

## Varistors with Thermal Decoupler - VTDM Series

### Description

The VTDM(S) Varistors with Thermal Decoupler use special-shape metal oxide varistors equipped with a thermal decoupling device. They are widely used in TVSS products, AC/DC power supplies, AC panel protection modules, AC line power supplies, surge protected strip connectors, AC power meters, UPS (Uninterruptible Power Supplies), inverters, white goods, GFCIs (Ground Fault Current Interrupters). The advantages of the VTDM(S) Varistors with Thermal Decoupler are: terminals construction for PCB mounting, a thermal decoupling device which protects VTDM(S) against varistor failure in the event of abnormal overvoltage and can withstand 16Amps (for one decoupler), the VTDM(S) - Match Series also has the remote signalization capability. They can have different voltage values (see VTD-MV) or they can be matched (VTDM...M) and therefore rated for higher currents or a combination of these new abilities.

### Main Features

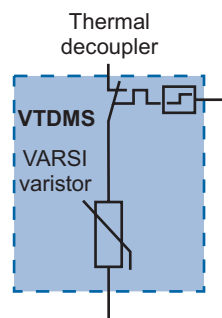
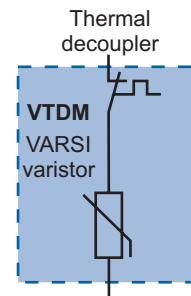
Wide Operating Voltage Range $V_{RMS}$	75 V to 440 V
Very Good Protection Level $U_P$ (at $U_{OC}/I_{SC}$ )	400 V to 1800 V
High Max. Discharge Current Capability $I_{max}$ (8/20 $\mu s$ )	20000 A
Wire Terminals for PCB Mounting	
Option with Decoupling Device with VTDM(S) Signalization	
Option with Matched Varistors for Higher Current Ratings (up to 160000 A)	
Options with Different Voltage Ratings in One Bulk (up to 8 different ratings)	
Options with Different Voltage Ratings and Different Current Ratings in One Bulk	

### General Technical Data

Tested in accordance with	IEC 61643-1, IEC 61051-1 and UL 1449
Category IEC / VDE	III / D
Operating Temperature	-40 ... +80°C
Response Time	< 25 ns
Mounting	on Printed Circuit Board

### Type Designation

<b>V</b>	<b>T</b>	<b>D</b>	<b>M</b>	<b>S</b>	<b>2</b>	<b>7</b>	<b>5</b>	<b>P</b>	<b>2</b>	<b>0</b>	<b>8</b>
<b>VARSI</b> Metal Oxide Varistor with Thermal Decoupler with Multiple Varistors											No. of varistors in one bulk (2 - 8 pcs.)
Option with Remote Signalization											Rated Diameter of Varistor Disc
											Varistor Design (Rectangular Disc)
											Max. AC Operating Voltage



## Application Examples for VTDMs

### VTDM symbol

The picture shows the symbol for our product named VTDM. It is a VARSI varistor with a thermal decoupler before it. If the thermal decoupler opens (it is normally closed), it disconnects the varistor from the line. This provides protection against varistor demolition (thermal runaway).

### Application Example 1

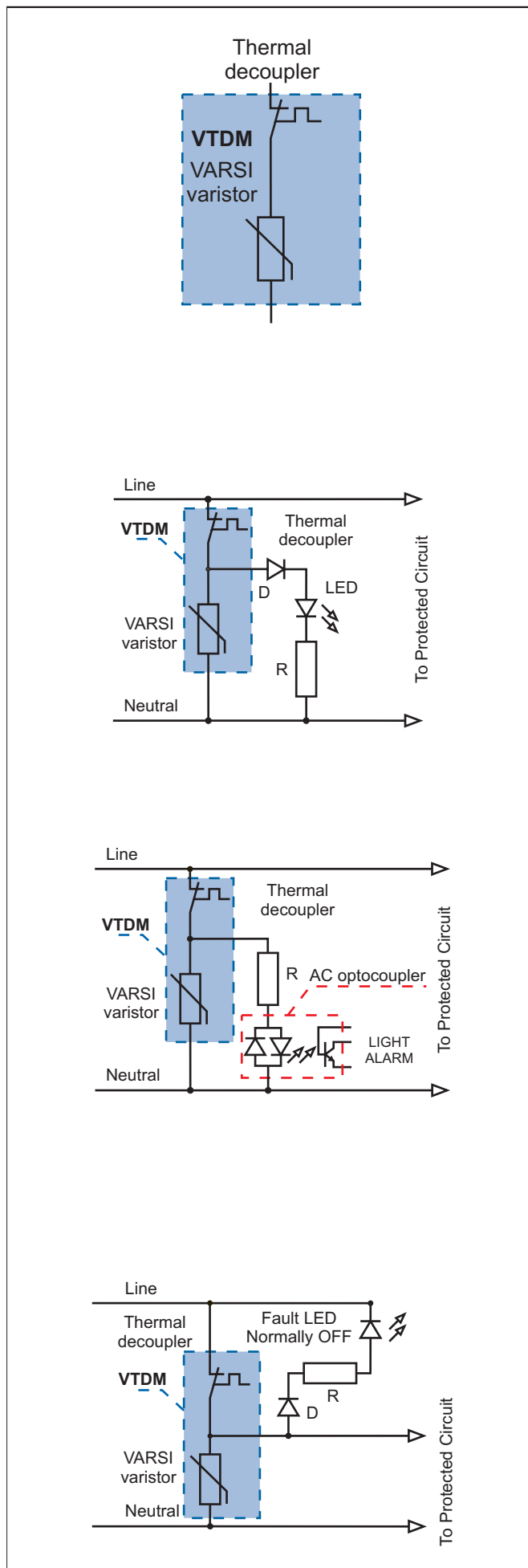
In this case we connect a LED between Line (after thermal decoupler) and Neutral, the LED is normally ON. If the thermal decoupler opens, the LED indication changes from ON to OFF.

### Application Example 2

In this case we connect Line after a thermal decoupler on an optocoupler to provide galvanic isolation between VTD and Line, then signaling an alarm.

### Application Example 3

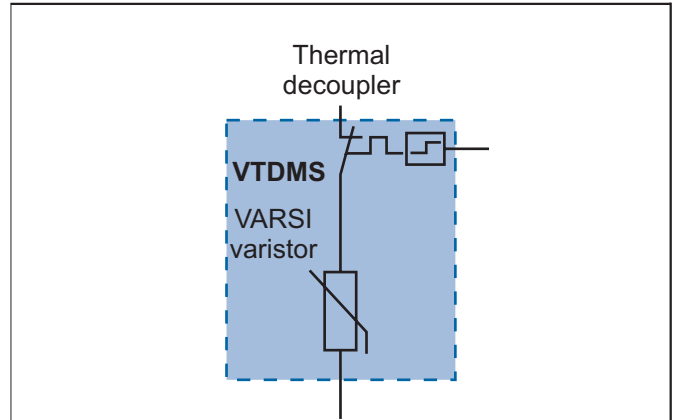
This example is used if we want to monitor VTD varistors lead to ensure that the equipment is only operated when overvoltage protection is present. There is also LED indication that is normally OFF. If the thermal decoupler opens the LED changes from OFF to ON and the connected equipment turns OFF. It can be used in very sensitive and expensive equipment.



**Application Examples for VTDMs**

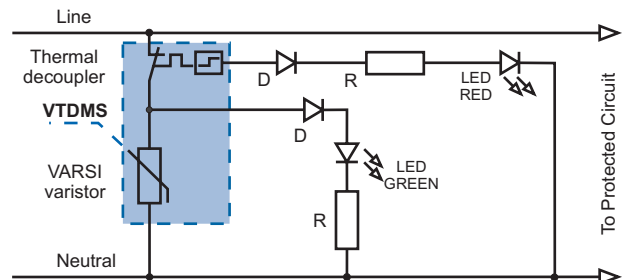
**VTDMs symbol**

The picture shows the symbol for our product named VTDMs. It is a VARSI varistor with a thermal decoupler and remote signalization contact connected before it. If the thermal decoupler opens (it is normally closed), it disconnects the varistor from the Line. When this happens the Line connects to the remote signalization contact and provides the circuit which is normally used for connecting the LED or ALARM. This provides protection against varistor demolition and also signalization of the thermal disconnecter's activity.



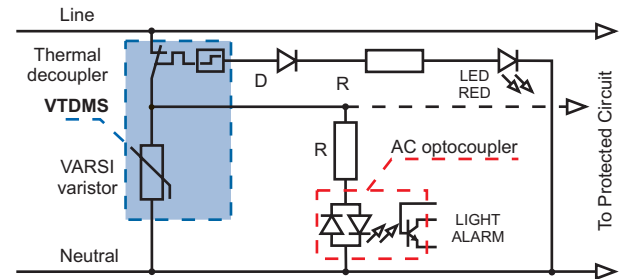
**Application Example 1**

In this case we connect two LED diodes. One LED (green) is connected between Line (after thermal disconnecter) and Neutral, the LED is normally ON. The other LED (red) is connected between signalization contacts in the thermal housing to Neutral, and it is normally OFF. If the thermal decoupler's opens the first LED (green) indication changes from ON to OFF, and the second LED (red) changes from OFF to ON.



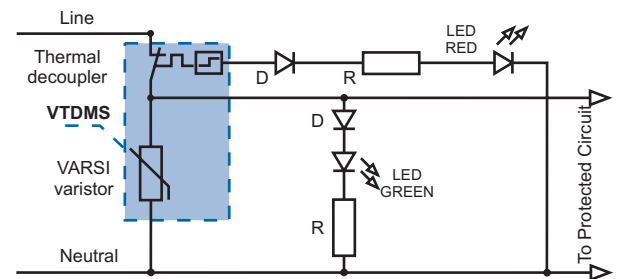
**Application Example 2**

In this case we connect the Line after the thermal decoupler on an optocoupler to provide galvanic isolation between VTDMs and Line, then signaling an alarm. We also connect the LED (red) between signalization contacts in the thermal decoupler housing to Neutral, and it is normally OFF. If the thermal decoupler opens, LED changes indication from OFF to ON. We can also use this application in order to monitor the VTDS varistor's lead to ensure that the equipment is only operated when overvoltage protection is present. If the thermal decoupler opens, the connected equipment turns OFF. This can be used in very sensitive and expensive equipment.



**Application Example 3**

In this case we connect two LED diodes. One LED (green) is connected between Line (after thermal decoupler) and Neutral, and the LED is normally ON. The other LED (red) is connected between signalization contacts in the thermal decoupler's housing to Neutral, and it is normally OFF. If the thermal decoupler opens the first LED (green) indication changes from ON to OFF, the second LED (red) changes from OFF to ON. We use this application in order to monitor the VTDMs varistor's lead to ensure that the equipment is only operated when overvoltage protection is present. If the thermal decoupler opens, the connected equipment turns OFF. This can be used in very sensitive and expensive equipment.



**Table of Standard Values**

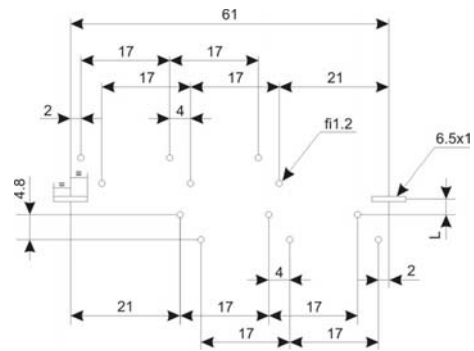
Part Number	Maximum Ratings $T_A = +80^\circ\text{C}$			Characteristics $T_A = +25^\circ\text{C}$							V - I Characteristic Page	Pulse Rating Page
	Operating Voltage		Max. Discharge Current (8/20 $\mu\text{s}$ ) $I_{\text{max}}$ (kA)	Protection Level at $U_{\text{oc}}/I_{\text{sc}}$ Test Current (8/20 $\mu\text{s}$ )		Varistor Voltage (1 mA)		Maximum Clamping Voltage at Test Current (8/20 $\mu\text{s}$ )		Typical Capacitance $f=1\text{kHz}$ C (pF)		
	RMS Voltage $V_{\text{RMS}}$ (V)	DC Voltage $V_{\text{DC}}$ (V)		$U_p$ (V)	$U_{\text{oc}}/I_{\text{sc}}$ (kV/kA)	$V_N$ (V)	$V_N$ ( $\pm\%$ )	$V_C$ (V)	I (A)			
VTDM75P20*	75	100	20	580	20/10	120	10	200	150	12000	7	7
VTDM95P20*	95	125	20	650	20/10	150	10	250	150	7400	7	7
VTDM115P20*	115	150	20	730	20/10	180	10	300	150	6000	7	7
VTDM130P20*	130	170	20	760	20/10	205	10	340	150	5800	7	7
VTDM140P20*	140	180	20	775	20/10	220	10	360	150	5400	7	7
VTDM150P20*	150	200	20	790	20/10	240	10	395	150	5000	7	7
VTDM175P20*	175	225	20	850	20/10	270	10	455	150	4200	7	7
VTDM230P20*	230	300	20	1100	20/10	360	10	595	150	3400	7	7
VTDM250P20*	250	320	20	1140	20/10	390	10	650	150	3200	7	7
VTDM275P20*	275	350	20	1210	20/10	430	10	710	150	2900	7	7
VTDM300P20*	300	385	20	1320	20/10	470	10	775	150	2700	7	7
VTDM320P20*	320	420	20	1430	20/10	510	10	840	150	2400	7	7
VTDM350P20*	350	460	20	1560	20/10	560	10	925	150	2200	7	7
VTDM385P20*	385	505	20	1730	20/10	620	10	1025	150	2000	7	7
VTDM420P20*	420	560	20	1880	20/10	680	10	1120	150	1900	7	7
VTDM440P20*	440	585	20	1970	20/10	715	10	1180	150	1800	7	7

\* number of varistors in one bulk

Dimensions					Part Number	VTDMSxxxP202
T <sub>max</sub> (mm)	W (mm)	L (mm)	D1 (mm)	D1 (mm)		
9.8	13.7	2.0	1.2x0.5	5x0.5	VTDM75P202	
10.0	13.7	2.2	1.2x0.5	5x0.5	VTDM95P202	
10.1	13.7	2.3	1.2x0.5	5x0.5	VTDM115P202	
10.2	13.7	2.5	1.2x0.5	5x0.5	VTDM130P202	
10.3	13.7	2.6	1.2x0.5	5x0.5	VTDM140P202	
10.4	13.7	2.7	1.2x0.5	5x0.5	VTDM150P202	
10.5	13.7	2.9	1.2x0.5	5x0.5	VTDM175P202	
10.6	13.7	3.0	1.2x0.5	5x0.5	VTDM230P202	
10.7	13.7	3.1	1.2x0.5	5x0.5	VTDM250P202	
10.8	13.7	3.2	1.2x0.5	5x0.5	VTDM275P202	
10.9	13.7	3.3	1.2x0.5	5x0.5	VTDM300P202	
11.1	13.7	3.4	1.2x0.5	5x0.5	VTDM320P202	
11.3	13.7	3.6	1.2x0.5	5x0.5	VTDM350P202	
11.5	13.7	3.8	1.2x0.5	5x0.5	VTDM385P202	
11.7	13.7	4.0	1.2x0.5	5x0.5	VTDM420P202	
11.8	13.7	4.1	1.2x0.5	5x0.5	VTDM440P202	
Footprint						
Dimensions					Part Number	VTDMSxxxP204
T <sub>max</sub> (mm)	W (mm)	L (mm)	D1 (mm)	D1 (mm)		
9.8	13.7	2.0	1.2x0.5	5x0.5	VTDM75P204	
10.0	13.7	2.2	1.2x0.5	5x0.5	VTDM95P204	
10.1	13.7	2.3	1.2x0.5	5x0.5	VTDM115P204	
10.2	13.7	2.5	1.2x0.5	5x0.5	VTDM130P204	
10.3	13.7	2.6	1.2x0.5	5x0.5	VTDM140P204	
10.4	13.7	2.7	1.2x0.5	5x0.5	VTDM150P204	
10.5	13.7	2.9	1.2x0.5	5x0.5	VTDM175P204	
10.6	13.7	3.0	1.2x0.5	5x0.5	VTDM230P204	
10.7	13.7	3.1	1.2x0.5	5x0.5	VTDM250P204	
10.8	13.7	3.2	1.2x0.5	5x0.5	VTDM275P204	
10.9	13.7	3.3	1.2x0.5	5x0.5	VTDM300P204	
11.1	13.7	3.4	1.2x0.5	5x0.5	VTDM320P204	
11.3	13.7	3.6	1.2x0.5	5x0.5	VTDM350P204	
11.5	13.7	3.8	1.2x0.5	5x0.5	VTDM385P204	
11.7	13.7	4.0	1.2x0.5	5x0.5	VTDM420P204	
11.8	13.7	4.1	1.2x0.5	5x0.5	VTDM440P204	
Footprint						

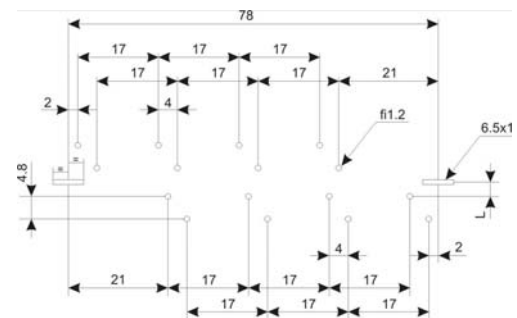
Dimensions					Part Number	VTDMSxxxP206
T <sub>max</sub> (mm)	W (mm)	L (mm)	D1 (mm)	D1 (mm)		
9.8	13.7	2.0	1.2x0.5	5x0.5	VTDM75P206	
10.0	13.7	2.2	1.2x0.5	5x0.5	VTDM95P206	
10.1	13.7	2.3	1.2x0.5	5x0.5	VTDM115P206	
10.2	13.7	2.5	1.2x0.5	5x0.5	VTDM130P206	
10.3	13.7	2.6	1.2x0.5	5x0.5	VTDM140P206	
10.4	13.7	2.7	1.2x0.5	5x0.5	VTDM150P206	
10.5	13.7	2.9	1.2x0.5	5x0.5	VTDM175P206	
10.6	13.7	3.0	1.2x0.5	5x0.5	VTDM230P206	
10.7	13.7	3.1	1.2x0.5	5x0.5	VTDM250P206	
10.8	13.7	3.2	1.2x0.5	5x0.5	VTDM275P206	
10.9	13.7	3.3	1.2x0.5	5x0.5	VTDM300P206	
11.1	13.7	3.4	1.2x0.5	5x0.5	VTDM320P206	
11.3	13.7	3.6	1.2x0.5	5x0.5	VTDM350P206	
11.5	13.7	3.8	1.2x0.5	5x0.5	VTDM385P206	
11.7	13.7	4.0	1.2x0.5	5x0.5	VTDM420P206	
11.8	13.7	4.1	1.2x0.5	5x0.5	VTDM440P206	

Footprint



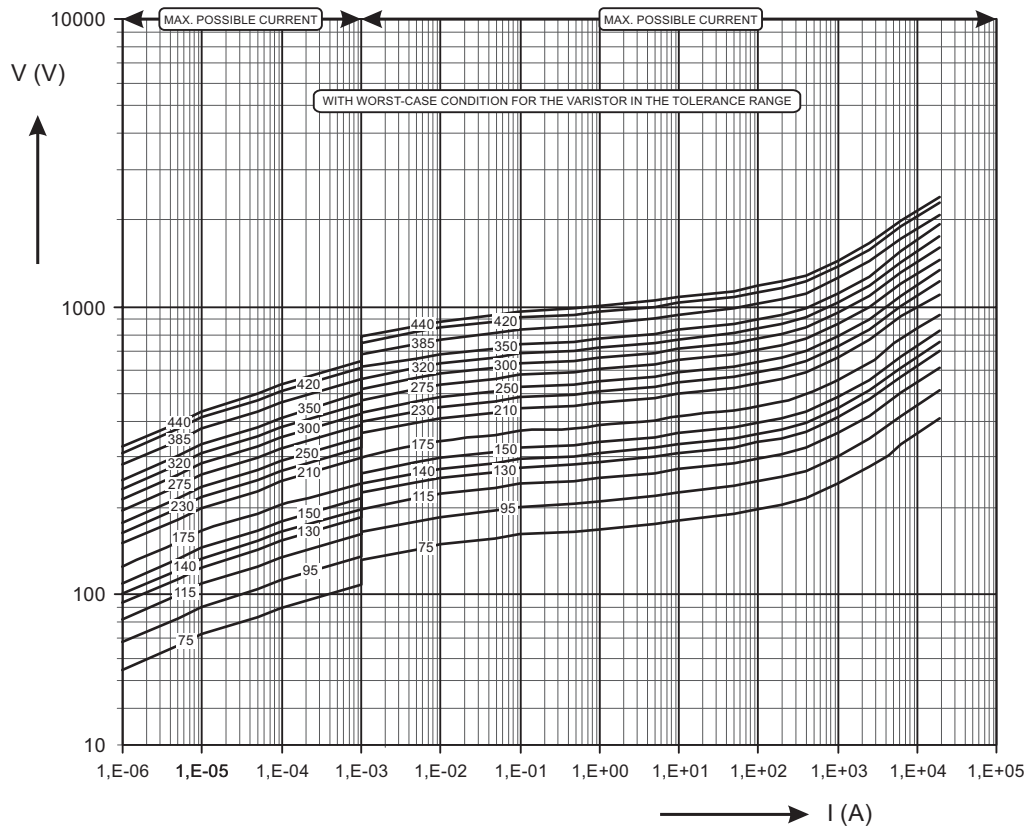
Dimensions					Part Number	VTDMSxxxP208
T <sub>max</sub> (mm)	W (mm)	L (mm)	D1 (mm)	D1 (mm)		
9.8	13.7	2.0	1.2x0.5	5x0.5	VTDM75P208	
10.0	13.7	2.2	1.2x0.5	5x0.5	VTDM95P208	
10.1	13.7	2.3	1.2x0.5	5x0.5	VTDM115P208	
10.2	13.7	2.5	1.2x0.5	5x0.5	VTDM130P208	
10.3	13.7	2.6	1.2x0.5	5x0.5	VTDM140P208	
10.4	13.7	2.7	1.2x0.5	5x0.5	VTDM150P208	
10.5	13.7	2.9	1.2x0.5	5x0.5	VTDM175P208	
10.6	13.7	3.0	1.2x0.5	5x0.5	VTDM230P208	
10.7	13.7	3.1	1.2x0.5	5x0.5	VTDM250P208	
10.8	13.7	3.2	1.2x0.5	5x0.5	VTDM275P208	
10.9	13.7	3.3	1.2x0.5	5x0.5	VTDM300P208	
11.1	13.7	3.4	1.2x0.5	5x0.5	VTDM320P208	
11.3	13.7	3.6	1.2x0.5	5x0.5	VTDM350P208	
11.5	13.7	3.8	1.2x0.5	5x0.5	VTDM385P208	
11.7	13.7	4.0	1.2x0.5	5x0.5	VTDM420P208	
11.8	13.7	4.1	1.2x0.5	5x0.5	VTDM440P208	

Footprint



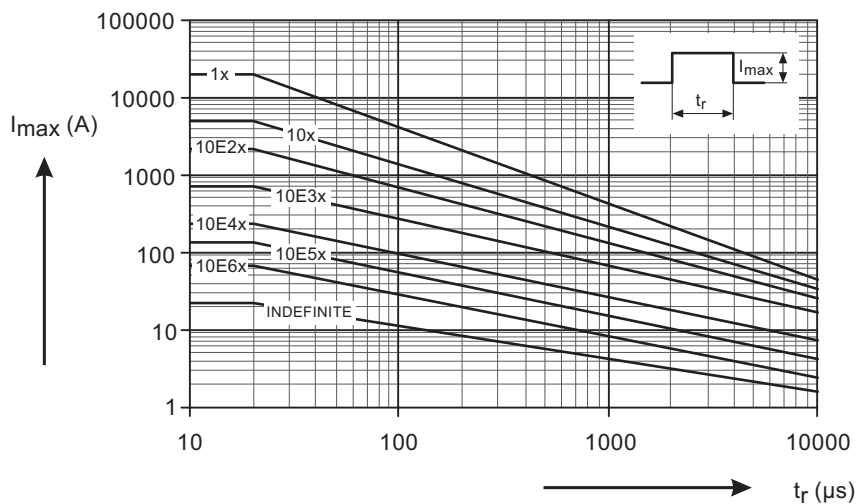
V-I Characteristics

VTDM75P202-VTDM440P202 (Single disc)



Pulse Ratings

VTDM75P202-VTDM440P202 (Single disc)



## Why should we use VTDs instead of varistors?

Under normal operating conditions, the AC voltage applied to an MOV is not expected to exceed the MOV's Maximum ACRMS Voltage Rating. Occasionally, overvoltage transients may occur that exceed these limits. If, unlike a short-duration transient, an MOV is subjected to a sustained abnormal overvoltage, limited current condition (as required by IEC 61643 and UL1449), the MOV may go into thermal runaway resulting in overheating, smoke, and potential fire. If there are devices or fuses tied to the AC line that limit the current flow, the MOV can overheat and potentially cause the protected device to overheat, which results in smoke and eventually fire, so some level of protection must be supplied to the MOV to prevent this failure mode. A thermal fuse has traditionally provided such protection, but in our case it is a thermal disconnecter, and the product's name is

## VTD - VARISTOR with THERMAL DECOUPLER



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Once a product has been selected, it should be tested by the user in all possible applications.

This brochure replaces the previous edition.