



Thermal Protection Metal Oxide Varistors

Onboard Module ,TPMOV,20 M series

Series/Type: VCRR20M***KIT

Ordering code: VCRR20M***KIT

Date: January 2020

Version: 1

Construction

- High energy varistor chip
- Flame-retardant casing: flame-retardant to UL 94 V-0
- Built in release device

Features

- Strong overvoltage protection capability and fast tripping
- Wide operating voltage range 50 ... 680V_{RMS}
- High surge current ratings up to 20KA

Design Principles

The MOV has two types of degradation: natural deterioration due to long-term operation or deterioration caused by abnormal surges. When a surge occurs, the leakage current of the deteriorated MOV continues to increase, leading to a continuous rise in the surface temperature of the MOV and the possibility of ignition. At this point, the heat from the MOV in TPMOV is conducted to the low-temperature alloy solder joint. The solder joint senses the abnormal temperature and acts (melts), driving the spring slider to cut off the circuit and detach the MOV from the main circuit to protect the entire circuit. Additionally, the MOV itself will not continue to heat up or catch fire

Approvals

- UL Certificate:E531647
- TUV Certificate:B1199670002
- CQC

Delivery mode

- Using boxed packaging

General technical data

Climatic category	to IEC 60068-1	40/136/56	
Operating temperature	to IEC 61051	-40 ... +136	°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 ($T_A = 85\text{ }^{\circ}\text{C}$)

Ordering code	Nominal System Voltage U_n [VAC]	V_{RMS} [V]	V_{DC} [V]	i_{max} (8/20 μ s) 1 time [KA]*	$I_n^{(1)}$ (8/20 μ s) 15 times [KA]*	W_{max} (10/1000u s) [J]	P_{max} [W]
VCRR20M50KIT	24	50	65	40	20	156	1.4
VCRR20M60KIT	48	60	85	40	20	195	1.4
VCRR20M75KIT	60	75	100	40	20	235	1.4
VCRR20M95KIT	60	95	125	40	20	296	1.4
VCRR20M115KIT	108	115	150	40	20	350	1.4
VCRR20M130KIT	120	130	170	40	20	400	1.4
VCRR20M140KIT	120	140	180	40	20	450	1.4
VCRR20M150KIT	120	150	200	40	20	480	1.4
VCRR20M175KIT	120	175	225	40	20	540	1.4
VCRR20M190KIT	150	190	250	40	20	600	1.4
VCRR20M210KIT	150	210	270	40	20	656	1.4
VCRR20M230KIT	150	230	300	40	20	745	1.4
VCRR20M250KIT	220	250	320	40	20	830	1.4
VCRR20M275KIT	230	275	350	40	20	920	1.4
VCRR20M300KIT	240	300	385	40	20	1000	1.4
VCRR20M320KIT	277	320	420	40	20	1060	1.4
VCRR20M350KIT	277	350	460	40	20	1150	1.4
VCRR20M385KIT	277	385	505	40	20	1250	1.4
VCRR20M420KIT	347	420	560	40	20	1250	1.4
VCRR20M460KIT	347	460	615	40	20	1280	1.4
VCRR20M510KIT	347	510	670	40	20	1300	1.4
VCRR20M550KIT	480	550	745	40	20	1475	1.4
VCRR20M575KIT	480	575	765	40	20	1550	1.4
VCRR20M625KIT	480	625	825	40	20	1580	1.4
VCRR20M680KIT	480	680	895	40	20	1750	1.4

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

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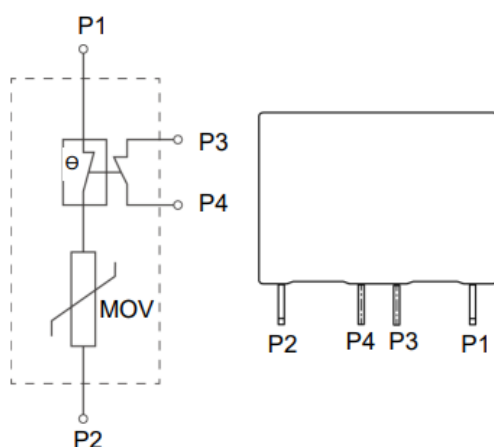
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Characteristics (T_A=25 °C):

Ordering code	Nominal System Voltage <i>U_n</i> [VAC]	V _v (1 mA) [V]	ΔV _v (1 mA) [%]	Max clamping voltage		C _{typ} (1 kHz) Reference [pF]
				V _c [V]	I _c [A]	
VCRR20M50KIT	24	82	±10	135	300	17950
VCRR20M60KIT	48	100	±10	165	300	15000
VCRR20M75KIT	60	120	±10	200	300	12200
VCRR20M95KIT	60	150	±10	250	300	10000
VCRR20M115KIT	108	180	±10	300	300	8250
VCRR20M130KIT	120	200	±10	340	300	6750
VCRR20M140KIT	120	220	±10	360	300	6400
VCRR20M150KIT	120	240	±10	395	300	5650
VCRR20M175KIT	120	270	±10	455	300	5100
VCRR20M190KIT	150	300	±10	500	300	4510
VCRR20M210KIT	150	330	±10	550	300	4150
VCRR20M230KIT	150	360	±10	595	300	3750
VCRR20M250KIT	220	390	±10	650	300	3500
VCRR20M275KIT	230	430	±10	710	300	2950
VCRR20M300KIT	240	470	±10	775	300	2880
VCRR20M320KIT	277	510	±10	840	300	2650
VCRR20M350KIT	277	560	±10	910	300	2450
VCRR20M385KIT	277	620	±10	1025	300	2200
VCRR20M420KIT	347	680	±10	1120	300	2000
VCRR20M460KIT	347	750	±10	1240	300	1820
VCRR20M510KIT	347	820	±10	1355	300	1800
VCRR20M550KIT	480	910	±10	1500	300	1500
VCRR20M575KIT	480	950	±10	1570	300	1400
VCRR20M625KIT	480	1000	±10	1650	300	1350
VCRR20M680KIT	480	1100	±10	1815	300	1230

2) *Please refer to the suffix code

Schematic Diagram:



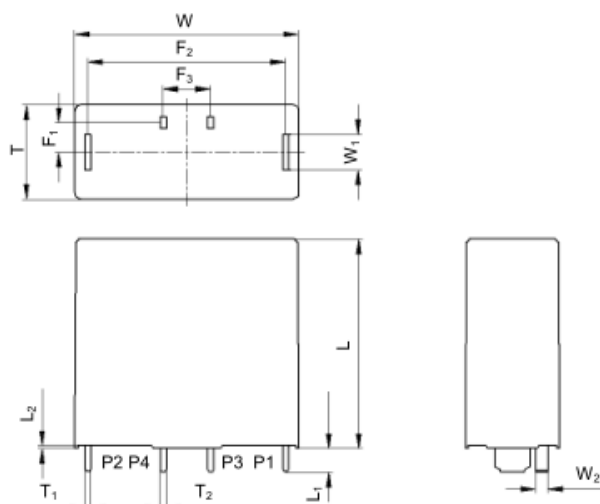
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Dimensional drawings



Weight

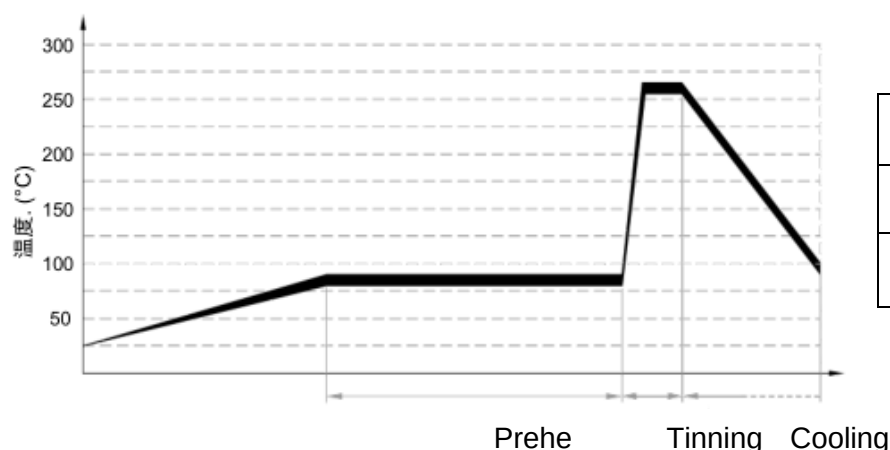
Nominal diameter mm	V _{RMS} V	Weight g
20M	50...680	80...160

Different voltage levels result in differences in weight.

Dimensions (mm)

L	L1	L2	W	W1	W2	T
35.5±1.0	4.0±0.5	0.5±0.3	38.0±1.0	6.0±0.5	2.0±0.3	16±1.0
T1	T2	F1	F2	F3		
1.0±0.2	1.0±0.2	5.0±0.5	33.5±0.5	8.0±0.5		

Wave soldering parameters (for Only reference)



Item	℃	Time(s)
Prehe	80~120	60~150
Tinning	250~270	4~6

Recommended manual welding parameters

Item	Condition
Temperature of soldering iron tip	350℃(Max)
welding time	4 Seconds(Max)
The distance between the welding point and the bottom of the product	2mm(Min)

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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 μ s) 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.	$ \Delta V/V (1 \text{ mA}) \leq 10\%$
Surge current derating, 8/20 μ s	10 surge currents (8/20 μ s), unipolar, interval 30 s, amplitude corresponding to derating curve for 10 impulses at 20 μ s	$ \Delta V/V (1 \text{ mA}) \leq 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	$ \Delta V/V (1 \text{ mA}) \leq 10\%$ (measured in direction of surge current) No visible damage
Electric strength	IEC 61051-1, test 4.9.2 Metal balls method, 2500 VRMS, 60 s The varistor is placed in a container holding 1.6 $\pm$ 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 VDC. 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 \text{ mA}) \leq 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 \text{ mA}) \leq 5\%$ No visible damage
Fire hazard	IEC 60695-11-5 (needle flame test) Severity: vertical 10 s	5 s max.

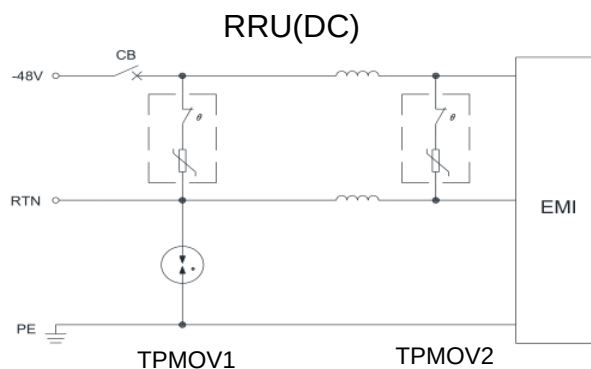
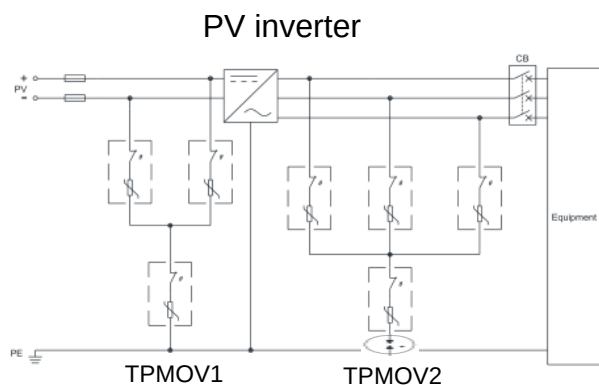
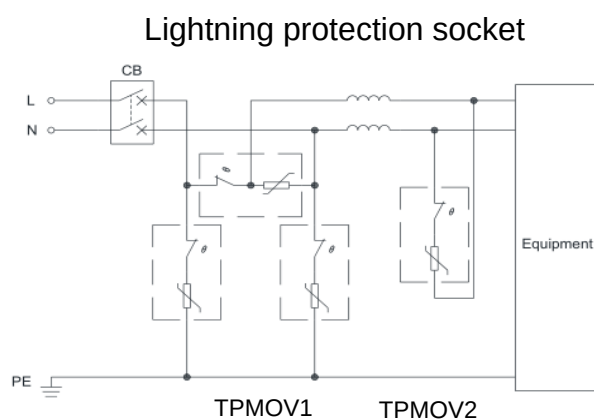
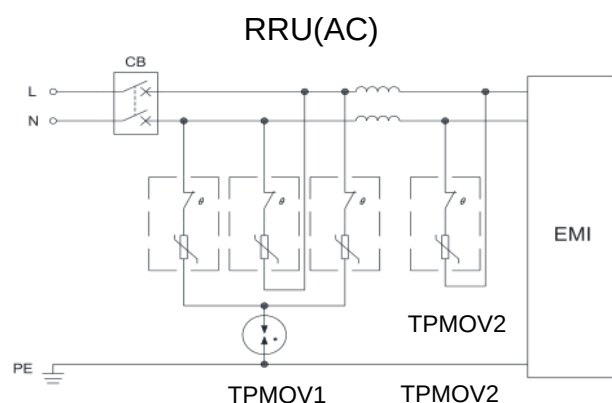
Note:

UCT = Upper category temperature

LCT = Lower category temperature

R_{ins} = Insulation resistance

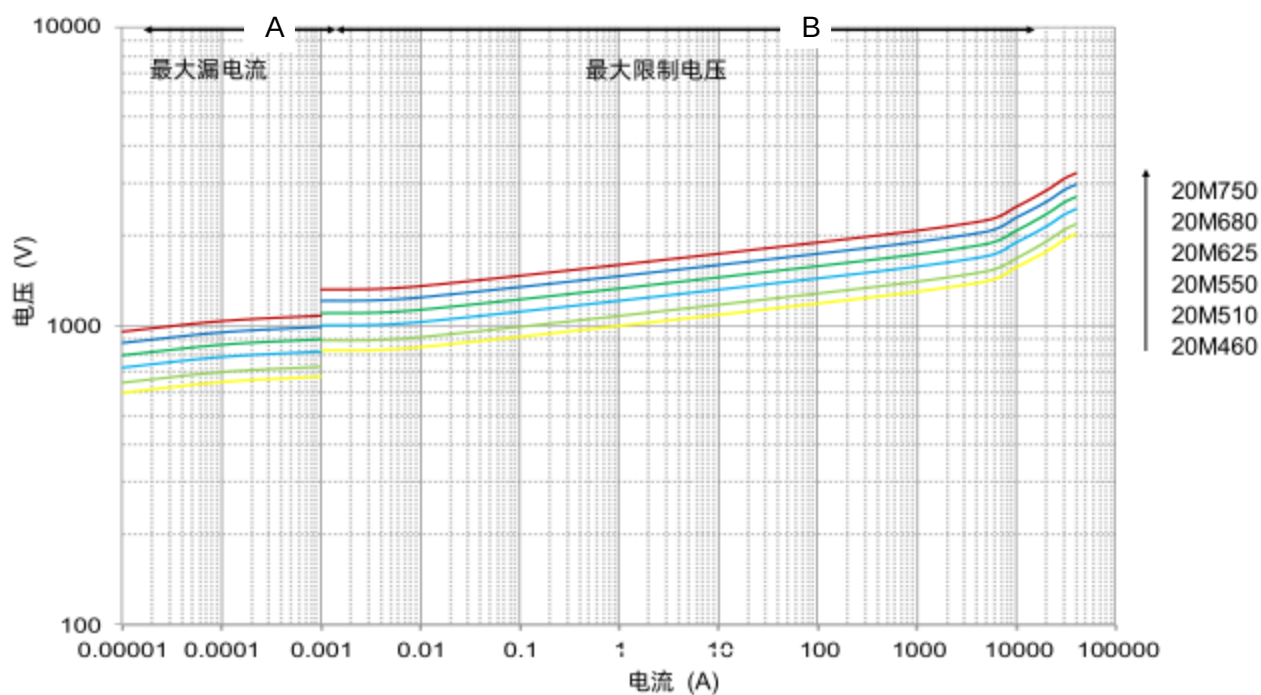
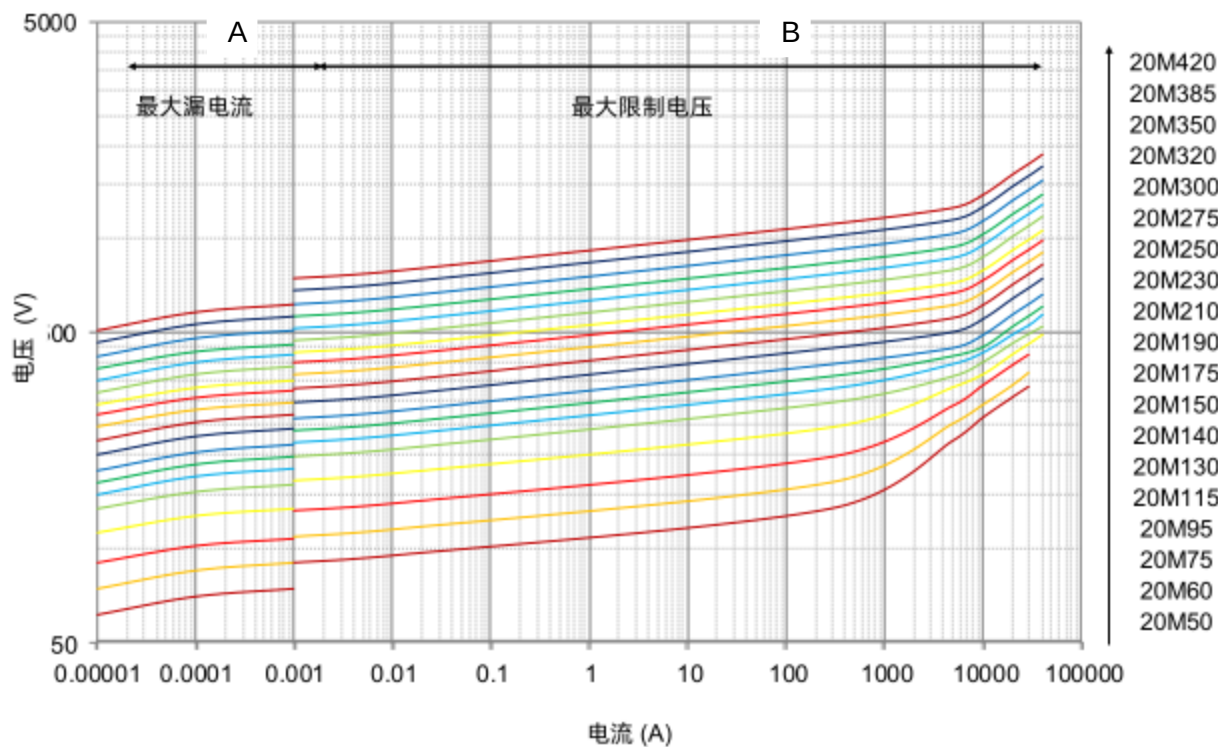
Application Example



v/i characteristics(Reference)

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

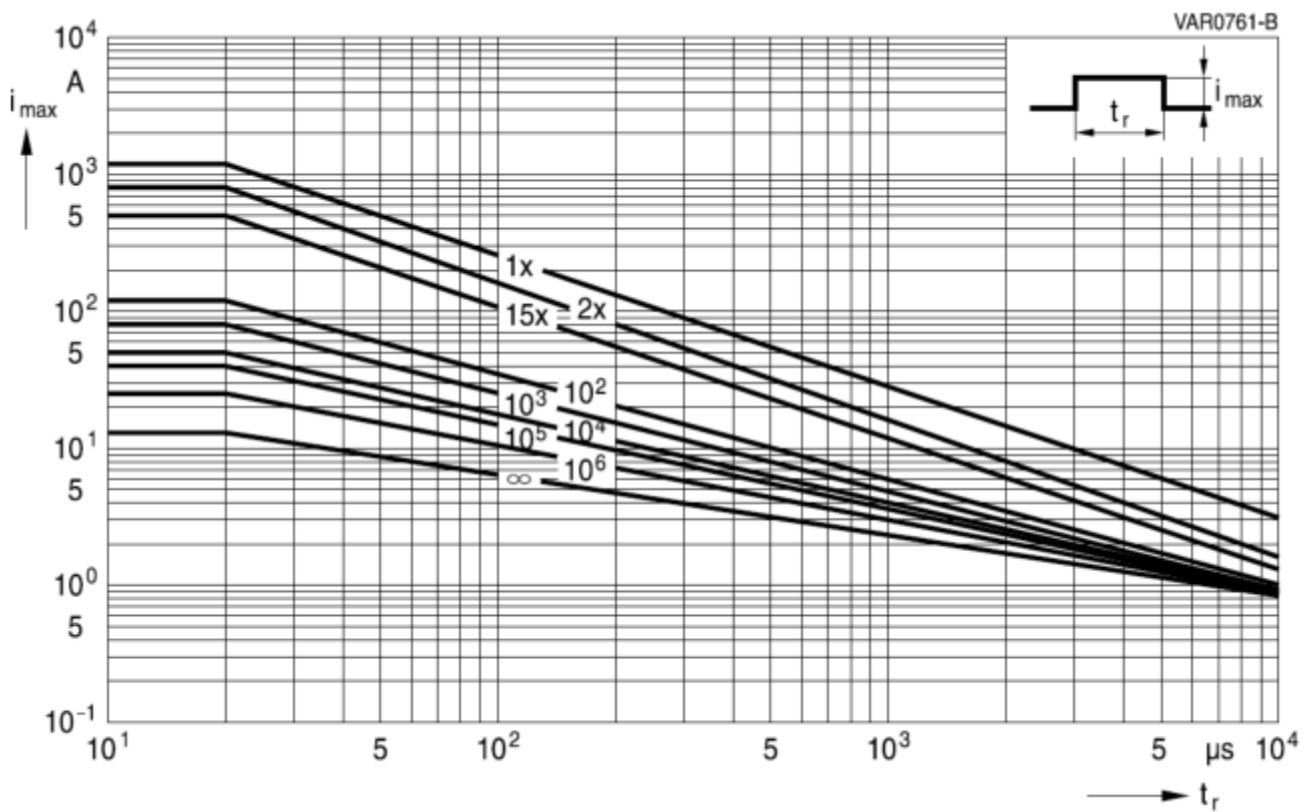
A = Leakage current, B = Protection level } for worst-case varistor tolerances



Derating curves

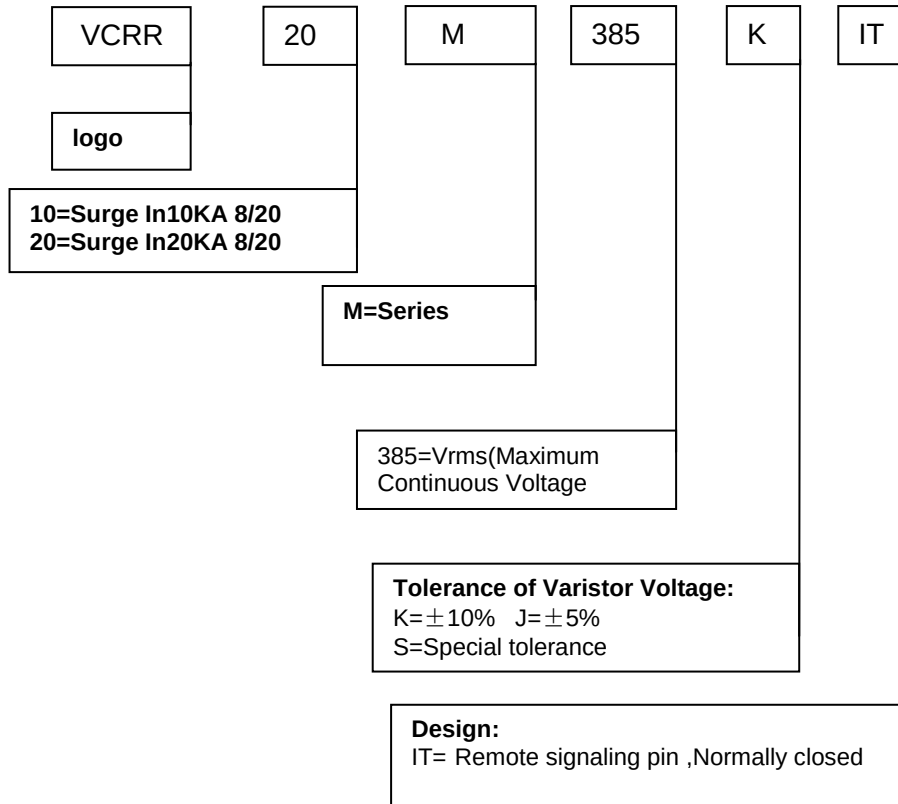
Maximum surge current $i_{\max} = f(t_r, \text{pulse train})$

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 Quantities Per Packaging

1. PACKING CONFIGURATION 包装配置

6 Inner Boxes in 1 Outer Box

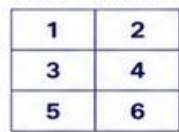
6 个内盒装入 1 个外箱

STACKING ARRANGEMENT 堆叠方式

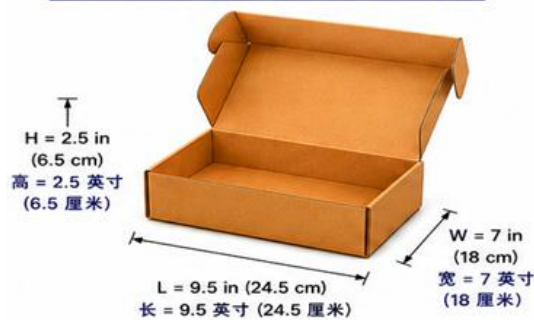
6 inner boxes are arranged
in 2 on top × 3 in height.

内盒排列为:

上层 2 个, 垂直 3 层。



2. INNER BOX DIMENSIONS 内盒尺寸



3. OUTER BOX DIMENSIONS 外箱尺寸



Part No	Voltage	Bulk Standard		Ammo Packing(Taping)	
		Box	Carton	Box	Carton
20M	50-680	60	360	---	----

2 Lead configuration

Straight leads are standard for disk varistors. Other lead configurations as crimp style or customerspecific lead wire length according to 3.1, 3.2, 3.3 and 3.4 are optional. Crimped leads (non-standard) are differently crimped for technical reasons; the individual crimp styles are denot-ed by consecutive numbers (S, S2 through S5) as shown in the dimensional drawings below.

The crimp styles of the individual types can be seen from the type designation in the ordering tables.

2.1 Standard leads and non-standard crimp styles

The basic dimensions in figure 1 to 5 are valid for types with either round or square (EnergetiQ series) component head

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 bookKIT 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 crackKIT.

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

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