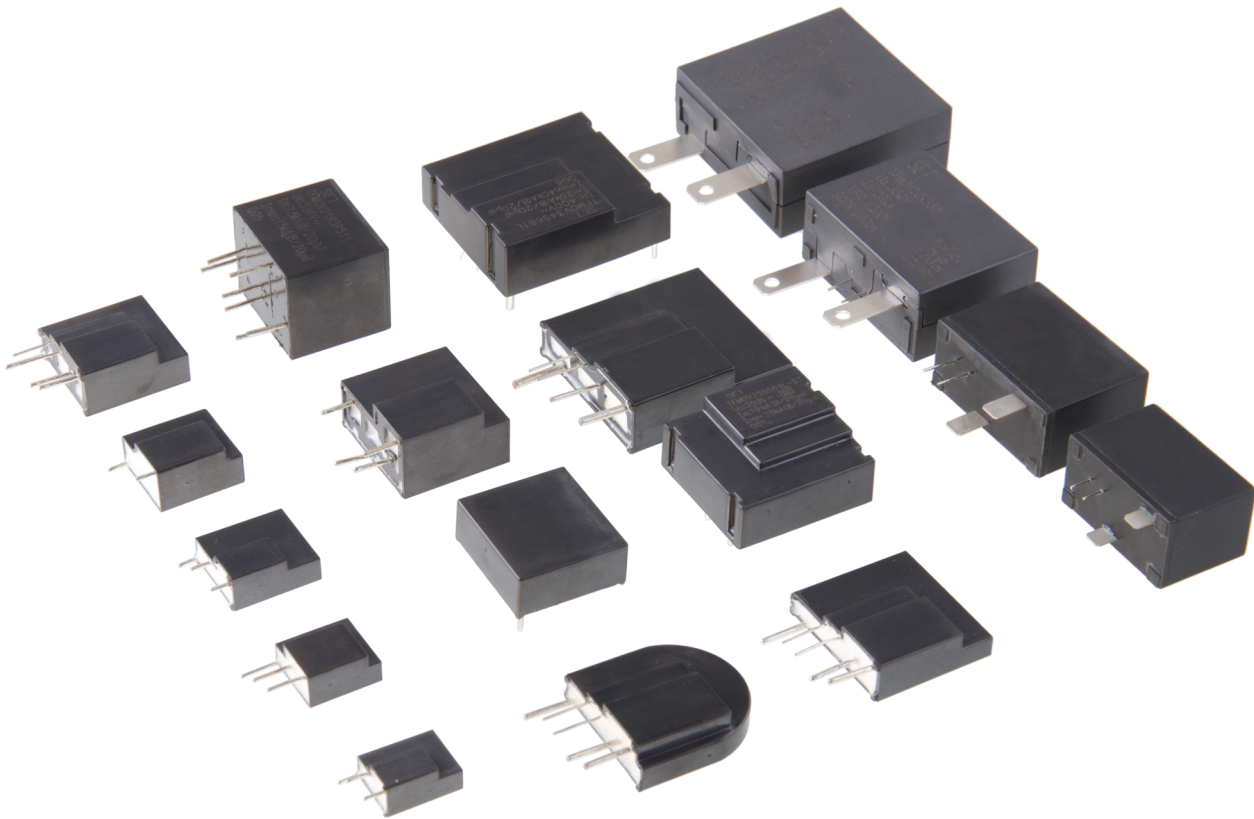


TFMOV

Thermal Fuse & MOV



Features

- Thermal Protection, High Reliability
- Small Size
- Remote Signal Contact for Failure Indication (Optional)
- High Energy Capacity
- Epoxy Sealing Material, Flame-retardant to V0 (UL 94)
- Comply with UL 1449 / IEC 61643-11

Applications

- Telecom Equipment
- String Inverter in Photovoltaic System
- AC / DC Power Supply
- Uninterruptable Power Supply (UPS)
- Surge Protective Device (SPD)
- Electric Meter
- Power Distribution Unit (PDU)

Thermal Fuse & MOV (TFMOV) Feature & Model List Overview

Rated Voltage U_n (V)	AC	DC	Nominal Discharge Current I_n (kA)							Maximum Continuous Operating Voltage U_n (V)		Model		
			1	1.5	2.5	3	4	5	AC	DC				
690V	600V		○	○	○	○	○	○	○	○	○	750	1000	
			○	○	○	○	○	○	○	○	○	680	895	
480V	400V		○	○	○	○	○	○	○	○	○	625	825	
			○	○	○	○	○	○	○	○	○	550	745	
347V	254		○	○	○	○	○	○	○	○	○	510	670	
			○	○	○	○	○	○	○	○	○	460	615	
220	277V		○	○	○	○	○	○	○	○	○	420	560	
			○	○	○	○	○	○	○	○	○	385	505	
230V	300V		○	○	○	○	○	○	○	○	○	350	460	
			○	○	○	○	○	○	○	○	○	320	415	
120	220V		○	○	○	○	○	○	○	○	○	300	385	
			○	○	○	○	○	○	○	○	○	275	350	
130V	110V		○	○	○	○	○	○	○	○	○	250	320	
			○	○	○	○	○	○	○	○	○	230	300	
110V	110V		○	○	○	○	○	○	○	○	○	210	275	
			○	○	○	○	○	○	○	○	○	190	250	
60V	60V		○	○	○	○	○	○	○	○	○	175	225	
			○	○	○	○	○	○	○	○	○	150	200	
48V	48V		○	○	○	○	○	○	○	○	○	140	180	
			○	○	○	○	○	○	○	○	○	130	170	
24V	24V		○	○	○	○	○	○	○	○	○	115	150	
			○	○	○	○	○	○	○	○	○	95	125	
12V	12V		○	○	○	○	○	○	○	○	○	75	100	
			○	○	○	○	○	○	○	○	○	60	85	
			○	○	○	○	○	○	○	○	50	65		
			○	○	○	○	○	○	○	○	40	56		
			○	○	○	○	○	○	○	○	35	45		
			○	○	○	○	○	○	○	○	30	38		
			○	○	○	○	○	○	○	○	25	31		
			○	○	○	○	○	○	○	○	20	26		
			○	○	○	○	○	○	○	○	17	22		

Thermal Fuse & MOV (TFMOV) Feature & Model List Overview

Rated Voltage U_n (V)	AC	DC	Model										Maximum Continuous Operating Voltage U_n (V)	
			7.5	8	10	10	10	10	10	10	15	15	AC	DC
690V	600V		TFMOV20S122x	○	○	○	TFMOV25D122x	TFMOV25S122x	○	○	○	○	750	1000
			TFMOV20S112x	○	○	○	TFMOV25D112x	TFMOV25S112x	○	○	○	○	680	895
480V	400V		TFMOV20S102x	○	○	○	TFMOV25D102x	TFMOV25S102x	○	○	○	○	625	825
			TFMOV20S911x	○	○	○	TFMOV25D911x	TFMOV25S911x	○	○	○	○	550	745
347V	300V		TFMOV20S821x	○	○	○	TFMOV25D821x	TFMOV25S821x	○	○	○	○	510	670
			TFMOV20S751x	○	○	○	TFMOV25D751x	TFMOV25S751x	○	○	○	○	460	615
220 - 230V	254 - 277V		TFMOV20S681x	TFMOV20S681Lx	○	○	TFMOV25D681x	TFMOV25S681x	TFMOV25S681Lx	○	○	○	420	560
			TFMOV20S621x	TFMOV20S621Lx	○	○	TFMOV25D621x	TFMOV25S621x	TFMOV25S621Lx	○	○	○	385	505
220 - 230V	300V		TFMOV20S561x	TFMOV20S561Lx	○	○	TFMOV25D561x	TFMOV25S561x	TFMOV25S561Lx	○	○	○	350	460
			TFMOV20S511x	TFMOV20S511Lx	○	○	TFMOV25D511x	TFMOV25S511x	TFMOV25S511Lx	○	○	○	320	415
110V	110V		TFMOV20S471x	TFMOV20S471Lx	○	○	TFMOV25D471x	TFMOV25S471x	TFMOV25S471Lx	○	○	○	300	385
			TFMOV20S431x	TFMOV20S431Lx	○	○	TFMOV25D431x	TFMOV25S431x	TFMOV25S431Lx	○	○	○	275	350
110V	220V		TFMOV20S391x	TFMOV20S391Lx	○	○	TFMOV25D391x	TFMOV25S391x	TFMOV25S391Lx	○	○	○	250	320
			TFMOV20S361x	TFMOV20S361Lx	○	○	TFMOV25D361x	TFMOV25S361x	TFMOV25S361Lx	○	○	○	230	300
110V	130V		TFMOV20S331x	TFMOV20S331Lx	○	○	TFMOV25D331x	TFMOV25S331x	TFMOV25S331Lx	○	○	○	210	275
			TFMOV20S301x	TFMOV20S301Lx	○	○	TFMOV25D301x	TFMOV25S301x	TFMOV25S301Lx	○	○	○	190	250
110V	110V		TFMOV20S271x	TFMOV20S271Lx	○	○	TFMOV25D271x	TFMOV25S271x	TFMOV25S271Lx	○	○	○	175	225
			TFMOV20S241x	TFMOV20S241Lx	○	○	TFMOV25D241x	TFMOV25S241x	TFMOV25S241Lx	○	○	○	150	200
48V	60V		TFMOV20S221x	TFMOV20S221Lx	○	○	TFMOV25D221x	TFMOV25S221x	TFMOV25S221Lx	○	○	○	140	180
			TFMOV20S201x	TFMOV20S201Lx	○	○	TFMOV25D201x	TFMOV25S201x	TFMOV25S201Lx	○	○	○	130	170
48V	60V		○	○	TFMOV25S181x	TFMOV25S181Lx	○	○	○	○	TFMOV20K181x	115	150	
			○	○	TFMOV25S151x	TFMOV25S151Lx	○	○	○	○	TFMOV20K151x	95	125	
36V	48V		○	○	TFMOV25S121x	TFMOV25S121Lx	○	○	○	○	TFMOV34S121x	75	100	
			○	○	TFMOV25S101x	TFMOV25S101Lx	○	○	○	TFMOV34S680Lx	TFMOV34S101x	60	85	
24V	24V		○	○	TFMOV25S820x	TFMOV25S820Lx	○	○	○	TFMOV34S560Lx	TFMOV34S820x	50	65	
			○	○	○	○	TFMOV34S680x	○	○	TFMOV34S470Lx	○	40	56	
12V	12V		○	○	○	○	TFMOV34S560x	○	○	○	○	35	45	
			○	○	○	○	TFMOV34S470x	○	○	○	○	30	38	
			○	○	○	○	○	○	○	○	25	31		
			○	○	○	○	○	○	○	○	20	26		
			○	○	○	○	○	○	○	○	17	22		

Thermal Fuse & MOV (TFMOV) Feature & Model List Overview

Rated Voltage U_n (V)	AC	DC	15	20 $I_{max} = 2.5I_n$	20	30	40	750	1000	Model	Maximum Continuous Operating Voltage U_n (V)			
											AC	DC		
690V	600V		○		○			○	○	TFMOV20K122x	○			
			○		○			○	○	TFMOV34S122x	○			
480V	400V		○		○			○	○	TFMOV20K112x	○			
			○		○			○	○	TFMOV34S112x	○			
347V	254		○		○			○	○	TFMOV20K102x	○			
			○		○			○	○	TFMOV34S102x	○			
220	277V		○		○			○	○	TFMOV20K911x	TFMOV20K550x	TFMOV34S911x	○	
			○		○			○	○	TFMOV40K911x	TFMOV40K550x	○		
230V	300V		○		○			○	○	TFMOV20K821x	○			
			○		○			○	○	TFMOV34S821x	○			
120	130V		○		○			○	○	TFMOV20K751x	TFMOV20K460x	TFMOV34S751x	○	
			○		○			○	○	TFMOV40K751x	TFMOV40K460x	○		
110V	110V		○		○			○	○	TFMOV20K681x	○			
			○		○			○	○	TFMOV34S681x	TFMOV34S681Lx	○		
48V	60V		○		○			○	○	TFMOV20K621x	○			
			○		○			○	○	TFMOV34S621x	TFMOV34S621Lx	○		
24V	24V		○		○			○	○	TFMOV20K561x	TFMOV20K350x	TFMOV34S561x	TFMOV34S561Lx	○
			○		○			○	○	TFMOV40K561x	TFMOV40K350x	○		
12V	12V		○		○			○	○	TFMOV20K511x	○			
			○		○			○	○	TFMOV34S511x	TFMOV34S511Lx	○		
48V	48V		○		○			○	○	TFMOV20K471x	○			
			○		○			○	○	TFMOV34S471x	TFMOV34S471Lx	○		
24V	24V		○		○			○	○	TFMOV20K431x	TFMOV20K300x	TFMOV34S431x	TFMOV34S431Lx	○
			○		○			○	○	TFMOV40K431x	TFMOV40K300x	○		
12V	12V		○		○			○	○	TFMOV20K391x	○			
			○		○			○	○	TFMOV34S391x	TFMOV34S391Lx	○		
12V	12V		○		○			○	○	TFMOV20K361x	○			
			○		○			○	○	TFMOV34S361x	TFMOV34S361Lx	○		
12V	12V		○		○			○	○	TFMOV20K331x	○			
			○		○			○	○	TFMOV34S331x	TFMOV34S331Lx	○		
12V	12V		○		○			○	○	TFMOV20K301x	○			
			○		○			○	○	TFMOV34S301x	TFMOV34S301Lx	○		
12V	12V		○		○			○	○	TFMOV20K271x	○			
			○		○			○	○	TFMOV34S271x	TFMOV34S271Lx	○		
12V	12V		○		○			○	○	TFMOV20K241x	TFMOV20K150x	TFMOV34S241x	TFMOV34S241Lx	○
			○		○			○	○	TFMOV40K241x	TFMOV40K150x	○		
12V	12V		○		○			○	○	TFMOV20K221x	○			
			○		○			○	○	TFMOV34S221x	TFMOV34S221Lx	○		
12V	12V		○		○			○	○	TFMOV20K201x	○			
			○		○			○	○	TFMOV34S201x	TFMOV34S201Lx	○		
12V	12V		○		○			○	○	○	○	TFMOV34S181x	TFMOV34S181Lx	○
			○		○			○	○	○	○	TFMOV40K181x	○	
12V	12V		○		○			○	○	○	○	TFMOV34S151x	TFMOV34S151Lx	○
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○			○	○	○	○	○	○	
12V	12V		○		○			○	○	○	○	○	○	
			○		○									

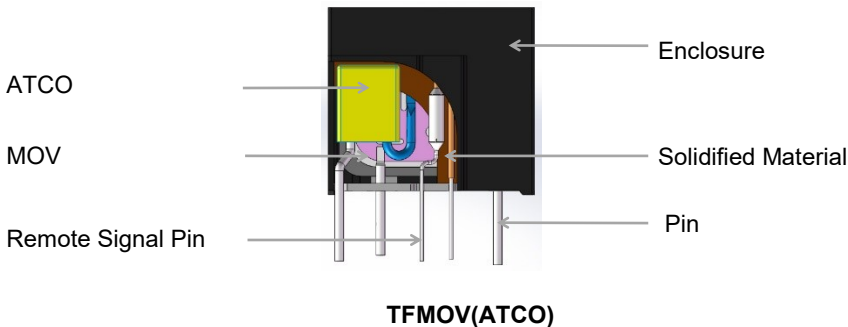
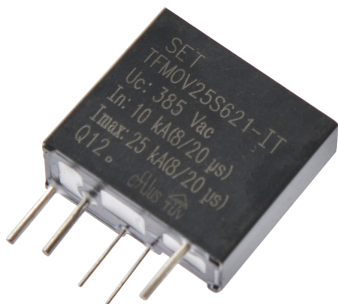
Thermal Fuse & MOV (TFMOV) Feature & Model List Overview

Rated Voltage U_n (V)	AC	DC	Nominal Discharge Current I_n (kA)						Maximum Continuous Operating Voltage U_n (V)		Model		
			2.5x2	5x2	7.5x2	2.5x3	5x3	7.5x3	AC	DC			
690V		600V									750	1000	
											680	895	
480V											625	825	
		400V									550	745	
347V											510	670	
											460	615	
		254									420	560	
220		277V									385	505	
											350	460	
230V		300V			TFMOV21R2P511					TFMOV21R3P511	320	415	
					TFMOV21R2P471					TFMOV21R3P471	300	385	
					TFMOV21R2P431					TFMOV21R3P431	275	350	
					TFMOV21R2P391					TFMOV21R3P391	250	320	
		120			TFMOV21R2P361					TFMOV21R3P361	230	300	
		130V			TFMOV21R2P331					TFMOV21R3P331	210	275	
					TFMOV21R2P301					TFMOV21R3P301	190	250	
					TFMOV21R2P271					TFMOV21R3P271	175	225	
		110V			TFMOV21R2P241					TFMOV21R3P241	150	200	
110V					TFMOV21R2P221					TFMOV21R3P221	140	180	
					TFMOV21R2P201					TFMOV21R3P201	130	170	
					TFMOV21R2P181					TFMOV21R3P181	115	150	
		60V			TFMOV21R2P151					TFMOV21R3P151	95	125	
48V					TFMOV21R2P121					TFMOV21R3P121	75	100	
		48V			TFMOV21R2P101					TFMOV21R3P101	60	85	
		36V			TFMOV21R2P820					TFMOV21R3P820	50	65	
					TFMOV21R2P680			TFMOV21R3P680			40	56	
24V		24V			TFMOV21R2P560			TFMOV21R3P560			35	45	
					TFMOV21R2P470			TFMOV21R3P470			30	38	
											25	31	
12V		12V									20	26	
											17	22	

TFMOV

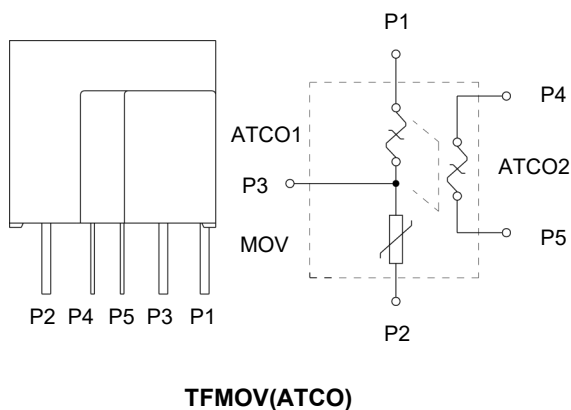
Thermal Fuse & MOV

Description



TFMOV is a combination of varistors (MOV) and thermal protection component. Since varistor has the characteristics of aging or degrading; TFMOV can separate the varistor from the main circuitry by opening the thermal protection component when the varistor (MOV) degrades or fails. It is often used in which requires high reliability and weather withstanding, such as photovoltaic inverters, communication equipment, and power supplies in data centers, etc.

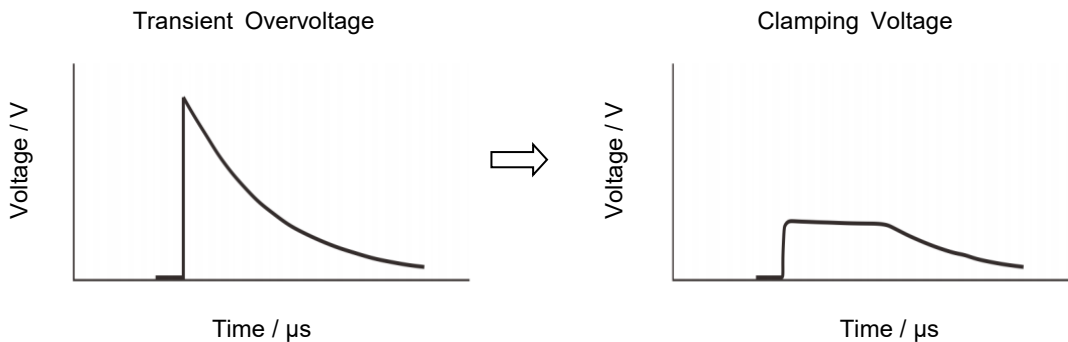
Schematics



TFMOV

Thermal Fuse & MOV

MOV Operation Principle



MOV Thermal Protection

Figure a is a surge protection circuit commonly used in power supplies. MOV is used to suppress the surge voltage and protect the subsequent circuit. There is a risk of burning when the varistor degrades or fails. In the high-reliability surge protection circuit of Figure b, in order to improve the safety of the circuit, a thermal protection varistor TFMOV is used as the surge voltage protection element. TFMOV is a combination of varistors (MOV) and thermal protection component. When the temperature of the MOV is abnormally exceeded, the thermal fuse will be opened first, so that the failure mode of the MOV appears to be open-circuit failure.

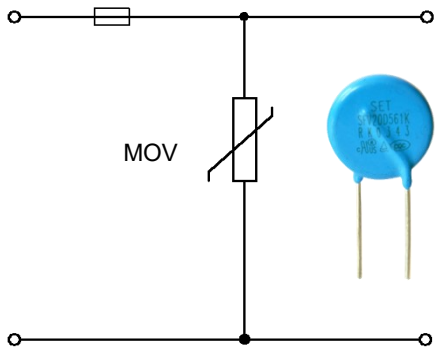


Figure a Typical surge protection circuit

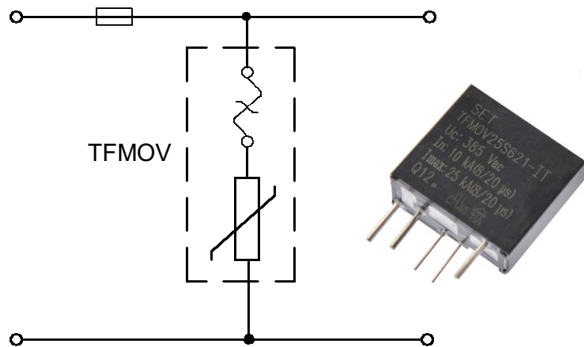
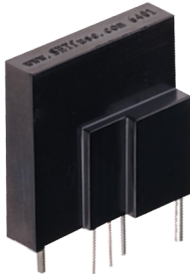


Figure b: High reliability surge protection circuit

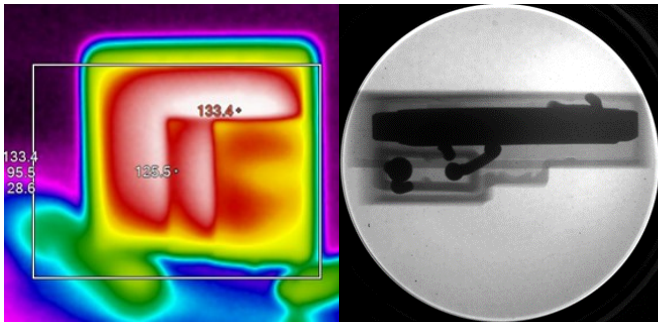
TFMOV

Thermal Fuse & MOV

Benefits



Safety

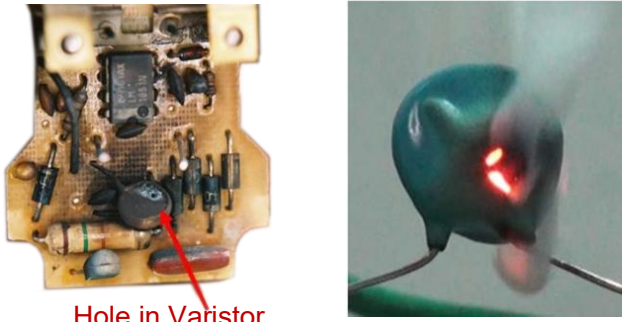


TFMOV Failure Simulation

During the electrical performance degrading of varistor, the inbuilt ATCO will open the circuit when the leakage current of varistor increases to tens of micro Amperes. As shown in the figure above, this is a safe open circuit failure.



Hidden Danger



MOV Failure Simulation

The electrical performance of varistor degrades with operating, mostly the varistor voltage drops, and leakage current increases. The heat accumulation can cause the temperature increase sharply and varistor results in thermal breakdown to short circuit status. It's very dangerous.

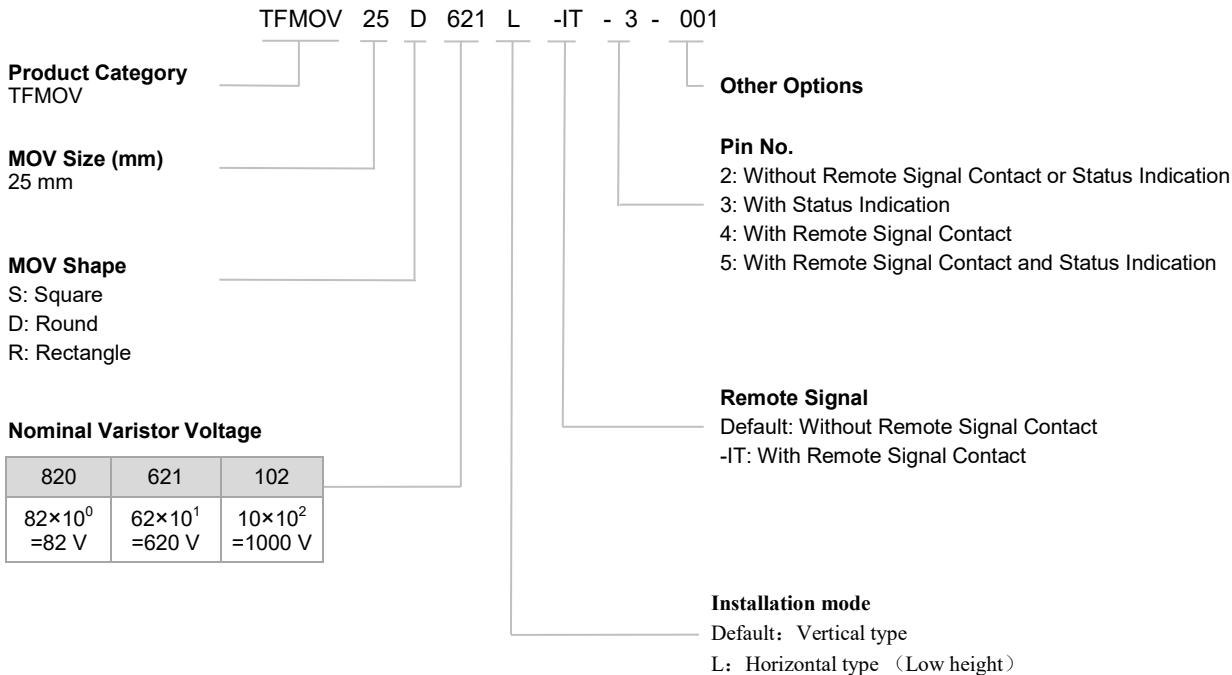
TFMOV

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Thermal Fuse & MOV

Part Numbering System

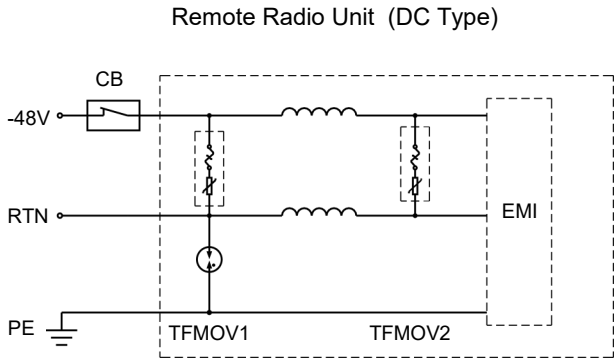
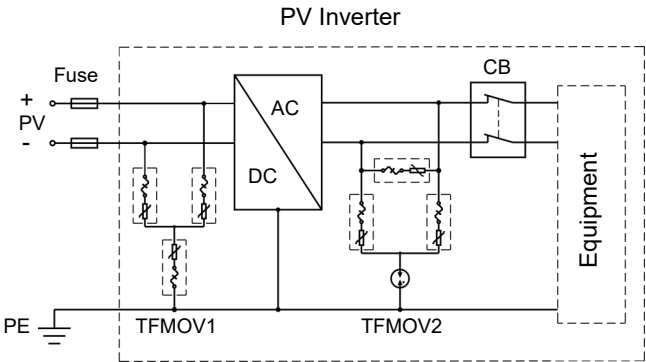


TFMOV

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Thermal Fuse & MOV



Design

When a single TFMOV surge capacity can't meet the requirement of customers, paralleling more TFMOVs is recommended. Due to its nonlinear current-voltage characteristics, please pay attention to below tips:

1. Use the TFMOV from the same manufacturer with same model to parallel.
2. Control the varistor voltage; Typically, the varistor voltage deviation should be less than 1% in the same group (between the Max and Min), and meet the next tip at the same time.
3. Calculate the average surge capacity for each TFMOV and keep a margin at least 10%.
4. Design the layout like Figure.2. to make sure the surge capacity is divided averagely.

The Design not Recommended

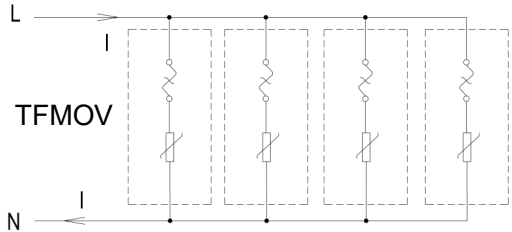


Figure .1

The Design Recommended

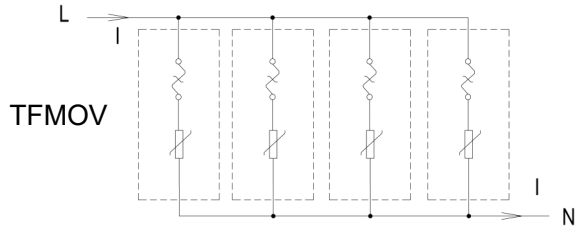


Figure .2





TFMOV

TFMOV

TFMOV

Thermal Fuse & MOV

Agency Information

Agency Information		Standards	NO.	Category
	UL	UL 1449 4th Edition	E322662	VZCA2
	CUL	CSA C22. 2 NO. 269, CSA ECN 516	E322662	VZCA8
	TUV	IEC/EN 61643-11, IEC/EN 61643-31	See the different models for details	N/A
	CQC	GB 4943.1-2011, GB 8898-2011; GB/T 10193-1997, GB/T 10194-1997	See the different models for details	N/A

Patents

Name	Region	Category	Patent NO.
Varistor with In-built Alloy-Type Thermal Fuse	China	Patent for Invention	ZL 200510044661.5
A Protection Pluggable Module with Over Current、 Over Voltage、 and Over Temperature Protection Function	China	Utility Model	ZL 201020244488.X
A Varistor with Double Protection Function	China	Utility Model	ZL 201020255481.8
Surge Protection Module Applicable for Power Strip	China	Utility Model	ZL 201120107173.5
A Surge Protection Module Applicable for Power Strip	China	Patent for Invention	ZL 201110092261.7
A New Type of Varistor and Surge Protective Device with Thermal Protection	China	Utility Mode	ZL 201420306127.1
A Surge Protective Device	China	Utility Modeel	ZL 201420415059.2
A Varistor and Thermal Protection Component Combination	China	Utility Mode	ZL 201520376567.9
合金型温度ヒューズ付のバリスタ	Japan	Utility Mode	3142835
Varistor with an Alloy-Type Temperature Fuse	Australia	Utility Mode	2007100456
Varistor with an Alloy-Type Temperature Fuse	Taiwan	Utility Model	M 300855
Varistor with an Alloy-type Temperature Fuse	Canada	Patent for Invention	2588819
Metal Oxide Varistor with Built-in Alloy-Type Temperature Fuse	USA	Patent for Invention	US 8780521
Varistor with In-built Alloy Type Thermal Fuse (with Housing)	USA	Patent for Invention	US 9355763

TFMOV

Thermal Fuse & MOV

Glossary

Item	Description
V_N	Nominal Varistor Voltage Voltage, at specified d.c. current used as a reference point in the component characteristic.
8/20 μ s	8/20 Current Impulse Current impulse with a nominal virtual front time of 8 μ s and a nominal time to half-value of 20 μ s. — (IEC 61643-11)
1.2/50 μ s	1.2/50 Voltage Impulse Voltage impulse with a nominal virtual front time of 1.2 μ s and a nominal time to half-value of 50 μ s. — (IEC 61643-11)
U_c	Maximum Continuous Operating Voltage Maximum r.m.s. voltage, which may be continuously applied to the SPD's mode of protection. — (IEC 61643-11)
I_n	Nominal Discharge Current Crest value of the current through the SPD having a current waveshape of 8/20 μ s. — (IEC 61643-11)
I_{imp}	Impulse Discharge Current for Class I Test Crest value of a discharge current through the SPD with specified charge transfer Q and specified energy W/R in the specified time. — (IEC 61643-11)
I_{max}	Maximum Discharge Current Crest value of a current through the SPD having an 8/20 μ s waveshape and magnitude according to the manufacturers specification. I_{max} is equal to or greater than I_n . — (IEC 61643-11)
V_c	Clamping Voltage Peak voltage developed across the varistor terminations under standard atmospheric conditions, when passing an 8/20 μ s class current pulse.
C_v	Capacitance Capacitance across the MOV measured at a specified frequency and voltage.
Modes of protection	Modes of protection An intended current path, between terminals that contains protective components, e.g. line-to-line, line-to-earth, line-to-neutral, neutral-to-earth. — (IEC 61643-11)
U_p	Voltage Protection Level Maximum voltage to be expected at the SPD terminals due to an impulse stress with defined voltage steepness and an impulse stress with a discharge current with given amplitude and wave shape. — (IEC 61643-11)
TCO	Thermal-Link A non-resettable device incorporating a THERMAL ELEMENT which will open a circuit once only when exposed for a sufficient length of time to a temperature in excess of that for which it has been designed.
ATCO	Alloy Thermal-Link Alloy Type Thermal-Link, Alloy is the thermal element.

TFMOV

Thermal Fuse & MOV



ATTENTION

Usage

1. Frequency range is from 47 Hz to 63 Hz.
2. The voltage applied continuously to the TFMOV can not exceed its maximum continuous operating voltage U_c .
3. When atmosphere press is from 80 kPa to 106 kPa, the related altitude shall be from 2000 meters to - 500 meters.
4. Do not touch the product body or pins directly when power is on, to avoid electric shock.
5. Do not clean the TFMOV with strong polar solvent such as ketone, esters, benzene, halogenated hydrocarbon, to avoid damaging the enclosure.
6. It should have a reliable grounding when using these products.

Replacement

TFMOV is a non-repairable product. For safety sake, please use equivalent TFMOV for replacement.

Storage

Do not store TFMOV at high temperature, high humidity or corrosive gas environment. To avoid reducing the solderability of the pins, please use them up within 1 year after receiving the goods.

Installation Position

Do not install the TFMOV on a place that may often suffer severe continuous vibration.

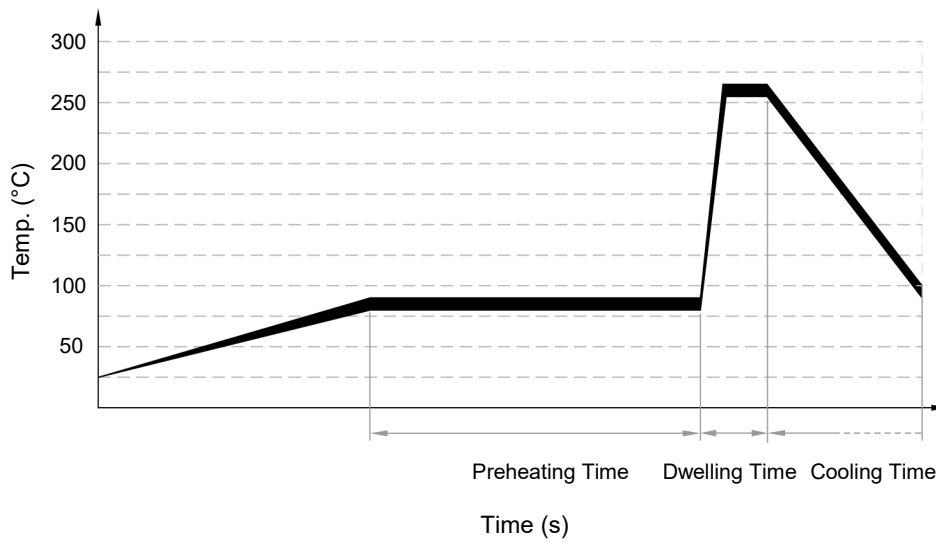
Mechanical Stress

Do not take violent action such as knocking when assembling to avoid mechanical damage.

TFMOV

Thermal Fuse & MOV

Wave Soldering Parameters (Reference)



Item	Temp. (°C)	Time (s)
Preheating	80 to 90	60 to 150
Dwelling	250 to 260	2 to 4

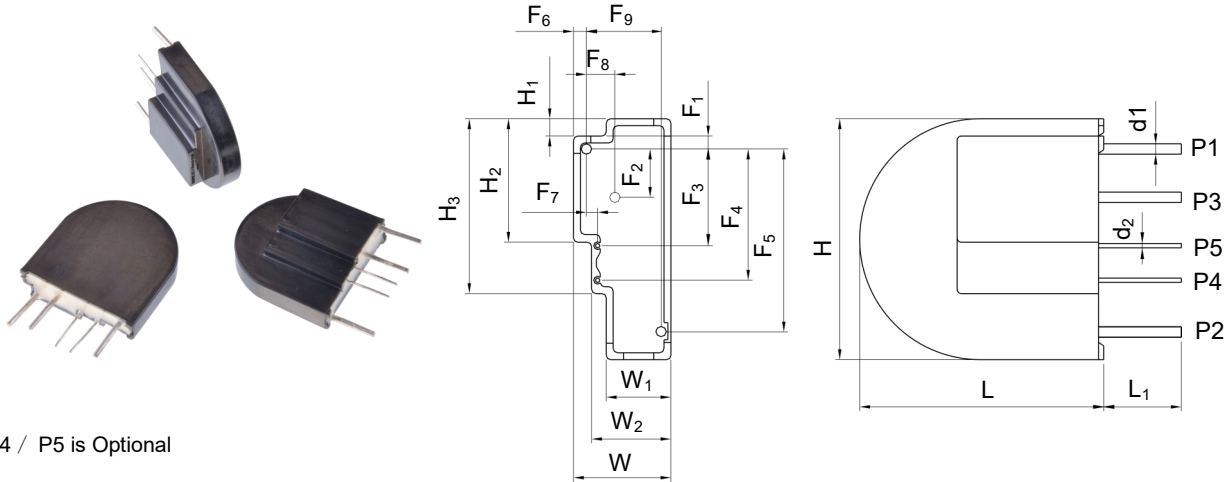
Recommended Hand-Soldering Parameters

Item	Condition
Iron Temperature	350 °C (Max.)
Soldering Time	4 seconds (Max.)
Distance between Soldering Point and the Bottom of Product	2 mm (Min.)

TFMOV

Thermal Fuse & MOV




TFMOV25D Series



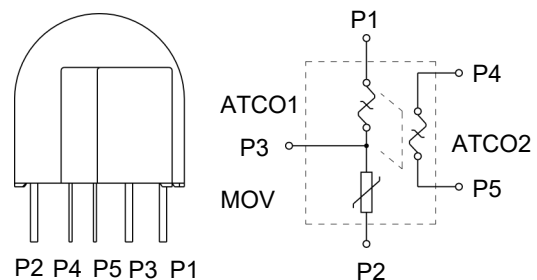
Note:
Pin P3 / P4 / P5 is Optional
Unit: mm

Nominal Varistor Voltage	L (±1.0)	L ₁ (±1.0)	W (±1.0)	W ₁ (±1.0)	W ₂ (±0.5)	H (±1.0)	H ₁ (±0.5)	H ₂ (±0.5)	H ₃ (±1.0)	d ₁ (-0.05,+0.15)
25D270 - 121	28.3	9.0	9.4	5.6	7.3	27.9	2.0	14.3	20.3	1.20
25D151 - 271	28.3	9.0	9.8	6.0	7.6	27.9	2.0	14.3	20.3	1.20
25D301 - 471	28.3	9.0	11.3	7.5	9.2	27.9	2.0	14.3	20.3	1.20
25D511 - 681	28.3	9.0	12.3	8.5	10.2	27.9	2.0	14.3	20.3	1.20
25D751 - 821	28.3	9.0	13.3	9.5	11.2	27.9	2.0	14.3	20.3	1.20
25D911 - 122	28.3	9.0	15.8	12.0	13.7	27.9	2.0	14.3	20.3	1.20
Nominal Varistor Voltage	d ₂ (±0.05)	F ₁ (±0.5)	F ₂ (±0.5)	F ₃ (±0.5)	F ₄ (±0.5)	F ₅ (±0.5)	F ₆ (±0.5)	F ₇ (±0.5)	F ₈ (±0.5)	F ₉ (±0.5)
25D270 - 121	0.50	1.5	5.6	11.2	15.2	21.2	1.5	1.3	3.3	6.9
25D151 - 271	0.50	1.5	5.6	11.2	15.2	21.2	1.5	1.3	3.3	7.3
25D301 - 471	0.50	1.5	5.6	11.2	15.2	21.2	1.5	1.3	3.3	8.8
25D511 - 681	0.50	1.5	5.6	11.2	15.2	21.2	1.5	1.3	3.3	9.8
25D751 - 821	0.50	1.5	5.6	11.2	15.2	21.2	1.5	1.3	3.3	10.8
25D911 - 122	0.50	1.5	5.6	11.2	15.2	21.2	1.5	1.3	3.3	13.3

Agency Approvals

Agency	Standards	No.
 UL US	UL1449	E322662
 TUV Rheinland	EN 61643-11	J 50210179
 CQC	GB 4943.1-2011 GB 8898-2011	CQC21001284843
Environment	RoHS & REACH	Compliant

Schematics



Specifications

Model	Max. Continuous Operating Voltage		Varistor Voltage @1 mA DC		Clamping Voltage (Max.)		Nominal Discharge Current (8/20 μs)	Max. Discharge Current (8/20 μs)	Voltage Clamping Ratio ^a		Max. Energy (Joule)	Typical Capacitance (Reference)	Thermal Fuse
	U _c		Min.	Max.	V _C	I _P	I _n	I _{max}	R _{cl}	I _n	10/1000 μs	@1 kHz	UL 60691 E214712
	(VAC)	(VDC)	(V)		(V)	(A)	(kA)			(kA)	(J)	(pF)	
TFMOV25D270x	17	22	24	31	53	30	1.5	3	4.6	1.5	30	26500	VT Series U _c :690 VAC I _n :15 A / 16 A
TFMOV25D330x	20	26	30	36	65	30	1.5	3	4.6	1.5	35	18000	
TFMOV25D390x	25	31	35	43	77	30	1.5	3	4.6	1.5	40	13500	
TFMOV25D470x	30	38	42	52	93	30	3	6	4.3	3	50	11500	
TFMOV25D560x	35	45	50	62	110	30	3	6	3.8	3	60	10500	
TFMOV25D680x	40	56	61	75	135	30	3	6	3.8	3	70	9050	
TFMOV25D820x	50	65	74	90	135	150	5	10	3.2	5	80	7700	
TFMOV25D101x	60	85	90	110	165	150	5	10	3.2	5	100	6300	
TFMOV25D121x	75	100	108	132	200	150	5	10	3.2	5	120	5200	
TFMOV25D151x	95	125	135	165	250	150	5	10	3.2	5	160	4300	
TFMOV25D181x	115	150	162	198	300	150	5	10	2.3	5	175	3500	
TFMOV25D201x	130	170	185	225	340	150	10	20	2.3	10	190	3200	
TFMOV25D221x	140	180	198	242	360	150	10	20	2.3	10	200	2900	
TFMOV25D241x	150	200	216	264	395	150	10	20	2.3	10	220	2650	
TFMOV25D271x	175	225	243	297	455	150	10	20	2.3	10	255	2400	
TFMOV25D301x	190	250	270	330	500	150	10	20	2.3	10	275	2100	
TFMOV25D331x	210	275	297	363	550	150	10	20	2.3	10	300	1900	
TFMOV25D361x	230	300	324	396	595	150	10	20	2.3	10	330	1750	
TFMOV25D391x	250	320	351	429	650	150	10	20	2.3	10	360	1600	
TFMOV25D431x	275	350	387	473	710	150	10	20	2.3	10	380	1500	
TFMOV25D471x	300	385	423	517	775	150	10	20	2.3	10	400	1400	
TFMOV25D511x	320	415	459	561	845	150	10	20	2.3	10	420	1250	
TFMOV25D561x	350	460	504	616	925	150	10	20	2.3	10	440	1150	
TFMOV25D621x	385	505	558	682	1025	150	10	20	2.3	10	450	1050	
TFMOV25D681x	420	560	612	748	1120	150	10	20	2.3	10	460	950	
TFMOV25D751x	460	615	675	825	1240	150	10	20	2.3	10	510	850	
TFMOV25D821x	510	670	738	902	1355	150	10	20	2.3	10	520	830	
TFMOV25D911x	550	745	819	1001	1500	150	10	20	2.3	10	620	730	
TFMOV25D102x	625	825	900	1100	1650	150	10	20	2.3	10	690	660	
TFMOV25D112x	680	895	990	1210	1815	150	10	20	2.3	10	760	600	
TFMOV25D122x	750	1000	1080	1320	1980	150	10	20	2.3	10	820	530	

Note:

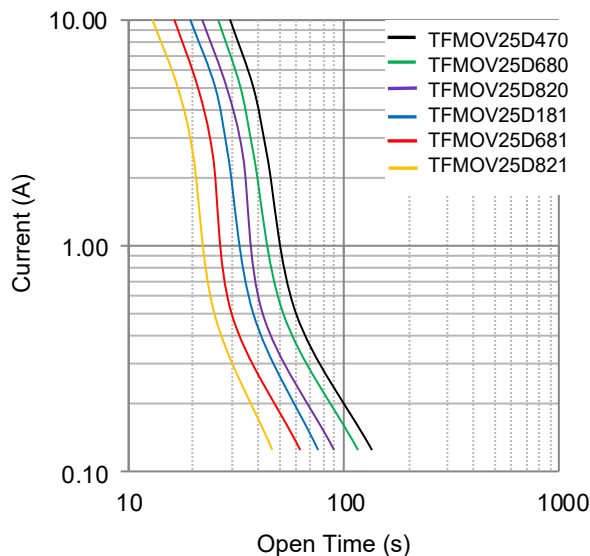
a: $R_{cl} = \frac{V_C}{I_n}$, $U_p \geq V_C$, V_C : Clamping Voltage (@ I_n), V_N : Varistor Voltage, U_p : Voltage Protection Level.

The Value of Voltage Protection Level (U_p) is determined according to IEC 61643-11:2011 clause 6.4.

Preferred values of voltage protection level (kV): 0.08, 0.09, 0.10, 0.12, 0.15, 0.22, 0.33, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 1.2, 1.5, 1.8, 2.0, 2.5, 3.0, 4.0, 5.0, 6.0, 8.0, 10.

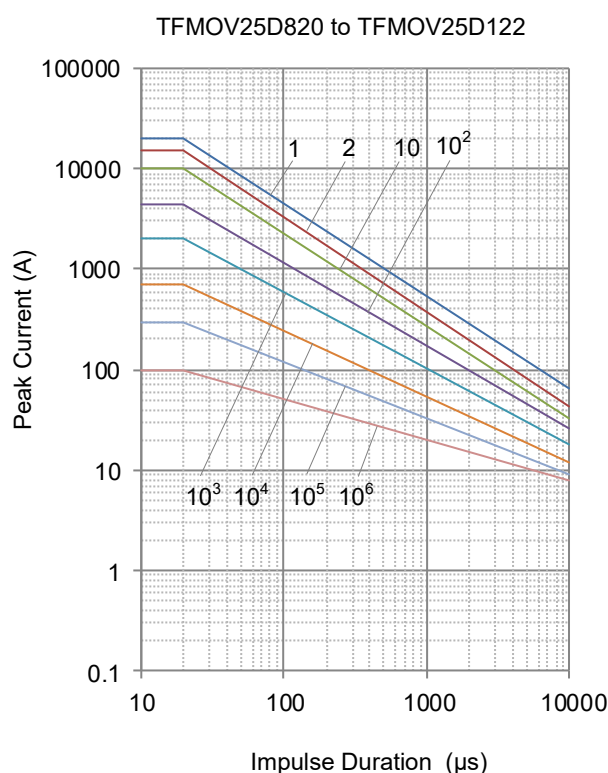
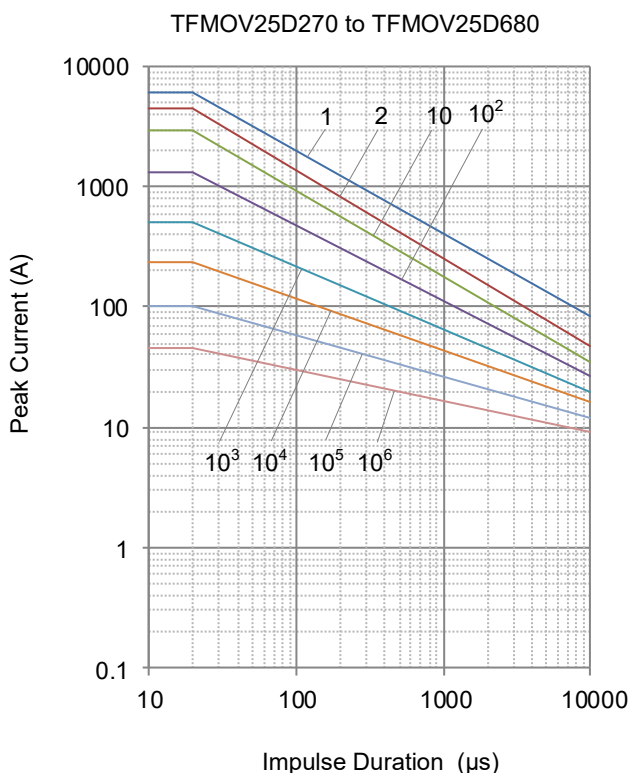
Performance Curve for Reference

Limited Current Test Curve (UL 1449 4th clause 44.4)



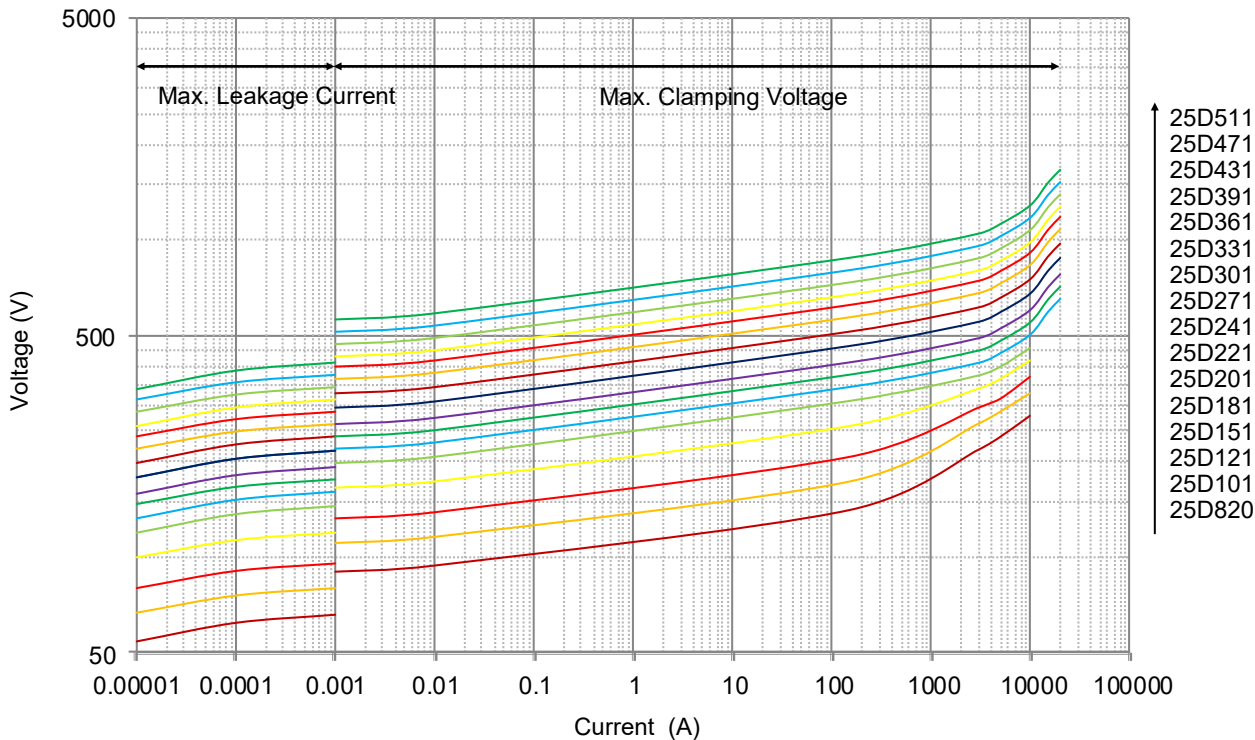
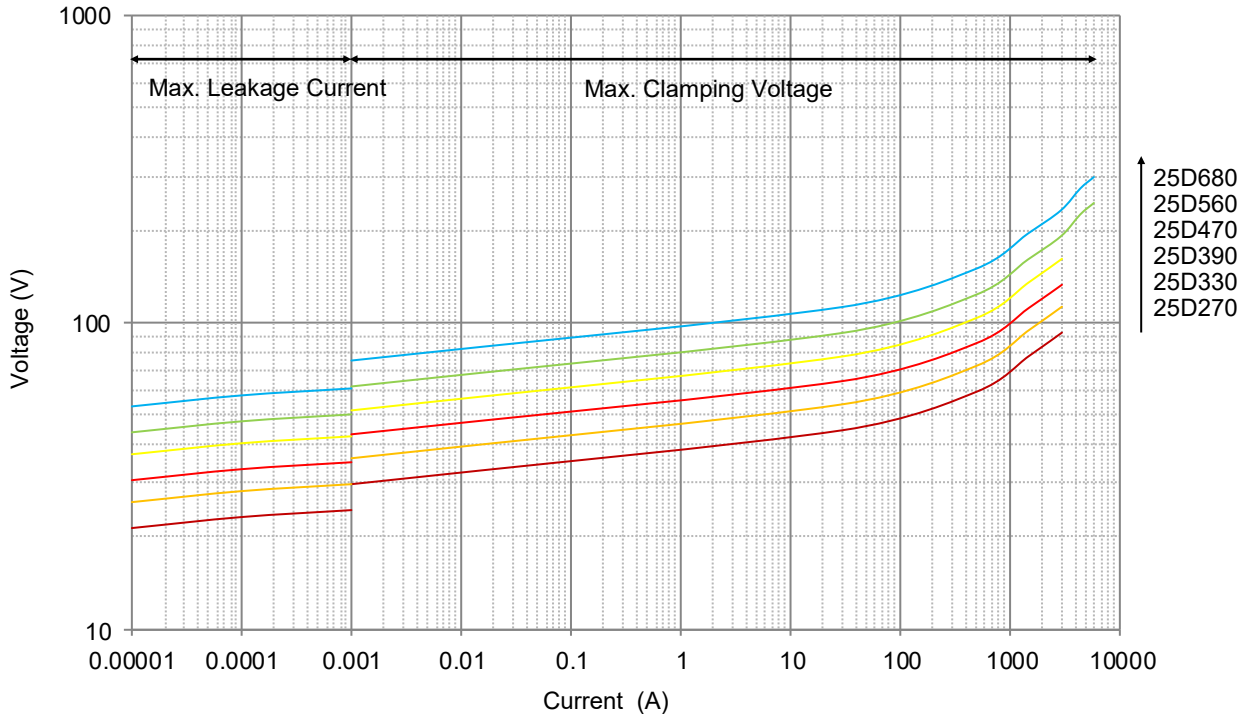
Note: The limited current test curve is for reference only.

Max. Peak Current Derating Curve



Note: 1, 2, 10, 10², 10³, 10⁴, 10⁵, 10⁶ Stand for number of repetitions.

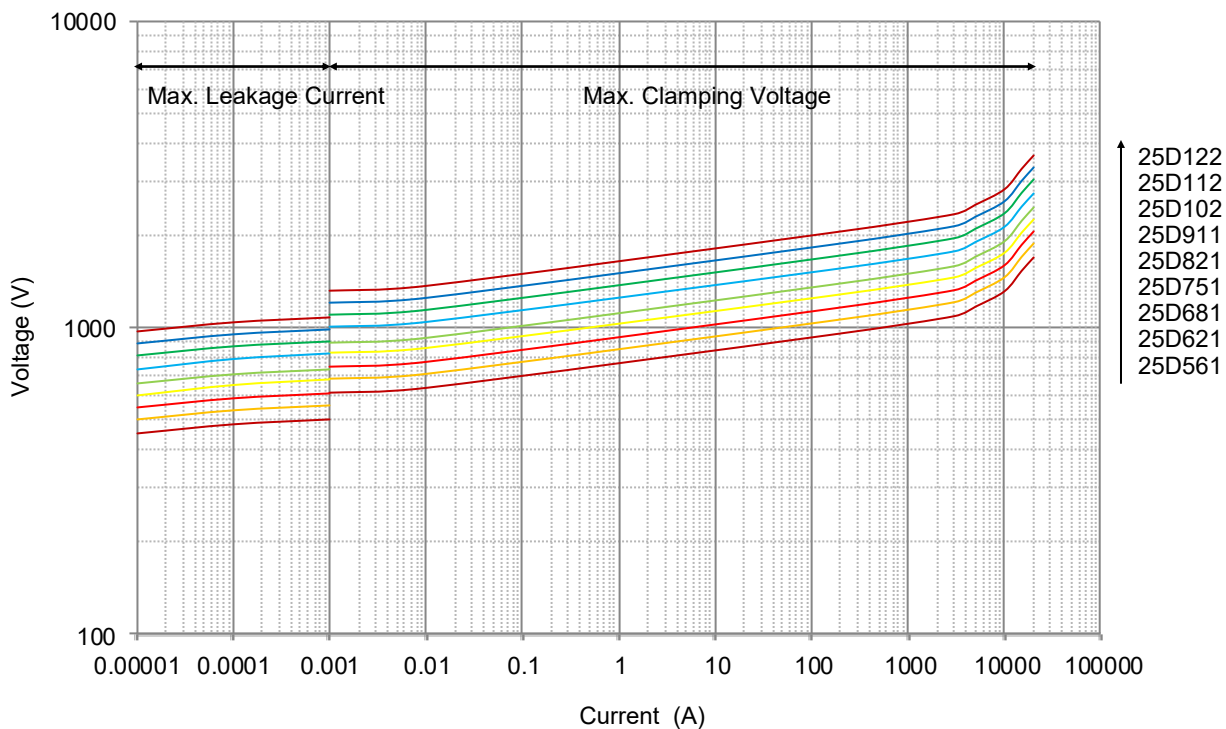
Voltage-Current Characteristic Curves



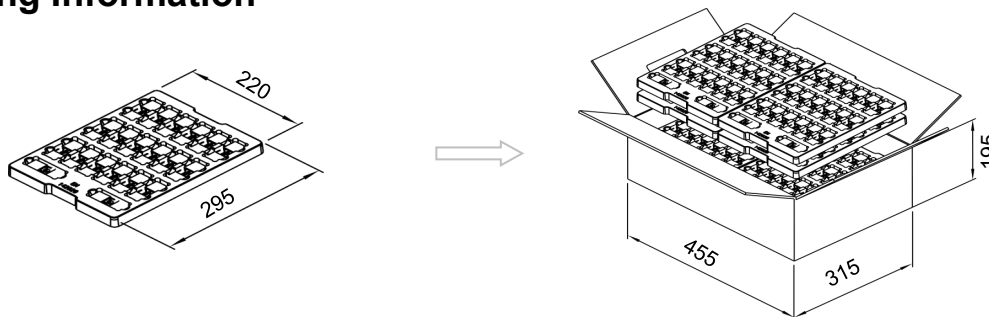
TFMOV

Thermal Fuse & MOV

TFMOV25D Series



Packaging Information



Unit: mm

Please contact us if you have special packaging requirements.

Item	Nominal Varistor Voltage	Tray	Carton
Dimensions (mm)	N/A	295 × 220	455 × 315 × 195
Quantity (PCS)	270 - 271	40	800
	301 - 821	40	640
	911 - 122	40	480