

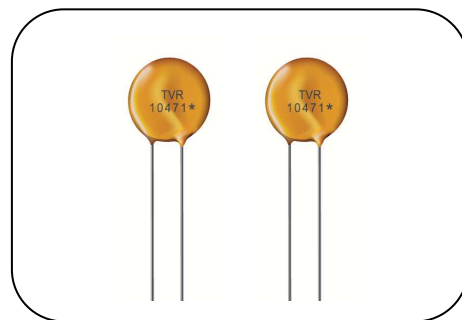
Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

Features

1. RoHS compliant
2. Halogen-free series are available
3. Body size: $\Phi 7\text{mm} \sim \Phi 20\text{mm}$
4. Wide operating voltage range: 115Vac ~ 680Vac
5. High surge current rating up to 13KA
6. High energy rating up to 720 Joule
7. Operating temperature range: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
Storage temperature range: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
8. Agency recognition: UL 1449 3rd/cUL/VDE/CQC
9. TVR10-D, 14-D, and 20-D meet IEC60950-1:2013 Annex Q requirement
10. TVR20-D series for SPD Type 2 is available



Note: * of the marking stands for TVR-D series

Recommended Applications

1. Power supply
2. Home appliance
3. Industrial equipment
4. Telecommunication or telephone system
5. Smart meter
6. PLC (Power line communication)
7. Lighting products
8. Photovoltaic industry

Part Number Code

$\Phi 7\text{mm} \sim \Phi 20\text{mm}$

T	V	R	1	4	2	4	1	K	S						W	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Product Type			Body Size		Varistor Voltage(V_{1mA})			Tolerance of V_{1mA}		Internal Control Code			Optional Suffix			
TVR	THINKING Varistor TVR series		07	$\Phi 7\text{mm}$	180	$18 \times 10^0 \text{V} = 18\text{V}$		K	$\pm 10\%$	01~ZZ			D	High surge series		
			10	$\Phi 10\text{mm}$	241	$24 \times 10^1 \text{V} = 240\text{V}$							W	High surge series, RoHS compliant		
			14	$\Phi 14\text{mm}$	102	$10 \times 10^2 \text{V} = 1000\text{V}$							K	High surge series, RoHS compliant & Halogen-Free		
			20	$\Phi 20\text{mm}$						Packaging			S	High surge series for UL 1449 3 rd SPD Type 2 application, RoHS compliant (TVR20 only)		
			Appearance								AR	Tape & reel packing (hole pitch: 12.7mm)		N	High surge series for UL 1449 3 rd SPD Type 2 application, RoHS compliant & Halogen-Free (TVR20 only)	
			S	Straight lead, epoxy coating							ER	Tape & reel packing (hole pitch: 15.0mm)				
			F	Y kink lead, epoxy coating							AB	Tape & ammo box packing (hole pitch: 12.7mm)				
			T	L kink lead, epoxy coating							EB	Tape & ammo box packing (hole pitch: 15.0mm)				
											C	Bulk & cut lead (followed by the codes of 2 leaded length)				
											Blank	Bulk				

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

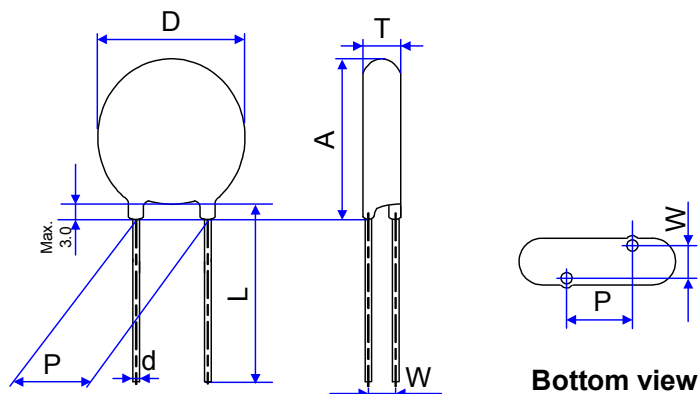
Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

Structures and Dimensions

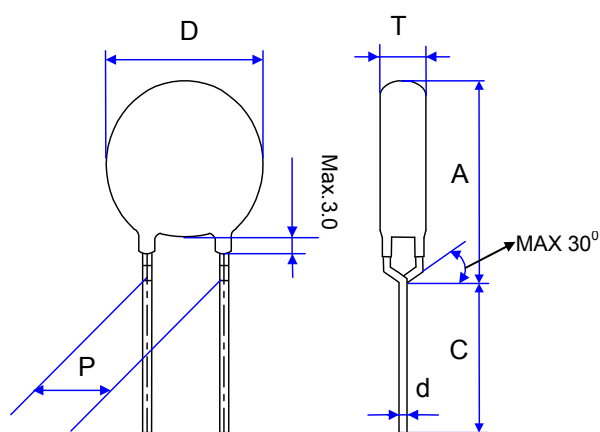
- S Type (Straight lead)



(Unit: mm)

Series	D	Lmin.	d	P	Amax.	Tmax.	W
TVR07-D	7.5~9.5	26.5	0.6±0.02	5±1	12.5	Please refer to Electrical Characteristics Table	
TVR10-D	12.0~14.0	26.5	0.8±0.02	7.5±1	17.5		
TVR14-D	16.0~18.5	26.5	0.8±0.02	7.5±1	21.5		
TVR20-D	22~24.5	22.5	1.0±0.02	10±1	28.5		

- F Type (Y kink lead)



(Unit: mm)

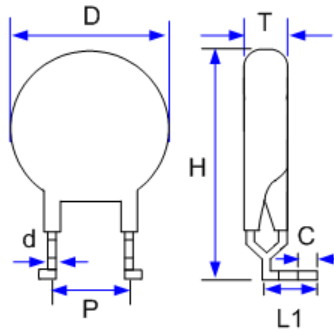
Series	D	Cmin.	d	P	Amax.	Tmax.	W
TVR07-D	7.5~9.5	20	0.6±0.02	5±1	12.5	Please refer to Electrical Characteristics Table	
TVR10-D	12.0~14.0	20	0.8±0.02	7.5±1	18.0		
TVR14-D	16.0~18.5	20	0.8±0.02	7.5±1	22.0		
TVR20-D	22~24.5	20	1.0±0.02	10±1	29.0		

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

- T Type (L kink lead)



(Unit: mm)

Series	D	C	d	P	Amax.	Hmax.	Tmax.
TVR10-D	12.0~14.0	3.8±0.8	0.8±0.02	7.5±1	22.0	7.0±1	Please refer to Electrical Characteristics Table
TVR14-D	16.0~18.5		0.8±0.02	7.5±1	26.5	7.0±1	
TVR20-D	22.0~24.5		1.0±0.02	10±1	33.0	9.0±1	

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

Electrical Characteristics

07-D Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Continuous Voltage			Max. Clamping Voltage (8/20µs)		Max. Surge Current (8/20µs)	Rated Power	Max. Energy (10/1000µs)	Reference Capacitance @1KHz	Dimension			UL 1449 3 rd SPD Application				
			V _{1mA}	V _{AC(rms)}	V _{DC}	V _P	I _P					I _{max}	P	W _{max}		C _p	T _{min}	T _{max}	W ±1.0
TVR07181-D	TVR07181KSW	180 (162~198)	115	150	300	10	1800	0.25	19	255	2.0	3.9	1.4	For Other Application					
TVR07201-D	TVR07201KSW	200 (180~220)	130	170	340	10	1800	0.25	21	230	2.1	4.0	1.5						
TVR07221-D	TVR07221KSW	220 (198~242)	140	180	360	10	1800	0.25	23	210	2.1	4.0	1.5						
TVR07241-D	TVR07241KSW	240(216~264)	150	200	395	10	1800	0.25	25	195	2.3	4.2	1.6						
TVR07271-D	TVR07271KSW	270 (243~297)	175	225	455	10	1800	0.25	28	175	2.4	4.4	1.7						
TVR07301-D	TVR07301KSW	300 (270~330)	195	250	500	10	1800	0.25	32	155	2.7	4.4	1.9						
TVR07331-D	TVR07331KSW	330 (297~363)	215	275	550	10	1800	0.25	34	140	2.8	4.5	2.0						
TVR07361-D	TVR07361KSW	360 (324~396)	230	300	595	10	1800	0.25	37	130	2.9	4.6	2.1						
TVR07391-D	TVR07391KSW	390 (351~429)	250	320	650	10	1800	0.25	40	120	3.1	4.8	2.3						
TVR07431-D	TVR07431KSW	430 (387~473)	275	350	710	10	1800	0.25	46	100	3.0	5.1	2.3						
TVR07471-D	TVR07471KSW	470 (423~517)	300	385	775	10	1800	0.25	49	90	3.2	5.2	2.4						
TVR07511-D	TVR07511KSW	510 (459~561)	320	410	845	10	1800	0.25	54	85	3.4	5.4	2.6						
TVR07561-D	TVR07561KSW	560 (504~616)	350	450	930	10	1800	0.25	55	80	3.6	5.5	2.8						
TVR07621-D	TVR07621KSW	620 (558~682)	395	510	1020	10	1800	0.25	59	80	3.9	5.9	3.0						
TVR07681-D	TVR07681KSW	680 (612~748)	420	560	1120	10	1800	0.25	62	75	4.1	6.2	3.2						
TVR07751-D	TVR07751KSW	750 (675~825)	465	615	1235	10	1800	0.25	66	70	4.4	6.4	3.5						
TVR07821-D	TVR07821KSW	820 (738~902)	510	670	1355	10	1800	0.25	71	65	4.5	6.4	3.2						

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

10-D Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Continuous 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			UL 1449 3 rd SPD Application
		V _{1mA}	V _{AC(rms)}	V _{DC}	V _P	I _P	I _{max}	P	W _{max}	C _p	T _{min}	T _{max}	W \pm 1.0	
		(V)	(V)	(V)	(V)	(A)	(A)	(W)	(J)	(pF)	(mm)			
TVR10181-D	TVR10181KSW	180 (162~198)	115	150	300	25	4000	0.4	47	570	2.4	4.3	1.6	For Other Application
TVR10201-D	TVR10201KSW	200 (180~220)	130	170	340	25	4000	0.4	52	520	2.5	4.4	1.7	For SPD Type 3 Application
TVR10221-D	TVR10221KSW	220 (198~242)	140	180	360	25	4000	0.4	58	470	2.5	4.4	1.7	
TVR10241-D	TVR10241KSW	240 (216~264)	150	200	395	25	4000	0.4	64	420	2.7	4.6	1.8	
TVR10271-D	TVR10271KSW	270 (243~297)	175	225	455	25	4000	0.4	67	370	2.8	4.8	1.9	
TVR10301-D	TVR10301KSW	300 (270~330)	195	250	500	25	4000	0.4	70	340	3.1	4.8	2.1	
TVR10331-D	TVR10331KSW	330 (297~363)	215	275	550	25	4000	0.4	72	320	3.2	4.9	2.2	
TVR10361-D	TVR10361KSW	360 (324~396)	230	300	595	25	4000	0.4	76	300	3.3	5.0	2.3	
TVR10391-D	TVR10391KSW	390 (351~429)	250	320	650	25	4000	0.4	82	280	3.5	5.2	2.5	
TVR10431-D	TVR10431KSW	430 (387~473)	275	350	710	25	4000	0.4	93	250	3.4	5.5	2.5	
TVR10471-D	TVR10471KSW	470 (423~517)	300	385	775	25	4000	0.4	99	240	3.6	5.6	2.6	
TVR10511-D	TVR10511KSW	510 (459~561)	320	410	845	25	4000	0.4	107	220	3.8	5.8	2.8	
TVR10561-D	TVR10561KSW	560 (504~616)	350	450	930	25	4000	0.4	113	200	4.0	5.9	3.0	
TVR10621-D	TVR10621KSW	620 (558~682)	395	510	1020	25	4000	0.4	125	190	4.3	6.3	3.2	
TVR10681-D	TVR10681KSW	680 (612~748)	420	560	1120	25	4000	0.4	128	180	4.9	6.6	3.4	
TVR10751-D	TVR10751KSW	750 (675~825)	465	615	1235	25	4000	0.4	134	170	4.9	6.8	3.7	
TVR10821-D	TVR10821KSW	820 (738~902)	510	670	1355	25	4000	0.4	146	140	4.9	6.8	3.4	
TVR10911-D	TVR10911KSW	910 (819~1001)	550	745	1500	25	4000	0.4	152	130	5.3	7.2	3.7	
TVR10102-D	TVR10102KSW	1000(900~1100)	625	825	1650	25	4000	0.4	170	120	5.5	7.5	4.0	
TVR10112-D	TVR10112KSW	1100(990~1210)	680	895	1815	25	4000	0.4	180	110	5.7	8.0	4.3	

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

14-D Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Continuous 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			UL 1449 3 rd SPD Application
		V _{1mA}	V _{AC(ms)}	V _{DC}	V _P	I _P	I _{max}	P	W _{max}	C _p	T _{min}	T _{max}	W \pm 1.0	
		(V)	(V)	(V)	(V)	(A)	(A)	(W)	(J)	(pF)	(mm)			
TVR14181-D	TVR14181KSW	180 (162~198)	115	150	300	50	8000	0.6	60	1000	2.4	4.3	1.6	For SPD Type 3 Application
TVR14201-D	TVR14201KSW	200 (180~220)	130	170	340	50	8000	0.6	82	900	2.5	4.4	1.7	
TVR14221-D	TVR14221KSW	220 (198~242)	140	180	360	50	8000	0.6	90	850	2.5	4.4	1.7	
TVR14241-D	TVR14241KSW	240 (216~264)	150	200	395	50	8000	0.6	98	780	2.7	4.6	1.8	
TVR14271-D	TVR14271KSW	270 (243~297)	175	225	455	50	8000	0.6	116	650	2.8	4.8	1.9	
TVR14301-D	TVR14301KSW	300 (270~330)	195	250	500	50	8000	0.6	128	610	3.1	4.8	2.1	
TVR14331-D	TVR14331KSW	330 (297~363)	215	275	550	50	8000	0.6	140	580	3.2	4.9	2.2	
TVR14361-D	TVR14361KSW	360 (324~396)	230	300	595	50	8000	0.6	158	550	3.3	5.0	2.3	
TVR14391-D	TVR14391KSW	390 (351~429)	250	320	650	50	8000	0.6	170	520	3.5	5.2	2.5	
TVR14431-D	TVR14431KSW	430 (387~473)	275	350	710	50	8000	0.6	185	480	3.4	5.5	2.5	
TVR14471-D	TVR14471KSW	470 (423~517)	300	385	775	50	8000	0.6	205	460	3.6	5.6	2.6	
TVR14511-D	TVR14511KSW	510 (459~561)	320	410	845	50	8000	0.6	220	430	3.8	5.8	2.8	
TVR14561-D	TVR14561KSW	560 (504~616)	350	450	930	50	8000	0.6	240	390	4.0	5.9	3.0	
TVR14621-D	TVR14621KSW	620 (558~682)	395	510	1020	50	8000	0.6	250	350	4.3	6.3	3.2	
TVR14681-D	TVR14681KSW	680 (612~748)	420	560	1120	50	8000	0.6	260	320	4.5	6.6	3.4	
TVR14751-D	TVR14751KSW	750 (675~825)	465	615	1235	50	8000	0.6	270	290	4.8	6.8	3.7	
TVR14821-D	TVR14821KSW	820 (738~902)	510	670	1355	50	8000	0.6	280	250	4.9	6.8	3.4	
TVR14911-D	TVR14911KSW	910 (819~1001)	550	745	1500	50	8000	0.6	295	230	5.3	7.2	3.7	
TVR14102-D	TVR14102KSW	1000(900~1100)	625	825	1650	50	8000	0.6	335	210	5.7	7.5	4.0	
TVR14112-D	TVR14112KSW	1100(990~1210)	680	895	1815	50	8000	0.6	360	190	5.8	8.0	4.3	

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

20-D Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Continuous Voltage			Max. Clamping Voltage (8/20μs)		Max. Surge Current (8/20μs)	Rated Power	Max. Energy (10/1000μs)	Reference Capacitance @1KHz	Dimension			UL 1449 3 rd SPD Application
		V _{1mA}	V _{AC(rms)}	V _{DC}	V _P	I _P	I _{max}	P	W _{max}	C _p	T _{min}	T _{max}	W ±1.0		
		(V)	(V)	(V)	(V)	(A)	(A)	(W)	(J)	(pF)	(mm)				
TVR20181-D	TVR20181KSW	180 (162~198)	115	150	300	100	13000	1.0	152	2200	2.8	4.7	1.8	For SPD Type 3 Application	
TVR20201-D	TVR20201KSW	200 (180~220)	130	170	340	100	13000	1.0	175	1900	2.9	4.8	1.9		
TVR20221-D	TVR20221KSW	220 (198~242)	140	180	360	100	13000	1.0	185	1700	2.9	4.8	1.9		
TVR20241-D	TVR20241KSW	240 (216~264)	150	200	395	100	13000	1.0	198	1500	3.1	5.0	2.0		
TVR20271-D	TVR20271KSW	270 (243~297)	175	225	455	100	13000	1.0	220	1400	3.2	5.2	2.1		
TVR20301-D	TVR20301KSW	300 (270~330)	195	250	500	100	13000	1.0	245	1300	3.5	5.2	2.3		
TVR20331-D	TVR20331KSW	330 (297~363)	215	275	550	100	13000	1.0	268	1200	3.6	5.3	2.4		
TVR20361-D	TVR20361KSW	360 (324~396)	230	300	595	100	13000	1.0	315	1000	3.7	5.4	2.5		
TVR20391-D	TVR20391KSW	390 (351~429)	250	320	650	100	13000	1.0	350	880	3.9	5.6	2.7		
TVR20431-D	TVR20431KSW	430 (387~473)	275	350	710	100	13000	1.0	380	800	3.8	5.9	2.7		
TVR20471-D	TVR20471KSW	470 (423~517)	300	385	775	100	13000	1.0	405	700	4.0	6.0	2.8		
TVR20511-D	TVR20511KSW	510 (459~561)	320	410	845	100	13000	1.0	445	630	4.2	6.2	3.0		
TVR20561-D	TVR20561KSW	560 (504~616)	350	450	930	100	13000	1.0	475	530	4.4	6.3	3.2		
TVR20621-D	TVR20621KSW	620 (558~682)	395	510	1020	100	13000	1.0	490	490	4.7	6.7	3.4		
TVR20681-D	TVR20681KSW	680 (612~748)	420	560	1120	100	13000	1.0	500	470	4.9	7.0	3.6		
TVR20751-D	TVR20751KSW	750 (675~825)	465	615	1235	100	13000	1.0	525	450	5.2	7.2	3.9		
TVR20821-D	TVR20821KSW	820 (738~902)	510	670	1355	100	13000	1.0	545	410	5.3	7.2	3.6		
TVR20911-D	TVR20911KSW	910 (819~1001)	550	745	1500	100	13000	1.0	595	380	5.7	7.6	3.9		
TVR20102-D	TVR20102KSW	1000(900~1100)	625	825	1650	100	13000	1.0	650	360	6.1	7.9	4.2		
TVR20112-D	TVR20112KSW	1100(990~1210)	680	895	1815	100	13000	1.0	720	340	6.2	8.4	4.5		

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

20-D for SPD Type 2 Application Series

Certified Model No.	Part No.	Varistor Voltage (@ 1mA DC)	Max. Continuous Voltage		Max. Clamping Voltage (8/20µs)		Max. Surge Current (8/20µs)	Nominal Discharge Current ^{*1} (8/20us)	Rated Power	Max. Energy (10/1000µs)	Reference Capacitance @1KHz	Dimension			UL 1449 3 rd SPD Application
		V _{1mA}	V _{AC(rms)}	V _{DC}	V _P	I _P	I _{max}	I _n	P	W _{max}	C _p	T _{min}	T _{max}	W ±1.0	
		(V)	(V)	(V)	(V)	(A)	(A)	(A)	(W)	(J)	(pF)	(mm)			
TVR20181-S	TVR20181KSS	180(162~198)	115	150	300	100	13000	5000	1.0	152	2200	2.8	4.7	1.8	For SPD Type 2 Application
TVR20201-S	TVR20201KSS	200(180~220)	130	170	340	100	13000	5000	1.0	175	1900	2.9	4.8	1.9	
TVR20221-S	TVR20221KSS	220(198~242)	140	180	360	100	13000	5000	1.0	185	1700	2.9	4.8	1.9	
TVR20241-S	TVR20241KSS	240(216~264)	150	200	395	100	13000	5000	1.0	198	1500	3.1	5.0	2.0	
TVR20271-S	TVR20271KSS	270(243~297)	175	225	455	100	13000	5000	1.0	220	1400	3.2	5.2	2.1	
TVR20301-S	TVR20301KSS	300(270~330)	195	250	500	100	13000	5000	1.0	245	1300	3.5	5.2	2.3	
TVR20331-S	TVR20331KSS	330(297~363)	215	275	550	100	13000	5000	1.0	268	1200	3.6	5.3	2.4	
TVR20361-S	TVR20361KSS	360(324~396)	230	300	595	100	13000	5000	1.0	315	1000	3.7	5.4	2.5	
TVR20391-S	TVR20391KSS	390(351~429)	250	320	650	100	13000	5000	1.0	350	880	3.9	5.6	2.7	
TVR20431-S	TVR20431KSS	430(387~473)	275	350	710	100	13000	5000	1.0	380	800	3.8	5.9	2.7	
TVR20471-S	TVR20471KSS	470(423~517)	300	385	775	100	13000	5000	1.0	405	700	4.0	6.0	2.8	
TVR20511-S	TVR20511KSS	510(459~561)	320	410	845	100	13000	5000	1.0	445	630	4.2	6.2	3.0	
TVR20561-S	TVR20561KSS	560(504~616)	350	450	930	100	13000	5000	1.0	475	530	4.4	6.3	3.2	
TVR20621-S	TVR20621KSS	620(558~682)	395	510	1020	100	13000	5000	1.0	490	490	4.7	6.7	3.4	
TVR20681-S	TVR20681KSS	680(612~748)	420	560	1120	100	13000	5000	1.0	500	470	4.9	7.0	3.6	
TVR20751-S	TVR20751KSS	750(675~825)	465	615	1235	100	13000	5000	1.0	525	450	5.2	7.2	3.9	
TVR20821-S	TVR20821KSS	820(738~902)	510	670	1355	100	13000	5000	1.0	545	410	5.3	7.2	3.6	
TVR20911-S	TVR20911KSS	910(819~1001)	550	745	1500	100	13000	5000	1.0	595	380	5.7	7.6	3.9	
TVR20102-S	TVR20102KSS	1000(900~1100)	625	825	1650	100	13000	5000	1.0	650	360	6.1	7.9	4.2	
TVR20112-S	TVR20112KSS	1100(990~1210)	680	895	1815	100	13000	5000	1.0	720	340	6.2	8.4	4.5	

Note:




*1: Nominal discharge current is the specification defined in UL 1449 3rd and use 8/20µs current waveform to test the varistor.

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)




■ Safety Approvals

Certified Model No.	Agency				
					
	UL1449 3 rd & cUL: E314979	40021243	IEC60950-1:2013 Annex Q	GB/T10193-1997 GB/T10194-1997 CQC10001041750 CQC10001041751	GB8898-2011 GB4943.1-2011 CQC10001041750 CQC10001041751
TVR07181-D	√	√		√	
TVR07201-D	√	√		√	
TVR07221-D	√	√		√	
TVR07241-D	√	√		√	
TVR07271-D	√	√		√	
TVR07301-D	√	√		√	
TVR07331-D	√	√		√	
TVR07361-D	√	√		√	
TVR07391-D	√	√		√	
TVR07431-D	√	√		√	
TVR07471-D	√	√		√	
TVR07511-D	√	√		√	
TVR07561-D	√	√		√	
TVR07621-D	√	√		√	
TVR07681-D	√	√		√	
TVR07751-D	√	√		√	
TVR07821-D	√	√		√	
TVR10181-D	√	√	√	√	
TVR10201-D	√	√	√	√	√
TVR10221-D	√	√	√	√	√
TVR10241-D	√	√	√	√	√
TVR10271-D	√	√	√	√	√
TVR10301-D	√	√	√	√	√
TVR10331-D	√	√	√	√	√
TVR10361-D	√	√	√	√	√
TVR10391-D	√	√	√	√	√
TVR10431-D	√	√	√	√	√
TVR10471-D	√	√	√	√	√
TVR10511-D	√	√	√	√	√
TVR10561-D	√	√	√	√	√
TVR10621-D	√	√	√	√	√
TVR10681-D	√	√	√	√	√
TVR10751-D	√	√	√	√	√
TVR10821-D	√	√	√	√	√
TVR10911-D	√	√	√	√	√
TVR10102-D	√	√	√	√	√
TVR10112-D	√	√	√	√	√

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

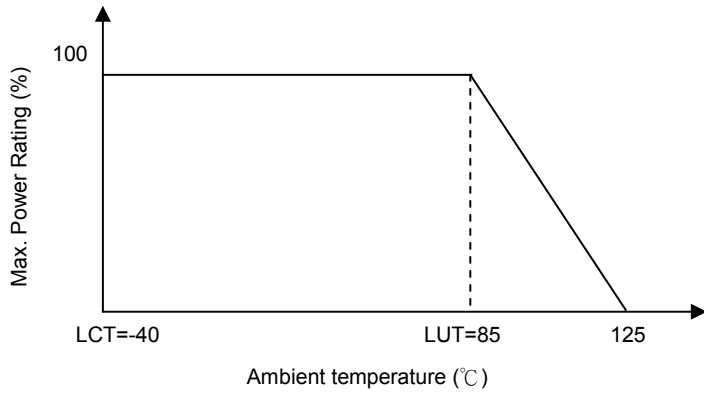
Certified Model No.	Agency				
					
	UL1449 3 rd & cUL: E314979	40021243	IEC60950-1:2013 Annex Q	GB/T10193-1997 GB/T10194-1997 CQC10001041750 CQC10001041751	GB8898-2011 GB4943.1-2011 CQC10001041750 CQC10001041751
TVR14181-D	√	√	√	√	
TVR14201-D	√	√	√	√	√
TVR14221-D	√	√	√	√	√
TVR14241-D	√	√	√	√	√
TVR14271-D	√	√	√	√	√
TVR14301-D	√	√	√	√	√
TVR14331-D	√	√	√	√	√
TVR14361-D	√	√	√	√	√
TVR14391-D	√	√	√	√	√
TVR14431-D	√	√	√	√	√
TVR14471-D	√	√	√	√	√
TVR14511-D	√	√	√	√	√
TVR14561-D	√	√	√	√	√
TVR14621-D	√	√	√	√	√
TVR14681-D	√	√	√	√	√
TVR14751-D	√	√	√	√	√
TVR14821-D	√	√	√	√	√
TVR14911-D	√	√	√	√	√
TVR14102-D	√	√	√	√	√
TVR14112-D	√	√	√	√	√
TVR20181-D / -S	√	√	√	√	
TVR20201-D / -S	√	√	√	√	√
TVR20221-D / -S	√	√	√	√	√
TVR20241-D / -S	√	√	√	√	√
TVR20271-D / -S	√	√	√	√	√
TVR20301-D / -S	√	√	√	√	√
TVR20331-D / -S	√	√	√	√	√
TVR20361-D / -S	√	√	√	√	√
TVR20391-D / -S	√	√	√	√	√
TVR20431-D / -S	√	√	√	√	√
TVR20471-D / -S	√	√	√	√	√
TVR20511-D / -S	√	√	√	√	√
TVR20561-D / -S	√	√	√	√	√
TVR20621-D / -S	√	√	√	√	√
TVR20681-D / -S	√	√	√	√	√
TVR20751-D / -S	√	√	√	√	√
TVR20821-D / -S	√	√	√	√	√
TVR20911-D / -S	√	√	√	√	√
TVR20102-D / -S	√	√	√	√	√
TVR20112-D / -S	√	√	√	√	√

Metal Oxide Varistor : TVR-D Series

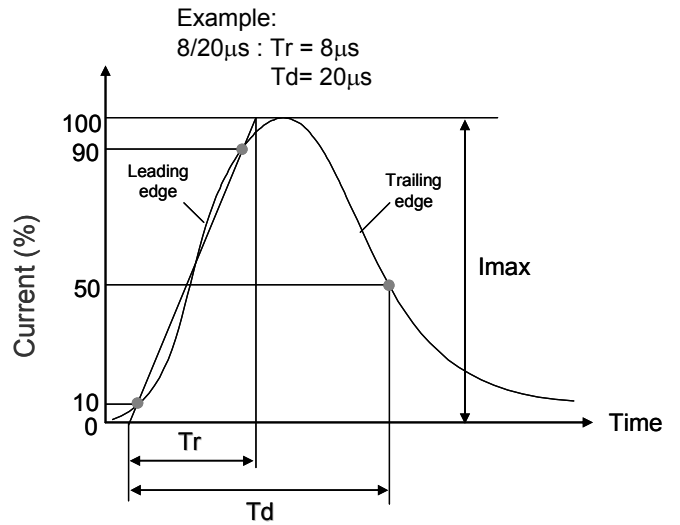


Disc Type Varistor for Surge Protection (High Surge Series)

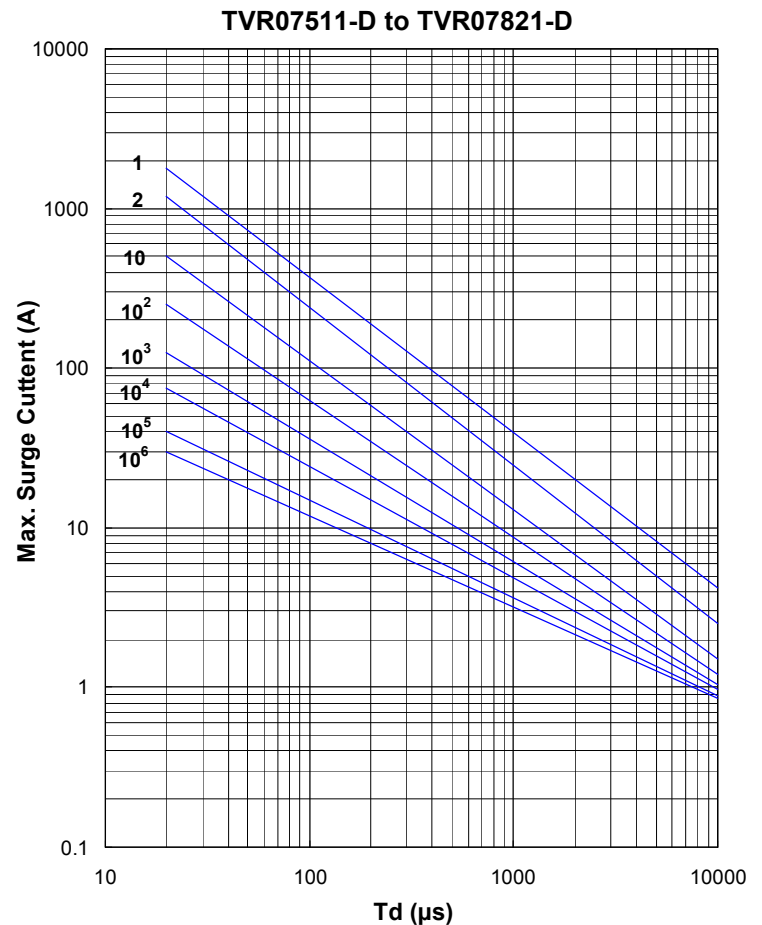
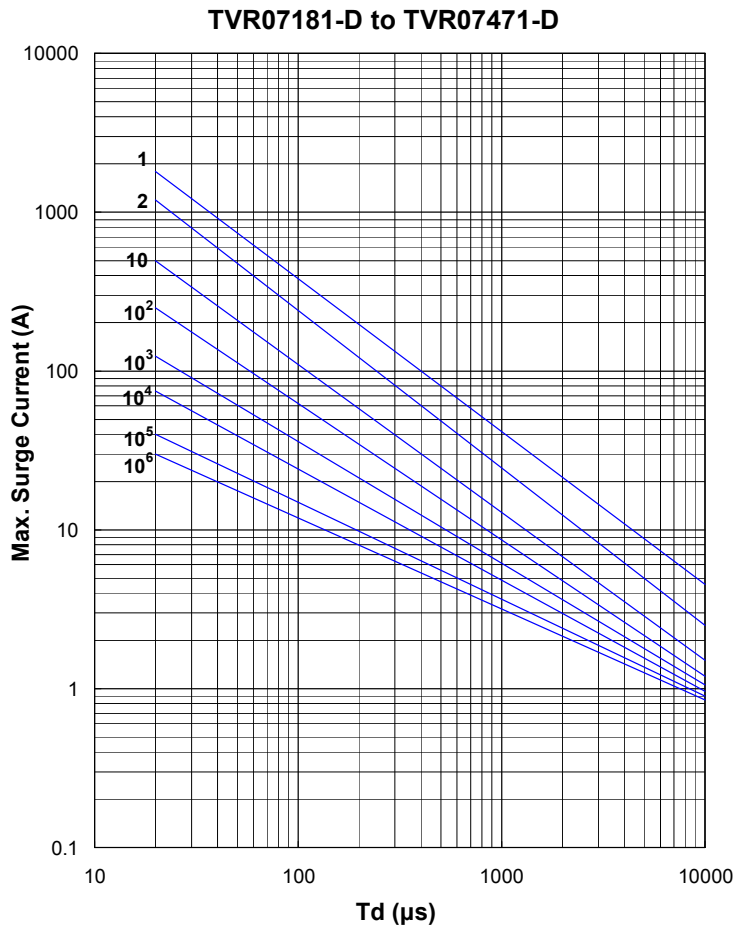
Power Derating Curve



Surge Current Standard Waveform



Max. Surge Current Derating Curves



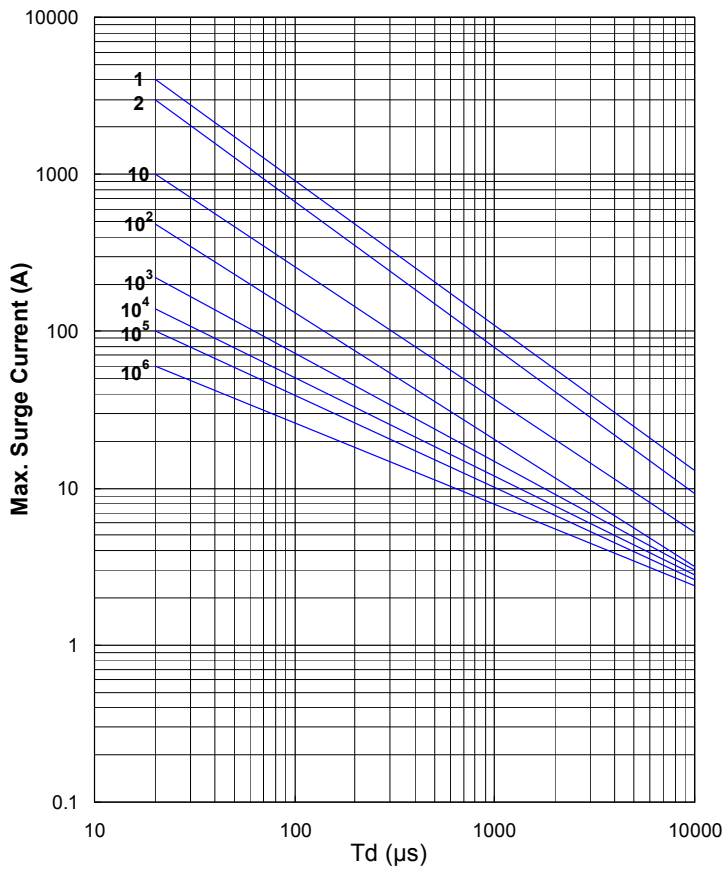
Metal Oxide Varistor : TVR-D Series



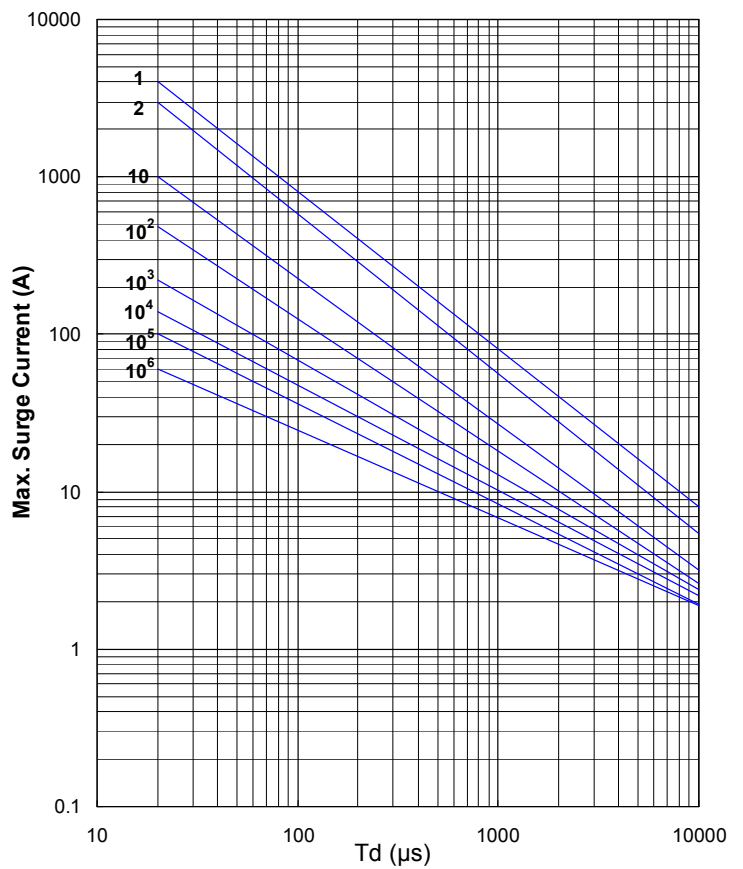
Disc Type Varistor for Surge Protection (High Surge Series)

■ Max. Surge Current Derating Curves

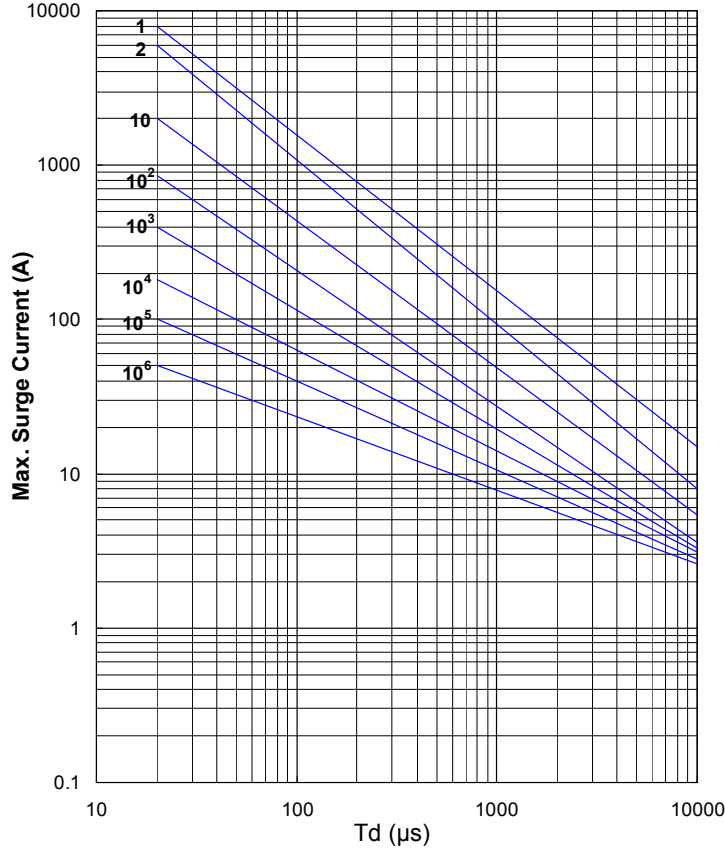
TVR10181-D to TVR10751-D



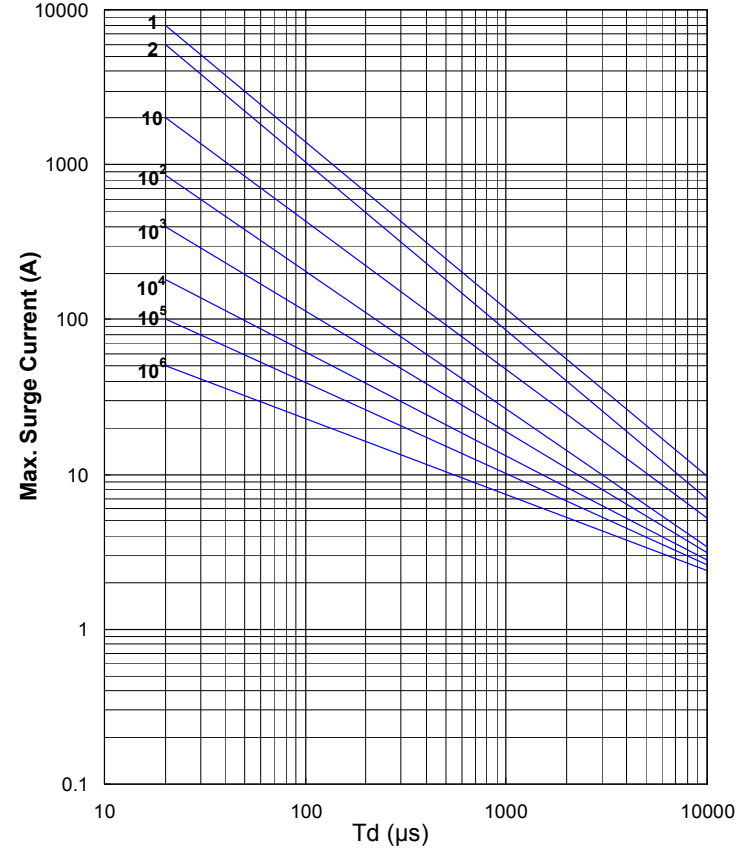
TVR10821-D to TVR10112-D



TVR14181-D to TVR14751-D



TVR14821-D to TVR14112-D



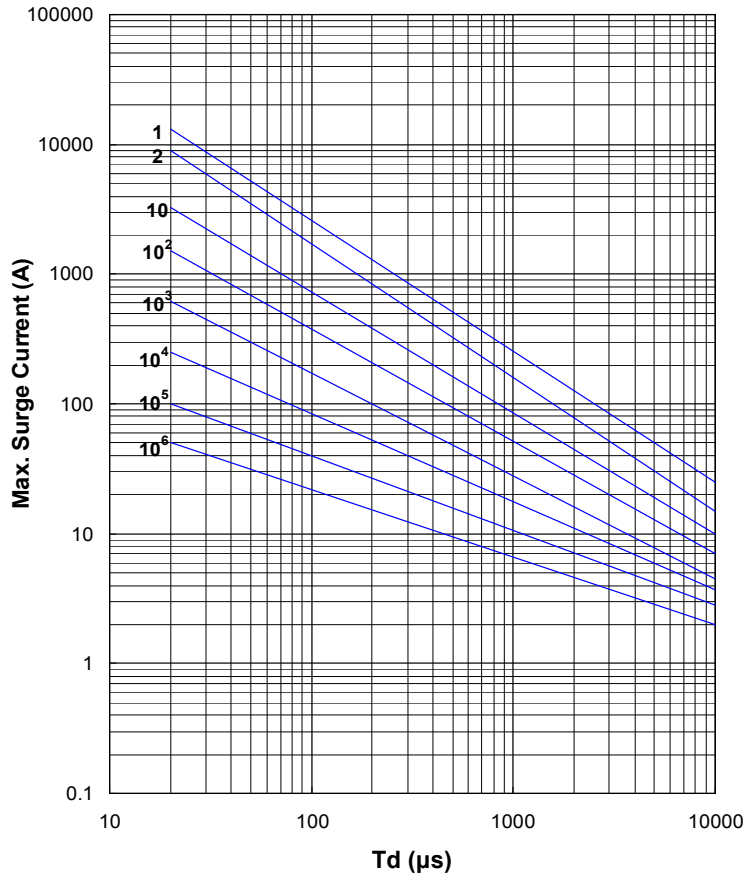
Metal Oxide Varistor : TVR-D Series



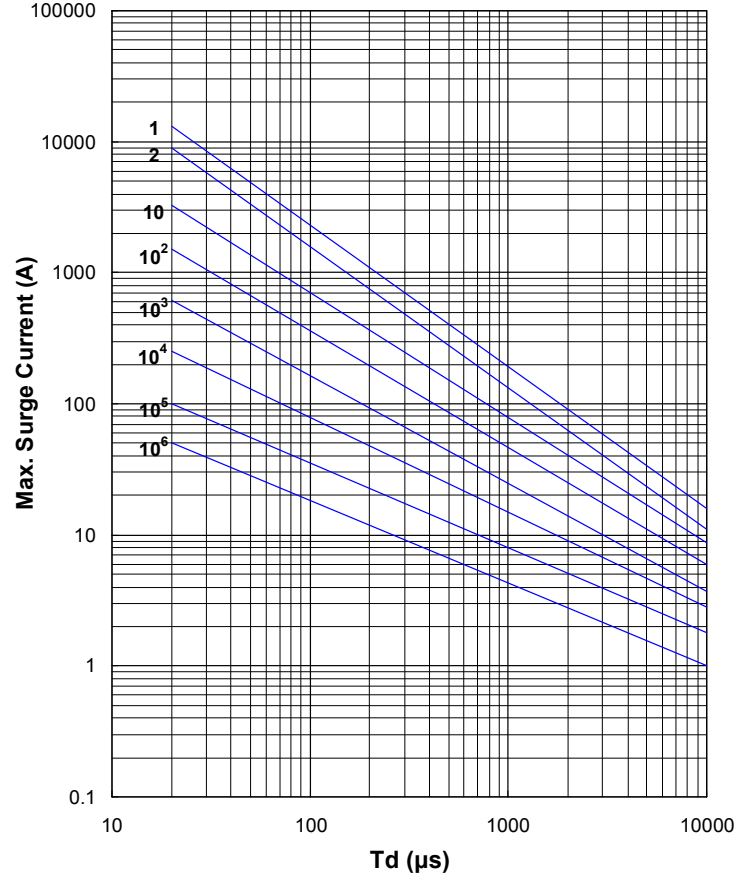
Disc Type Varistor for Surge Protection (High Surge Series)

Max. Surge Current Derating Curves

TVR20181-D(-S) to TVR20751-D(-S)

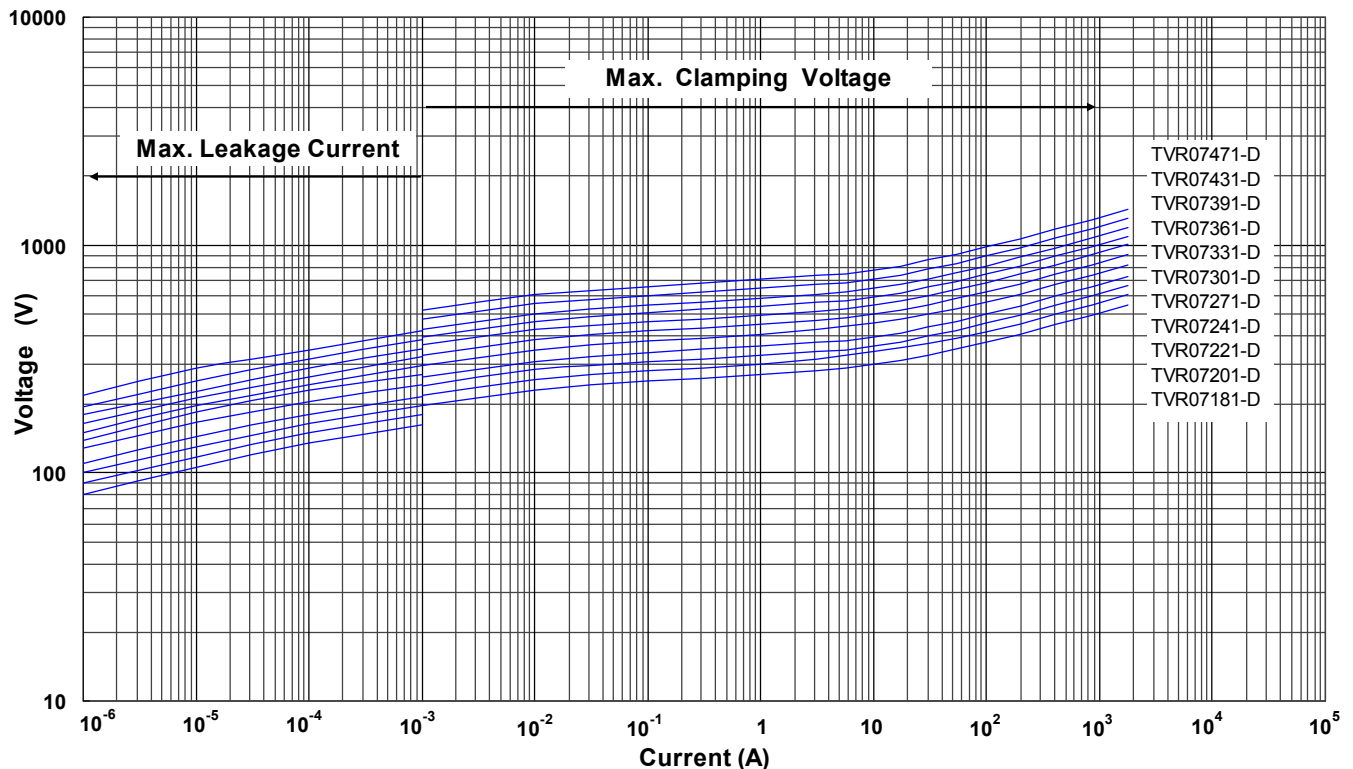


TVR20821-D(-S) to TVR20112-D(-S)



Max. Leakage Current and Max. Clamping Voltage Curves

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



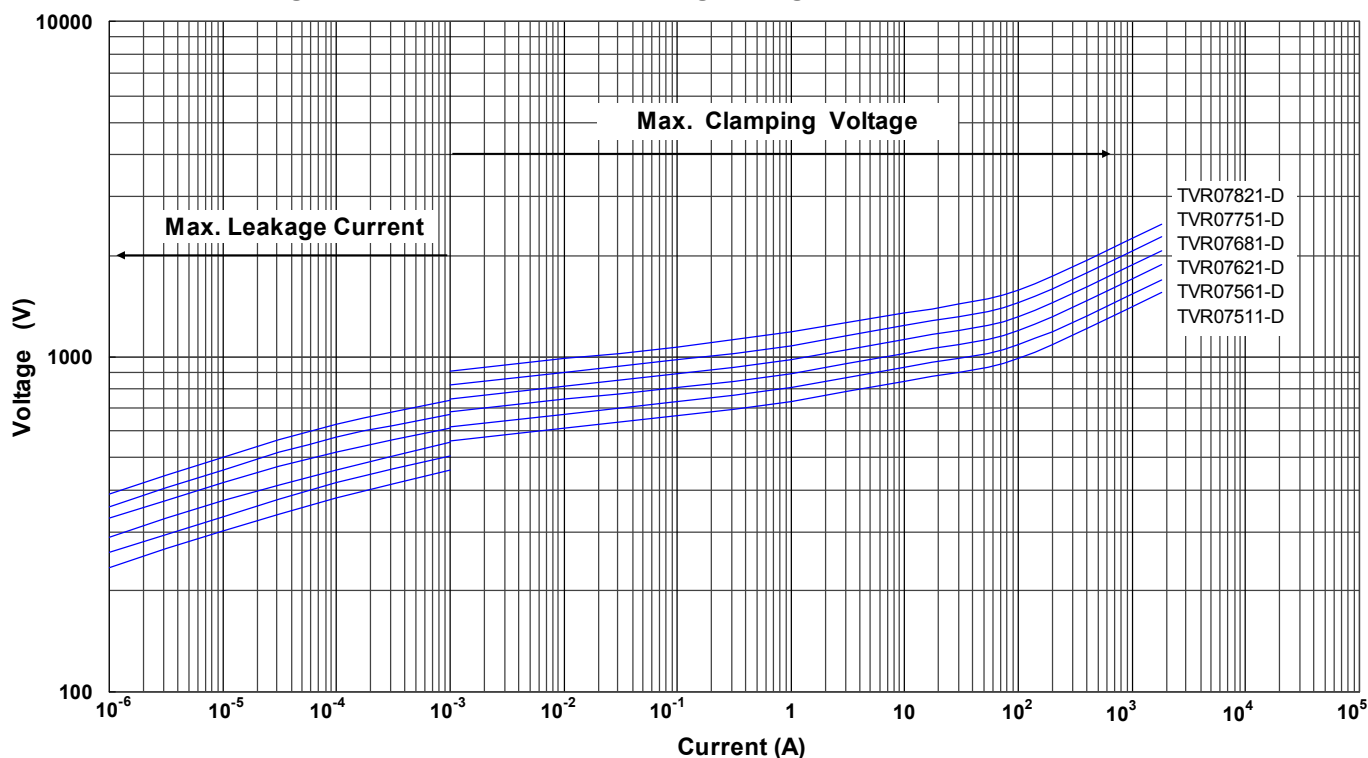
Metal Oxide Varistor : TVR-D Series



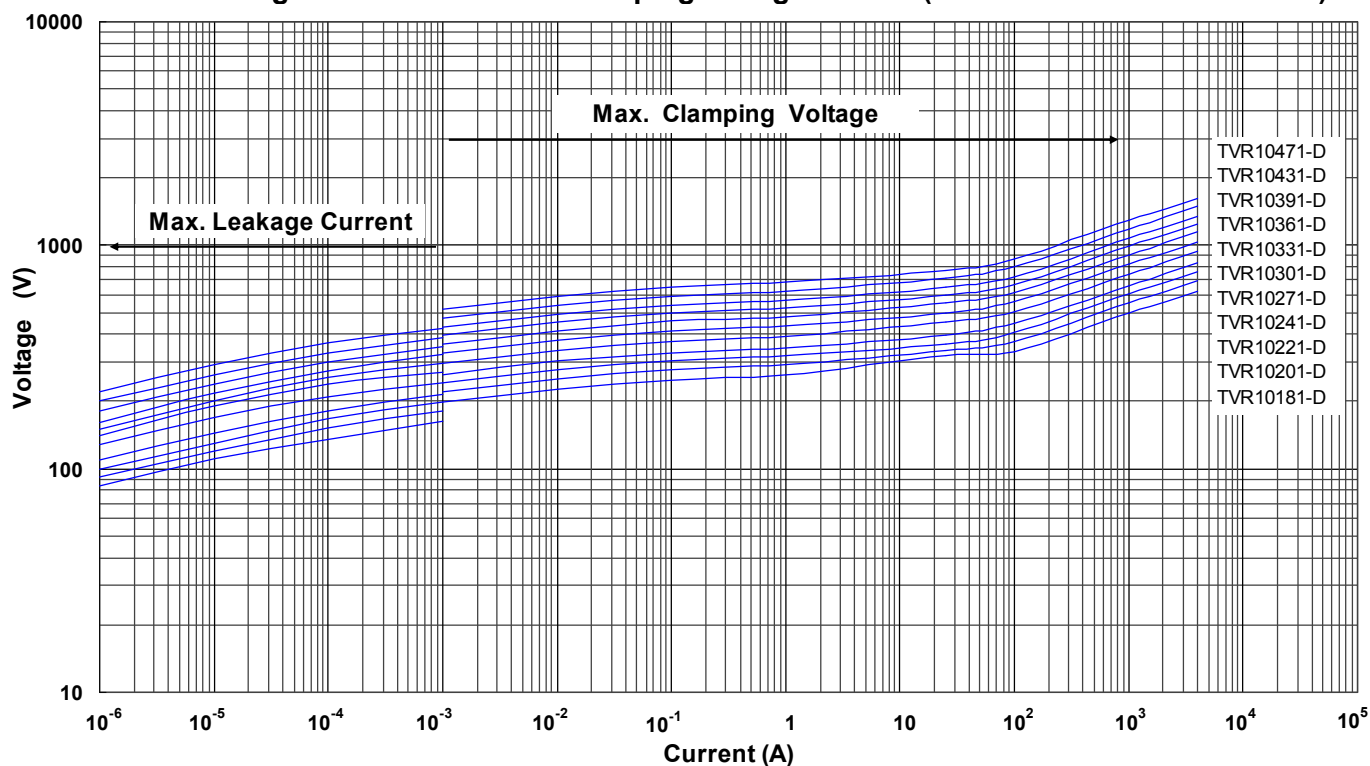
Disc Type Varistor for Surge Protection (High Surge Series)

■ Max. Leakage Current and Max. Clamping Voltage Curves

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



Max. Leakage Current and Max. Clamping Voltage Curves (TVR10181-D to TVR10471-D)



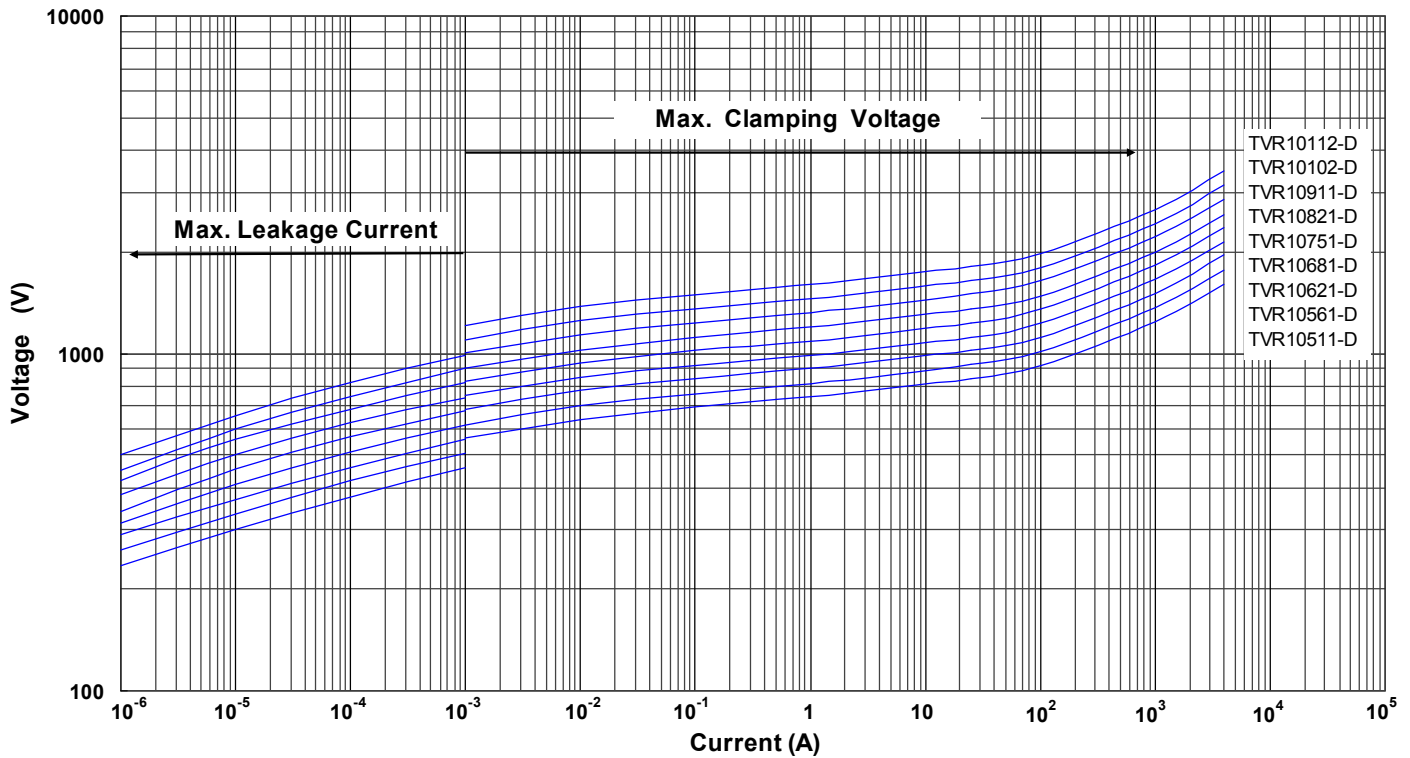
Metal Oxide Varistor : TVR-D Series



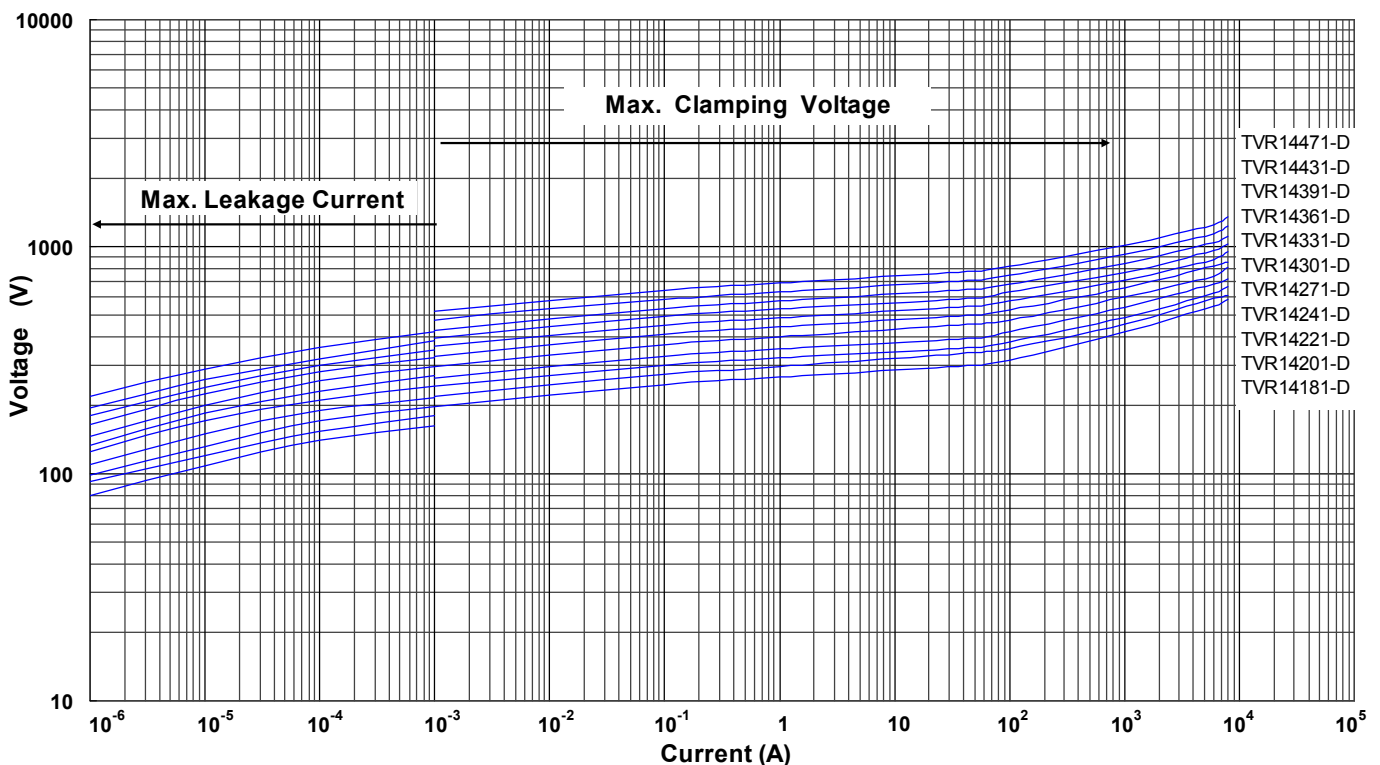
Disc Type Varistor for Surge Protection (High Surge Series)

■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR10511-D to TVR10112-D)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR14181-D to TVR14471-D)



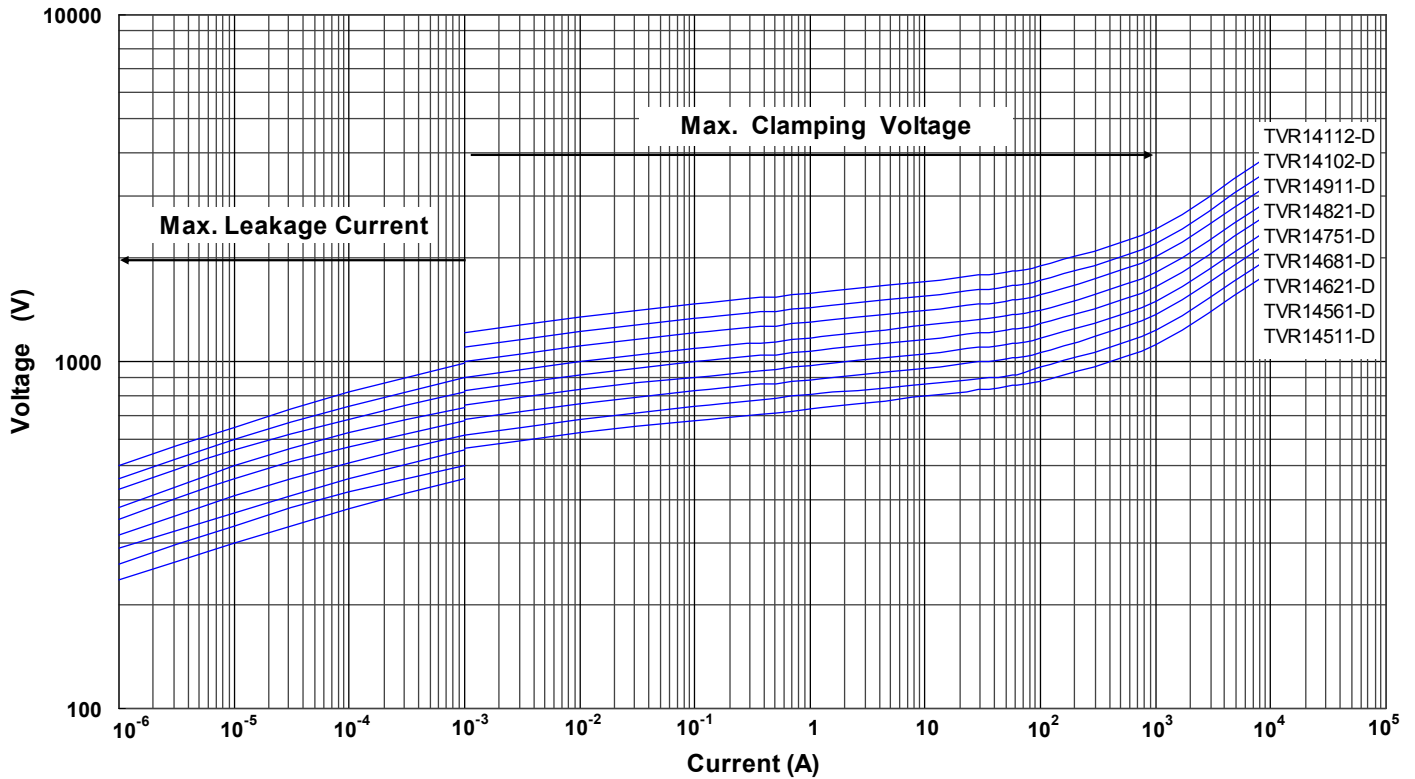
Metal Oxide Varistor : TVR-D Series



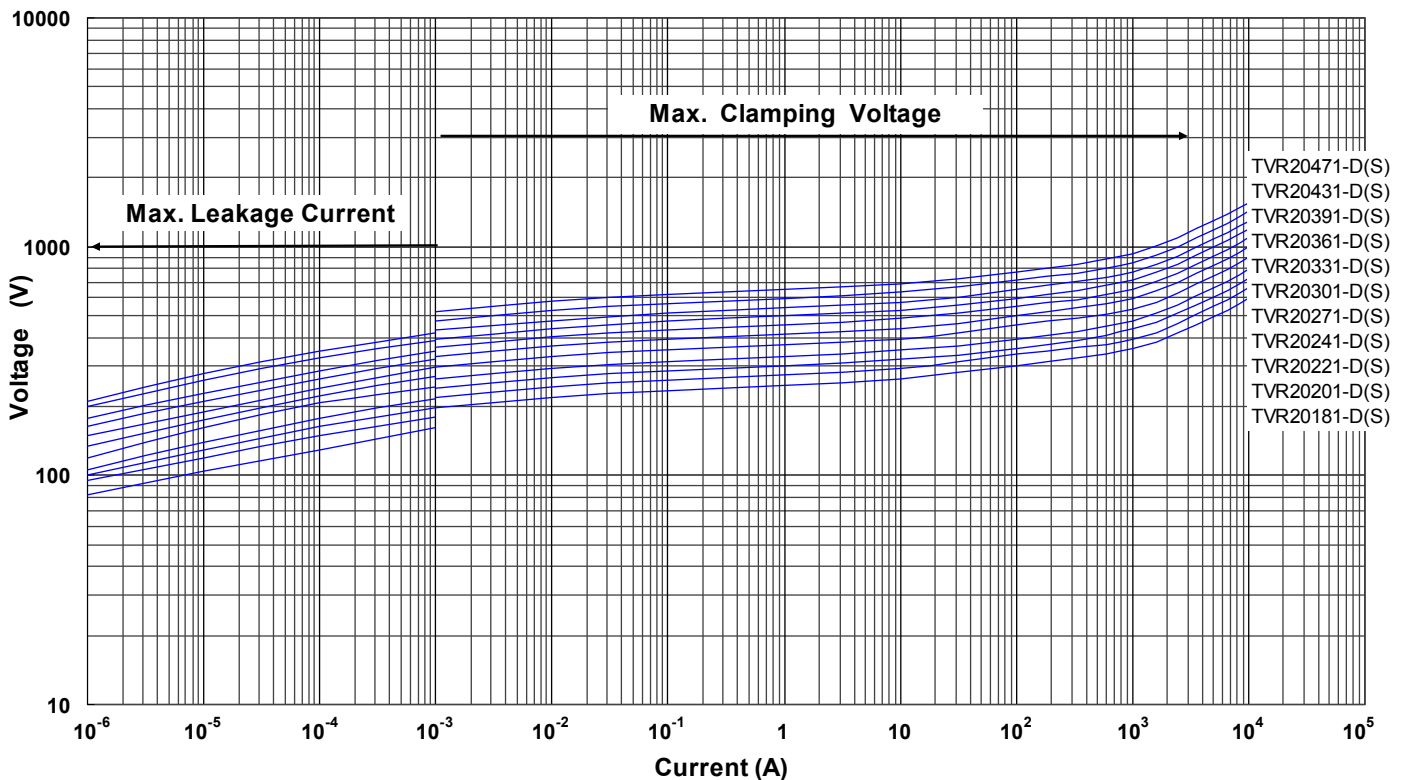
Disc Type Varistor for Surge Protection (High Surge Series)

■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR14511-D to TVR14112-D)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR20181-D(-S) to TVR20471-D(-S))

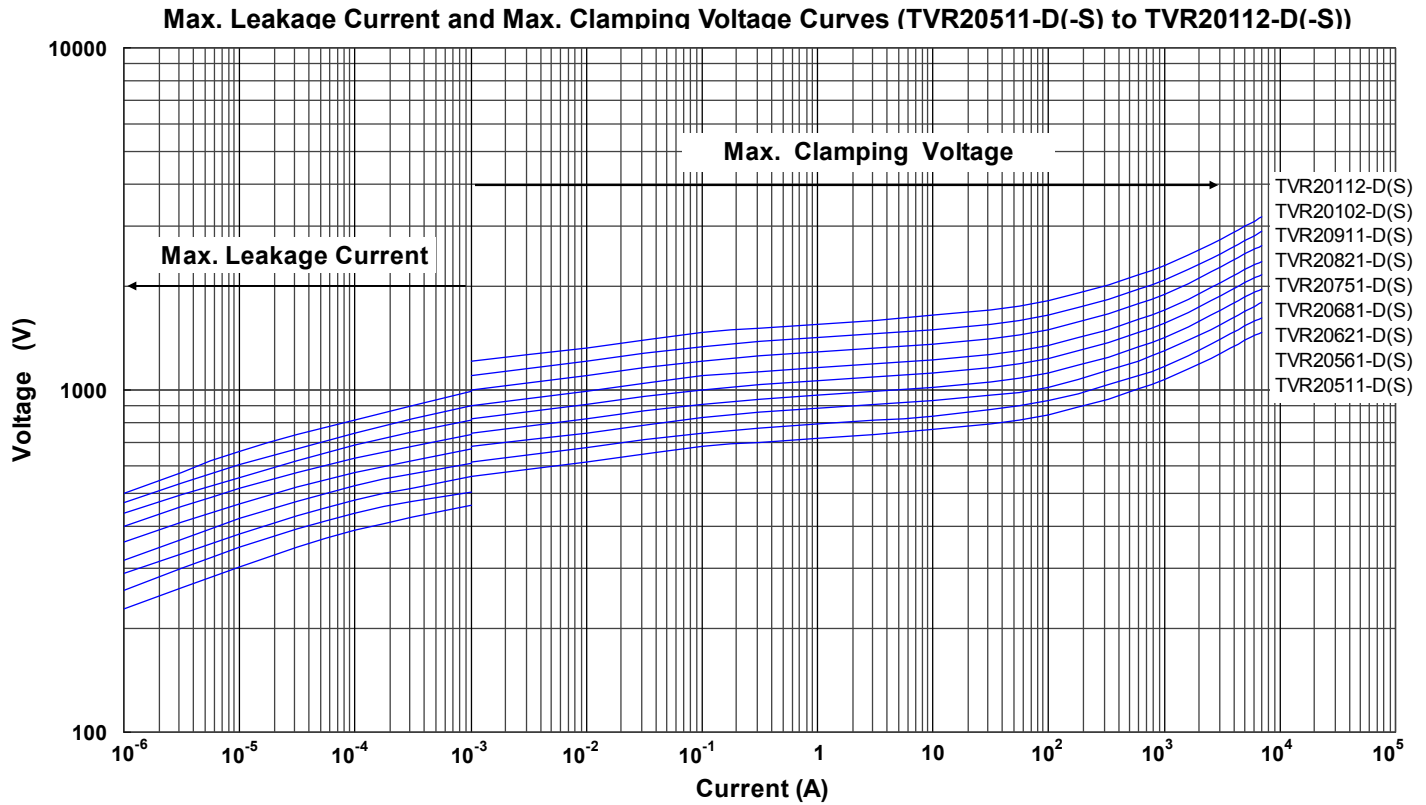


Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

■ Max. Leakage Current and Max. Clamping Voltage Curves



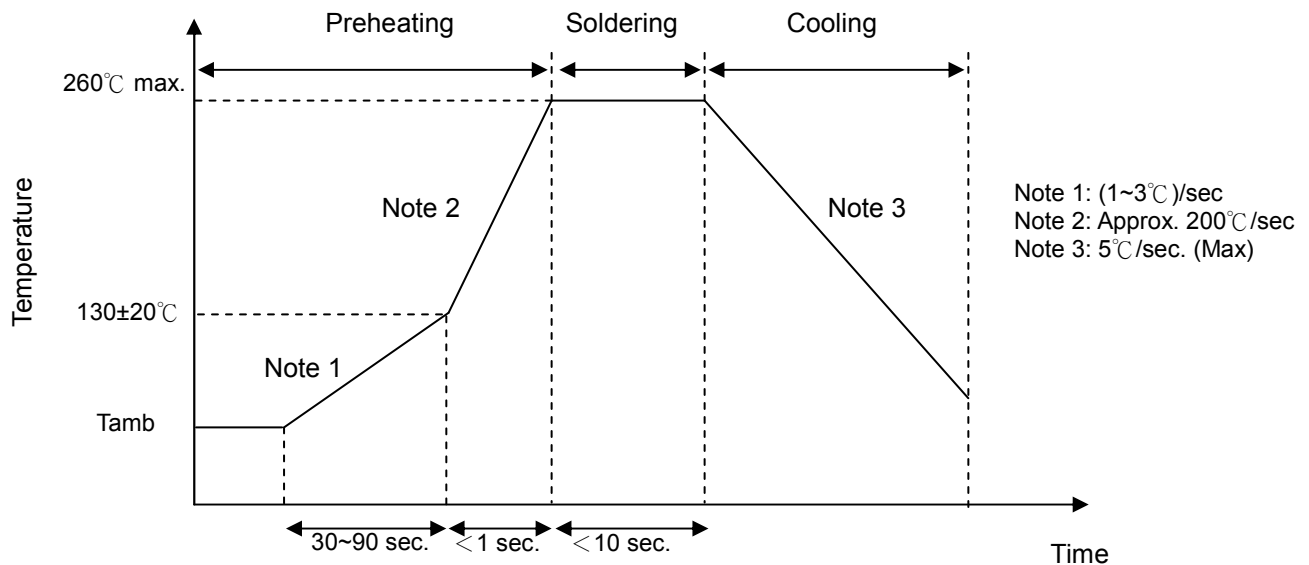
Metal Oxide Varistor : TVR-D Series



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 apply the specified force and keep the unit fixed for 10±1 sec. Terminal diameter (mm) Force (Kg) 0.5<d≤0.8 1.0 0.8<d≤1.25 2.0	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage															
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. Terminal diameter (mm) Force (Kg) 0.5<d≤0.8 0.5 0.8<d≤1.25 1.0	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage															
Vibration	IEC 60068-2-6	Frequency range: 10~55Hz Amplitude: 0.75mm or 98m/s ² Direction: 3 mutually perpendicular directions, 2 hrs each.	$ \Delta V_{1mA}/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_{1mA}/V_{1mA} \leq 5\%$ No visible damage															
High Temperature Storage	IEC 60068-2-2	125±5°C x 1000 hrs ± 24hrs	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage															
Damp Heat, Steady State	IEC 60068-2-78	a. 40±2°C, 90 ~ 95 % RH, 1344 hrs b. 40±2°C, 90~ 95 % RH , at 10% Vdc, 1344 hrs	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage Insulation Resistance ≥ 100MΩ															
Rapid Change of Temperature	IEC 60068-2-14	The conditions shown below shall be repeated 5 cycles <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Period (minutes)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-40±3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temperature</td> <td>5±3</td> </tr> <tr> <td>3</td> <td>85±2</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temperature</td> <td>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_{1mA}/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																
High Temp. Load	MIL-STD-202 Method 108	85±2°C, 1000±24 hrs at V _{DC} or V _{rms} (Max. Continuous Voltage)	$ \Delta V_{1mA}/V_{1mA} \leq 10\%$ No visible damage															
8/20μs Surge Life	IEC 61051-1	8/20μs waveform, 10 surge currents, unipolar, interval 30 sec, amplitude corresponding to max. surge current derating curves for 20μs.	$ \Delta V_{1mA}/V_{1mA} \leq 10\%$ No visible damage															
10/1000μs Surge Life	IEC 61051-1	10/1000μs waveform, 10 surge currents, unipolar, interval 2 mins, amplitude corresponding to max. surge current derating curves for 1000μs.	$ \Delta V_{1mA}/V_{1mA} \leq 10\%$ No visible damage															
Operating Duty Cycle Test	UL1449 3 rd	6KV/3KA 1.2/50μs+8/20μs combination waveform with V _{ac} (@ Deg 90) for 15 times. Interval time between tests is 60 secs. (For UL1449 3 rd SPD Type 3 application test only)	$ \Delta V_p/V_p \leq 10\%$ No visible damage															
Nominal Discharge Current Test	UL1449 3 rd	Refer to UL 1449 3 rd item 37.7, the test condition is 3KA 8/20μs surge current waveform for 15 times (For TVR20R UL1449 3 rd SPD Type 2 application test only)	$ \Delta V_p/V_p \leq 10\%$ No visible damage															
Voltage Proof	IEC 61051-1	Metal balls method, 2500 V _{ac} 1 min	No visible damage															
Varistor Voltage Temp. Coefficient	Specification Standard	$\frac{V_{1mA@85^\circ C} - V_{1mA@25^\circ C}}{V_{1mA@25^\circ C}} \times \frac{1}{60} \times 100\% (\% / ^\circ C)$, $\frac{V_{1mA@-40^\circ C} - V_{1mA@25^\circ C}}{V_{1mA@25^\circ C}} \times \frac{1}{65} \times 100\% (\% / ^\circ C)$	-0.05 ≤ TC ≤ 0.05 (%/°C)															

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

■ Packaging

● Taping Specification

S Type (Straight lead)

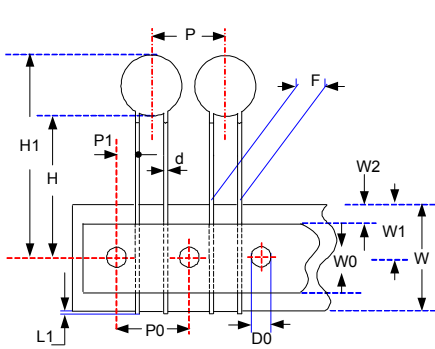


Figure A

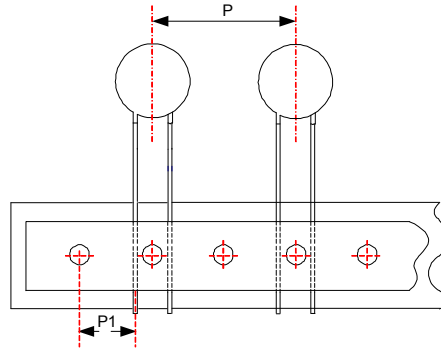


Figure B

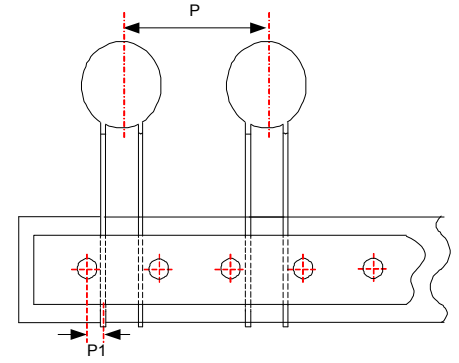
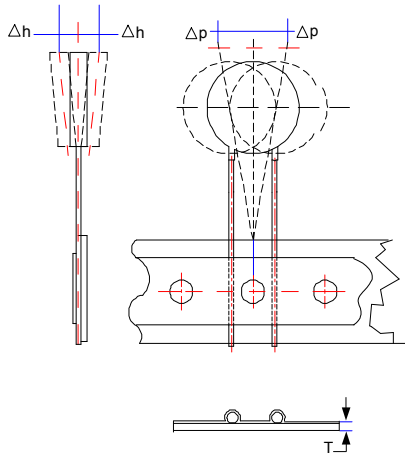


Figure C



(Unit: mm)

Taping Code	Series	P ₀	F	P	P ₁	H	H ₁	d	W ₀	W ₁	W ₂	W	ΔP	Δh	L ₁	D ₀	T	Figure
		±0.3	±1	±1	±0.7	+2/-0	Max.	±0.02	±1	+0.75/-0.5	Max	+1/-0.5	Max.	Max.	Max.	±0.2	±0.2	
A (P ₀ :12.7)	07-D	12.7	5.0	12.7	3.85	18	31	0.6	12	9	3	18	1	2	0.5	4	0.6	A
	10-D	12.7	7.5	25.4	8.95	18	36	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	14-D	12.7	7.5	25.4	8.95	18	40	0.8	12	9	3	18	1	2	0.5	4	0.6	B
E (P ₀ :15.0)	07-D	15.0	5.0	15.0	5.00	18	31	0.6	12	9	3	18	1	2	0.5	4	0.6	A
	10-D	15.0	7.5	15.0	3.75	18	36	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	14-D	15.0	7.5	30.0	3.75	18	40	0.8	12	9	3	18	1	2	0.5	4	0.6	C

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

F Type (Y kink lead)

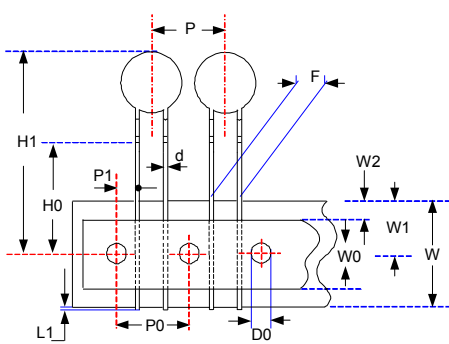


Figure A

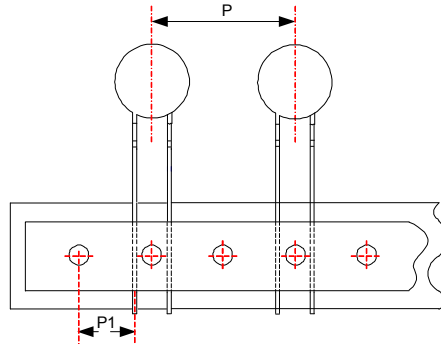


Figure B

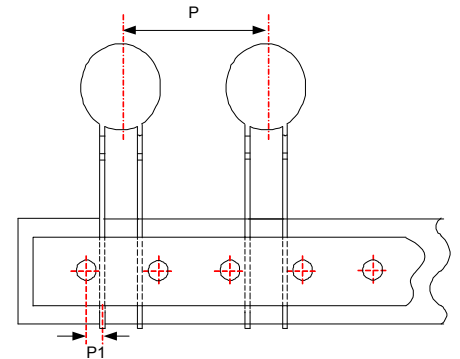
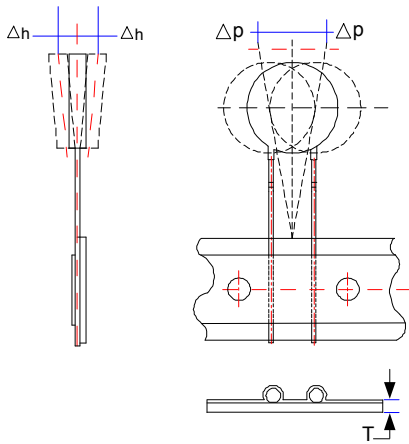


Figure C



(Unit: mm)

Taping Code	Series	P ₀	F	P	P ₁	H ₀	H ₁	d	W ₀	W ₁	W ₂	W	ΔP	Δh	L ₁	D ₀	T	Figure
		±0.3	±1	±1	±0.7	+2/-0	Max.	±0.02	±1	+0.75/-0.5	Max	+1/-0.5	Max.	Max.	Max.	±0.2	±0.2	
A (P ₀ :12.7)	07-D	12.7	5.0	12.7	3.85	16	31	0.6	12	9	3	18	1	2	0.5	4	0.6	A
	10-D	12.7	7.5	25.4	8.95	16	36	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	14-D	12.7	7.5	25.4	8.95	16	40	0.8	12	9	3	18	1	2	0.5	4	0.6	B
E (P ₀ :15.0)	07-D	15.0	5.0	15.0	5.00	16	31	0.6	12	9	3	18	1	2	0.5	4	0.6	A
	10-D	15.0	7.5	15.0	3.75	16	36	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	14-D	15.0	7.5	30.0	3.75	16	40	0.8	12	9	3	18	1	2	0.5	4	0.6	C

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

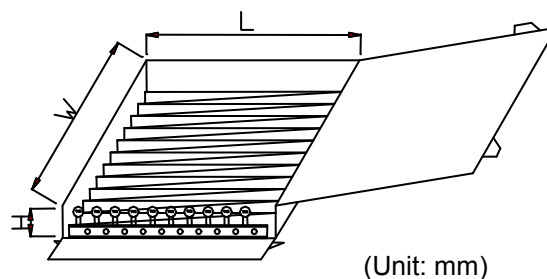
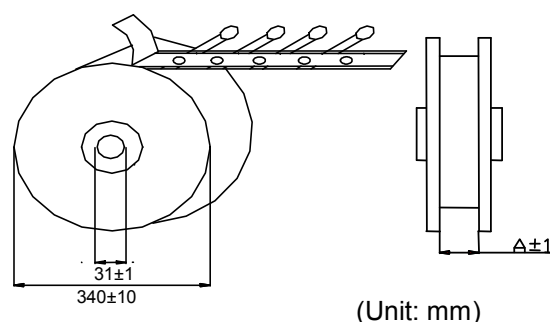
■ Quantity

● Bulk Packing

Series	Straight Lead Type Quantity (pcs/bag)	Cut Lead Type Quantity (pcs/bag)	Kink Type Quantity (pcs/bag)
TVR07-D	250	250	200
TVR10-D	200	200	200
TVR14-D	100	100	100
TVR20-D	50	50	50

● Reel Packing

Series	A (mm)	Quantity (pcs/reel)
TVR07(181~391) -D	46	1,500
TVR07(431~821) -D		1,000
TVR10(181~391) -D		1,000
TVR10 (431~561,681~911) -D		750
TVR10621-D		500
TVR10(102~112) -D		500
TVR14(181~331) -D	55	750
TVR14(361~112) -D		500
TVR20(181~681) -D		500
TVR20(751~112) -D		250



● Ammo Packing

Series	Quantity (pcs/box)
TVR07(181~821) -D	1,000
TVR10(181~361) -D	750
TVR10(391~621) -D	400
TVR10(681~112) -D	300
TVR14(181~271) -D	500
TVR14(301~112) -D	250

Series	W±5	L±5	H±5
TVR07-D~ TVR14-D	348	185	60
	348	275	60

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

■ Warehouse Storage Conditions of Products

● Storage Conditions:

1. Storage Temperature: -10°C ~ +40°C
2. Relative Humidity: ≤ 75%RH
3. Keep away from corrosive atmosphere and sunlight.

● Period of Storage: 1 year