

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

■ Features

1. Body size: $\Phi 7$ mm ~ $\Phi 20$ mm
2. Wide operating voltage range: 115 Vac ~ 680Vac
3. High surge current rating up to 13KA
4. High energy rating up to 720 Joule
5. Agency recognition: UL 1449 3rd /cUL/VDE/CQC
6. TVR10-D, 14-D, and 20-D meet IEC 60950-1 Annex Q requirement
7. TVR20-D series for SPD type 2 is available
8. RoHS compliant & Halogen-free series are available



■ Recommended Applications

1. Power supply
2. Home appliance
3. Industrial equipment
4. Telecommunication or telephone system

■ Part Number Code

$\Phi 7$ mm~ $\Phi 20$ mm

T	V	R	0	5	1	8	0	K	I	A					W
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Product Type		Size		Varistor Voltage(V_{1mA})		Tolerance of V_{1mA}		Internal Control Code		Packaging		Optional Suffix			
TVR	THINKING Varistor TVR series		07	$\Phi 7$ mm	180	$18 \times 10^0 V = 18V$	K	$\pm 10\%$	0001~ZZZZ	A	Tape (hole pitch:12.7mm)	W	High surge series, RoHS compliant		
			10	$\Phi 10$ mm	241	$24 \times 10^1 V = 240V$				E	Tape (hole pitch:15.0mm)	K	High surge series, RoHS compliant & Halogen-Free		
			14	$\Phi 14$ mm	102	$10 \times 10^2 V = 1000V$				B	Tape + ammo box packing	S	High surge series for UL 1449 3 RD type 2 application, RoHS compliant (TVR20 only)		
			20	$\Phi 20$ mm						R	Tape + reel packing	N	High surge series for UL 1449 3 RD type 2 application, RoHS compliant & Halogen-Free (TVR20 only)		
					Appearance					C	Bulk + cut lead (followed by the codes of 2 lead length)				
					S	Straight lead, epoxy coating				Blank	Bulk				
					F	Y kink lead, epoxy coating									
					J	L kink lead, epoxy coating									

Note: 1. Optional suffix will be the 11th digit if packaging and internal control codes are not coded.

2. "+" (instead of "**") as part of body marking is upon request.

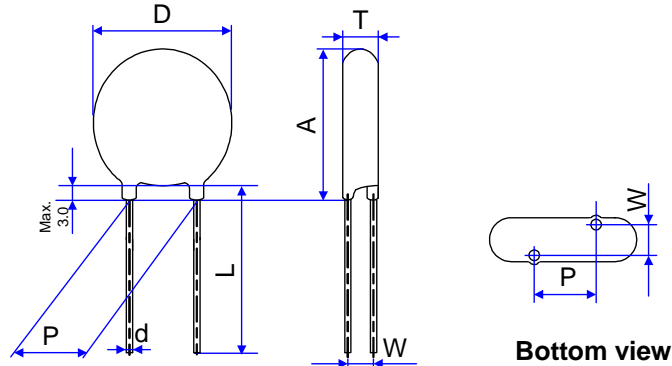
Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

Structures and Dimensions

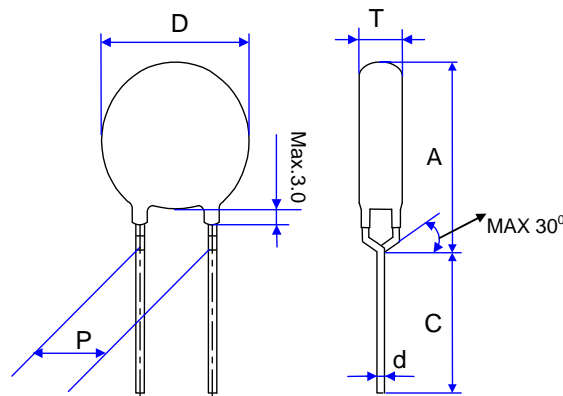
- S Type (Straight lead)



(Unit :mm)

Disc Size	D.	L min.	d	P.	A max.	T max.	W
07-D	7.5~9.5	26.5	0.6±0.02	5±1	12.5	Please refer to Electrical Characteristics Table	
10-D	12.0~14.0	26.5	0.8±0.02	7.5±1	17.5		
14-D	16.0~18.5	26.5	0.8±0.02	7.5±1	21.5		
20-D	22~24.5	22.5	1.0±0.02	10±1	28.5		

- F Type (Y kink lead)



(Unit :mm)

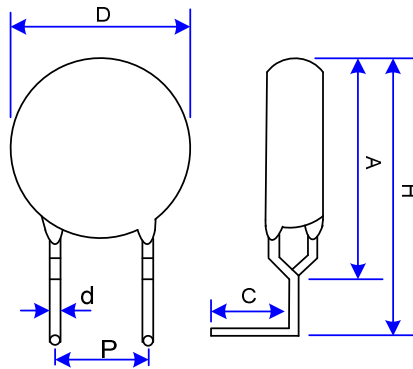
Disc Size	D.	C min.	d	P.	A max.	T max.	W
07-D	7.5~9.5	25	0.6±0.02	5±1	12.5	Please refer to Electrical Characteristics Table	
10-D	12.0~14.0	25	0.8±0.02	7.5±1	18.0		
14-D	16.0~18.5	25	0.8±0.02	7.5±1	22.0		
20-D	22~24.5	20	1.0±0.02	10±1	29.0		

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Disc Type Varistor for Surge Protection (High Surge Series)

- J Type (L kink lead)



(Unit :mm)

Disc Size	Dmax.	C	d	P	Amax.	Hmax.	T max.
10-D	14.0	4.0±1	0.8±0.02	7.5±1	18.0	22.0	Please refer to Electrical Characteristics Table
14-D	18.5		0.8±0.02	7.5±1	22.5	26.5	

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Disc Type Varistor for Surge Protection (High Surge Series)

Electrical Characteristics

07-D Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Operating Voltage		Max. Clamping Voltage (8/20μs)		Max. Surge Current (8/20μs)	Rated Power	Max. Energy (10/1000μs)	Reference Capacitance @1KHz	Dimension			UL1449 3 rd SPD TYPE
		V _{1mA}	V _{AC(rms)}	V _{DC}	I _p	V _P	I _{max}	W	E	C _p	T _{min}	T _{max}	W ±1.0	
		(V)	(V)	(V)	(A)	(V)	(A)	(W)	(J)	(PF)	(mm)			
TVR07181-D	TVR07181KSW	180 (162~198)	115	150	10	300	1800	0.25	19	255	2.0	3.9	1.4	4
TVR07201-D	TVR07201KSW	200 (180~220)	130	170	10	340	1800	0.25	21	230	2.1	4.0	1.5	4
TVR07221-D	TVR07221KSW	220 (198~242)	140	180	10	360	1800	0.25	23	210	2.1	4.0	1.5	4
TVR07241-D	TVR07241KSW	240(216~264)	150	200	10	395	1800	0.25	25	195	2.3	4.2	1.6	4
TVR07271-D	TVR07271KSW	270 (243~297)	175	225	10	455	1800	0.25	28	175	2.4	4.4	1.7	4
TVR07301-D	TVR07301KSW	300 (270~330)	195	250	10	500	1800	0.25	32	155	2.7	4.4	1.9	4
TVR07331-D	TVR07331KSW	330 (297~363)	215	275	10	550	1800	0.25	34	140	2.8	4.5	2.0	4
TVR07361-D	TVR07361KSW	360 (324~396)	230	300	10	595	1800	0.25	37	130	2.9	4.6	2.1	4
TVR07391-D	TVR07391KSW	390 (351~429)	250	320	10	650	1800	0.25	40	120	3.1	4.8	2.3	4
TVR07431-D	TVR07431KSW	430 (387~473)	275	350	10	710	1800	0.25	46	100	3.0	5.1	2.3	4
TVR07471-D	TVR07471KSW	470 (423~517)	300	385	10	775	1800	0.25	49	90	3.2	5.2	2.4	4
TVR07511-D	TVR07511KSW	510 (459~561)	320	410	10	845	1800	0.25	54	85	3.4	5.4	2.6	4
TVR07561-D	TVR07561KSW	560 (504~616)	350	450	10	930	1800	0.25	55	80	3.6	5.5	2.8	4
TVR07621-D	TVR07621KSW	620 (558~682)	395	510	10	1020	1800	0.25	59	80	3.9	5.9	3.0	4
TVR07681-D	TVR07681KSW	680 (612~748)	420	560	10	1120	1800	0.25	62	75	4.1	6.2	3.2	4
TVR07751-D	TVR07751KSW	750(675~825)	465	615	10	1235	1800	0.25	66	70	4.4	6.4	3.5	4
TVR07821-D	TVR07821KSW	820 (738~902)	510	670	10	1355	1800	0.25	71	65	4.5	6.4	3.2	4

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10-D Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Operating Voltage		Max. Clamping Voltage (8/20µs)		Max. Surge Current (8/20µs)	Rated Power	Max. Energy (10/1000µs)	Reference Capacitance @1KHz	Dimension			UL1449 3 rd SPD TYPE
		V _{1mA}	V _{AC(rms)}	V _{DC}	I _p	V _P	I _{max}	W	E	C _p	T _{min}	T _{max.}	W ±1.0	
		(V)	(V)	(V)	(A)	(V)	(A)	(W)	(J)	(PF)	(mm)			
TVR10181-D	TVR10181KSW	180 (162~198)	115	150	25	300	4000	0.4	47	570	2.4	4.3	1.6	4
TVR10201-D	TVR10201KSW	200 (180~220)	130	170	25	340	4000	0.4	52	520	2.5	4.4	1.7	3
TVR10221-D	TVR10221KSW	220 (198~242)	140	180	25	360	4000	0.4	58	470	2.5	4.4	1.7	3
TVR10241-D	TVR10241KSW	240 (216~264)	150	200	25	395	4000	0.4	64	420	2.7	4.6	1.8	3
TVR10271-D	TVR10271KSW	270 (243~297)	175	225	25	455	4000	0.4	67	370	2.8	4.8	1.9	3
TVR10301-D	TVR10301KSW	300 (270~330)	195	250	25	500	4000	0.4	70	340	3.1	4.8	2.1	3
TVR10331-D	TVR10331KSW	330 (297~363)	215	275	25	550	4000	0.4	72	320	3.2	4.9	2.2	3
TVR10361-D	TVR10361KSW	360 (324~396)	230	300	25	595	4000	0.4	76	300	3.3	5.0	2.3	3
TVR10391-D	TVR10391KSW	390 (351~429)	250	320	25	650	4000	0.4	82	280	3.5	5.2	2.5	3
TVR10431-D	TVR10431KSW	430 (387~473)	275	350	25	710	4000	0.4	93	250	3.4	5.5	2.5	3
TVR10471-D	TVR10471KSW	470 (423~517)	300	385	25	775	4000	0.4	99	240	3.6	5.6	2.6	3
TVR10511-D	TVR10511KSW	510 (459~561)	320	410	25	845	4000	0.4	107	220	3.8	5.8	2.8	3
TVR10561-D	TVR10561KSW	560 (504~616)	350	450	25	930	4000	0.4	113	200	4.0	5.9	3.0	3
TVR10621-D	TVR10621KSW	620 (558~682)	395	510	25	1020	4000	0.4	125	190	4.3	6.3	3.2	3
TVR10681-D	TVR10681KSW	680 (612~748)	420	560	25	1120	4000	0.4	128	180	4.9	6.6	3.4	3
TVR10751-D	TVR10751KSW	750 (675~825)	465	615	25	1235	4000	0.4	134	170	4.9	6.8	3.7	3
TVR10821-D	TVR10821KSW	820 (738~902)	510	670	25	1355	4000	0.4	146	140	4.9	6.8	3.4	3
TVR10911-D	TVR10911KSW	910 (819~1001)	550	745	25	1500	4000	0.4	152	130	5.3	7.2	3.7	3
TVR10102-D	TVR10102KSW	1000 (900~1100)	625	825	25	1650	4000	0.4	170	120	5.7	7.5	4.0	3
TVR10112-D	TVR10112KSW	1100 (990~1210)	680	895	25	1815	4000	0.4	180	110	5.8	8.0	4.3	3

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14-D Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Operating Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Rated Power	Max. Energy (10/1000 μ s)	Reference Capacitance @1KHz	Dimension			UL1449 3 rd SPD TYPE
		V _{1mA}	V _{AC(rms)}	V _{DC}	I _p	V _P	I _{max}	W	E	C _p	T _{min}	T _{max.}	W ± 1.0	
		(V)	(V)	(V)	(A)	(V)	(A)	(W)	(J)	(PF)	(mm)			
TVR14181-D	TVR14181KSW	180 (162~198)	115	150	50	300	8000	0.6	60	1000	2.4	4.3	1.6	3
TVR14201-D	TVR14201KSW	200 (180~220)	130	170	50	340	8000	0.6	82	900	2.5	4.4	1.7	3
TVR14221-D	TVR14221KSW	220 (198~242)	140	180	50	360	8000	0.6	90	850	2.5	4.4	1.7	3
TVR14241-D	TVR14241KSW	240 (216~264)	150	200	50	395	8000	0.6	98	780	2.7	4.6	1.8	3
TVR14271-D	TVR14271KSW	270 (243~297)	175	225	50	455	8000	0.6	116	650	2.8	4.8	1.9	3
TVR14301-D	TVR14301KSW	300 (270~330)	195	250	50	500	8000	0.6	128	610	3.1	4.8	2.1	3
TVR14331-D	TVR14331KSW	330 (297~363)	215	275	50	550	8000	0.6	140	580	3.2	4.9	2.2	3
TVR14361-D	TVR14361KSW	360 (324~396)	230	300	50	595	8000	0.6	158	550	3.3	5.0	2.3	3
TVR14391-D	TVR14391KSW	390 (351~429)	250	320	50	650	8000	0.6	170	520	3.5	5.2	2.5	3
TVR14431-D	TVR14431KSW	430 (387~473)	275	350	50	710	8000	0.6	185	480	3.4	5.5	2.5	3
TVR14471-D	TVR14471KSW	470 (423~517)	300	385	50	775	8000	0.6	205	460	3.6	5.6	2.6	3
TVR14511-D	TVR14511KSW	510 (459~561)	320	410	50	845	8000	0.6	220	430	3.8	5.8	2.8	3
TVR14561-D	TVR14561KSW	560 (504~616)	350	450	50	930	8000	0.6	240	390	4.0	5.9	3.0	3
TVR14621-D	TVR14621KSW	620 (558~682)	395	510	50	1020	8000	0.6	250	350	4.3	6.3	3.2	3
TVR14681-D	TVR14681KSW	680 (612~748)	420	560	50	1120	8000	0.6	260	320	4.5	6.6	3.4	3
TVR14751-D	TVR14751KSW	750 (675~825)	465	615	50	1235	8000	0.6	270	290	4.8	6.8	3.7	3
TVR14821-D	TVR14821KSW	820 (738~902)	510	670	50	1355	8000	0.6	280	250	4.9	6.8	3.4	3
TVR14911-D	TVR14911KSW	910 (819~1001)	550	745	50	1500	8000	0.6	295	230	5.3	7.2	3.7	3
TVR14102-D	TVR14102KSW	1000 (900~1100)	625	825	50	1650	8000	0.6	335	210	5.7	7.5	4.0	3
TVR14112-D	TVR14112KSW	1100 (990~1210)	680	895	50	1815	8000	0.6	360	190	5.8	8.0	4.3	3

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Disc Type Varistor for Surge Protection (High Surge Series)

20-D Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Operating Voltage		Max. Clamping Voltage (8/20µs)		Max. Surge Current (8/20µs)	Rated Power	Max. Energy (10/1000µs)	Reference Capacitance @1KHz	Dimension			UL1449 3 rd SPD TYPE
		V _{1mA}	V _{AC(rms)}	V _{DC}	I _p	V _P	I _{max}	W	E	C _p	T _{min}	T _{max.}	W ±1.0	
		(V)	(V)	(V)	(A)	(V)	(A)	(W)	(J)	(PF)	(mm)			
TVR20181-D	TVR20181KSW	180(162~198)	115	150	100	300	13000	1.0	152	2200	2.8	4.7	1.8	3
TVR20201-D	TVR20201KSW	200(180~220)	130	170	100	340	13000	1.0	175	1900	2.9	4.8	1.9	3
TVR20221-D	TVR20221KSW	220(198~242)	140	180	100	360	13000	1.0	185	1700	2.9	4.8	1.9	3
TVR20241-D	TVR20241KSW	240(216~264)	150	200	100	395	13000	1.0	198	1500	3.1	5.0	2.0	3
TVR20271-D	TVR20271KSW	270(243~297)	175	225	100	455	13000	1.0	220	1400	3.2	5.2	2.1	3
TVR20301-D	TVR20301KSW	300(270~330)	195	250	100	500	13000	1.0	245	1300	3.5	5.2	2.3	3
TVR20331-D	TVR20331KSW	330(297~363)	215	275	100	550	13000	1.0	268	1200	3.6	5.3	2.4	3
TVR20361-D	TVR20361KSW	360(324~396)	230	300	100	595	13000	1.0	315	1000	3.7	5.4	2.5	3
TVR20391-D	TVR20391KSW	390(351~429)	250	320	100	650	13000	1.0	350	880	3.9	5.6	2.7	3
TVR20431-D	TVR20431KSW	430(387~473)	275	350	100	710	13000	1.0	380	800	3.8	5.9	2.7	3
TVR20471-D	TVR20471KSW	470(423~517)	300	385	100	775	13000	1.0	405	700	4.0	6.0	2.8	3
TVR20511-D	TVR20511KSW	510(459~561)	320	410	100	845	13000	1.0	445	630	4.2	6.2	3.0	3
TVR20561-D	TVR20561KSW	560(504~616)	350	450	100	930	13000	1.0	475	530	4.4	6.3	3.2	3
TVR20621-D	TVR20621KSW	620(558~682)	395	510	100	1020	13000	1.0	490	490	4.7	6.7	3.4	3
TVR20681-D	TVR20681KSW	680(612~748)	420	560	100	1120	13000	1.0	500	470	4.9	7.0	3.6	3
TVR20751-D	TVR20751KSW	750(675~825)	465	615	100	1235	13000	1.0	525	450	5.2	7.2	3.9	3
TVR20821-D	TVR20821KSW	820(738~902)	510	670	100	1355	13000	1.0	545	410	5.3	7.2	3.6	3
TVR20911-D	TVR20911KSW	910(819~1001)	550	745	100	1500	13000	1.0	595	380	5.7	7.6	3.9	3
TVR20102-D	TVR20102KSW	1000(900~1100)	625	825	100	1650	13000	1.0	650	360	6.1	7.9	4.2	3
TVR20112-D	TVR20112KSW	1100(990~1210)	680	895	100	1815	13000	1.0	720	340	6.2	8.4	4.5	3

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Disc Type Varistor for Surge Protection (High Surge Series)

20-D for SPD Type 2 Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Operating Voltage		Max. Clamping Voltage (8/20µs)		Max. Surge Current (8/20µs)	Rated Power	Max. Energy (10/1000µs)	Reference Capacitance @1KHz	Dimension			UL1449 3 rd SPD TYPE
		V _{1mA}	V _{AC(rms)}	V _{DC}	I _p	V _P	I _{max}	W	E	C _p	T _{min}	T _{max}	W ±1.0	
		(V)	(V)	(V)	(A)	(V)	(A)	(W)	(J)	(PF)	(mm)			
TVR20181-S	TVR20181KSS	180(162~198)	115	150	100	300	13000	1.0	152	2200	2.8	4.7	1.8	2
TVR20201-S	TVR20201KSS	200(180~220)	130	170	100	340	13000	1.0	175	1900	2.9	4.8	1.9	2
TVR20221-S	TVR20221KSS	220(198~242)	140	180	100	360	13000	1.0	185	1700	2.9	4.8	1.9	2
TVR20241-S	TVR20241KSS	240(216~264)	150	200	100	395	13000	1.0	198	1500	3.1	5.0	2.0	2
TVR20271-S	TVR20271KSS	270(243~297)	175	225	100	455	13000	1.0	220	1400	3.2	5.2	2.1	2
TVR20301-S	TVR20301KSS	300(270~330)	195	250	100	500	13000	1.0	245	1300	3.5	5.2	2.3	2
TVR20331-S	TVR20331KSS	330(297~363)	215	275	100	550	13000	1.0	268	1200	3.6	5.3	2.4	2
TVR20361-S	TVR20361KSS	360(324~396)	230	300	100	595	13000	1.0	315	1000	3.7	5.4	2.5	2
TVR20391-S	TVR20391KSS	390(351~429)	250	320	100	650	13000	1.0	350	880	3.9	5.6	2.7	2
TVR20431-S	TVR20431KSS	430(387~473)	275	350	100	710	13000	1.0	380	800	3.8	5.9	2.7	2
TVR20471-S	TVR20471KSS	470(423~517)	300	385	100	775	13000	1.0	405	700	4.0	6.0	2.8	2
TVR20511-S	TVR20511KSS	510(459~561)	320	410	100	845	13000	1.0	445	630	4.2	6.2	3.0	2
TVR20561-S	TVR20561KSS	560(504~616)	350	450	100	930	13000	1.0	475	530	4.4	6.3	3.2	2
TVR20621-S	TVR20621KSS	620(558~682)	395	510	100	1020	13000	1.0	490	490	4.7	6.7	3.4	2
TVR20681-S	TVR20681KSS	680(612~748)	420	560	100	1120	13000	1.0	500	470	4.9	7.0	3.6	2
TVR20751-S	TVR20751KSS	750(675~825)	465	615	100	1235	13000	1.0	525	450	5.2	7.2	3.9	2
TVR20821-S	TVR20821KSS	820(738~902)	510	670	100	1355	13000	1.0	545	410	5.3	7.2	3.6	2
TVR20911-S	TVR20911KSS	910(819~1001)	550	745	100	1500	13000	1.0	595	380	5.7	7.6	3.9	2
TVR20102-S	TVR20102KSS	1000(900~1100)	625	825	100	1650	13000	1.0	650	360	6.1	7.9	4.2	2
TVR20112-S	TVR20112KSS	1100(990~1210)	680	895	100	1815	13000	1.0	720	340	6.2	8.4	4.5	2

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Disc Type Varistor for Surge Protection (High Surge Series)



■ Safety Approvals

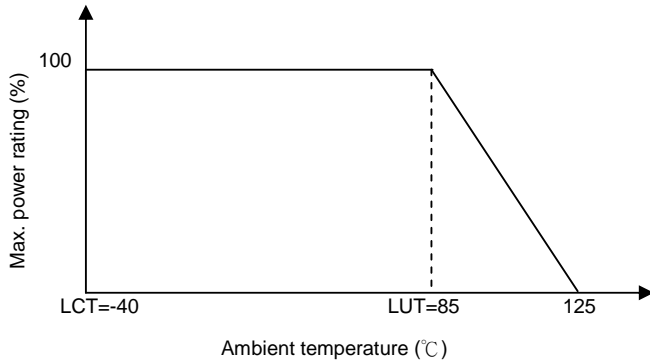
Certified Model /Type					Certified Model /Type.				
	UL1449 3 rd /cUL : E314979	40021243	IEC60950-1 2 nd Annex Q	CQC10001041750 CQC10001041751		UL1449 3 rd /cUL : E314979	40021243	IEC60950-1 2 nd Annex Q	CQC10001041750 CQC10001041751
TVR07181-D	√	√		√	TVR14181-D	√	√	√	√
TVR07201-D	√	√		√	TVR14201-D	√	√	√	√
TVR07221-D	√	√		√	TVR14221-D	√	√	√	√
TVR07241-D	√	√		√	TVR14241-D	√	√	√	√
TVR07271-D	√	√		√	TVR14271-D	√	√	√	√
TVR07301-D	√	√		√	TVR14301-D	√	√	√	√
TVR07331-D	√	√		√	TVR14331-D	√	√	√	√
TVR07361-D	√	√		√	TVR14361-D	√	√	√	√
TVR07391-D	√	√		√	TVR14391-D	√	√	√	√
TVR07431-D	√	√		√	TVR14431-D	√	√	√	√
TVR07471-D	√	√		√	TVR14471-D	√	√	√	√
TVR07511-D	√	√		√	TVR14511-D	√	√	√	√
TVR07561-D	√	√		√	TVR14561-D	√	√	√	√
TVR07621-D	√	√		√	TVR14621-D	√	√	√	√
TVR07681-D	√	√		√	TVR14681-D	√	√	√	√
TVR07751-D	√	√		√	TVR14751-D	√	√	√	√
TVR07821-D	√	√		√	TVR14821-D	√	√	√	√
					TVR14911-D	√	√	√	√
					TVR14102-D	√	√	√	√
					TVR14112-D	√	√	√	√
TVR10181-D	√	√	√	√	TVR20181-D	√	√	√	√
TVR10201-D	√	√	√	√	TVR20201-D	√	√	√	√
TVR10221-D	√	√	√	√	TVR20221-D	√	√	√	√
TVR10241-D	√	√	√	√	TVR20241-D	√	√	√	√
TVR10271-D	√	√	√	√	TVR20271-D	√	√	√	√
TVR10301-D	√	√	√	√	TVR20301-D	√	√	√	√
TVR10331-D	√	√	√	√	TVR20331-D	√	√	√	√
TVR10361-D	√	√	√	√	TVR20361-D	√	√	√	√
TVR10391-D	√	√	√	√	TVR20391-D	√	√	√	√
TVR10431-D	√	√	√	√	TVR20431-D	√	√	√	√
TVR10471-D	√	√	√	√	TVR20471-D	√	√	√	√
TVR10511-D	√	√	√	√	TVR20511-D	√	√	√	√
TVR10561-D	√	√	√	√	TVR20561-D	√	√	√	√
TVR10621-D	√	√	√	√	TVR20621-D	√	√	√	√
TVR10681-D	√	√	√	√	TVR20681-D	√	√	√	√
TVR10751-D	√	√	√	√	TVR20751-D	√	√	√	√
TVR10821-D	√	√	√	√	TVR20821-D	√	√	√	√
TVR10911-D	√	√	√	√	TVR20911-D	√	√	√	√
TVR10102-D	√	√	√	√	TVR20102-D	√	√	√	√
TVR10112-D	√	√	√	√	TVR20112-D	√	√	√	√

Metal Oxide Varistor : TVR-D Series

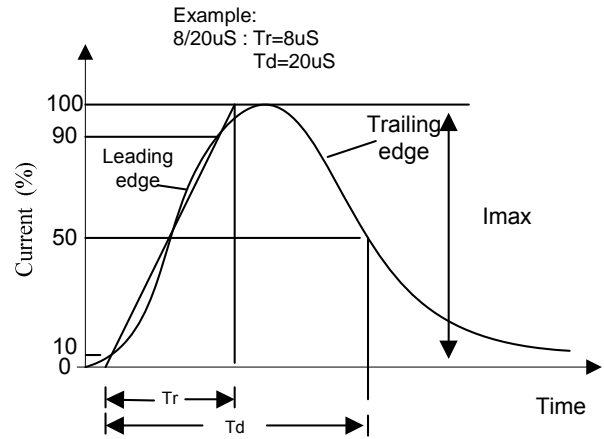


Disc Type Varistor for Surge Protection (High Surge Series)

■ Power Derating Curve

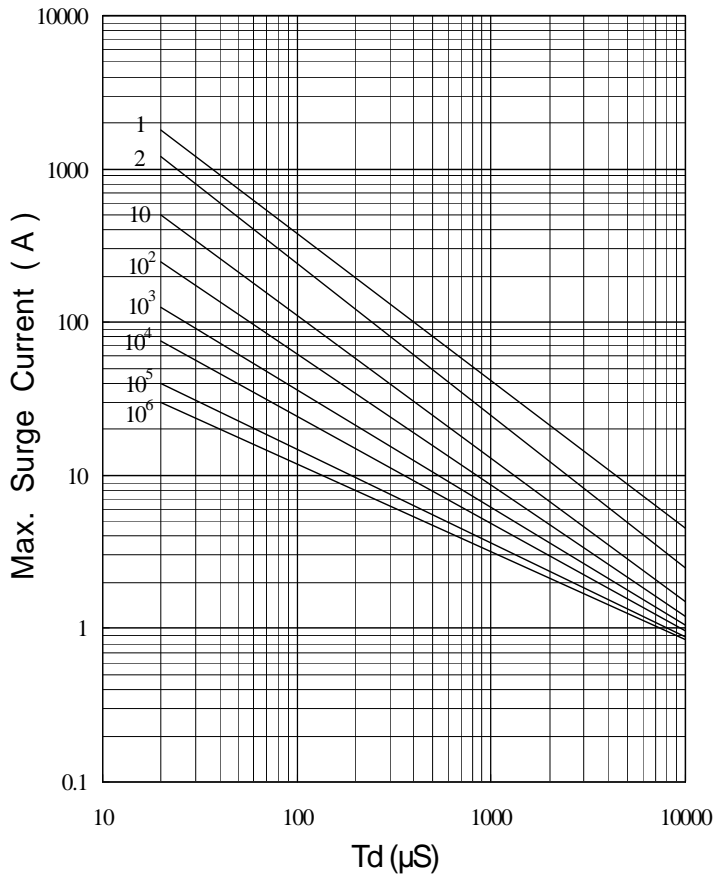


■ Surge Current Standard Waveform

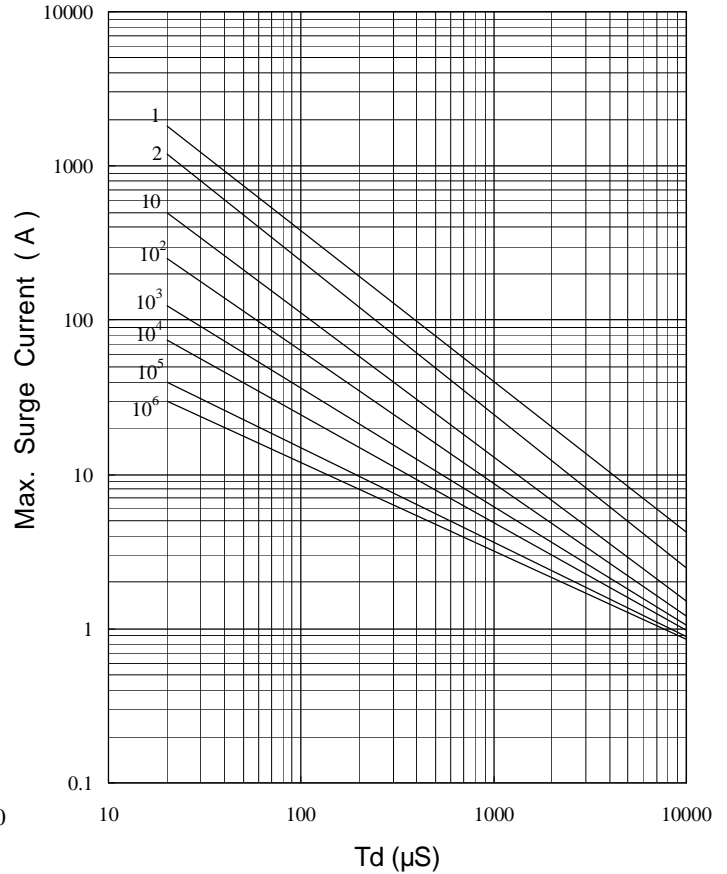


■ Max. Surge Current Derating Curves

TVR07181-D to TVR07471-D



TVR07511-D to TVR07821-D



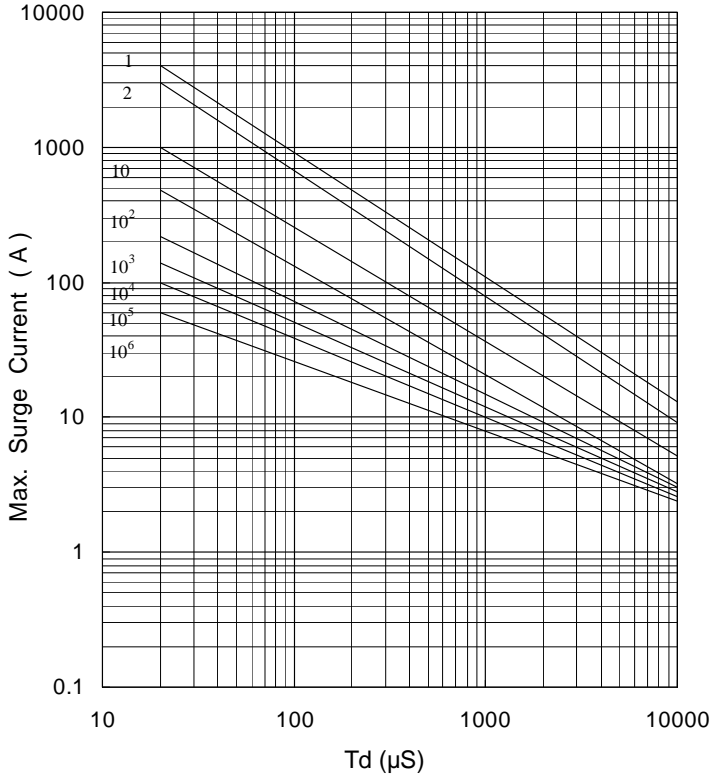
Metal Oxide Varistor : TVR-D Series

Disc Type Varistor for Surge Protection (High Surge Series)

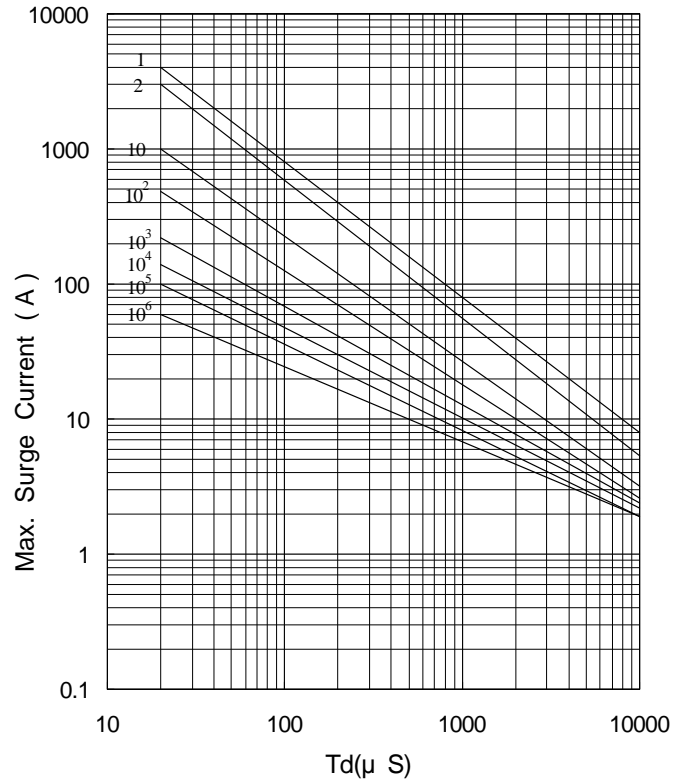


■ Max. Surge Current Derating Curves

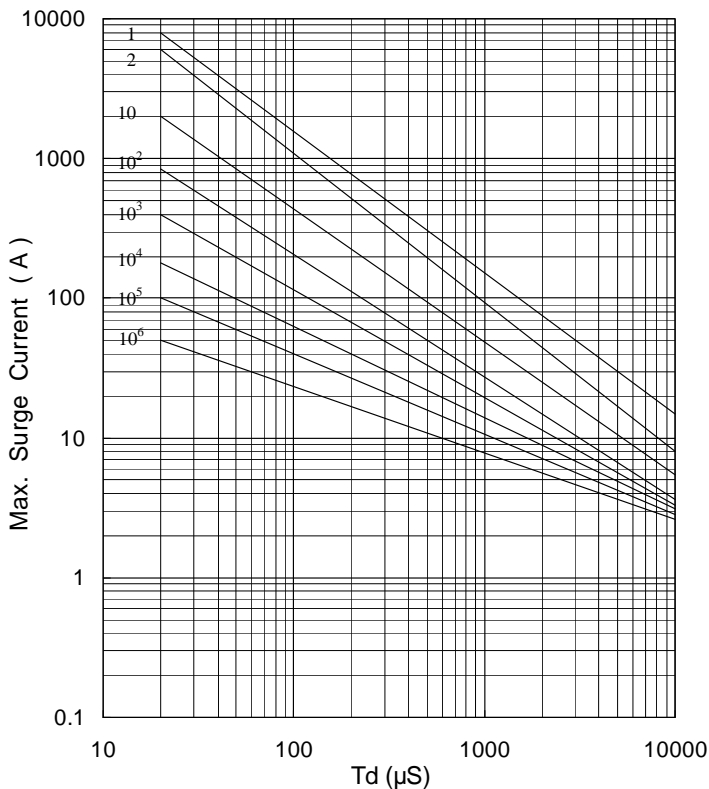
TVR10181-D to TVR10751-D



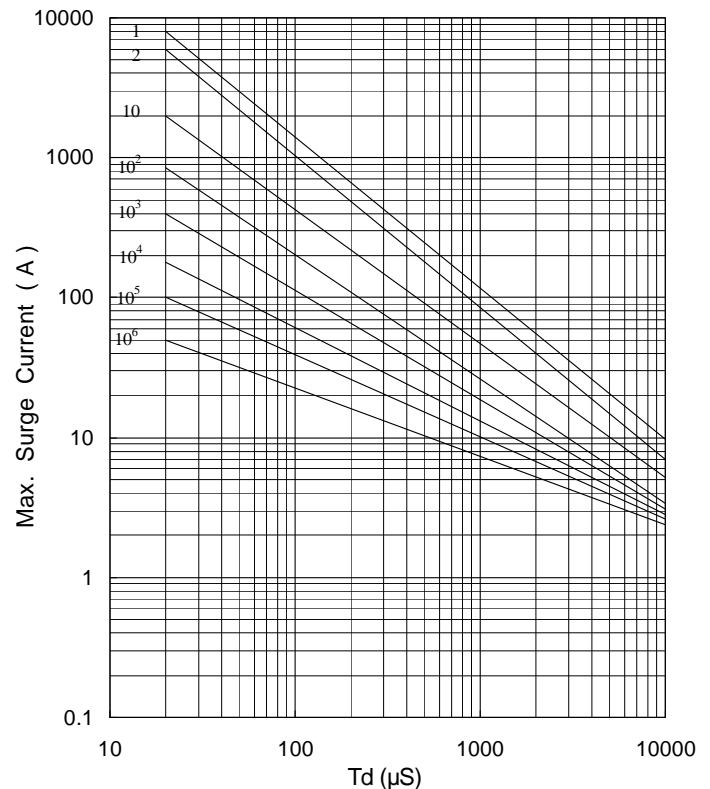
TVR10821-D to TVR10112-D



TVR14181-D to TVR14751-D



TVR14821-D to TVR14112-D



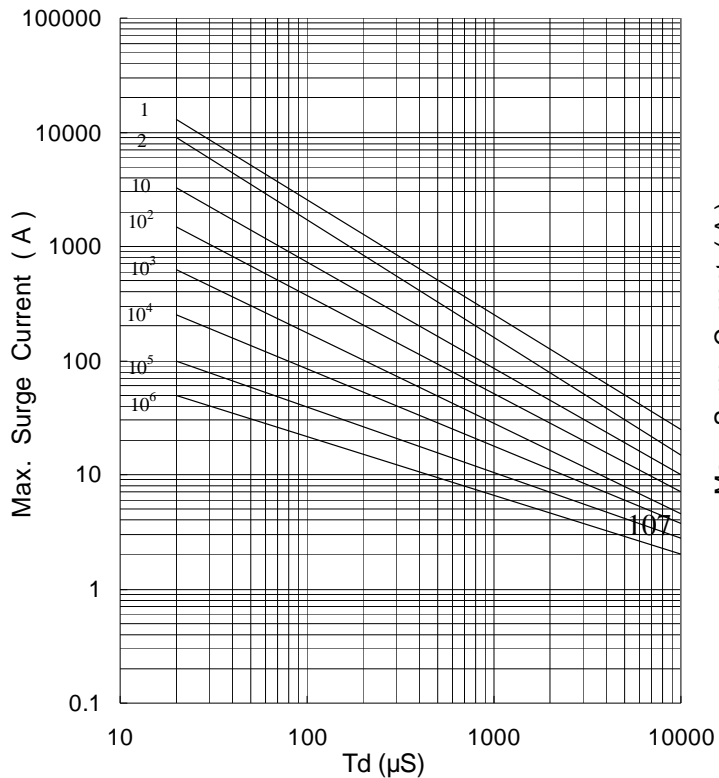
Metal Oxide Varistor : TVR-D Series



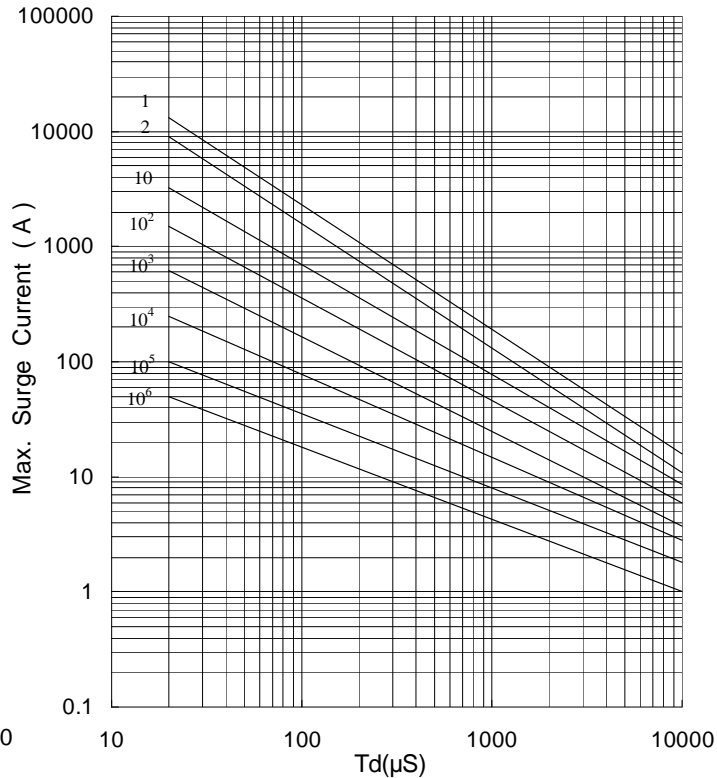
Disc Type Varistor for Surge Protection (High Surge Series)

■ Max. Surge Current Derating Curves

TVR20181-D to TVR20751-D



TVR20821-D to TVR20112-D



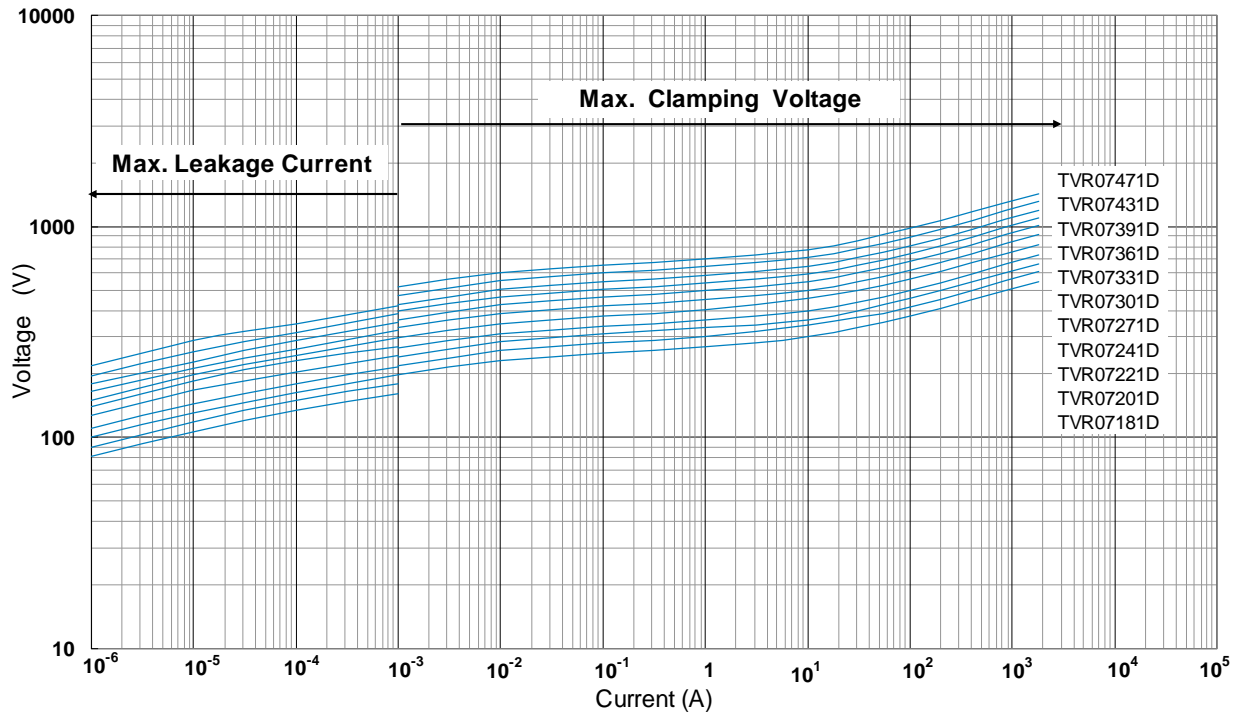
Metal Oxide Varistor : TVR-D Series

Disc Type Varistor for Surge Protection (High Surge Series)

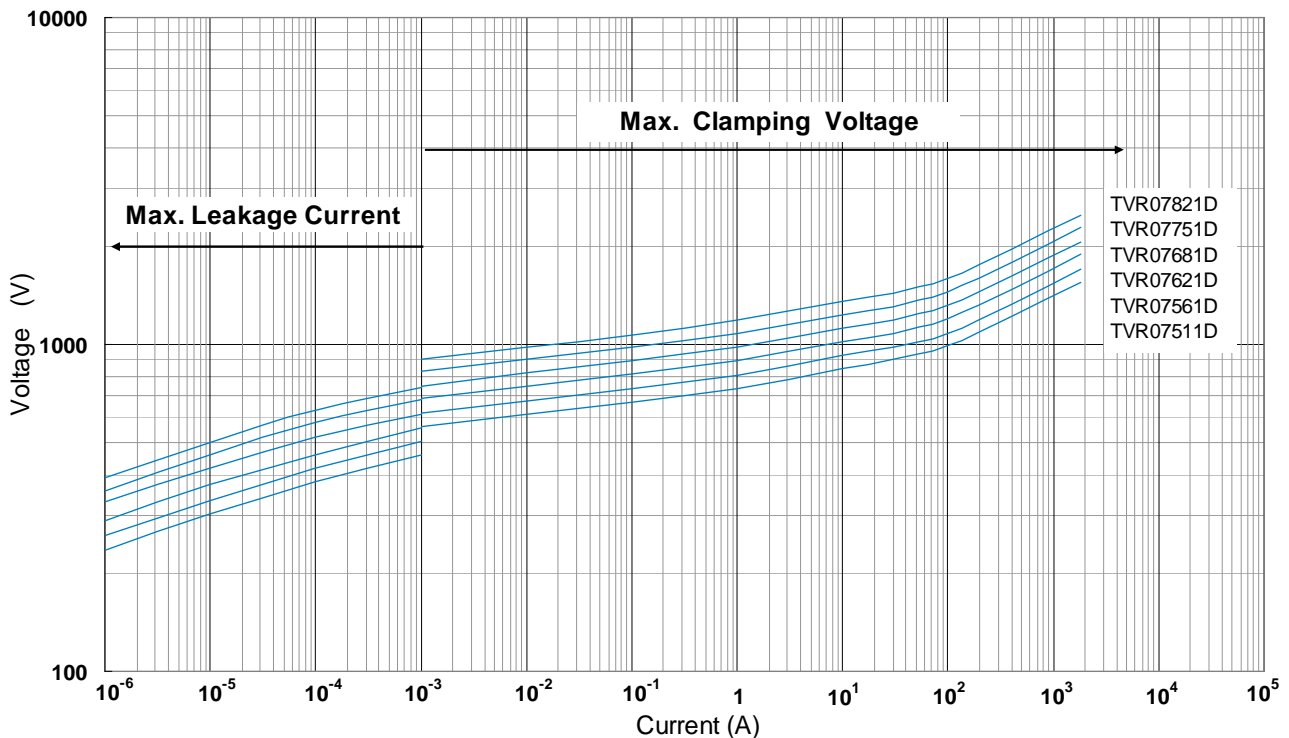


■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR07181-D to TVR07471-D)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR07511-D to TVR07821-D)

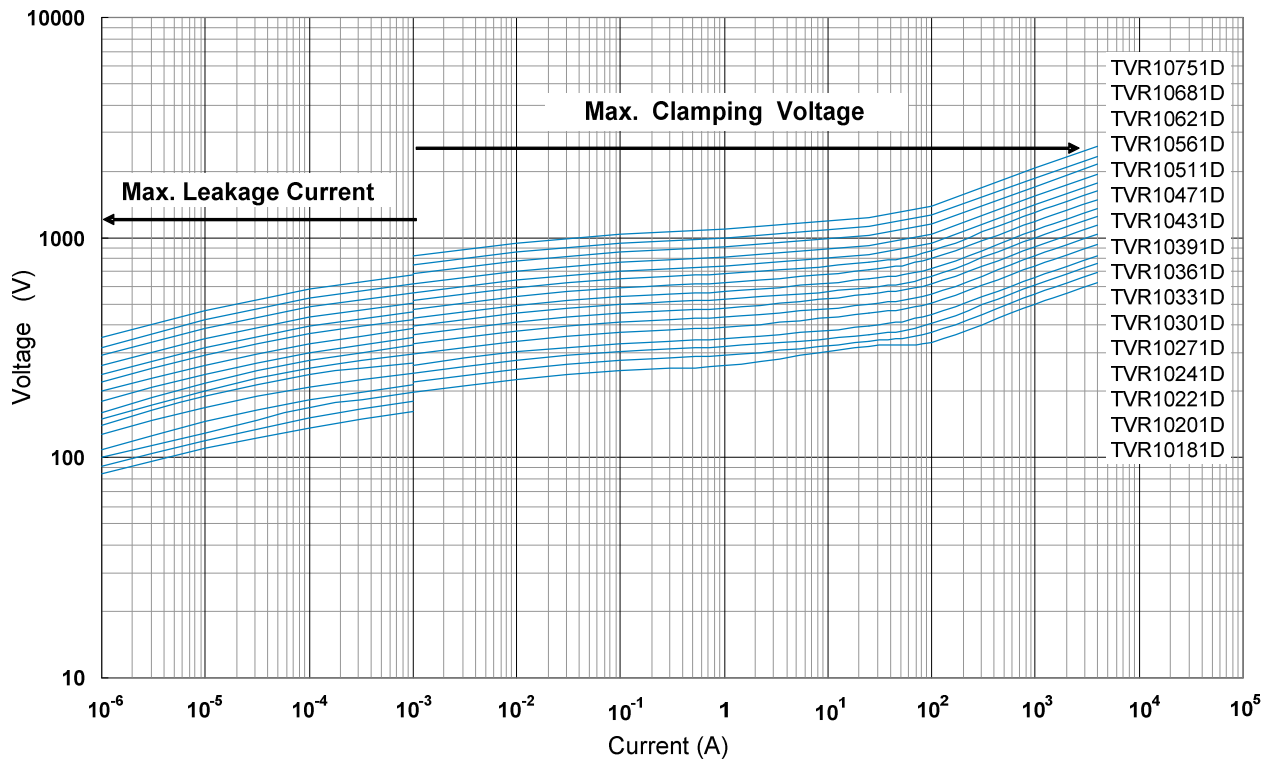


Metal Oxide Varistor : TVR-D Series

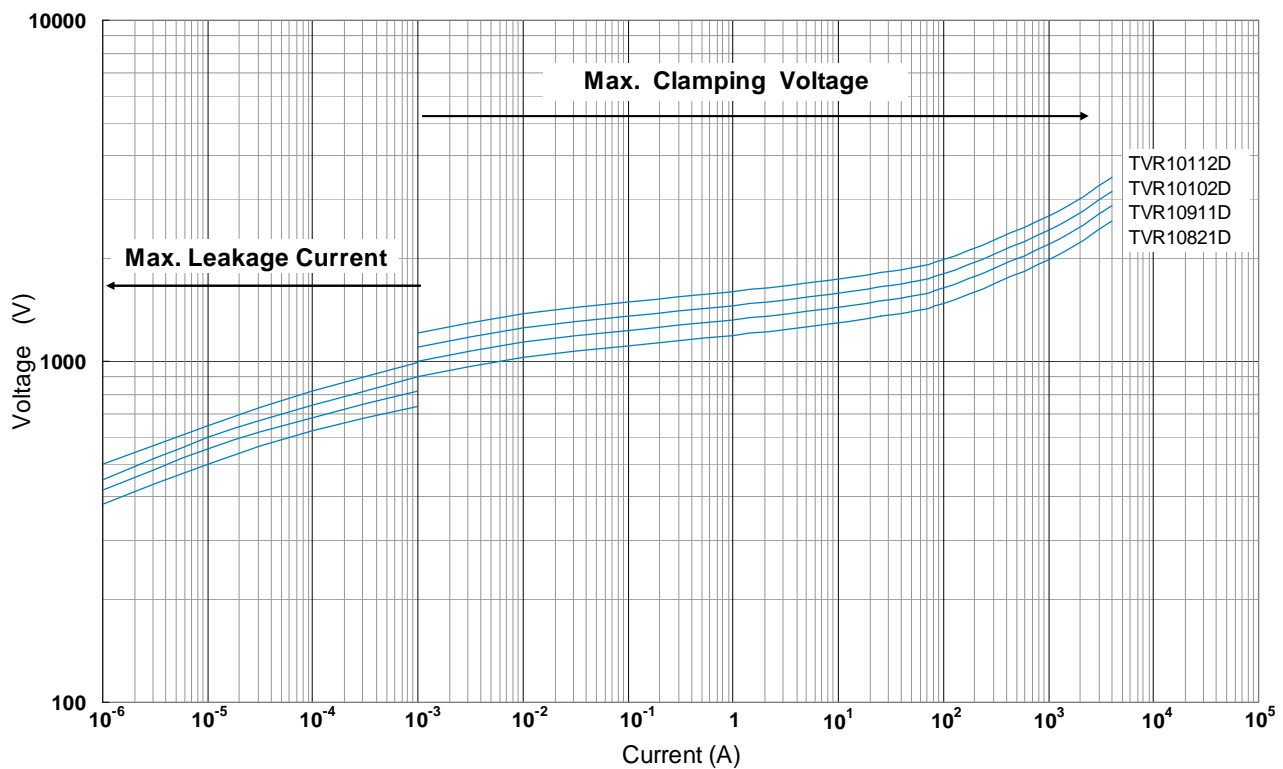
Disc Type Varistor for Surge Protection (High Surge Series)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR10181-D to TVR10751-D)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR10821-D to TVR10112-D)

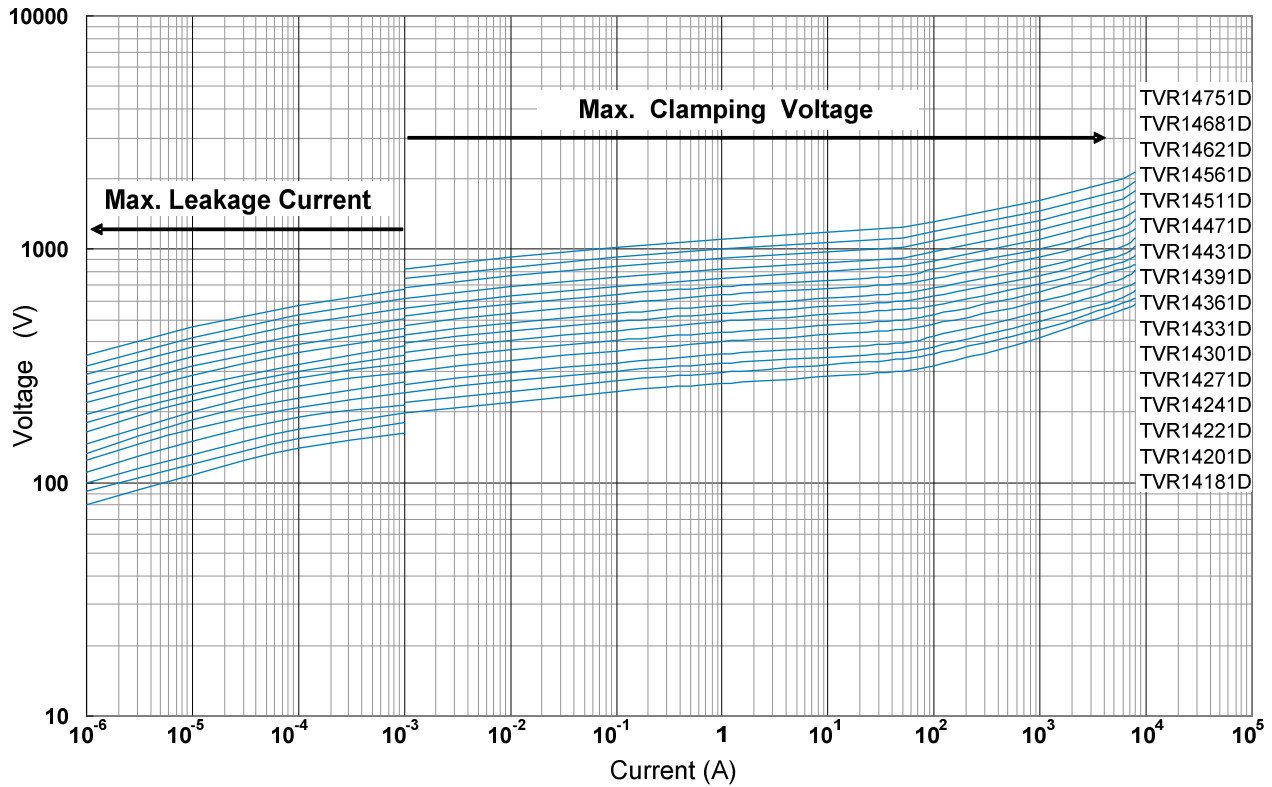


Metal Oxide Varistor : TVR-D Series

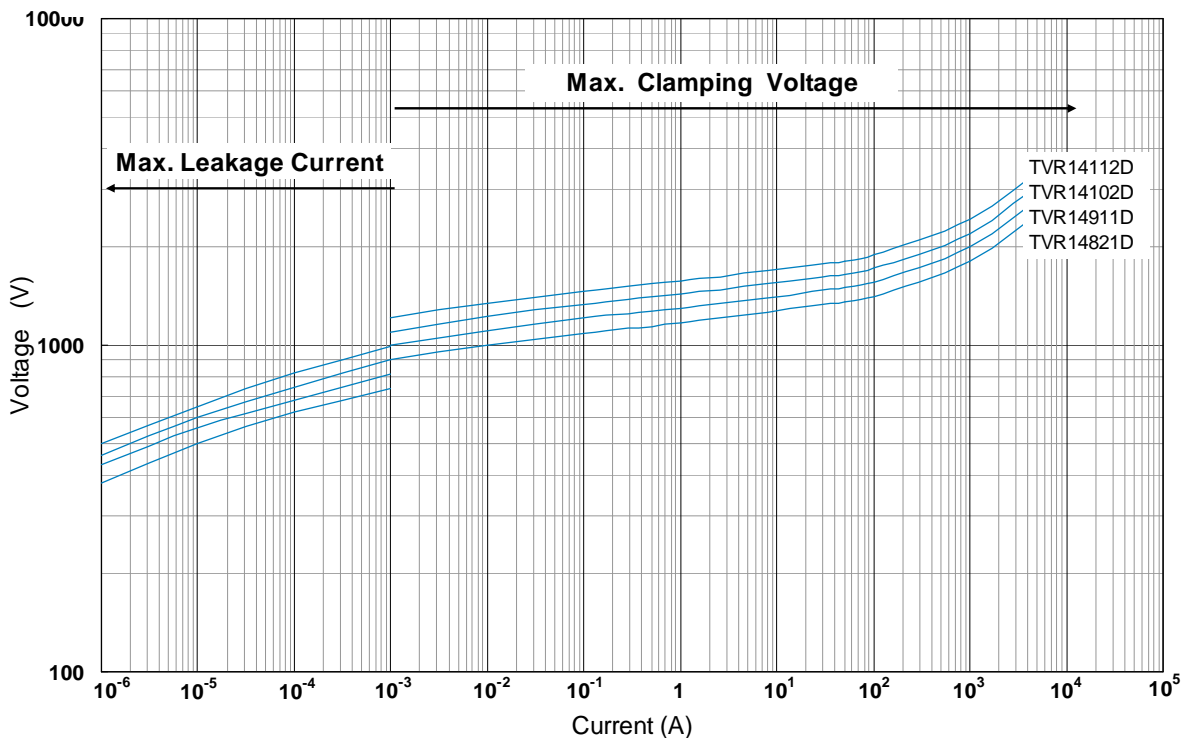
Disc Type Varistor for Surge Protection (High Surge Series)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR 14181-D to TVR14751-D)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR14821-D to TVR14112-D)

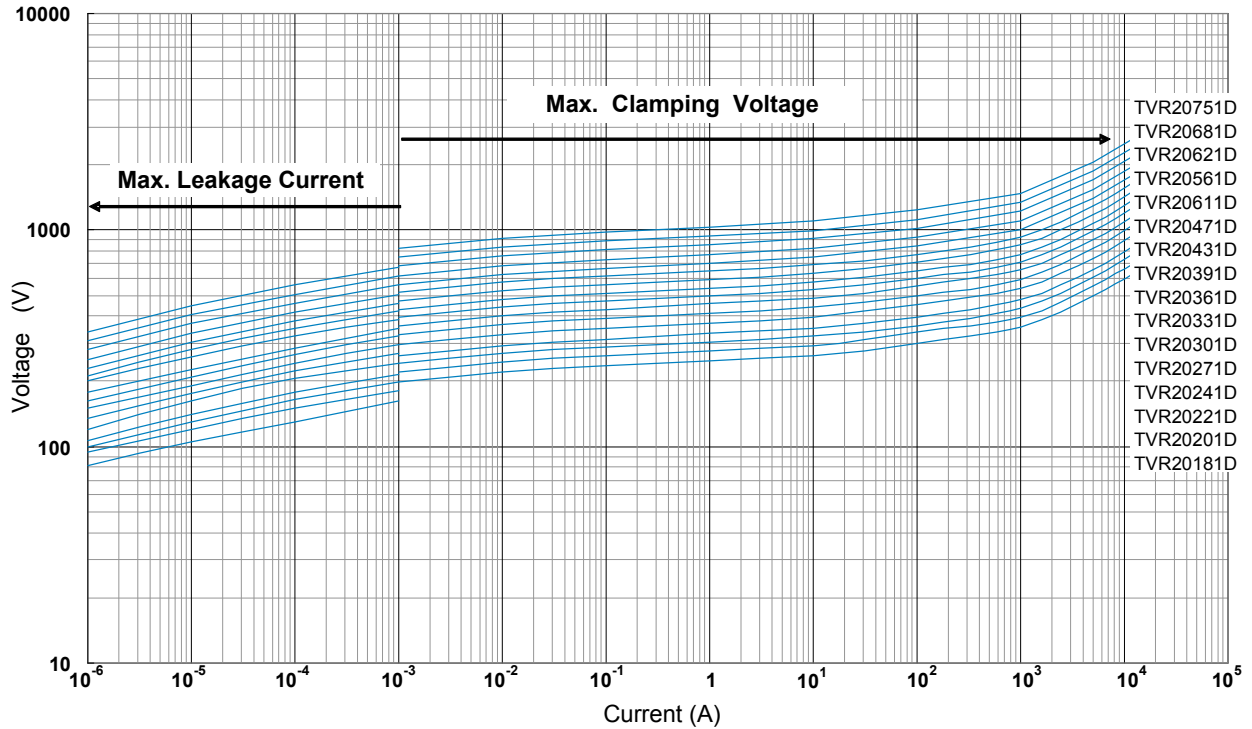


Metal Oxide Varistor : TVR-D Series

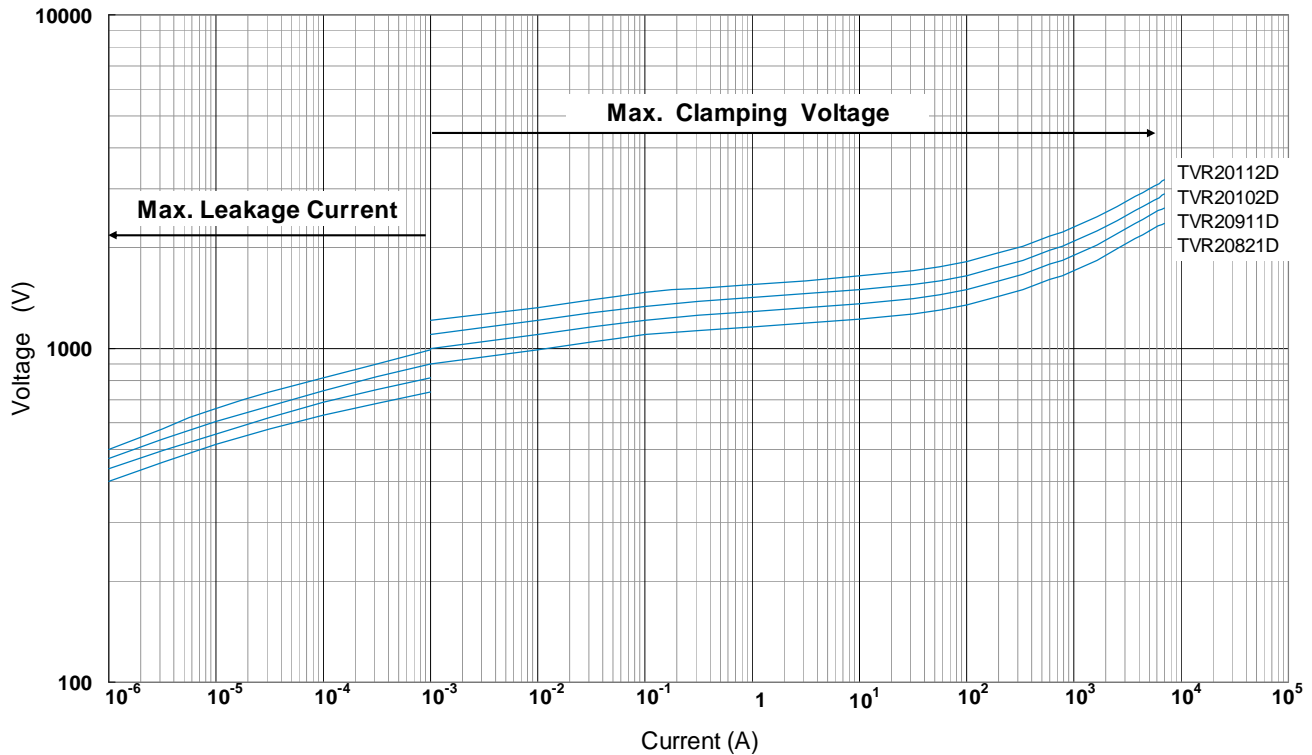
Disc Type Varistor for Surge Protection (High Surge Series)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR20181-D to TVR20751-D)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR20821-D to TVR20112-D)



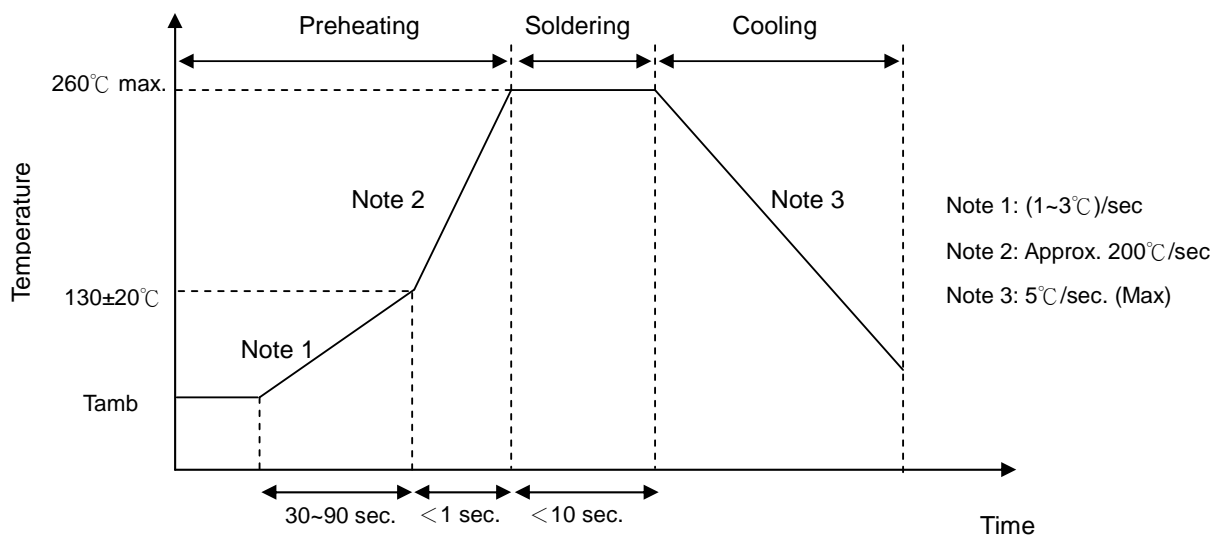
Metal Oxide Varistor : TVR-D Series

Disc Type Varistor for Surge Protection (High Surge Series)



■ Soldering Recommendation

● Wave Soldering Profile



● Recommended Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 sec (max.)
Distance from Varistor	2 mm (min.)

Metal Oxide Varistor : TVR-D Series

Disc Type Varistor for Surge Protection (High Surge Series)



■ Reliability

Item	Standard	Test conditions / Methods	Specifications															
Tensile Strength of Terminations	IEC 60068-2-21	Gradually applying the force specified and keeping the unit fixed for 10±1 sec. <table style="width:100%; border:none;"> <tr> <td style="text-align:center;">Terminal diameter (mm)</td> <td style="text-align:center;">Force (Kg)</td> </tr> <tr> <td style="text-align:center;">0.5<d≤0.8</td> <td style="text-align:center;">1.0</td> </tr> <tr> <td style="text-align:center;">0.8<d≤1.25</td> <td style="text-align:center;">2.0</td> </tr> <tr> <td style="text-align:center;">1.25<d</td> <td style="text-align:center;">4.0</td> </tr> </table>	Terminal diameter (mm)	Force (Kg)	0.5<d≤0.8	1.0	0.8<d≤1.25	2.0	1.25<d	4.0	$ \Delta V/V_{1mA} \leq 5\%$ No visible damage							
Terminal diameter (mm)	Force (Kg)																	
0.5<d≤0.8	1.0																	
0.8<d≤1.25	2.0																	
1.25<d	4.0																	
Bending Strength of Terminals	IEC 60068-2-21	Hold specimen and apply the force specified below to each lead. Bend the specimen to 90°, then return to the original position. Repeat the procedure in the opposite direction. <table style="width:100%; border:none;"> <tr> <td style="text-align:center;">Terminal diameter (mm)</td> <td style="text-align:center;">Force (Kg)</td> </tr> <tr> <td style="text-align:center;">0.5<d≤0.8</td> <td style="text-align:center;">0.5</td> </tr> <tr> <td style="text-align:center;">0.8<d≤1.25</td> <td style="text-align:center;">1.0</td> </tr> <tr> <td style="text-align:center;">1.25<d</td> <td style="text-align:center;">2.0</td> </tr> </table>	Terminal diameter (mm)	Force (Kg)	0.5<d≤0.8	0.5	0.8<d≤1.25	1.0	1.25<d	2.0	$ \Delta V/V_{1mA} \leq 5\%$ No visible damage							
Terminal diameter (mm)	Force (Kg)																	
0.5<d≤0.8	0.5																	
0.8<d≤1.25	1.0																	
1.25<d	2.0																	
Vibration	IEC 1051-1	Frequency range:10~55Hz Amplitude:0.75mm or 98m/S2 Direction: 3 mutually perpendicular directions,2hrs each.	$ \Delta V/V_{1mA} \leq 5\%$ No visible damage															
Solderability	IEC 60068-2-20	245±5°C , 3±0.3 sec.	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC 60068-2-20	260±3°C , 10±1 sec	$ \Delta V/V_{1mA} \leq 5\%$ No visible damage															
High Temperature Storage	IEC 60068-2-2	125±5°C x 1000 hrs ± 24hrs	$ \Delta V/V_{1mA} \leq 5\%$ No visible damage															
Damp heat, Steady State	IEC 60068-2-3	a. 40±2°C , 90 ~ 95 % RH, 1344 hrs b. 40±2°C , 90~ 95 % RH , at 10%VDC, 1344 hrs	No visible damage $ \Delta V/V_{1mA} \leq 5\%$ Insulation Resistance ≥ 100MΩ															
Rapid Change of Temperature	IEC 60068-2-14	The conditions shown below shall be repeated 5 cycles <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td style="text-align:center;">1</td> <td style="text-align:center;">-40±3</td> <td style="text-align:center;">30±3</td> </tr> <tr> <td style="text-align:center;">2</td> <td style="text-align:center;">Room temperature</td> <td style="text-align:center;">5±3</td> </tr> <tr> <td style="text-align:center;">3</td> <td style="text-align:center;">85±2</td> <td style="text-align:center;">30±3</td> </tr> <tr> <td style="text-align:center;">4</td> <td style="text-align:center;">Room temperature</td> <td style="text-align:center;">5±3</td> </tr> </tbody> </table>	Step	Temperature (°C)	Period (minutes)	1	-40±3	30±3	2	Room temperature	5±3	3	85±2	30±3	4	Room temperature	5±3	$ \Delta V/V_{1mA} \leq 5\%$ No visible damage
Step	Temperature (°C)	Period (minutes)																
1	-40±3	30±3																
2	Room temperature	5±3																
3	85±2	30±3																
4	Room temperature	5±3																
Endurance at Upper Category Temperature	IEC61051-4.20	85 ± 2 °C, 1000 ± 24 hrs, at VDC or Vrms(Max. Operating Voltage)	$ \Delta V/V_{1mA} \leq 10\%$ No visible damage															
Low Temperature Storage (optional)	CECC42000	-40±5°C, 1000±24 hrs	$ \Delta V/V_{1mA} \leq 5\%$ No visible damage															
8/20µs Surge Life	CECC42000	10,000 pulses(8/20µs) , unipolar, interval 10 sec, amplitude corr. to max. Surge current derating curves for 20µS	$ \Delta V/V_{1mA} \leq 10\%$ No visible damage															
10/1000µs Surge Life	CECC42000	10/1000µS waveform, 10 surge currents,unipolar,interval 2min, amplitude corr. to max. surge current derating curves for 1000µS	$ \Delta V/V_{1mA} \leq 10\%$ No visible damage															
Varistor Voltage Temp. Coefficient	Specification standard	$\frac{V_{1mA} \text{ at } 85^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{60} \times 100 (\% / ^{\circ}\text{C})$ $\frac{V_{1mA} \text{ at } -40^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{65} \times 100 (\% / ^{\circ}\text{C})$	-0.05 ≤ T _c ≤ 0.05 (% / °C)															
Voltage Proof	IEC61051-4.8	Metal balls method, 2500 V _{ac} 1 min	No visible damage															

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

- Packaging
 - Taping Specification
 - S Type (Straight lead)

Figure A

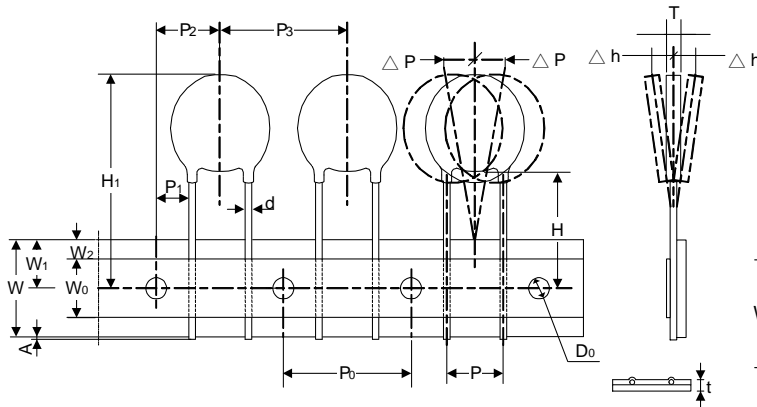


Figure C

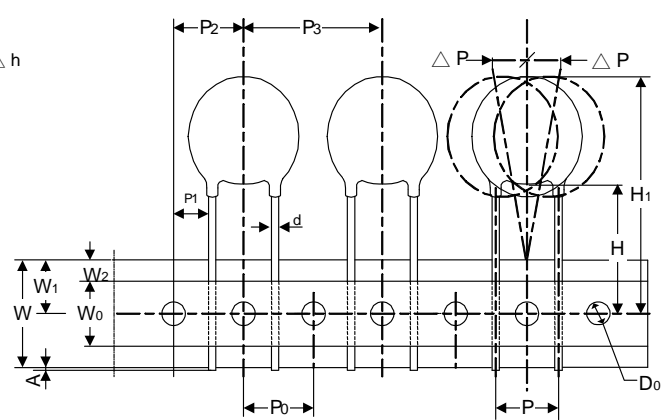


Figure B

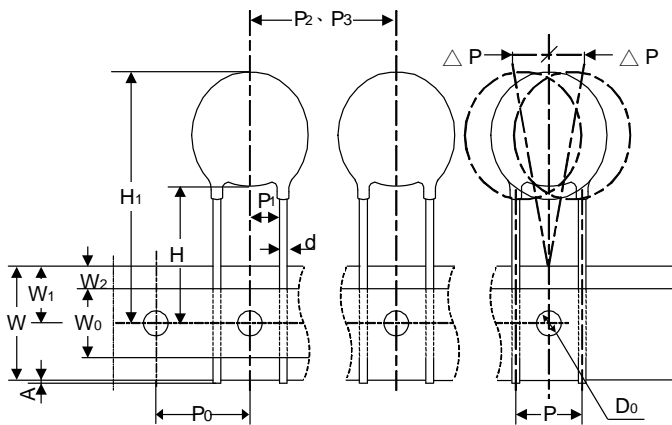
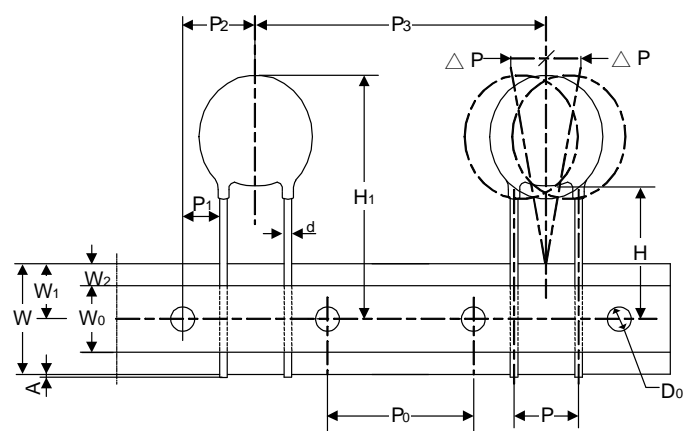


Figure D



(Unit: mm)

Taping Code	Disc Size	P ₀	P	P ₁	P ₂	P ₃	H	H ₁	d	W ₀	W ₁	W ₂	W	ΔP	Δh	A	D ₀	t	Figure
		±0.3	±1	±1	±1.3	±1	+2/-0	Max.	±0.02	±1	+0.75/-0.5	Max.	±1	Max.	Max.	Max.	±0.2	±0.2	
A (P ₀ =12.7)	07-D	12.7	5	3.55	6.35	12.7	18	31	0.6	12	9	3	18	1	2	0.5	4	0.6	A
	10-D	12.7	7.5	3.35	25.4	25.4	18	36	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	14-D	12.7	7.5	8.55	12.7	25.4	18	40	0.8	12	9	3	18	1	2	0.5	4	0.6	C
E (P ₀ =15.0)	07-D	15	5	4.7	7.5	15	18	31	0.6	12	9	3	18	1	2	0.5	4	0.6	A
	10-D	15	7.5	3.35	7.5	15	18	36	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	14-D	15	7.5	3.35	7.5	30	18	40	0.8	12	9	3	18	1	2	0.5	4	0.6	D

Metal Oxide Varistor : TVR-D Series

Disc Type Varistor for Surge Protection (High Surge Series)



F Type (Y kink lead)

Figure A

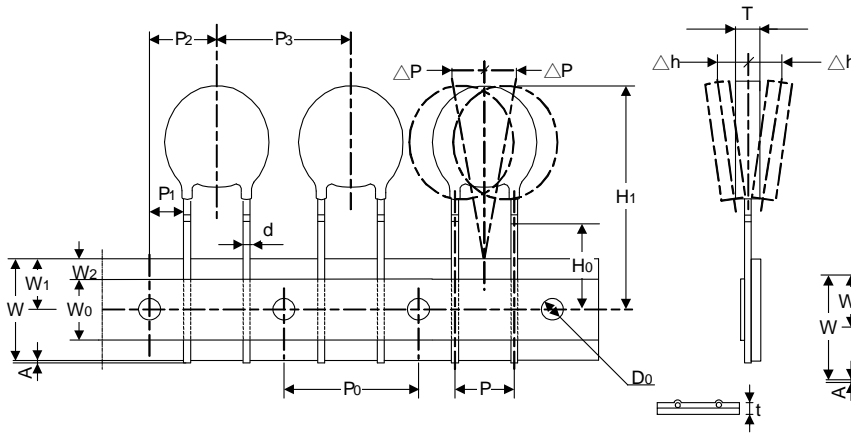


Figure C

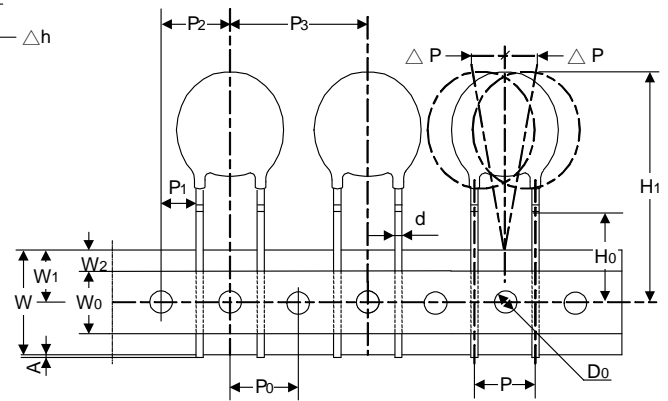


Figure B

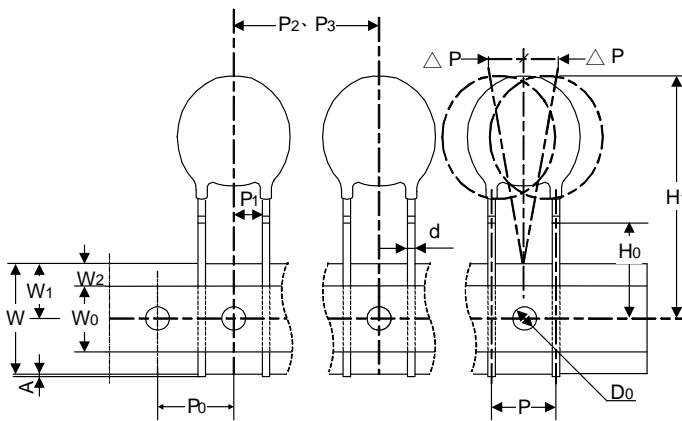
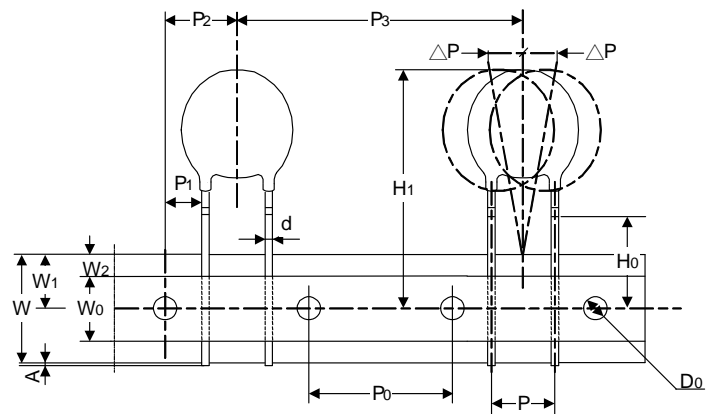


Figure D



(Unit: mm)

Taping Code	Disc Size	P ₀	P	P ₁	P ₂	P ₃	H ₀	H ₁	d	W ₀	W ₁	W ₂	W	ΔP	Δh	A	D ₀	t	Figure
		±0.3	±1	±1	±1.3	±1	±0.5	Max.	±0.02	±1	+0.75/-0.5	Max.	±1	Max.	Max.	Max.	±0.2	±0.2	
A (P ₀ =12.7)	07-D	12.7	5	3.55	6.35	12.7	16	31	0.6	12	9	3	18	1	2	0.5	4	0.6	A
	10-D	12.7	7.5	3.35	25.4	25.4	16	36	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	14-D	12.7	7.5	8.55	12.7	25.4	16	40	0.8	12	9	3	18	1	2	0.5	4	0.6	C
E (P ₀ =15.0)	07-D	15	5	4.7	7.5	15	16	31	0.6	12	9	3	18	1	2	0.5	4	0.6	A
	10-D	15	7.5	3.35	7.5	15	16	36	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	14-D	15	7.5	3.35	7.5	30	16	40	0.8	12	9	3	18	1	2	0.5	4	0.6	D

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

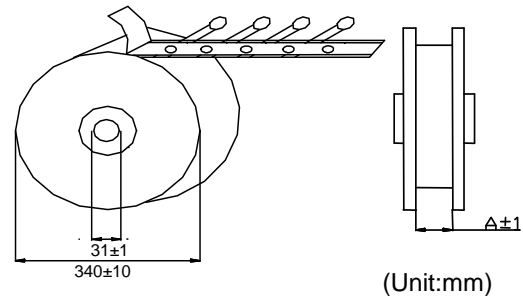
■ Quantity

● Bulk Packing

Disc Size/mm	Quantity pcs/ bag
Φ 07-D	250
Φ 10-D	200
Φ 14-D	100
Φ 20-D	50

● Reel Packing

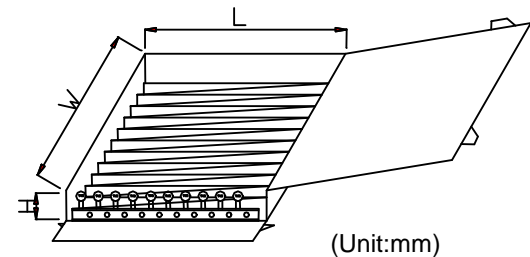
Disc Size/mm	Quantity pcs/reel
Φ 07(181~391) -D	1500
Φ 07(431~821) -D	1000
Φ 10(181~391) -D	1000
Φ 10(431~911) -D	750
Φ 10(102~112) -D	500
Φ 14(181~391) -D	750
Φ 14(431~112) -D	500
Φ 20(181~681) -D	500
Φ 20(751~112) -D	250



A	46	55
Disc Size	Φ 07 ~ Φ 10	Φ 14 ~ Φ 20

● Ammo Packing

Disc Size/mm	Quantity pcs/ box
Φ 07(181~821) -D	1000
Φ 10(181~361) -D	750
Φ 10(391~621) -D	400
Φ 10(681~112) -D	300
Φ 14(181~271) -D	500
Φ 14(301~112) -D	250



Disc Size	W±5	L±5	H±5
Φ 07~ Φ 14	348	185	60
	348	275	60

Note: The standard package for TVR20-D is bulk. For any other demand, please contact our sales person.

Metal Oxide Varistor : TVR-D Series

Disc Type Varistor for Surge Protection (High Surge Series)



■ Storage Conditions of Products

- Storage Conditions :
 1. Storage Temperature : $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$
 2. Relative Humidity : $\leq 75\% \text{RH}$
 3. Keep away from corrosive atmosphere and sunlight.
- Period of Storage: 1 year.