

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: $-40^{\circ}\text{C} \sim +105^{\circ}\text{C}$
Storage temperature range: $-40^{\circ}\text{C} \sim +125^{\circ}\text{C}$
8. Agency recognition: UL 1449 4th /cUL/TUV/VDE/CQC



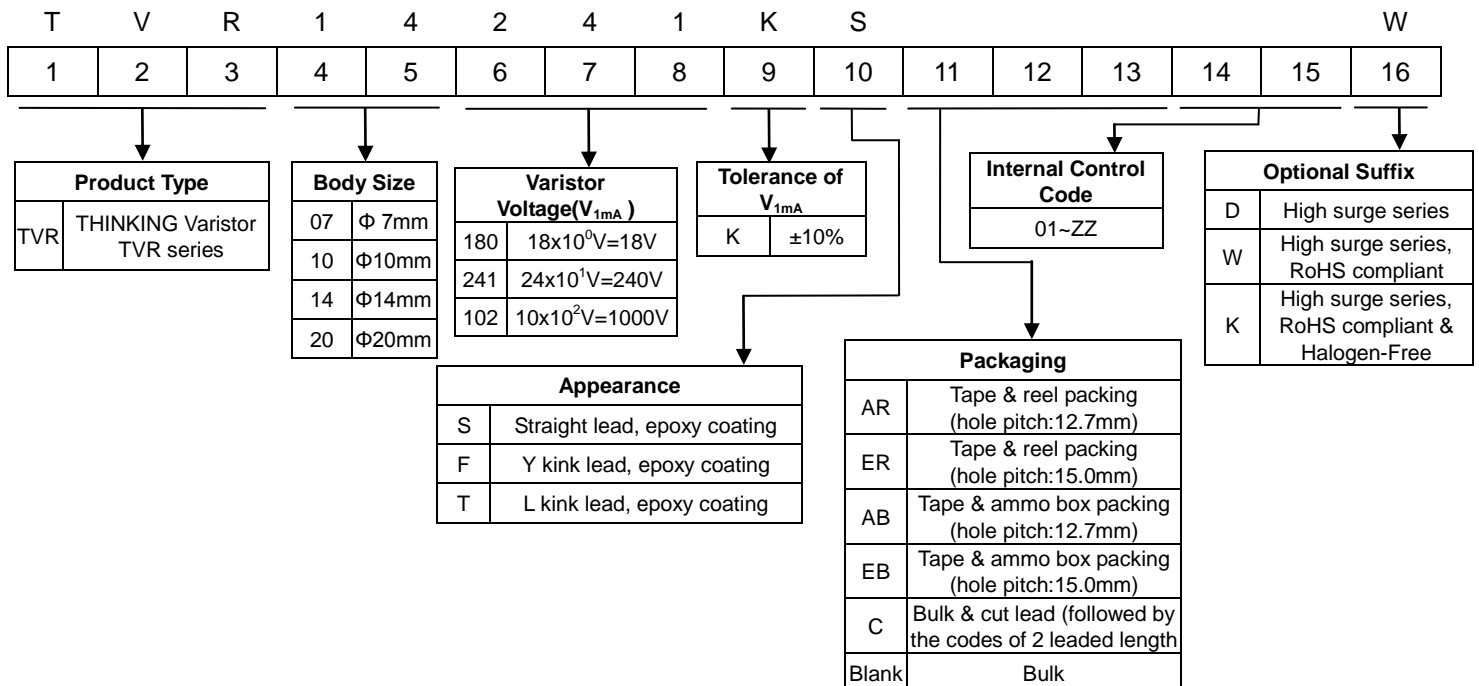
Note: * of the marking stands for TVR-D series

■ 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

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



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

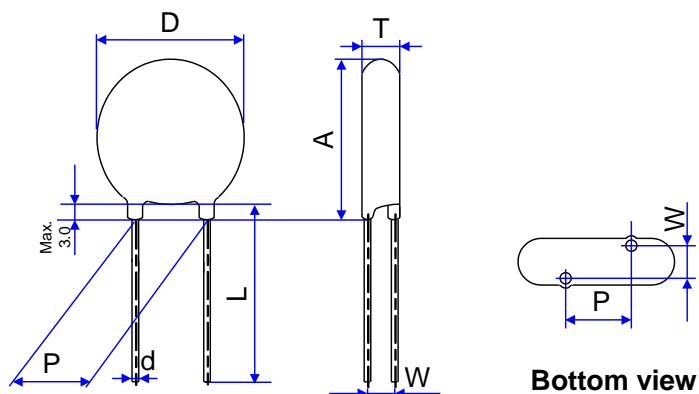
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Disc Type Varistor for Surge Protection (High Surge Series)

Structures and Dimensions

S Type (Straight lead)



(Unit: mm)

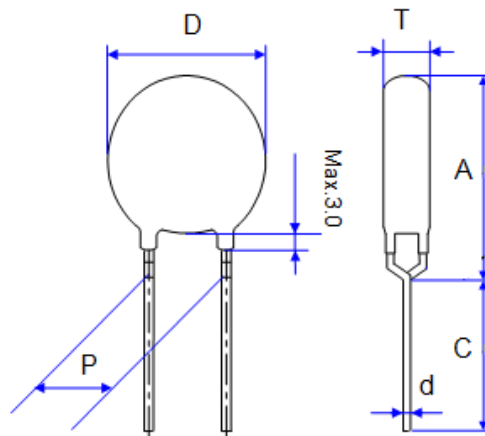
Series	D	Lmin.	d	P	Amax.	Tmax.	W
TVR07-D	7.5~9.5	26.5	0.6 ± 0.02	5.0 ± 0.5 (for TVR07181-561-D) 5.0 ± 1.0 (for TVR07621-821-D)	12.5	Please refer to Electrical Characteristics Table	
TVR10-D	12.0~14.0	26.5	0.8 ± 0.02	7.5 ± 0.5 (for TVR10181-561-D) 7.5 ± 1.0 (for TVR10621-182-D)	17.5		
TVR14-D	16.0~18.5	26.5	0.8 ± 0.02	7.5 ± 0.5 (for TVR14181-561-D) 7.5 ± 1.0 (for TVR14621-112-D)	21.5		
TVR20-D	22~24.5	22.5	1.0 ± 0.02	10 ± 1	28.5		

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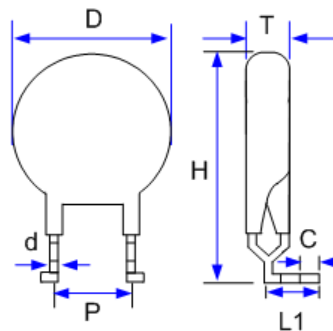
■ F Type (Y kink lead)



(Unit: mm)

Series	D	C _{min.}	d	P	A _{max.}	T _{max.}	W
TVR07-D	7.5~9.5	20	0.6±0.02	5.0±0.5 (for TVR07181-561-D) 5.0±1.0 (for TVR07621-821-D)	12.5	Please refer to Electrical Characteristics Table	
TVR10-D	12.0~14.0	20	0.8±0.02	7.5±0.5 (for TVR10181-561-D) 7.5±1.0 (for TVR10621-112-D)	18.0		
TVR14-D	16.0~18.5	20	0.8±0.02	7.5±0.5 (for TVR14181-561-D) 7.5±1.0 (for TVR14621-112-D)	22.0		
TVR20-D	22~24.5	20	1.0±0.02	10±1	29.0		

■ T Type (L kink lead)



(Unit: mm)

Series	D	C	d	P	A _{max.}	H _{max.}	T _{max.}
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)	Dimension		
		V _{1mA}	V _{AC(rms)}	V _{DC}	V _P	I _P	I _{max}	P	Wmax	Tmin	Tmax	W ±1.0
		(V)	(V)	(V)	(V)	(A)	(A)	(W)	(J)	(mm)		
TVR07181-D	TVR07181KSW	180 (162~198)	115	150	300	10	1800	0.25	19	2.0	3.9	1.4
TVR07201-D	TVR07201KSW	200 (180~220)	130	170	340	10	1800	0.25	21	2.1	4.0	1.5
TVR07221-D	TVR07221KSW	220 (198~242)	140	180	360	10	1800	0.25	23	2.1	4.0	1.5
TVR07241-D	TVR07241KSW	240 (216~264)	150	200	395	10	1800	0.25	25	2.3	4.2	1.6
TVR07271-D	TVR07271KSW	270 (243~297)	175	225	455	10	1800	0.25	28	2.4	4.4	1.7
TVR07301-D	TVR07301KSW	300 (270~330)	195	250	500	10	1800	0.25	32	2.7	4.4	1.9
TVR07331-D	TVR07331KSW	330 (297~363)	215	275	550	10	1800	0.25	34	2.8	4.5	2.0
TVR07361-D	TVR07361KSW	360 (324~396)	230	300	595	10	1800	0.25	37	2.9	4.6	2.1
TVR07391-D	TVR07391KSW	390 (351~429)	250	320	650	10	1800	0.25	40	3.1	4.8	2.3
TVR07431-D	TVR07431KSW	430 (387~473)	275	350	710	10	1800	0.25	46	3.0	5.1	2.3
TVR07471-D	TVR07471KSW	470 (423~517)	300	385	775	10	1800	0.25	49	3.2	5.2	2.4
TVR07511-D	TVR07511KSW	510 (459~561)	320	410	845	10	1800	0.25	54	3.4	5.4	2.6
TVR07561-D	TVR07561KSW	560 (504~616)	350	450	930	10	1800	0.25	55	3.6	5.5	2.8
TVR07621-D	TVR07621KSW	620 (558~682)	395	510	1020	10	1800	0.25	59	3.9	5.9	3.0
TVR07681-D	TVR07681KSW	680 (612~748)	420	560	1120	10	1800	0.25	62	4.1	6.2	3.2
TVR07751-D	TVR07751KSW	750 (675~825)	465	615	1235	10	1800	0.25	66	4.4	6.4	3.5
TVR07821-D	TVR07821KSW	820 (738~902)	510	670	1355	10	1800	0.25	71	4.5	6.4	3.2

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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)	Dimension		
		V _{1mA}	V _{AC(rms)}	V _{DC}	V _P	I _P	I _{max}	P	Wmax	Tmin	Tmax	W ± 1.0
		(V)	(V)	(V)	(V)	(A)	(A)	(W)	(J)	(mm)		
TVR10181-D	TVR10181KSW	180 (162~198)	115	150	300	25	4000	0.4	47	2.4	4.3	1.6
TVR10201-D	TVR10201KSW	200 (180~220)	130	170	340	25	4000	0.4	52	2.5	4.4	1.7
TVR10221-D	TVR10221KSW	220 (198~242)	140	180	360	25	4000	0.4	58	2.5	4.4	1.7
TVR10241-D	TVR10241KSW	240 (216~264)	150	200	395	25	4000	0.4	64	2.7	4.6	1.8
TVR10271-D	TVR10271KSW	270 (243~297)	175	225	455	25	4000	0.4	67	2.8	4.8	1.9
TVR10301-D	TVR10301KSW	300 (270~330)	195	250	500	25	4000	0.4	70	3.1	4.8	2.1
TVR10331-D	TVR10331KSW	330 (297~363)	215	275	550	25	4000	0.4	72	3.2	4.9	2.2
TVR10361-D	TVR10361KSW	360 (324~396)	230	300	595	25	4000	0.4	76	3.3	5.0	2.3
TVR10391-D	TVR10391KSW	390 (351~429)	250	320	650	25	4000	0.4	82	3.5	5.2	2.5
TVR10431-D	TVR10431KSW	430 (387~473)	275	350	710	25	4000	0.4	93	3.4	5.5	2.5
TVR10471-D	TVR10471KSW	470 (423~517)	300	385	775	25	4000	0.4	99	3.6	5.6	2.6
TVR10511-D	TVR10511KSW	510 (459~561)	320	410	845	25	4000	0.4	107	3.8	5.8	2.8
TVR10561-D	TVR10561KSW	560 (504~616)	350	450	930	25	4000	0.4	113	4.0	5.9	3.0
TVR10621-D	TVR10621KSW	620 (558~682)	395	510	1020	25	4000	0.4	125	4.3	6.3	3.2
TVR10681-D	TVR10681KSW	680 (612~748)	420	560	1120	25	4000	0.4	128	4.9	6.6	3.4
TVR10751-D	TVR10751KSW	750 (675~825)	465	615	1235	25	4000	0.4	134	4.9	6.8	3.7
TVR10821-D	TVR10821KSW	820 (738~902)	510	670	1355	25	4000	0.4	146	4.9	6.8	3.4
TVR10911-D	TVR10911KSW	910 (819~1001)	550	745	1500	25	4000	0.4	152	5.3	7.2	3.7
TVR10102-D	TVR10102KSW	1000(900~1100)	625	825	1650	25	4000	0.4	170	5.5	7.5	4.0
TVR10112-D	TVR10112KSW	1100(990~1210)	680	895	1815	25	4000	0.4	180	5.7	8.0	4.3

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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 (8/20µs)		Max. Surge Current (8/20µs)	Rated Power	Max. Energy (10/1000µs)	Dimension		
		V _{1mA}	V _{AC(rms)}	V _{DC}	V _P	I _P	I _{max}	P	W _{max}	T _{min}	T _{max}	W ±1.0	
		(V)	(V)	(V)	(V)	(A)	(A)	(W)	(J)	(mm)			
TVR14181-D	TVR14181KSW	180 (162~198)	115	150	300	50	8000	0.6	60	2.4	4.3	1.6	
TVR14201-D	TVR14201KSW	200 (180~220)	130	170	340	50	8000	0.6	82	2.5	4.4	1.7	
TVR14221-D	TVR14221KSW	220 (198~242)	140	180	360	50	8000	0.6	90	2.5	4.4	1.7	
TVR14241-D	TVR14241KSW	240 (216~264)	150	200	395	50	8000	0.6	98	2.7	4.6	1.8	
TVR14271-D	TVR14271KSW	270 (243~297)	175	225	455	50	8000	0.6	116	2.8	4.8	1.9	
TVR14301-D	TVR14301KSW	300 (270~330)	195	250	500	50	8000	0.6	128	3.1	4.8	2.1	
TVR14331-D	TVR14331KSW	330 (297~363)	215	275	550	50	8000	0.6	140	3.2	4.9	2.2	
TVR14361-D	TVR14361KSW	360 (324~396)	230	300	595	50	8000	0.6	158	3.3	5.0	2.3	
TVR14391-D	TVR14391KSW	390 (351~429)	250	320	650	50	8000	0.6	170	3.5	5.2	2.5	
TVR14431-D	TVR14431KSW	430 (387~473)	275	350	710	50	8000	0.6	185	3.4	5.5	2.5	
TVR14471-D	TVR14471KSW	470 (423~517)	300	385	775	50	8000	0.6	205	3.6	5.6	2.6	
TVR14511-D	TVR14511KSW	510 (459~561)	320	410	845	50	8000	0.6	220	3.8	5.8	2.8	
TVR14561-D	TVR14561KSW	560 (504~616)	350	450	930	50	8000	0.6	240	4.0	5.9	3.0	
TVR14621-D	TVR14621KSW	620 (558~682)	395	510	1020	50	8000	0.6	250	4.3	6.3	3.2	
TVR14681-D	TVR14681KSW	680 (612~748)	420	560	1120	50	8000	0.6	260	4.5	6.6	3.4	
TVR14751-D	TVR14751KSW	750 (675~825)	465	615	1235	50	8000	0.6	270	4.8	6.8	3.7	
TVR14821-D	TVR14821KSW	820 (738~902)	510	670	1355	50	8000	0.6	280	4.9	6.8	3.4	
TVR14911-D	TVR14911KSW	910 (819~1001)	550	745	1500	50	8000	0.6	295	5.3	7.2	3.7	
TVR14102-D	TVR14102KSW	1000(900~1100)	625	825	1650	50	8000	0.6	335	5.7	7.5	4.0	
TVR14112-D	TVR14112KSW	1100(990~1210)	680	895	1815	50	8000	0.6	360	5.8	8.0	4.3	

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20-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)	Dimension		
		V_{1mA}	$V_{AC(rms)}$	V_{DC}	V_P	I_P	I_{max}	P	Wmax	Tmin	Tmax	W ± 1.0
		(V)	(V)	(V)	(V)	(A)	(A)	(W)	(J)	(mm)		
TVR20181-D	TVR20181KSW	180 (162~198)	115	150	300	100	13000	1.0	152	2.8	4.7	1.8
TVR20201-D	TVR20201KSW	200 (180~220)	130	170	340	100	13000	1.0	175	2.9	4.8	1.9
TVR20221-D	TVR20221KSW	220 (198~242)	140	180	360	100	13000	1.0	185	2.9	4.8	1.9
TVR20241-D	TVR20241KSW	240 (216~264)	150	200	395	100	13000	1.0	198	3.1	5.0	2.0
TVR20271-D	TVR20271KSW	270 (243~297)	175	225	455	100	13000	1.0	220	3.2	5.2	2.1
TVR20301-D	TVR20301KSW	300 (270~330)	195	250	500	100	13000	1.0	245	3.5	5.2	2.3
TVR20331-D	TVR20331KSW	330 (297~363)	215	275	550	100	13000	1.0	268	3.6	5.3	2.4
TVR20361-D	TVR20361KSW	360 (324~396)	230	300	595	100	13000	1.0	315	3.7	5.4	2.5
TVR20391-D	TVR20391KSW	390 (351~429)	250	320	650	100	13000	1.0	350	3.9	5.6	2.7
TVR20431-D	TVR20431KSW	430 (387~473)	275	350	710	100	13000	1.0	380	3.8	5.9	2.7
TVR20471-D	TVR20471KSW	470 (423~517)	300	385	775	100	13000	1.0	405	4.0	6.0	2.8
TVR20511-D	TVR20511KSW	510 (459~561)	320	410	845	100	13000	1.0	445	4.2	6.2	3.0
TVR20561-D	TVR20561KSW	560 (504~616)	350	450	930	100	13000	1.0	475	4.4	6.3	3.2
TVR20621-D	TVR20621KSW	620 (558~682)	395	510	1020	100	13000	1.0	490	4.7	6.7	3.4
TVR20681-D	TVR20681KSW	680 (612~748)	420	560	1120	100	13000	1.0	500	4.9	7.0	3.6
TVR20751-D	TVR20751KSW	750 (675~825)	465	615	1235	100	13000	1.0	525	5.2	7.2	3.9
TVR20821-D	TVR20821KSW	820 (738~902)	510	670	1355	100	13000	1.0	545	5.3	7.2	3.6
TVR20911-D	TVR20911KSW	910 (819~1001)	550	745	1500	100	13000	1.0	595	5.7	7.6	3.9
TVR20102-D	TVR20102KSW	1000(900~1100)	625	825	1650	100	13000	1.0	650	6.1	7.9	4.2
TVR20112-D	TVR20112KSW	1100(990~1210)	680	895	1815	100	13000	1.0	720	6.2	8.4	4.5

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■ Safety Approvals

Certified Model No.	Agency			
				
	UL1449 4 th & cUL	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	IEC 61051-1 IEC 61051-2 IEC 61051-2-2	GB/T10193-1997 GB/T10194-1997
	E314979	J50411760	40021243	CQC10001041751 CQC10001041750
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	√	√	√	√

Note:

1. UL/cUL/TUV/CQC certification: Operating Temperature is 105°C
VDE certification: Operating Temperature is 85°C; 105°C rating is under application.

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Certified Model No.	Agency						
	UL1449 4 th & cUL	EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2	IEC/EN 60950-1 Annex Q, IEC/EN 62368-1 Annex G.8.2	EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2	IEC 62368-1 Annex G.8.2	GB/T10193-1997, GB/T10194-1997	GB8898-2011, GB4943.1-2011
	E314979	J50411760		40021243		Current No: CQC10001041751 CQC10001041750 New No: (Refer to Note) CQC18001199808 CQC18001198323	
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	√	√	√	√	√	√	√

Note:

1. For CQC certification, its current and New numbers are both effective. However, its current number will be canceled on 2019/12/31, and only its NEW number will be available from 2020/01/01. Please use NEW number as your first priority.
2. UL/cUL/TUV/CQC certification: Operating Temperature is 105°C
VDE certification: Operating Temperature is 85°C; 105°C rating is under application.

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Certified Model No.	Agency						
	UL1449 4 th & cUL	EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2	IEC/EN 60950-1 Annex Q, IEC/EN 62368-1 Annex G.8.2	EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2	IEC 62368-1 Annex G.8.2	GB/T10193-1997, GB/T10194-1997	GB8898-2011, GB4943.1-2011
	E314979	J50411760		40021243		Current No: CQC10001041751 CQC10001041750 New No: (Refer to Note) CQC18001199809 CQC18001199002	
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	√	√	√	√	√	√	√

Note:

1. For CQC certification, its current and New numbers are both effective. However, its current number will be canceled on 2019/12/31, and only its NEW number will be available from 2020/01/01. Please use NEW number as your first priority.
2. UL/cUL/TUV/CQC certification: Operating Temperature is 105°C
VDE certification: Operating Temperature is 85°C; 105°C rating is under application.

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

Certified Model No.	Agency						
	UL1449 4 th & cUL	EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2	IEC/EN 60950-1 Annex Q, IEC/EN 62368-1 Annex G.8.2	EN/IEC 61051-1, IEC 61051-2, IEC 61051-2-2	IEC 62368-1 Annex G.8.2	GB/T10193-1997, GB/T10194-1997	GB8898-2011, GB4943.1-2011
E314979	J50411760	40021243		Current No: CQC10001041751 CQC10001041750 New No: (Refer to Note) CQC18001199810 CQC18001199791			
TVR20181-D	√	√		√	√	√	
TVR20201-D	√	√	√	√	√	√	√
TVR20221-D	√	√	√	√	√	√	√
TVR20241-D	√	√	√	√	√	√	√
TVR20271-D	√	√	√	√	√	√	√
TVR20301-D	√	√	√	√	√	√	√
TVR20331-D	√	√	√	√	√	√	√
TVR20361-D	√	√	√	√	√	√	√
TVR20391-D	√	√	√	√	√	√	√
TVR20431-D	√	√	√	√	√	√	√
TVR20471-D	√	√	√	√	√	√	√
TVR20511-D	√	√	√	√	√	√	√
TVR20561-D	√	√	√	√	√	√	√
TVR20621-D	√	√	√	√	√	√	√
TVR20681-D	√	√	√	√	√	√	√
TVR20751-D	√	√	√	√	√	√	√
TVR20821-D	√	√	√	√	√	√	√
TVR20911-D	√	√	√	√	√	√	√
TVR20102-D	√	√	√	√	√	√	√
TVR20112-D	√	√	√	√	√	√	√

Note:

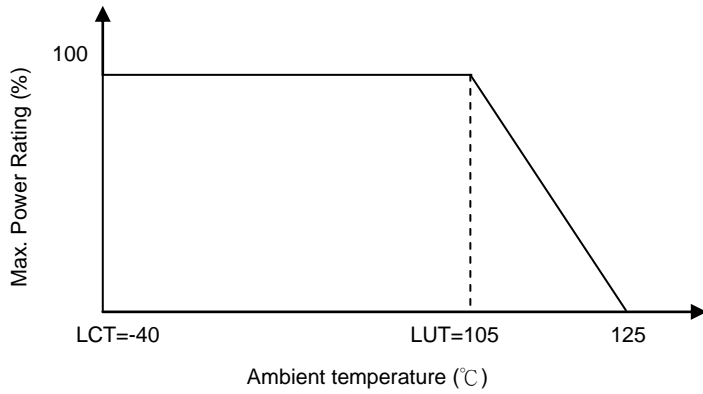
1. For CQC certification, its current and New numbers are both effective. However, its current number will be canceled on 2019/12/31, and only its NEW number will be available from 2020/01/01. Please use NEW number as your first priority.
2. UL/cUL/TUV/CQC certification: Operating Temperature is 105°C
VDE certification: Operating Temperature is 85°C; 105°C rating is under application.

Metal Oxide Varistor : TVR-D Series

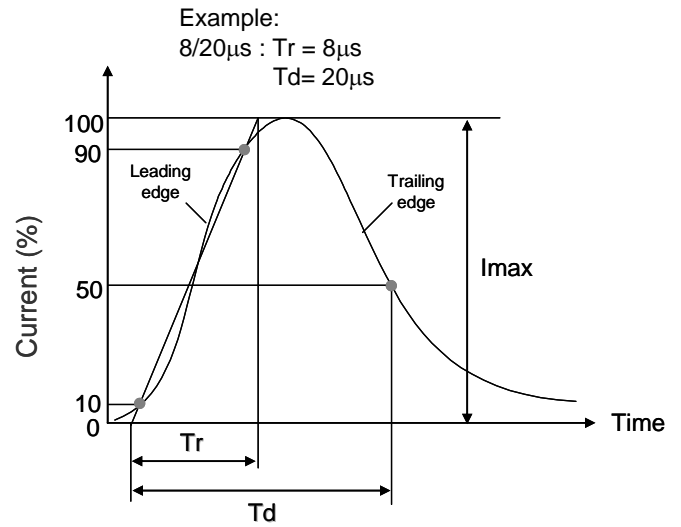


Disc Type Varistor for Surge Protection (High Surge Series)

Power Derating Curve

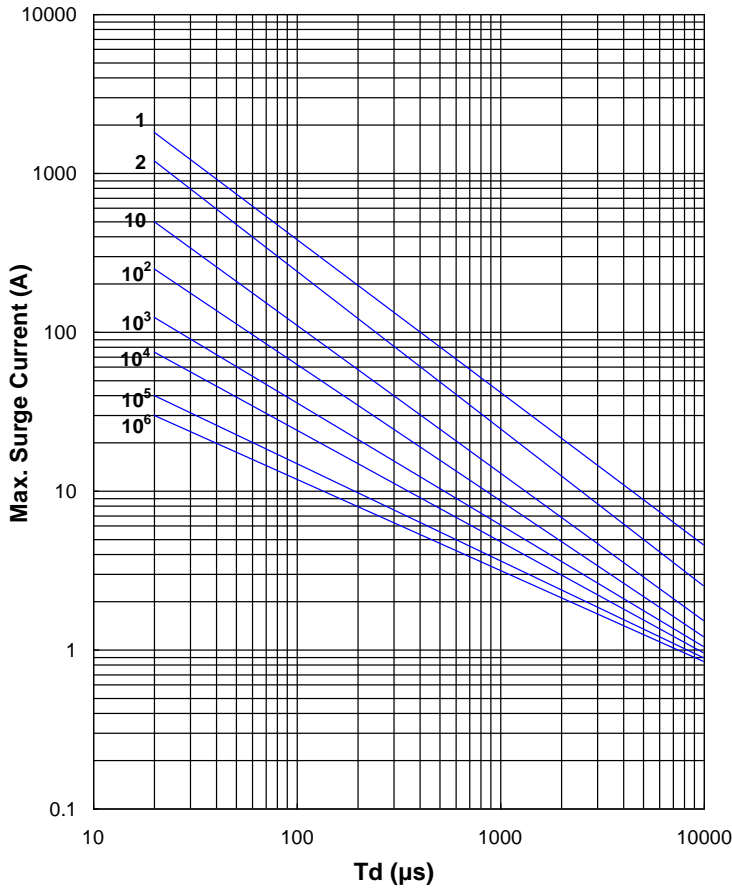


Surge Current Standard Waveform

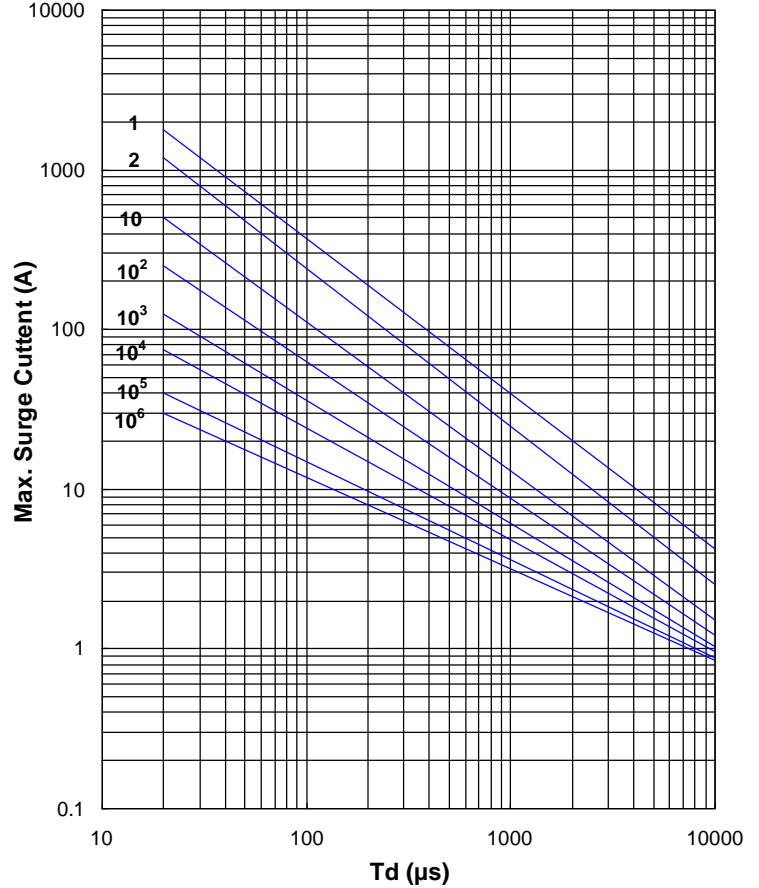


Max. Surge Current Derating Curves

TVR07181-D to TVR07471-D



TVR07511-D to TVR07821-D



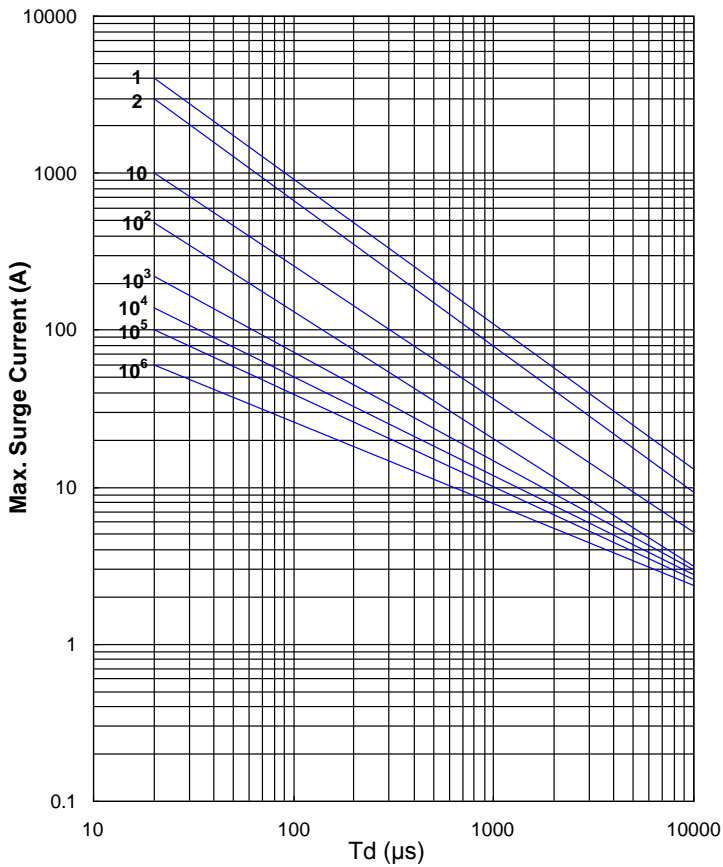
Metal Oxide Varistor : TVR-D Series



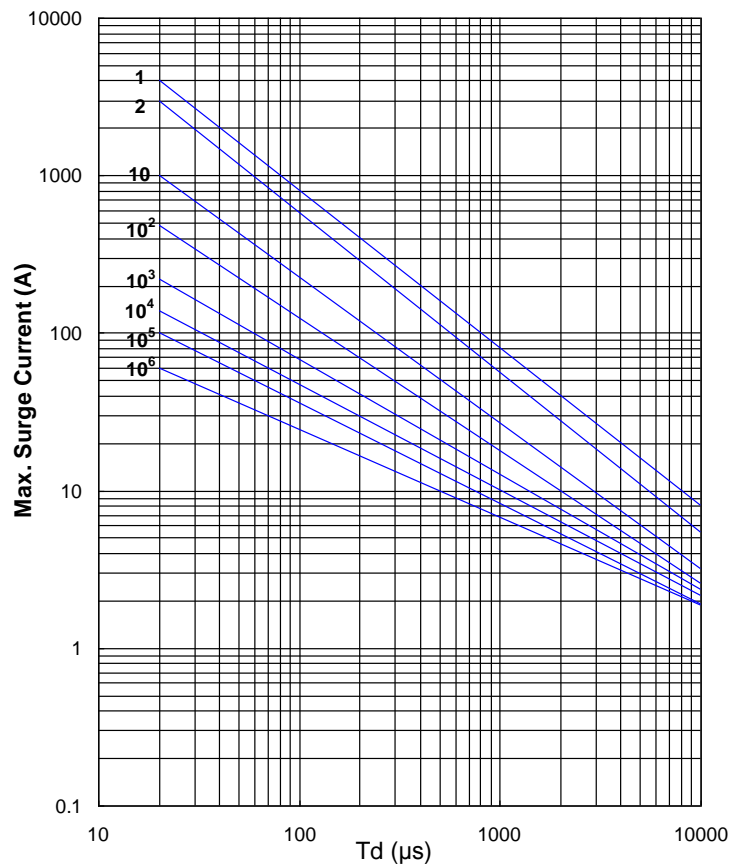
Disc Type Varistor for Surge Protection (High Surge Series)

■ Max. Surge Current Derating Curves

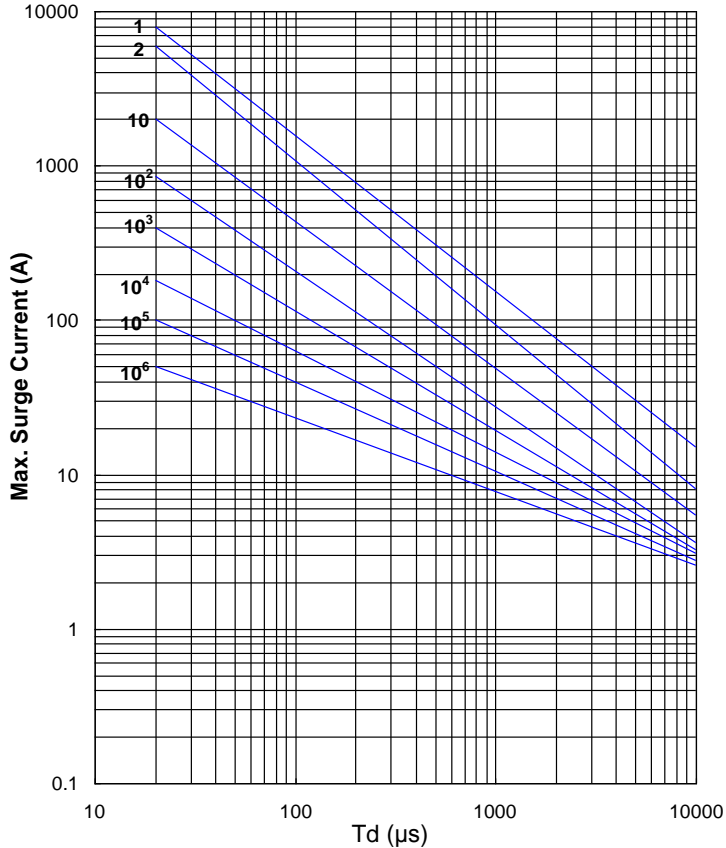
TVR10181-D to TVR10751-D



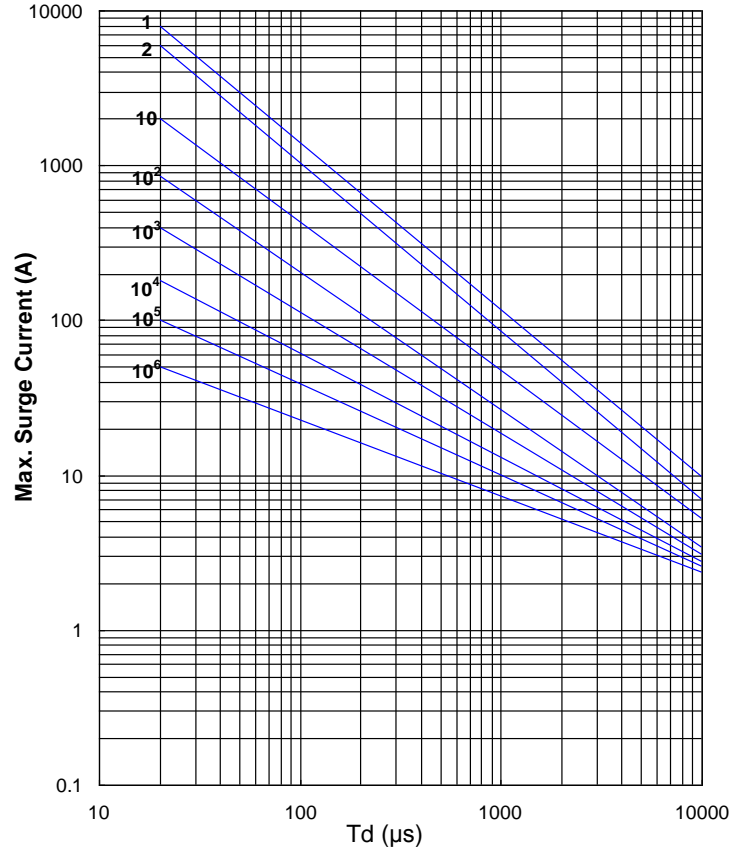
TVR10821-D to TVR10112-D



TVR14181-D to TVR14751-D



TVR14821-D to TVR14112-D



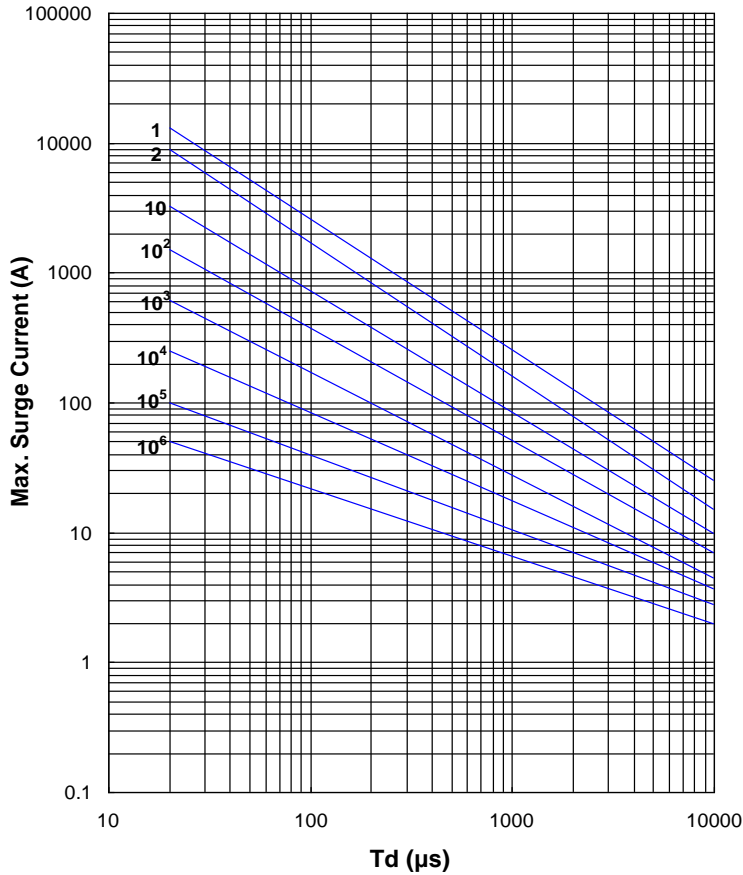
Metal Oxide Varistor : TVR-D Series



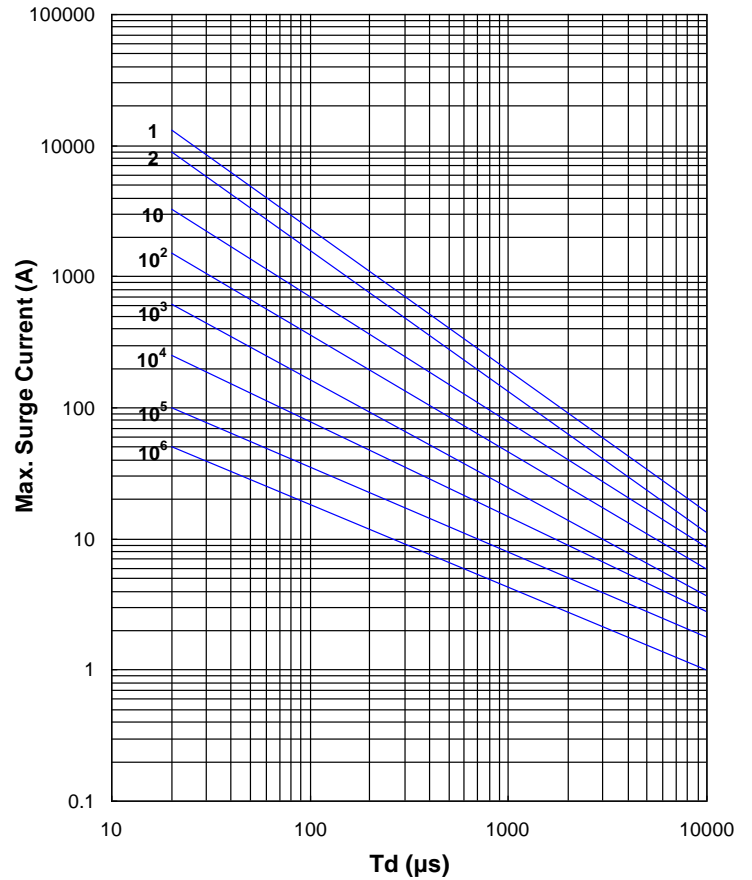
Disc Type Varistor for Surge Protection (High Surge Series)

Max. Surge Current Derating Curves

TVR20181-D to TVR20751-D

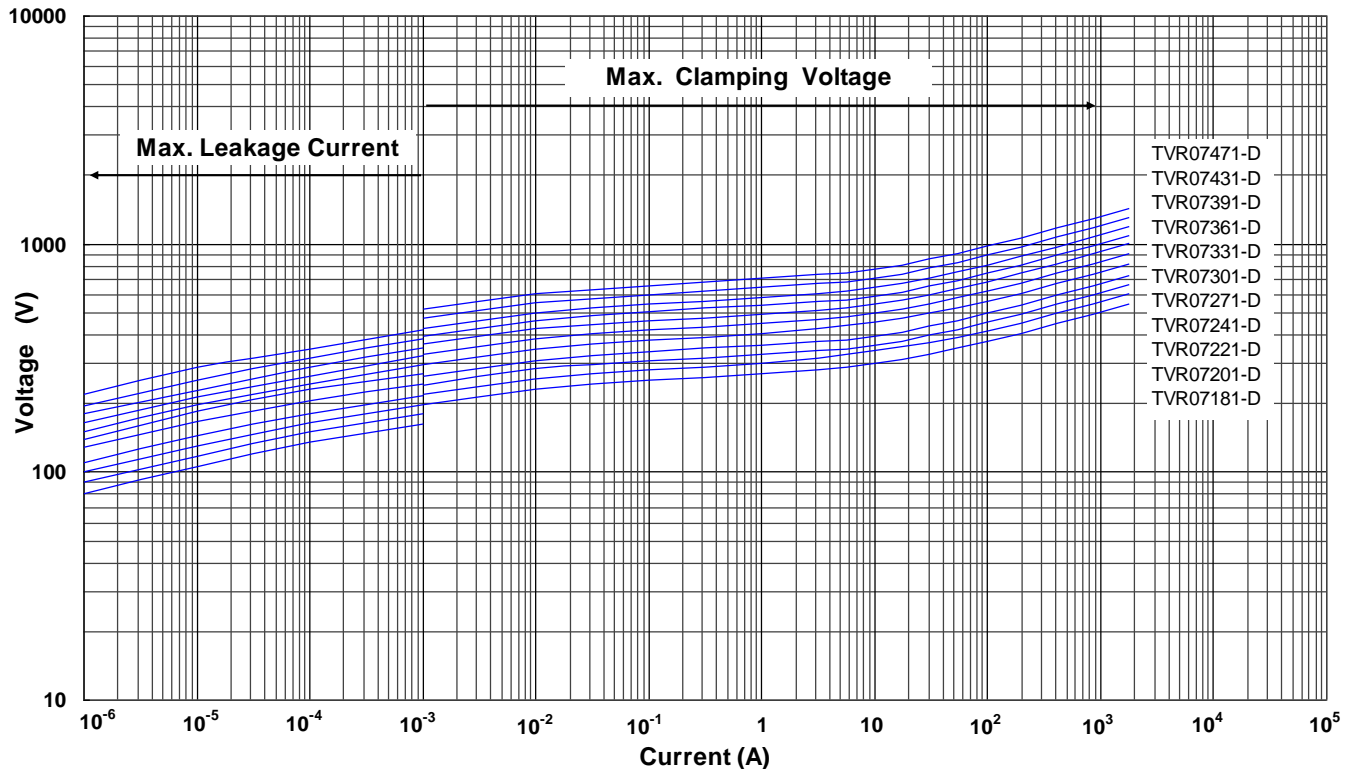


TVR20821-D to TVR20112-D



Max. Leakage Current and Max. Clamping Voltage Curves

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



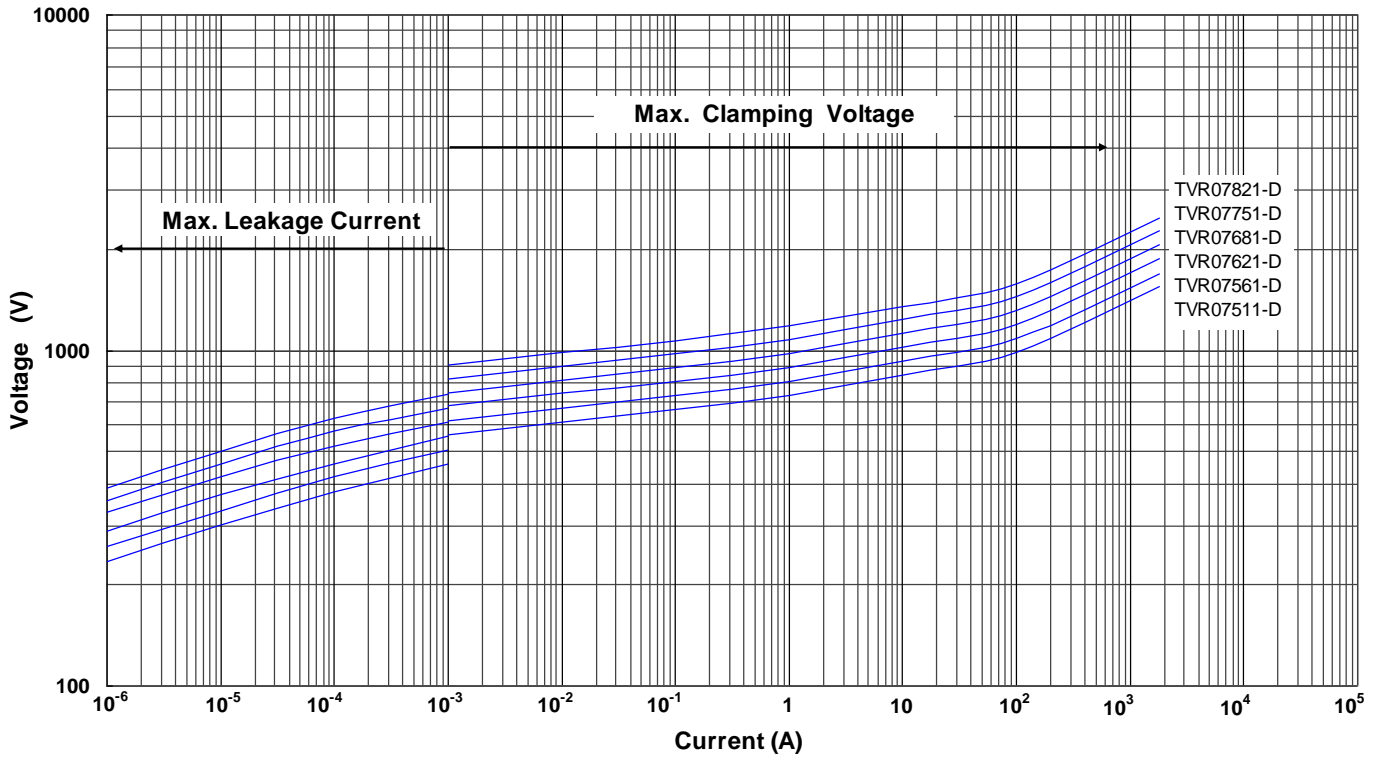
Metal Oxide Varistor : TVR-D Series



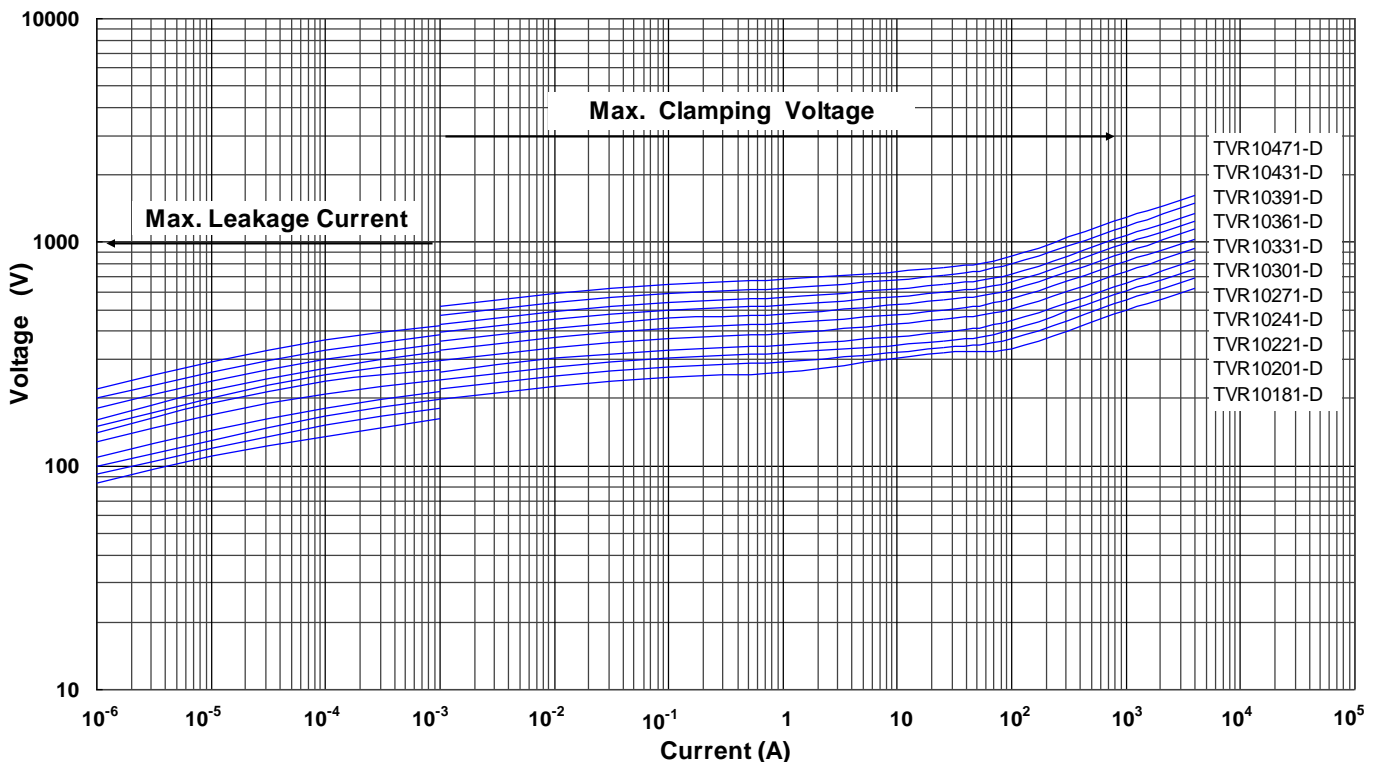
Disc Type Varistor for Surge Protection (High Surge Series)

■ 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)



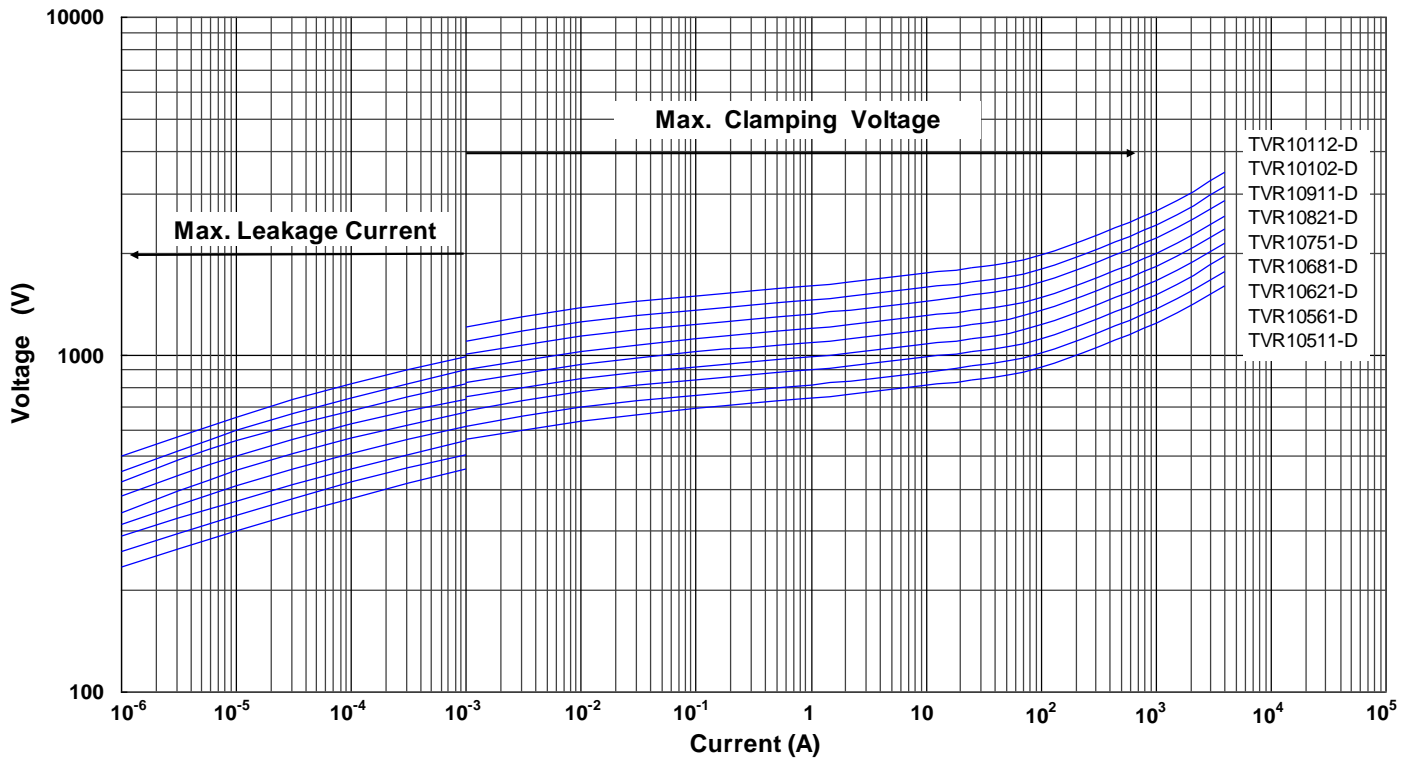
Metal Oxide Varistor : TVR-D Series



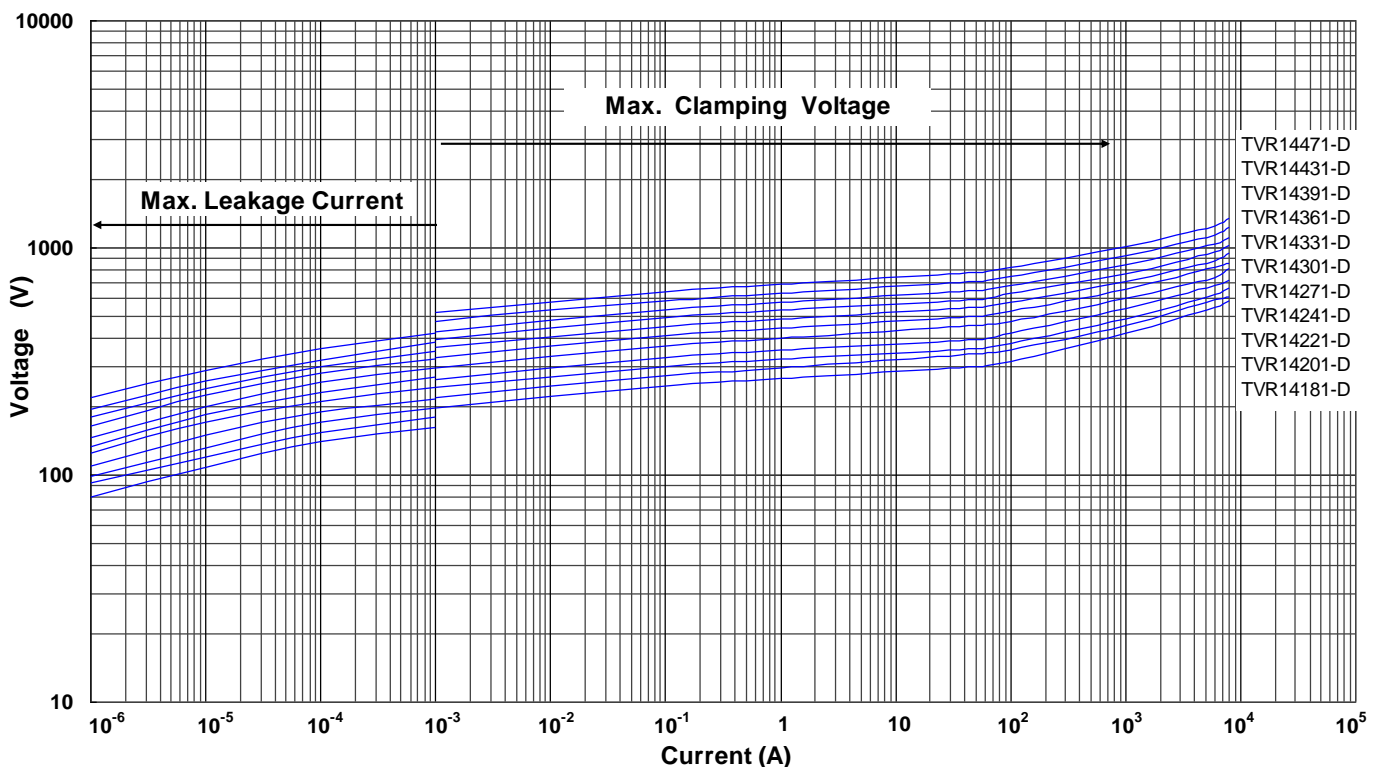
Disc Type Varistor for Surge Protection (High Surge Series)

■ 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)



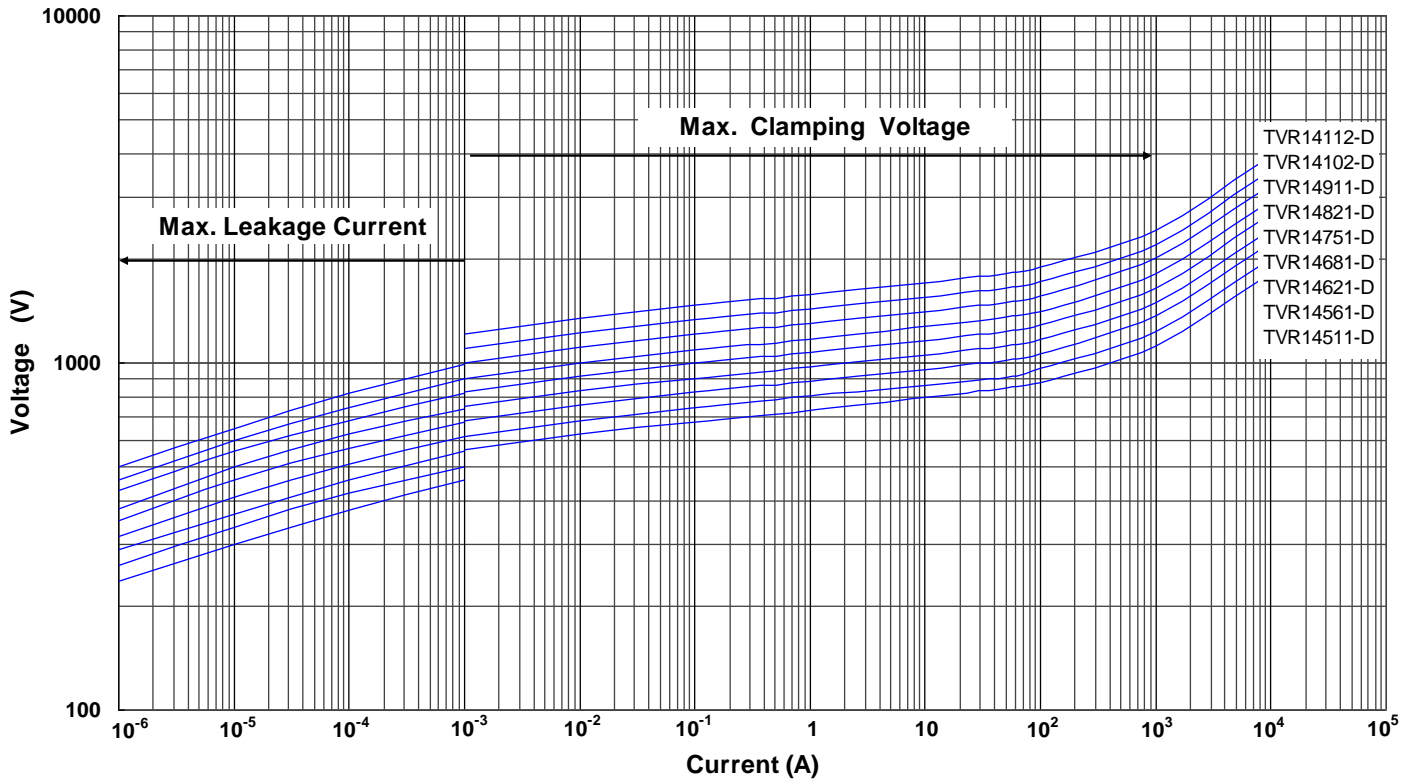
Metal Oxide Varistor : TVR-D Series



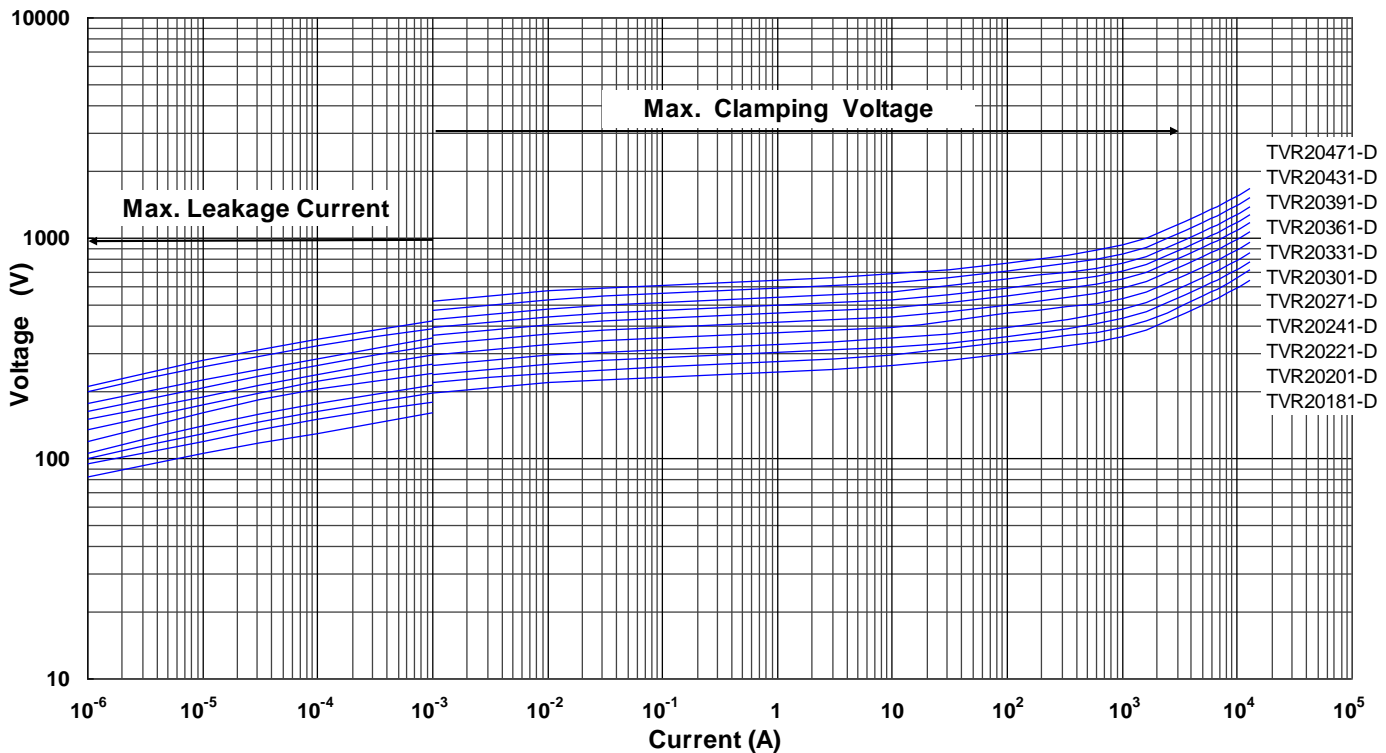
Disc Type Varistor for Surge Protection (High Surge Series)

■ 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 to TVR20471-D)



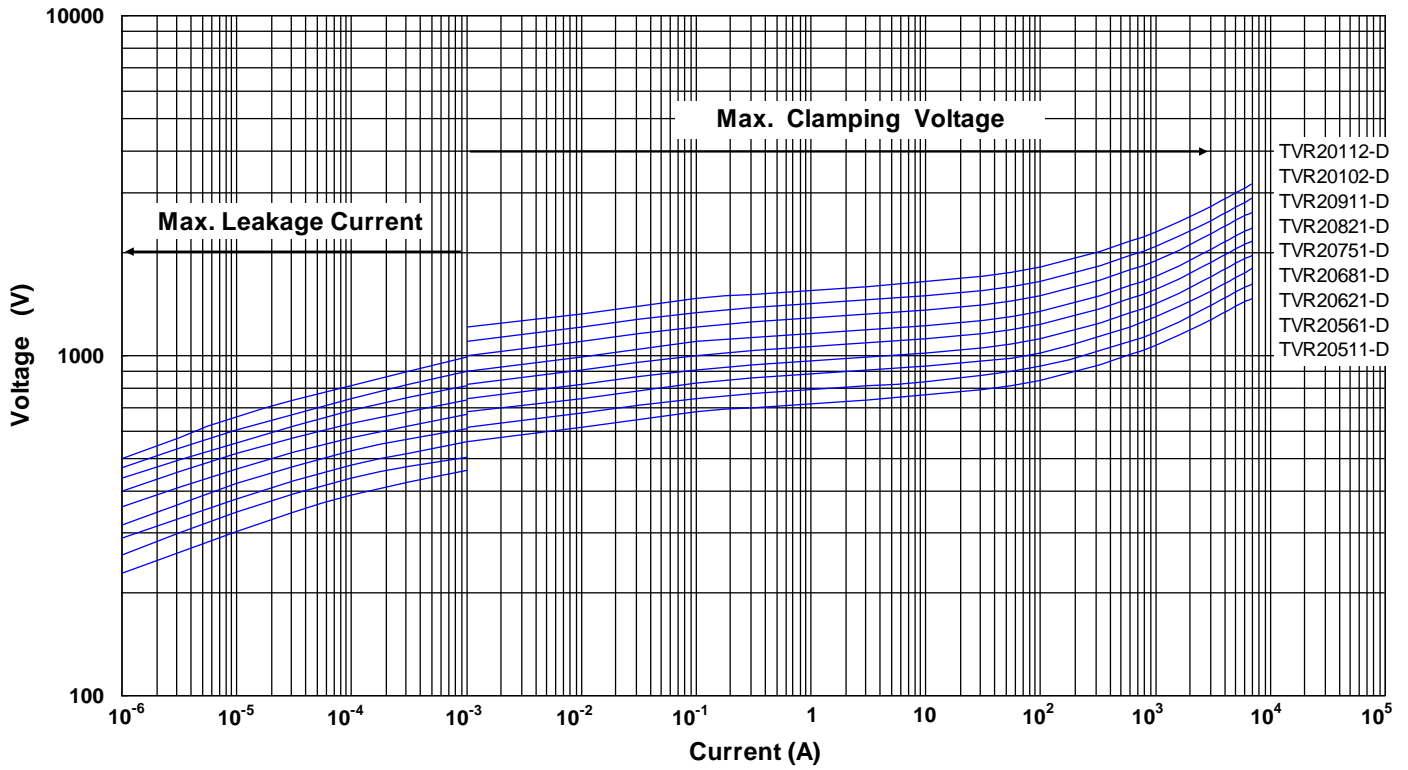
Metal Oxide Varistor : TVR-D Series



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 (TVR20511-D to TVR20112-D)



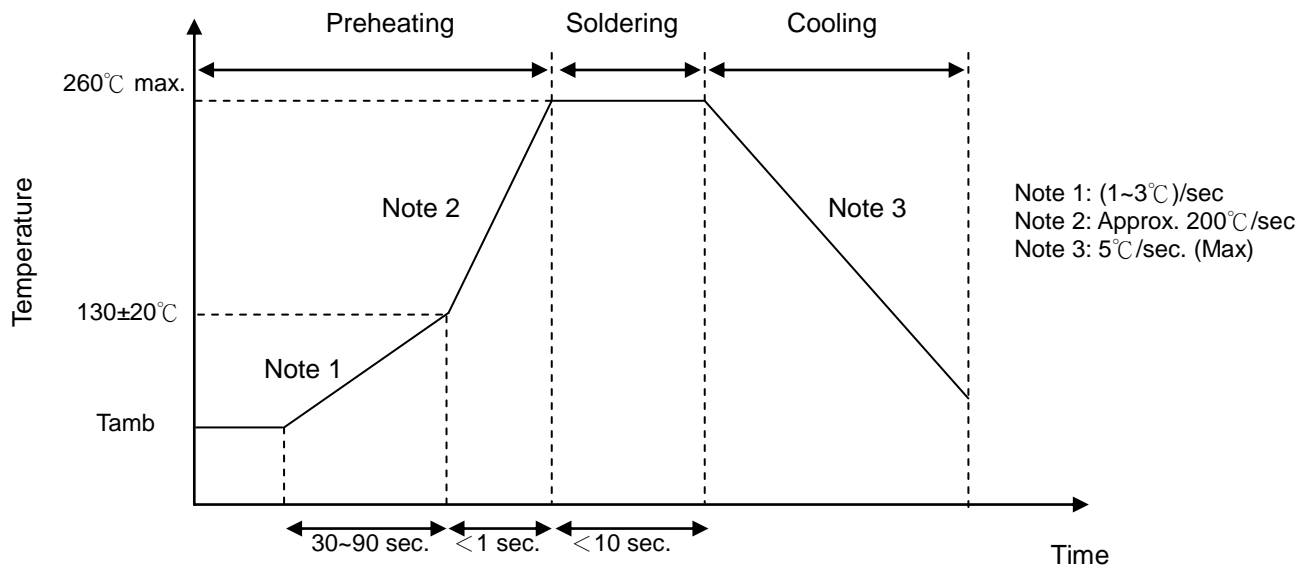
Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

■ Soldering Recommendation

● Wave Soldering Profile



● Recommended Reworking Conditions with Soldering Iron

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

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

■ Reliability

Item	Standard	Test conditions / Methods	Specifications															
Tensile Strength of Terminations	IEC 60068-2-21	Gradually 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>105±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	105±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	105±2	30±3																
4	Room temperature	5±3																
High Temp. Load	MIL-STD-202 Method 108	105±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															
Voltage Proof	IEC 61051-1	Metal balls method, 2500 V _{ac} 1 min	No visible damage															
Varistor Voltage Temp. Coefficient	Specification Standard	$\frac{V_{1mA \text{ at } 105^\circ\text{C}} - V_{1mA \text{ at } 25^\circ\text{C}}}{V_{1mA \text{ at } 25^\circ\text{C}}} \times \frac{1}{80} \times 100 (\% / ^\circ\text{C})$ $\frac{V_{1mA \text{ at } -40^\circ\text{C}} - V_{1mA \text{ at } 25^\circ\text{C}}}{V_{1mA \text{ at } 25^\circ\text{C}}} \times \frac{1}{65} \times 100 (\% / ^\circ\text{C})$	-0.05 ≤ 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)

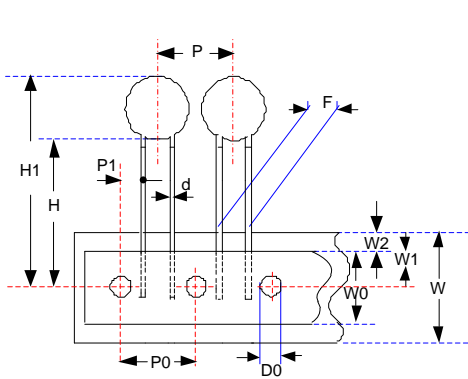


Figure A

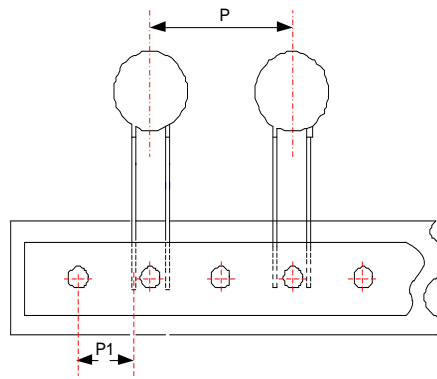


Figure B

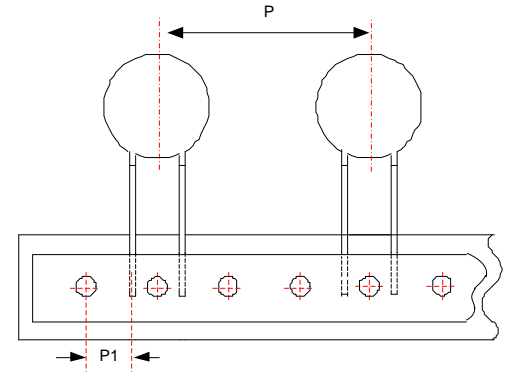


Figure C

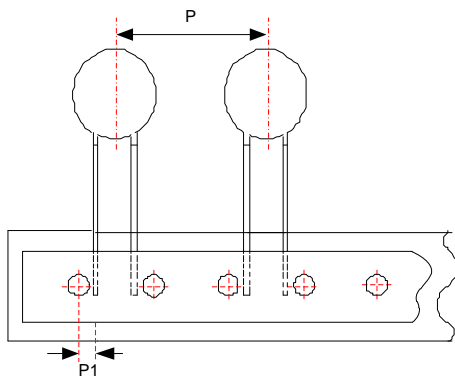
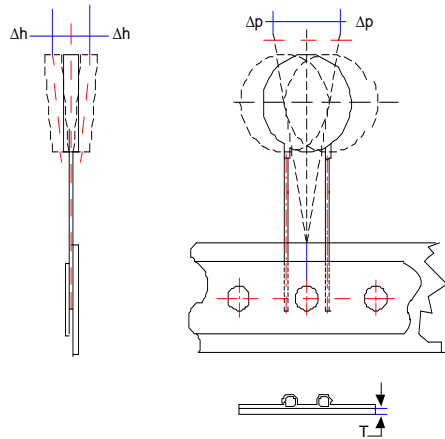


Figure D



(Unit: mm)

Taping Code	Body Size	P ₀	F	P	P ₁	H	H ₁	d	W ₀	W ₁	W ₂	W	Δ P	Δ h	D ₀	T	Figure
		±0.3	±1	±1	±1	+2/-0	Max.	±0.02	±1	+0.75/-0.5	Max	+1/-0.5	Max.	Max.	±0.2	±0.2	
A (P ₀ :12.7)	07-D	12.7	5.0	12.7	3.55	18	31	0.6	12	9	3	18	1	2	4	0.6	A
	10-D	12.7	7.5	25.4	8.55	18	36	0.8	12	9	3	18	1	2	4	0.6	B
	14-D	12.7	7.5	25.4	8.55	18	40	0.8	12	9	3	18	1	2	4	0.6	B
	20-D	12.7	10.0	38.1	7.20	18	40.5	1.0	12	9	3	18	1	2	4	0.6	C
E (P ₀ :15.0)	07-D	15	5.0	15.0	4.70	18	31	0.6	12	9	3	18	1	2	4	0.6	A
	10-D	15	7.5	15.0	3.35	18	36	0.8	12	9	3	18	1	2	4	0.6	A
	14-D	15	7.5	30.0	3.35	18	40	0.8	12	9	3	18	1	2	4	0.6	D
	20-D	15	10.0	30.0	9.50	18	40.5	1.0	12	9	3	18	1	2	4	0.6	B

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

F Type (Y kink lead)

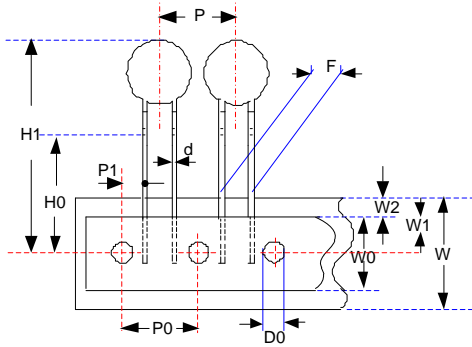


Figure A

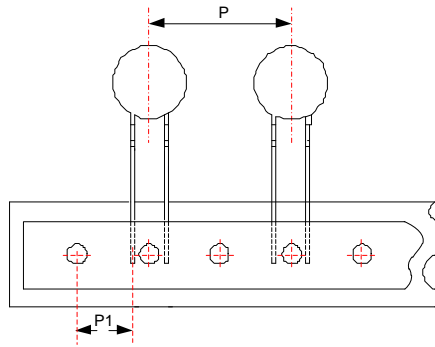


Figure B

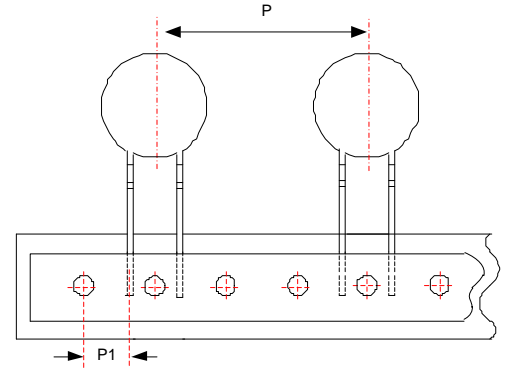


Figure C

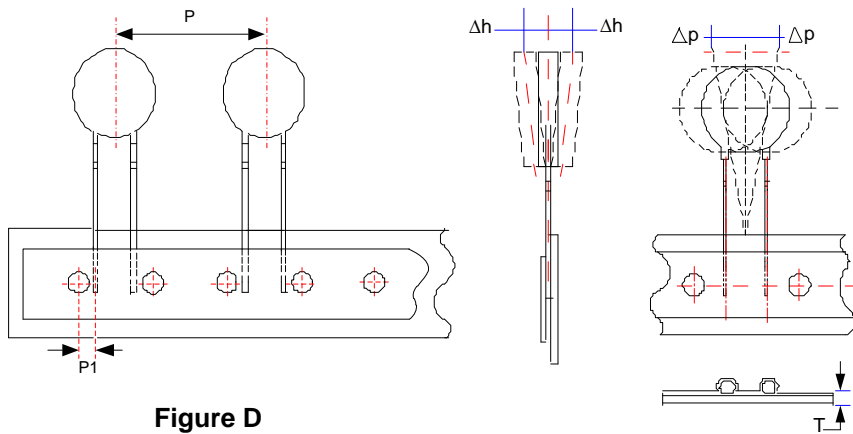


Figure D

Taping Code	Body Size	P ₀	F	P	P ₁	H ₀	H ₁	d	W ₀	W ₁	W ₂	W	ΔP	Δh	D ₀	T	Figure
		±0.3	±1	±1	±1	±0.5	Max.	±0.02	±1	+0.75/-0.5	Max	+1/-0.5	Max.	Max.	±0.2	±0.2	
A (P ₀ :12.7)	07-D	12.7	5.0	12.7	3.55	16	31	0.6	12	9	3	18	1	2	4	0.6	A
	10-D	12.7	7.5	25.4	8.55	16	36	0.8	12	9	3	18	1	2	4	0.6	B
	14-D	12.7	7.5	25.4	8.55	16	40	0.8	12	9	3	18	1	2	4	0.6	B
	20-D	12.7	10	38.1	7.20	16	44.5	1.0	12	9	3	18	1	2	4	0.6	C
E (P ₀ :15.0)	07-D	15	5.0	15.0	4.70	16	31	0.6	12	9	3	18	1	2	4	0.6	A
	10-D	15	7.5	15.0	3.35	16	36	0.8	12	9	3	18	1	2	4	0.6	A
	14-D	15	7.5	30.0	3.35	16	40	0.8	12	9	3	18	1	2	4	0.6	D
	20-D	15	7.5	30.0	9.50	16	44.5	0.8	12	9	3	18	1	2	4	0.6	B

Metal Oxide Varistor : TVR-D Series



Disc Type Varistor for Surge Protection (High Surge Series)

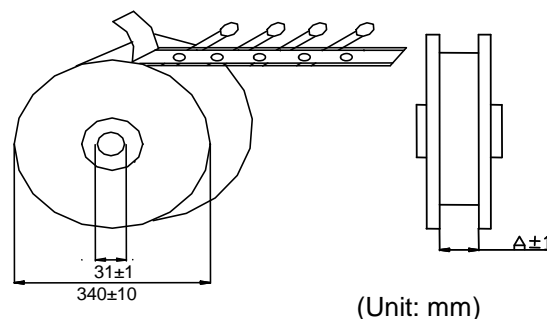
■ Quantity

● 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 (181~751)	200	200	200
TVR10-D (821~112)	100	100	100
TVR14-D	100	100	100
TVR20-D	50	50	50

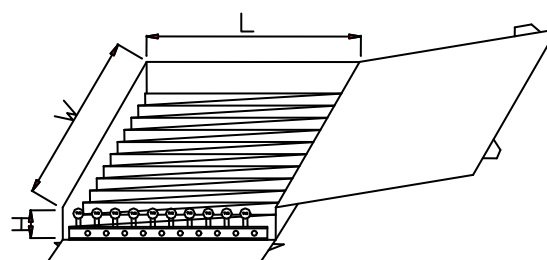
● Reel Packing

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(431~621)-D		600
TVR10(681~112)-D	52	500
TVR14(181~331)-D		750
TVR14(361~112)-D		500
TVR20(181~431)-D	55	500
TVR20(471~681)-D		400
TVR20(751~112)-D		250



● Ammo Packing

Series	Quantity (pcs/box) P0=12.7mm	Quantity (pcs/box) P0=15.0mm
TVR07(181~361)-D	1,200	1,200
TVR07(391~821)-D	1,000	1,000
TVR10(181~361)-D	700	850
TVR10(391~621)-D	550	750
TVR10(681~112)-D	400	650
TVR14(181~271)-D	650	550
TVR14(301~561)-D	450	400
TVR14(621~112)-D	350	300
TVR20(181~271)-D	300	300
TVR20(301~112)-D	200	200



Series	W±5	L±5	H±5
TVR07-D~ TVR20-D	345	275	55

■ 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