



**WORLD PRODUCTS INC.**  
ELECTRONIC COMPONENT SOLUTIONS



# THERMALLY PROTECTED VARISTORS

AUTOMOTIVE



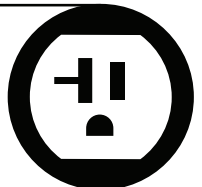
INDUSTRIAL



TELECOM



POWER SUPPLY



SURGE PROTECTION





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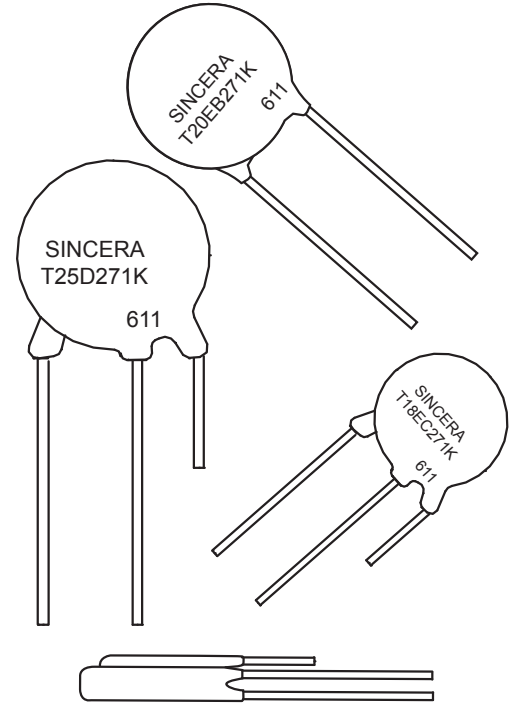
## World Products Inc. TVZ series is a two or three-leaded Thermally Protected Metal Oxide Varistor.

One lead of the TVZ varistor is connected to a thermal fuse which is designed to open when the varistor is under sustained abnormal over-voltage conditions. The TVZ series is designed to meet the abnormal over-voltage requirements of UL 1449 3rd edition, Section 37.4.

Traditional Metal Oxide Varistors withstand 150% of its rated voltage for a given duration. But Metal Oxide Varistors may fail to a short-circuit condition or fail to open when subjected to sustained steady-state over-voltage above its rated specifications. TVZ has a thermal fuse integrated with an MOV disk that responds to the MOV temperature and disconnects the MOV from the line, should the temperature or voltage exceed a certain level.

World Products Inc. three-leaded device is designed to be connected, via the monitor lead, to an indicator (such as an LED) to provide diagnostic features indicating if the MOV is disconnected from the circuit in the event the fuse element opens.

As a result of the integration of the thermal fuse attached to the MOV disc, Thermally Fused Varistors provide an instant response to unexpected over-voltage situations. Lower inductance is another benefit of the inclusion of a thermal fuse, enhancing clamping performance to sudden over-voltage transients. World Products Inc. Thermally Protected Varistors offer protection to sensitive downstream electric components.



### Features

- UL1449, UL1414 and cUL recognition or pending status.
- Patented product (Patent #6636403).
- Low Leakage Current under normal operating voltage.
- UL1449 3rd edition abnormal over-voltage test (10A, 5A, 2.5A, 0.5A and 0.125A) recognition pending.
- Wave solderable.
- High Surge Current Rating up to 40kA.
- -55°C to 85°C Operating Temperature Range.
- Three-leaded versions available, with fuses located on either the third or second lead.
- Compliance with Accelerated Aging Test Requirements per ANSI/IEEE C62.11 pending.
- UL60691 recognition pending.
- ISO and TS16949 certification.

### Marking

- SINCERA brand name.
- Part Marking representing the part number: T25D271K is TVZ25D271KBS.
- Date code first digit represents the year and second and third digits represent the week of the year. For example 611 date code is separated as follows: 6 = 2006 and 11 = The 11th week of the year. This date code system was implemented from 9/15/05.

### Approvals

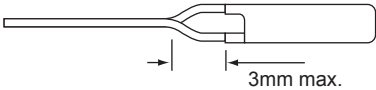
	14mm	18mm	20mm	25mm	34mm
UL and CUL 1449 Third Edition File # E196885	Pending	Pending	Pending	Pending	Pending
UL and CUL 1449 Third Edition 37.4 File #E196885	Pending	Pending	Pending	Pending	Pending
UL and CUL1414 File # E71602	Recognized	Recognized	Recognized	Recognized	Recognized
UL60691 File #E196885	Pending	Pending	Pending	Pending	Pending
Complies with accelerated aging test requirements ANSI/IEEE C62.11 File #E196885	Pending	Pending	Pending	Pending	Pending

### Applications

- Transient Voltage Surge Suppressor (TVSS) Products
- AC Panel Protection Modules
- AC Line Power Supplies
- Surge Protected Strip
- AC Power Meters
- Uninterruptable Power Supply
- White Goods
- Inverters
- DIN Rail
- AC/DC Power Supplies

## Ordering Information

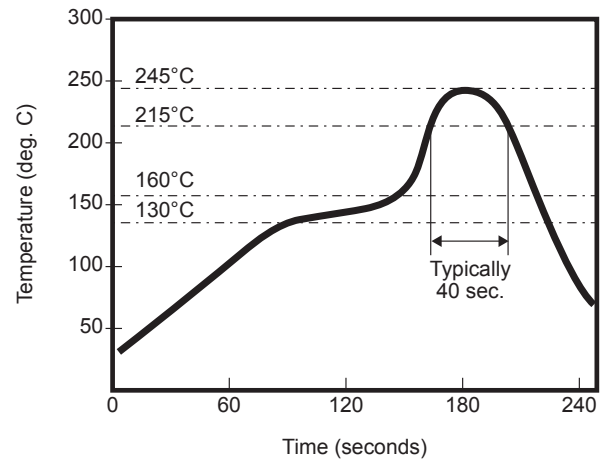
**TVZ 20 E B 241 K B S - N**  
**(1) (2) (3) (4) (5) (6) (7) (8) (9)**

<p><b>(1) Thermal Fuse Metal Oxide Varistor</b></p> <p><b>(2) Diameter</b>  <b>14:</b> 14mm  <b>18:</b> 18mm  <b>20:</b> 20mm  <b>25:</b> 25mm  <b>34:</b> 34mm</p> <p><b>(3) Energy Rating</b>  <b>D:</b> 25mm Standard Energy Rating  <b>E:</b> High Energy Rating  <b>R:</b> 34mm Standard Energy Rating</p> <p><b>(4) Fuse Location</b>  <b>Blank:</b> 3-Leaded, Fuse Located on Third Lead (Available in 25mm)  <b>B:</b> 2-Leaded, No Monitor Lead (Available in 14mm, 18mm, 20mm)  <b>C:</b> 3-Leaded, Fuse Located on Second Lead (Available in 14mm, 18mm, 20mm, 34mm)</p> <p><b>(5) Varistor Voltage/AC Voltage</b>                  Varistor Voltage for 14, 18, 20, &amp; 25mm, <b>201</b> = <math>20 \times 10^1 = 200\text{VDC}</math>                  AC Voltage for 34mm, <b>151</b> = 150VAC</p> <p><b>(6) Tolerance</b>  <b>K:</b> <math>\pm 10\%</math></p>	<p><b>(7) Packaging</b>  <b>B:</b> Bulk                  For taped and lead configuration of taped parts, see taping specifications for suffix codes.</p> <p><b>(8) Lead Configuration for Bulk Parts Only</b>  <b>S:</b> Straight (For varistor voltage <math>&lt;681\text{K}</math>), and inline crimped (for varistor voltage <math>\geq 681\text{K}</math>)  <b>L:</b> Inline crimped (For varistor voltage <math>&lt;681\text{K}</math>)  <b>N:</b> Varistor voltage <math>\geq 681</math> come standard with inline crimp (see illustration below) for straight disc seating on PC boards. If straight leads are required instead of inline crimp please use code "N" in this position.</p> <div style="text-align: center;">  <p><b>Inline Crimp</b></p> </div> <p><b>(9) N: RoHS Compliant - UL1414/CUL recognized.</b></p> <p><b>(10) Suffix for Custom Types</b>  <b>X33:</b> Alternative Design with 3mm Monitor Terminal (34mm only) See Fuse Configuration &amp; Dimensions for 34mm for more information.</p>
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## Absolute Maximum Ratings

Continuous RMS Current (Monitor Lead)	100mA
Typical Response Time	<15nseconds
Insulation Resistance	>1000MΩ
Hi-Pot Encapsulation	2500 VDC
Maximum Voltage-Temperature Coefficient	<0.01%/°C
Operating Temperature Range	-55°C to 85°C
Storage Temperature Range	-55°C to 125°C
Isolation Capability (when thermal element is open)	600VAC

## Soldering Profile



# THERMALLY PROTECTED VARISTORS

## Fuse Configuration and Dimensions

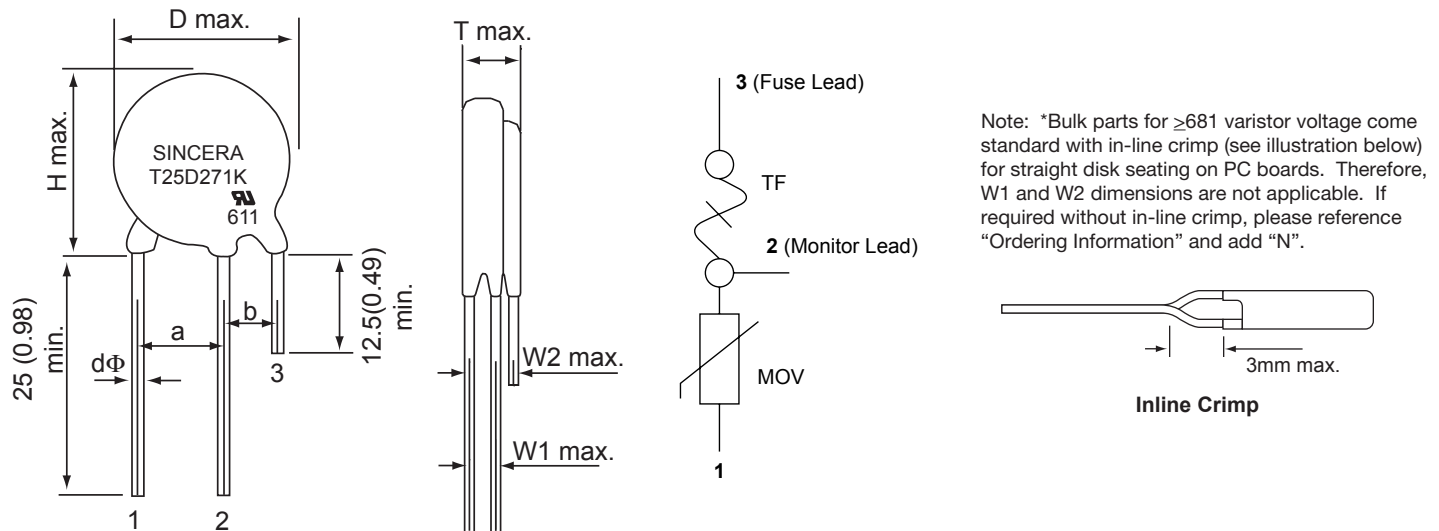
### Standard Series for 25mm

#### 3-Leaded, Fuse Located on Third Lead

Unit: mm (inch)

Varistor Type	25mm		
	T max	W1 max.	W2 max.
201K	7.9 (0.31)	2.1 (0.08)	3.7 (0.15)
221K	8.2 (0.32)	2.2 (0.09)	3.8 (0.15)
241K	8.3 (0.33)	2.3 (0.09)	3.9 (0.15)
271K	8.4 (0.33)	2.4 (0.09)	4.0 (0.16)
301K	8.6 (0.34)	2.6 (0.10)	4.2 (0.17)
331K	8.8 (0.35)	2.8 (0.11)	4.4 (0.17)
361K	8.9 (0.35)	2.9 (0.11)	4.5 (0.18)
391K	9.0 (0.35)	3.1 (0.12)	4.7 (0.19)
431K	9.2 (0.36)	3.3 (0.13)	4.9 (0.19)
471K	9.5 (0.37)	3.5 (0.14)	5.2 (0.20)
511K	9.9 (0.39)	3.7 (0.15)	5.5 (0.22)
561K	10.1 (0.40)	3.9 (0.15)	5.7 (0.22)
621K	10.4 (0.41)	4.2 (0.17)	6.0 (0.24)
681K	10.7 (0.42)	*4.5 (0.18)	*6.3 (0.25)
751K	11.1 (0.44)	*4.8 (0.19)	*6.7 (0.26)
781K	11.3 (0.44)	*5.0 (0.20)	*6.9 (0.27)
821K	11.4 (0.45)	*5.2 (0.20)	*7.1 (0.28)
911K	11.8 (0.46)	*5.6 (0.22)	*7.6 (0.30)
102K	12.4 (0.49)	*6.1 (0.24)	*8.1 (0.32)
112K	12.6 (0.50)	*6.6 (0.26)	*8.7 (0.34)

Series	Size	D max	H max	dΦ nom.	a	b
TVZ25	25mm	28.5 (1.12)	33.0 (1.30)	1.0 (0.039)	12.7 (0.50) ± 1.0 (0.039)	6.5 (0.26) ± 1.2 (0.047)



# THERMALLY PROTECTED VARISTORS

## Fuse Configuration and Dimensions (Continued)

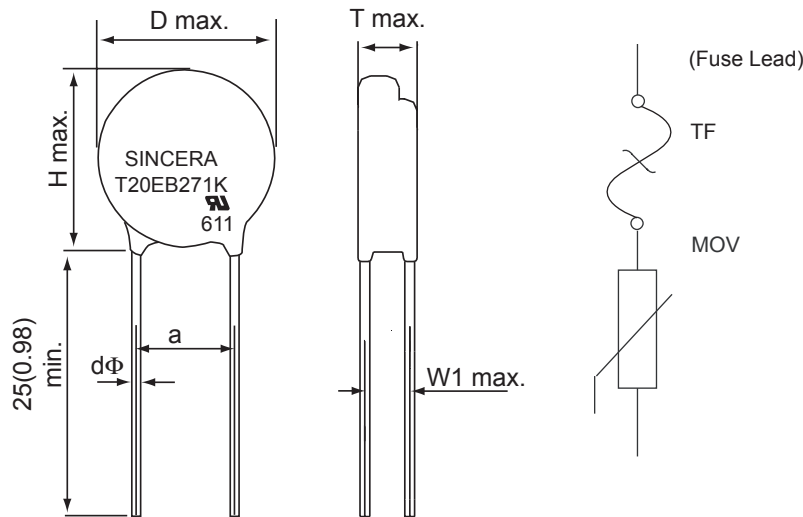
### B Series for 14mm, 18mm

#### 2-Leaded, No Monitor Lead

Unit: mm (inch)

Varistor Type	14mm			18mm		
	T max	a	W1 max.	T max	a	W1 max.
181K	6.2 (0.24)	7.5 (0.30)	3.4 (0.13)	7.4 (0.29)	7.5 (0.30)	3.4 (0.13)
201K	6.2 (0.24)	7.5 (0.30)	3.5 (0.14)	7.8 (0.31)	7.5 (0.30)	3.5 (0.14)
221K	6.3 (0.25)	7.5 (0.30)	3.6 (0.14)	8.0 (0.31)	7.5 (0.30)	3.6 (0.14)
241K	6.3 (0.25)	7.5 (0.30)	3.7 (0.15)	8.1 (0.32)	7.5 (0.30)	3.7 (0.15)
271K	6.4 (0.25)	7.5 (0.30)	3.8 (0.15)	8.2 (0.32)	7.5 (0.30)	3.8 (0.15)
311K	6.7 (0.26)	7.5 (0.30)	4.2 (0.17)	8.5 (0.33)	7.5 (0.30)	4.2 (0.17)
361K	6.7 (0.26)	7.5 (0.30)	4.3 (0.17)	8.5 (0.33)	7.5 (0.30)	4.3 (0.17)
391K	6.8 (0.27)	7.5 (0.30)	4.5 (0.18)	8.6 (0.34)	7.5 (0.30)	4.5 (0.18)
431K	7.0 (0.28)	7.5 (0.30)	4.7 (0.19)	8.7 (0.34)	7.5 (0.30)	4.7 (0.19)
471K	7.2 (0.28)	7.5 (0.30)	4.9 (0.19)	9.0 (0.37)	7.5 (0.30)	4.9 (0.19)
511K	7.4 (0.29)	7.5 (0.30)	5.2 (0.20)	9.4 (0.37)	7.5 (0.30)	5.2 (0.20)
621K	8.0 (0.31)	7.5 (0.30)	5.7 (0.22)	10.0 (0.39)	7.5 (0.30)	5.7 (0.22)
681K	8.2 (0.32)	7.5 (0.30)	*6.0 (0.24)	10.3 (0.41)	7.5 (0.30)	*6.0 (0.24)
751K				10.4 (0.41)	7.5 (0.30)	*6.4 (0.25)
821K				10.8 (0.43)	7.5 (0.30)	*6.8 (0.27)
911K				11.3 (0.44)	7.5 (0.30)	*7.2 (0.28)
951K				11.8 (0.46)	7.5 (0.30)	*7.8 (0.31)
102K				11.8 (0.46)	7.5 (0.30)	*7.8 (0.31)
122K				13.0 (0.51)	7.5 (0.30)	*9.0 (0.35)

Series	Size	D max	H max	dΦ nom.	a
TVZ14	14mm	17.5 (0.69)	20.5 (0.98)	0.8 (0.03)	7.5(0.30) ± 1.0 (0.039)
TVZ18	18mm	21.0 (0.83)	24.0 (0.94)	*0.8 (0.031)	7.5 (0.30) ± 1.0 (0.039)



Note: \*Bulk parts for ≥681 varistor voltage come standard with in-line crimp (see illustration below) for straight disk seating on PC boards. Therefore, W1 dimensions are not applicable. If required without in-line crimp, please reference "Ordering Information" and add "N".



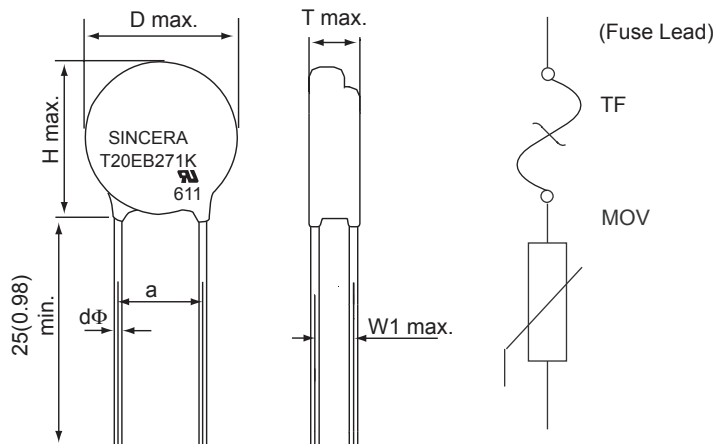
## Fuse Configuration and Dimensions (Continued)

### B Series for 20mm 2-Leaded, No Monitor Lead

Unit: mm (inch)

Varistor Type	20mm		
	T max	a	W1 max.
181K	7.6 (0.30)	7.5 (0.30)	3.4 (0.13)
201K	7.9 (0.31)	7.5 (0.30)	3.6 (0.14)
221K	8.1 (0.32)	7.5 (0.30)	3.7 (0.15)
241K	8.2 (0.32)	7.5 (0.30)	3.8 (0.15)
271K	8.3 (0.33)	7.5 (0.30)	3.9 (0.15)
301K			
311K	8.5 (0.33)	7.5 (0.30)	4.3 (0.17)
331K			
361K	8.6 (0.34)	7.5 (0.30)	4.4 (0.17)
391K	8.7 (0.34)	7.5 (0.30)	4.6 (0.18)
431K	8.8 (0.35)	7.5 (0.30)	4.8 (0.19)
471K	9.1 (0.36)	7.5 (0.30)	5.1 (0.20)
511K	9.5 (0.37)	7.5 (0.30)	5.4 (0.21)
561K			
621K	10.1 (0.40)	7.5 (0.30)	5.9 (0.23)
681K	10.4 (0.41)	7.5 (0.30)	*6.2 (0.24)
751K	10.7 (0.43)	7.5 (0.30)	*6.6 (0.26)
781K			
821K	11.0 (0.43)	7.5 (0.30)	*7.0 (0.28)
911K	11.5 (0.45)	7.5 (0.30)	*7.5 (0.30)
951K	12.0 (0.47)	7.5 (0.30)	*8.0 (0.31)
102K	12.0 (0.47)	7.5 (0.30)	*8.0 (0.31)
112K			
122K	13.0 (0.51)	7.5 (0.30)	*8.3 (0.33)

Series	Size	D max	H max	dΦ nom.	a
TVZ20	20mm	23.0 (0.90)	28.0 (1.10)	0.8 (0.031) for 181 - 681K, 1.0 (0.039) for 751K - 122K	7.5 (0.30) ± 1.0 (0.039)



Note: \*Bulk parts for ≥681 varistor voltage come standard with in-line crimp (see illustration below) for straight disk seating on PC boards. Therefore, W1 dimensions are not applicable. If required without in-line crimp, please reference "Ordering Information" and add "N".





# THERMALLY PROTECTED VARISTORS

## Fuse Configuration and Dimensions (Continued)

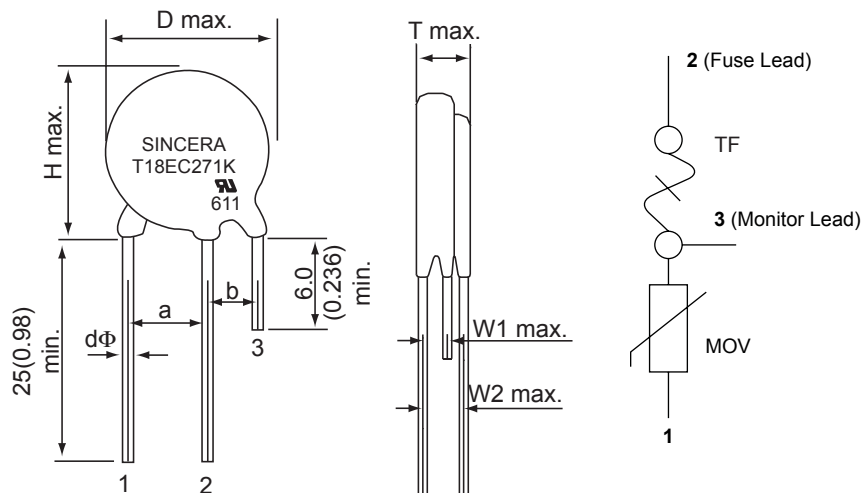
### C Series for 14mm, 18mm, 20mm

#### 3-Leaded, Fuse Located on Second Lead

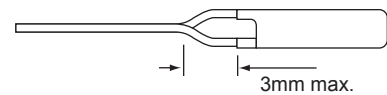
Unit: mm (inch)

Varistor Type	14mm			18mm			20mm		
	T max	W1 max.	W2 max.	T max	W1 max.	W2 max.	T max	W1 max.	W2 max.
181K	7.4 (0.29)	1.9 (0.07)	3.4 (0.13)	7.4 (0.29)	1.9 (0.07)	3.4 (0.13)	7.6 (0.30)	1.9 (0.07)	3.4 (0.13)
201K	7.8 (0.31)	2.0 (0.08)	3.5 (0.14)	7.8 (0.31)	2.0 (0.08)	3.5 (0.14)	7.9 (0.31)	2.0 (0.08)	3.6 (0.14)
221K	8.0 (0.31)	2.0 (0.08)	3.6 (0.14)	8.0 (0.31)	2.0 (0.08)	3.6 (0.14)	8.1 (0.32)	2.1 (0.08)	3.7 (0.15)
241K	8.1 (0.32)	2.1 (0.08)	3.7 (0.15)	8.1 (0.32)	2.1 (0.08)	3.7 (0.15)	8.2 (0.32)	2.2 (0.09)	3.8 (0.15)
271K	8.2 (0.32)	2.2 (0.09)	3.8 (0.15)	8.2 (0.32)	2.2 (0.09)	3.8 (0.15)	8.3 (0.33)	2.3 (0.09)	3.9 (0.15)
311K	8.4 (0.33)	2.4 (0.09)	4.0 (0.16)	8.4 (0.33)	2.4 (0.09)	4.0 (0.16)	8.4 (0.33)	2.5 (0.10)	4.1 (0.16)
361K	8.5 (0.34)	2.7 (0.11)	4.3 (0.17)	8.5 (0.33)	2.7 (0.11)	4.3 (0.17)	8.6 (0.34)	2.8 (0.11)	4.4 (0.17)
391K	8.6 (0.34)	2.9 (0.11)	4.5 (0.18)	8.6 (0.34)	2.9 (0.11)	4.5 (0.18)	8.7 (0.34)	3.0 (0.12)	4.6 (0.18)
431K	8.7 (0.34)	3.0 (0.12)	4.7 (0.19)	8.7 (0.34)	3.0 (0.12)	4.7 (0.19)	8.8 (0.35)	3.2 (0.13)	4.8 (0.19)
471K	9.0 (0.37)	3.2 (0.13)	4.9 (0.19)	9.0 (0.35)	3.2 (0.13)	4.9 (0.19)	9.1 (0.36)	3.4 (0.13)	5.1 (0.20)
511K	9.4 (0.38)	3.4 (0.13)	5.2 (0.20)	9.4 (0.37)	3.4 (0.13)	5.2 (0.20)	9.5 (0.37)	3.6 (0.14)	5.4 (0.21)
621K	10.0 (0.39)	3.9 (0.15)	5.7 (0.22)	10.0 (0.39)	3.9 (0.15)	5.7 (0.22)	10.1 (0.40)	4.1 (0.16)	5.9 (0.23)
681K	10.3 (0.41)	*4.2 (0.17)	*6.0 (0.24)	10.3 (0.41)	*4.2 (0.17)	*6.0 (0.24)	10.4 (0.41)	*4.4 (0.17)	*6.2 (0.24)
751K				10.4 (0.41)	*4.5 (0.18)	*6.4 (0.25)	10.7 (0.42)	*4.7 (0.19)	*6.6 (0.26)
821K				10.8 (0.43)	*4.9 (0.19)	*6.8 (0.27)	11.0 (0.43)	*5.1 (0.20)	*7.0 (0.28)
911K				11.3 (0.44)	*5.3 (0.21)	*7.2 (0.28)	11.5 (0.45)	*5.5 (0.22)	*7.5 (0.30)
951K				11.5 (0.45)	*5.5 (0.22)	*7.5 (0.30)	11.8 (0.46)	*5.5 (0.22)	*7.8 (0.31)
102K				11.8 (0.46)	*5.7 (0.22)	*7.8 (0.31)	12.0 (0.47)	*5.5 (0.22)	*8.1 (0.32)
122K				12.8 (0.50)	*6.9 (0.27)	*8.8 (0.35)	13.0 (0.51)	*7.0 (0.27)	*9.0 (0.35)

Series	Size	D max	H max	dΦ nom.	a	b
TVZ14	14mm	17.5 (0.69)	20.5 (0.98)	0.8 (0.03)	7.5 (0.30) ± 1.0 (0.039)	5.0 (0.20) ± 1.0 (0.039)
TVZ18	18mm	21.0 (0.83)	24.0 (0.94)	0.8 (0.031)	7.5 (0.30) ± 1.0 (0.039)	5.0 (0.20) ± 1.0 (0.039)
TVZ20	20mm	23.0 (0.90)	28.0 (1.10)	0.8 (0.031) for 181-681K 1.0 (0.039) for 751-122K	7.5 (0.30) ± 1.0 (0.039)	5.0 (0.20) ± 1.0 (0.039)



Note: \*Bulk parts for ≥681 varistor voltage come standard with in-line crimp (see illustration below) for straight disk seating on PC boards. Therefore, W1 dimensions are not applicable. If required without in-line crimp, please reference "Ordering Information" and add "N".



**In-line Crimp**

# THERMALLY PROTECTED VARISTORS

## Fuse Configuration and Dimensions (Continued)

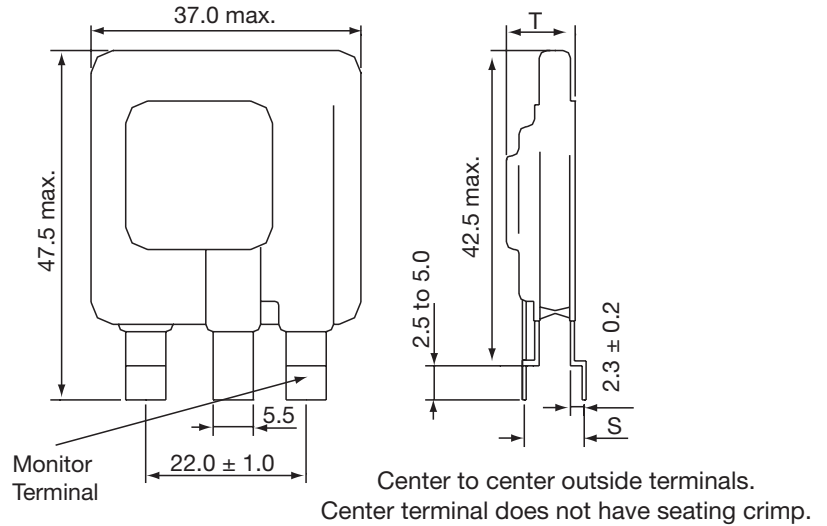
### C Series for 34mm

#### 3-Leaded, Fuse Located on Second Lead

Unit: mm (inch)

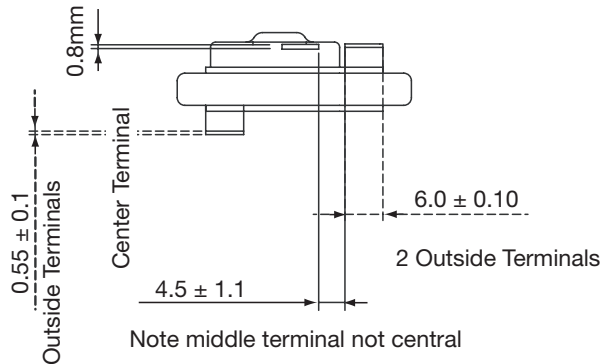
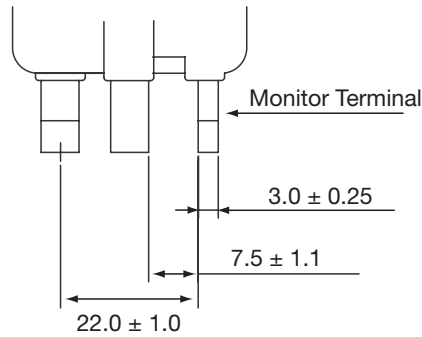
AC Voltage Type	34mm	
	T max	S
111K	11.9	5.2 ± 0.65
131K	12.2	5.5 ± 0.65
141K	12.3	5.7 ± 0.85
151K	12.4	5.9 ± 0.85
181K	12.8	6.3 ± 0.85
201K	13.0	6.5 ± 0.85
251K	11.8	6.25 ± 0.85
271K	12.0	6.50 ± 0.85
301K	12.3	6.8 ± 1.0
321K	12.5	6.9 ± 1.0
331K	13.0	7.2 ± 1.0
351K	13.1	7.4 ± 1.0
391K	13.2	7.6 ± 1.0
421K	13.4	7.85 ± 1.0
461K	13.7	8.15 ± 1.0
481K	13.9	8.25 ± 1.0
511K	14.2	8.6 ± 1.0
551K	14.8	8.65 ± 1.0
571K	15.0	8.85 ± 1.0
621K	15.4	9.25 ± 1.0
661K	15.8	9.65 ± 1.0
681K	16.0	9.85 ± 1.0
751K	16.3	10.65 ± 1.0

Faces of terminal in line ±0.75mm.



### Alternative Design with 3mm Monitor Terminal

Add suffix X33, see Ordering Information.

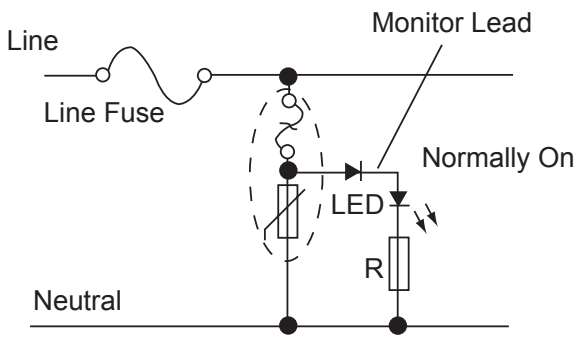


Notes:  
Dimension in mm are typical, unless otherwise specified.

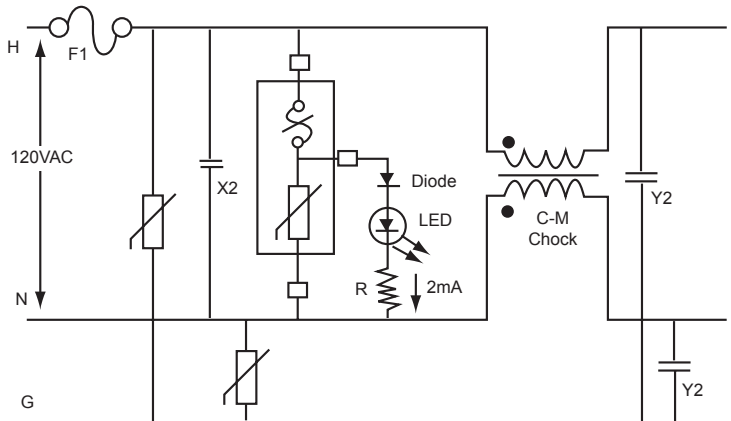
# THERMALLY PROTECTED VARISTORS

## Varistor Application Examples

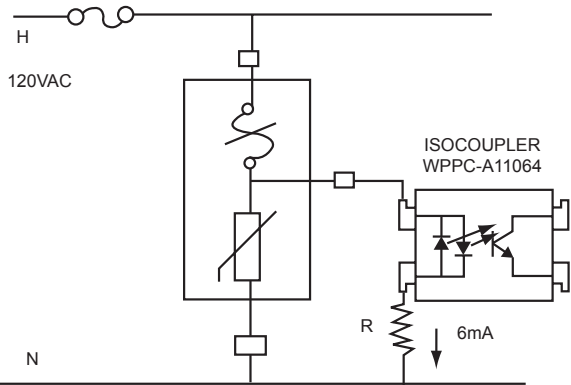
**AC Line Protection example**



**AC Line Protection example**



**AC Line Protection example**



# THERMALLY PROTECTED VARISTORS

## Specifications

**25mm --- Standard Series, 3- Leaded, Fuse Located on Third Lead --- D, Standard Energy Rating**

Part Number	Maximum Ratings					Specifications		
	Maximum Continuous Working Voltage		Maximum Non-Repetitive Surge Current (8/20us)	Maximum Non-Repetitive Surge Energy (10/1000us)	Maximum Clamping Voltage at Specified Current (8/20us) /100A	Nominal Voltage at 1mA(DC) Current		Typical Capacitance at 1KHz
	V <sub>M(AC)</sub>	V <sub>M(DC)</sub>	I <sub>TM</sub>	W <sub>TM</sub>	V <sub>C</sub>	V <sub>N(DC) min.</sub>	V <sub>N(DC) max.</sub>	C
	(V)	(V)	(A)	(J)	(V)	(V)	(V)	(pF)
TVZ25D201KBS	130	175	18000	200	340	185	225	3600
TVZ25D221KBS	140	180	18000	225	360	198	242	3300
TVZ25D241KBS	150	200	18000	235	395	216	264	3050
TVZ25D271KBS	180	230	18000	245	465	255	311	2600
TVZ25D301KBS	195	250	18000	255	505	270	330	2400
TVZ25D331KBS	210	275	18000	270	540	297	363	2200
TVZ25D361KBS	230	300	18000	315	595	324	396	2050
TVZ25D391KBS	250	330	18000	342	650	351	429	1900
TVZ25D431KBS	275	370	18000	370	710	387	473	1700
TVZ25D471KBS	300	385	18000	390	775	423	517	1600
TVZ25D511KBS	320	420	18000	422	840	459	561	1400
TVZ25D561KBS	360	470	18000	460	910	522	638	1200
TVZ25D621KBS	390	505	18000	495	1025	558	682	1180
TVZ25D681KBS	420	560	18000	515	1120	612	748	1100
TVZ25D751KBS	460	615	18000	530	1240	675	825	1000
TVZ25D781KBS	485	640	18000	540	1240	702	858	980
TVZ25D821KBS	510	675	18000	550	1350	738	902	920
TVZ25D911KBS	550	745	18000	600	1400	819	1001	880
TVZ25D102KBS	625	825	18000	630	1620	900	1100	760
TVZ25D112KBS	680	865	18000	700	1800	962	1175	650

# THERMALLY PROTECTED VARISTORS

## Specifications (Continued)

**14mm --- B Series, 2 -Leaded, No Monitor Lead --- E, High Energy Rating**

Part Number	Maximum Ratings					Specifications		
	Maximum Continuous Working Voltage		Maximum Non-Repetitive Surge Current (8/20us)	Maximum Non-Repetitive Surge Energy (10/1000us)	Maximum Clamping Voltage at Specified Current (8/20us) /50A	Nominal Voltage at 1mA(DC) Current		Typical Capacitance at 1MHz
	V <sub>M(AC)</sub>	V <sub>M(DC)</sub>	I <sub>TM</sub>	W <sub>TM</sub>	V <sub>C</sub>	V <sub>N(DC) min.</sub>	V <sub>N(DC) max.</sub>	C
	(V)	(V)	(A)	(J)	(V)	(V)	(V)	(pF)
TVZ14EB181KBS	115	150	6000	53	300	162	198	1100
TVZ14EB201KBS	130	170	6000	60	340	184	226	100
TVZ14EB221KBS	140	180	6000	60	360	200	240	900
TVZ14EB241KBS	150	200	6000	66	395	216	264	800
TVZ14EB271KBS	175	225	6000	72	455	243	297	700
TVZ14EB311KBS	200	230	6000	78	530	281	344	630
TVZ14EB361KBS	230	250	6000	87	595	324	396	550
TVZ14EB391KBS	250	320	6000	98	650	351	429	500
TVZ14EB431KBS	275	350	6000	102	710	387	473	450
TVZ14EB471KBS	300	385	6000	115	775	423	517	400
TVZ14EB511KBS	320	420	6000	125	840	459	561	380
TVZ14EB621KBS	385	505	6000	128	1025	558	682	360
TVZ14EB681KBS	420	560	6000	139	1120	612	748	300

# THERMALLY PROTECTED VARISTORS

## Specifications (Continued)

**18mm --- B Series, 2 -Leaded, No Monitor Lead --- E, High Energy Rating**

Part Number	Maximum Ratings					Specifications		
	Maximum Continuous Working Voltage		Maximum Non-Repetitive Surge Current (8/20us)	Maximum Non-Repetitive Surge Energy (10/1000us)	Maximum Clamping Voltage at Specified Current (8/20us) /80A	Nominal Voltage at 1mA(DC) Current		Typical Capacitance at 1KHz
	V <sub>M(AC)</sub> (V)	V <sub>M(DC)</sub> (V)	I <sub>TM</sub> (A)	W <sub>TM</sub> (J)	V <sub>C</sub> (V)	V <sub>N(DC)</sub> min. (V)	V <sub>N(DC)</sub> max. (V)	C (pF)
TVZ18EB181KBS	115	150	9000	135	320	162	198	1300
TVZ18EB201KBS	130	170	9000	140	340	184	226	1270
TVZ18EB221KBS	140	180	9000	150	360	200	240	1220
TVZ18EB241KBS	150	200	9000	155	395	216	264	1200
TVZ18EB271KBS	175	225	9000	163	455	243	297	1050
TVZ18EB311KBS	200	230	9000	170	505	281	344	1000
TVZ18EB361KBS	230	250	9000	190	545	324	396	950
TVZ18EB391KBS	250	320	9000	220	595	351	429	870
TVZ18EB431KBS	275	350	9000	245	650	387	473	800
TVZ18EB471KBS	300	385	9000	270	710	423	517	730
TVZ18EB511KBS	320	420	9000	290	775	459	561	660
TVZ18EB621KBS	385	505	9000	314	840	558	682	570
TVZ18EB681KBS	420	560	9000	330	910	612	748	560
TVZ18EB751KBS	460	615	9000	345	1025	675	825	540
TVZ18EB821KBS	510	675	9000	355	1120	738	901	500
TVZ18EB911KBS	550	745	9000	365	1240	819	1001	460
TVZ18EB951KBS	575	785	9000	378	1250	856	1047	400
TVZ18EB102KBS	625	825	9000	388	1350	900	1100	310
TVZ18EB122KBS	750	975	9000	415	1400	1080	1320	300

# THERMALLY PROTECTED VARISTORS

## Specifications (Continued)

### 20mm --- B Series, 2 -Leaded, No Monitor Lead --- E, High Energy Rating

Part Number	Maximum Ratings					Specifications		
	Maximum Continuous Working Voltage		Maximum Non-Repetitive Surge Current (8/20us)	Maximum Non-Repetitive Surge Energy (10/1000us)	Maximum Clamping Voltage at Specified Current (8/20us) /100A	Nominal Voltage at 1mA(DC) Current		Typical Capacitance at 1MHz
	V <sub>M(AC)</sub>	V <sub>M(DC)</sub>	I <sub>TM</sub>	W <sub>TM</sub>	V <sub>C</sub>	V <sub>N(DC) min.</sub>	V <sub>N(DC) max.</sub>	C
	(V)	(V)	(A)	(J)	(V)	(V)	(V)	(pF)
TVZ20EB181KBS	115	150	12000	56	300	162	198	2400
TVZ20EB201KBS	130	170	12000	135	340	184	226	1900
TVZ20EB221KBS	140	180	12000	170	360	200	240	1750
TVZ20EB241KBS	150	200	12000	180	395	216	264	1600
TVZ20EB271KBS	175	225	12000	190	455	243	297	1400
TVZ20EB311KBS	200	230	12000	200	530	281	344	1250
TVZ20EB361KBS	230	250	12000	210	595	324	396	1100
TVZ20EB391KBS	250	320	12000	228	650	351	429	1000
TVZ20EB431KBS	275	350	12000	275	710	387	473	900
TVZ20EB471KBS	300	385	12000	305	775	423	517	800
TVZ20EB511KBS	320	420	12000	330	840	459	561	750
TVZ20EB621KBS	385	505	12000	350	1025	558	682	700
TVZ20EB681KBS	420	560	12000	382	1120	612	748	600
TVZ20EB751KBS	460	615	12000	420	1240	675	825	200
TVZ20EB821KBS	510	670	12000	430	1355	738	902	350
TVZ20EB911KBS	550	745	12000	435	1500	819	1001	300
TVZ20EB951KBS	575	785	12000	440	1568	856	1047	275
TVZ20EB102KBS	625	825	12000	450	1650	900	1100	250
TVZ20EB122KBS	750	975	12000	460	1980	1080	1320	175

### 14mm --- C Series, 3 -Leaded, Fuse Located on Second Lead --- E, High Energy Rating

Part Number	Maximum Ratings					Specifications		
	Maximum Continuous Working Voltage		Maximum Non-Repetitive Surge Current (8/20us)	Maximum Non-Repetitive Surge Energy (10/1000us)	Maximum Clamping Voltage at Specified Current (8/20us) /50A	Nominal Voltage at 1mA(DC) Current		Typical Capacitance at 1MHz
	V <sub>M(AC)</sub>	V <sub>M(DC)</sub>	I <sub>TM</sub>	W <sub>TM</sub>	V <sub>C</sub>	V <sub>N(DC) min.</sub>	V <sub>N(DC) max.</sub>	C
	(V)	(V)	(A)	(J)	(V)	(V)	(V)	(pF)
TVZ14EC181KBS	115	150	6000	53	300	162	198	1100
TVZ14EC201KBS	130	170	6000	60	340	184	226	1000
TVZ14EC221KBS	140	180	6000	60	360	200	240	900
TVZ14EC241KBS	150	200	6000	66	395	216	264	800
TVZ14EC271KBS	175	225	6000	72	455	243	297	700
TVZ14EC311KBS	200	230	6000	78	530	281	344	630
TVZ14EC361KBS	230	250	6000	87	595	324	396	550
TVZ14EC391KBS	250	320	6000	98	650	351	429	500
TVZ14EC431KBS	275	350	6000	102	710	387	473	450
TVZ14EC471KBS	300	385	6000	115	775	423	517	400
TVZ14EC511KBS	320	420	6000	125	840	459	561	380
TVZ14EC621KBS	385	505	6000	128	1025	558	682	360
TVZ14EC681KBS	420	560	6000	139	1120	612	748	300

# THERMALLY PROTECTED VARISTORS

## Specifications (Continued)

**18mm --- C Series, 3 -Leaded, Fuse Located on Second Lead --- E, High Energy Rating**

Part Number	Maximum Ratings					Specifications		
	Maximum Continuous Working Voltage		Maximum Non-Repetitive Surge Current (8/20us)	Maximum Non-Repetitive Surge Energy (10/1000us)	Maximum Clamping Voltage at Specified Current (8/20us) /80A	Nominal Voltage at 1mA(DC) Current		Typical Capacitance at 1KHz
	V <sub>M(AC)</sub>	V <sub>M(DC)</sub>	I <sub>TM</sub>	W <sub>TM</sub>	V <sub>C</sub>	V <sub>N(DC) min.</sub>	V <sub>N(DC) max.</sub>	C
	(V)	(V)	(A)	(J)	(V)	(V)	(V)	(pF)
TVZ18EC181KBS	115	150	9000	135	320	162	198	1300
TVZ18EC201KBS	130	170	9000	140	340	184	226	1270
TVZ18EC221KBS	140	180	9000	150	360	200	240	1220
TVZ18EC241KBS	150	200	9000	155	395	216	264	1200
TVZ18EC271KBS	175	225	9000	163	455	243	297	1050
TVZ18EC311KBS	200	230	9000	170	505	281	344	1000
TVZ18EC361KBS	230	250	9000	190	545	324	396	950
TVZ18EC391KBS	250	320	9000	220	595	351	429	870
TVZ18EC431KBS	275	350	9000	245	650	387	473	800
TVZ18EC471KBS	300	385	9000	270	710	423	517	730
TVZ18EC511KBS	320	420	9000	290	775	459	561	660
TVZ18EC621KBS	385	505	9000	314	840	558	682	570
TVZ18EC681KBS	420	560	9000	330	910	612	748	560
TVZ18EC751KBS	460	615	9000	345	1025	675	825	540
TVZ18EC821KBS	510	675	9000	355	1120	738	901	500
TVZ18EC911KBS	550	745	9000	365	1240	819	1001	460
TVZ18EC951KBS	575	785	9000	378	1250	856	1047	400
TVZ18EC102KBS	625	825	9000	388	1350	900	1100	310
TVZ18EC122KBS	750	975	9000	415	1400	1080	1320	300



# THERMALLY PROTECTED VARISTORS

## Specifications (Continued)

### 20mm --- C Series, 3 -Leaded, Fuse Located on Second Lead --- E, High Energy Rating

Part Number	Maximum Ratings					Specifications		
	Maximum Continuous Working Voltage		Maximum Non-Repetitive Surge Current (8/20us)	Maximum Non-Repetitive Surge Energy (10/1000us)	Maximum Clamping Voltage at Specified Current (8/20us) /100A	Nominal Voltage at 1mA(DC) Current		Typical Capacitance at 1 MHz
	V <sub>M(AC)</sub>	V <sub>M(DC)</sub>	I <sub>TM</sub>	W <sub>TM</sub>	V <sub>C</sub>	V <sub>N(DC) min.</sub>	V <sub>N(DC) max.</sub>	C
	(V)	(V)	(A)	(J)	(V)	(V)	(V)	(pF)
TVZ20EC181KBS	115	150	12000	56	300	162	198	2400
TVZ20EC201KBS	130	170	12000	135	340	184	226	1900
TVZ20EC221KBS	140	180	12000	170	360	200	240	1750
TVZ20EC241KBS	150	200	12000	180	395	216	264	1600
TVZ20EC271KBS	175	225	12000	190	455	243	297	1400
TVZ20EC311KBS	200	230	12000	200	530	281	344	1250
TVZ20EC361KBS	230	250	12000	210	595	324	396	1100
TVZ20EC391KBS	250	320	12000	228	650	351	429	1000
TVZ20EC431KBS	275	350	12000	275	710	387	473	900
TVZ20EC471KBS	300	385	12000	305	775	423	517	800
TVZ20EC511KBS	320	420	12000	330	840	459	561	750
TVZ20EC621KBS	385	505	12000	350	1025	558	682	700
TVZ20EC681KBS	420	560	12000	382	1120	612	748	600
TVZ20EC751KBS	460	615	12000	420	1240	675	825	200
TVZ20EC821KBS	510	670	12000	430	1355	738	902	350
TVZ20EC911KBS	550	745	12000	435	1500	819	1001	300
TVZ20EC951KBS	575	785	12000	440	1568	856	1047	275
TVZ20EC102KBS	625	825	12000	450	1650	900	1100	250
TVZ20EC122KBS	750	975	12000	460	1980	1080	1320	175

# THERMALLY PROTECTED VARISTORS

## Specifications (Continued)

### 34mm --- C Series, 3 -Leaded, Fuse Located on Second Lead --- Standard Energy Rating

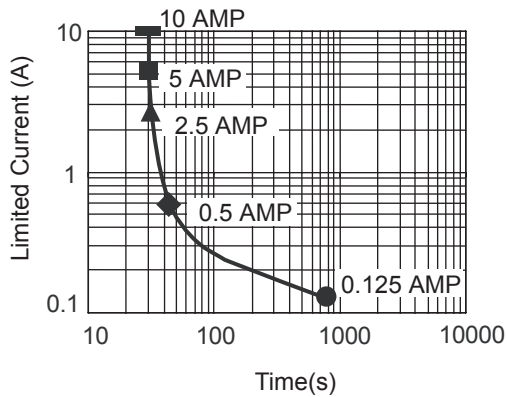
Part Number	Maximum Ratings					Electrical Characteristics			
	Continuous Rated Voltage		Rated Single Pulse Transient			Varistor Voltage @ 1mA DC		Maximum Clamping Voltage @ Test Current 8/20us 200A	Typical Capacitance at 1MHz
	AC RMS Volts	DC Volts	MCOV Surge Arrester	Energy	Peak Surge Current 8/20us	Min Volts	Max Volts	Volts	C
			VM(AC) RMS Volts	WTM 1 x Pulse Joules	ITM 1 x Pulse Amps				
TVZ34RC111KBS	115	150	98	235	40000 <sup>1</sup>	163	202	305	11500
TVZ34RC131KBS	130	175	111	270	40000 <sup>2</sup>	184	228	345	10000
TVZ34RC141KBS	140	188	119	291	40000 <sup>3</sup>	198	248	375	9000
TVZ34RC151KBS	150	200	128	300	40000 <sup>4</sup>	212	268	405	8000
TVZ34RC181KBS	180	240	153	330	40000 <sup>5</sup>	254	312	488	6800
TVZ34RC201KBS	200	265	170	335	40000	283	357	540	6500
TVZ34RC251KBS	250	330	213	370	40000	354	429	650	5000
TVZ34RC271KBS	275	369	234	400	40000	389	473	730	4500
TVZ34RC301KBS	300	400	255	435	40000	433	528	780	4050
TVZ34RC321KBS	320	420	272	460	40000	462	561	830	3800
TVZ34RC331KBS	330	435	281	475	40000	476	581	855	3700
TVZ34RC351KBS	350	460	298	500	40000	505	616	910	3500
TVZ34RC391KBS	385	506	327	550	40000	555	678	1005	3300
TVZ34RC421KBS	420	560	357	600	40000	610	748	1130	3000
TVZ34RC461KBS	460	610	391	620	40000	642	783	1188	2800
TVZ34RC481KBS	480	640	408	650	40000	670	825	1240	2700
TVZ34RC511KBS	510	675	434	700	40000	735	910	1350	2500
TVZ34RC551KBS	550	700	468	735	40000	770	939	1415	2250
TVZ34RC571KBS	575	730	489	770	40000	805	1000	1480	2200
TVZ34RC621KBS	620	800	527	840	40000	880	1074	1589	2100
TVZ34RC661KBS	660	850	561	900	40000	940	1160	1720	2000
TVZ34RC681KBS	680	890	578	950	40000	980	1195	1772	1970
TVZ34RC751KBS	750	970	638	1050	40000	1080	1320	2000	1800

**Notes:**

1. Peak current applies to applications rated up to 100VAC<sub>RMS</sub>, 132VDC. Peak current is 30kA<sub>max</sub> for applications greater than 100VAC<sub>RMS</sub>, 132VDC.
2. Peak current applies to applications rated up to 115VAC<sub>RMS</sub>, 145VDC. Peak current is 30kA<sub>max</sub> for applications greater than 115VAC<sub>RMS</sub>, 145VDC.
3. Peak current applies to applications rated up to 123VAC<sub>RMS</sub>, 165VDC. Peak current is 30kA<sub>max</sub> for applications greater than 123VAC<sub>RMS</sub>, 165VDC.
4. Peak current applies to applications rated up to 132VAC<sub>RMS</sub>, 176VDC. Peak current is 30kA<sub>max</sub> for applications greater than 132VAC<sub>RMS</sub>, 176VDC.
5. Peak current applies to applications rated up to 158VAC<sub>RMS</sub>, 211VDC. Peak current is 30kA<sub>max</sub> for applications greater than 158VAC<sub>RMS</sub>, 211VDC.

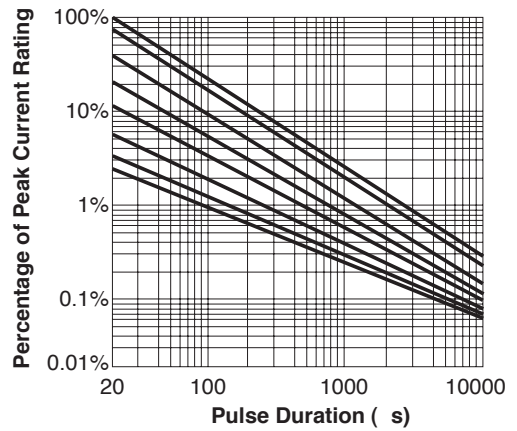
## Thermal Characteristics

### Limited Current Test



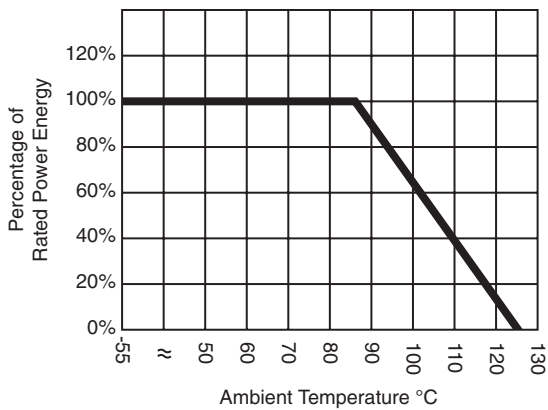
(Typical time to open according to UL1449 Abnormal Overvoltage Limited Current Test.)

### Peak Current Per Pulse Vs. Pulse Duration



- 1 Repetition - (Top line on graph)
- 2 Repetitions
- 10 Repetitions
- 10<sup>2</sup> Repetitions
- 10<sup>3</sup> Repetitions
- 10<sup>4</sup> Repetitions
- 10<sup>5</sup> Repetitions
- 10<sup>6</sup> Repetitions - (Bottom line on graph)

### Temperature Derating Curve Power and Energy Rating Vs. Temperature

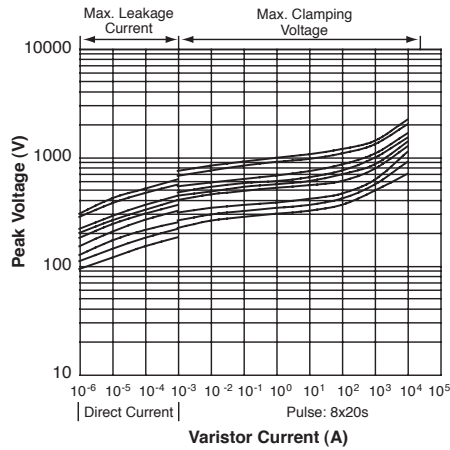


# THERMALLY PROTECTED VARISTORS

## V-I Characteristics

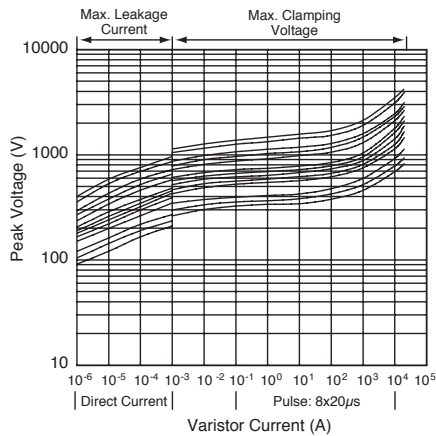
### 14mm Disc Size

681K - (Top line on graph)  
 621K  
 471K  
 431K  
 391K  
 361K  
 271K  
 241K  
 201K - (Bottom line on graph)



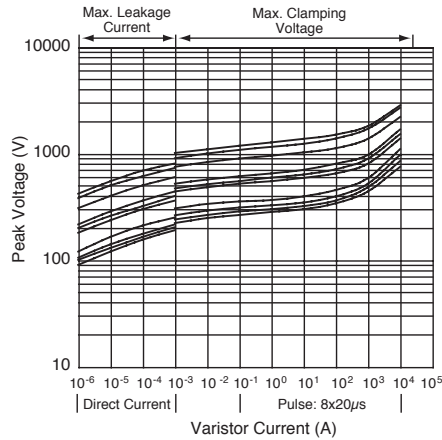
### 18mm Disc Size

911K - (Top line on graph)  
 821K  
 681K  
 621K  
 511K  
 471K  
 431K  
 391K  
 361K  
 271K  
 241K  
 201K - (Bottom line on graph)



### 20mm Disc Size

911K - (Top line on graph)  
 821K  
 681K  
 471K  
 431K  
 391K  
 271K  
 241K  
 221K  
 201K - (Bottom line on graph)

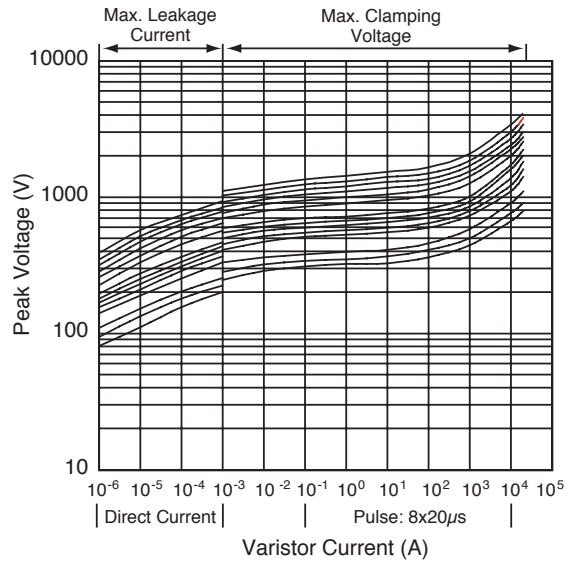


At idle power, current levels shown to the left of the discontinuity illustrate typically the high end leakage current. However, if lower leakage current levels are desired, they may be guaranteed. In the clamping voltage region to the right of the discontinuity, maximum clamping voltage is plotted.

## V-I Characteristics (Continued)

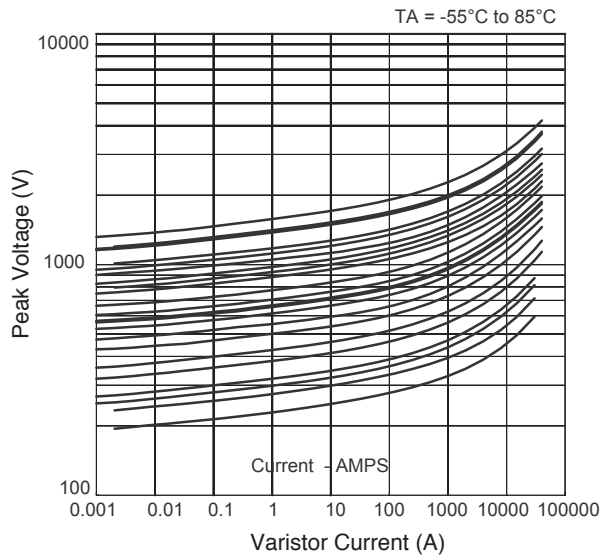
### 25mm Disc Size

911K - (Top line on graph)  
 821K  
 751K  
 681K  
 621K  
 511K  
 471K  
 431K  
 391K  
 361K  
 271K  
 241K  
 201K - (Bottom line on graph)



### 34mm Disc Size

751K - (Top line on graph)  
 681K  
 661K  
 571K  
 551K  
 511K  
 481K  
 441K  
 421K  
 391K  
 351K  
 331K  
 321K  
 301K  
 271K  
 251K  
 201K  
 181K - (Bottom line on graph)



At idle power, current levels shown to the left of the discontinuity illustrate typically the high end leakage current. However, if lower leakage current levels are desired, they may be guaranteed. In the clamping voltage region to the right of the discontinuity, maximum clamping voltage is plotted.

# THERMALLY PROTECTED VARISTORS

## Taping Specifications

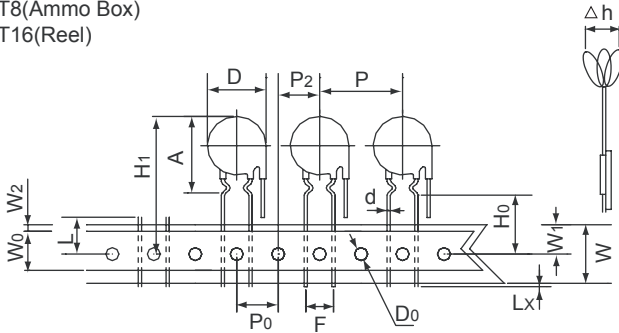
### 14mm

Available for rated voltages  $\leq 420\text{VAC}$ . Contact World Products Inc. for availability of higher voltages.

Unit: mm

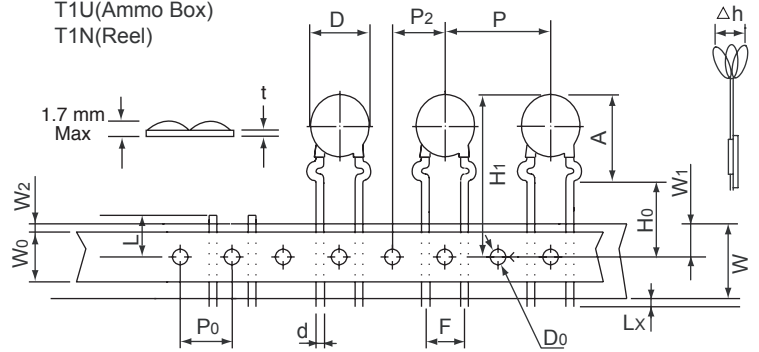
### Inward Crimp

T8(Ammo Box)  
T16(Reel)



### Outward Crimp

T1U(Ammo Box)  
T1N(Reel)



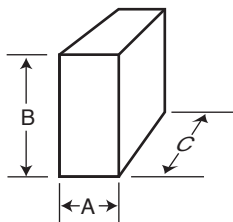
ITEM		Disk Size
		14 $\phi$
Taping Code		T1N, T1U, T8, T16
Body Diameter	D	17.5 Max.
Lead Wire Diameter	d	0.8 $\pm$ 0.05
Pitch of Component	P	25.4 $\pm$ 1
Hole Center to Component Center	P <sub>2</sub>	12.7 $\pm$ 0.3
Feed Hole Pitch	P <sub>0</sub>	12.7 $\pm$ 0.2
Lead to Lead Distance (Center to Center)	F	7.5 $\pm$ 0.8
Component Alignment	$\Delta h$	2.0 Max.
Base paper Tape Width	W	18 +1, -0.5
Adhesive Tape Width	W <sub>0</sub>	10 Min.
Hole Position	W <sub>1</sub>	9.0 $\pm$ 0.5
Adhesive Tape Border	W <sub>2</sub>	1.5 Max.
Lead Wire Clinch Height	H <sub>0</sub>	16 $\pm$ 1
Component Height	H <sub>1</sub>	40 Max.
Lead-Wire Protrusion	Lx	1.0 Max.
Feed Hole Diameter	D <sub>0</sub>	4.0 $\pm$ 0.2
Total Tape Thickness	t	< 0.7
Length of Clipped Lead	L	11 Max.
Component Height from Seating Plane	A	22.5 Max.

Based on EIA-468-B Specification.

## Ammo Box

Unit: mm

Ammo Box Taping Codes: T1U, T8



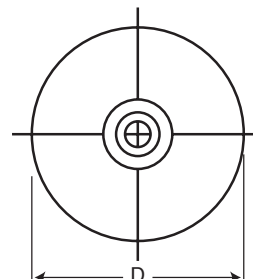
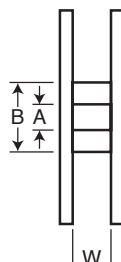
A = 65 max  
B = 250 max  
C = 340 max

<300VAC = 500 to 1000 pieces  
 $\geq 300\text{VAC}$  = 300 pieces

## Reel

Unit: mm

Reel Taping Codes: T1N, T16



A = Approximately 30 $\phi$   
B = Approximately 95 $\phi$   
D = 350 $\phi$  max  
W = Approximately 50

<300VAC = 500 to 1000 pieces  
 $\geq 300\text{VAC}$  = 300 pieces

# THERMALLY PROTECTED VARISTORS

## Taping Specifications

18mm & 20mm

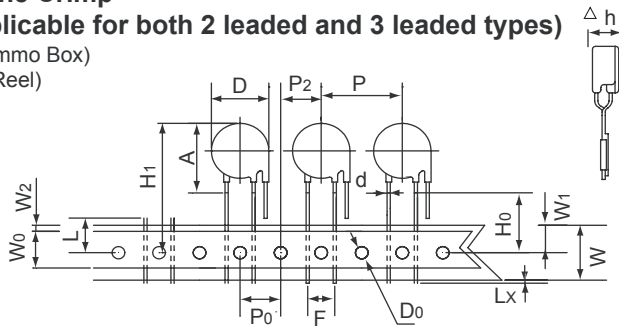
Unit: mm

### In-Line Crimp

(Applicable for both 2 leaded and 3 leaded types)

T2 (Ammo Box)

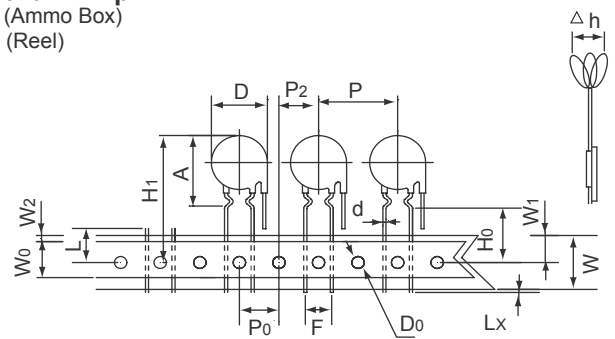
T25 (Reel)



### Inward Crimp

T40 (Ammo Box)

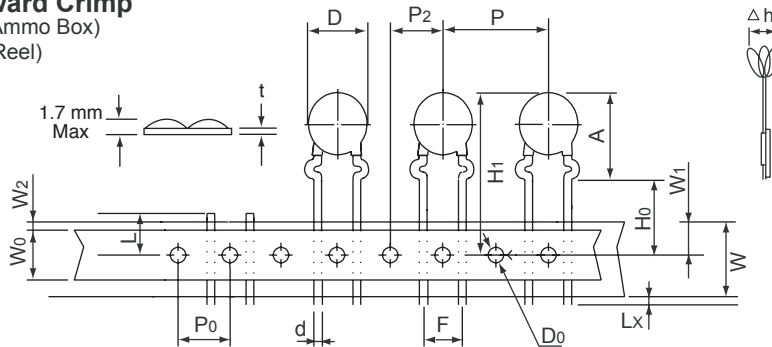
T4X (Reel)



### Outward Crimp

T45 (Ammo Box)

T1X (Reel)



ITEM		Disk Size	
		T18Φ, T20Φ	
Taping Code		T45, T1X, T40, T4X	T2, T25
Body Diameter	D	24 Max*	24 Max*
Lead Wire Diameter	d	0.8 ± 0.1	0.8 ± 0.1
Pitch of Component	P	25.4 ± 1.0	25.4 ± 1.0
Feed Hole Pitch	P0	12.7 ± 0.2	12.7 ± 0.2
Hole Center to Component Center	P2	12.7 ± 0.3	12.7 ± 0.3
Lead to Lead Distance (Center to Center)	F	7.5 ± 0.8	7.5 ± 0.8
Component Alignment	Δh	2.0 Max.	2.0 Max.
Base paper Tape Width	W	18 +1, -0.5	18 +1, -0.5
Adhesive Tape Width	W0	10 Min.	10 Min.
Hole Position	W1	9 ± 0.5	9 ± 0.5
Adhesive Tape Border	W2	1.5 Max.	1.5 Max.
Lead Wire Clinch Height	H0	16 ± 1	16 ± 1
Component Height	H1	48 Max.*	48 Max.*
Lead-Wire Protrusion	Lx	1.0 Max.	1.0 Max.
Feed Hole Diameter	D0	4 ± 0.2	4 ± 0.2
Total Tape Thickness	t	< 0.7	< 0.7
Length of Clipped Lead	L	11 Max.	11 Max.
Component Height from Seating Plane	A	29 Max.*	28 Max.*

\*For 18Φ, D = 22 Max., H1 = 46 Max. and A = 26 Max.  
Based on EIA-468-B specification.

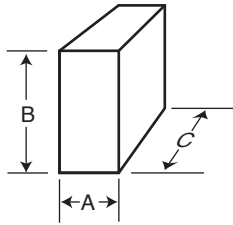
# THERMALLY PROTECTED VARISTORS

## Taping Specifications

### 18mm & 20mm (Continued)

Available for rated voltages  $\leq 420\text{VAC}$ . Contact World Products Inc. for availability of higher voltages.

### Ammo Box



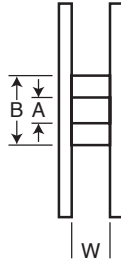
Unit: mm

Ammo Box Taping Codes:  
T2, T45, T40

A = 65 max  
B = 250 max  
C = 340 max

$< 300\text{VAC}$  = 500 pieces  
 $\geq 300\text{VAC}$  = 300 pieces

### Reel

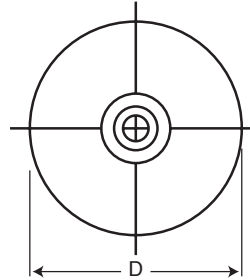


Unit: mm

Reel Taping Codes:  
T25, T1X, T4X

A = Approximately  $30\phi$   
B = Approximately  $95\phi$   
D =  $350\phi$  max  
W = Approximately 50

$< 300\text{VAC}$  = 500 pieces  
 $\geq 300\text{VAC}$  = 300 pieces

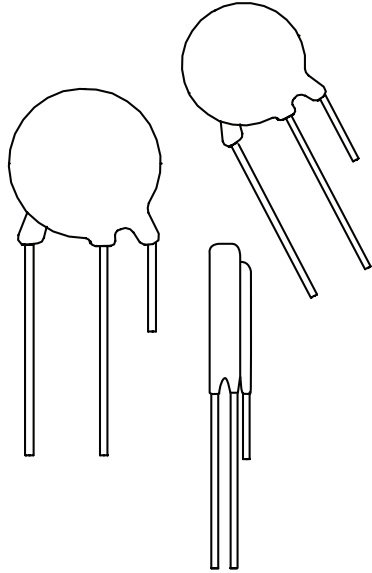


## Standard Bulk Packaging

Disk Size mm	Varistor Voltage	Quantity pcs/bag	Quantity pcs/carton
14	ALL	300	3000
18	ALL	200	2000
20	181K-681K	100	1000
	Above 751K	50	500
25	181K-681K	50	500
	Above 751K	30	300
34	201K-391K	170	340
	431K-621K	160	320
	681K-112K	130	260

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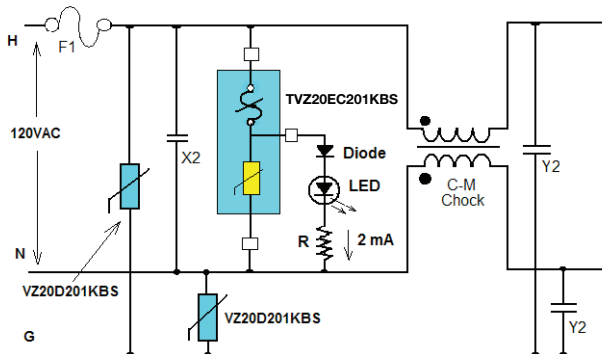




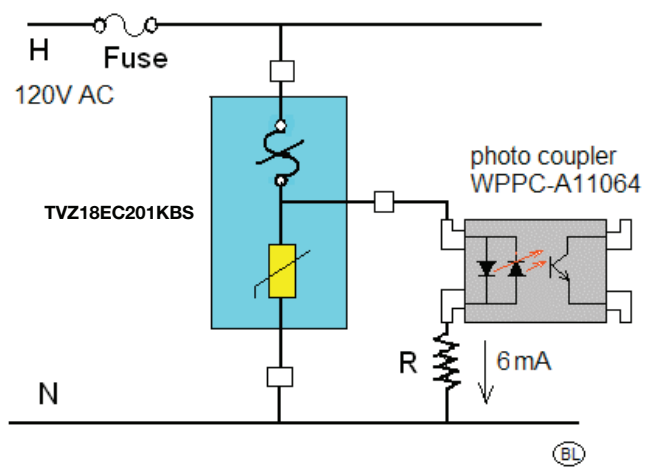
# THERMALLY PROTECTED VARISTOR APPLICATIONS

**Thermo-Fuse Varistors** are transient voltage surge suppression products. The configuration is two or three leads, one lead of this device is connected to a thermal fuse, which may open when the varistor is subjected to prolonged over-voltage conditions in both AC and DC applications, thereby preventing catastrophic failure mode of the varistor. This device (in the three leaved configuration) further provides for diagnostic capabilities in the customers circuit.

Thermo-Fuse Varistor In AC Line Protection



Thermo-Fuse Varistor In AC Line Protection 2



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