

Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge protection

■ Features

1. RoHS Compliant
2. Body size $\Phi 5 \sim \Phi 20\text{mm}$
3. Wide operating voltage range : 11Vac ~ 680Vac
4. Large withstanding surge current capability : 100A ~ 6500A (@8/20)
5. Radial lead resin coated
6. Excellent clamping ratio
7. Low leakage current
8. Bidirectional and symmetrical V/I characteristics
9. Cost effective
10. Operating temperature range : $-40 \sim +85^\circ\text{C}$
11. Agency Recognition: UL /cUL/VDE /CSA/CQC

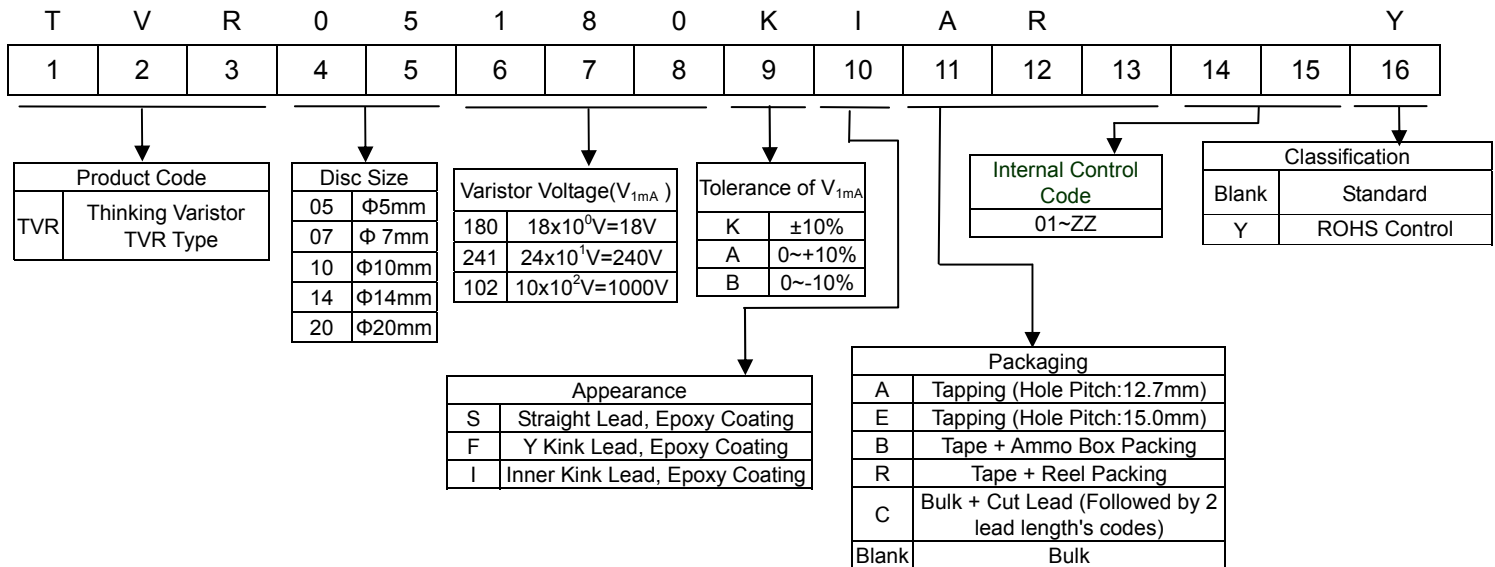


■ Recommended Applications

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

■ Part No. Code

$\Phi 5\text{mm} \sim \Phi 20\text{mm}$



Note: Code 11~16 will shift forward when previous codes are not used.

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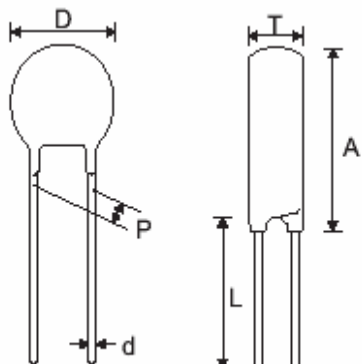


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■ Dimensions

- S Type (Straight Lead)

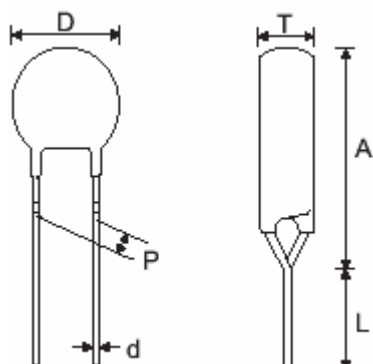
(Unit :mm)



Disc Size	D max.	L min.	d nor.	P nor.	A max.	T max.
05	7.5	30	0.6±0.02	5±1	10	Show on the characteristics
07	9.5	30	0.6±0.02	5±1	12	
10	12.5	30	0.8±0.02	7.5±1	15.5	
14	17	30	0.8±0.02	7.5±1	20	
20	23.5	26	1.0±0.02	10±1	26.5	

- F Type (Y Kink Lead)

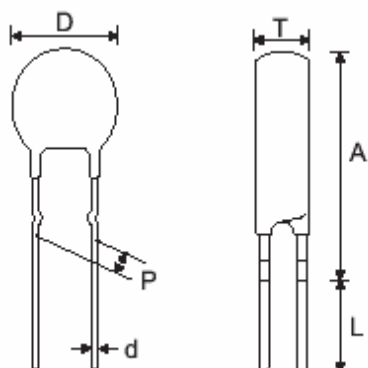
(Unit :mm)



Disc Size	D max.	L min.	d nor.	P nor.	A max.	T max.
05	7.5	28	0.6±0.02	5±1	12.5	Show on the characteristics
07	9.5	28	0.6±0.02	5±1	14.5	
10	12.5	26	0.8±0.02	7.5±1	19	
14	17	26	0.8±0.02	7.5±1	22.5	
20	23.5	24	1.0±0.02	10±1	29.5	

- I Type (Inner Kink Lead)

(Unit :mm)



Disc Size	D max.	L min.	d nor.	P nor.	A max.	T max.
05	7.5	25	0.6±0.02	5±1	12.5	Show on the characteristics
07	9.5	25	0.6±0.02	5±1	14.5	
10	12.5	25	0.8±0.02	7.5±1	20	
14	17	25	0.8±0.02	7.5±1	22.5	
20	23.5	25	1.0±0.02	10±1	29.5	

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■ Characteristics

Part No.	Normal Varistor Voltage	Max. Allowable Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Max. Energy (10/1000 μ s)	Rated Power	Reference Capacitance @1KHz	Thickness
	V _{1mA} (V)	V _{AC(rms)} (V)	V _{DC} (V)	V _p (V)	I _p (A)	I _{max} (A)	W _{max} (J)	P (W)	C (PF)	T _{max} (mm)
TVR 05180	18	11	14	40	1	100	0.4	0.01	1300	3.9
TVR 07180	18	11	14	36	2.5	250	0.9	0.02	2400	3.9
TVR 10180	18	11	14	36	5	500	2.1	0.05	4500	4.3
TVR 14180	18	11	14	36	10	1000	4	0.1	10000	4.3
TVR 20180	18	11	14	36	20	2000	11	0.2	19000	4.7
TVR 05220	22	14	18	48	1	100	0.5	0.01	1000	4.1
TVR 07220	22	14	18	43	2.5	250	1.1	0.02	2000	4.1
TVR 10220	22	14	18	43	5	500	2.5	0.05	3500	4.5
TVR 14220	22	14	18	43	10	1000	5	0.1	8500	4.5
TVR 20220	22	14	18	43	20	2000	14	0.2	16000	4.9
TVR 05270	27	17	22	60	1	100	0.6	0.01	850	4.3
TVR 07270	27	17	22	53	2.5	250	1.4	0.02	1600	4.3
TVR 10270	27	17	22	53	5	500	3	0.05	3000	4.7
TVR 14270	27	17	22	53	10	1000	6	0.1	7000	4.7
TVR 20270	27	17	22	53	20	2000	18	0.2	14500	5.1
TVR 05330	33	20	26	73	1	100	0.8	0.01	700	4.5
TVR 07330	33	20	26	65	2.5	250	1.7	0.02	1300	4.5
TVR 10330	33	20	26	65	5	500	4	0.05	2500	4.9
TVR 14330	33	20	26	65	10	1000	7.5	0.1	6000	4.9
TVR 20330	33	20	26	65	20	2000	23	0.2	13000	5.3
TVR 05390	39	25	31	86	1	100	0.9	0.01	600	4.0
TVR 07390	39	25	31	77	2.5	250	2.1	0.02	1200	4.0
TVR 10390	39	25	31	77	5	500	4.6	0.05	2000	4.4
TVR 14390	39	25	31	77	10	1000	8.6	0.1	4800	4.4
TVR 20390	39	25	31	77	20	2000	26	0.2	12000	4.8
TVR 05470	47	30	38	104	1	100	1.1	0.01	500	4.1
TVR 07470	47	30	38	93	2.5	250	2.5	0.02	1100	4.1
TVR 10470	47	30	38	93	5	500	5.5	0.05	1500	4.5
TVR 14470	47	30	38	93	10	1000	10	0.1	3800	4.5
TVR 20470	47	30	38	93	20	2000	33	0.2	11000	4.9
TVR 05560	56	35	45	123	1	100	1.3	0.01	400	4.3
TVR 07560	56	35	45	110	2.5	250	3.1	0.02	1000	4.3
TVR 10560	56	35	45	110	5	500	7	0.05	1350	4.7
TVR 14560	56	35	45	110	10	1000	11	0.1	3300	4.7
TVR 20560	56	35	45	110	20	2000	41	0.2	9000	5.1
TVR 05680	68	40	56	150	1	100	1.6	0.01	330	4.6
TVR 07680	68	40	56	135	2.5	250	3.6	0.02	850	4.6
TVR 10680	68	40	56	135	5	500	8.2	0.05	1250	5.0
TVR 14680	68	40	56	135	10	1000	14	0.1	2700	5.0
TVR 20680	68	40	56	135	20	2000	46	0.2	7500	5.4
TVR 05820	82	50	65	145	5	400	2.5	0.1	250	4.0
TVR 07820	82	50	65	135	10	1200	5.5	0.25	460	4.0
TVR 10820	82	50	65	135	25	2500	12	0.4	1000	4.4
TVR 14820	82	50	65	135	50	4500	22	0.6	2100	4.4
TVR 20820	82	50	65	135	100	6500	48	1	4800	4.8

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	V _{1mA} (V)	V _{AC(rms)} (V)	V _{DC} (V)	V _p (V)	I _p (A)	I _{max} (A)	W _{max} (J)	P (W)	C (PF)	T _{max} (mm)
TVR 05101	100	60	85	175	5	400	3	0.1	230	4.2
TVR 07101	100	60	85	165	10	1200	6.5	0.25	420	4.2
TVR 10101	100	60	85	165	25	2500	15	0.4	920	4.6
TVR 14101	100	60	85	165	50	4500	28	0.6	1900	4.6
TVR 20101	100	60	85	165	100	6500	51	1	3900	5.0
TVR 05121	120	75	100	210	5	400	4	0.1	210	4.4
TVR 07121	120	75	100	200	10	1200	7.8	0.25	380	4.4
TVR 10121	120	75	100	200	25	2500	18	0.4	830	4.8
TVR 14121	120	75	100	200	50	4500	32	0.6	1700	4.8
TVR 20121	120	75	100	200	100	6500	55	1	3300	5.2
TVR 05151	150	95	125	260	5	400	4.8	0.1	190	4.7
TVR 07151	150	95	125	250	10	1200	9.7	0.25	350	4.7
TVR 10151	150	95	125	250	25	2500	22	0.4	760	5.1
TVR 14151	150	95	125	250	50	4500	40	0.6	940	5.1
TVR 20151	150	95	125	250	100	6500	70	1	1950	5.5
TVR 05181	180	115	150	315	5	400	5.9	0.1	70	4.2
TVR 07181	180	115	150	300	10	1200	11.7	0.25	155	4.2
TVR 10181	180	115	150	300	25	2500	27	0.4	310	4.6
TVR 14181	180	115	150	300	50	4500	52	0.6	800	4.6
TVR 20181	180	115	150	300	100	6500	84	1	1620	5.0
TVR 05201	200	130	170	355	5	400	6.5	0.1	65	4.3
TVR 07201	200	130	170	340	10	1200	13	0.25	140	4.3
TVR 10201	200	130	170	340	25	2500	30	0.4	290	4.7
TVR 14201	200	130	170	340	50	4500	57	0.6	700	4.7
TVR 20201	200	130	170	340	100	6500	95	1	1460	5.1
TVR 05221	220	140	180	380	5	400	7	0.1	60	4.4
TVR 07221	220	140	180	360	10	1200	14	0.25	130	4.4
TVR 10221	220	140	180	360	25	2500	32	0.4	270	4.8
TVR 14221	220	140	180	360	50	4500	60	0.6	640	4.8
TVR 20221	220	140	180	360	100	6500	100	1	1320	5.2
TVR 05241	240	150	200	415	5	400	8	0.1	55	4.5
TVR 07241	240	150	200	395	10	1200	15	0.25	120	4.5
TVR 10241	240	150	200	395	25	2500	35	0.4	240	4.9
TVR 14241	240	150	200	395	50	4500	63	0.6	580	4.9
TVR 20241	240	150	200	395	100	6500	108	1	1200	5.3
TVR 05271	270	175	225	475	5	400	8.5	0.1	50	4.7
TVR 07271	270	175	225	455	10	1200	18	0.25	110	4.7
TVR 10271	270	175	225	455	25	2500	40	0.4	230	5.1
TVR 14271	270	175	225	455	50	4500	70	0.6	520	5.1
TVR 20271	270	175	225	455	100	6500	127	1	1100	5.5

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	V _{1mA} (V)	V _{AC(rms)} (V)	V _{DC} (V)	V _p (V)	I _p (A)	I _{max} (A)	W _{max} (J)	P (W)	C (PF)	T _{max} (mm)
TVR 05301	300	195	250	525	5	400	8.5	0.1	50	4.6
TVR 07301	300	195	250	500	10	1200	21	0.25	105	4.6
TVR 10301	300	195	250	500	25	2500	40	0.4	210	5.0
TVR 14301	300	195	250	500	50	4500	78	0.6	480	5.0
TVR 20301	300	195	250	500	100	6500	136	1	1000	5.4
TVR 05331	330	215	275	585	5	400	9.2	0.1	45	4.7
TVR 07331	330	215	275	550	10	1200	23	0.25	100	4.7
TVR 10331	330	215	275	550	25	2500	43	0.4	200	5.1
TVR 14331	330	215	275	550	50	4500	85	0.6	450	5.1
TVR 20331	330	215	275	550	100	6500	150	1	950	5.5
TVR 05361	360	230	300	620	5	400	10	0.1	45	4.8
TVR 07361	360	230	300	595	10	1200	25	0.25	95	4.8
TVR 10361	360	230	300	595	25	2500	47	0.4	190	5.2
TVR 14361	360	230	300	595	50	4500	93	0.6	430	5.2
TVR 20361	360	230	300	595	100	6500	163	1	900	5.6
TVR 05391	390	250	320	675	5	400	12	0.1	40	5.0
TVR 07391	390	250	320	650	10	1200	25	0.25	85	5.0
TVR 10391	390	250	320	650	25	2500	60	0.4	175	5.4
TVR 14391	390	250	320	650	50	4500	100	0.6	390	5.4
TVR 20391	390	250	320	650	100	6500	180	1	800	5.8
TVR 05431	430	275	350	745	5	400	13	0.1	35	5.2
TVR 07431	430	275	350	710	10	1200	28	0.25	80	5.2
TVR 10431	430	275	350	710	25	2500	65	0.4	160	5.6
TVR 14431	430	275	350	710	50	4500	115	0.6	370	5.6
TVR 20431	430	275	350	710	100	6500	190	1	700	6.0
TVR 05471	470	300	385	810	5	400	15	0.1	30	5.3
TVR 07471	470	300	385	775	10	1200	30	0.25	70	5.3
TVR 10471	470	300	385	775	25	2500	70	0.4	150	5.7
TVR 14471	470	300	385	775	50	4500	125	0.6	320	5.7
TVR 20471	470	300	385	775	100	6500	220	1	620	6.1
TVR 05511	510	320	410	878	5	400	16	0.1	30	5.5
TVR 07511	510	320	410	845	10	1200	33	0.25	65	5.5
TVR 10511	510	320	410	845	25	2500	70	0.4	130	5.9
TVR 14511	510	320	410	845	50	4500	125	0.6	290	5.9
TVR 20511	510	320	410	845	100	6500	220	1	530	6.3
TVR 05561	560	350	450	962	5	400	18	0.1	30	5.3
TVR 07561	560	350	450	930	10	1200	33	0.25	60	5.7
TVR 10561	560	350	450	930	25	2500	70	0.4	120	6.1
TVR 14561	560	350	450	930	50	4500	125	0.6	260	6.1
TVR 20561	560	350	450	930	100	6500	220	1	480	6.5

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	V _{1mA} (V)	V _{AC(rms)} (V)	V _{DC} (V)	V _p (V)	I _p (A)	I _{max} (A)	W _{max} (J)	P (W)	C (PF)	T _{max} (mm)
TVR 05621	620	395	510	1050	5	400	18	0.1	25	5.5
TVR 07621	620	395	510	1020	10	1200	35	0.25	55	6
TVR 10621	620	395	510	1020	25	2500	70	0.4	110	6.4
TVR 14621	620	395	510	1020	50	4500	125	0.6	240	6.4
TVR 20621	620	395	510	1020	100	6500	220	1	450	6.8
TVR 05681	680	420	560	1120	5	400	18	0.1	20	5.7
TVR 07681	680	420	560	1120	10	1200	35	0.25	50	6.3
TVR 10681	680	420	560	1120	25	2500	70	0.4	100	6.7
TVR 14681	680	420	560	1120	50	4500	130	0.6	230	6.7
TVR 20681	680	420	560	1120	100	6500	230	1	440	7.1
TVR 07751	750	465	615	1235	10	1200	38	0.25	45	6.6
TVR 10751	750	465	615	1235	25	2500	75	0.4	90	7
TVR 14751	750	465	615	1235	50	4500	143	0.6	220	7
TVR 20751	750	465	615	1235	100	6500	255	1	420	7.4
TVR 07821	820	510	670	1355	10	1200	42	0.25	40	6.5
TVR 10821	820	510	670	1355	25	2500	85	0.4	80	6.9
TVR 14821	820	510	670	1355	50	4500	157	0.6	180	6.9
TVR 20821	820	510	670	1355	100	6500	282	1	390	7.3
TVR 10911	910	550	745	1500	25	2500	93	0.4	70	7.3
TVR 14911	910	550	745	1500	50	4500	175	0.6	170	7.3
TVR 20911	910	550	745	1500	100	6500	320	1	360	7.7
TVR 10102	1000	625	825	1650	25	2500	102	0.4	65	7.7
TVR 14102	1000	625	825	1650	50	4500	190	0.6	150	7.6
TVR 20102	1000	625	825	1650	100	6500	342	1	330	8.1
TVR 10112	1100	680	895	1815	25	2500	115	0.4	60	8.1
TVR 14112	1100	680	895	1815	50	4500	213	0.6	140	8.1
TVR 20112	1100	680	895	1815	100	6500	383	1	310	8.5
TVR 10122	1200	725	975	1980	25	2500	125	0.4	55	8.0
TVR 14122	1200	725	975	1980	50	4500	230	0.6	130	8.1
TVR 20122	1200	725	975	1980	100	6500	415	1	290	8.6
TVR 10142	1400	820	1140	2300	25	2500	145	0.4	45	8.8
TVR 14142	1400	820	1140	2300	50	4500	250	0.6	110	8.9
TVR 20142	1400	820	1140	2300	100	6500	480	1	250	9.4
TVR 10162	1600	910	1300	2630	25	2500	165	0.4	40	10.0
TVR 14162	1600	910	1300	2630	50	4500	315	0.6	95	10.1
TVR 20162	1600	910	1300	2630	100	6500	550	1	220	10.6
TVR 10182	1800	1000	1465	2950	25	2500	185	0.4	35	10.5
TVR 14182	1800	1000	1465	2950	50	4500	354	0.6	85	10.6
TVR 20182	1800	1000	1465	2950	100	6500	620	1	195	11.2

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■ Safety Approvals

File no. Part no.	Agency						
							
	UL1449 : E173642		UL1414 : E186499		97495	5944	CQC03001005165 CQC03001007654
TVR05180	√					√	√
TVR07180	√	√				√	√
TVR10180	√	√				√	√
TVR14180	√	√				√	√
TVR20180	√	√				√	√
TVR05220	√					√	√
TVR07220	√	√				√	√
TVR10220	√	√				√	√
TVR14220	√	√				√	√
TVR20220	√	√				√	√
TVR05270	√					√	√
TVR07270	√	√				√	√
TVR10270	√	√				√	√
TVR14270	√	√				√	√
TVR20270	√	√				√	√
TVR05330	√	√				√	√
TVR07330	√	√				√	√
TVR10330	√	√				√	√
TVR14330	√	√				√	√
TVR20330	√	√				√	√
TVR05390	√	√				√	√
TVR07390	√	√				√	√
TVR10390	√	√				√	√
TVR14390	√	√				√	√
TVR20390	√	√				√	√
TVR05470	√	√				√	√
TVR07470	√	√				√	√
TVR10470	√	√				√	√
TVR14470	√	√				√	√
TVR20470	√	√				√	√
TVR05560	√	√				√	√
TVR07560	√	√				√	√
TVR10560	√	√				√	√
TVR14560	√	√				√	√
TVR20560	√	√				√	√
TVR05680	√	√				√	√
TVR07680	√	√				√	√
TVR10680	√	√				√	√
TVR14680	√	√				√	√
TVR20680	√	√				√	√
TVR05820	√	√				√	√
TVR07820	√	√				√	√
TVR10820	√	√				√	√
TVR14820	√	√				√	√
TVR20820	√	√				√	√

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File no. Part no.	Agency						
							
	UL1449 : E173642		UL1414 : E186499		97495	5944	CQC03001005165 CQC03001007654
TVR05101	√	√				√	√
TVR07101	√	√				√	√
TVR10101	√	√				√	√
TVR14101	√	√				√	√
TVR20101	√	√				√	√
TVR05121	√	√				√	√
TVR07121	√	√				√	√
TVR10121	√	√				√	√
TVR14121	√	√				√	√
TVR20121	√	√				√	√
TVR05151	√	√				√	√
TVR07151	√	√				√	√
TVR10151	√	√				√	√
TVR14151	√	√				√	√
TVR20151	√	√				√	√
TVR05181	√	√				√	√
TVR07181	√	√				√	√
TVR10181	√	√				√	√
TVR14181	√	√				√	√
TVR20181	√	√				√	√
TVR05201	√	√			√	√	√
TVR07201	√	√	√	√	√	√	√
TVR10201	√	√	√	√	√	√	√
TVR14201	√	√	√	√	√	√	√
TVR20201	√	√	√	√	√	√	√
TVR05221	√	√			√	√	√
TVR07221	√	√	√	√	√	√	√
TVR10221	√	√	√	√	√	√	√
TVR14221	√	√	√	√	√	√	√
TVR20221	√	√	√	√	√	√	√
TVR05241	√	√			√	√	√
TVR07241	√	√	√	√	√	√	√
TVR10241	√	√	√	√	√	√	√
TVR14241	√	√	√	√	√	√	√
TVR20241	√	√	√	√	√	√	√
TVR05271	√	√			√	√	√
TVR07271	√	√	√	√	√	√	√
TVR10271	√	√	√	√	√	√	√
TVR14271	√	√	√	√	√	√	√
TVR20271	√	√	√	√	√	√	√

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge protection










File no. Part no.	Agency						
							
	UL1449 : E173642		UL1414 : E186499		97495	5944	CQC03001005165 CQC03001007654
TVR05301	√	√			√	√	√
TVR07301	√	√	√	√	√	√	√
TVR10301	√	√	√	√	√	√	√
TVR14301	√	√	√	√	√	√	√
TVR20301	√	√	√	√	√	√	√
TVR05331	√	√			√	√	√
TVR07331	√	√	√	√	√	√	√
TVR10331	√	√	√	√	√	√	√
TVR14331	√	√	√	√	√	√	√
TVR20331	√	√	√	√	√	√	√
TVR05361	√	√			√	√	√
TVR07361	√	√	√	√	√	√	√
TVR10361	√	√	√	√	√	√	√
TVR14361	√	√	√	√	√	√	√
TVR20361	√	√	√	√	√	√	√
TVR05391	√	√			√	√	√
TVR07391	√	√	√	√	√	√	√
TVR10391	√	√	√	√	√	√	√
TVR14391	√	√	√	√	√	√	√
TVR20391	√	√	√	√	√	√	√
TVR05431	√	√			√	√	√
TVR07431	√	√	√	√	√	√	√
TVR10431	√	√	√	√	√	√	√
TVR14431	√	√	√	√	√	√	√
TVR20431	√	√	√	√	√	√	√
TVR05471	√	√			√	√	√
TVR07471	√	√	√	√	√	√	√
TVR10471	√	√	√	√	√	√	√
TVR14471	√	√	√	√	√	√	√
TVR20471	√	√	√	√	√	√	√
TVR05511						√	
TVR07511	√	√	√	√		√	√
TVR10511	√	√	√	√		√	√
TVR14511	√	√	√	√		√	√
TVR20511	√	√	√	√		√	√
TVR05561						√	
TVR07561	√	√	√	√		√	√
TVR10561	√	√	√	√		√	√
TVR14561	√	√	√	√		√	√
TVR20561	√	√	√	√		√	√

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge protection



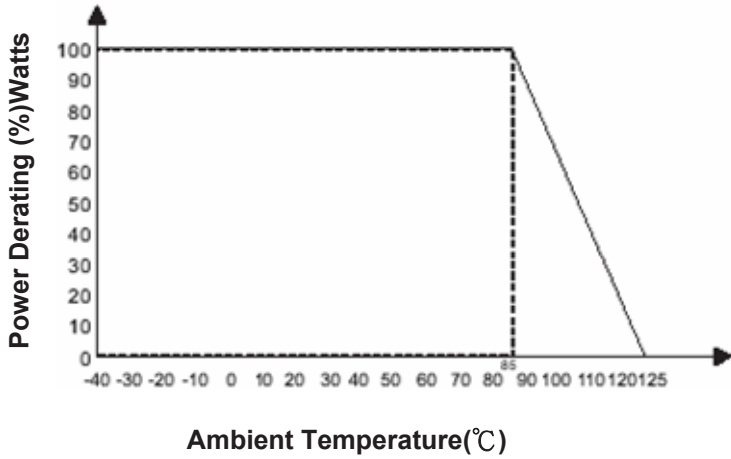
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TVR07621	√	√	√	√	√	√	√
TVR10621	√	√	√	√	√	√	√
TVR14621	√	√	√	√	√	√	√
TVR20621	√	√	√	√	√	√	√
TVR05681						√	
TVR07681	√	√	√	√	√	√	√
TVR10681	√	√	√	√	√	√	√
TVR14681	√	√	√	√	√	√	√
TVR20681	√	√	√	√	√	√	√
TVR07751	√	√			√	√	√
TVR10751	√	√	√	√	√	√	√
TVR14751	√	√	√	√	√	√	√
TVR20751	√	√	√	√	√	√	√
TVR07821	√	√			√	√	√
TVR10821	√	√	√	√	√	√	√
TVR14821	√	√	√	√	√	√	√
TVR20821	√	√	√	√	√	√	√
TVR10911	√	√	√	√	√	√	√
TVR14911	√	√	√	√	√	√	√
TVR20911	√	√	√	√	√	√	√
TVR10102	√	√	√	√	√	√	√
TVR14102	√	√	√	√	√	√	√
TVR20102	√	√	√	√	√	√	√
TVR10112	√	√	√	√	√	√	√
TVR14112	√	√	√	√	√	√	√
TVR20112	√	√	√	√	√	√	√
TVR10122	√	√					
TVR14122	√	√					
TVR20122	√	√					
TVR10142	√	√					
TVR14142	√	√					
TVR20142	√	√					
TVR10162	√	√					
TVR14162	√	√					
TVR20162	√	√					
TVR10182	√	√					
TVR14182	√	√					
TVR20182	√	√					

Metal Oxide Varistor : TVR Series

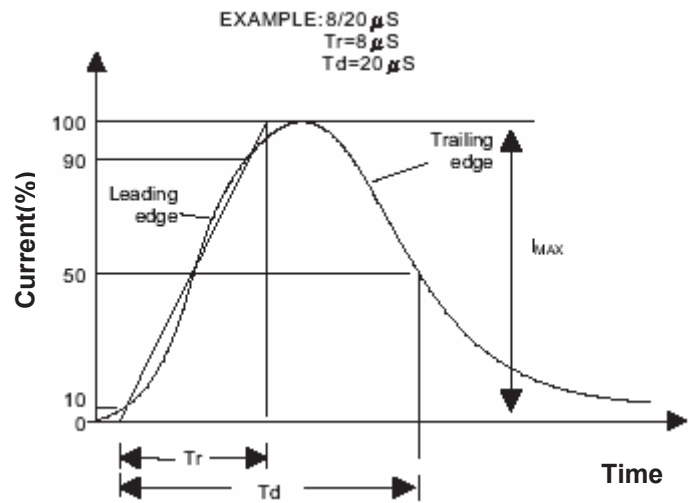


Disc Type Varistor for Surge protection

■ Operating Temperature vs. Power Derating Curve

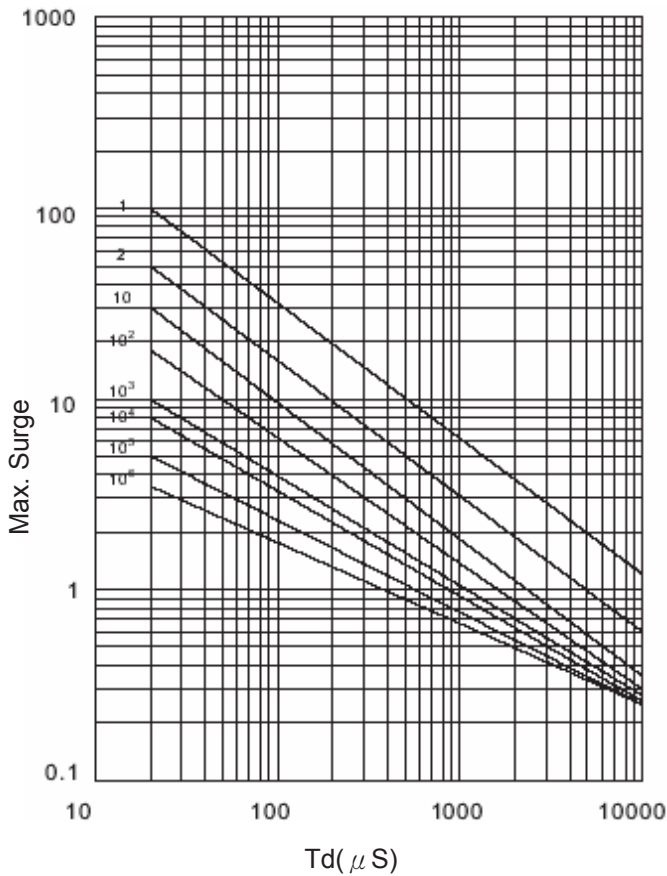


■ Surge Current Standard Waveform

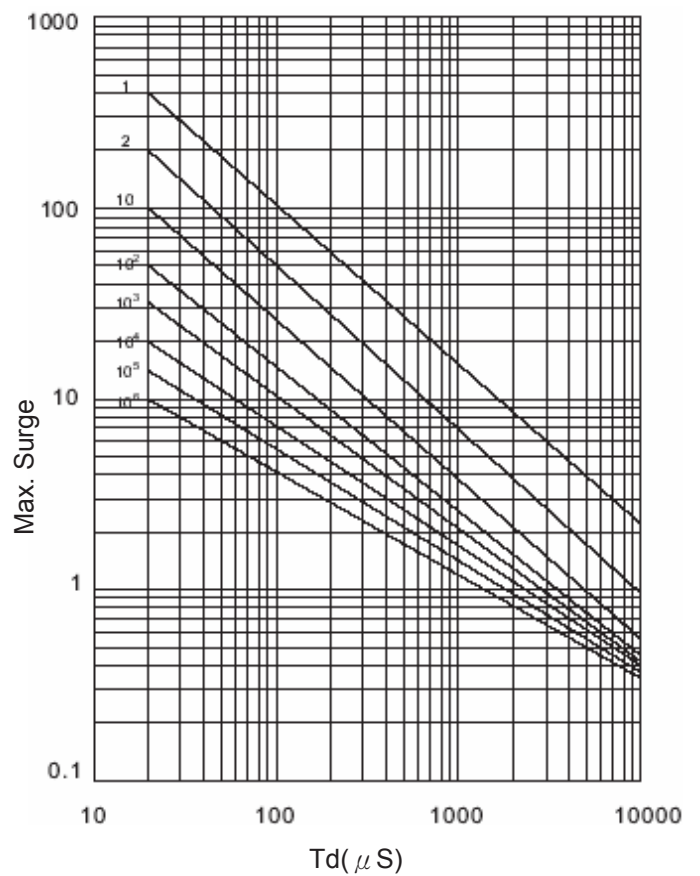


■ Max. Surge Current Derating Curves

TVR05180~TVR05680



TVR05820~TVR05751

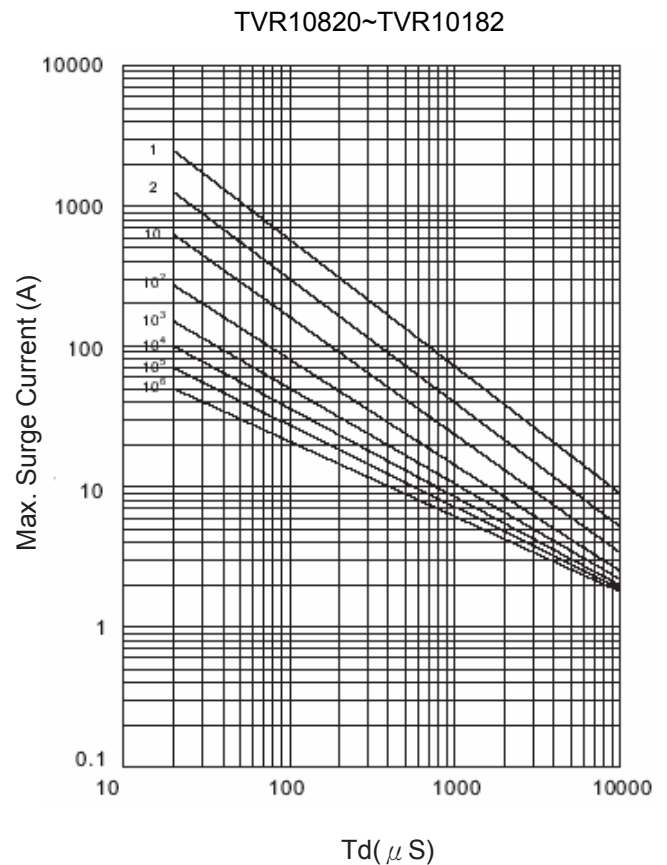
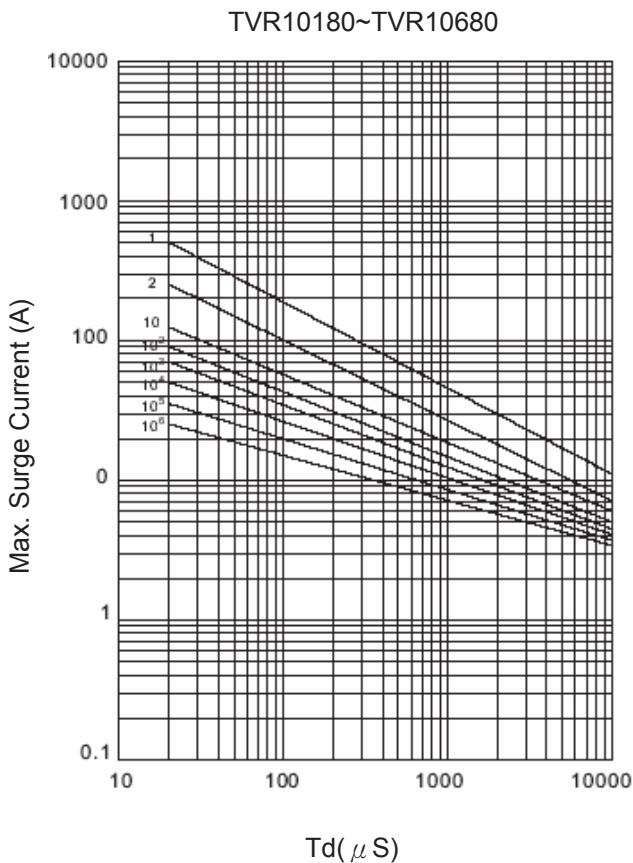
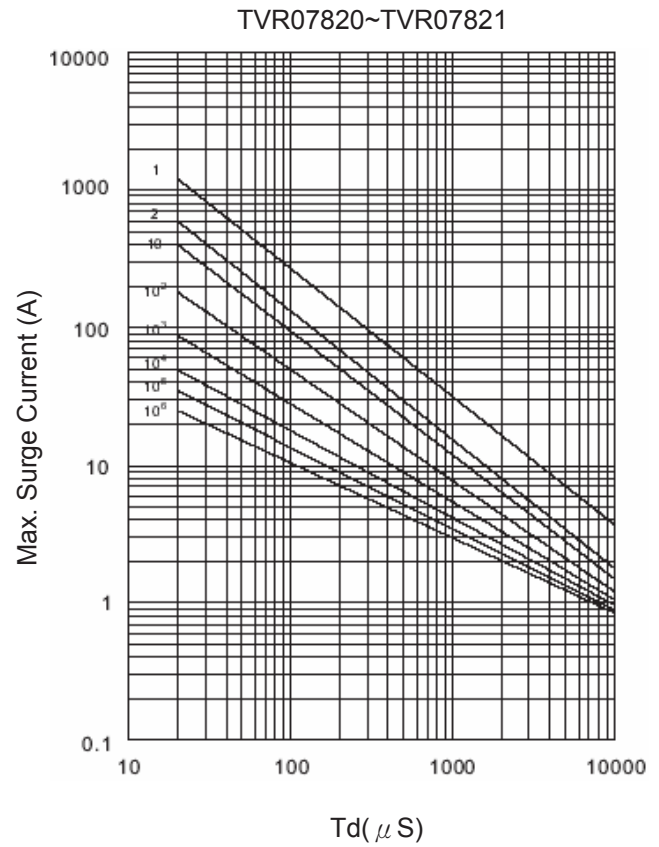
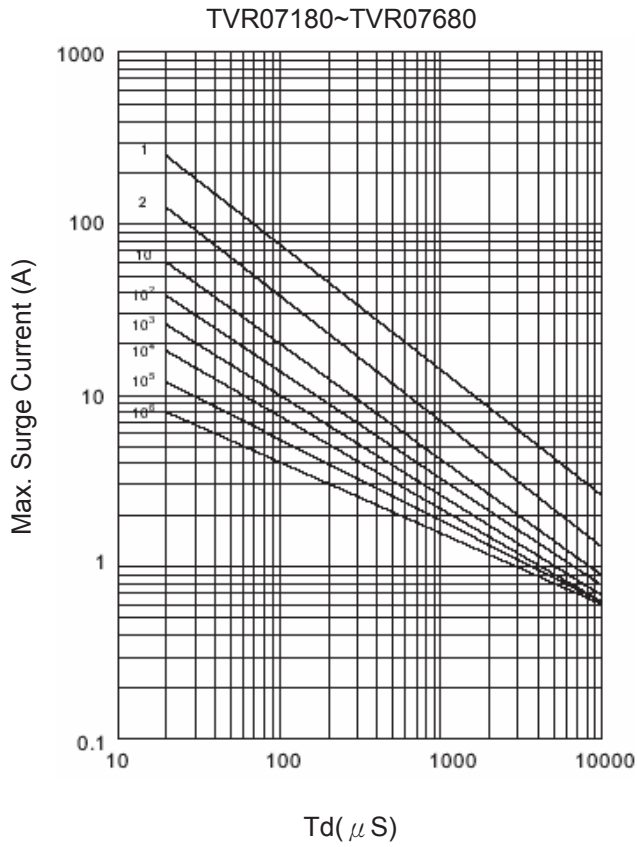


Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge protection

Max. Surge Current Derating Curves

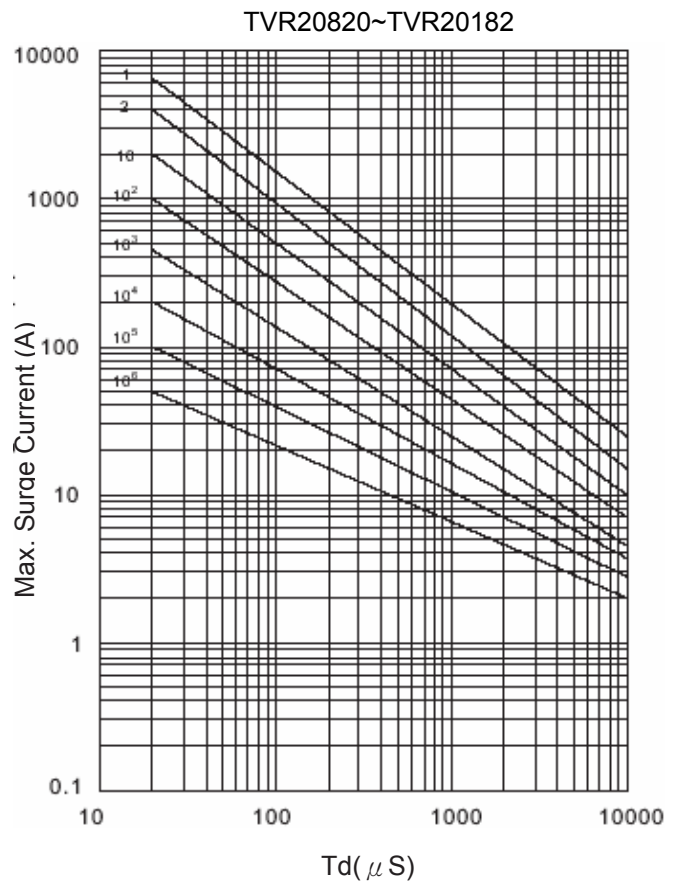
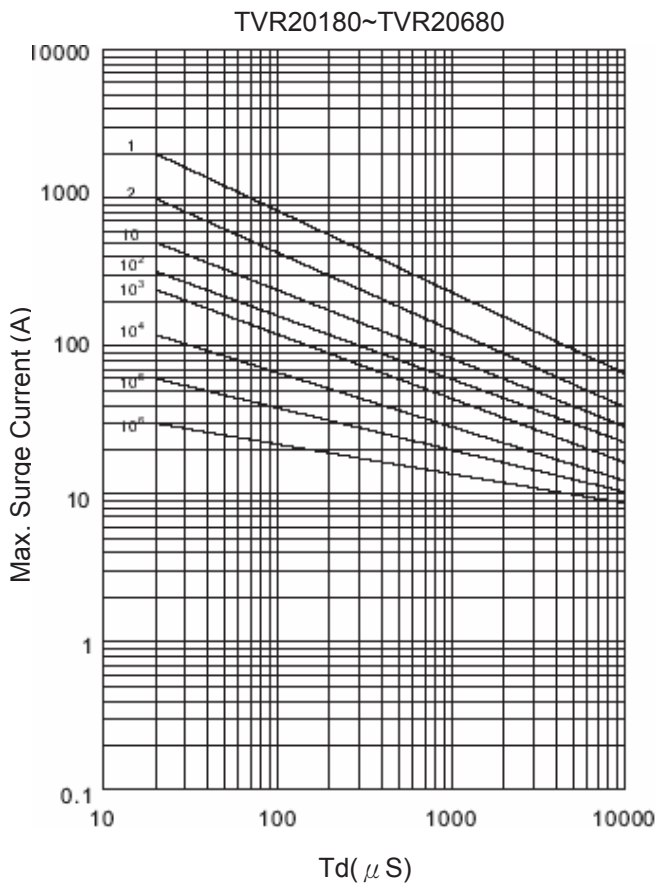
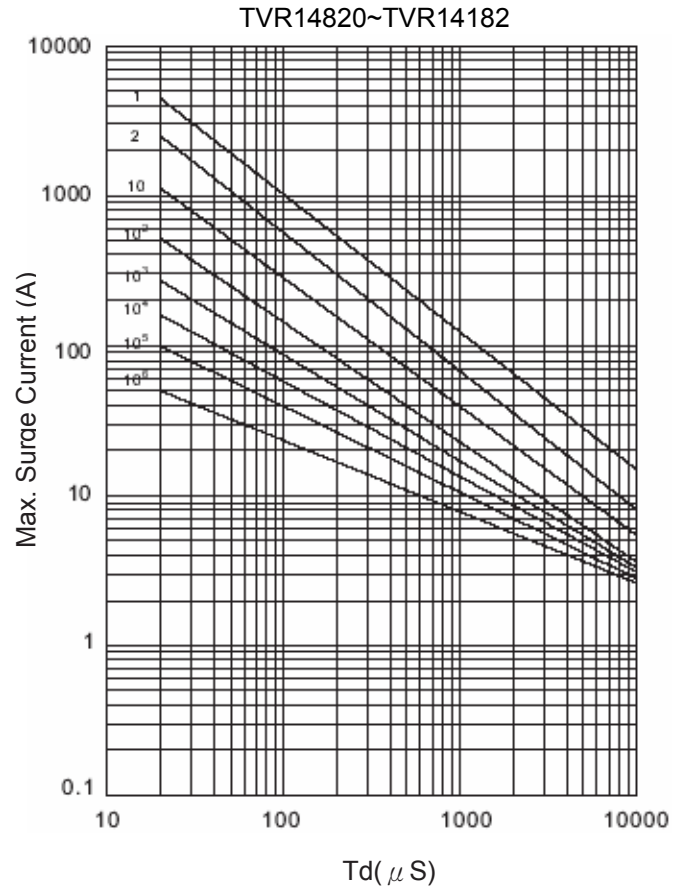
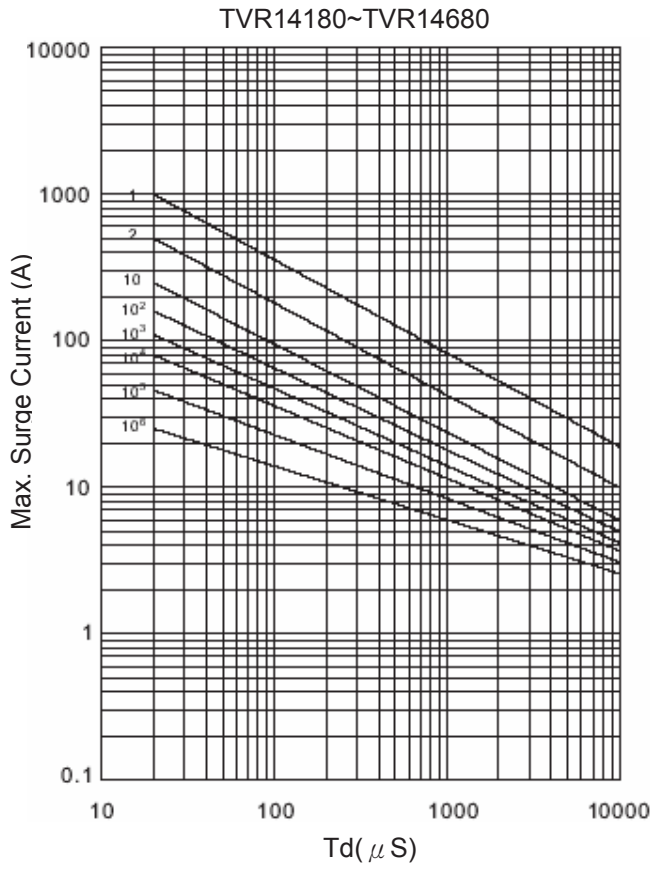


Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge protection

Max. Surge Current Derating Curves



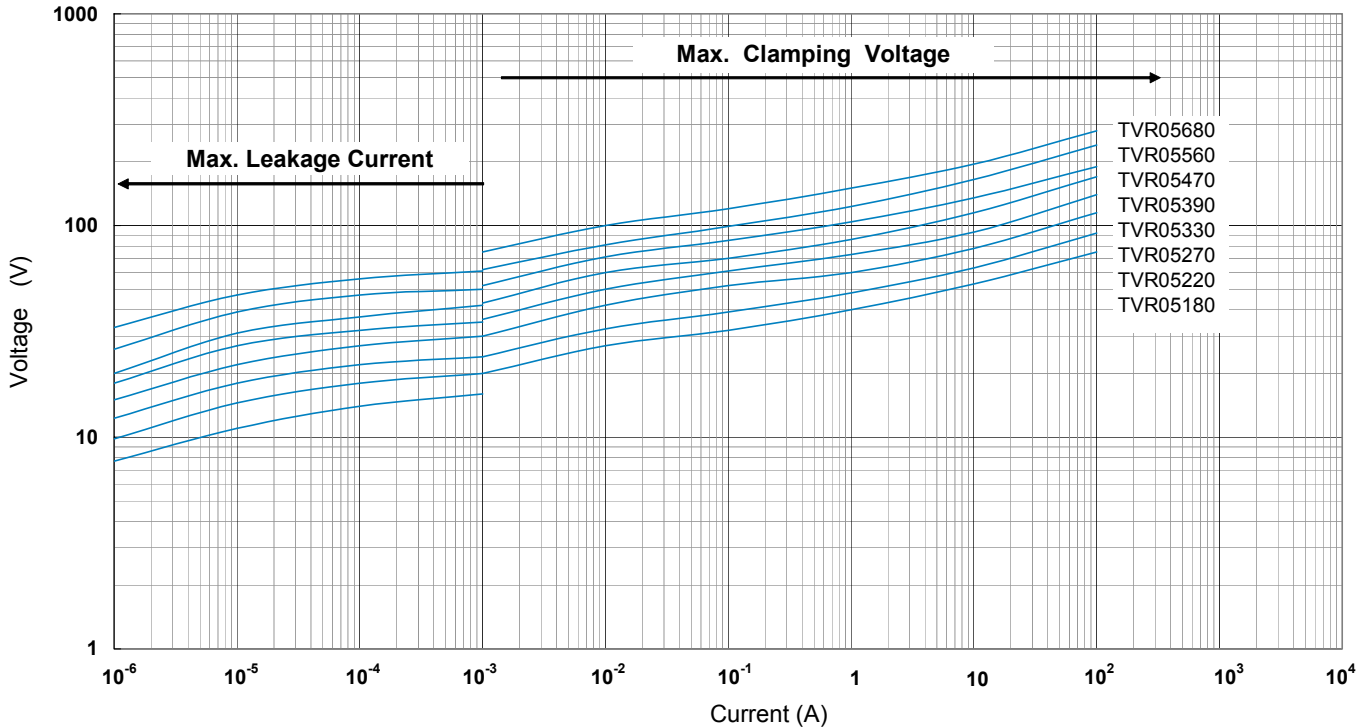
Metal Oxide Varistor : TVR Series



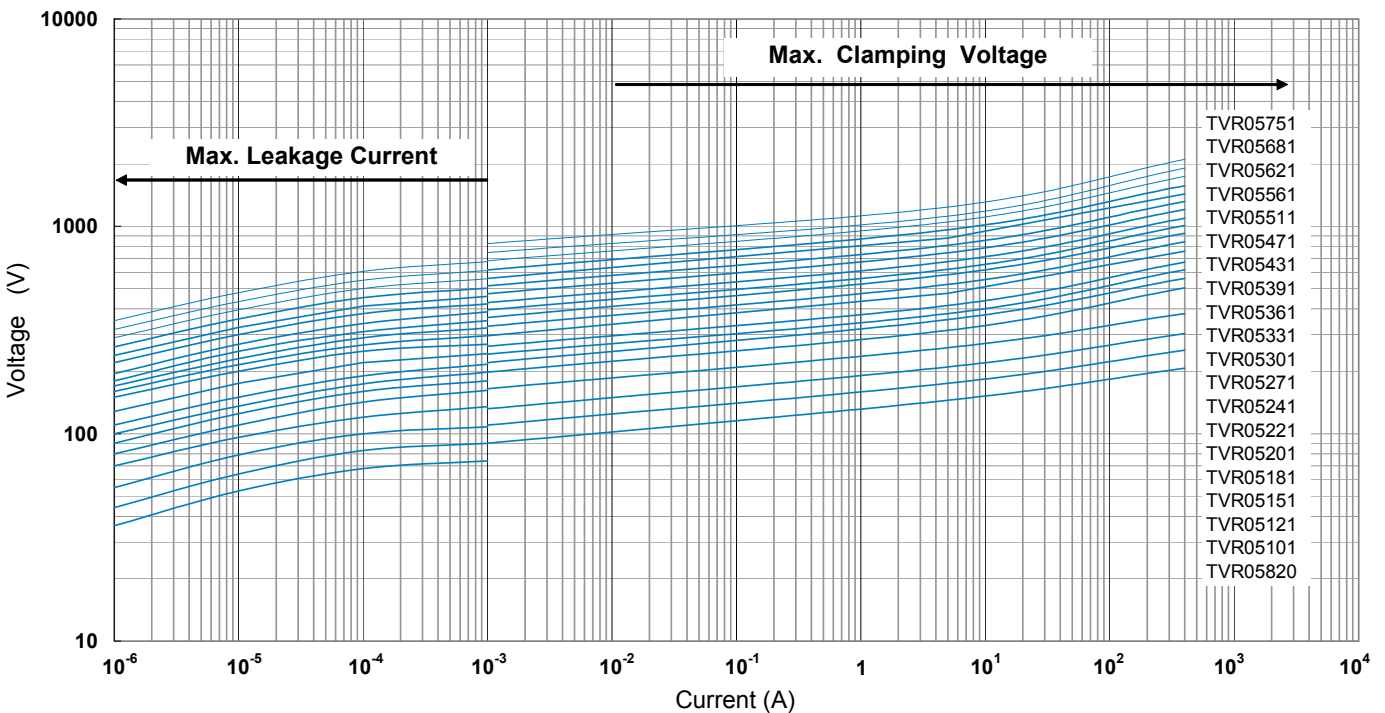
Disc Type Varistor for Surge protection

■ Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVR 05 180 to TVR 05 680)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR 05 820 to TVR 05 751)

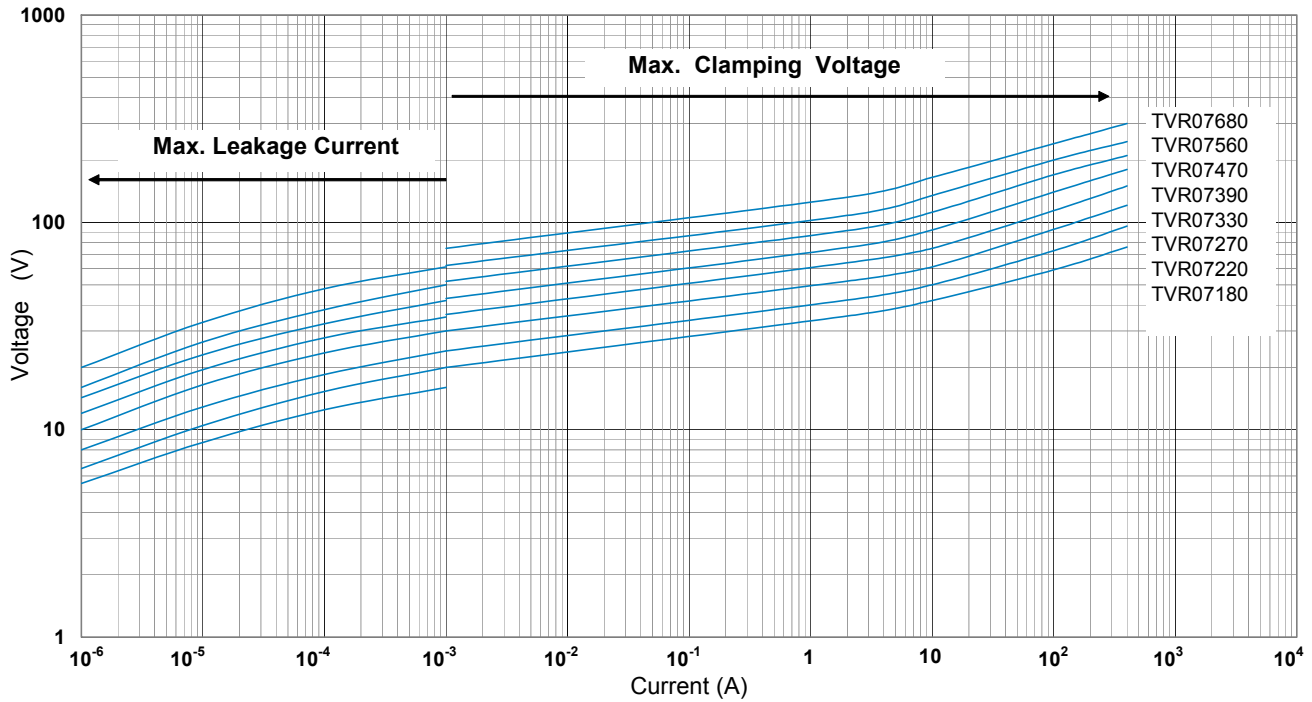


Metal Oxide Varistor : TVR Series

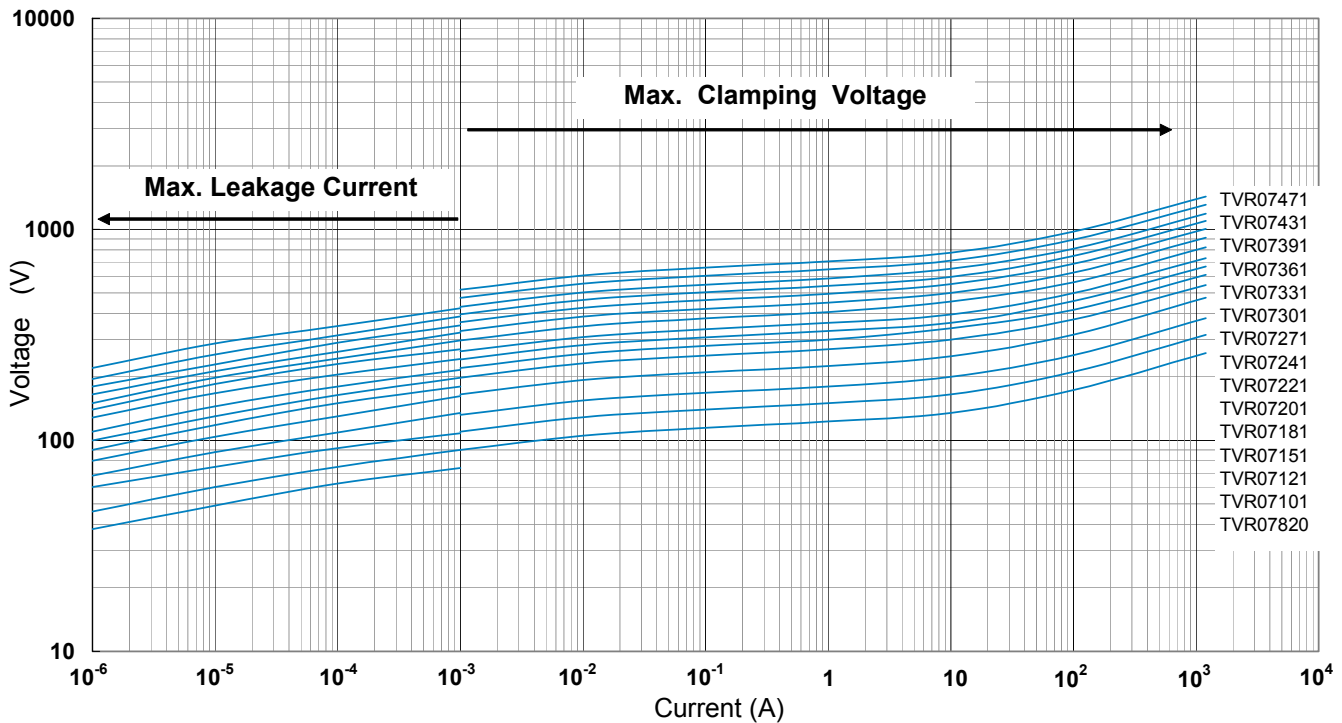


Disc Type Varistor for Surge protection

Max. Leakage Current and Max. Clamping Voltage Curves (TVR07 180 to TVR 07 680)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR 07 820 to TVR 07 471)

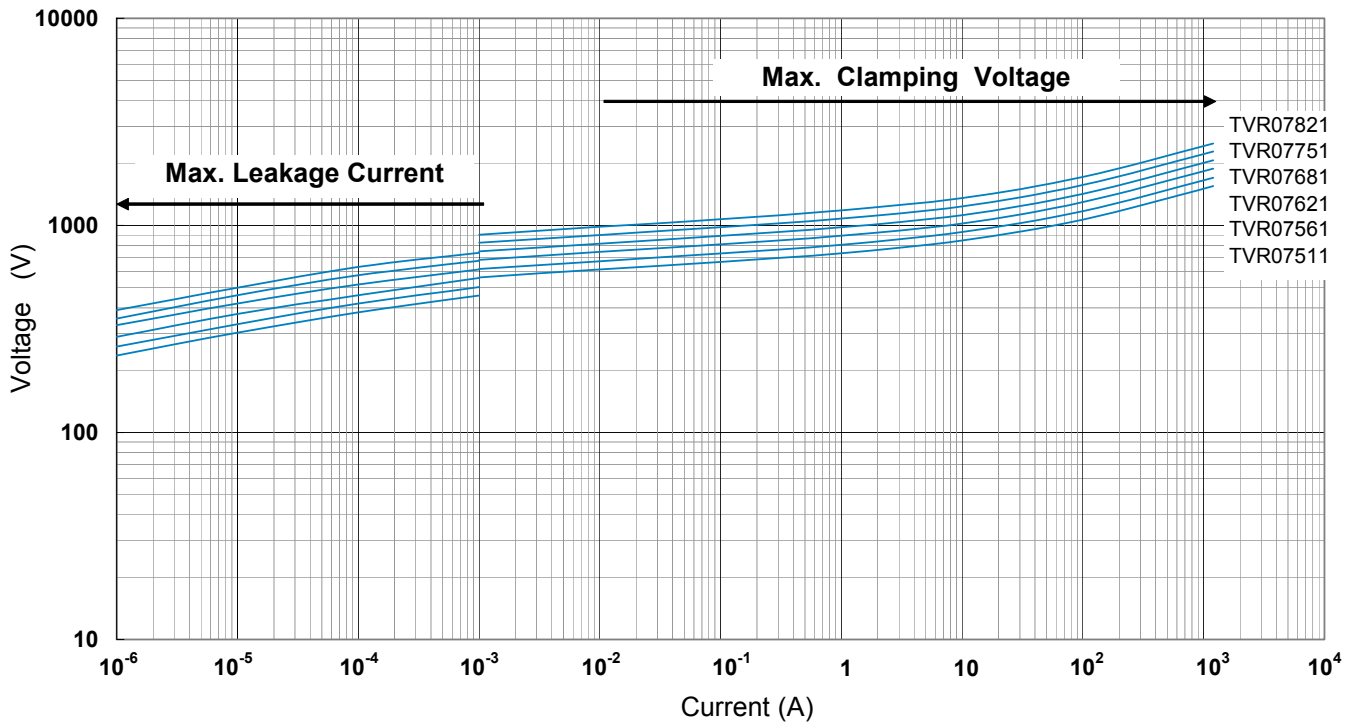


Metal Oxide Varistor : TVR Series

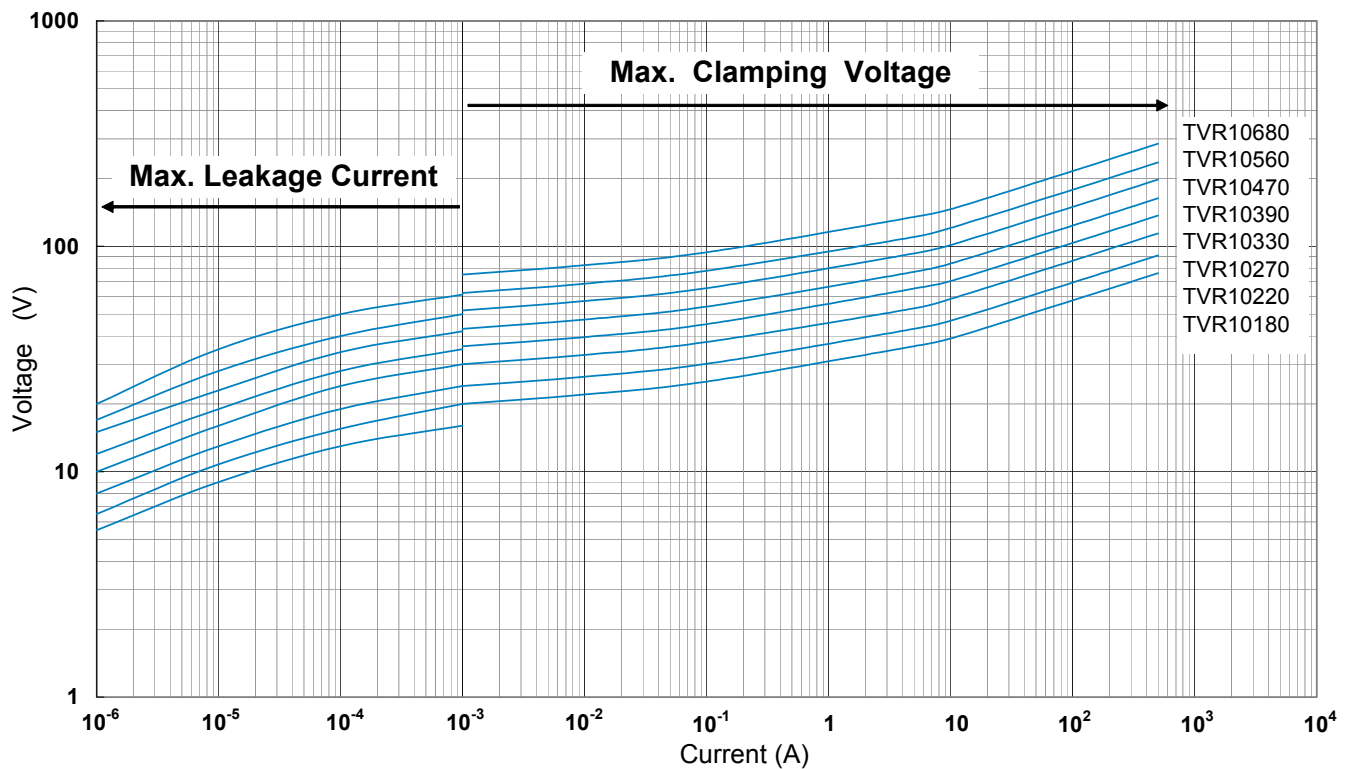


Disc Type Varistor for Surge protection

Max. Leakage Current and Max. Clamping Voltage Curves (TVR 07 511 to TVR 07 821)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR 10 180 to TVR 10 680)

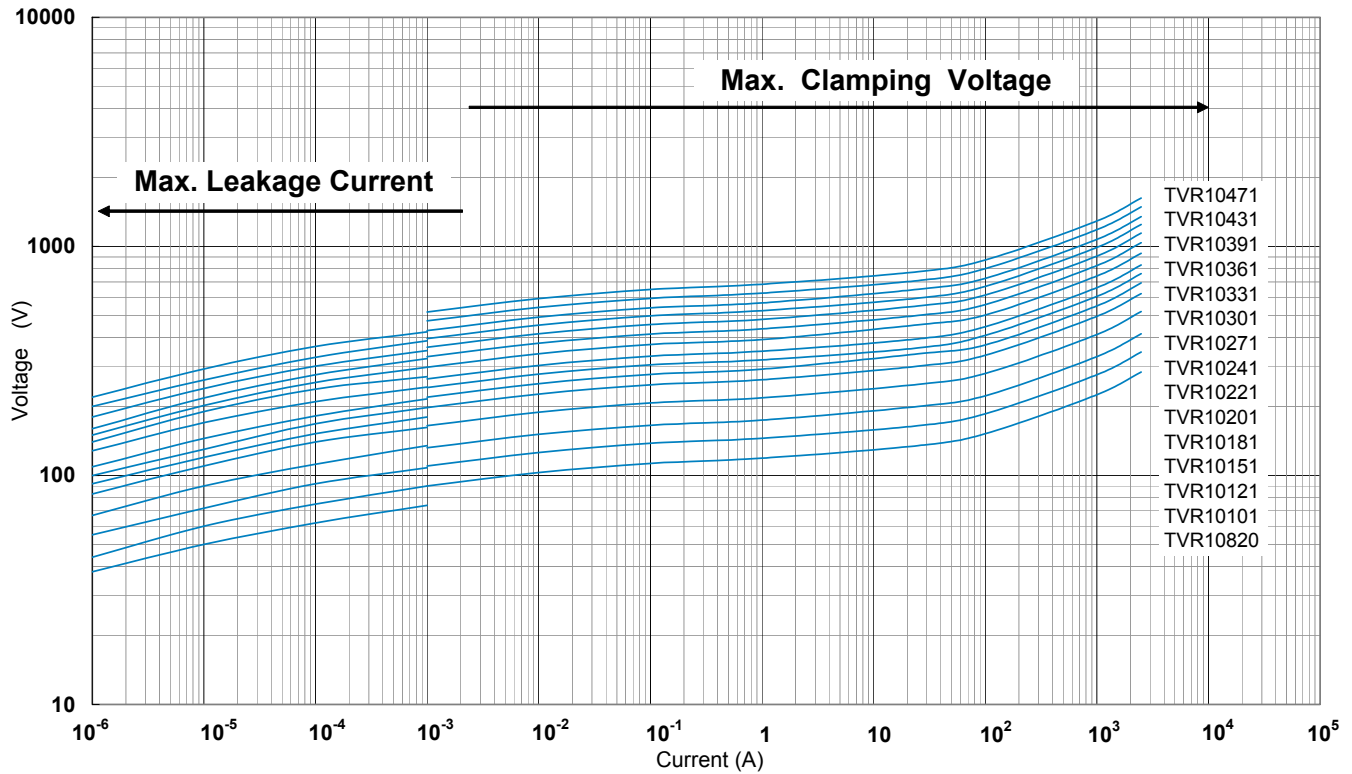


Metal Oxide Varistor : TVR Series

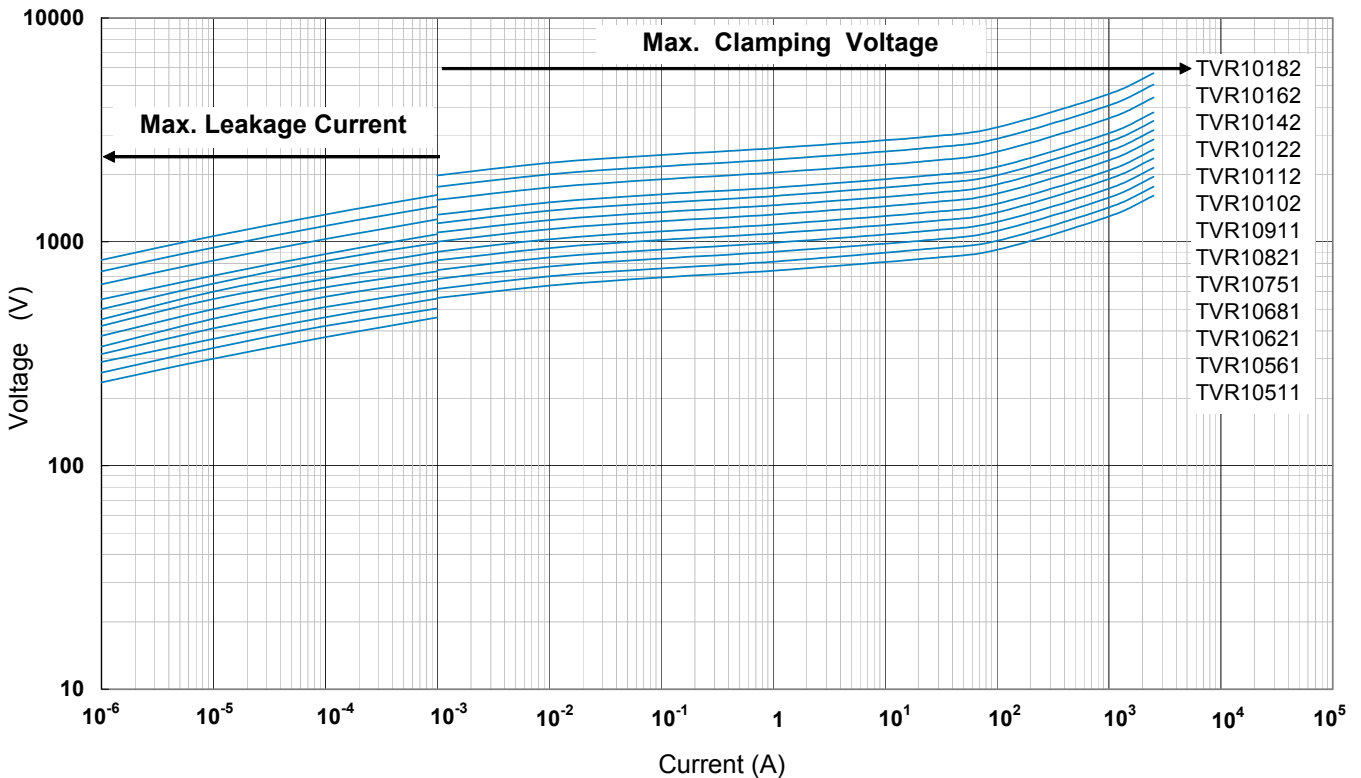


Disc Type Varistor for Surge protection

Max. Leakage Current and Max. Clamping Voltage Curves (TVR 10 820 to TVR10 471)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR 10 511 to TVR 10 182)

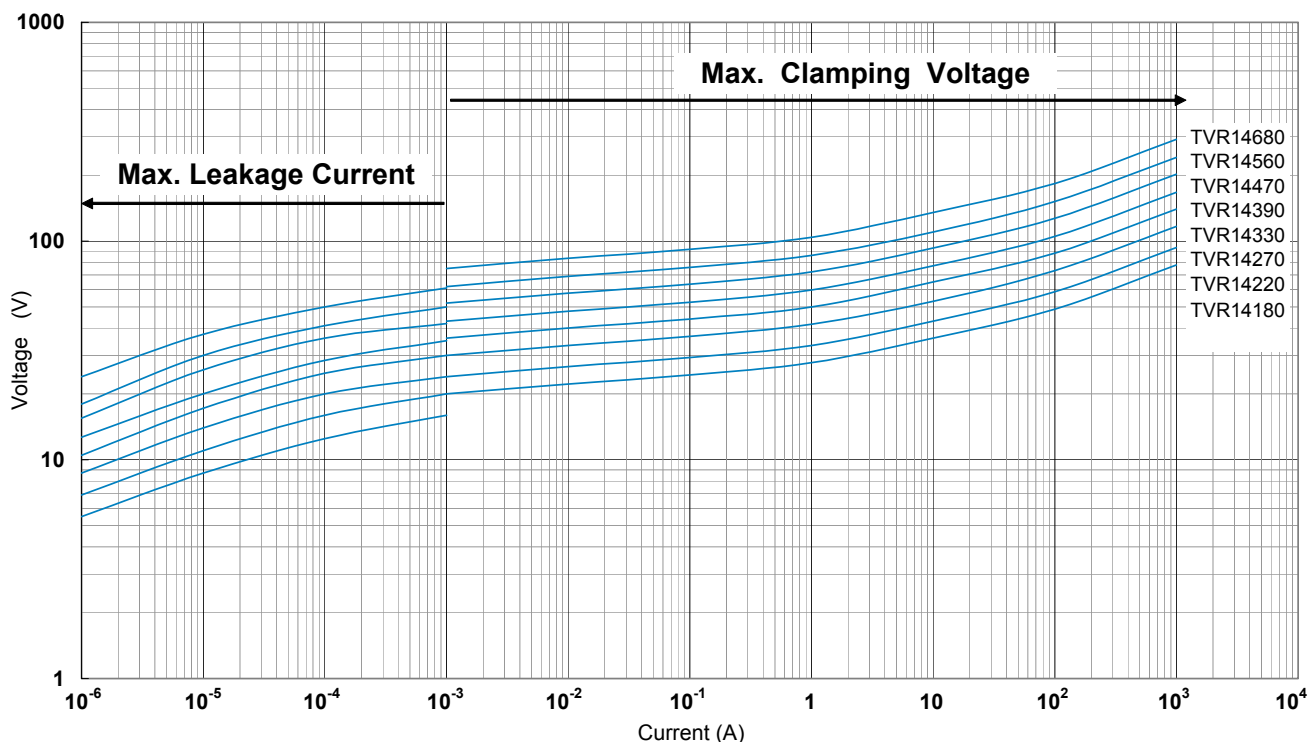


Metal Oxide Varistor : TVR Series

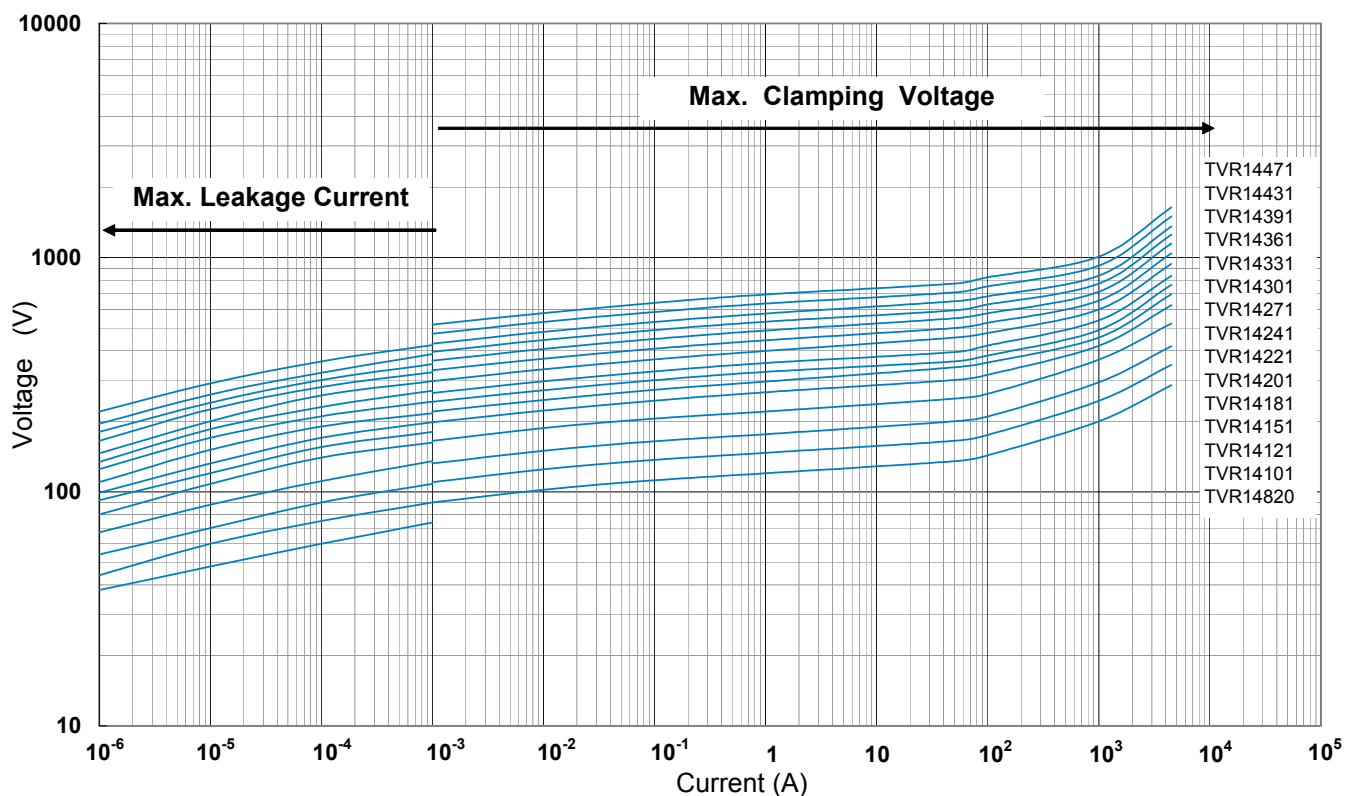
Disc Type Varistor for Surge protection



Max. Leakage Current and Max. Clamping Voltage Curves (TVR14 180 to TVR14 680)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR14 820 to TVR14 471)

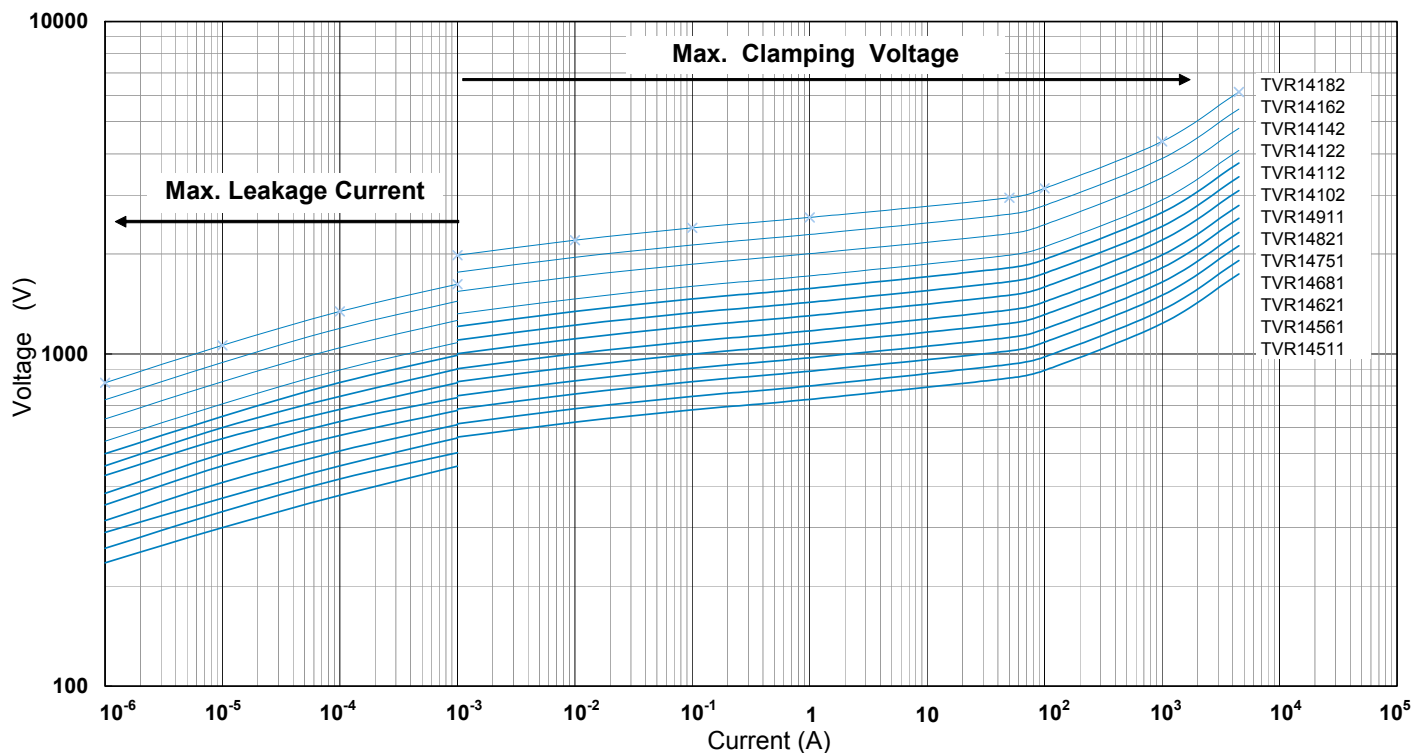


Metal Oxide Varistor : TVR Series

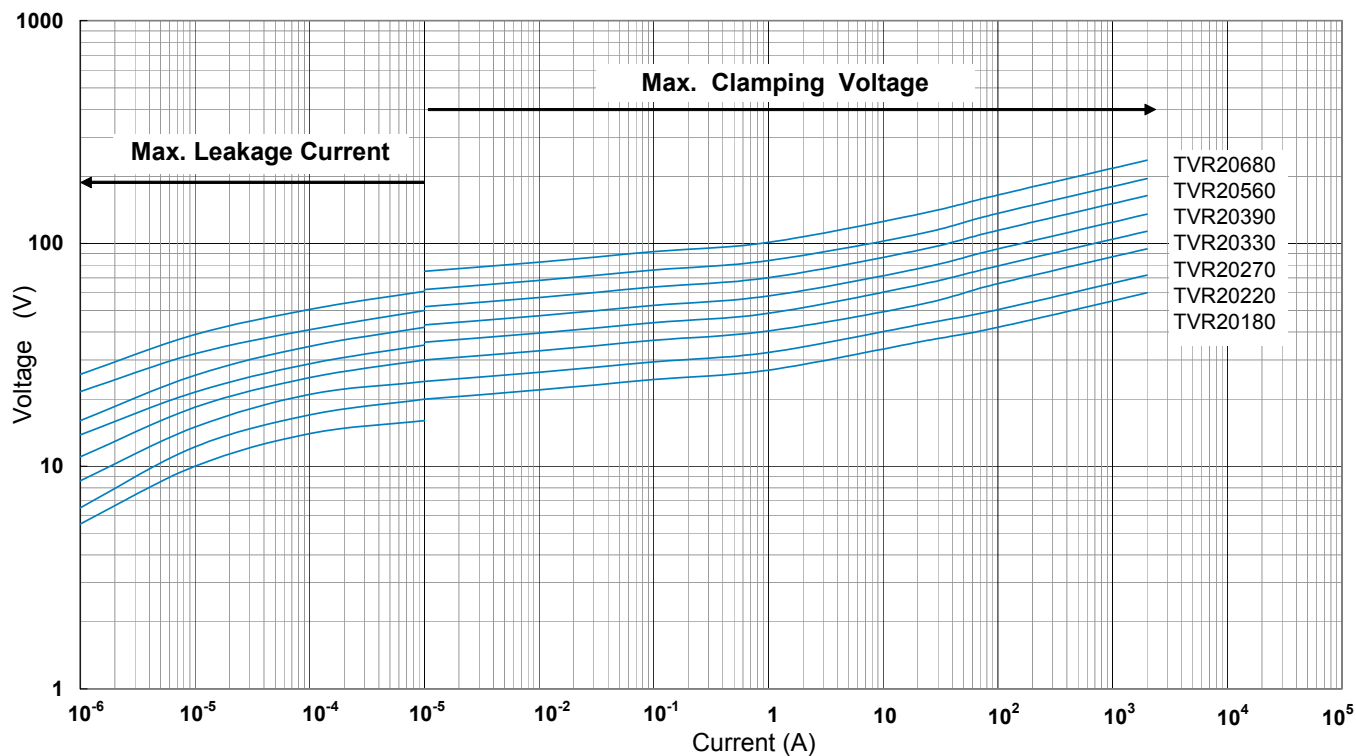


Disc Type Varistor for Surge protection

Max. Leakage Current and Max. Clamping Voltage Curves (TVR 14 511~ TVR 14 182)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR 20 180 to TVR 20 680)

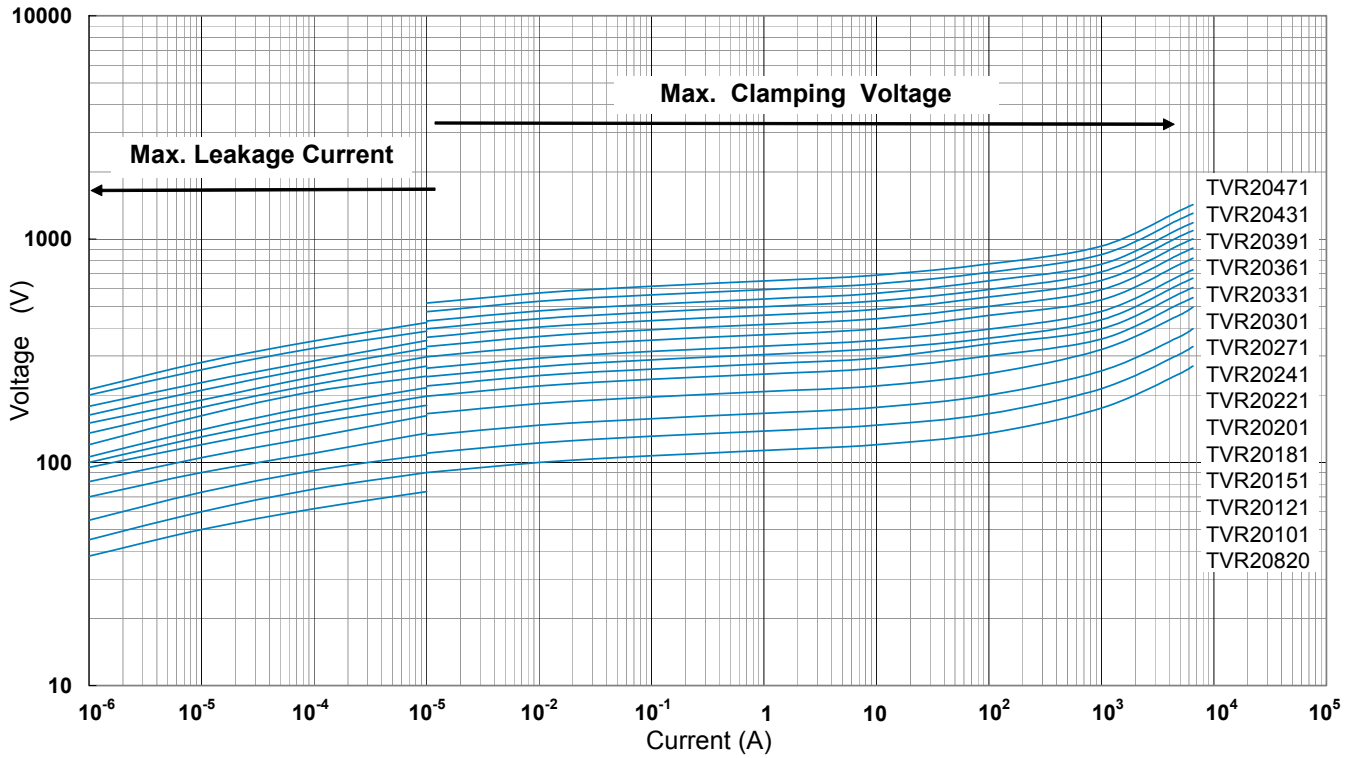


Metal Oxide Varistor : TVR Series

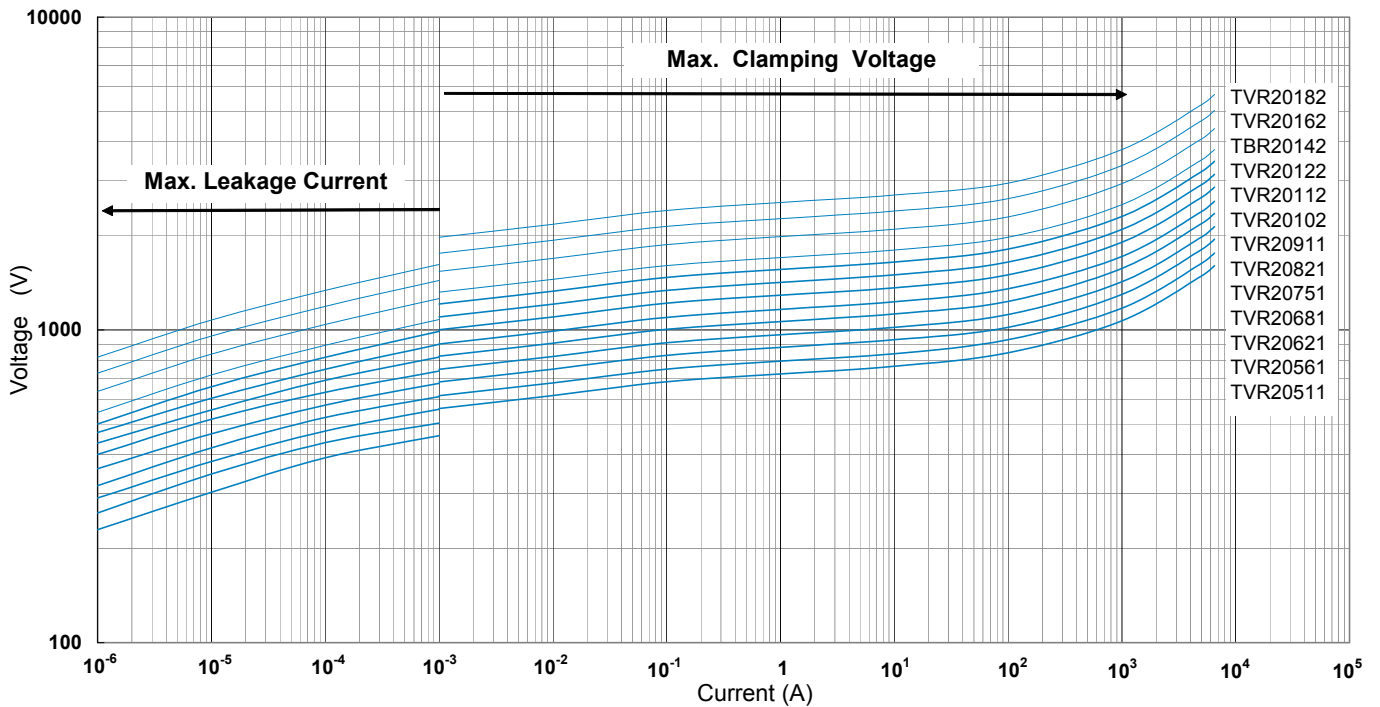


Disc Type Varistor for Surge protection

Max. Leakage Current and Max. Clamping Voltage Curves (TVR20 820 to TVR20 471)



Max. Leakage Current and Max. Clamping Voltage Curves (TVR20 511 to TVR20 182)



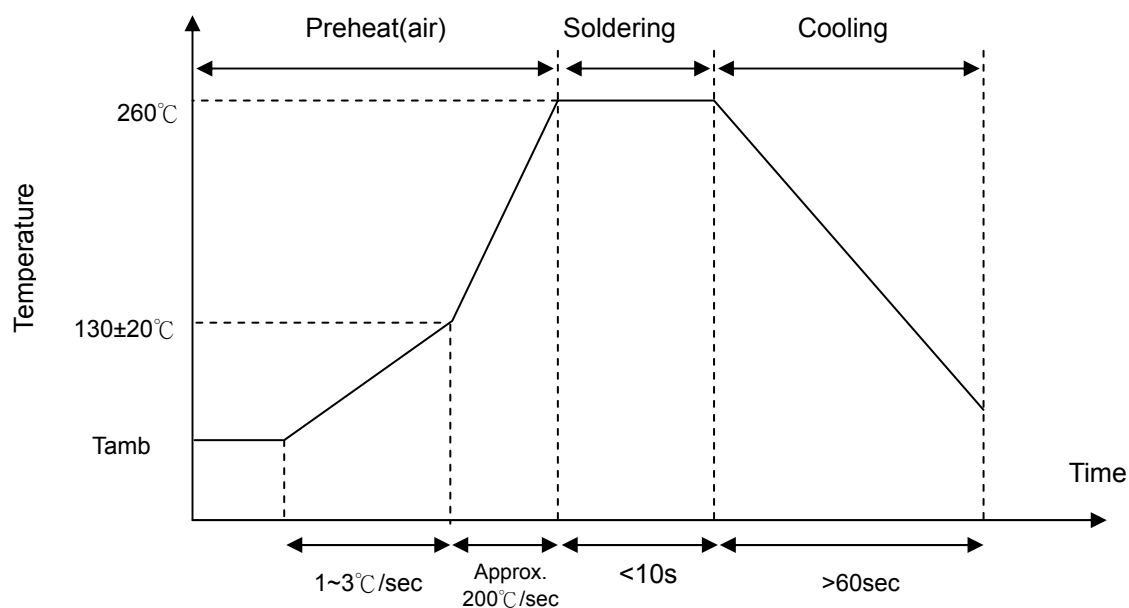
Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge protection

■ Soldering Recommendation

● Wave Flow Soldering Profile



● Recommended Reworking Conditions With Soldering Iron

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

Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge protection

■ Reliability Test

Item	Standard	Test Conditions / Methods	Specifications															
Tensile Strength of Terminations	IEC60068-2-21	<p>Gradually applying the force specified below to each terminal and keeping the unit fixed for 10±1 sec</p> <table border="1"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (Kg)</th> </tr> </thead> <tbody> <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> <tr> <td>1.25<d</td> <td>4.0</td> </tr> </tbody> </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	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 Terminations	IEC 60068-2-21	<p>Hanging the force specified below to each terminal and gradually bending each terminal by 90° in one direction, then 90° in the opposite direction, and again back to the origin.</p> <table border="1"> <thead> <tr> <th>Terminal diameter (mm)</th> <th>Force (Kg)</th> </tr> </thead> <tbody> <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> <tr> <td>1.25<d</td> <td>2.0</td> </tr> </tbody> </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	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 1051-14.16	<p>Frequency range: 10 ~ 55 Hz Amplitude: 0.75mm or 98 m/s² Duration: 6 HRS (3 x 2 HRS)</p>	No visible damage															
Solderability	IEC 60068-2-20	235±5°C , 2±0.5 sec	At least 95% of terminal electrode is covered by new solder															
Resistance to Soldering Heat	IEC 60068-2-20	260±5°C , 10±1 sec	ΔV/V _{1mA} ≤ 5 % No visible damage															
High Temperature Storage	IEC 60068-2-2	125±5°C x 1000± 24 hrs	ΔV/V _{1mA} ≤ 5 %															
Damp Heat Load	IEC 60068-2-3	40±2°C , 90 ~ 95 % RH 1000 ±24 HRS at V _{DC}	ΔV/V _{1mA} ≤ 5 %															
Thermal Shock	IEC 60068-2-14	<p>The thermal shock conditions shown below shall be repeated 5 cycles</p> <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	ΔV/V _{1mA} ≤ 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 Temperature Load	CECC42000	85±2°C , 1000±24 HRS at V _{DC} or V _{rms} (Max. Allowable Voltage)	ΔV/V _{1mA} ≤ 10 %															
Low Temperature Storage (Optional)	CECC42000	-40±5°C , 1000±24 HRS at V _{DC} or V _{rms} (Max. Allowable Voltage)	ΔV/V _{1mA} ≤ 5 %															
8/20μs Surge Life	CECC42000	8/20 μs waveform, 10000 surge currents, unipolar, interval 10 secs amplitude corr. to max. Surge current derating curves for 20 μs	ΔV/V _{1mA} ≤ 10 % No visible damage															
Varistor Voltage Temp. Coefficient	Specification Standard	$\frac{V_{1mA} \text{ at } 85^{\circ}\text{C} - V_{1mA} \text{ at } 25^{\circ}\text{C}}{V_{1mA} \text{ at } 25^{\circ}\text{C}} \times \frac{1}{60} \times 100 (\% / ^{\circ}\text{C})$	-0.05 ≤ T _C ≤ 0 (% / °C)															
Voltage Proof	CECC42000	Metal balls method, 2500 V _{ac} 1 min	No visible damage															

Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge protection

■ Packaging

● Taping Specification

S Type (Straight Lead)

Figure A

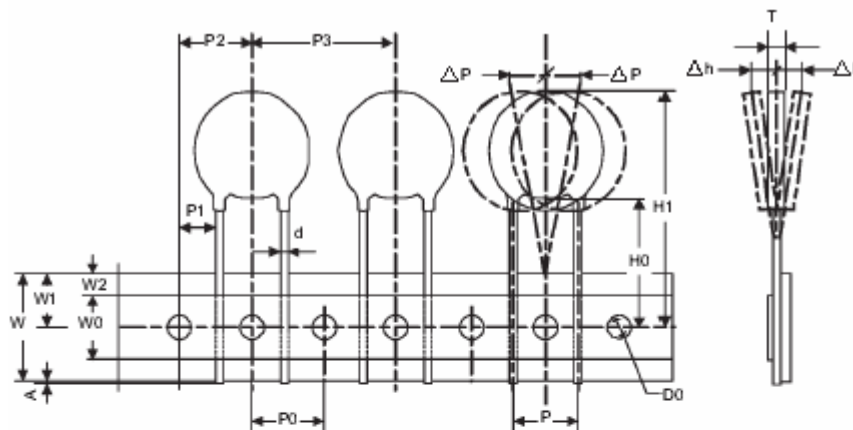
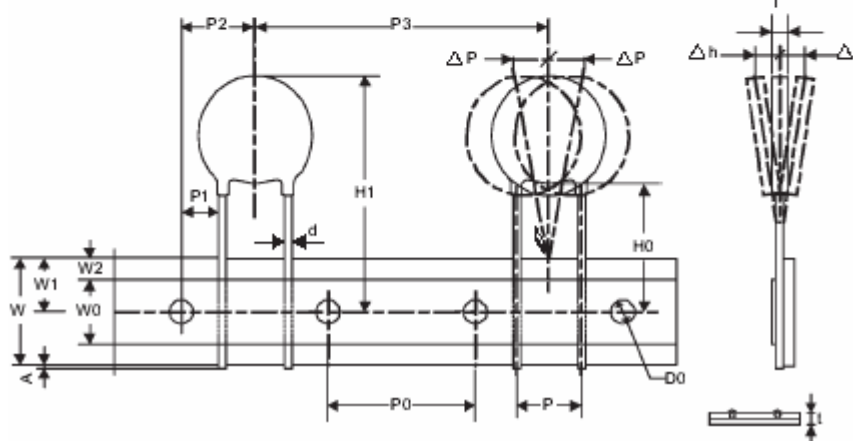


Figure B



(Unit: mm)

Taping Code	Disc Size	P ₀ ±0.3	P ±1	P ₁ ±1	P ₂ ±1.3	P ₃ ±1	H ₀ ±1	H ₁ Max.	d ±0.02	W ₀ ±1	W ₁ ±1	W ₂ Max.	W ±1	△P Max.	△h Max.	A Max.	D ₀ ±0.2	t ±0.2	Figure
A (P ₀ =12.7)	05	12.7	5	3.55	6.35	12.7	20	28	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	07	12.7	5	3.55	6.35	12.7	20	30	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	10	12.7	7.5	8.55	12.7	12.7	20	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	14	12.7	7.5	8.55	12.7	25.4	20	38	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	20	12.7	7.5	8.55	12.7	25.4	16	40.5	1.0	12	9	3	18	1	2	0.5	4	0.6	A
E (P ₀ =15.0)	05	15	5	4.7	7.5	15	20	28	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	07	15	5	4.7	7.5	15	20	30	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	10	15	7.5	3.35	7.5	15	20	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	14	15	7.5	3.35	7.5	30	20	38	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	20	15	7.5	3.35	7.5	30	16	40.5	1.0	12	9	3	18	1	2	0.5	4	0.6	B

Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge protection

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I Type (Inner Kink Lead)

Figure A

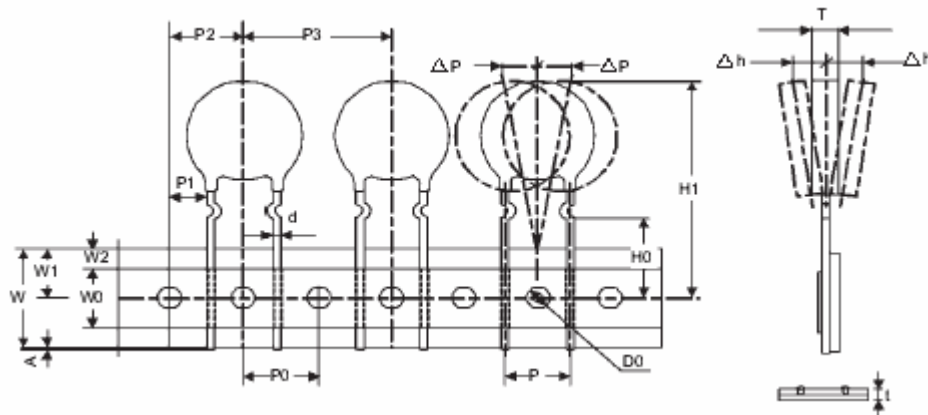
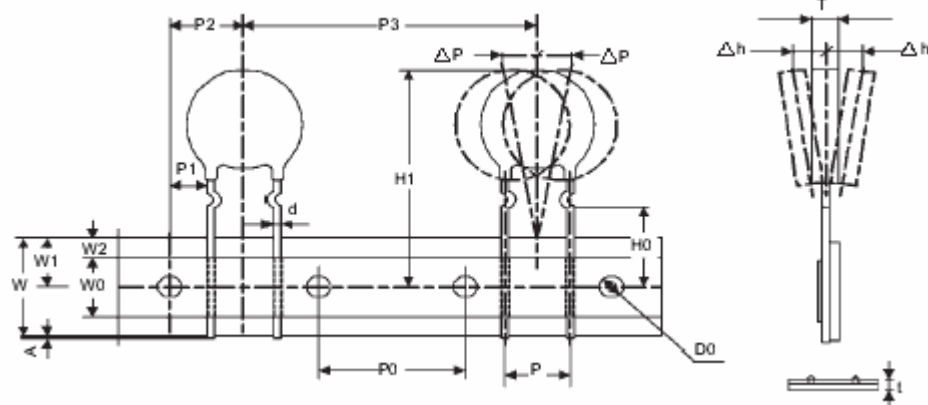


Figure B



(Unit: mm)

Taping Code	Disc Size	P ₀ ±0.3	P ±1	P ₁ ±1	P ₂ ±1.3	P ₃ ±1	H ₀ ±1	H ₁ Max.	d ±0.02	W ₀ ±1	W ₁ ±1	W ₂ Max.	W ±1	ΔP Max.	Δh Max.	A Max.	D ₀ ±0.2	t ±0.2	Figure
A (P ₀ =12.7)	05	12.7	5	3.55	6.35	12.7	16	28	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	07	12.7	5	3.55	6.35	12.7	16	30	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	10	12.7	7.5	8.55	12.7	12.7	16	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	14	12.7	7.5	8.55	12.7	25.4	16	38	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	20	12.7	7.5	8.55	12.7	25.4	16	40.5	1.0	12	9	3	18	1	2	0.5	4	0.6	A
E (P ₀ =15.0)	05	15	5	4.7	7.5	15	16	28	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	07	15	5	4.7	7.5	15	16	30	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	10	15	7.5	3.35	7.5	15	16	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	14	15	7.5	3.35	7.5	30	16	38	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	20	15	7.5	3.35	7.5	30	16	44.5	1.0	12	9	3	18	1	2	0.5	4	0.6	B

Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge protection

F Type (Y Kink Lead)

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Figure A

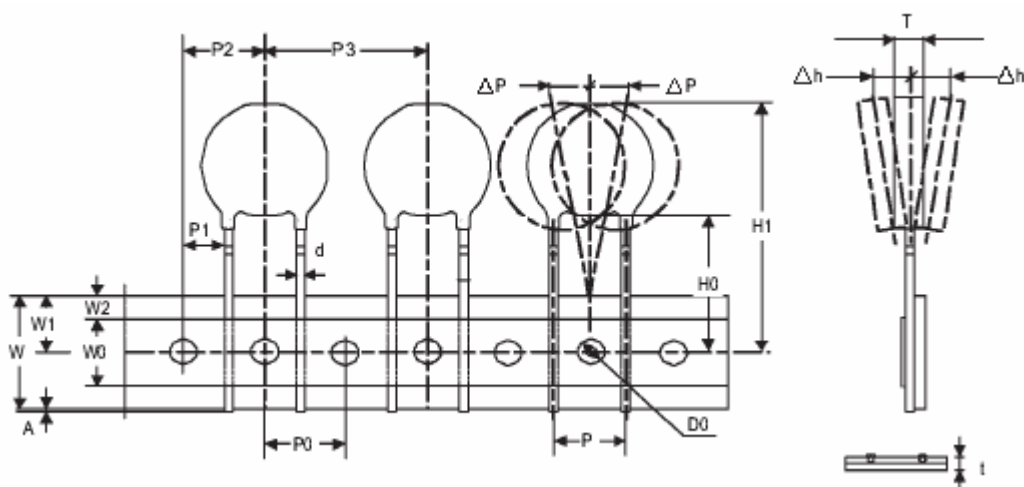
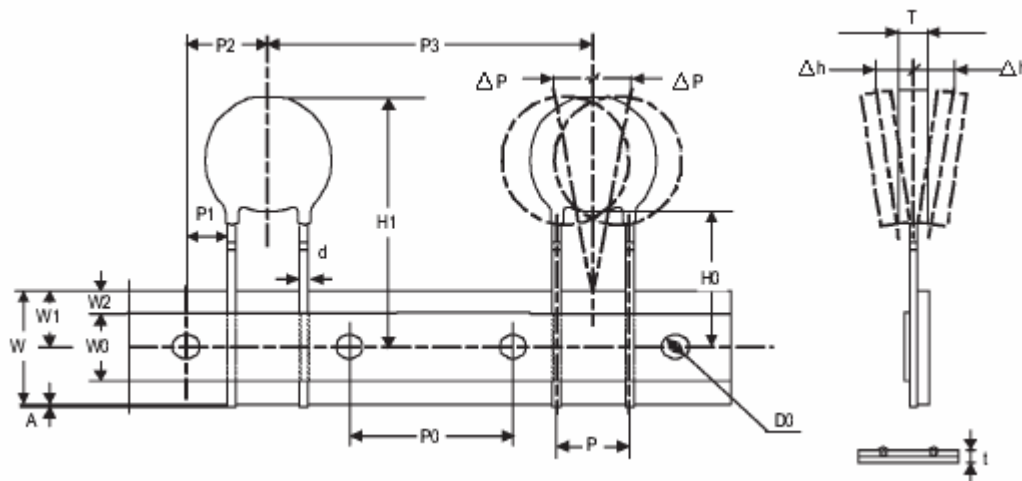


Figure B



(Unit: mm)

Taping Code	Disc Size	P ₀ ±0.3	P ±1	P ₁ ±1	P ₂ ±1.3	P ₃ ±1	H ₀ ±1	H ₁ Max.	d ±0.02	W ₀ ±1	W ₁ ±1	W ₂ Max.	W ±1	ΔP Max.	Δh Max.	A Max.	D ₀ ±0.2	t ±0.2	Figure
A (P ₀ =12.7)	05	12.7	5	3.55	6.35	12.7	20	28	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	07	12.7	5	3.55	6.35	12.7	20	30	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	10	12.7	7.5	8.55	12.7	12.7	20	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	14	12.7	7.5	8.55	12.7	25.4	20	38	0.8	12	9	3	18	1	2	0.5	4	0.6	A
	20	12.7	7.5	8.55	12.7	25.4	20	40.5	1.0	12	9	3	18	1	2	0.5	4	0.6	A
E (P ₀ =15.0)	05	15	5	4.7	7.5	15	20	28	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	07	15	5	4.7	7.5	15	20	30	0.6	12	9	3	18	1	2	0.5	4	0.6	B
	10	15	7.5	3.35	7.5	15	20	33.5	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	14	15	7.5	3.35	7.5	30	20	38	0.8	12	9	3	18	1	2	0.5	4	0.6	B
	20	15	7.5	3.35	7.5	30	20	40.5	1.0	12	9	3	18	1	2	0.5	4	0.6	B

Metal Oxide Varistor : TVR Series



Disc Type Varistor for Surge protection

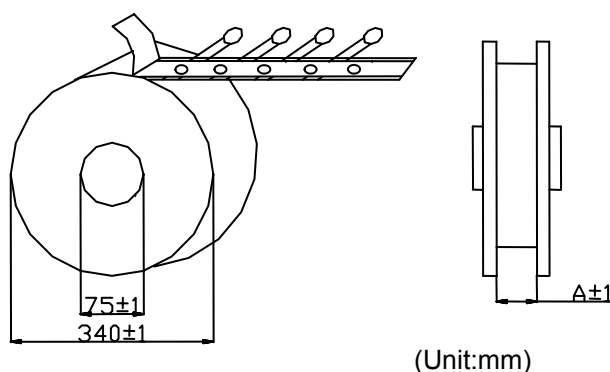
■ Quantity

● Bulk Packing

Disc Size/mm	Quantity PCS/ Bag
φ 05	200
φ 07	200
φ 10	200
φ 14	100
φ 20	50

● Reel Packing

Disc Size/mm	Quantity PCS/Reel
φ 05(180~391)	1500
φ 05(431~751)	1000
φ 07(180~391)	1500
φ 07(431~821)	1000
φ 10(180~911)	1000
φ 10(102~112)	750
φ 14(180~470)	1000
φ 14(560~391)	750
φ 14(431~112)	500
φ 20(301~561)	500
φ 20(621~112)	300

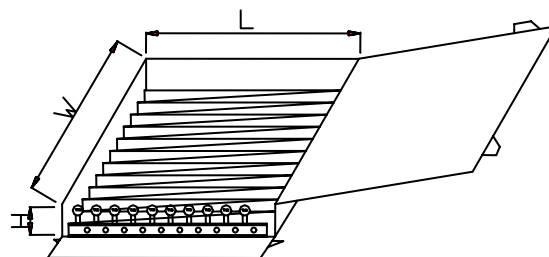


A	46	55
Disc Size	φ 05 ~ φ 14	φ 20

Note: The standard package for TVRXX122 to TVRXX182 is bulk. For any other demand, please contact sales.

● Ammo packing

Disc Size/mm	Quantity PCS/ Box
φ 05(180~391)	1000
φ 05(431~751)	1200
φ 07(180~821)	1000
φ 10(180~361)	750
φ 10(391~621)	500
φ 10(681~112)	400
φ 14(180~271)	500
φ 14(301~112)	250
φ 20(180~112)	250



Disc Size	W±5	L±5	H±5
φ07~φ14	348	275	50
	348	185	50
φ20	348	275	60
	348	185	60

Note: The standard package for TVRXX122 to TVRXX182 is bulk. For any other demand, please contact sales.

Metal Oxide Varistor : TVR Series

Disc Type Varistor for Surge protection



■ Storage condition

- Storage Conditions :
 1. Storage Temperature : $-10^{\circ}\text{C} \sim +40^{\circ}\text{C}$
 2. Relative humidity : $\leq 75\% \text{RH}$
 3. Varistor must be kept away from sunlight and stored in a non-corrosive atmosphere.
- Period of Storage : 1 year . If stored beyond 1 year, please check the solder ability before use.