text{pulse train})$

For explanation of the derating curves refer to "General technical information".



Taping, packaging and lead configuration

1 JORDUN Electronics ordering code system for leaded varistors



1.1 Packaging Method

Part No	Voltage	Bulk		Ammo Packing(Taping)	
		Bag	Carton	Box	Carton
7D	181-821	1000	12000	1000	10000
10D	180-182	500	6000	1000	10000
14D	180-182	500	6000	800	8000
20D	180-182	250	3000	----	----
32D	180-182	100	600	----	----

Cautions and warnings

General

1. JORDUN Electronics metal oxide varistors (MOV) are designed for specific applications and should not be used for purposes not identified in our specifications, application notes and data books unless otherwise agreed with JORDUN Electronics during the design-in-phase.
2. Ensure suitability of MOV through reliability testing during the design-in phase. The MOV should be evaluated taking into consideration worst-case conditions.
3. For applications of MOV in line-to ground circuits based on various international and local standards there are restrictions existing or additional safety measures required.

Storage

1. Store MOV only in original packaging. Do not open the package prior to processing.
2. Recommended storage conditions in original packaging:

Storage temperature:	-25 °C ... +45 °C
Relative humidity:	<75% annual average, <95% on maximum 30 days a year.
Dew precipitation:	Is to be avoided.
3. Avoid contamination of an MOV's during storage, handling and processing.
4. Avoid storage of MOVs in harmful environments that can affect the function during long-term operation (examples given under operation precautions).
5. The MOV type series should be soldered after shipment from JORDUN ELECTRONIC within the time specified.

MOV-J,N,T	24 months
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Handling

1. MOVs must not be dropped.
2. Components must not be touched with bare hands. Gloves are recommended.
3. Avoid contamination of the surface of MOV electrodes during handling, be careful of the sharp edge of MOV electrodes.

Soldering (where applicable)

1. Use rosin-type flux or non-activated flux.
2. Insufficient preheating may cause ceramic cracks.

3. Rapid cooling by dipping in solvent is not recommended.
4. Complete removal of flux is recommended.
5. Temperatures of all preheat stages and the solder bath must be strictly controlled especially for T series (T14 and T20).

Mounting

1. Potting, sealing or adhesive compounds can produce chemical reactions in the MOV ceramic that will degrade the component's electrical characteristics.
2. Overloading MOVs may result in ruptured packages and expulsion of hot materials. For this reason the MOVs should be physically shielded from adjacent components.

Operation

1. Use MOVs only within the specified temperature operating range
2. Use MOVs only within the specified voltage and current ranges.
3. Environmental conditions must not harm the MOVs. Use MOVs only in normal atmospheric conditions. Avoid use in the presence of deoxidizing gases (chlorine gas, hydrogen sulfide gas, ammonia gas, sulfuric acid gas, etc), corrosive agents, humid or salty conditions, Avoid contact with any liquids and solvents.

Symbols and terms

Symbol	Term
C	Capacitance
C_{typ}	Typical capacitance
i	Current
i_c	Current at which $V_{c, max}$ is measured
I_{leak}	Leakage current
i_{max}	Maximum surge current (also termed peak current)
I_{max}	Maximum discharge current
I_n	Nominal discharge current to UL 1449
LCT	Lower category temperature
L_{typ}	Typical inductance
P_{max}	Maximum average power dissipation
R_{ins}	Insulation resistance
R_{min}	Minimum resistance
T_A	Ambient temperature
t_r	Duration of equivalent rectangular wave
UCT	Upper category temperature
v	Voltage
V_{clamp}	Clamping voltage
$V_{c, max}$	Maximum clamping voltage at specified current i_c DC operating voltage
V_{DC}	Maximum jump start voltage
V_{jump}	Maximum voltage
V_{max}	Operating voltage
V_{op}	AC operating voltage, root-mean-square value
V_{RMS}	Root-mean-square value of max. DC operating voltage incl. ripple current
$V_{RMS, op, max}$	Super imposed surge voltage
V_{surge}	Varistor voltage
V_V	Tolerance of varistor voltage
ΔV_V	
W_{LD}	Maximum load dump
W_{max}	Maximum energy absorption
	Lead spacing

All dimensions are given in mm.

The commas used in numerical values denote decimal points.

Release:Version January,2020