

Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



■ Features

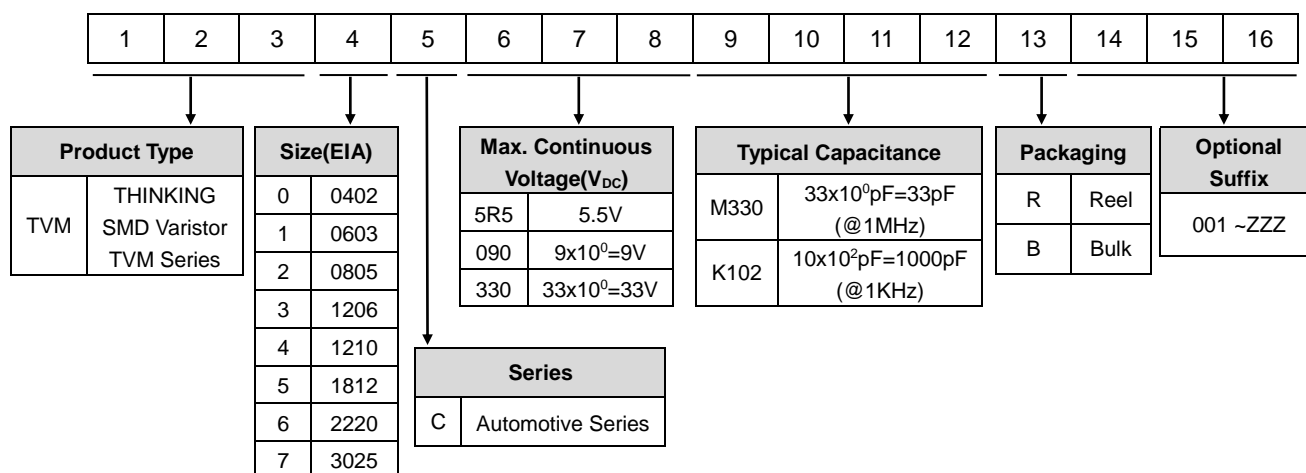
1. Qualification based on AEC-Q200 Rev-C
2. High surge suppression capability for automotive application (load dump)
3. No temperature derating up to 125 °C
4. Bidirectional and symmetrical V/I characteristics
5. Stability in high-temperature and high-humidity environment
6. RoHS & Halogen Free (HF) compliant



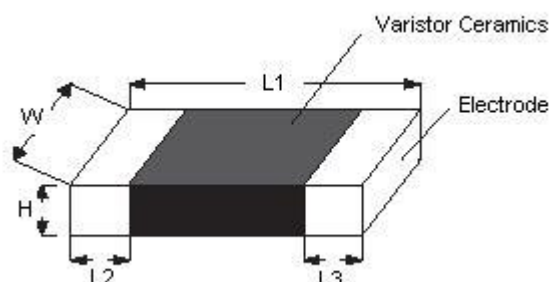
■ Recommended Applications

Transient overvoltage protection in automotive applications: engine management, airbag, control units, electro hydraulic brake, ABS/ESP, sunroof

■ Part Number Code



■ Structures and Dimensions



(Unit: mm)

Part No.	Size (EIA)	L1	W	H max.	L2 and L3
TVM0	0402	1.00±0.15	0.50±0.10	0.50±0.10	0.20±0.10
TVM1	0603	1.60 ±0.15	0.80±0.15	0.80±0.15	0.35±0.15
TVM2	0805	2.00 ±0.20	1.25±0.20	1.20	0.40±0.20
TVM3	1206	3.20 ±0.30	1.60±0.20	1.50	0.50±0.20
TVM4	1210	3.20 ±0.30	2.50±0.25	1.50	0.50±0.20
TVM5	1812	4.50 ±0.40	3.20±0.30	2.00	0.60±0.30
TVM6	2220	5.70±0.40	5.00±0.30	2.50	0.60±0.30
TVM7	3025	7.50±0.50	6.30±0.40	2.50	0.60±0.30

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Electrical Characteristics

0402 Series

Part No.	Varistor Voltage	Max. Continuous Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Max. Energy (10/1000 μ s)	Typical Capacitance		Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz	1MHz	(°C)
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)	(pF)	
TVM0C5R5M330*	8.8~13.2	4	5.5	31	1	4	0.02	--	33±30%	-55~+125
TVM0C5R5M900*	8.8~13.2	4	5.5	30	1	10	0.05	--	90±30%	
TVM0C5R5M301*	16~21	11	14	35	1	10	0.05	80±30%	--	
TVM0C140K800*	22~28	14	18	55	1	2	0.03	--	12±30%	
TVM0C180M120*	22~28	14	18	50	1	20	0.05	--	40±30%	
TVM0C180M400*	22~28	14	18	50	1	20	0.05	--	50±30%	
TVM0C180M500*	22~28	14	18	50	1	20	0.05	--	60±30%	
TVM0C180M600*	22~28	14	18	50	1	20	0.05	--	65±30%	
TVM0C700M010*	100~120	55	70	190	0.3	0.3	0.001	--	1±0.4pF	
TVM0C700M030*	90~110	55	70	190	1	1	0.003	--	4.7±30%	
TVM0C5R5M330*	8.8~13.2	4	5.5	31	1	4	0.02	--	33±30%	
TVM0C5R5M900*	8.8~13.2	4	5.5	30	1	10	0.05	--	90±30%	
TVM0C5R5M301*	16~21	11	14	35	1	10	0.05	80±30%	--	

0603 Series

Part No.	Varistor Voltage	Max. Continuous Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Max. Energy (10/1000 μ s)	Typical Capacitance		Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz	1MHz	(°C)
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)	(pF)	
TVM1C5R5M271*	8~12	4	5.5	25	1	20	0.1	--	270±30%	-55~+125
TVM1C5R5M761*	8~12	4	5.5	25	1	30	0.1	--	760±30%	
TVM1C8R6K601*	11~16	6.1	8.6	29	1	80	0.1	600±30%	--	
TVM1C090M220*	11~16	7	9	40	1	2	0.02	--	22±30%	
TVM1C090M491*	11~16	7	9	29	1	30	0.1	--	490±30%	
TVM1C160K561*	21.6~26.4	12	16	45	1	30	0.1	560±30%	--	
TVM1C180M120*	23~30	14	18	55	1	2	0.03	--	12±30%	
TVM1C180K150*	23~30	14	18	55	1	2	0.03	15±30%	--	
TVM1C180M150*	23~30	14	18	55	1	2	0.03	--	15±30%	
TVM1C180K300*	23~30	14	18	52	1	4	0.03	30±30%	--	
TVM1C180M300*	23~30	14	18	52	1	4	0.03	--	30±30%	
TVM1C180M900*	23~30	14	18	48	1	30	0.1	--	90±30%	
TVM1C180K101*	23~30	14	18	48	1	30	0.1	100±30%	--	
TVM1C180K151*	23~30	14	18	45	1	50	0.1	430±30%	--	
TVM1C180K431*	25~40	17	22	50	1	30	0.105	53±30%	--	
TVM1C220K530*	25~33	17	22	50	1	30	0.1	100±30%	--	

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● 0603 Series

Part No.	Varistor Voltage	Max. Continuous Voltage		Max. Clamping Voltage (8/20μs)		Max. Surge Current (8/20μs)	Max. Energy (10/1000μs)	Typical Capacitance		Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz	1MHz	(°C)
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)	(pF)	
TVM1C220K101*	31~38	20	26	60	1	30	0.1	--	110±30%	-55~+125
TVM1C300K250*	37~46	23	30	70	1	10	0.3	25±30%		
TVM1C300K121*	36.9~45.1	21	30	67	1	30	0.1	125±30%		
TVM1C310K900*	35.1~42.9	25	31	67	1	30	0.3	90±30%	--	
TVM1C320M100*	51.9~70.1	25	32	120	1	5	0.05	--	10±30%	
TVM1C380K101*	42.3~51.7	30	38	77	1	30	0.3	100±30%		
TVM1C380K161*	42.3~51.7	30	38	77	1	30	0.3	160±30%		
TVM1C700M180*	102~138	54	70	180	1	2	0.01		18±30%	

● 0805 Series

Part No.	Varistor Voltage	Max. Continuous Voltage		Max. Clamping Voltage (8/20μs)		Max. Surge Current (8/20μs)	Max. Energy (10/1000μs)	Typical Capacitance		V _{jump} (5min)	W _{LD} (10x)	Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz	1MHz	(V)	(J)	(°C)
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)	(pF)			
TVM2C160K651*	21.6~26.4	12	16	40	1	120	0.3	650±20%		24.5	1	-55~+125
TVM2C180K651*	23~28	14	18	44	1	120	0.3	650±20%		24.5	1	
TVM2C180K751*	23~28	14	18	44	1	120	0.3	750±20%		24.5	1	
TVM2C220M101*	25~33	17	22	50	1	30	0.1		100±20%			
TVM2C220K551*	25~33	17	22	50	1	160	0.3	550±20%				
TVM2C240K551*	29.7~36.3	18	24	59	5	240	0.5	550±20%		27	1.0	
TVM2C260K501*	29.7~36.3	20	26	56	1	80	0.3	500±20%		27	1	
TVM2C310K251*	35.1~42.9	25	31	67	1	80	0.3	250±20%		29	0.5	

● 1206 Series

Part No.	Varistor Voltage	Max. Continuous Voltage		Max. Clamping Voltage (8/20μs)		Max. Surge Current (8/20μs)	Max. Energy (10/1000μs)	Typical Capacitance		V _{jump} (5min)	W _{LD} (10x)	Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz	1MHz	(V)	(J)	(°C)
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)	(pF)			
TVM3C5R5M332*	6.4~9.6	4	5.5	20	1	100	0.3		3300±20%	8	1.0	-55~+125
TVM3C160K102*	21.6~26.4	12	16	40	1	200	0.6	1000±20%		24.5	1.5	
TVM3C160K242*	21.6~26.4	12	16	38	1	400	0.6	2400±20%		24.5	2	
TVM3C180K102*	22.95~28.05	14	18	42	1	150	0.6	1000±20%		24.5	1.5	

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● 1206 Series

Part No.	Varistor Voltage		Max. Continuous Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Max. Energy (10/1000 μ s)	Typical Capacitance		V _{jump} (5min)	W _{LD} (10x)	Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz	1MHz				
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)	(pF)	(V)	(J)	(°C)	
TVM3C220K132*	29.7~36.3	20	26	54	1	200	0.7	800±20%		27.5	1.2	-55~+125	
TVM3C260K801*	29.7~36.3	20	26	54	1	250	0.7	1300±20%		27.5	1.5		
TVM3C260K132*	42.3~51.7	26	34	77	1	200	0.4	550±20%		50	1.5		
TVM3C340K551*	50.4~61.6	35	45	90	1	100	0.4	300±20%		59	1.2		
TVM3C450K301*	55.8~68.2	37	48	100	1	100	0.4	270±20%		59	1.2		
TVM3C480K271*	61.2~74.8	40	56	110	1	100	0.5	250±20%		65	1.5		
TVM3C650K201*	76.5~93.5	50	65	135	1	150	1.0	200±20%		70	1.5		

● 1210 Series

Part No.	Varistor Voltage		Max. Continuous Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Max. Energy (10/1000 μ s)	Typical Capacitance		V _{jump} (5min)	W _{LD} (10x)	Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz	1MHz				
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)	(pF)	(V)	(J)	(°C)	
TVM4C5R5M332*	10~15	4	5.5	33	2.5	200	0.3		3300±20%	8	1.5	-55~+125	
TVM4C5R5K402*	10~15	4	5.5	33	2.5	200	0.3	4000±20%		8	1.5		
TVM4C160K242*	21.6~26.4	12	16	40	2.5	400	1.6	2400±20%		24.5	3		
TVM4C180K312*	22.95~28.05	14	18	42	2.5	500	1.6	3100±20%		27.5	3		
TVM4C260K152*	29.7~36.3	20	26	54	2.5	400	1.9	1500±20%		27	3		
TVM4C310K122*	35.1~42.9	25	31	65	2.5	300	1.7	1200±20%		29	3		
TVM4C340K112*	42.3~51.7	26	34	75	2.5	300	2.3	1100±20%		50	3		
TVM4C450K601*	50.4~61.6	35	45	90	2.5	250	2	600±20%		60	1.5		
TVM4C480K401*	54.5~66.5	37	48	95	2.5	250	2.0	400±20%		62	1.5		
TVM4C600K451*	67.5~82.5	45	60	130	2.5	200	2.3	450±20%		70	3.0		

● 1812 Series

Part No.	Varistor Voltage		Max. Continuous Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Max. Energy (10/1000 μ s)	Typical Capacitance	V _{jump} (5min)	W _{LD} (10x)	Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz				
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)	(pF)	(V)	(J)	(°C)
TVM5C160K452*	21.6~26.4	12	16	40	5	800	2.4	4500±20%		24.5	6	-55~+125
TVM5C260K322*	29.7~36.3	20	26	54	5	800	3	3200±20%		30	6	
TVM5C300K172*	35~43	23	30	77	5	600	3.8	1700±20%		45	6	
TVM5C380K202*	42.3~51.7	30	38	77	5	800	4.2	2000±20%		50	6	
TVM5C420K182*	50.4~61.6	32	42	90	5	500	4.0	1800±20%		48	6	

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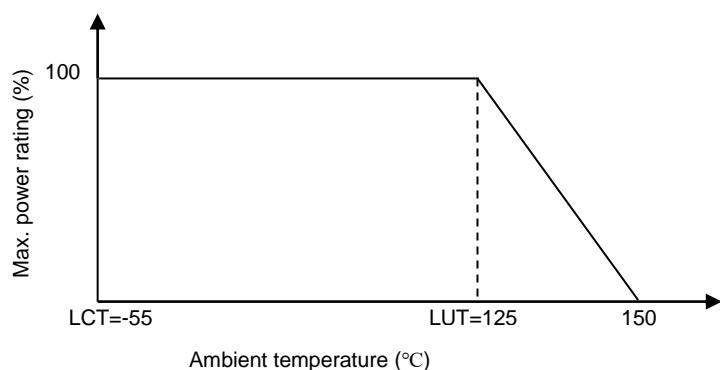
● 2220 Series

Part No.	Varistor Voltage	Max. Continuous Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Max. Energy (10/1000 μ s)	Typical Capacitance	V _{jump} (5min)	W _{LD} (10x)	Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz	(V)	(J)	(°C)
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)			
TVM6C160K103*	21.6~26.4	12	16	42	10	1200	5.8	10000 \pm 20%	24.5	12	-55~+125
TVM6C160K203*	21.6~26.4	12	16	42	10	1200	10	20000 \pm 20%	24.5	25	
TVM6C160K453*	22~27	12	16	42	10	1200	10.0	45000 \pm 20%	24.5	40	
TVM6C180K203*	23~32 @10mA	14	18	42	10	1200	10.0	20000 \pm 20%	24.5	25	
TVM6C260K702*	29.7~36.3	20	26	56	10	1000	7.8	7000 \pm 20%	30	15	
TVM6C340K652*	42.3~51.7	26	34	77	10	1200	12	6500 \pm 20%	50	12	
TVM6C380K302*	42.3~51.7	30	38	77	10	1000	12	3000 \pm 20%	50	12	
TVM6C560K202*	61.2~74.8	40	56	115	10	1000	16.0	2000 \pm 20%	65	16	

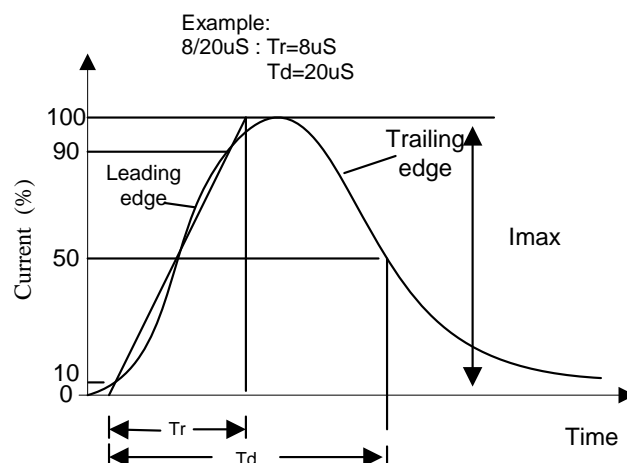
● 3025 Series

Part No.	Varistor Voltage	Max. Continuous Voltage		Max. Clamping Voltage (8/20 μ s)		Max. Surge Current (8/20 μ s)	Max. Energy (10/1000 μ s)	Typical Capacitance	V _{jump} (5min)	WLD (10x)	Operating Temp. Range
	V _{1mA}	V _{AC}	V _{DC}	V _P	I _P	I _{max}	W _{max}	1KHz	(V)	(J)	(°C)
	(V)	(V)	(V)	(V)	(A)	(A)	(J)	(pF)			
TVM7C160K273R*	21.6~32.4	12	16	48	10	1200	12.5	27000 \pm 20%	24.5	25	-55~+125
TVM7C160K403R*	21.6~32.4	12	16	48	10	1200	12.5	40000 \pm 20%	24.5	25	
TVM7C260K153R*	31.5~38.5	20	26	57	10	1400	15	15000 \pm 20%	30	30	
TVM7C380K332R*	42.3~51.7	30	38	80	10	1000	15	3300 \pm 20%	50	30	

■ Power Derating Curve



■ Surge Current Standard Waveform

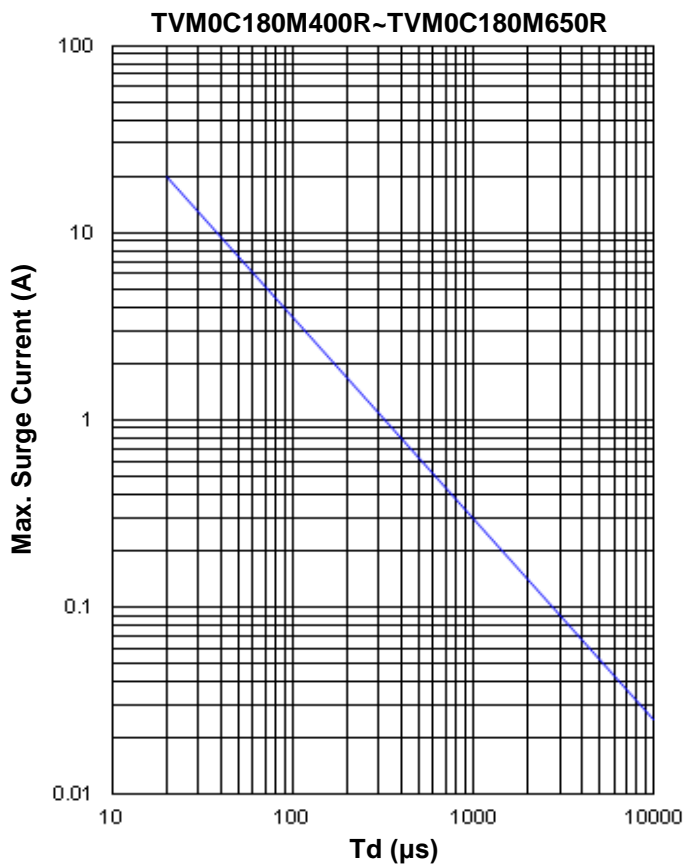
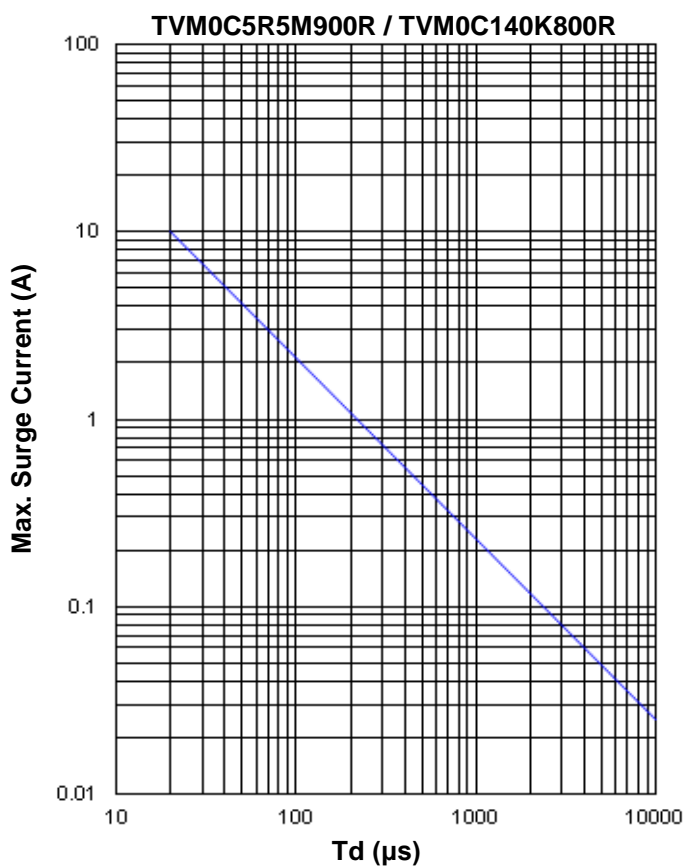
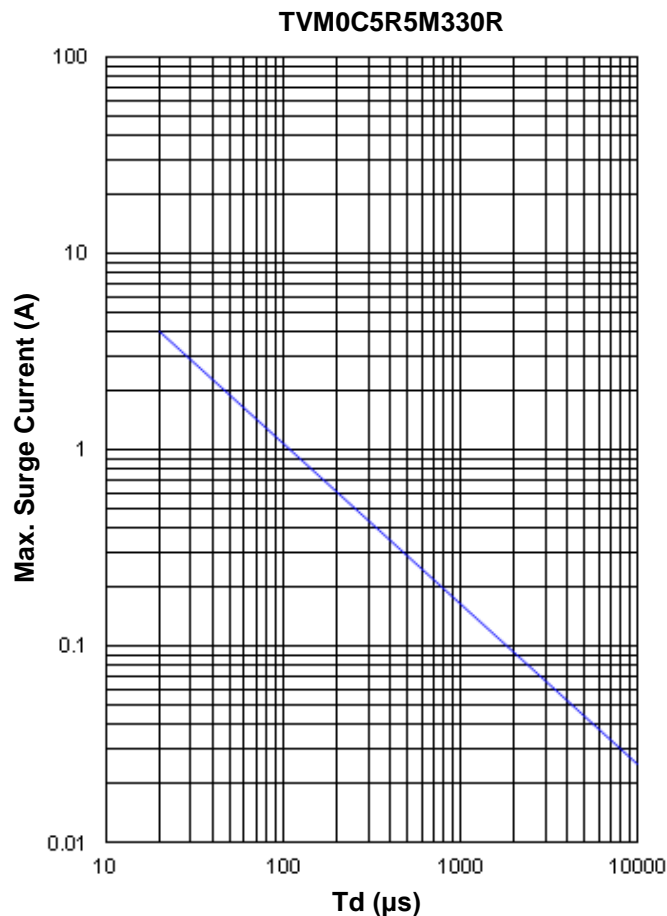
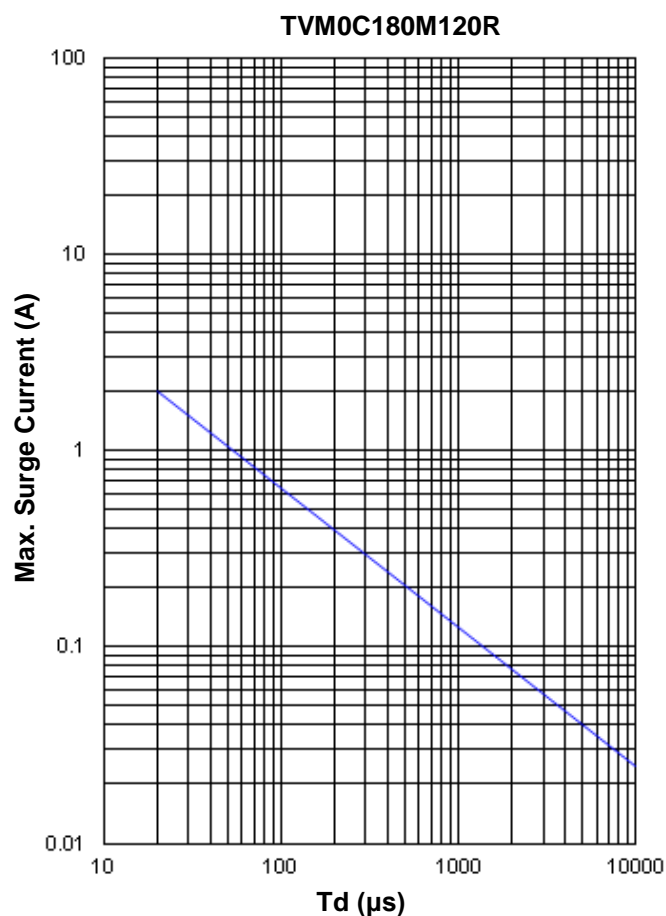


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Max. Surge Current Derating Curves

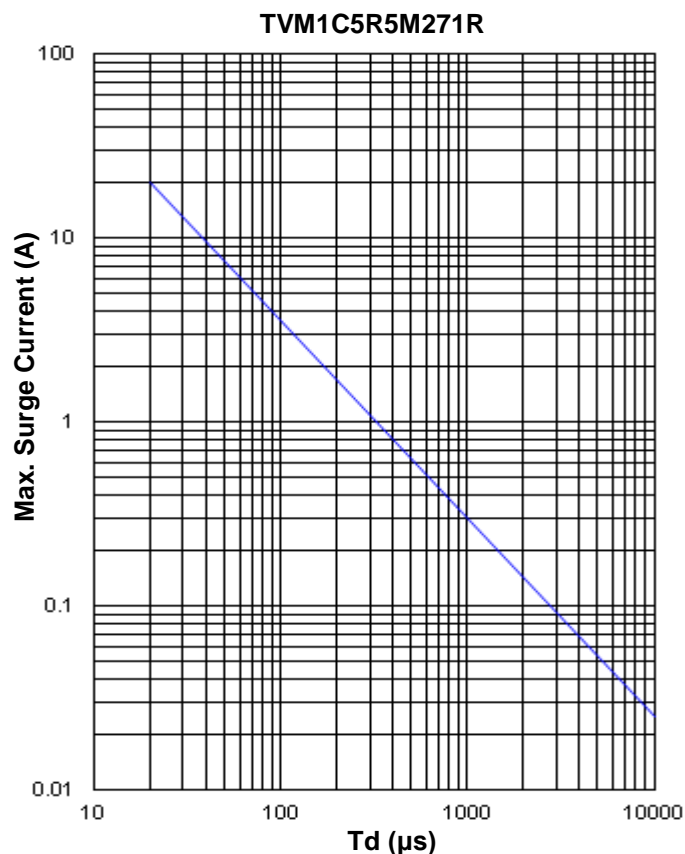
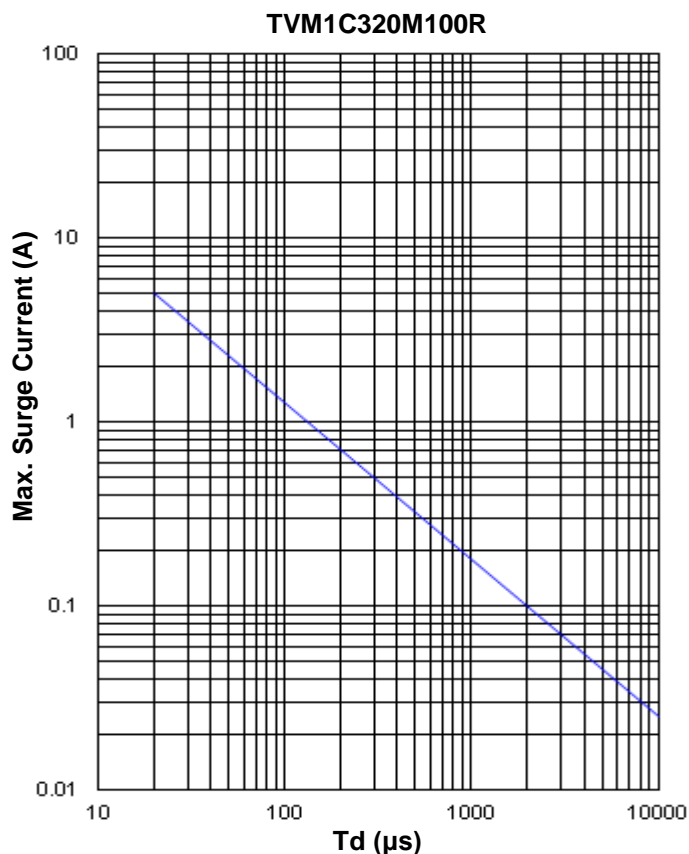
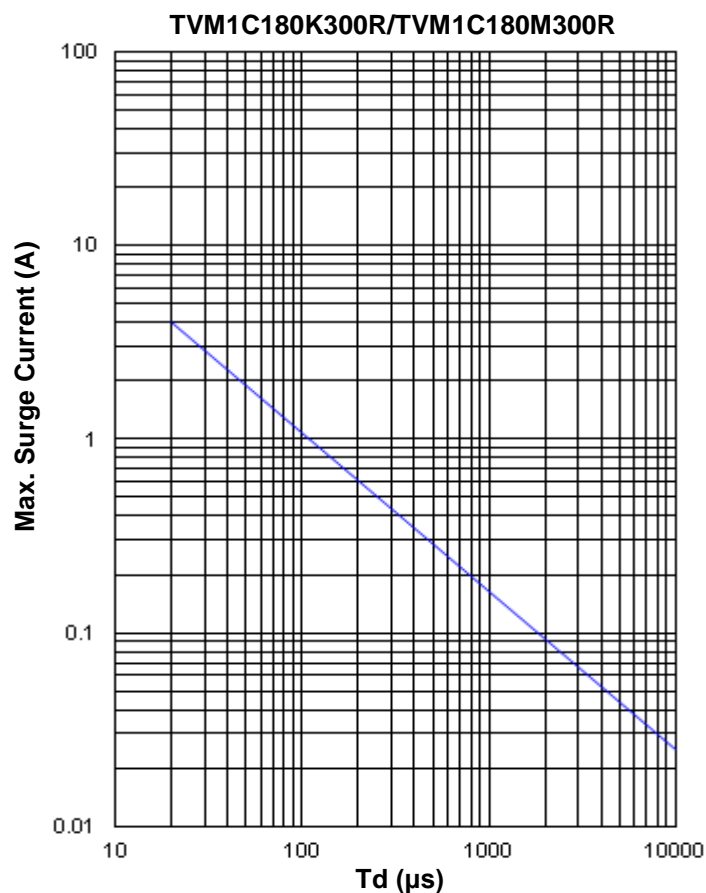
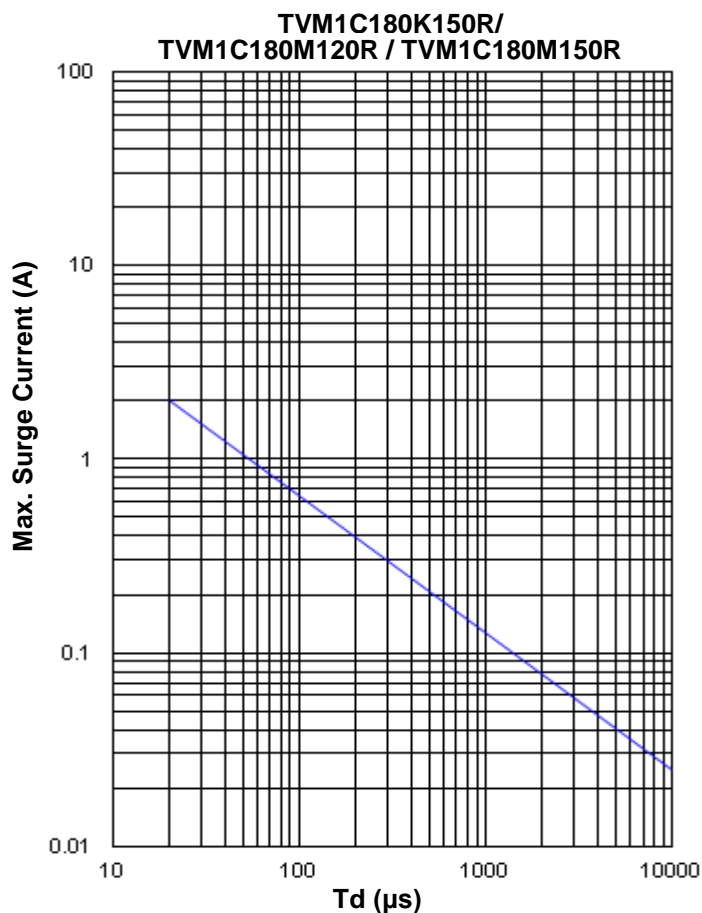


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Max. Surge Current Derating Curves



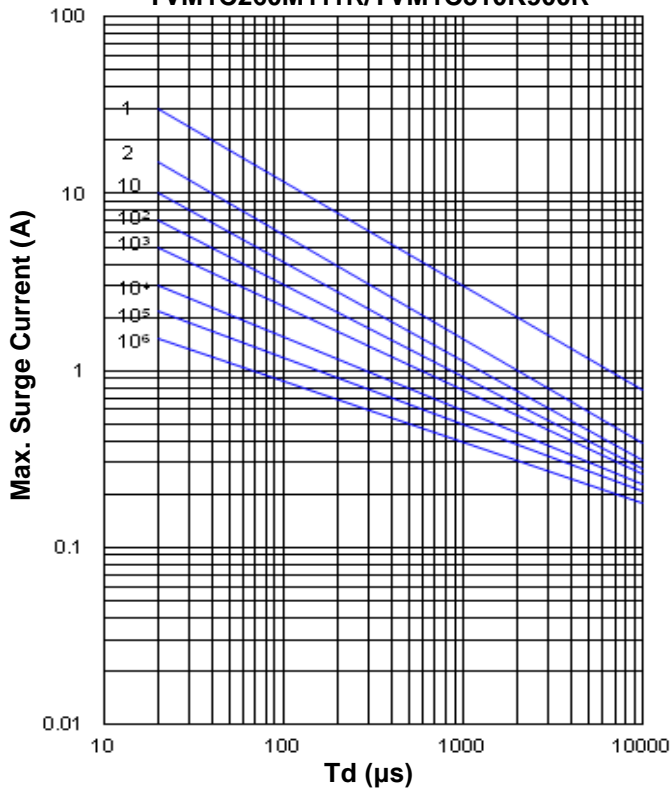
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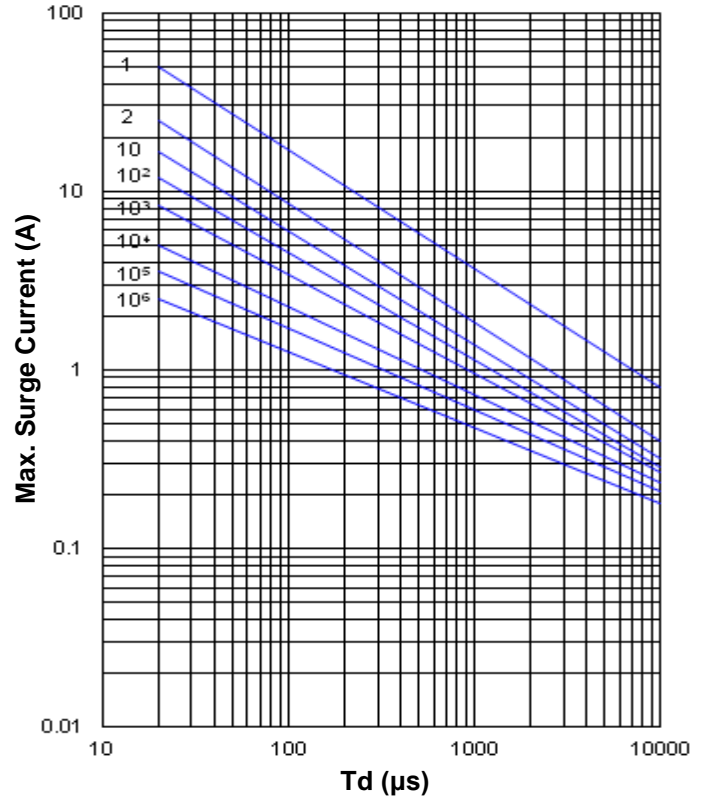


Max. Surge Current Derating Curves

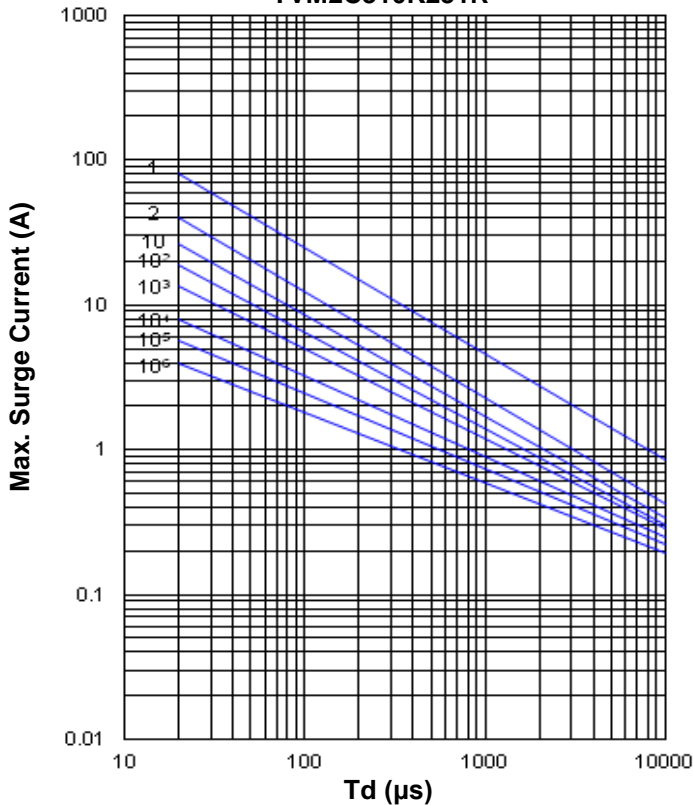
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 TVM1C220K530R/TVM1C220K101R/
 TVM1C260M111R/TVM1C310K900R



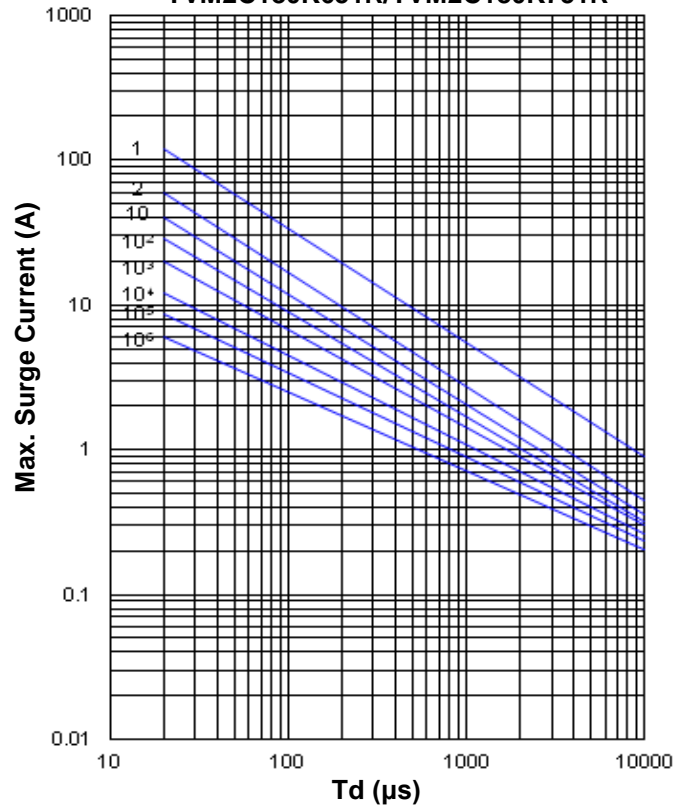
TVM1C180K431R



TVM2C260K501R
 TVM2C310K251R



TVM2C160K651R
 TVM2C180K651R/TVM2C180K751R



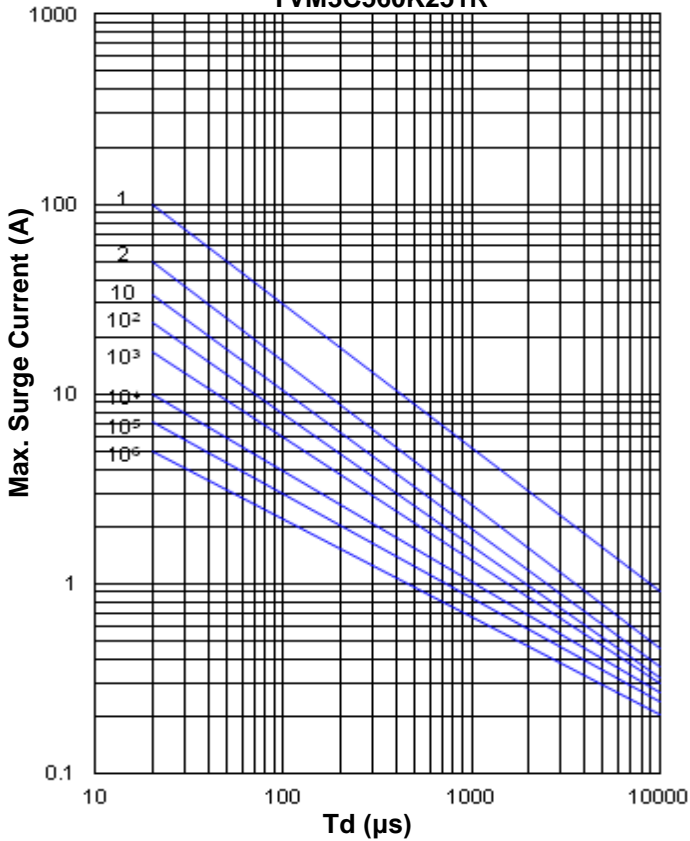
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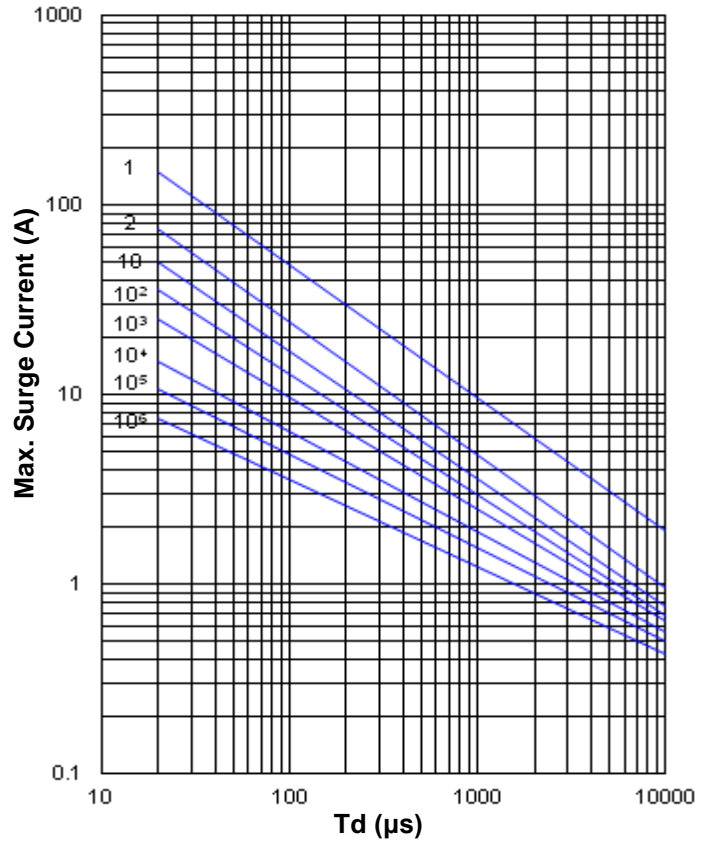


Max. Surge Current Derating Curves

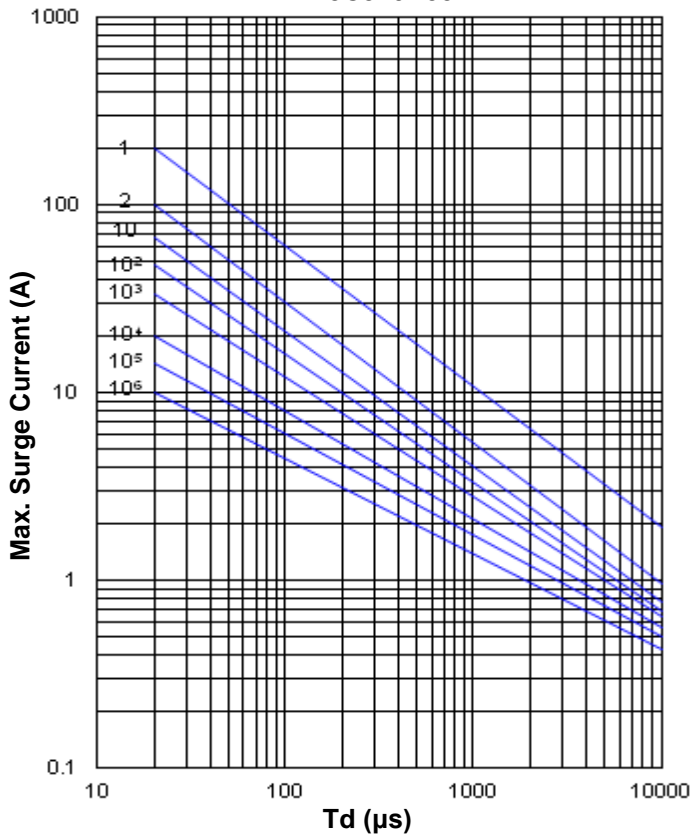
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TVM3C560K251R



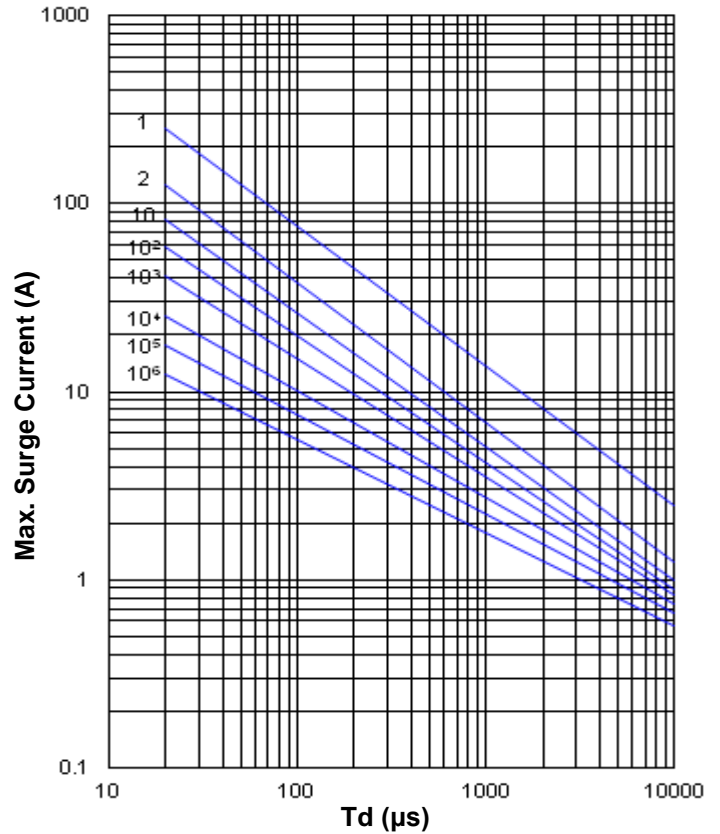
TVM3C180K102R



TVM3C160K102R/TVM3C260K801R/
TVM3C340K551R



TVM3C260K132R

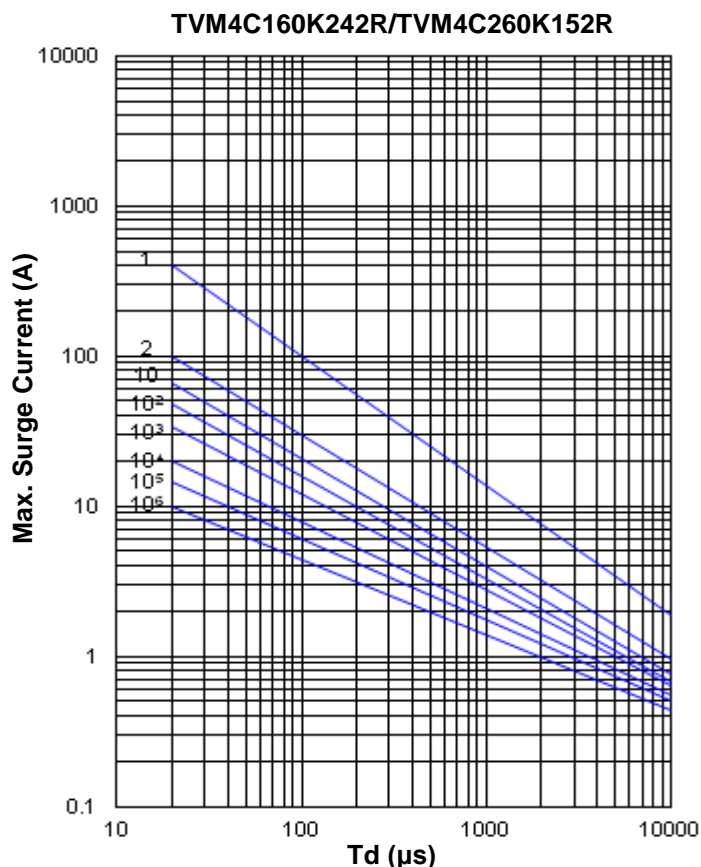
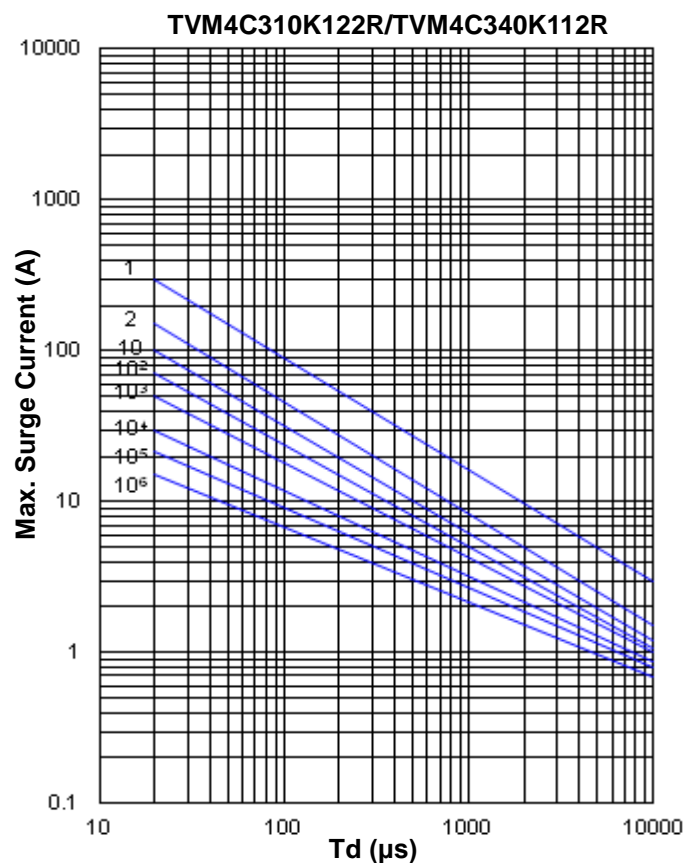
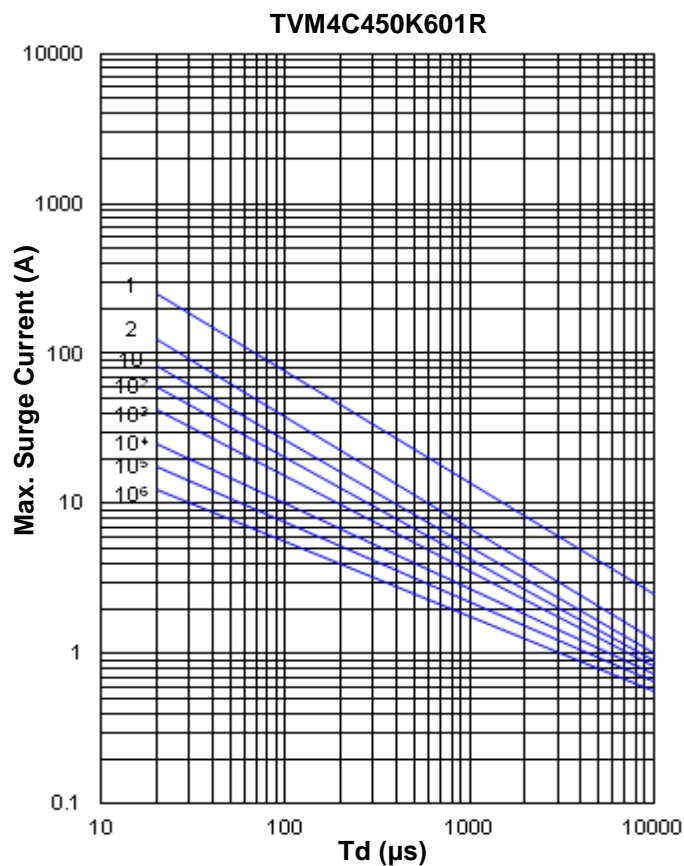
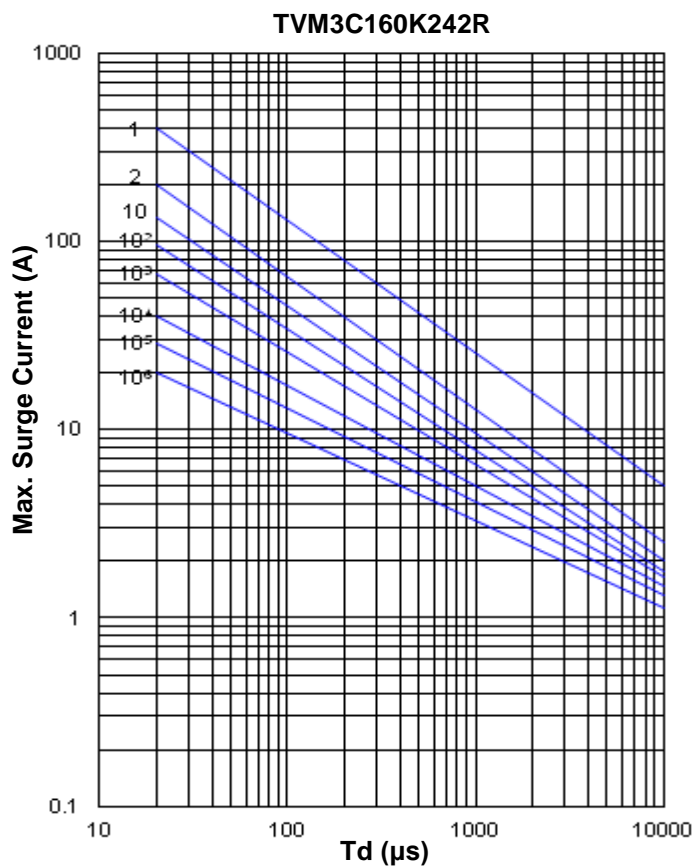


Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



Max. Surge Current Derating Curves



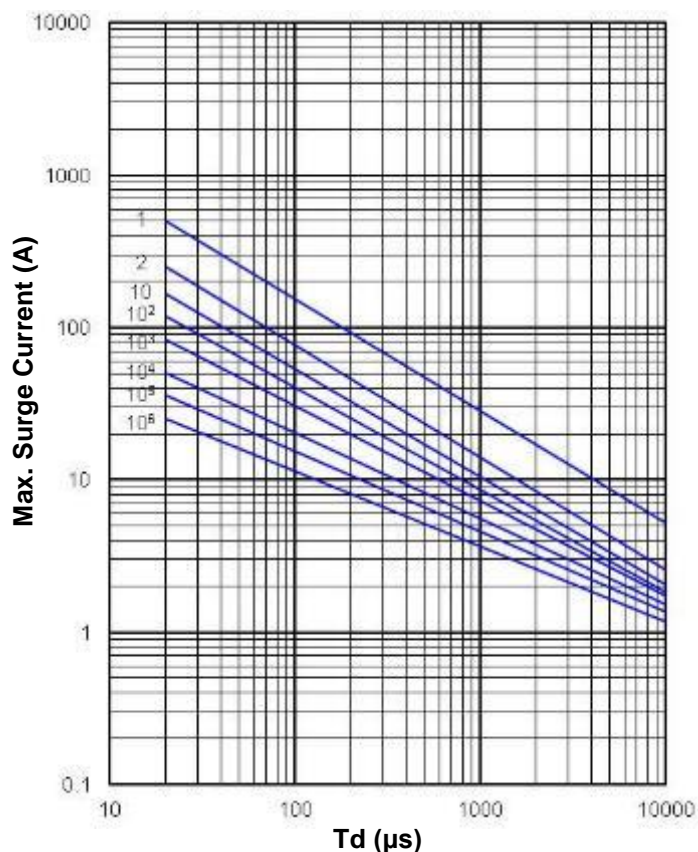
Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection

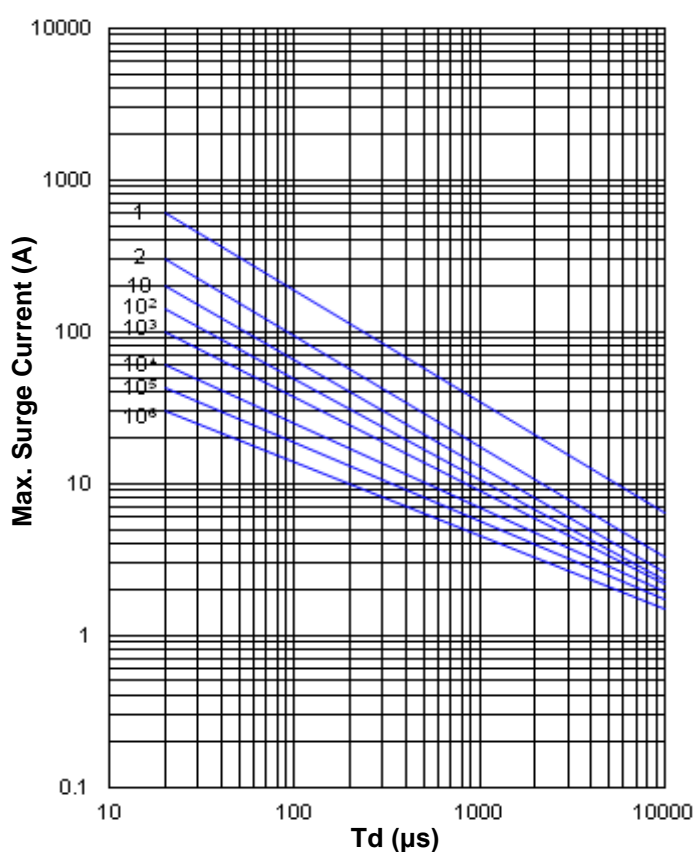


Max. Surge Current Derating Curves

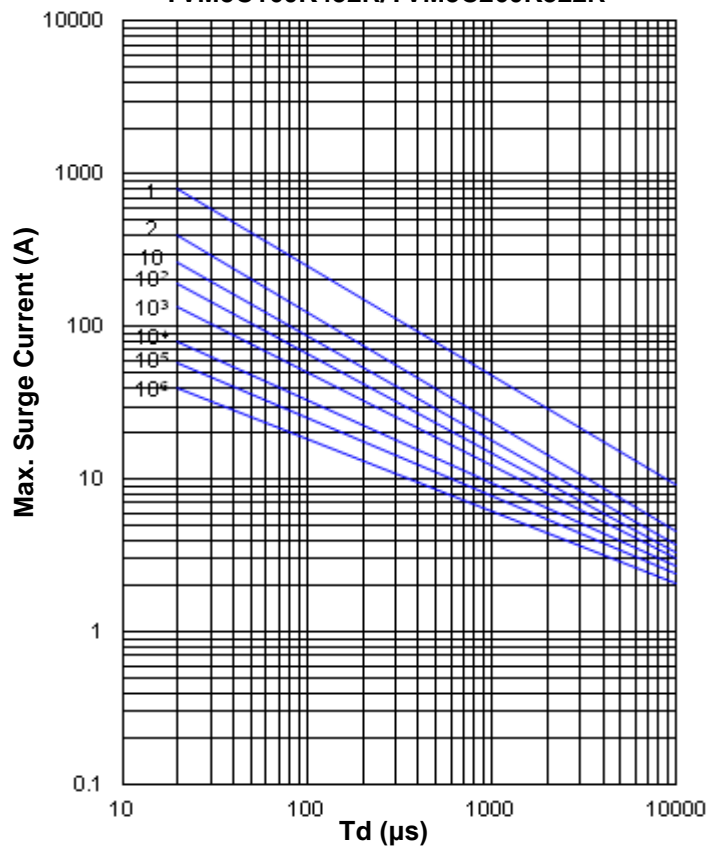
TVM4C180K312R



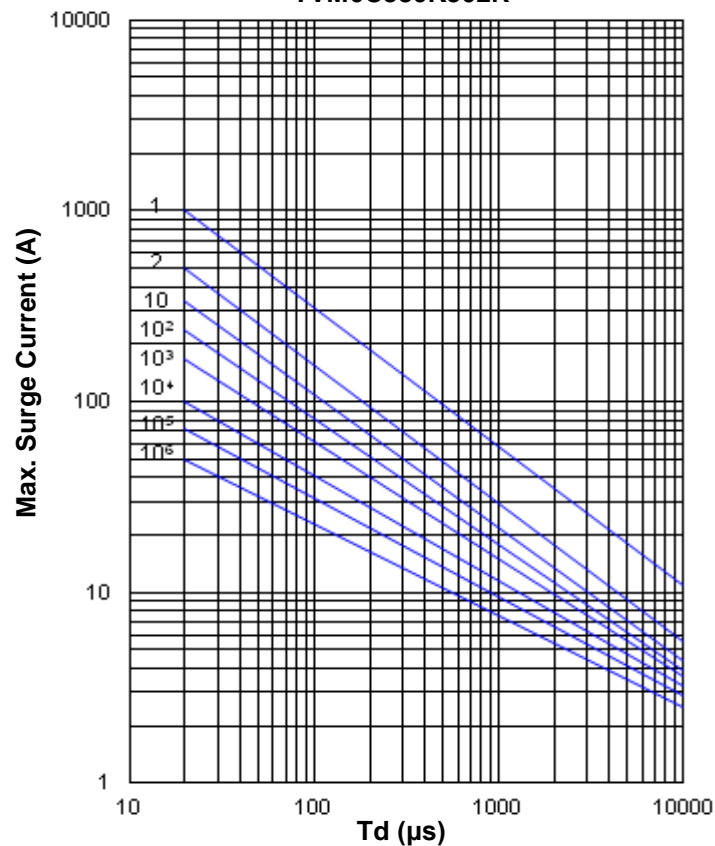
TVM5C300K172R



TVM5C160K452R/TVM5C260K322R



TVM6C380K302R



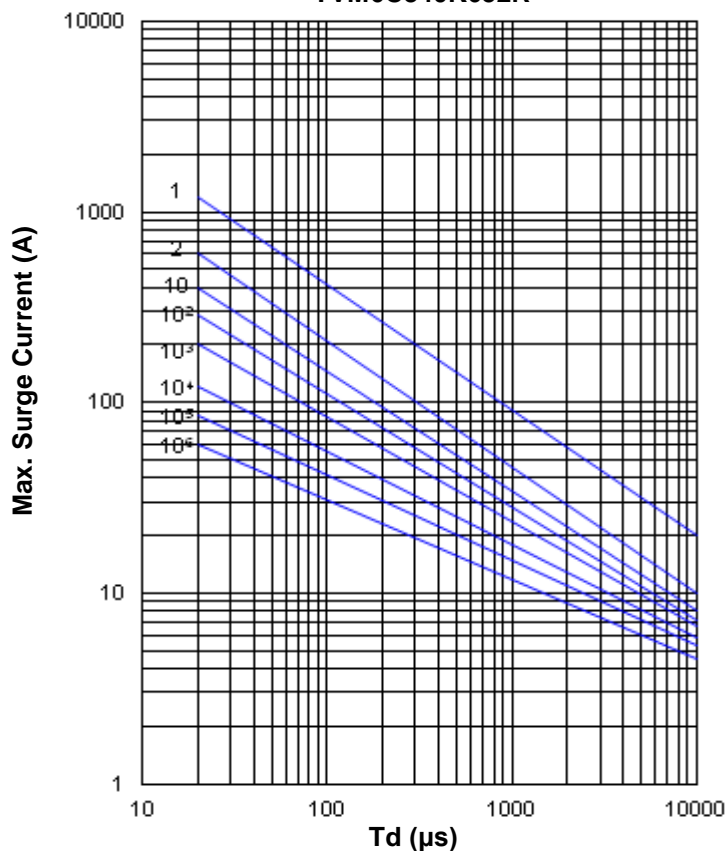
Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection

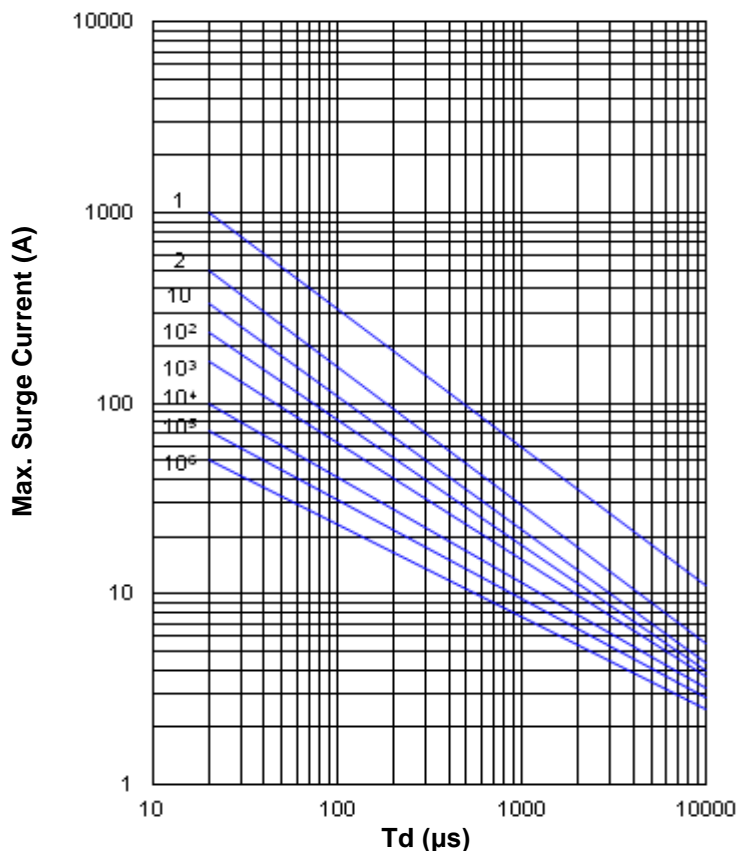


■ Max. Surge Current Derating Curves

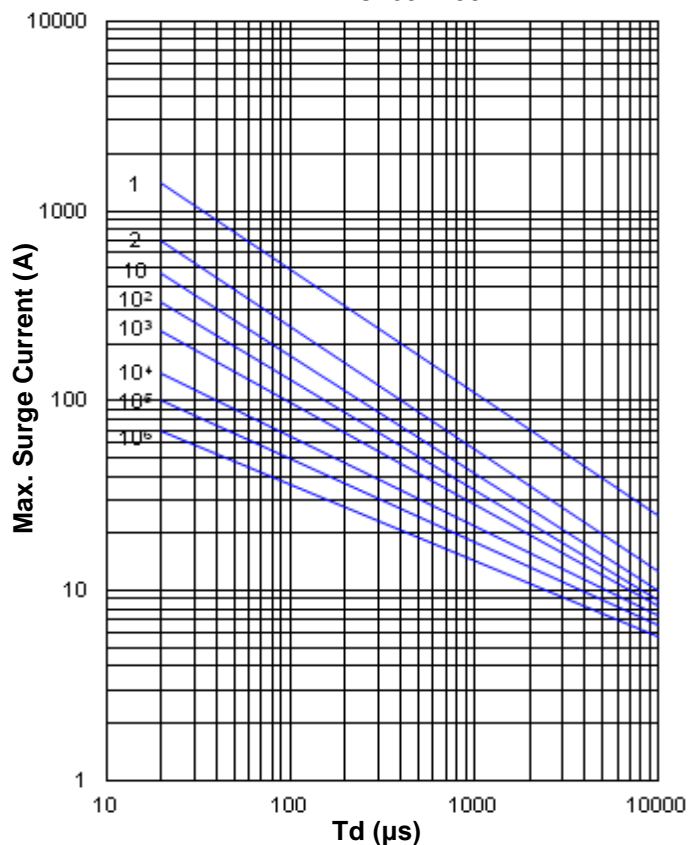
TVM6C160K103R/TVM6C160K203R/
TVM6C340K652R



TVM7C380K322R



TVM7C260K153R

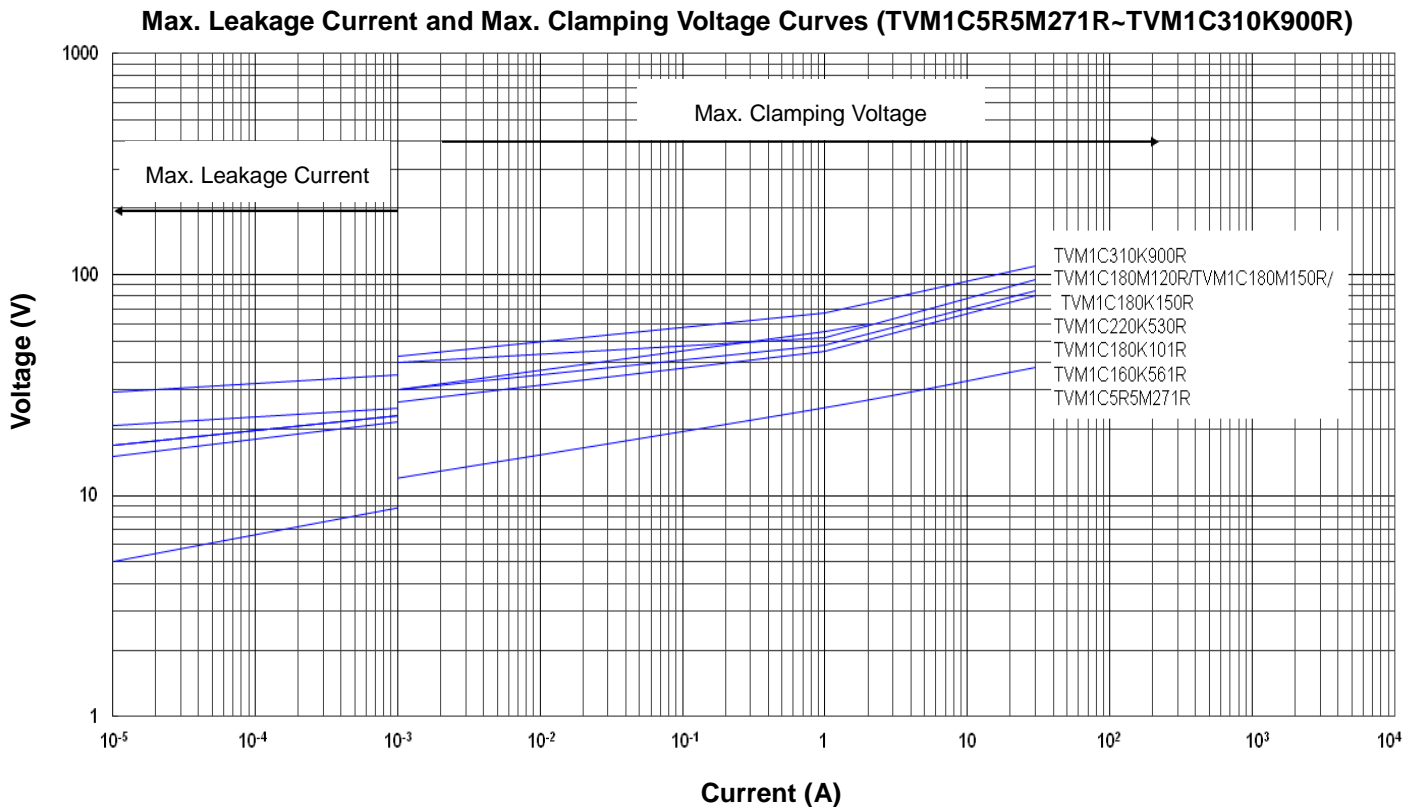
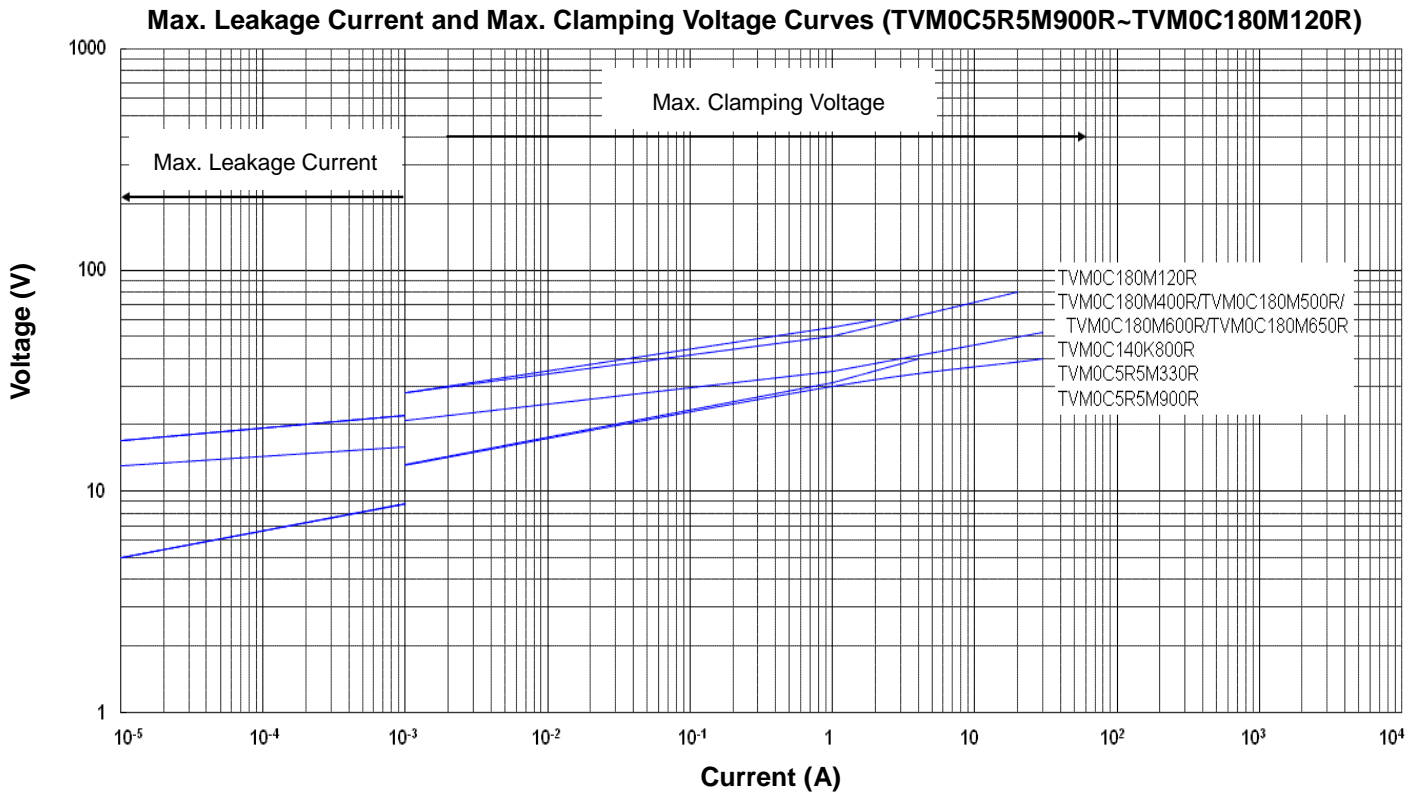


Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



Max. Leakage Current and Max. Clamping Voltage Curves



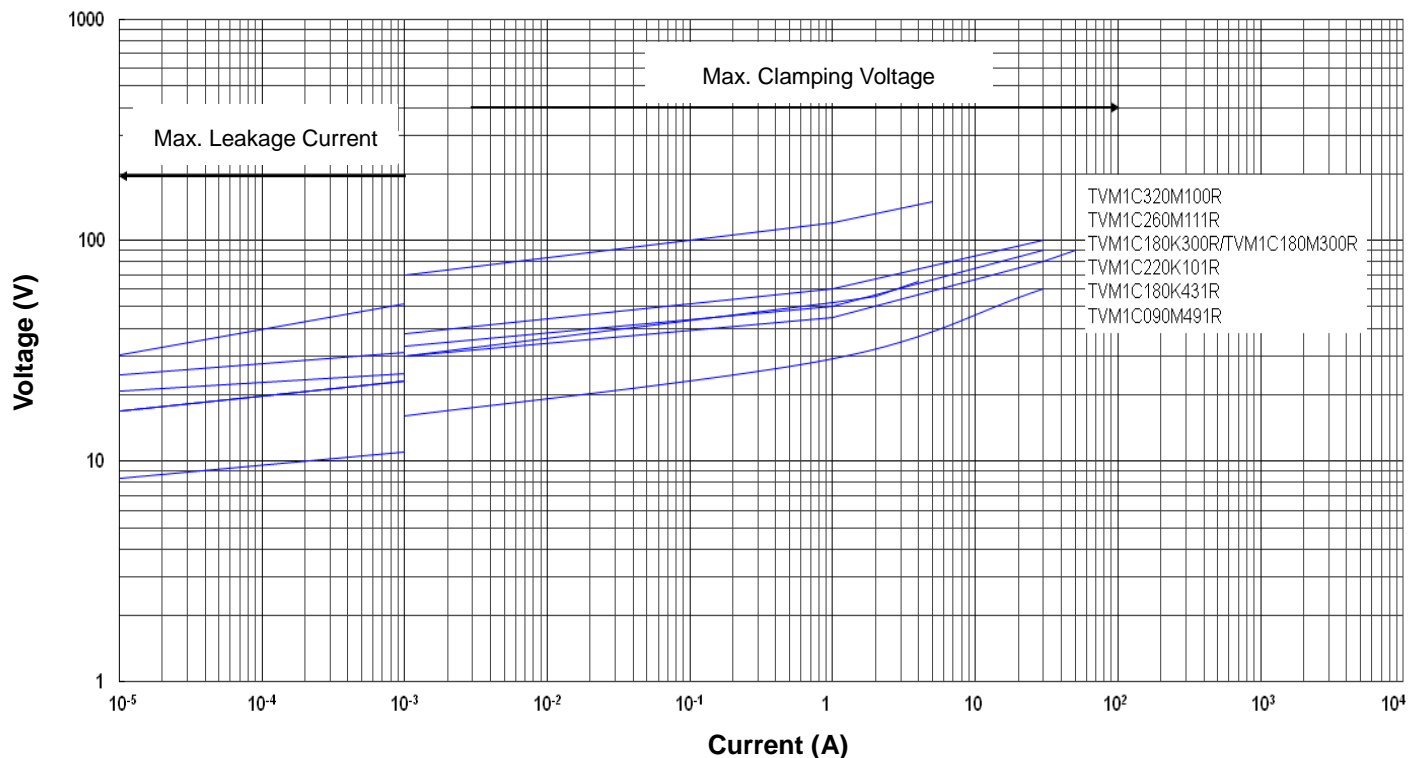
Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection

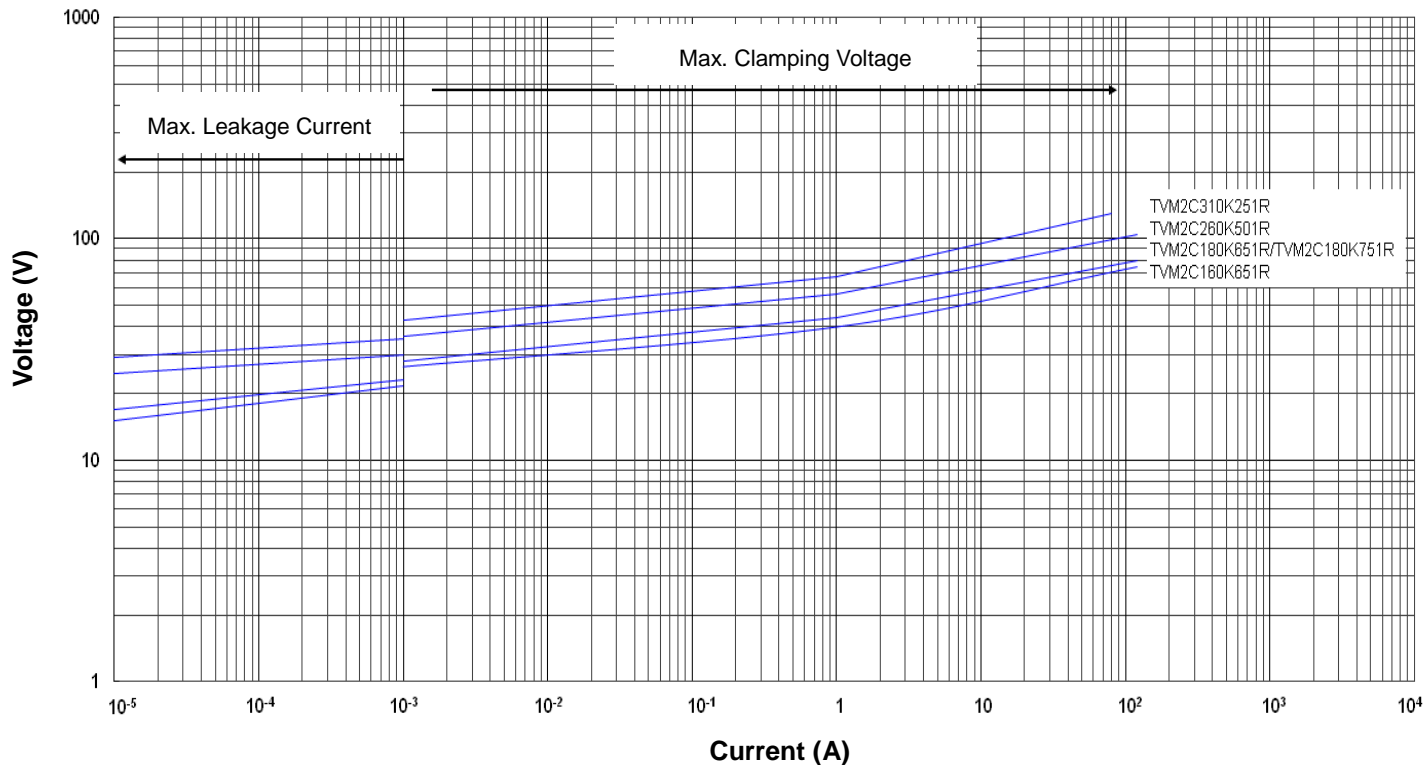


Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVM1C090M491R~TVM1C320M100R)



Max. Leakage Current and Max. Clamping Voltage Curves (TVM2C160K651R~TVM2C310K251R)



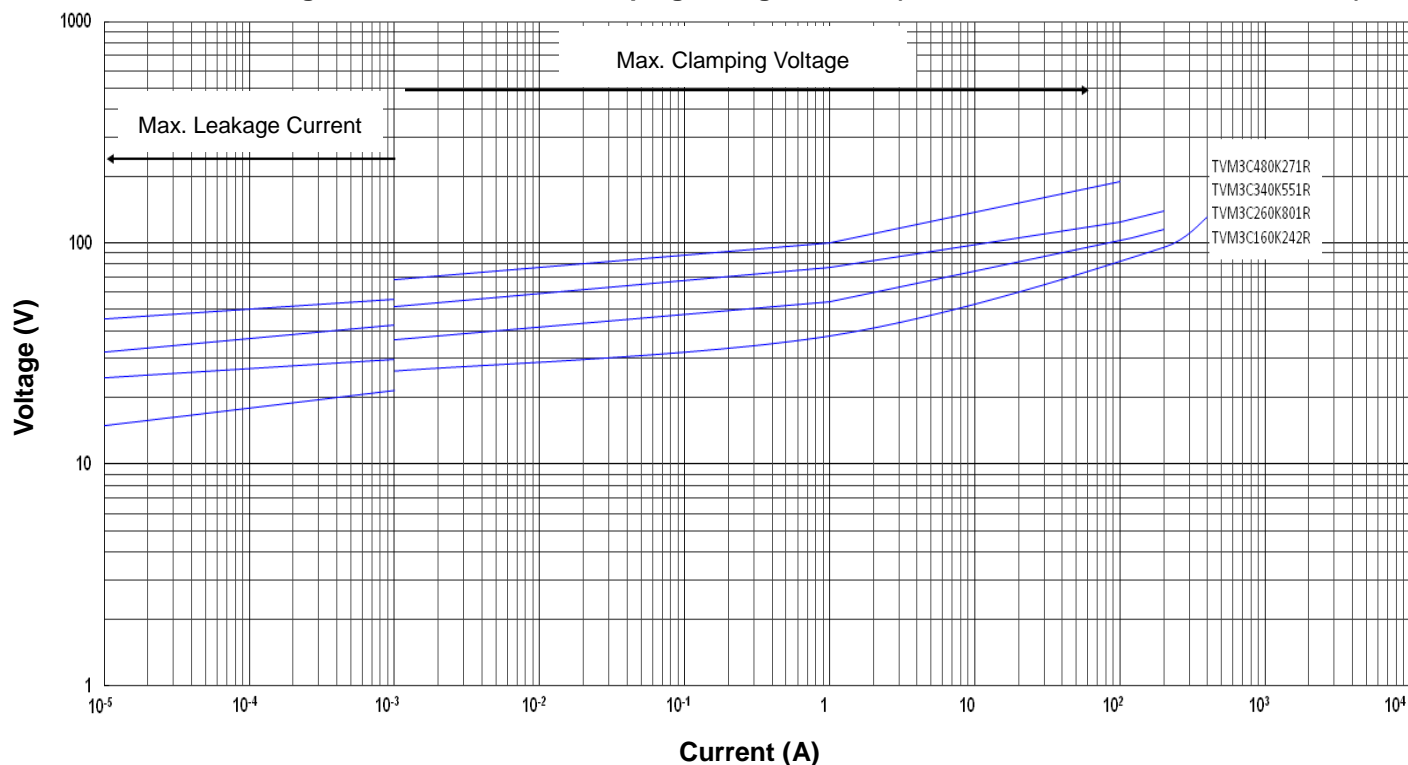
Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection

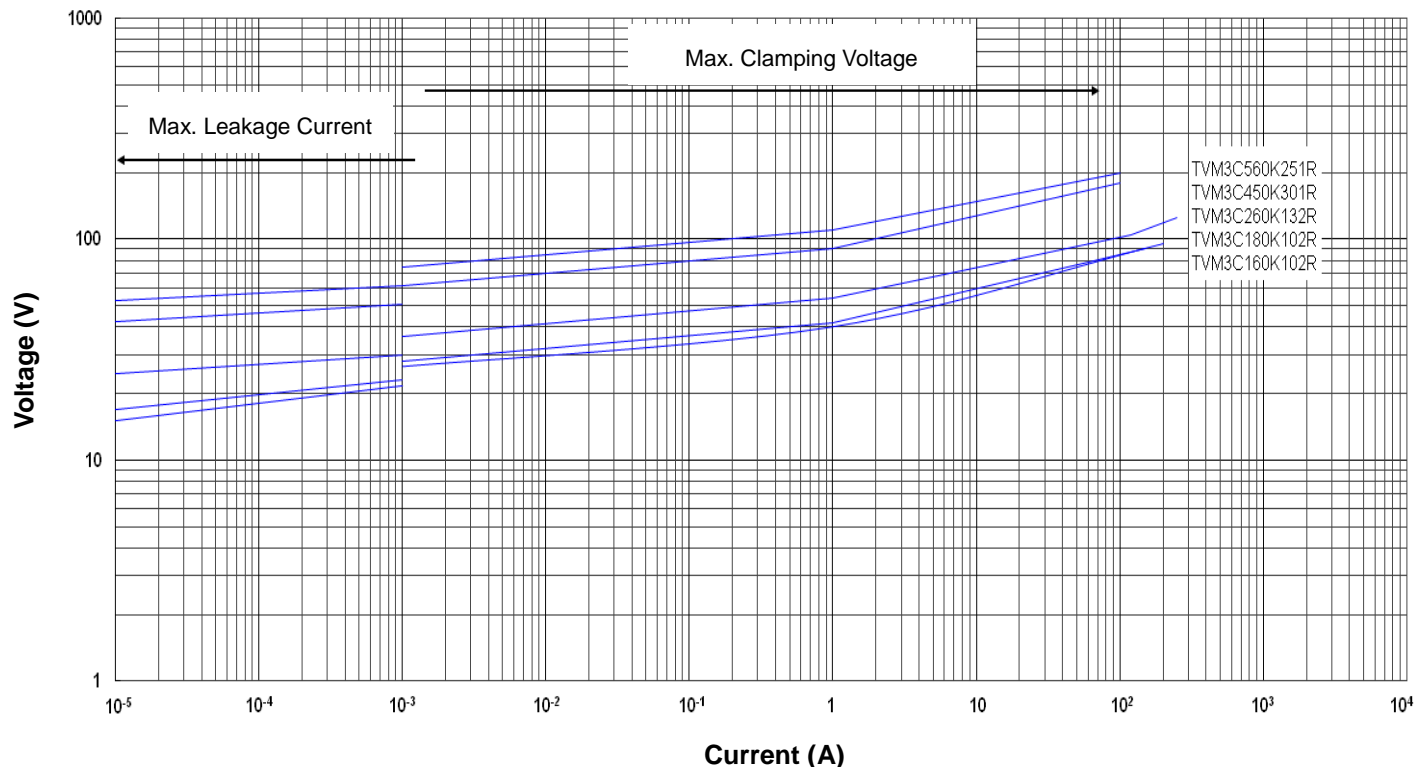


Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVM3C160K242R~TVM3C480K271R)



Max. Leakage Current and Max. Clamping Voltage Curves (TVM3C160K102R~TVM3C560K251R)



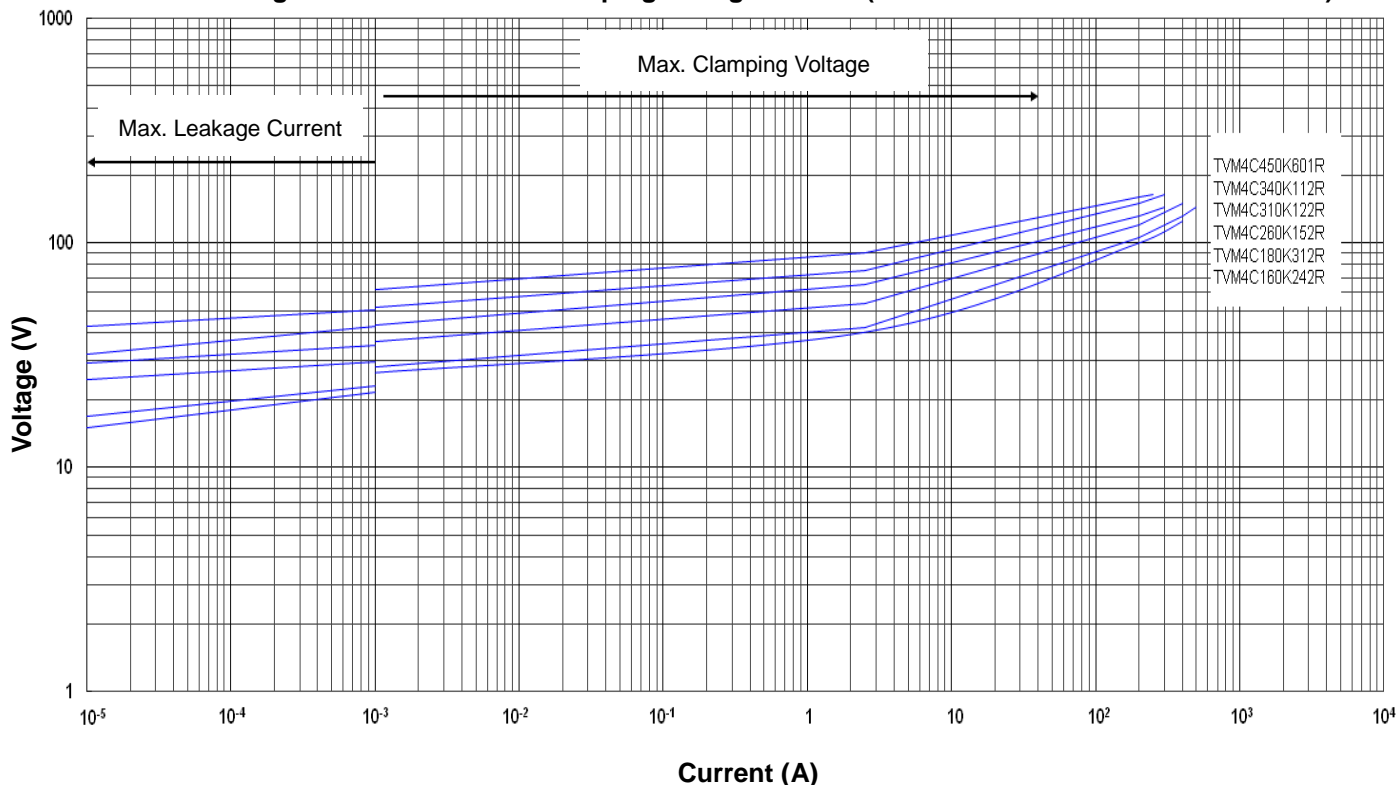
Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection

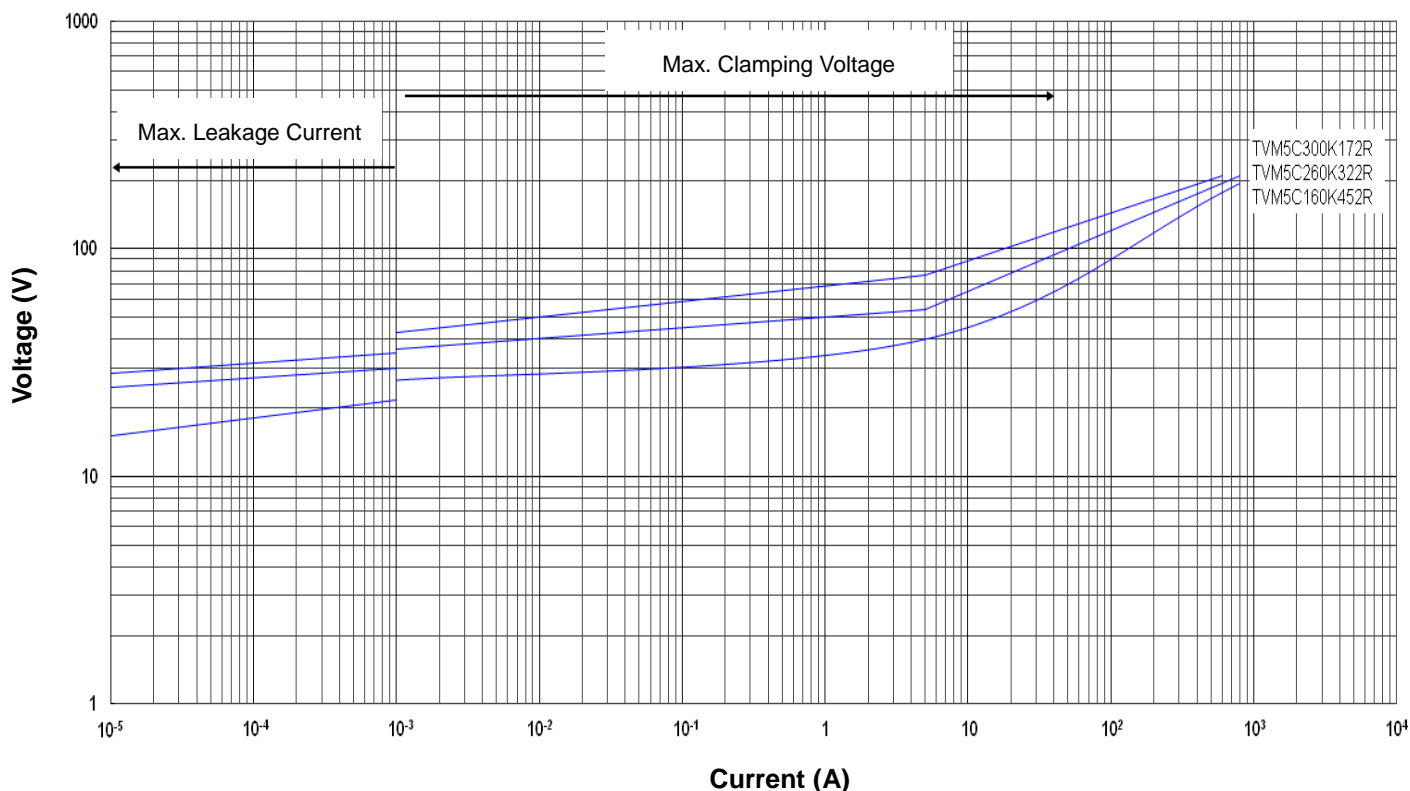


Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVM4C160K242R~TVM4C560K601R)



Max. Leakage Current and Max. Clamping Voltage Curves (TVM5C160K452R~TVM5C300K172R)



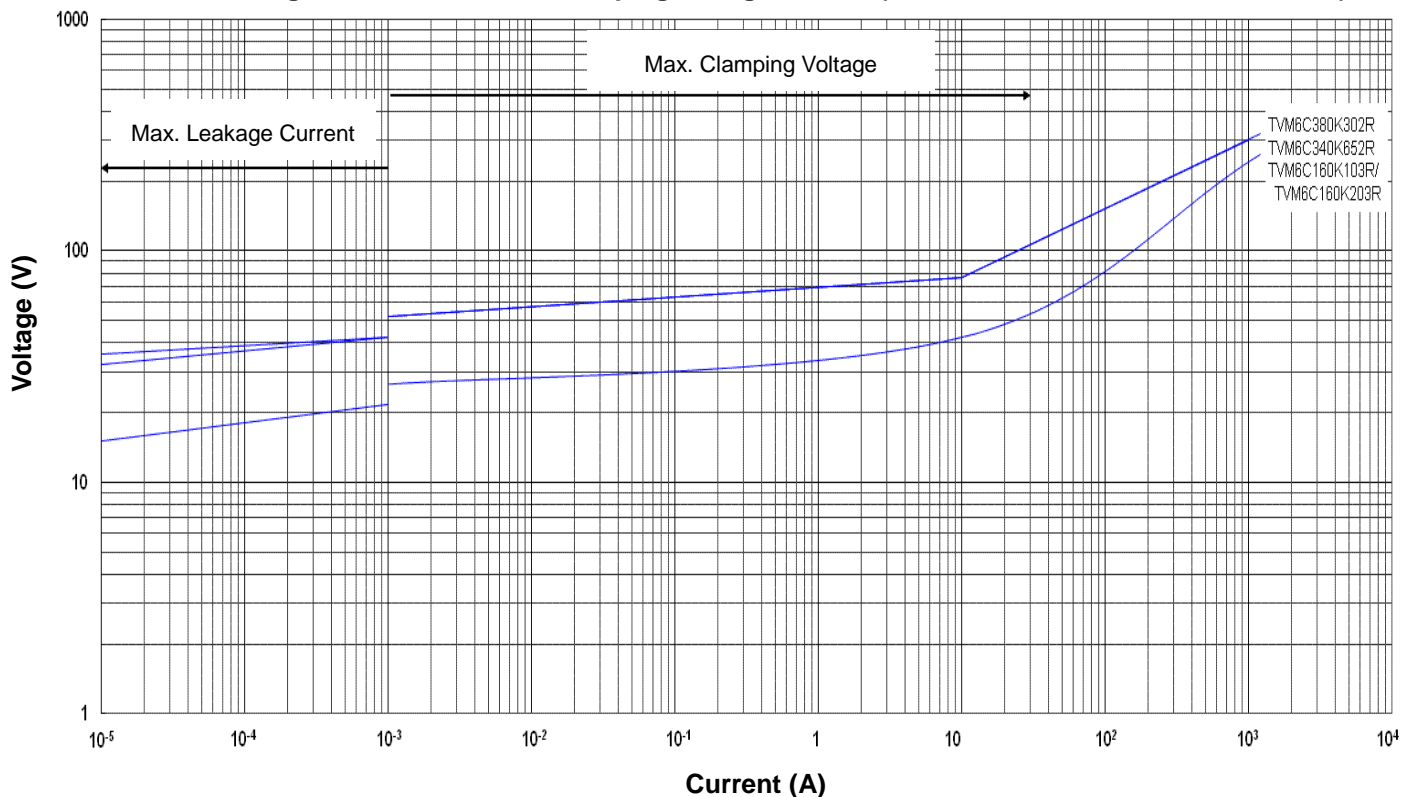
Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection

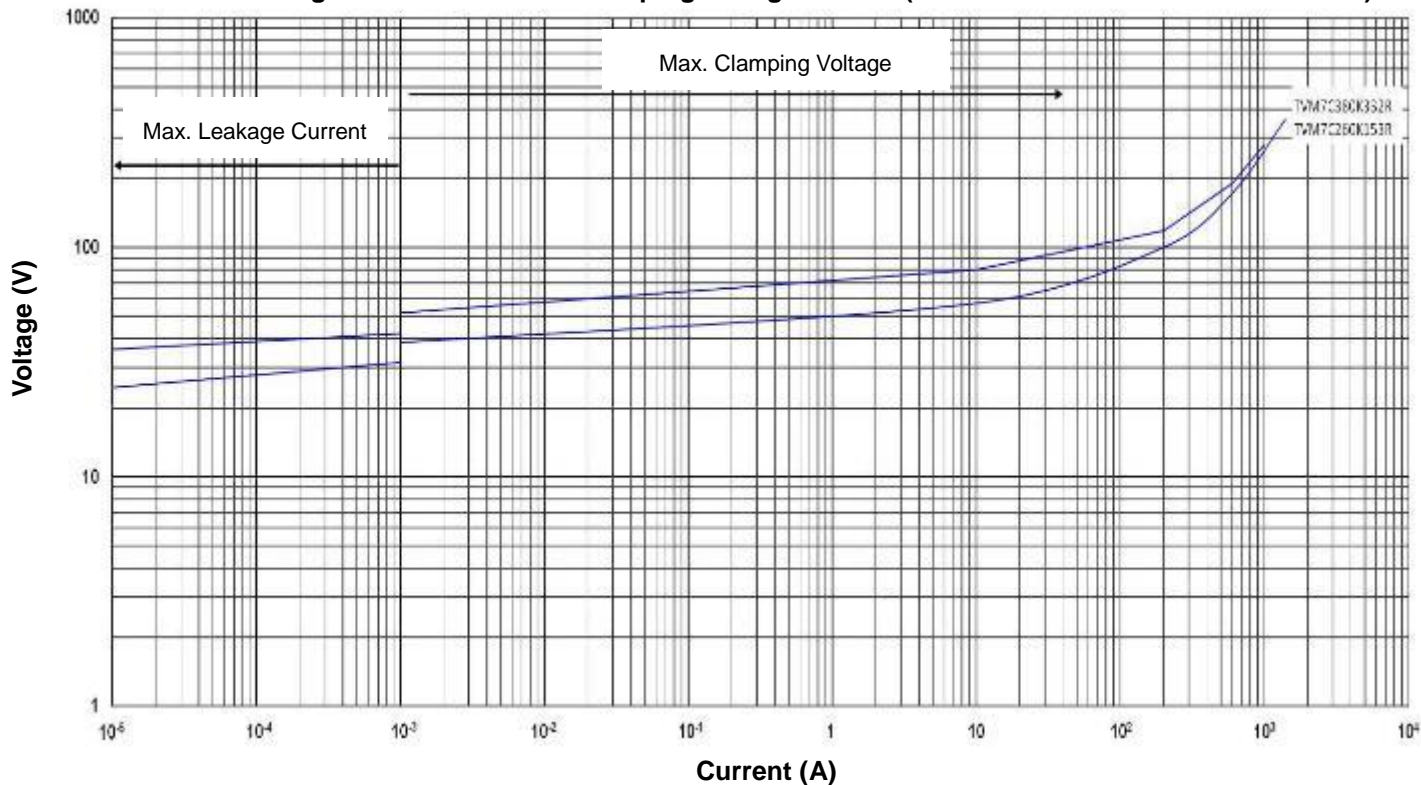


Max. Leakage Current and Max. Clamping Voltage Curves

Max. Leakage Current and Max. Clamping Voltage Curves (TVM6C160K203R~TVM6C380K302R)



Max. Leakage Current and Max. Clamping Voltage Curves (TVM7C260K153R~TVM7C380K332R)



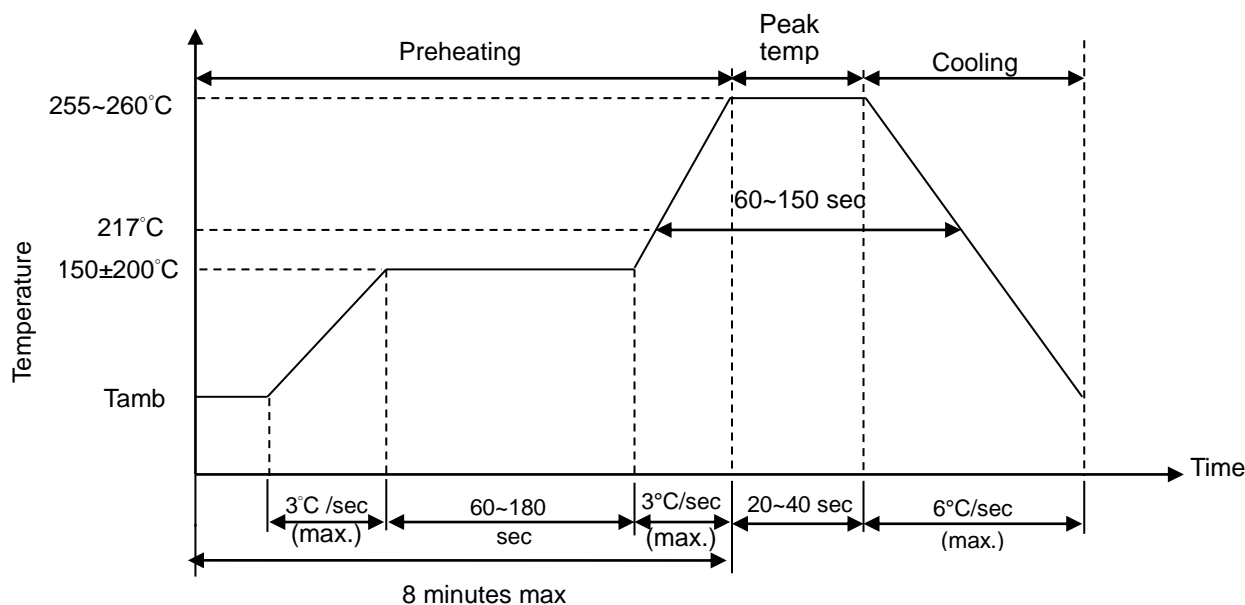
Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



■ Soldering Recommendation

● IR-Reflow Soldering Profile



● Reworking Conditions with Soldering Iron

Item	Conditions
Temperature of Soldering Iron-tip	360°C (max.)
Soldering Time	3 sec (max.)
Diameter of Soldering Iron-tip	Φ 3mm (max.)

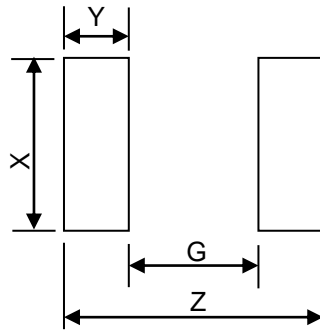
Caution: Do not touch the component surface with soldering iron directly to prevent it from damage.

Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



■ Recommended Soldering Pad Dimensions



Size	Z (mm)	G (mm)	X (mm)	Y (mm)
0402	1.7	0.5	0.6	0.6
0603	2.8	0.8	1.0	1.0
0805	3.4	1.0	1.4	1.2
1206	4.5	2.1	1.8	1.2
1210	4.5	2.1	2.8	1.2
1812	6.0	3.0	3.6	1.5
2220	7.2	4.2	5.5	1.5
3025	11.7	8.7	6.8	1.5

Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



■ Reliability (based on AEC-Q200 Rev-C)

Item	Standard	Test conditions / Methods	Specifications																																										
High Temperature Exposure (Storage)	MIL-STD-202 Method 108	Test temp. : 150 +3/-0°C Duration: 1000 h Unpowered Measurement at 24±2 hours after test conclusion.	No visible damage $\Delta V_{1mA}/V_{1mA}$ ≤ 10%																																										
Temperature Cycling	JESD22 Method JA-104	Lower test temp. : -40 +0/-3°C Upper test temp. : 125 +3/-0°C Soak time at lower or upper temp. : 1 min Cycle time: 2 Cycles/hr Number of cycles: 1000 Measurement at 24±2 hours after test conclusion.	No visible damage $\Delta V_{1mA}/V_{1mA}$ ≤ 10%																																										
Moisture Resistance	MIL-STD-202 Method 106	Duration of 1 cycle: 24 h Number of cycles: 10, Unpowered Measurement at 24±2 hours after test conclusion. <table border="1"> <thead> <tr> <th rowspan="2">Step</th> <th colspan="2">Temp. (°C)</th> <th rowspan="2">Humidity (%)</th> <th rowspan="2">Period (hr)</th> </tr> <tr> <th>Start</th> <th>Finish</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>25</td> <td>65</td> <td>90~100</td> <td>2.5</td> </tr> <tr> <td>2</td> <td>65</td> <td>65</td> <td>90~100</td> <td>3</td> </tr> <tr> <td>3</td> <td>65</td> <td>25</td> <td>80~100</td> <td>2.5</td> </tr> <tr> <td>4</td> <td>25</td> <td>65</td> <td>90~100</td> <td>2.5</td> </tr> <tr> <td>5</td> <td>65</td> <td>65</td> <td>90~100</td> <td>3</td> </tr> <tr> <td>6</td> <td>65</td> <td>25</td> <td>80~100</td> <td>2.5</td> </tr> <tr> <td>7</td> <td>25</td> <td>25</td> <td>80~100</td> <td>8</td> </tr> </tbody> </table>	Step	Temp. (°C)		Humidity (%)	Period (hr)	Start	Finish	1	25	65	90~100	2.5	2	65	65	90~100	3	3	65	25	80~100	2.5	4	25	65	90~100	2.5	5	65	65	90~100	3	6	65	25	80~100	2.5	7	25	25	80~100	8	No visible damage $\Delta V_{1mA}/V_{1mA}$ ≤ 10%
Step	Temp. (°C)			Humidity (%)	Period (hr)																																								
	Start	Finish																																											
1	25	65	90~100	2.5																																									
2	65	65	90~100	3																																									
3	65	25	80~100	2.5																																									
4	25	65	90~100	2.5																																									
5	65	65	90~100	3																																									
6	65	25	80~100	2.5																																									
7	25	25	80~100	8																																									
Biased Humidity	MIL-STD-202 Method 103	Test temp. : 85°C Rel. humidity of air: 85% Duration: 1000 h Bias at Working Voltage Vdc. Measurement at 24±2 hours after test conclusion.	No visible damage $\Delta V_{1mA}/V_{1mA}$ ≤ 10%																																										

Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



Item	Standard	Test conditions / Methods	Specifications
Operational Life	MIL-STD-202 Method 108	Test temp.: 125 +3/-0°C Duration: 1000 h Bias at Working Voltage Vdc. Measurement at 24±2 hours after test conclusion.	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
External Visual	MIL-STD-883 Method 2009	Inspect device construction, marking and workmanship.	No visible damage
Physical Dimension	JESD22 Method JB-100	Verify physical dimensions to the applicable device specification.	Within the specified values
Resistance to Solvents	MIL-STD-202 Method 215	Per MIL-STD-202 Method 215 Solvent 1: 1 part (by volume) of isopropyl alcohol 3 part (by volume) of mineral spirits.	No visible damage
Mechanical Shock	MIL-STD -202-213	Test Condition F Peak value: 1500g's Half sine Waveform Normal duration (D) : 0.5ms In 3 directions perpendicularly intersecting each other (total 18 times).	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Vibration	MIL-STD-202 Method 204	Acceleration: 5 g's Sweep time: 20 min Frequency range: 10 to 2000 Hz 3×12 cycles	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Resistance to Soldering Heat	MIL-STD-202 Method 210	Condition B No pre-heat of samples. Temperature: 260±5°C, Time : 10±1s Immersion and emersion rate : 25mm/s ±6 mm/s Number of heat cycles: 1	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 5\%$
Thermal Shock	MIL-STD-202 Method 107	Lower test temp. : -55 +0/-3°C Upper test temp. : 125 +3/-0°C Maximum transfer time: 20 seconds. Dwell time: 15 minutes. Air-Air. Number of cycles: 300	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$

Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



Item	Standard	Test conditions / Methods	Specifications
ESD	AEC-Q200 -002	Discharge capacitance: 150 pF Charging voltage: 6 KV Contact discharge 1 pulse in each polarity	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Solderability	IEC 60068-2- 58 J-STD-002	a) 4 h @ 155°C dry heat Dip @245±5°C 3±0.3sec b) Steam aging 8h±15min @93±3°C Dip @260±5°C 7±0.5sec	95% of termination wetted
Electrical Characterization	Specifications	V1mA(-55°C), V1mA(25°C), V1mA(125°C)	Within the specified values
Board Flex	AEC-Q200 -005 (JIS-C-6429)	Bend the board: 2mm (Min.) Duration: 60 (+5) Sec	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Terminal Strength	AEC-Q200 -006 (JIS-C-6429)	Apply force: 0402=0.5kg (5 N) 0603=1.0kg (10 N) Chip size>0805=1.8kg (17.7 N) Duration of the applied forces: 60 (+1) Sec	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 10\%$
Electrical Transient Conduction	ISO-7637-2	Test pulses 5a Number of pulses: 10 Test Energy: W _{LD} (Load dump)	No visible damage $ \Delta V_{1mA}/V_{1mA} \leq 15\%$

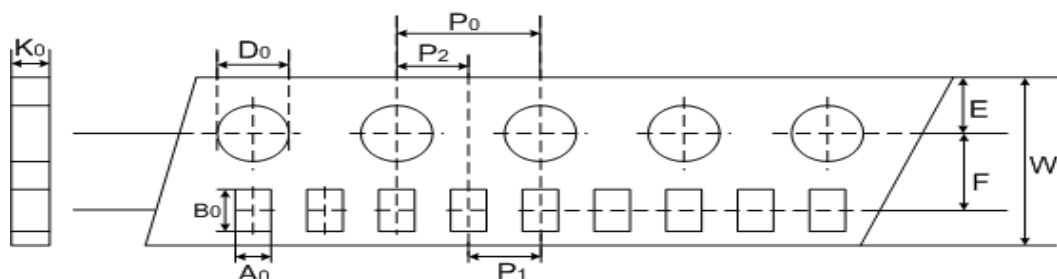
Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



■ Packaging

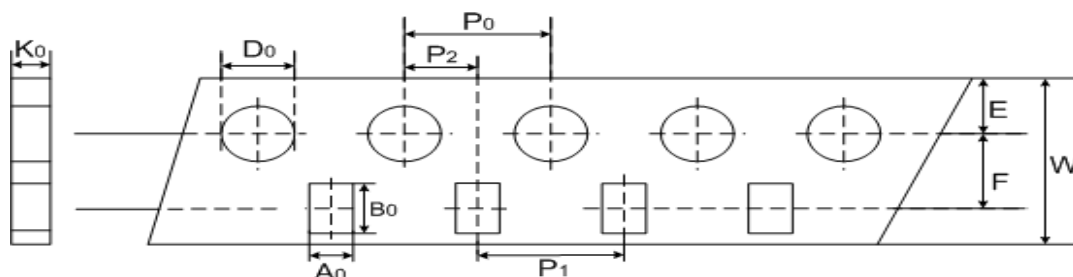
● Taping Specification (SMD 0402)



(Unit: mm)

Index Size	A_0	B_0	W	E	F	P_1	P_2	P_0	D_0	K_0
0402	± 0.05	± 0.12	± 0.2	± 0.1	± 0.05	± 0.1	± 0.05	± 0.1	± 0.1	± 0.1

● Taping Specification (SMD 0603 & 0805)



(Unit: mm)

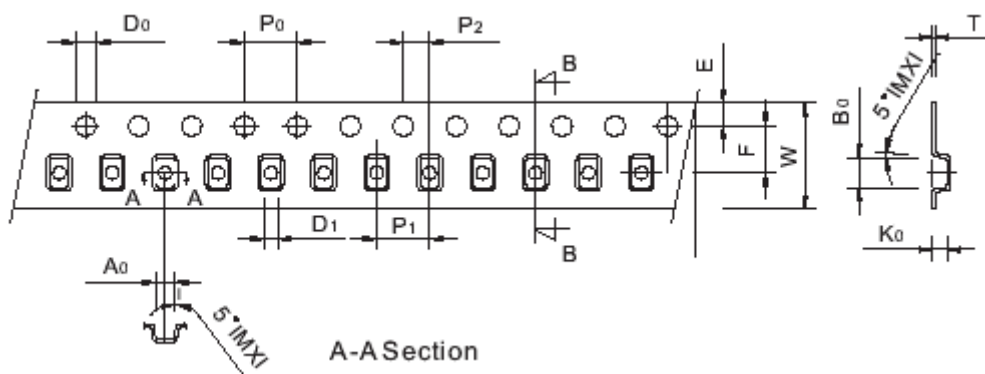
Index Size	A_0	B_0	W	E	F	P_1	P_2	P_0	D_0	K_0
0603	± 0.2	± 0.2	± 0.2	± 0.1	± 0.05	± 0.1	± 0.05	± 0.1	± 0.1	± 0.1
0805	1.5	2.3	8	1.75	3.5	4	2	4	1.55	1.0

Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection



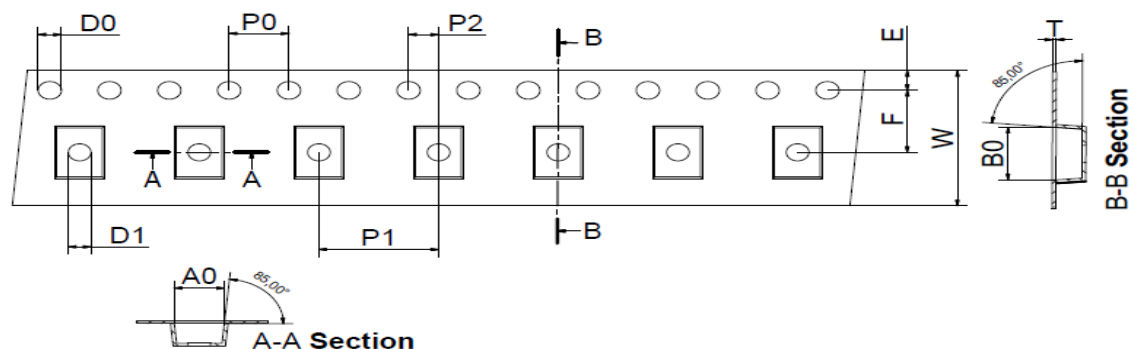
● Taping Specification(SMD 1206 & 1210)



(Unit: mm)

Index Size	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	D ₁	T
1206	±0.2	±0.2	±0.2	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1	±0.1
1210	2.75	3.55	8	1.75	3.5	4	2	4	1.55	1	0.25

● Taping Specification(SMD 1812 ~3025)



(Unit: mm)

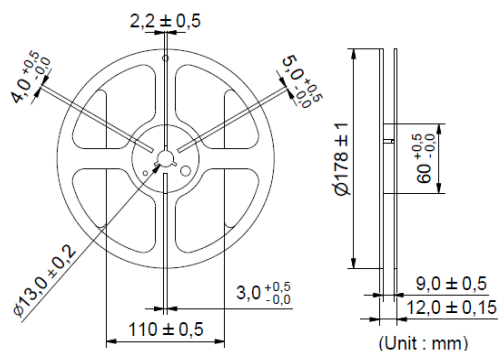
Index Size	A ₀	B ₀	W	E	F	P ₁	P ₂	P ₀	D ₀	D ₁	T
1812	±0.2	±0.2	±0.3	±0.1	±0.05	±0.1	±0.05	±0.1	±0.1	±0.1	±0.1
2220	3.65	4.96	12	1.75	5.5	8	2	4	1.55	1.5	0.25
3025	5.50	6.25	12	1.75	5.5	8	2	4	1.55	1.5	0.25
3025	6.75	8.30	16	1.75	5.5	8	2	4	1.55	1.6	0.3

Metal Oxide Varistor for Automotive: TVM-C Series

SMD Type for Transient Overvoltage Protection

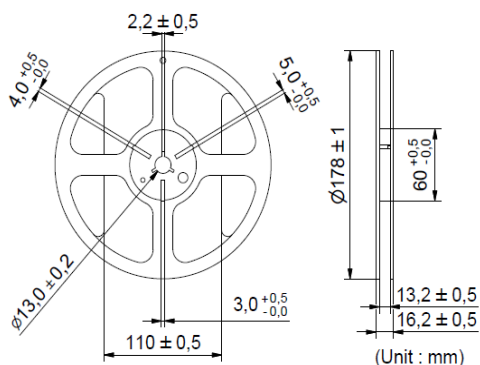


- Quantity
- ◆ 0402 ~ 1210



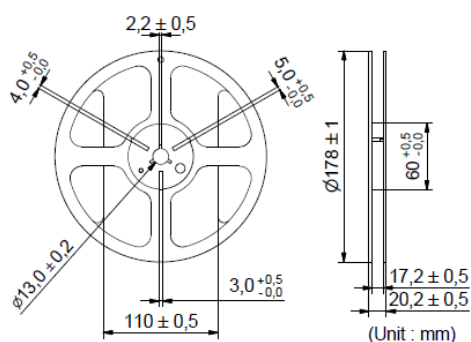
Type	Quantity (pcs/reel)
0402	10,000
0603	4,000
0805	3,000
1206	2,000
1210	2,000

- ◆ 1812~2220



Type	Quantity (pcs/reel)
1812	1,000
2220	800

- ◆ 3025



Type	Quantity (pcs/reel)
3025	800

■ 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