

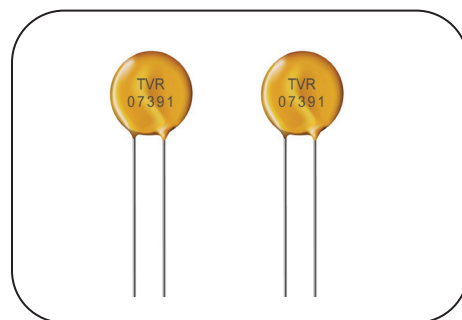
Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge Protection

■ Features

1. RoHS compliant
2. Halogen-free series are available
3. Body size: $\Phi 5 \sim \Phi 20\text{mm}$
4. Wide operating voltage range: 11Vac ~ 1000 Vac
5. Operating temperature range: $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
Storage temperature range: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
6. Agency recognition: UL 1449 3rd/UL 1414/cUL/VDE/CSA/CQC
7. TVR14181~14112 and TVR20181~20112 meet IEC 60950-1:2013 Annex Q requirement
8. TVR20 series for UL 1449 3rd SPD Type 2 application is available



■ 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

T	V	R	0	5	1	8	0	K	S						Y
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}		Appearance		Packaging		Optional Suffix		Internal Control Code	
TVR	THINKING Varistor TVR Series	05	$\Phi 5\text{mm}$	180	$18 \times 10^0\text{V}=18\text{V}$	K	$\pm 10\%$	S	Straight lead, epoxy coating	AR	Tape & reel packing (hole pitch:12.7mm)	Y	RoHS Compliant		
		07	$\Phi 7\text{mm}$	241	$24 \times 10^1\text{V}=240\text{V}$			F	Y kink lead, epoxy coating	ER	Tape & reel packing (hole pitch:15.0mm)	F	RoHS Compliant & Halogen-Free		
		10	$\Phi 10\text{mm}$	102	$10 \times 10^2\text{V}=1000\text{V}$			T	L kink lead, epoxy coating	AB	Tape & ammo box packing (hole pitch:12.7mm)	R	For UL 1449 3 rd SPD Type 2 Application (TVR20 only)		
		14	$\Phi 14\text{mm}$							EB	Tape & ammo box packing (hole pitch:15.0mm)				
		20	$\Phi 20\text{mm}$							C	Bulk & cut lead (followed by the codes of 2 leaded length)				
										Blank	Bulk				
														01~ZZ	

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

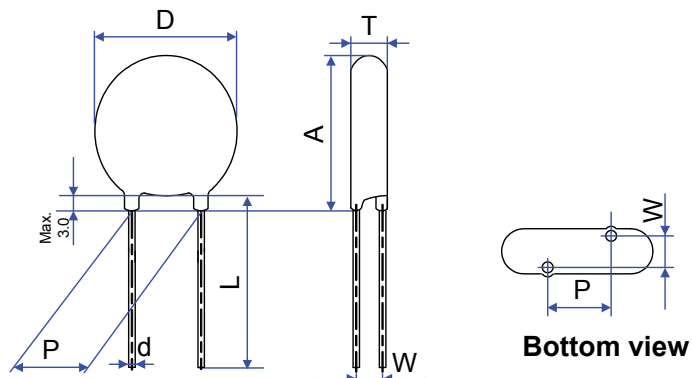
Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge Protection

■ Structures and Dimensions

- S Type (Straight lead)



(Unit: mm)

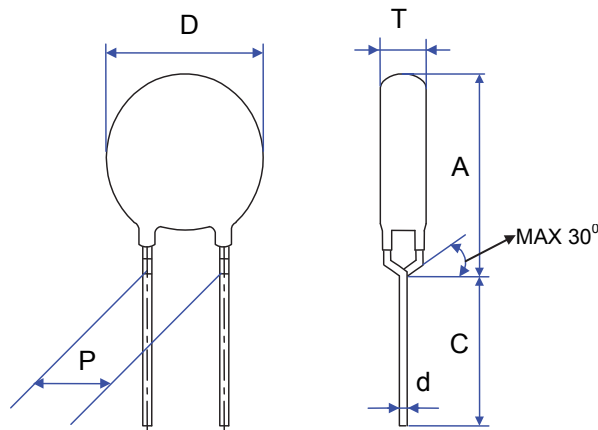
Series	D	Lmin.	d	P	Amax.	Tmax.	W
TVR05	5.0~7.0	26.5	0.6±0.02	5±1	9.0	Please refer to the Electrical Characteristics Table	
TVR07	6.5~9.0	26.5	0.6±0.02	5±1	11.0 (for TVR07180~621) 11.5 (for TVR07681~821)		
TVR10	9.5~12.5 9.5~13.5 (for TVR10182)	26.5	0.8±0.02	7.5±1	15.0 (for TVR10180-112) 15.5 (for TVR10122-182)		
TVR14	13.5~16.0	26.5	0.8±0.02	7.5±1	18.5 (for TVR14180-511) 19.0 (for TVR14561-182)		
TVR20	19.5~22.0	22.5	1.0±0.02	10±1	25.5 (for TVR20180-511) 26.0 (for TVR20561-112) 26.5 (for TVR20122-182)		

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



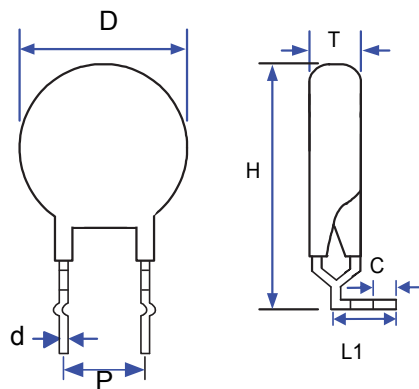
- F Type (Y kink lead)



(Unit: mm)

Series	D	Cmin.	d	P	Amax.	Tmax.
TVR05	5.0~7.0	20	0.6±0.02	5±1	9.5	Please refer to the Electrical Characteristics Table
TVR07	6.5~9.0	20	0.6±0.02	5±1	11.5	
TVR10	9.5~12.5 9.5~13.5 (for TVR10182)	20	0.8±0.02	7.5±1	16.0	
TVR14	13.5 ~16.0	20	0.8±0.02	7.5±1	19.0	
TVR20	19.5~22	20	1.0±0.02	10±1	26.5	

- T Type (L kink lead)



(Unit: mm)

Series	D	C	d	P	Hmax.	L1	Tmax.
TVR10	9.5~12.5 9.5~13.5 (for TVR10182)	3.8±0.8	0.8±0.02	7.5±1	20.0	7.0±1	Please refer to the Electrical Characteristics Table
TVR14	13.5 ~16.0		0.8±0.02	7.5±1	23.5	7.0±1	
TVR20	19.5~22		1.0±0.02	10±1	30.5	9.0±1	

Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge Protection

■ Electrical Characteristics

05mm Series

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)			
TVR05180	18 (16~20)	11	14	40	1.0	100	0.01	0.4	1300	2.3	3.9	1.5	For Other Application
TVR05220	22 (20~24)	14	18	48	1.0	100	0.01	0.5	1000	2.4	4.1	1.5	
TVR05270	27 (24~30)	17	22	60	1.0	100	0.01	0.6	850	2.6	4.3	1.5	
TVR05330	33 (30~36)	20	26	73	1.0	100	0.01	0.8	700	2.9	4.5	1.5	
TVR05390	39 (35~43)	25	31	86	1.0	100	0.01	0.9	600	2.9	4.5	1.5	
TVR05470	47 (42~52)	30	38	104	1.0	100	0.01	1.1	500	2.5	4.1	1.5	
TVR05560	56 (50~62)	35	45	123	1.0	100	0.01	1.3	400	2.7	4.3	1.5	
TVR05680	68 (61~75)	40	56	150	1.0	100	0.01	1.6	330	2.9	4.6	1.5	
TVR05820	82 (74~90)	50	65	145	5.0	400	0.1	2.5	250	2.2	3.9	1.5	
TVR05101	100 (90~110)	60	85	175	5.0	400	0.1	3.0	230	2.4	4.1	1.6	
TVR05121	120 (108~132)	75	100	210	5.0	400	0.1	4.0	210	2.5	4.3	1.8	
TVR05151	150 (135~165)	95	125	260	5.0	400	0.1	4.8	190	2.0	4.6	1.6	
TVR05181	180 (162~198)	115	150	315	5.0	400	0.1	5.9	70	2.0	3.9	1.4	
TVR05201	200 (180~220)	130	170	355	5.0	400	0.1	6.5	65	2.1	4.0	1.5	
TVR05221	220 (198~242)	140	180	380	5.0	400	0.1	7.0	60	2.1	4.0	1.5	
TVR05241	240 (216~264)	150	200	415	5.0	400	0.1	8.0	55	2.3	4.2	1.6	
TVR05271	270 (243~297)	175	225	475	5.0	400	0.1	8.5	50	2.4	4.4	1.7	
TVR05301	300 (270~330)	195	250	525	5.0	400	0.1	8.5	50	2.7	4.4	1.9	
TVR05331	330 (297~363)	215	275	585	5.0	400	0.1	9.2	45	2.8	4.5	2.0	
TVR05361	360 (324~396)	230	300	620	5.0	400	0.1	10	45	2.9	4.6	2.1	
TVR05391	390 (351~429)	250	320	675	5.0	400	0.1	12	40	3.1	4.8	2.3	
TVR05431	430 (387~473)	275	350	745	5.0	400	0.1	13	35	3.0	5.1	2.3	
TVR05471	470 (423~517)	300	385	810	5.0	400	0.1	15	30	3.2	5.2	2.4	
TVR05511	510 (459~561)	320	410	878	5.0	400	0.1	16	30	3.4	5.4	2.6	
TVR05561	560 (504~616)	350	450	962	5.0	400	0.1	18	30	3.6	5.5	2.8	
TVR05621	620 (558~682)	395	510	1050	5.0	400	0.1	18	25	3.9	5.9	3.0	
TVR05681	680 (612~748)	420	560	1120	5.0	400	0.1	18	20	4.1	6.2	3.2	
TVR05751	750 (675~825)	460	615	1240	5.0	400	0.1	18	20	4.4	6.4	3.5	

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



07mm Series

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)			
TVR07180	18 (16~20)	11	14	36	2.5	250	0.02	0.9	2400	2.3	3.9	1.3	For Other Application
TVR07220	22 (20~24)	14	18	43	2.5	250	0.02	1.1	2000	2.4	4.1	1.4	
TVR07270	27 (24~30)	17	22	53	2.5	250	0.02	1.4	1600	2.6	4.3	1.5	
TVR07330	33 (30~36)	20	26	65	2.5	250	0.02	1.7	1300	2.9	4.5	1.7	
TVR07390	39 (35~43)	25	31	77	2.5	250	0.02	2.1	1200	2.9	4.5	1.8	
TVR07470	47 (42~52)	30	38	93	2.5	250	0.02	2.5	1100	2.5	4.1	1.9	
TVR07560	56 (50~62)	35	45	110	2.5	250	0.02	3.1	1000	2.7	4.3	2.0	
TVR07680	68 (61~75)	40	56	135	2.5	250	0.02	3.6	850	2.9	4.6	2.1	
TVR07820	82 (74~90)	50	65	135	10	1200	0.25	5.5	460	2.2	3.9	1.5	
TVR07101	100 (90~110)	60	85	165	10	1200	0.25	6.5	420	2.4	4.1	1.6	
TVR07121	120 (108~132)	75	100	200	10	1200	0.25	7.8	380	2.5	4.3	1.8	
TVR07151	150 (135~165)	95	125	250	10	1200	0.25	9.7	350	2.0	4.6	1.6	
TVR07181	180 (162~198)	115	150	300	10	1200	0.25	11.7	155	2.0	3.9	1.4	
TVR07201	200 (180~220)	130	170	340	10	1200	0.25	13	140	2.1	4.0	1.5	
TVR07221	220 (198~242)	140	180	360	10	1200	0.25	14	130	2.1	4.0	1.5	
TVR07241	240 (216~264)	150	200	395	10	1200	0.25	15	120	2.3	4.2	1.6	
TVR07271	270 (243~297)	175	225	455	10	1200	0.25	18	110	2.4	4.4	1.7	
TVR07301	300 (270~330)	195	250	500	10	1200	0.25	21	105	2.7	4.4	1.9	
TVR07331	330 (297~363)	215	275	550	10	1200	0.25	23	100	2.8	4.5	2.0	
TVR07361	360 (324~396)	230	300	595	10	1200	0.25	25	95	2.9	4.6	2.1	
TVR07391	390 (351~429)	250	320	650	10	1200	0.25	25	85	3.1	4.8	2.3	
TVR07431	430 (387~473)	275	350	710	10	1200	0.25	28	80	3.0	5.1	2.3	
TVR07471	470 (423~517)	300	385	775	10	1200	0.25	30	70	3.2	5.2	2.4	
TVR07511	510 (459~561)	320	410	845	10	1200	0.25	33	65	3.4	5.4	2.6	
TVR07561	560 (504~616)	350	450	930	10	1200	0.25	33	60	3.6	5.5	2.8	
TVR07621	620 (558~682)	395	510	1020	10	1200	0.25	35	55	3.9	5.9	3.0	
TVR07681	680 (612~748)	420	560	1120	10	1200	0.25	35	50	4.1	6.2	3.2	
TVR07751	750 (675~825)	465	615	1235	10	1200	0.25	38	45	4.4	6.4	3.5	
TVR07821	820 (738~902)	510	670	1355	10	1200	0.25	42	40	4.5	6.4	3.2	

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



10mm Series

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)			
TVR10180	18 (16~20)	11	14	36	5.0	500	0.05	2.1	4500	2.7	4.3	1.3	For Other Application
TVR10220	22 (20~24)	14	18	43	5.0	500	0.05	2.5	3500	2.8	4.5	1.4	
TVR10270	27 (24~30)	17	22	53	5.0	500	0.05	3.0	3000	3.0	4.7	1.5	
TVR10330	33 (30~36)	20	26	65	5.0	500	0.05	4.0	2500	3.3	4.9	1.7	
TVR10390	39 (35~43)	25	31	77	5.0	500	0.05	4.6	2000	3.4	5.1	1.8	
TVR10470	47 (42~52)	30	38	93	5.0	500	0.05	5.5	1500	2.9	4.5	1.8	
TVR10560	56 (50~62)	35	45	110	5.0	500	0.05	7.0	1350	3.1	4.7	1.9	
TVR10680	68 (61~75)	40	56	135	5.0	500	0.05	8.2	1250	3.3	5.0	2.2	
TVR10820	82 (74~90)	50	65	135	25	2500	0.4	12	1000	2.6	4.3	1.6	
TVR10101	100 (90~110)	60	85	165	25	2500	0.4	15	920	2.8	4.5	1.8	
TVR10121	120 (108~132)	75	100	200	25	2500	0.4	18	830	2.9	4.7	2.0	
TVR10151	150 (135~165)	95	125	250	25	2500	0.4	22	760	2.4	5.0	1.8	
TVR10181	180 (162~198)	115	150	300	25	2500	0.4	27	310	2.4	4.3	1.6	
TVR10201	200 (180~220)	130	170	340	25	2500	0.4	30	290	2.5	4.4	1.7	
TVR10221	220 (198~242)	140	180	360	25	2500	0.4	32	270	2.5	4.4	1.7	
TVR10241	240 (216~264)	150	200	395	25	2500	0.4	35	240	2.7	4.6	1.8	
TVR10271	270 (243~297)	175	225	455	25	2500	0.4	40	230	2.8	4.8	1.9	
TVR10301	300 (270~330)	195	250	500	25	2500	0.4	40	210	3.1	4.8	2.1	
TVR10331	330 (297~363)	215	275	550	25	2500	0.4	43	200	3.2	4.9	2.2	
TVR10361	360 (324~396)	230	300	595	25	2500	0.4	47	190	3.3	5.0	2.3	
TVR10391	390 (351~429)	250	320	650	25	2500	0.4	60	175	3.5	5.2	2.5	
TVR10431	430 (387~473)	275	350	710	25	2500	0.4	65	160	3.4	5.5	2.5	
TVR10471	470 (423~517)	300	385	775	25	2500	0.4	70	150	3.6	5.6	2.6	
TVR10511	510 (459~561)	320	410	845	25	2500	0.4	70	130	3.8	5.8	2.8	
TVR10561	560 (504~616)	350	450	930	25	2500	0.4	70	120	4.0	5.9	3.0	
TVR10621	620 (558~682)	395	510	1020	25	2500	0.4	70	110	4.3	6.3	3.2	
TVR10681	680 (612~748)	420	560	1120	25	2500	0.4	70	100	4.5	6.6	3.4	
TVR10751	750 (675~825)	465	615	1235	25	2500	0.4	75	90	4.8	6.8	3.7	
TVR10821	820 (738~902)	510	670	1355	25	2500	0.4	85	80	4.9	6.8	3.4	
TVR10911	910 (819~1001)	550	745	1500	25	2500	0.4	93	70	5.3	7.2	3.7	
TVR10102	1000 (900~1100)	625	825	1650	25	2500	0.4	102	65	5.5	7.5	4.0	
TVR10112	1100 (990~1210)	680	895	1815	25	2500	0.4	115	60	5.7	8.0	4.3	
TVR10122	1200 (1080~1320)	725	975	1980	25	2500	0.4	125	55	6.0	8.1	5.2	
TVR10142	1400 (1260~1540)	820	1140	2300	25	2500	0.4	145	45	6.6	8.7	6.0	
TVR10162	1600 (1440~1760)	910	1300	2630	25	2500	0.4	165	40	7.1	9.8	6.7	
TVR10182	1800 (1620~1980)	1000	1465	2950	25	2500	0.4	185	35	7.8	10.3	7.4	

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



14mm Series

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)			
TVR14180	18 (16~20)	11	14	36	10	1000	0.1	4.0	10000	2.7	4.3	1.3	For Other Application
TVR14220	22 (20~24)	14	18	43	10	1000	0.1	5.0	8500	2.8	4.5	1.4	
TVR14270	27 (24~30)	17	22	53	10	1000	0.1	6.0	7000	3.0	4.7	1.5	
TVR14330	33 (30~36)	20	26	65	10	1000	0.1	7.5	6000	3.3	4.9	1.7	
TVR14390	39 (35~43)	25	31	77	10	1000	0.1	8.6	4800	3.4	5.1	1.8	
TVR14470	47 (42~52)	30	38	93	10	1000	0.1	10	3800	2.9	4.5	1.8	
TVR14560	56 (50~62)	35	45	110	10	1000	0.1	11	3300	3.1	4.7	1.9	
TVR14680	68 (61~75)	40	56	135	10	1000	0.1	14	2700	3.3	5.0	2.2	
TVR14820	82 (74~90)	50	65	135	50	4500	0.6	22	2100	2.6	4.3	1.6	For SPD Type 3 Application
TVR14101	100 (90~110)	60	85	165	50	4500	0.6	28	1900	2.8	4.5	1.8	
TVR14121	120 (108~132)	75	100	200	50	4500	0.6	32	1700	2.9	4.7	2.0	
TVR14151	150 (135~165)	95	125	250	50	4500	0.6	40	940	2.4	5.0	1.8	
TVR14181	180 (162~198)	115	150	300	50	4500	0.6	52	800	2.4	4.3	1.6	
TVR14201	200 (180~220)	130	170	340	50	4500	0.6	57	700	2.5	4.4	1.7	
TVR14221	220 (198~242)	140	180	360	50	4500	0.6	60	640	2.5	4.4	1.7	
TVR14241	240 (216~264)	150	200	395	50	4500	0.6	63	580	2.7	4.6	1.8	
TVR14271	270 (243~297)	175	225	455	50	4500	0.6	70	520	2.8	4.8	1.9	
TVR14301	300 (270~330)	195	250	500	50	4500	0.6	78	480	3.1	4.8	2.1	
TVR14331	330 (297~363)	215	275	550	50	4500	0.6	85	450	3.2	4.9	2.2	
TVR14361	360 (324~396)	230	300	595	50	4500	0.6	93	430	3.3	5.0	2.3	
TVR14391	390 (351~429)	250	320	650	50	4500	0.6	100	390	3.5	5.2	2.5	
TVR14431	430 (387~473)	275	350	710	50	4500	0.6	115	370	3.4	5.5	2.5	
TVR14471	470 (423~517)	300	385	775	50	4500	0.6	125	320	3.6	5.6	2.6	
TVR14511	510 (459~561)	320	410	845	50	4500	0.6	125	290	3.8	5.8	2.8	
TVR14561	560 (504~616)	350	450	930	50	4500	0.6	125	260	4.0	5.9	3.0	
TVR14621	620 (558~682)	395	510	1020	50	4500	0.6	125	240	4.3	6.3	3.2	
TVR14681	680 (612~748)	420	560	1120	50	4500	0.6	130	230	4.5	6.6	3.4	
TVR14751	750 (675~825)	465	615	1235	50	4500	0.6	143	220	4.8	6.8	3.7	
TVR14821	820 (738~902)	510	670	1355	50	4500	0.6	157	180	4.9	6.8	3.4	
TVR14911	910 (819~1001)	550	745	1500	50	4500	0.6	175	170	5.3	7.2	3.7	
TVR14102	1000 (900~1100)	625	825	1650	50	4500	0.6	190	150	5.5	7.5	4.0	
TVR14112	1100 (990~1210)	680	895	1815	50	4500	0.6	213	140	5.6	8.0	4.3	
TVR14122	1200 (1080~1320)	725	975	1980	50	4500	0.6	230	130	6.0	8.1	5.2	
TVR14142	1400 (1260~1540)	820	1140	2300	50	4500	0.6	250	110	6.6	8.7	6.0	
TVR14162	1600 (1440~1760)	910	1300	2630	50	4500	0.6	315	95	7.1	9.8	6.7	
TVR14182	1800 (1620~1980)	1000	1465	2950	50	4500	0.6	354	85	7.8	10.3	7.4	

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



20mm Series

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)			
TVR20180	18 (16~20)	11	14	36	20	2000	0.2	11	19000	3.1	4.7	1.3	For Other Application
TVR20220	22 (20~24)	14	18	43	20	2000	0.2	14	16000	3.2	4.9	1.4	
TVR20270	27 (24~30)	17	22	53	20	2000	0.2	18	14500	3.4	5.1	1.5	
TVR20330	33 (30~36)	20	26	65	20	2000	0.2	23	13000	3.7	5.3	1.7	
TVR20390	39 (35~43)	25	31	77	20	2000	0.2	26	12000	3.8	5.5	1.7	
TVR20470	47 (42~52)	30	38	93	20	2000	0.2	33	11000	3.3	4.9	1.8	
TVR20560	56 (50~62)	35	45	110	20	2000	0.2	41	9000	3.5	5.1	2.0	
TVR20680	68 (61~75)	40	56	135	20	2000	0.2	46	7500	3.7	5.4	2.2	
TVR20820	82 (74~90)	50	65	135	100	6500	1.0	48	4800	3.0	4.7	1.8	For SPD Type 3 Application
TVR20101	100 (90~110)	60	85	165	100	6500	1.0	51	3900	3.2	4.9	2.0	
TVR20121	120 (108~132)	75	100	200	100	6500	1.0	55	3300	3.3	5.1	2.2	
TVR20151	150 (135~165)	95	125	250	100	6500	1.0	70	1950	2.8	5.4	2.0	
TVR20181	180 (162~198)	115	150	300	100	6500	1.0	84	1620	2.8	4.7	1.8	
TVR20201	200 (180~220)	130	170	340	100	6500	1.0	95	1460	2.9	4.8	1.9	
TVR20221	220 (198~242)	140	180	360	100	6500	1.0	100	1320	2.9	4.8	1.9	
TVR20241	240 (216~264)	150	200	395	100	6500	1.0	108	1200	3.1	5.0	2.0	
TVR20271	270 (243~297)	175	225	455	100	6500	1.0	127	1100	3.2	5.2	2.1	
TVR20301	300 (270~330)	195	250	500	100	6500	1.0	136	1000	3.5	5.2	2.3	
TVR20331	330 (297~363)	215	275	550	100	6500	1.0	150	950	3.6	5.3	2.4	
TVR20361	360 (324~396)	230	300	595	100	6500	1.0	163	900	3.7	5.4	2.5	
TVR20391	390 (351~429)	250	320	650	100	6500	1.0	180	800	3.9	5.6	2.7	
TVR20431	430 (387~473)	275	350	710	100	6500	1.0	190	700	3.8	5.9	2.7	
TVR20471	470 (423~517)	300	385	775	100	6500	1.0	220	620	4.0	6.0	2.8	
TVR20511	510 (459~561)	320	410	845	100	6500	1.0	220	530	4.2	6.2	3.0	
TVR20561	560 (504~616)	350	450	930	100	6500	1.0	220	480	4.4	6.3	3.2	
TVR20621	620 (558~682)	395	510	1020	100	6500	1.0	220	450	4.7	6.7	3.4	
TVR20681	680 (612~748)	420	560	1120	100	6500	1.0	230	440	4.9	7.0	3.6	
TVR20751	750 (675~825)	465	615	1235	100	6500	1.0	255	420	5.2	7.2	3.9	
TVR20821	820 (738~902)	510	670	1355	100	6500	1.0	282	390	5.3	7.2	3.6	
TVR20911	910 (819~1001)	550	745	1500	100	6500	1.0	310	360	5.7	7.6	3.9	
TVR20102	1000 (900~1100)	625	825	1650	100	6500	1.0	342	330	6.1	7.9	4.2	
TVR20112	1100 (990~1210)	680	895	1815	100	6500	1.0	383	310	6.2	8.4	4.5	
TVR20122	1200 (1080~1320)	725	975	1980	100	6500	1.0	415	290	6.4	8.5	5.4	
TVR20142	1400 (1260~1540)	820	1140	2300	100	6500	1.0	480	250	7.0	9.1	6.2	
TVR20162	1600 (1440~1760)	910	1300	2630	100	6500	1.0	550	220	7.5	10.2	6.9	
TVR20182	1800 (1620~1980)	1000	1465	2950	100	6500	1.0	620	195	8.5	10.7	7.6	

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



20mm Series for SPD Type 2 Application

Part No.	Varistor Voltage (@ 1mA DC)	Max. Continuous Voltage		Max. Clamping Voltage (8/20μs)		Max. Surge Current (8/20μs)	Nominal Discharge Current ^{*1} (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}	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)			
TVR20820R	82 (74~90)	50	65	135	100	6500	3000	1.0	48	4800	3.0	4.7	1.8	For SPD Type 2 Application
TVR20101R	100 (90~110)	60	85	165	100	6500	3000	1.0	51	3900	3.2	4.9	2.0	
TVR20121R	120 (108~132)	75	100	200	100	6500	3000	1.0	55	3300	3.3	5.1	2.2	
TVR20151R	150 (135~165)	95	125	250	100	6500	3000	1.0	70	1950	2.8	5.4	2.0	
TVR20181R	180 (162~198)	115	150	300	100	6500	3000	1.0	84	1620	2.8	4.7	1.8	
TVR20201R	200 (180~220)	130	170	340	100	6500	3000	1.0	95	1460	2.9	4.8	1.9	
TVR20221R	220 (198~242)	140	180	360	100	6500	3000	1.0	100	1320	2.9	4.8	1.9	
TVR20241R	240 (216~264)	150	200	395	100	6500	3000	1.0	108	1200	3.1	5.0	2.0	
TVR20271R	270 (243~297)	175	225	455	100	6500	3000	1.0	127	1100	3.2	5.2	2.1	
TVR20301R	300 (270~330)	195	250	500	100	6500	3000	1.0	136	1000	3.5	5.2	2.3	
TVR20331R	330 (297~363)	215	275	550	100	6500	3000	1.0	150	950	3.6	5.3	2.4	
TVR20361R	360 (324~396)	230	300	595	100	6500	3000	1.0	163	900	3.7	5.4	2.5	
TVR20391R	390 (351~429)	250	320	650	100	6500	3000	1.0	180	800	3.9	5.6	2.7	
TVR20431R	430 (387~473)	275	350	710	100	6500	3000	1.0	190	700	3.8	5.9	2.7	
TVR20471R	470 (423~517)	300	385	775	100	6500	3000	1.0	220	620	4.0	6.0	2.8	
TVR20511R	510 (459~561)	320	410	845	100	6500	3000	1.0	220	530	4.2	6.2	3.0	
TVR20561R	560 (504~616)	350	450	930	100	6500	3000	1.0	220	480	4.4	6.3	3.2	
TVR20621R	620 (558~682)	395	510	1020	100	6500	3000	1.0	220	450	4.7	6.7	3.4	
TVR20681R	680 (612~748)	420	560	1120	100	6500	3000	1.0	230	440	4.9	7.0	3.6	
TVR20751R	750 (675~825)	465	615	1235	100	6500	3000	1.0	255	420	5.2	7.2	3.9	
TVR20821R	820 (738~902)	510	670	1355	100	6500	3000	1.0	282	390	5.3	7.2	3.6	
TVR20911R	910 (819~1001)	550	745	1500	100	6500	3000	1.0	310	360	5.7	7.6	3.9	
TVR20102R	1000 (900~1100)	625	825	1650	100	6500	3000	1.0	342	330	6.1	7.9	4.2	
TVR20112R	1100 (990~1210)	680	895	1815	100	6500	3000	1.0	383	310	6.2	8.4	4.5	
TVR20122R	1200 (1080~1320)	725	975	1980	100	6500	3000	1.0	415	290	6.4	8.5	5.4	
TVR20142R	1400 (1260~1540)	820	1140	2300	100	6500	3000	1.0	480	250	7.0	9.1	6.2	
TVR20162R	1600 (1440~1760)	910	1300	2630	100	6500	3000	1.0	550	220	7.5	10.2	6.9	
TVR20182R	1800 (1620~1980)	1000	1465	2950	100	6500	3000	1.0	620	195	8.5	10.7	7.6	

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 Series

Disc Type Varistor for Surge Protection



■ Safety Approvals

Certified Model No.	Agency				
					
	UL1449 3 rd & cUL: E314979	UL1414 & cUL: E186499	97495	5944	CQC03001005165 CQC03001007654
TVR05180	√			√	√
TVR05220	√			√	√
TVR05270	√			√	√
TVR05330	√			√	√
TVR05390	√			√	√
TVR05470	√			√	√
TVR05560	√			√	√
TVR05680	√			√	√
TVR05820	√			√	√
TVR05101	√			√	√
TVR05121	√			√	√
TVR05151	√			√	√
TVR05181	√			√	√
TVR05201	√		√	√	√
TVR05221	√		√	√	√
TVR05241	√		√	√	√
TVR05271	√		√	√	√
TVR05301	√		√	√	√
TVR05331	√		√	√	√
TVR05361	√		√	√	√
TVR05391	√		√	√	√
TVR05431	√		√	√	√
TVR05471	√		√	√	√
TVR05511				√	
TVR05561				√	
TVR05621				√	
TVR05681				√	
TVR05751					

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



Certified Model No.	Agency				
					
	UL1449 3 rd & cUL: E314979	UL1414 & cUL: E186499	97495	5944	CQC03001005165 CQC03001007654
TVR07180	√			√	√
TVR07220	√			√	√
TVR07270	√			√	√
TVR07330	√			√	√
TVR07390	√			√	√
TVR07470	√			√	√
TVR07560	√			√	√
TVR07680	√			√	√
TVR07820	√			√	√
TVR07101	√			√	√
TVR07121	√			√	√
TVR07151	√			√	√
TVR07181	√			√	√
TVR07201	√	√	√	√	√
TVR07221	√	√	√	√	√
TVR07241	√	√	√	√	√
TVR07271	√	√	√	√	√
TVR07301	√	√	√	√	√
TVR07331	√	√	√	√	√
TVR07361	√	√	√	√	√
TVR07391	√	√	√	√	√
TVR07431	√	√	√	√	√
TVR07471	√	√	√	√	√
TVR07511	√	√		√	√
TVR07561	√	√		√	√
TVR07621	√	√	√	√	√
TVR07681	√	√	√	√	√
TVR07751	√		√	√	√
TVR07821	√		√	√	√

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



Certified Model No.	Agency				
					
	UL1449 3 rd & cUL: E314979	UL1414 & cUL: E186499	97495	5944	CQC03001005165 CQC03001007654
TVR10180	√			√	√
TVR10220	√			√	√
TVR10270	√			√	√
TVR10330	√			√	√
TVR10390	√			√	√
TVR10470	√			√	√
TVR10560	√			√	√
TVR10680	√			√	√
TVR10820	√			√	√
TVR10101	√			√	√
TVR10121	√			√	√
TVR10151	√			√	√
TVR10181	√			√	√
TVR10201	√	√	√	√	√
TVR10221	√	√	√	√	√
TVR10241	√	√	√	√	√
TVR10271	√	√	√	√	√
TVR10301	√	√	√	√	√
TVR10331	√	√	√	√	√
TVR10361	√	√	√	√	√
TVR10391	√	√	√	√	√
TVR10431	√	√	√	√	√
TVR10471	√	√	√	√	√
TVR10511	√	√		√	√
TVR10561	√	√		√	√
TVR10621	√	√	√	√	√
TVR10681	√	√	√	√	√
TVR10751	√	√	√	√	√
TVR10821	√	√	√	√	√
TVR10911	√	√	√	√	√
TVR10102	√	√	√	√	√
TVR10112	√	√	√	√	√
TVR10122	√				
TVR10142	√				
TVR10162	√				
TVR10182	√				

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



Certified Model No.	Agency						
							
	UL1449 3 rd & cUL: E314979	UL1414 & cUL: E186499	97495	5944	IEC 60950-1:2013, Annex Q	GB/T10193-1997 GB/T10194-1997 CQC03001005165 CQC03001007654	GB8898-2011 GB4943.1-2011 CQC03001005165 CQC03001007654
TVR14180	√			√		√	
TVR14220	√			√		√	
TVR14270	√			√		√	
TVR14330	√			√		√	
TVR14390	√			√		√	
TVR14470	√			√		√	
TVR14560	√			√		√	
TVR14680	√			√		√	
TVR14820	√			√		√	
TVR14101	√			√		√	
TVR14121	√			√		√	
TVR14151	√			√		√	
TVR14181	√			√	√	√	
TVR14201	√	√	√	√	√	√	√
TVR14221	√	√	√	√	√	√	√
TVR14241	√	√	√	√	√	√	√
TVR14271	√	√	√	√	√	√	√
TVR14301	√	√	√	√	√	√	√
TVR14331	√	√	√	√	√	√	√
TVR14361	√	√	√	√	√	√	√
TVR14391	√	√	√	√	√	√	√
TVR14431	√	√	√	√	√	√	√
TVR14471	√	√	√	√	√	√	√
TVR14511	√	√		√	√	√	√
TVR14561	√	√		√	√	√	√
TVR14621	√	√	√	√	√	√	√
TVR14681	√	√	√	√	√	√	√
TVR14751	√	√	√	√	√	√	√
TVR14821	√	√	√	√	√	√	√
TVR14911	√	√	√	√	√	√	√
TVR14102	√	√	√	√	√	√	√
TVR14112	√	√	√	√	√	√	√
TVR14122	√			√	√		
TVR14142	√			√	√		
TVR14162	√			√	√		
TVR14182	√			√	√		

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



Certified Model No.	Agency						
							
	UL1449 3 rd & cUL: E314979	UL1414 & cUL: E186499	97495	5944	IEC 60950-1:2013, Annex Q	GB/T10193-1997 GB/T10194-1997 CQC03001005165 CQC03001007654	GB8898-2011 GB4943.1-2011 CQC03001005165 CQC03001007654
TVR20180	√			√		√	
TVR20220	√			√		√	
TVR20270	√			√		√	
TVR20330	√			√		√	
TVR20390	√			√		√	
TVR20470	√			√		√	
TVR20560	√			√		√	
TVR20680	√			√		√	
TVR20820	√			√		√	
TVR20101	√			√		√	
TVR20121	√			√		√	
TVR20151	√			√		√	
TVR20181	√			√	√	√	
TVR20201	√	√	√	√	√	√	√
TVR20221	√	√	√	√	√	√	√
TVR20241	√	√	√	√	√	√	√
TVR20271	√	√	√	√	√	√	√
TVR20301	√	√	√	√	√	√	√
TVR20331	√	√	√	√	√	√	√
TVR20361	√	√	√	√	√	√	√
TVR20391	√	√	√	√	√	√	√
TVR20431	√	√	√	√	√	√	√
TVR20471	√	√	√	√	√	√	√
TVR20511	√	√		√	√	√	√
TVR20561	√	√		√	√	√	√
TVR20621	√	√	√	√	√	√	√
TVR20681	√	√	√	√	√	√	√
TVR20751	√	√	√	√	√	√	√
TVR20821	√	√	√	√	√	√	√
TVR20911	√	√	√	√	√	√	√
TVR20102	√	√	√	√	√	√	√
TVR20112	√	√	√	√	√	√	√
TVR20122	√			√	√		
TVR20142	√			√	√		
TVR20162	√			√	√		
TVR20182	√			√	√		

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



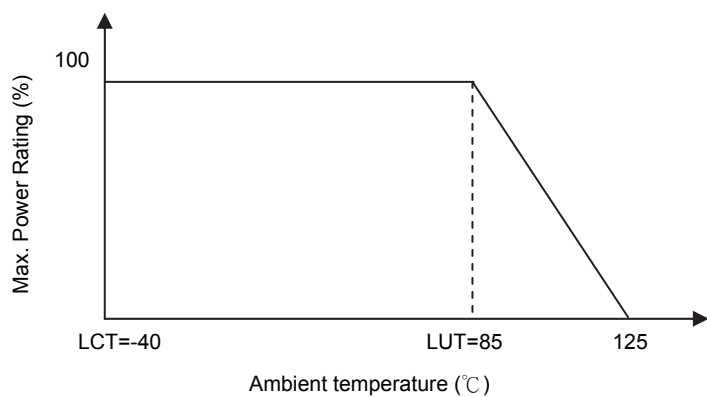
Certified Model No.	Agency				
					
	UL1449 3 rd & cUL: E314979	5944	IEC 60950-1:2013, Annex Q	GB/T10193-1997 GB/T10194-1997 CQC03001005165 CQC03001007654	GB8898-2011 GB4943.1-2011 CQC03001005165 CQC03001007654
TVR20820R	√	√		√	
TVR20101R	√	√		√	
TVR20121R	√	√		√	
TVR20151R	√	√		√	
TVR20181R	√	√	√	√	
TVR20201R	√	√	√	√	√
TVR20221R	√	√	√	√	√
TVR20241R	√	√	√	√	√
TVR20271R	√	√	√	√	√
TVR20301R	√	√	√	√	√
TVR20331R	√	√	√	√	√
TVR20361R	√	√	√	√	√
TVR20391R	√	√	√	√	√
TVR20431R	√	√	√	√	√
TVR20471R	√	√	√	√	√
TVR20511R	√	√	√	√	√
TVR20561R	√	√	√	√	√
TVR20621R	√	√	√	√	√
TVR20681R	√	√	√	√	√
TVR20751R	√	√	√	√	√
TVR20821R	√	√	√	√	√
TVR20911R	√	√	√	√	√
TVR20102R	√	√	√	√	√
TVR20112R	√	√	√	√	√
TVR20122R	√	√	√		
TVR20142R	√	√	√		
TVR20162R	√	√	√		
TVR20182R	√	√	√		

Metal Oxide Varistor : TVR Series

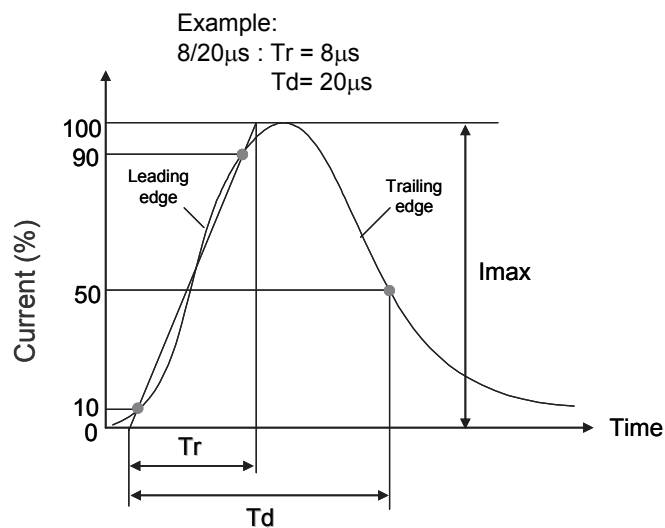


Disc Type Varistor for Surge Protection

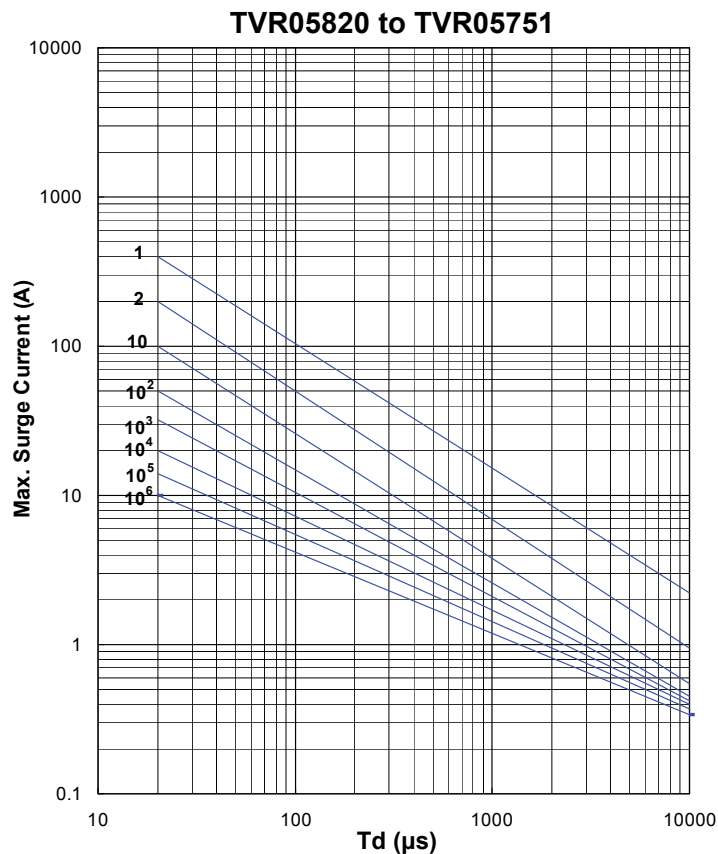
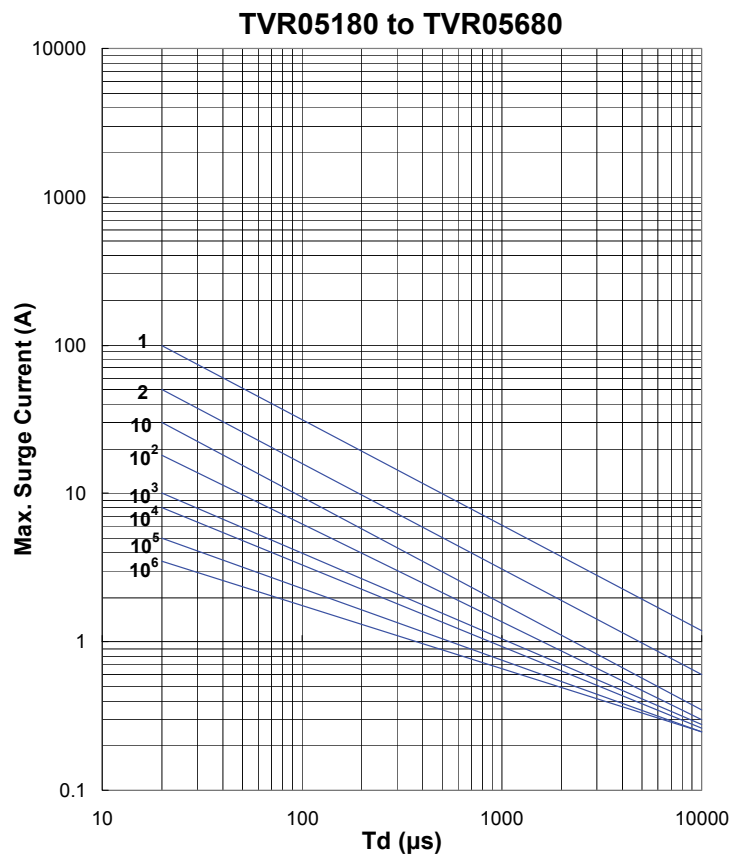
■ Power Derating Curve



■ Surge Current Standard Waveform



■ Max. Surge Current Derating Curves



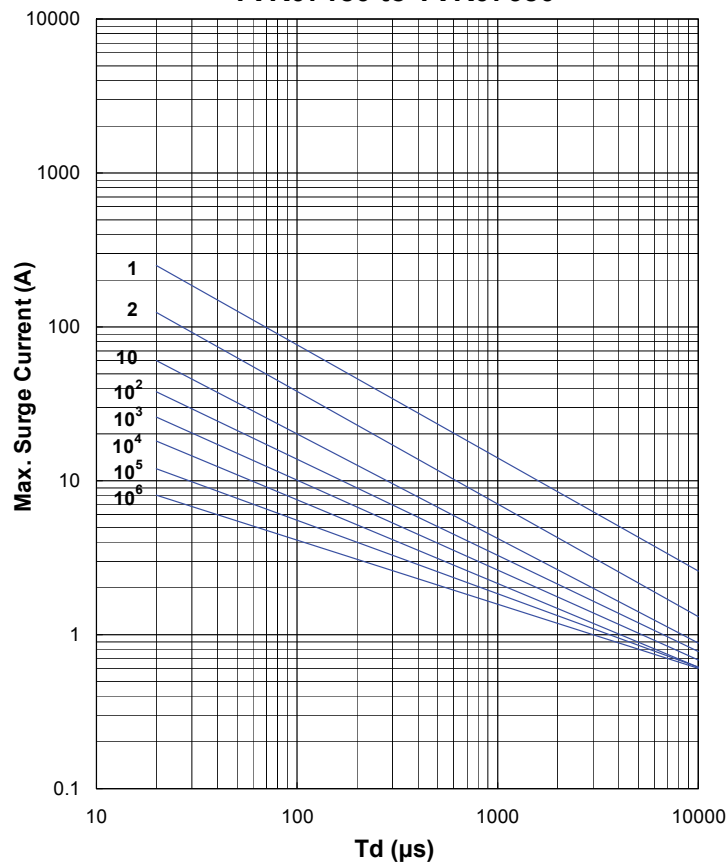
Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection

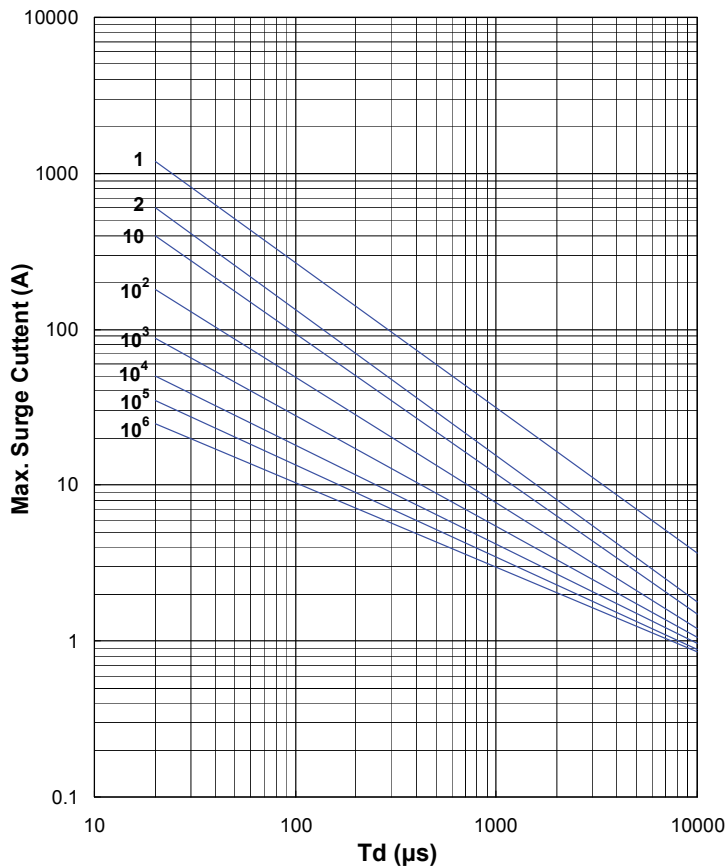


■ Max. Surge Current Derating Curves

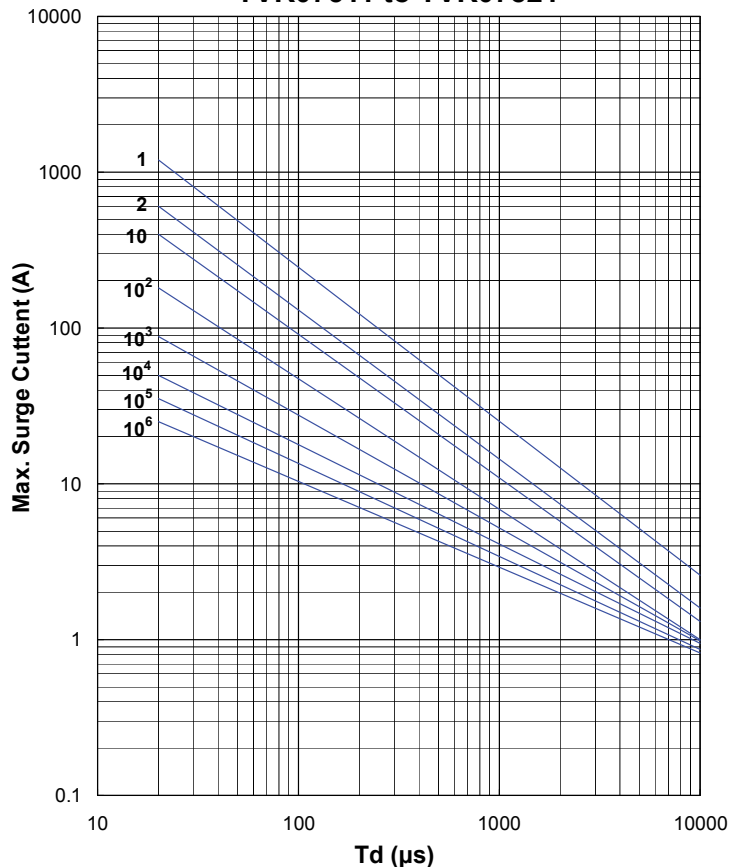
TVR07180 to TVR07680



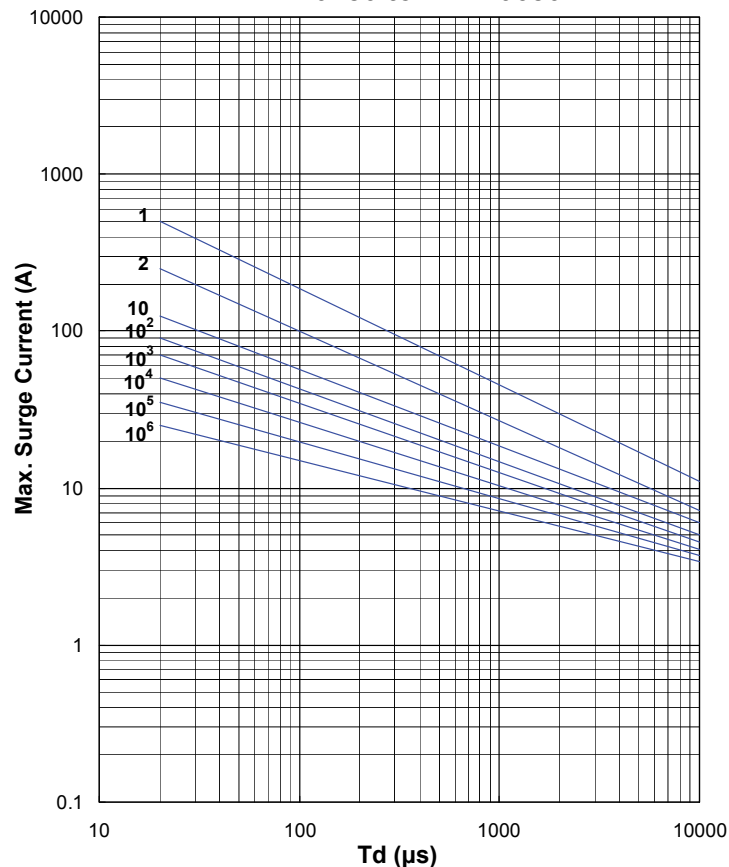
TVR07820 to TVR07471



TVR07511 to TVR07821



TVR10180 to TVR10680



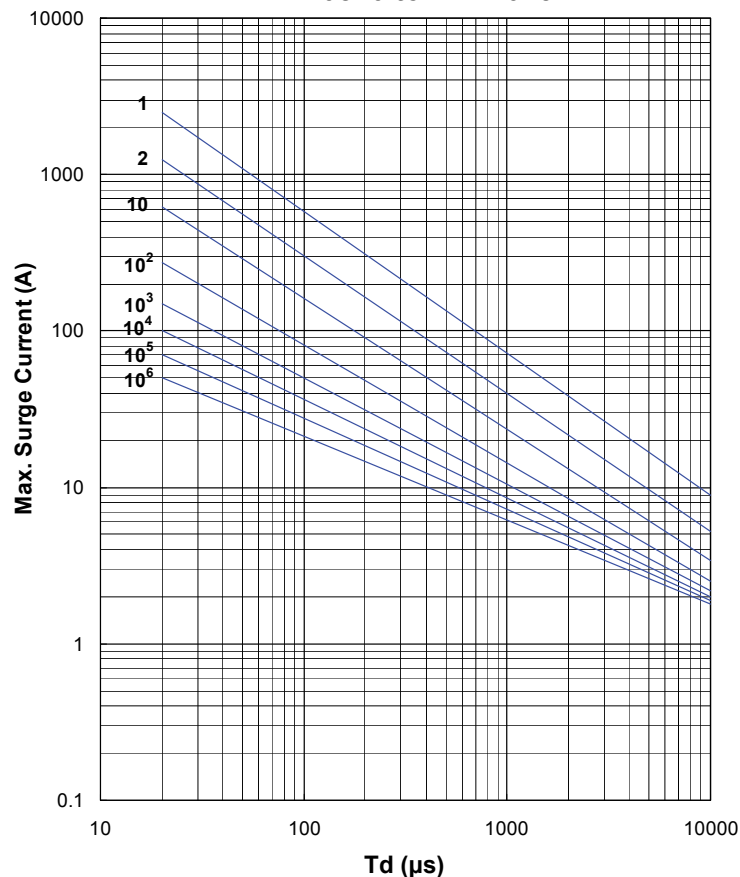
Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection

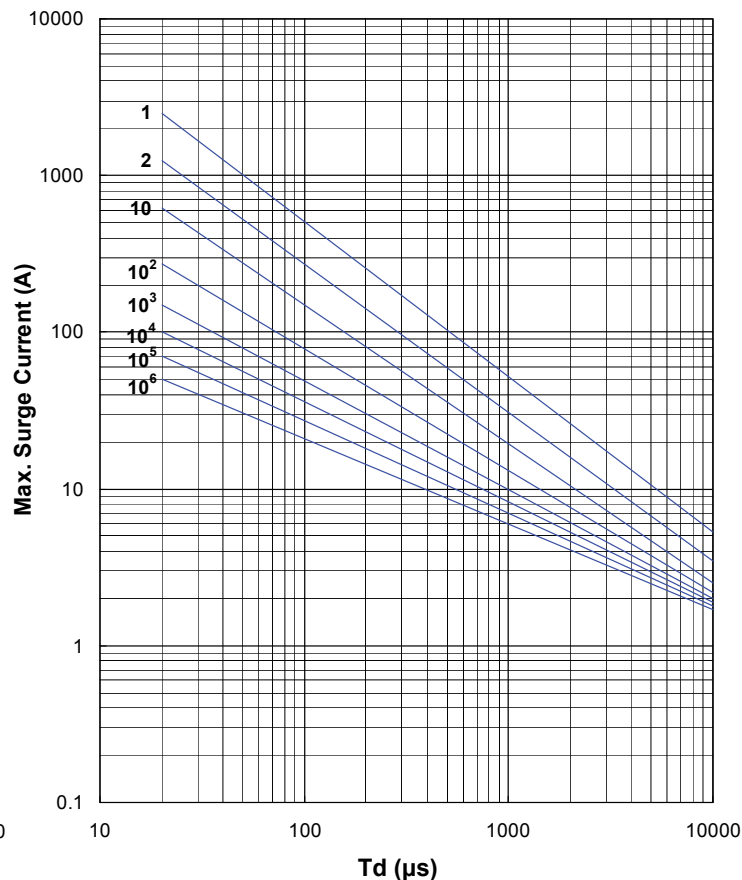


■ Max. Surge Current Derating Curves

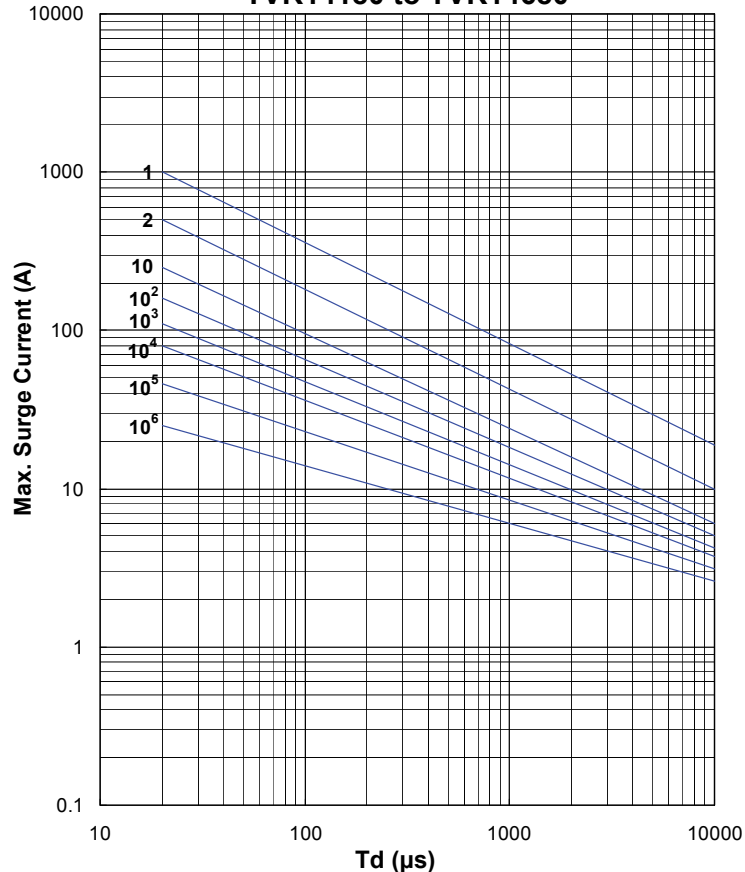
TVR10820 to TVR10751



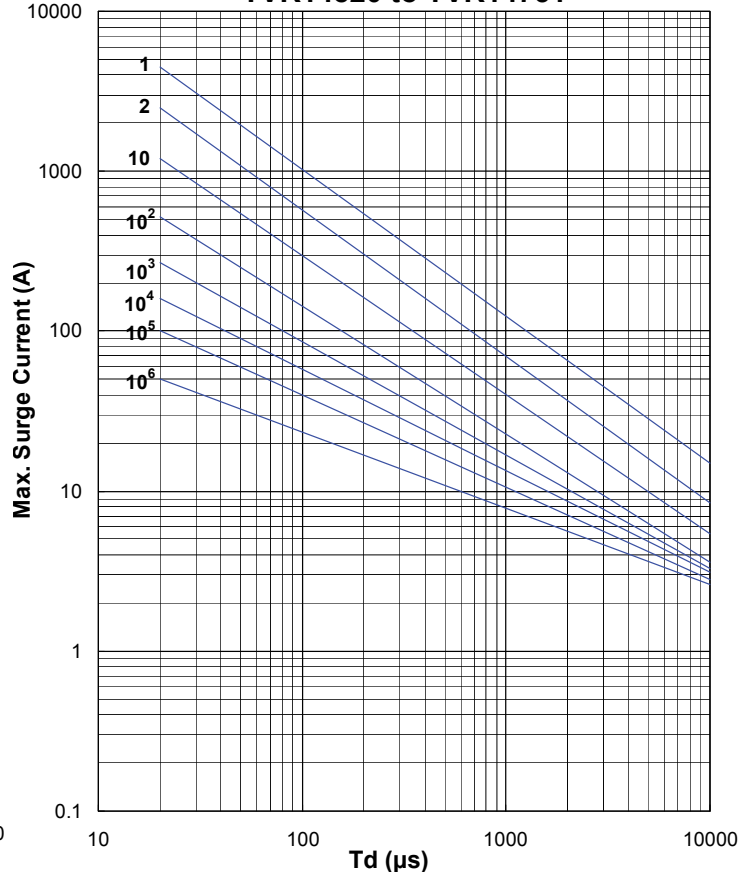
TVR10821 to TVR10182



TVR14180 to TVR14680



TVR14820 to TVR14751

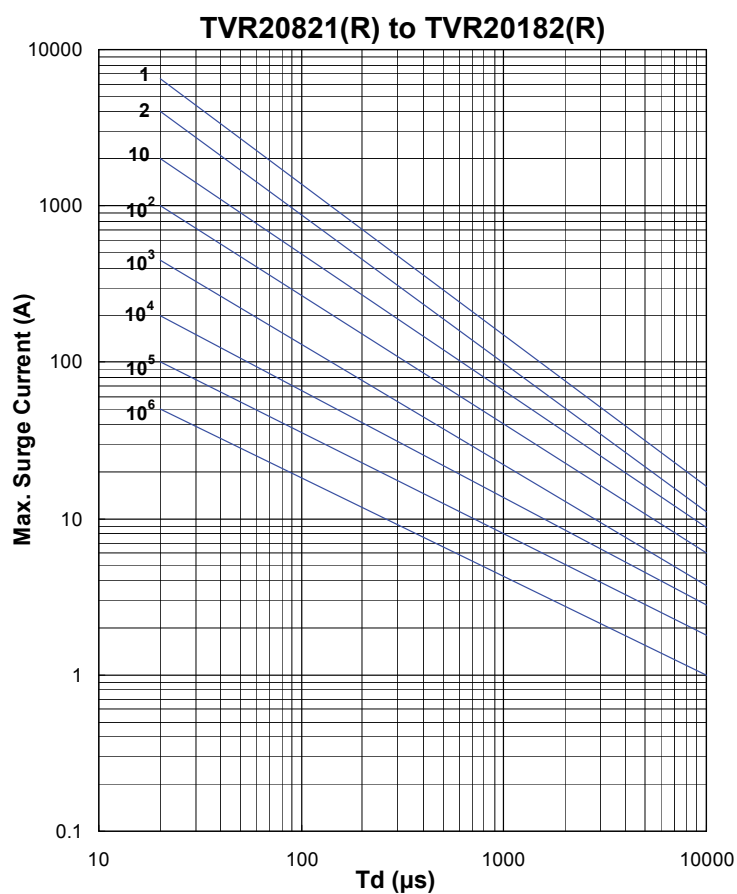
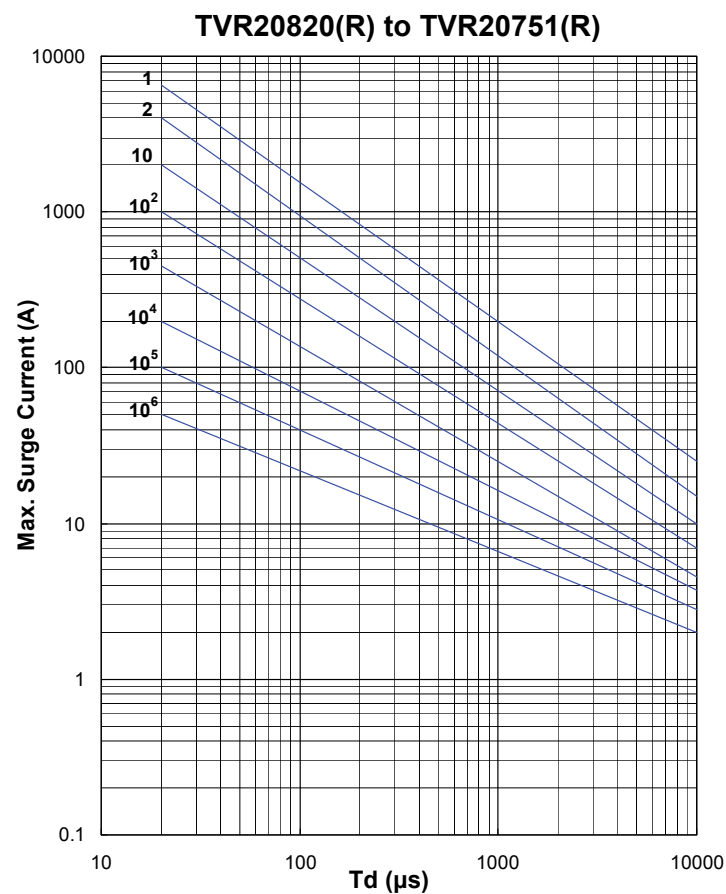
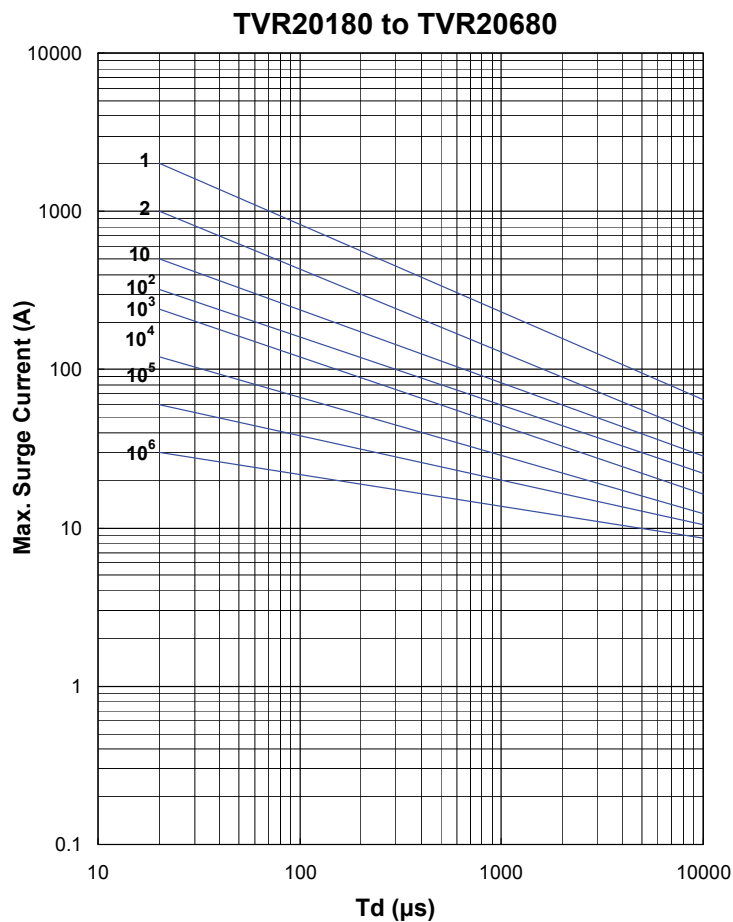
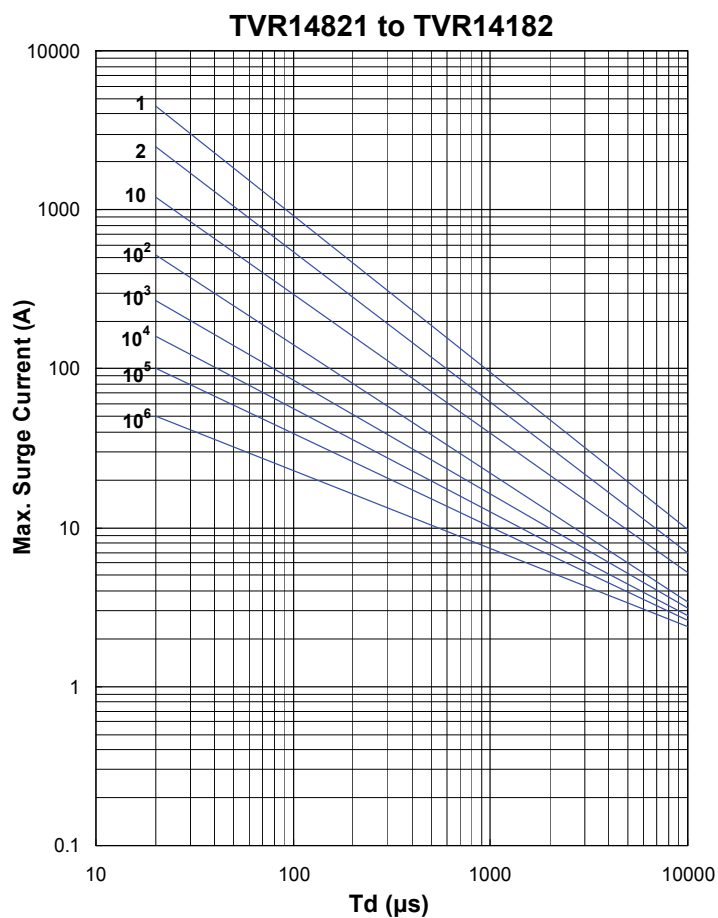


Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



■ Max. Surge Current Derating Curves



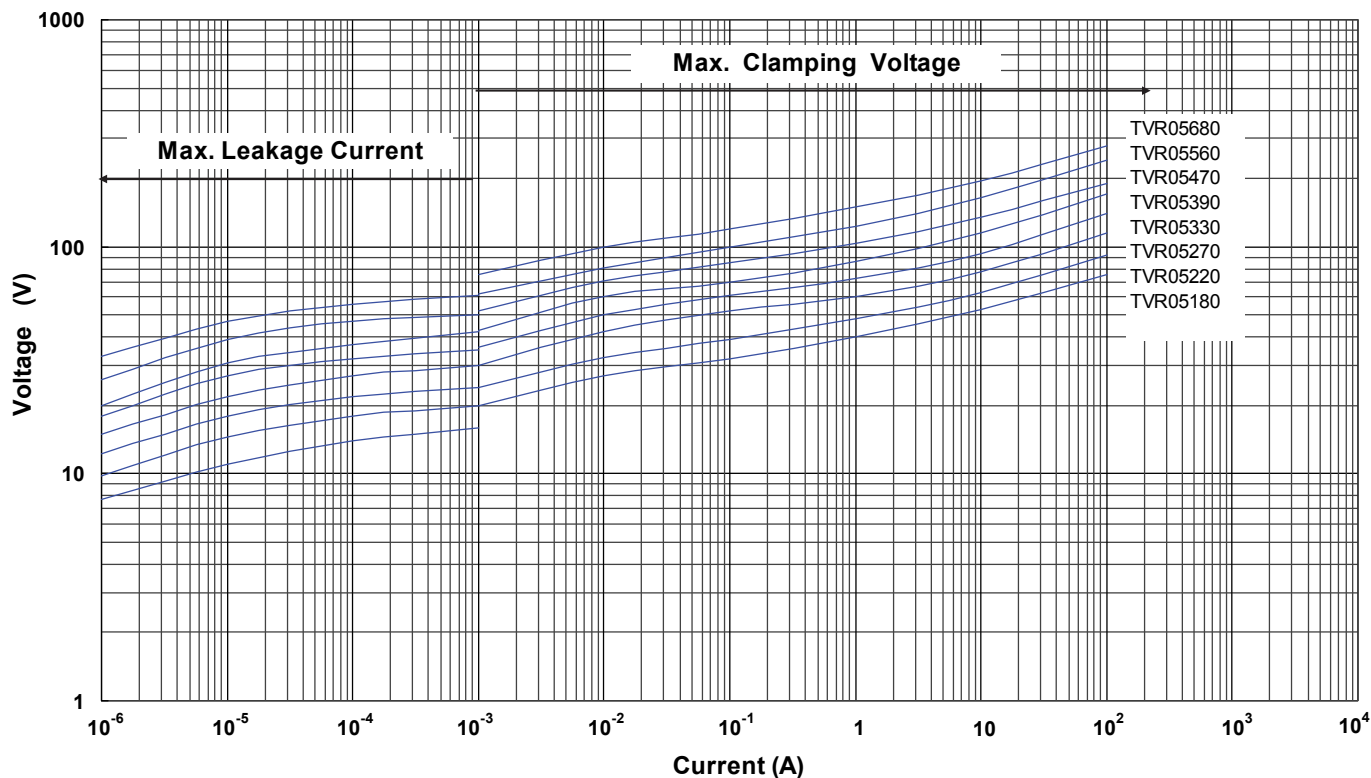
Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection

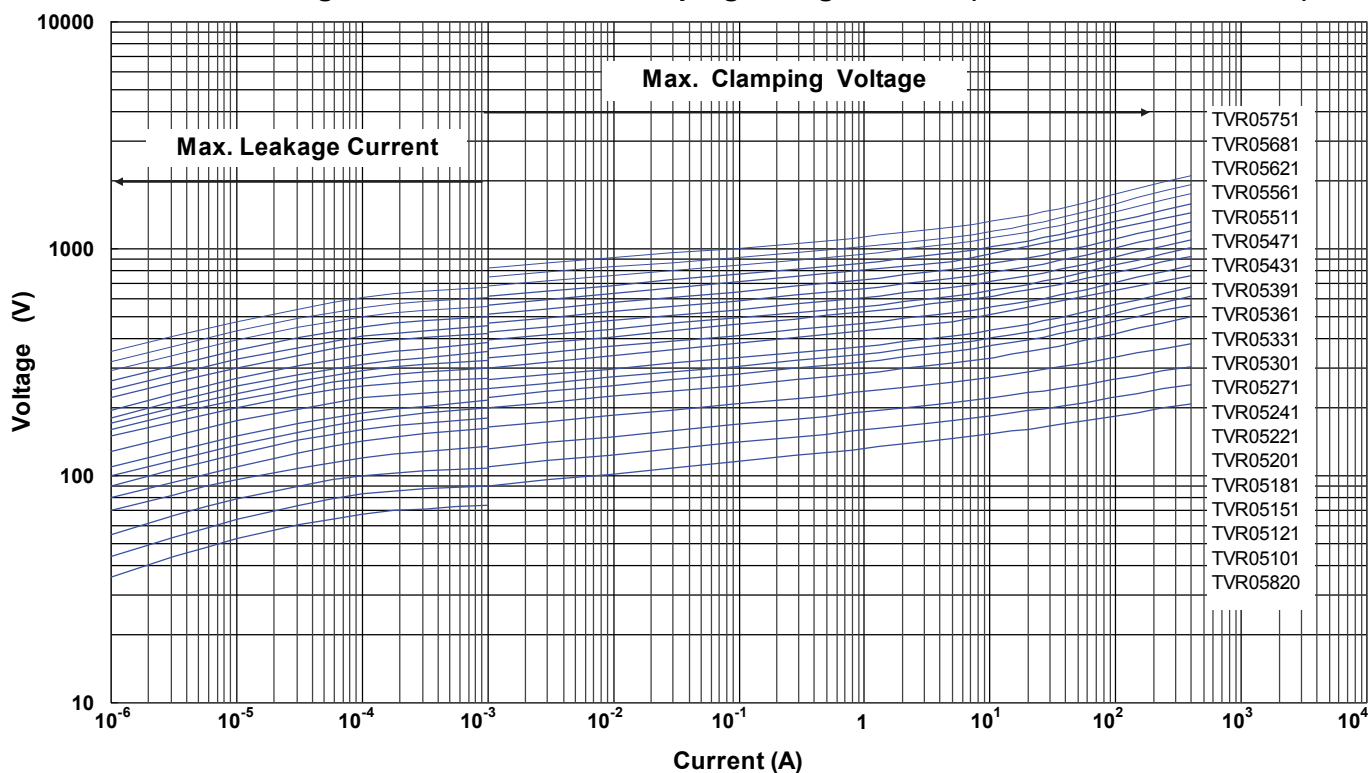


■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR05180 to TVR05680)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR05820 to TVR05751)



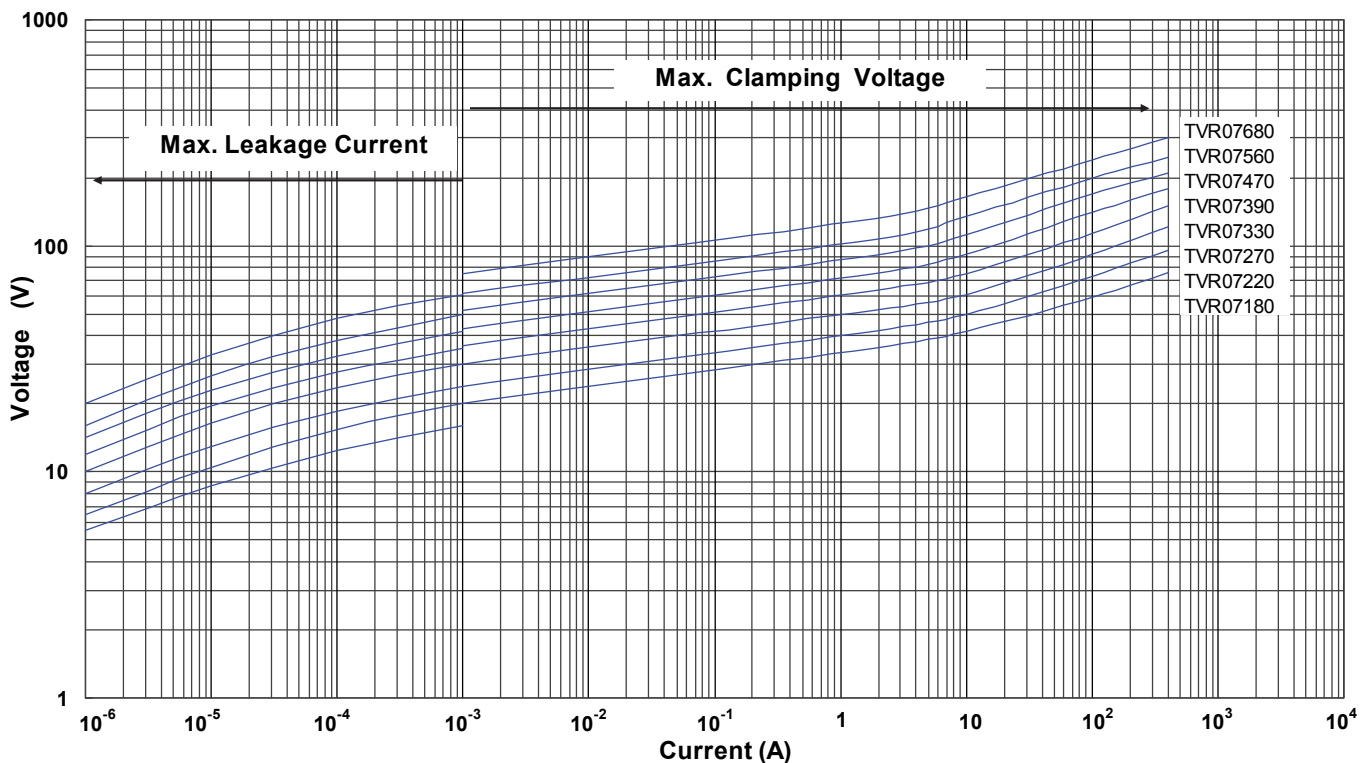
Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection

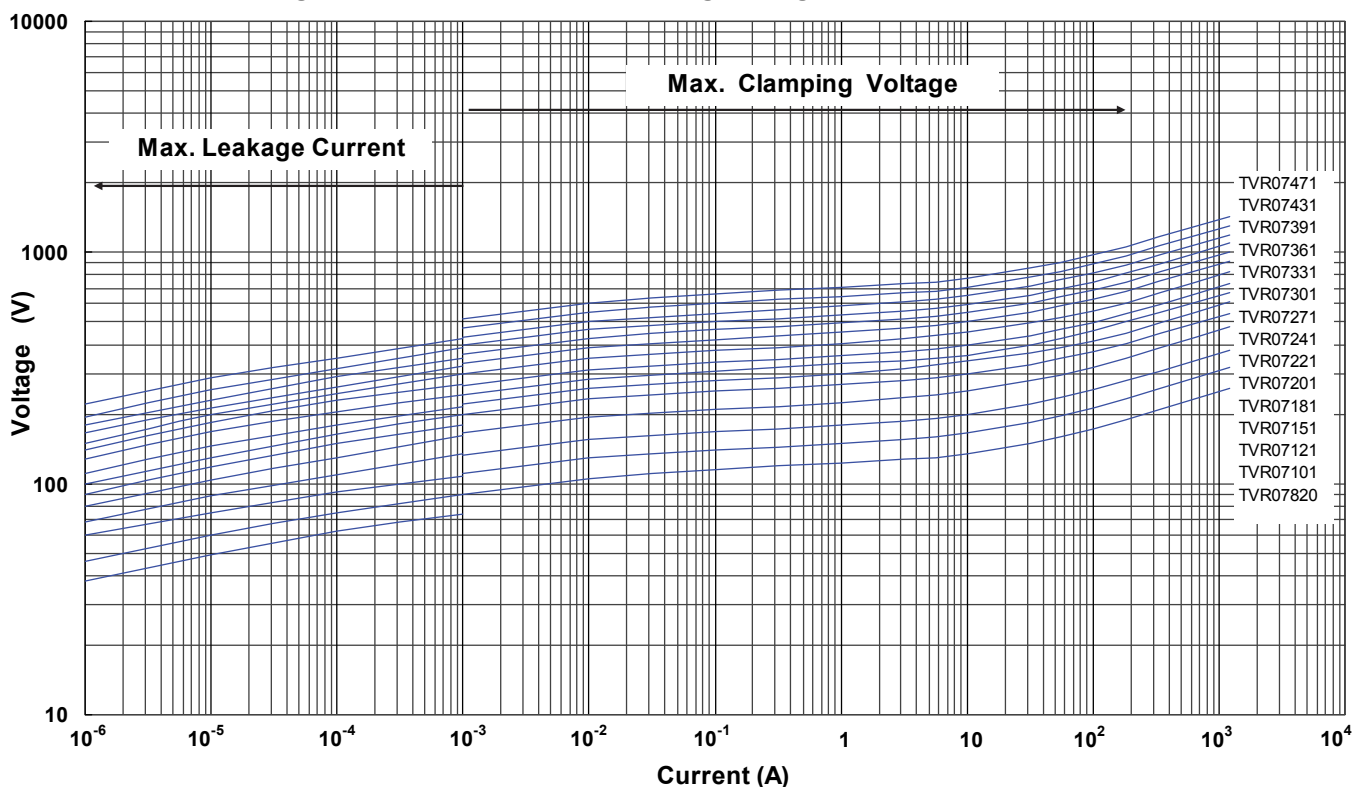


■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR07180 to TVR07680)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR07820 to TVR07471)



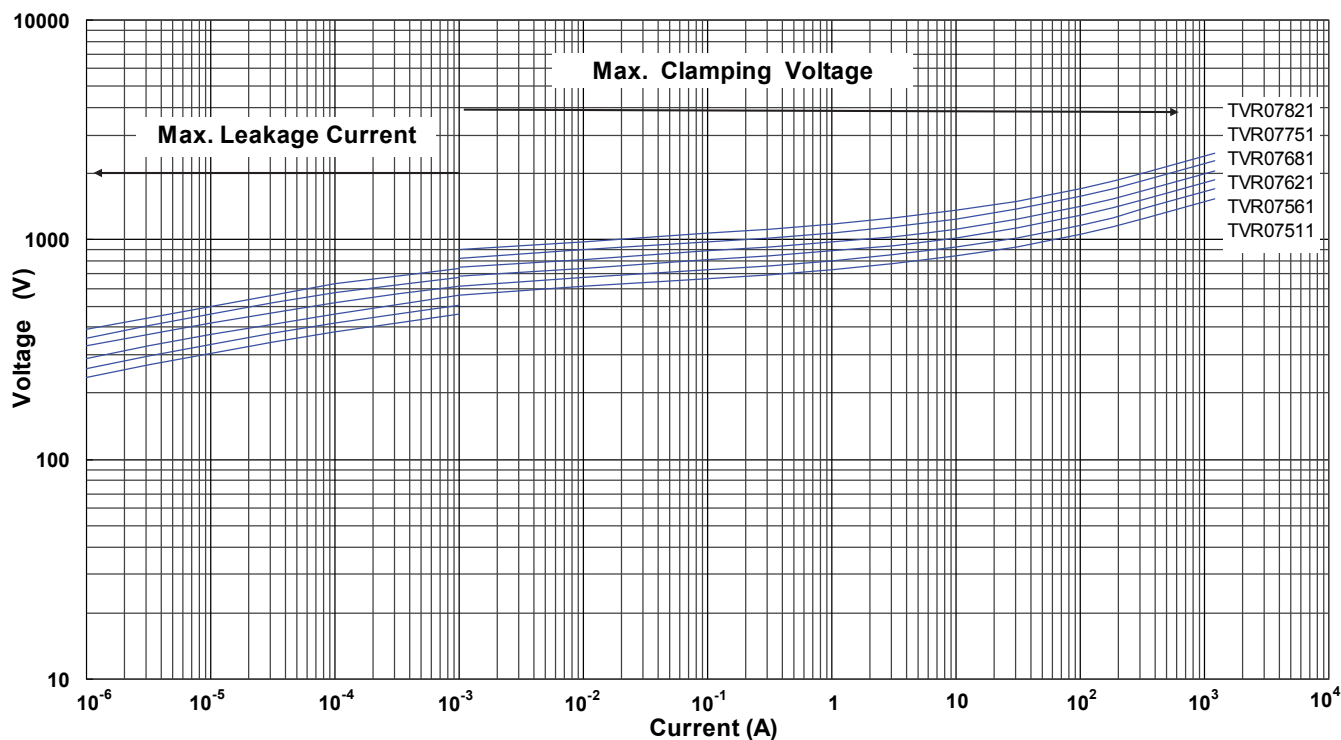
Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection

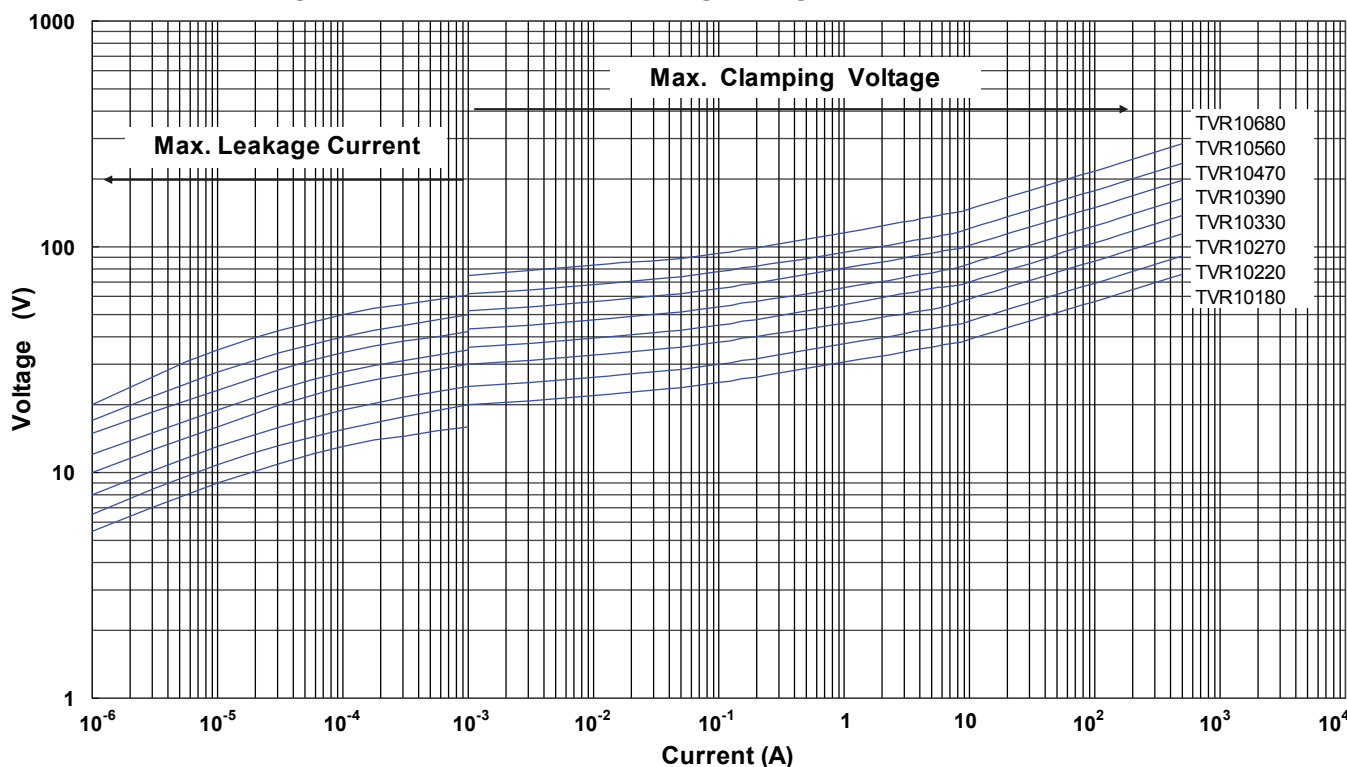


■ Max. Leakage Current and Max. Clamping Voltage Curves

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



Max. Leakage Current and Max. Clamping Voltage Curves (TVR10180 to TVR10680)



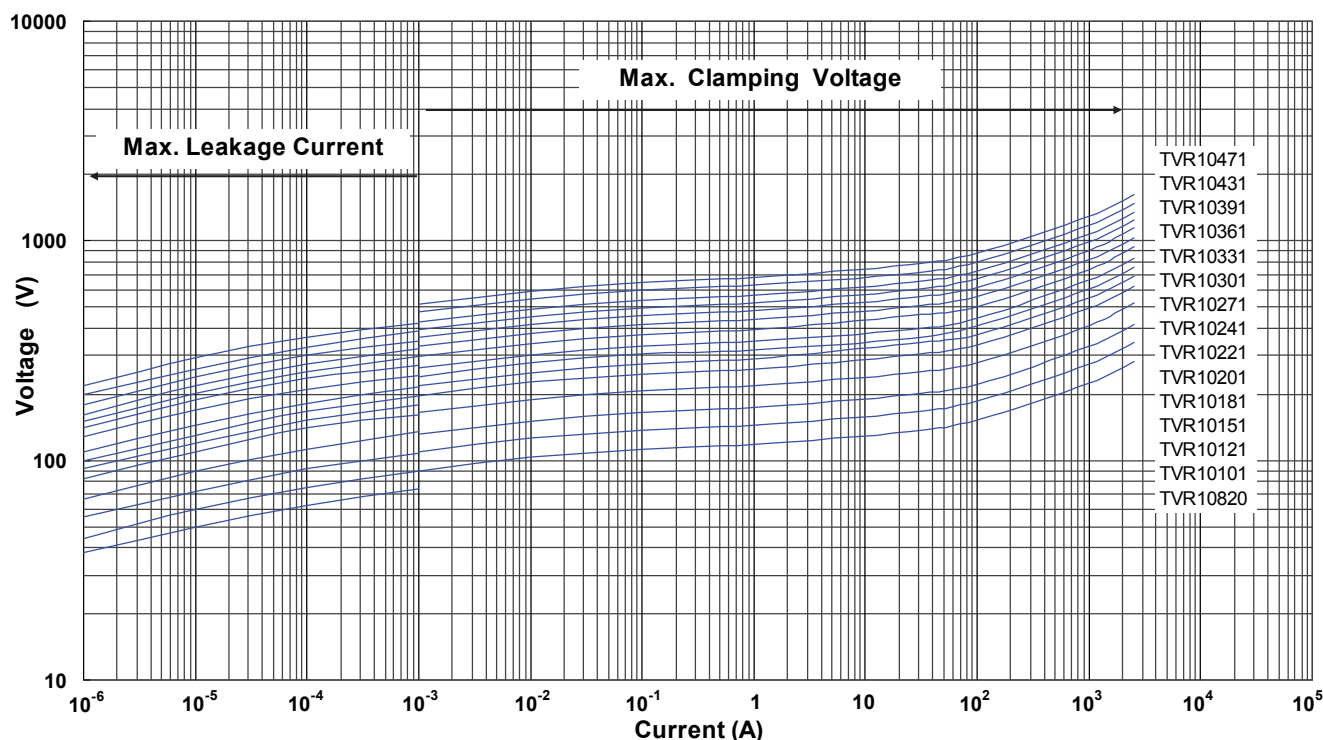
Metal Oxide Varistor : TVR Series



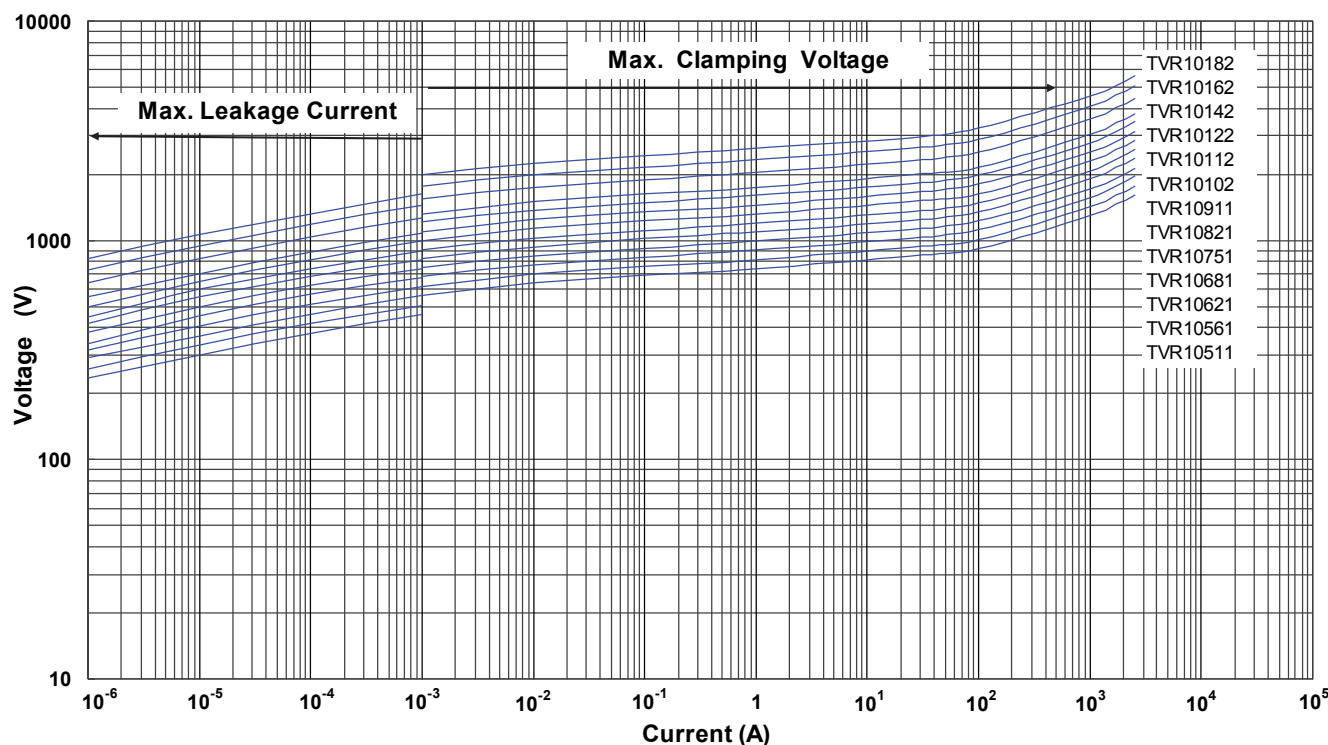
Disc Type Varistor for Surge Protection

■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR10820 to TVR10471)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR10511 to TVR10182)



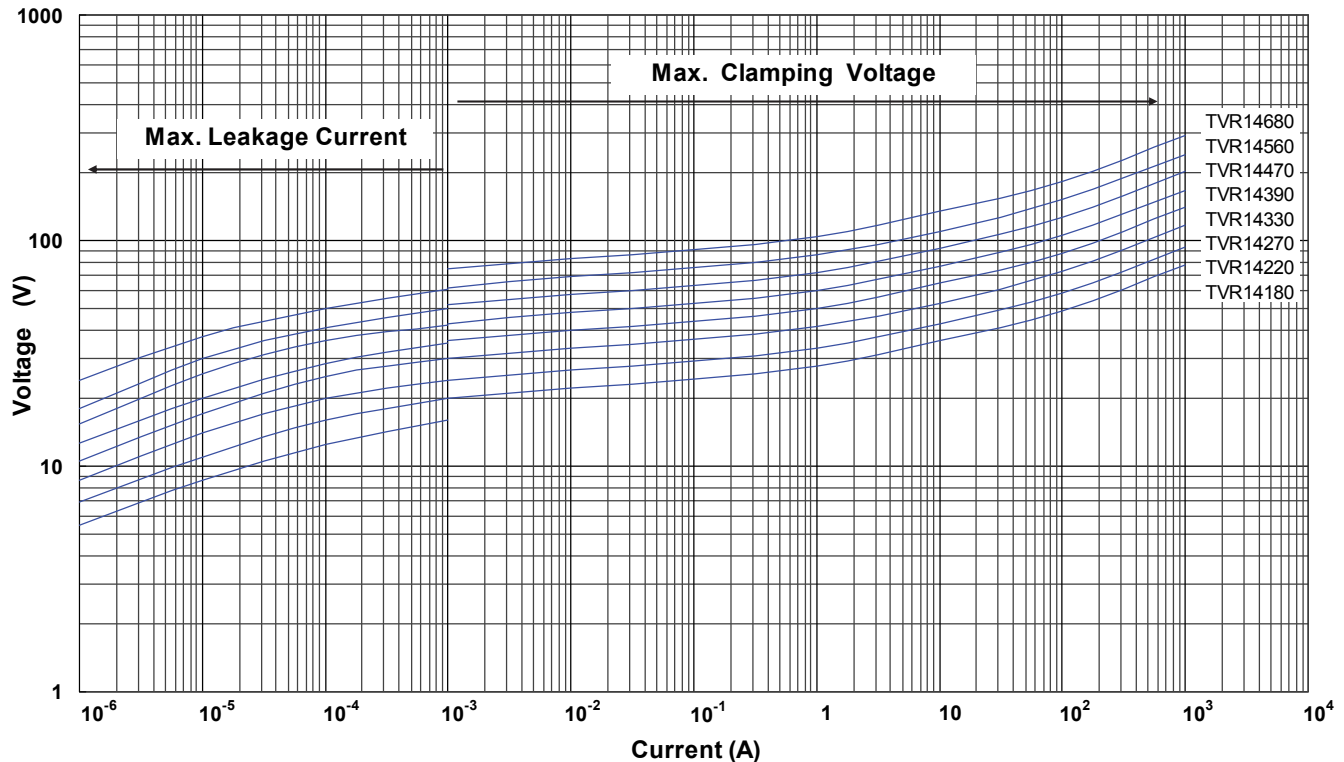
Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection

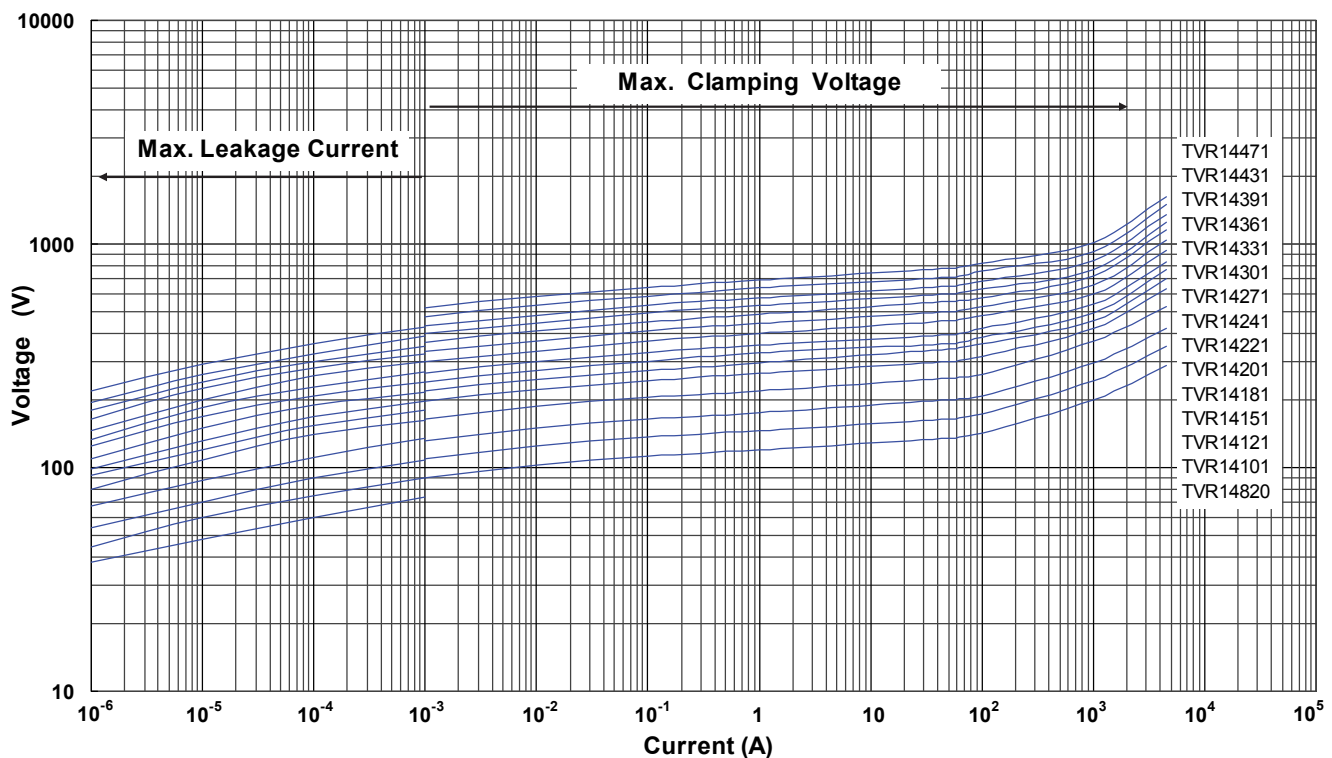


■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR14180 to TVR14680)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR14820 to TVR14471)



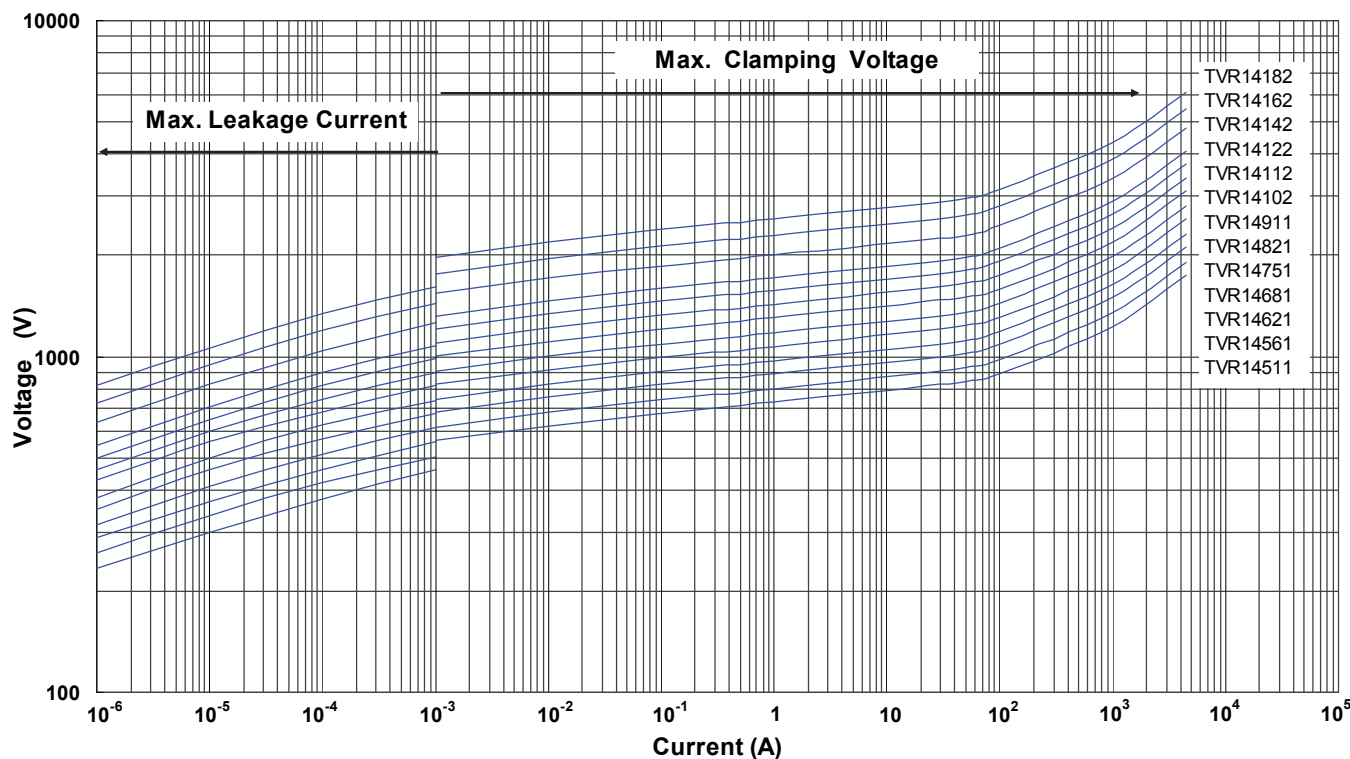
Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection

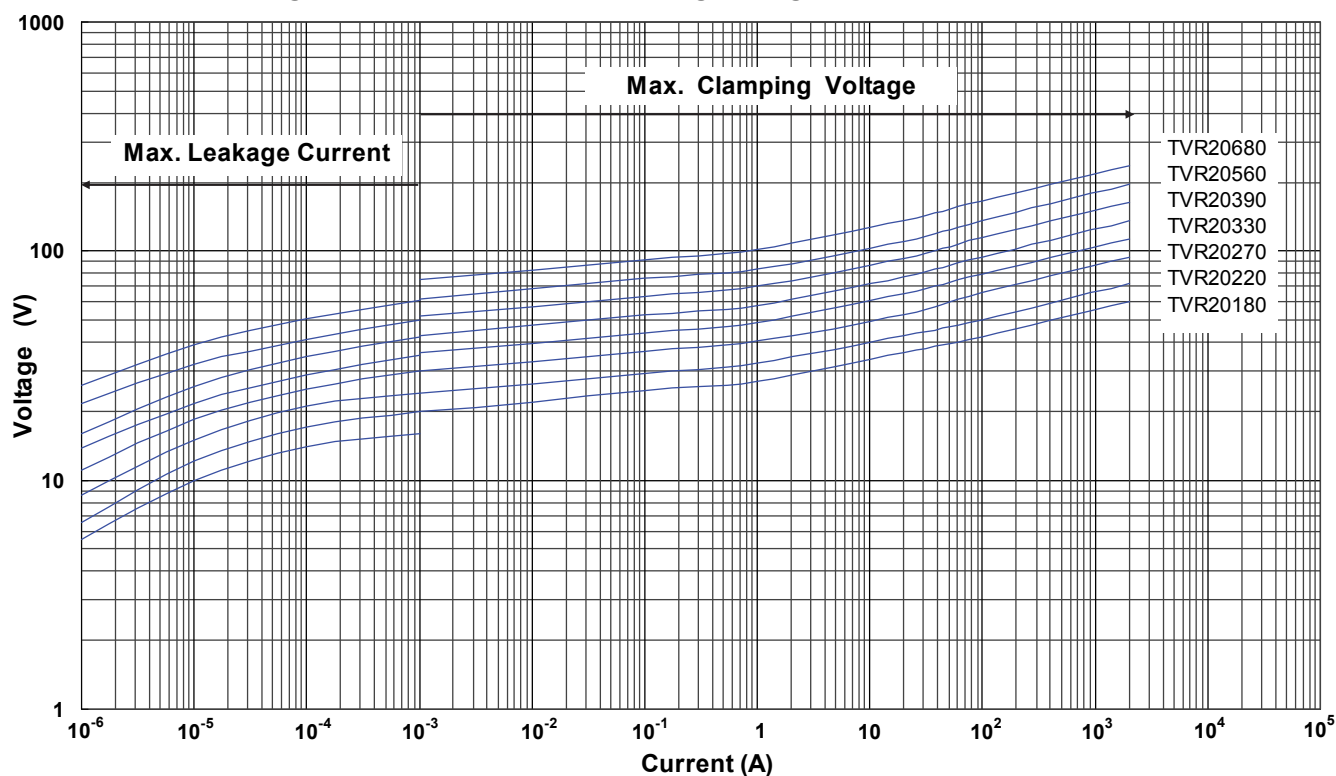


■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR14511 to TVR14182)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR20180 to TVR20680)



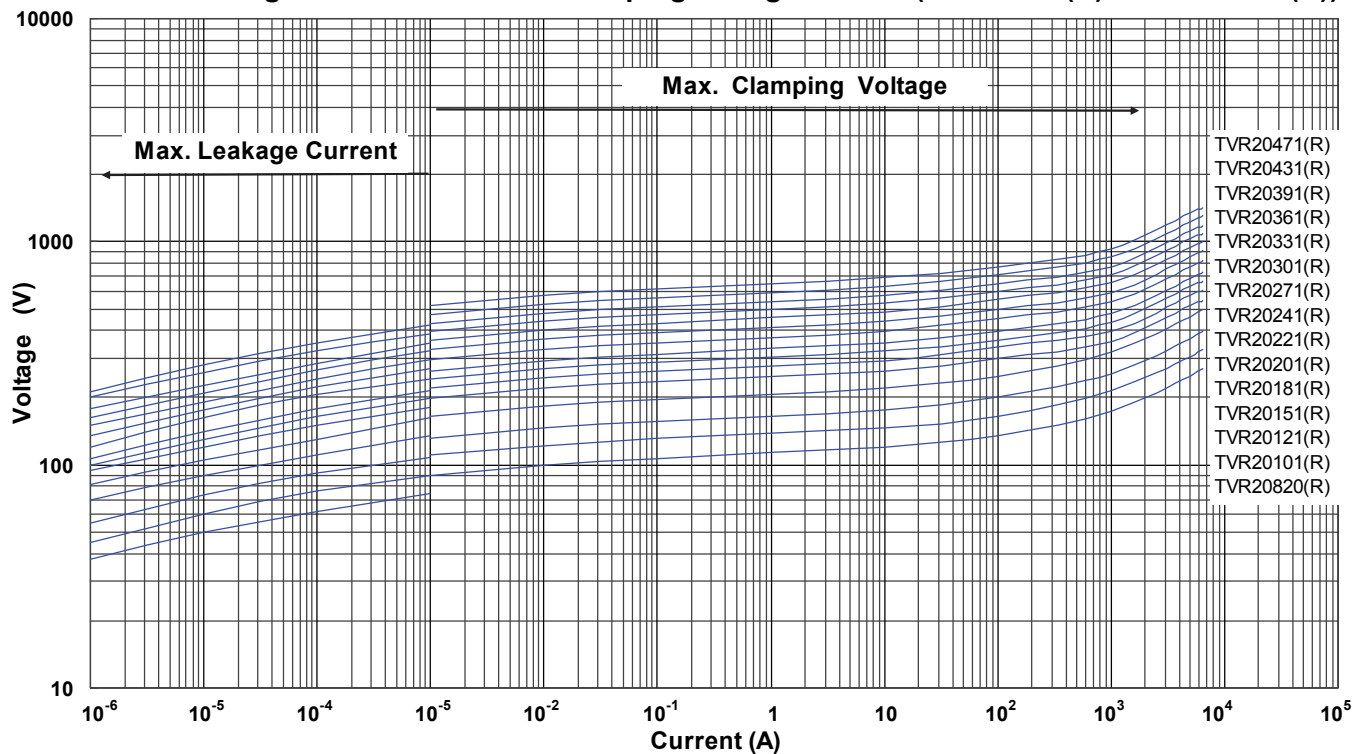
Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection

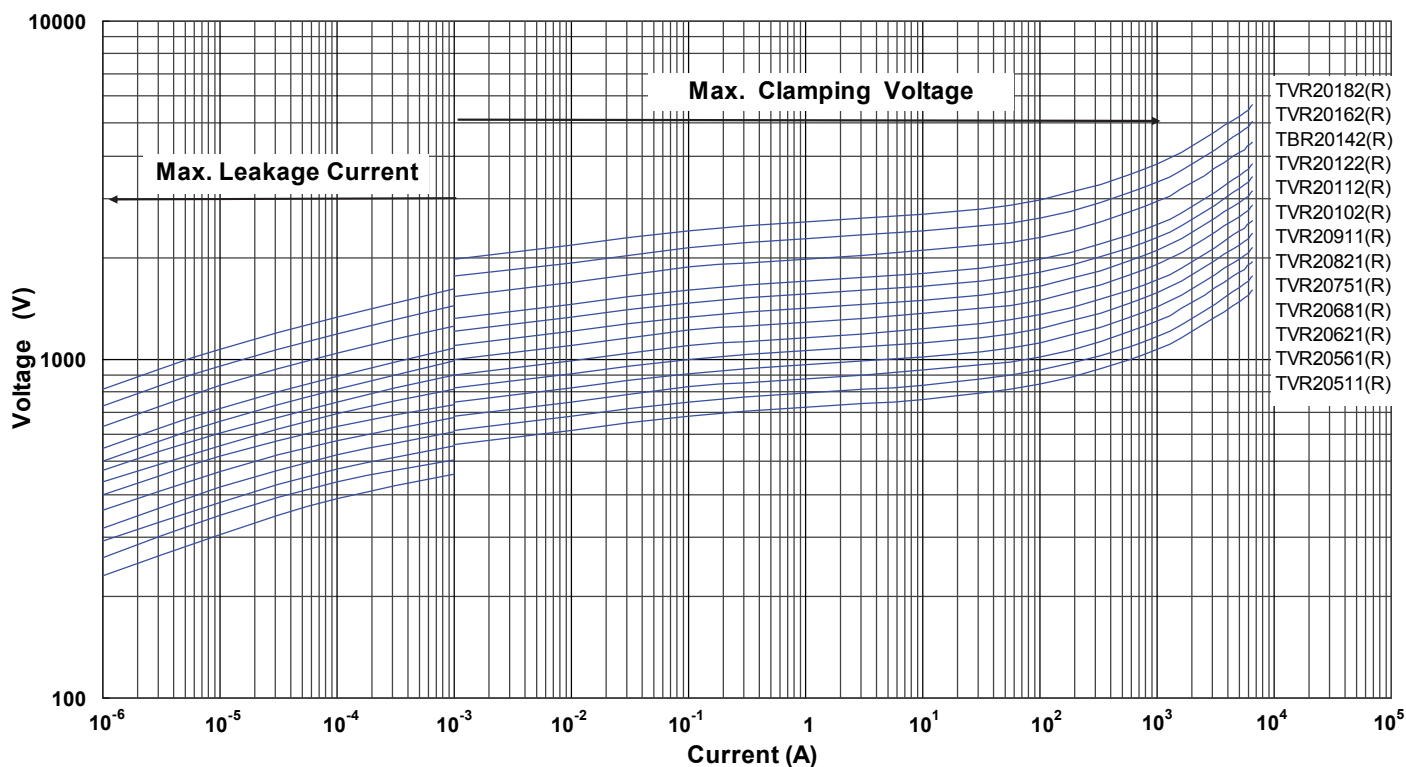


■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR20820(R) to TVR20471(R))



Max. Leakage Current and Max. Clamping Voltage Curves (TVR20511(R) to TVR20182(R))



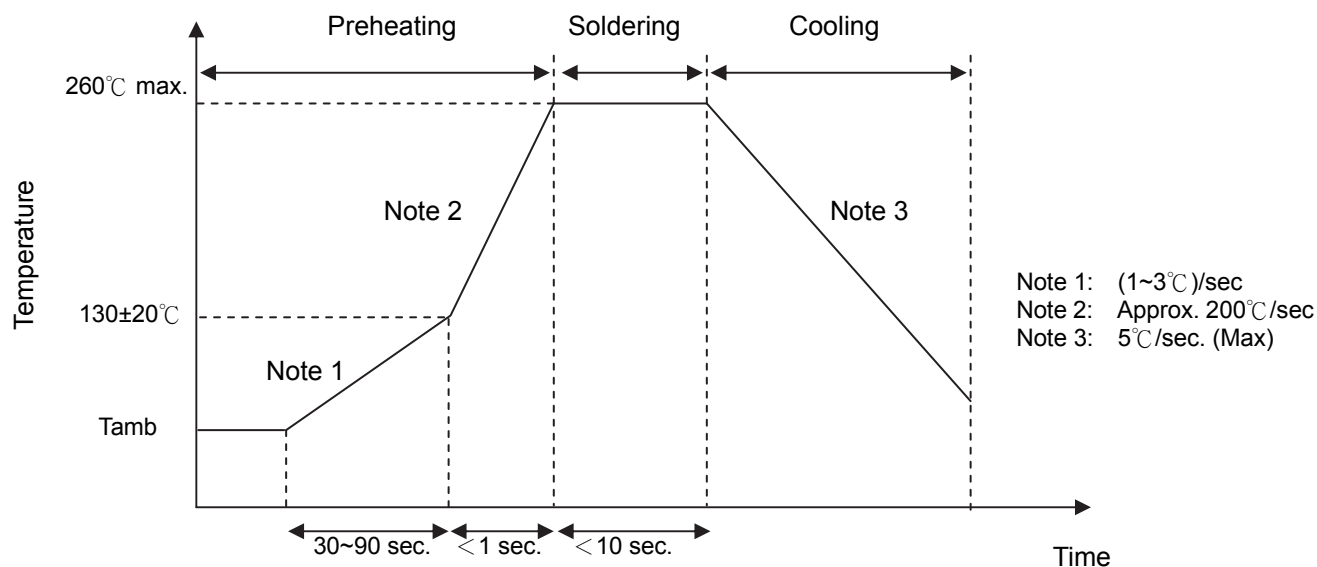
Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge Protection

■ 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 Series

Disc Type Varistor for Surge Protection



■ Reliability

Item	Standard	Test conditions / Methods	Specifications																		
Tensile Strength of Terminals	IEC60068-2-21	Gradually apply the specified force and keep the unit fixed for 10±1 sec. <table><tr><td>Terminal diameter (mm)</td><td>Force (Kg)</td></tr><tr><td>0.5<d≤0.8</td><td>1.0</td></tr><tr><td>0.8<d≤1.25</td><td>2.0</td></tr></table>	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												
Terminal diameter (mm)	Force (Kg)																				
0.5<d≤0.8	1.0																				
0.8<d≤1.25	2.0																				
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><tr><td>Terminal diameter (mm)</td><td>Force (Kg)</td></tr><tr><td>0.5<d≤0.8</td><td>0.5</td></tr><tr><td>0.8<d≤1.25</td><td>1.0</td></tr></table>	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												
Terminal diameter (mm)	Force (Kg)																				
0.5<d≤0.8	0.5																				
0.8<d≤1.25	1.0																				
Vibration	IEC 60068-2-6	Frequency range: 10-55 Hz Amplitude: 0.75mm or 98 m/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±3℃, 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℃, 10±1 sec, (5±0.5 sec for TVR05)	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage																		
High Temperature Storage	IEC 60068-2-2	125±5℃ x 1000± 24 hrs	$ \Delta V_{1mA}/V_{1mA} \leq 5\%$ No visible damage																		
Damp Heat, Steady State	IEC60068-2-78	a. 40±2℃, 90 ~ 95 % RH, 1344 hrs b. 40±2℃, 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	<table><tr><td colspan="3">The conditions shown below shall be repeated 5 cycles</td></tr><tr><td>Step</td><td>Temperature (℃)</td><td>Period (minutes)</td></tr><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></table>	The conditions shown below shall be repeated 5 cycles			Step	Temperature (℃)	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
The conditions shown below shall be repeated 5 cycles																					
Step	Temperature (℃)	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℃, 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 secs, 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 2mins, amplitude corresponding to max. surge current derating curves for 1000μs.	$ \Delta V_{1mA}/V_{1mA} \leq 10\%$ No visible damage																		
Operating Duty Cycle Test	UL 1449 3 rd	6KV/3KA 1.2/50μs +8/20μs combination waveform with Vac(@ 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	UL 1449 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 Vac 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 (%/℃)																		

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



■ Packaging

● Taping Specification

S Type (Straight Lead)

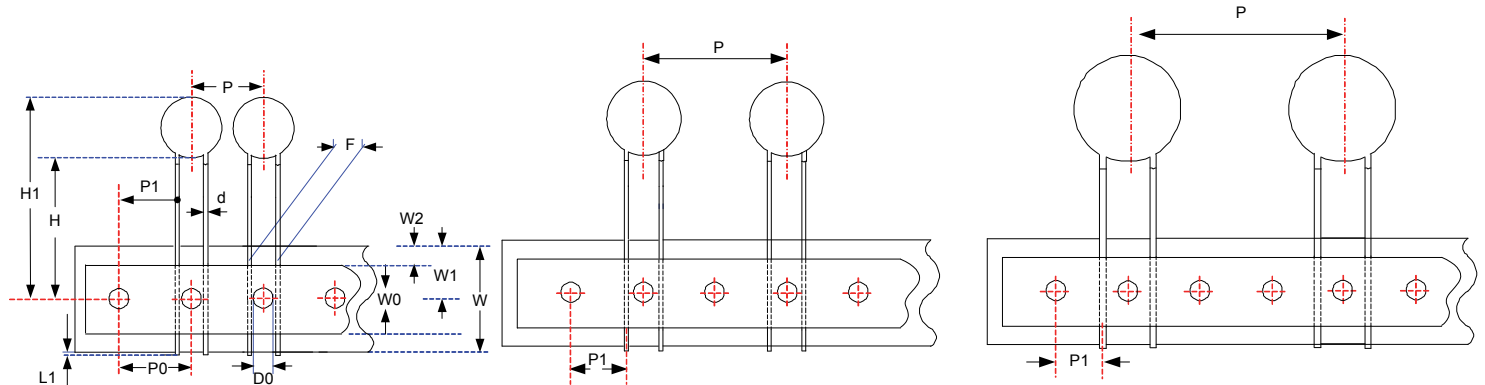


Figure A

Figure B

Figure C

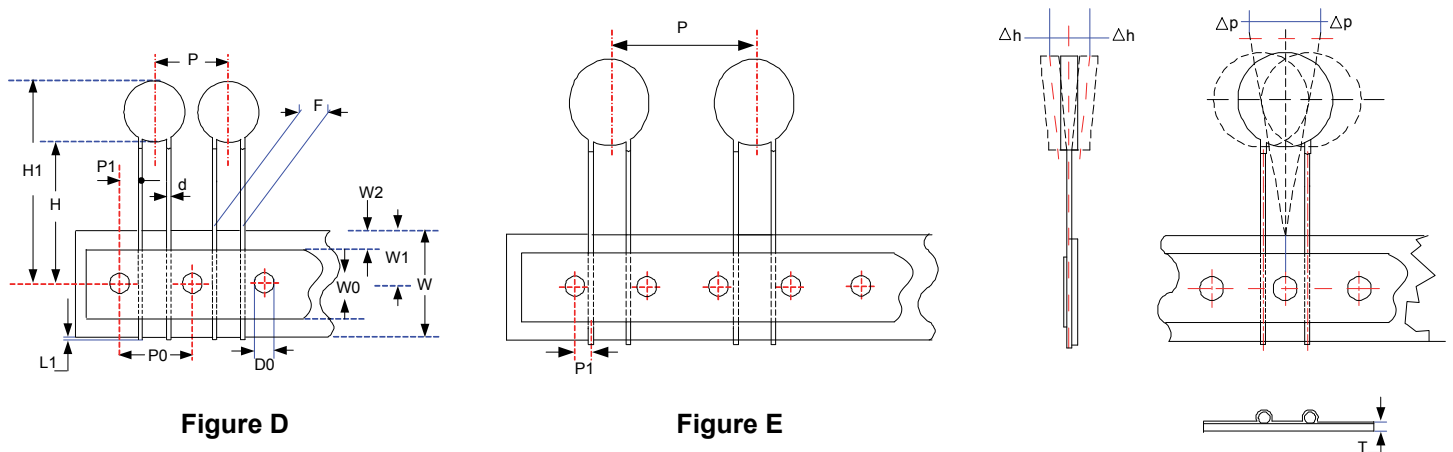


Figure D

Figure E

(Unit: mm)

Taping Code	Body Size	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)	05	12.7	5.0	12.7	3.85	18	28.0	0.6	12	9	3	18	1	2	0.5	4	0.6	D
	07	12.7	5.0	12.7	3.85	18	30.0	0.6	12	9	3	18	1	2	0.5	4	0.6	D
	10	12.7	7.5	12.7	8.95	18	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	14	12.7	7.5	25.4	8.95	18	38.0	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	20	12.7	7.5	25.4	8.95	18	40.5	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	20	12.7	10	38.1	7.70	18	40.5	1.0	12	9	3	18	1	2	0.5	4	0.6	C
E (P ₀ :15.0)	05	15	5.0	15.0	5.00	18	28.0	0.6	12	9	3	18	1	2	0.5	4	0.6	D
	07	15	5.0	15.0	5.00	18	30.0	0.6	12	9	3	18	1	2	0.5	4	0.6	D
	10	15	7.5	15.0	3.75	18	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	D
	14	15	7.5	30.0	3.75	18	38.0	0.8	12	9	3	18	1	2	0.5	4	0.6	E
	20	15	7.5	30.0	3.75	18	40.5	0.8	12	9	3	18	1	2	0.5	4	0.6	E

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



F Type (Y Kink Lead)

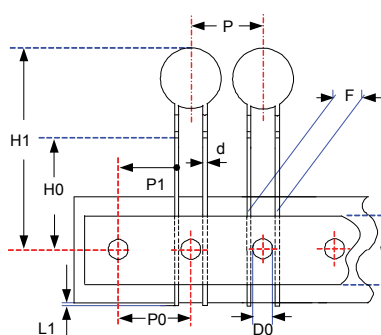


Figure A

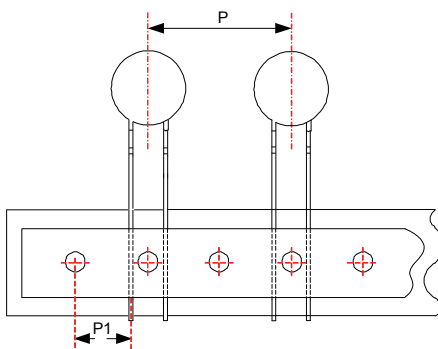


Figure B

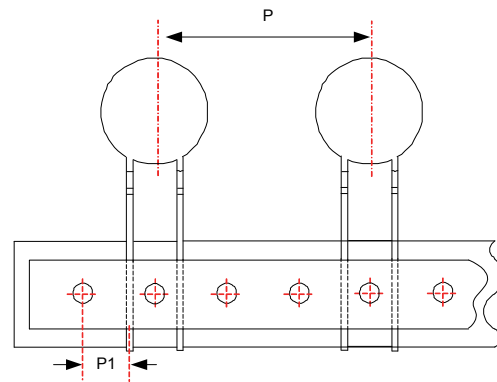


Figure C

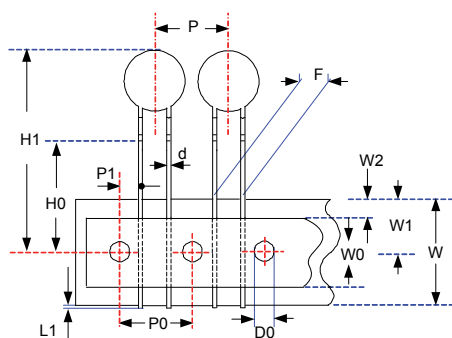


Figure D

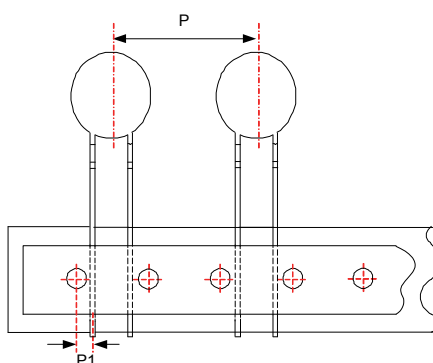
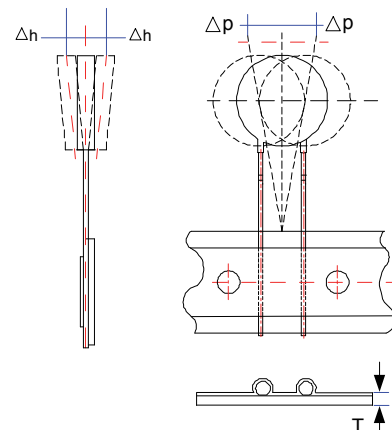


Figure E



(Unit: mm)

Taping Code	Body Size	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	±0.5	Max.	±0.02	±1	+0.75/-0.5	Max	+1/-0.5	Max.	Max.	Max.	±0.2	±0.2	
A (P ₀ :12.7)	05	12.7	5.0	12.7	3.85	16	28.0	0.6	12	9	3	18	1	2	0.5	4	0.6	D
	07	12.7	5.0	12.7	3.85	16	30.0	0.6	12	9	3	18	1	2	0.5	4	0.6	D
	10	12.7	7.5	12.7	8.95	16	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	14	12.7	7.5	25.4	8.95	16	38.0	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	20	12.7	7.5	25.4	8.95	16	40.5	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	20	12.7	10	38.1	7.70	16	40.5	1.0	12	9	3	18	1	2	0.5	4	0.6	C
E (P ₀ :15.0)	05	15	5.0	15.0	5.00	16	28.0	0.6	12	9	3	18	1	2	0.5	4	0.6	D
	07	15	5.0	15.0	5.00	16	30.0	0.6	12	9	3	18	1	2	0.5	4	0.6	D
	10	15	7.5	15.0	3.75	16	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	D
	14	15	7.5	30.0	3.75	16	38.0	0.8	12	9	3	18	1	2	0.5	4	0.6	E
	20	15	7.5	30.0	3.75	16	40.5	0.8	12	9	3	18	1	2	0.5	4	0.6	E
	20	15	7.5	30.0	3.75	16	40.5	0.8	12	9	3	18	1	2	0.5	4	0.6	E

Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge Protection

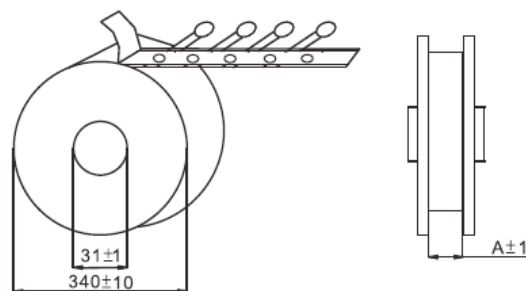
■ Quantity

● Bulk Packing

Series	Straight Lead Type Quantity (pcs/bag)	Cut Lead Type Quantity (pcs/bag)	Kink Type Quantity (pcs/bag)
TVR05	250	250	---
TVR07	250	250	200
TVR10	200	200	200
TVR14	100	100	100
TVR20	50	50	50

● Reel Packing

Series	A (mm)	Quantity (pcs/reel)
TVR05(180~391)	46	1,500
TVR05(431~751)		1,000
TVR07(180~391)		1,500
TVR07(431~821)		1,000
TVR10(180~911)		1,000
TVR10(102~112)		750
TVR10(122~182)		500
TVR14(180~470)		1,000
TVR14(560~391)		750
TVR14(431~182)		500
TVR20(180~681)	55	500
TVR20(751~182)		250



(Unit: mm)

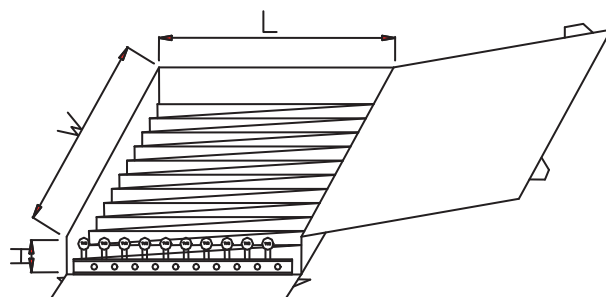
Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge Protection



● Ammo Packing

Series	Quantity (pcs/box)
TVR05(180~391)	1,000
TVR05(431~471)	1,200
TVR05(511~751)	1,000
TVR07(180~821)	1,000
TVR10(180~361)	750
TVR10(391~621)	500
TVR10(681~112)	400
TVR10(122~182)	200
TVR14(180~271)	500
TVR14(301~112)	250
TVR14(122~182)	200
TVR20(180~112)	250
TVR20(122~182)	200



(Unit: mm)

Series	W±5	L±5	H±5
TVR05 ~ TVR20	348	185	60
	348	275	60

■ Warehouse Storage Conditions of Products

● Storage Conditions:

1. Storage Temperature: -10℃ ~ +40℃
2. Relative Humidity: $\leq 75\%RH$
3. Keep away from corrosive atmosphere and sunlight.

● Period of Storage: 1 year