OVERVOLTAGE SUPPRESSION PRODUCTS

Varistors, Surge Fuses and Varistor Assemblies

What Are Transients?

Transients are short duration surges of electrical energy that result from the sudden release of previously stored energy. In terms of electrical and electronic circuits, this energy can be released through intentional, controlled switching action, or induced into a circuit from external sources. If the voltage magnitude of the transient is large enough, circuit component damage or malfunction of the circuit may result.

Transient Sources and Magnitude

	VOLTAGE	CURRENT	RISE-TIME	DURATION
Lightning	25 kV	20 kA	10 µs	50 ms
Switching	600 V	500 A	50 µs	500 ms
EMP	300 kV	10 A	20 ns	1 ms
ESD	15 kV	30 A	1-5 ns	100 ns

Transient Voltage Scenarios

The switching of inductive loads generates high energy transients that increase in magnitude with increasingly heavy loads. When the inductive load is switched off, the collapsing magnetic field is converted into electrical energy, which takes the form of a double exponential transient. Depending on the source, these transients can be as large as hundreds of volts and hundreds of amps with duration times of 400 milliseconds.

Typical sources of inductive transients are:

- Generators
- Motors
- Relays
- Transformers

These examples are extremely common in electrical and electronic systems. Because the sizes of the loads vary according to the application, the wave shape, duration, peak current, and peak voltage are all variables which exist in real world transients. Once these variables can be approximated, a suitable suppressor technology can be selected.

Overvoltage Applications

- Industrial, High Energy AC Products such as Solenoids, Motor Drives and Robotics
- Telecommunications Products
- UPS, AC Panels, Power Supplies, Circuit Breakers (TVSS Products)
- Portable and Automotive Electronic Equipment

Lightning Induced Transients

Transients induced by lightning are not the result of a direct strike. When a lightning strike occurs, the event creates a magnetic field which can induce transients of large magnitude in nearby electrical cables.

Technological Solutions for Transient Threats

Because of the various types of transients and applications, it is necessary to employ protection devices with different characteristics in different applications. Littelfuse offers the broadest range of circuit protection technologies.

Overvoltage Protection Portfolio Includes:

MOVs (Metal Oxide Varistors)

A ceramic technology that offers medium to very high energy ratings for a wide range of applications. Available in screw terminal, radial, square and axial leaded connections.

Discrete TVS Diode

This Silicon Avalanche Diode Technology is available in surface mount and axial leaded packages. It offers protection from medium to very high energy transients and can be used in wide range of applications.

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Radial Leaded MOV

SERIES NAME[1]		OPERATING AC VOLTAGE RANGE	OPERATING DC VOLTAGE RANGE	PEAK CURRENT RANGE[2] (A)	PEAK ENERGY RANGE[3]	OPERATING TEMPERATURE RANGE	MOUNT/ FORM FACTOR	DISC SIZE	AGENCY				ROHS	LEAD FREE
									UL	CSA	VDE	CECC		
TMOV®/iTMOV®		115-750	—	6000-10,000	35-480	-55 to +85°C	Radial Leaded	14, 20, 34 mm	•	•	•	•	•	•
TMOV® 25S		115-750	—	20,000	170-670			25 mm	•				•	•
UltraMOV™		130-625	170-825	1750-10,000	12.5-720			7, 10, 14, 20, 25 mm	•	•	•	•	•	•
UltraMOV™ 25S		115-750	150-970	22,000	230-890			25 mm	•	•	•	•	•	•
C-III		130-660		3500-9000	40-530			10, 14, 20 mm	•	•	•		•	•
LA		130-1000	175-1200	1200-6500	11-360			7, 10, 14, 20 mm	•	•	•	•	•	•
ZA		4-460	5.5-615	50-6500	0.1-52			5, 7, 10, 14, 20 mm	•		•	•	•	•

Industrial High Energy Terminal MOV

SERIES NAME[1]		OPERATING AC VOLTAGE RANGE	OPERATING DC VOLTAGE RANGE	PEAK CURRENT RANGE[2] (A)	PEAK ENERGY RANGE[3]	OPERATING TEMPERATURE RANGE	MOUNT/ FORM FACTOR	DISC SIZE	AGENCY		ROHS	LEAD FREE
									UL	CSA		
BA/BB		130-2800	175-3500	50,000 70,000	450-10,000	-55 to +85°C	Screw / Clip Terminals	60 mm	•		•	
DA/DB		130-750	175-970	40,000	270-1050			40 mm	•		•	•
HA		130-750	175-970	25,000 40,000	200-1050		Industrial Packaged Radial Leads	32, 40 mm	•	•	•	•
TMOV34S®		115-750	—	40,000	235-1050			34 mm	•		•	•
HB34, HG34, HF34		130-750	175-970	40,000	270-1050			34 mm	•	•	•	•
DHB34		250-2800	330-3500	20,000 70,000	330-10,000			34 mm			•	
CA		250-2800	330-3500	20,000 70,000	330-10,000		Bare Disc	60 mm			•	

High Power TVS Diodes

SERIES NAME[1]		PACKAGE TYPE	REVERSE STANDOFF VOLTAGE (V_R)	PEAK PULSE POWER RANGE[1] (P_{PP})	PEAK PULSE CURRENT (I_{PP} 8x20µs)	OPERATING TEMPERATURE	HALOGEN FREE	ROHS COMPLIANT
15KPA		P600	17-280	15,000 W	Not Applicable	-85° to +302° F (-55° to +175° C)	•	•
20KPA		P600	20.0-300	20,000 W			•	•
30KPA		P600	28.0-288	30,000 W			•	•
AK6		Radial Lead	58-430	NA	6,000 A	-67° to +347° F (-55° to +150° C)	•	•
AK10		Radial Lead	58-430	NA	10,000 A		•	•

1. Detailed information about most product series listed here can be found on littelfuse.com/varistor
2. Not an applicable parameter for Crowbar devices
3. Value shown in Joules