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IEC 62368-1
Overvoltage requirements

- Consumer electronics
- Datacenter & cloud
- Building automation
- Appliances
- Mobile & wearables

REV0121

IEC 62368-1: Global safety standard applies to a wide range of electrical and electronic equipment up to 600 V

IEC 62368-1*

IEC 60950-1†
(Information and communication technology equipment)

Point-of-sale equipment

Banking equipment

Office equipment

Telecommunication equipment

IEC 60065†
(Audio/video and similar electronic equipment)

Audio & video equipment, and musical instruments

Other equipment‡

Smart IoT appliances

Battery-powered electronic devices

* *UL/EN/CSA have created versions of 62368-1 based on IEC62368-1.*

† *Standards replaced by IEC 62368-1. All products, sub-assemblies, and components previously covered under these standards are covered under UL/IEC 62368-1.*

‡ *Other equipment comprises of two product types: products not covered under any product safety standard, such as smart IoT equipment, and products covered under various standards, such as battery-powered consumer electronic devices.*

Minimum transient voltage withstand rating is determined by the AC mains voltage

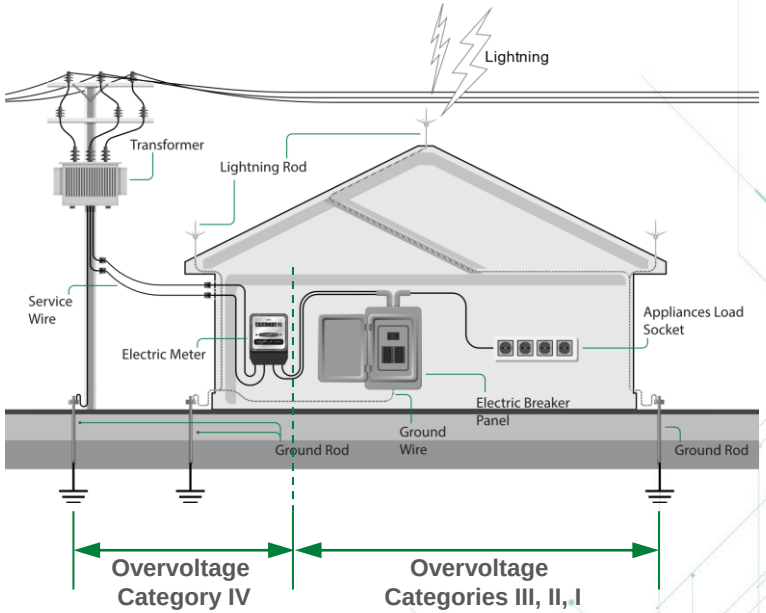
Electrical and electronic equipment and transients

Transient voltages are determined based on the system voltage and where, in a distribution system, the equipment it is connected (overvoltage category)

PCs, routers, notebooks, tablets, and their power supplies fall within Overvoltage Category II

Table 12 in section 5.4 specifies the following: 120 VAC power supplies will need to withstand 1500 V_{pk}; 240 VAC power supplies need to withstand 2500 V_{pk}

Overvoltage categorization



Additional tests included in the standard to ensure compliance when using varistors

Tests	Unreliable earth/ground bond  Non-industrial plug examples	Reliable earth/ground bond ‡  Industrial plug examples
Varistor overload test * (Annex G.8.2.2)	✓	✓
Temporary overvoltage test † (Annex G.8.2.3)	✓	✓
Basic insulation requirement (Clause 5.4.9.1)	✓	Not required

Table notes: *(Detailed list of tests provided in supplementary slide).*
** Test not required if varistor voltage rating is greater than 2 x V_R.*
† Test not required if varistor voltage rating is (1.1 x V_R) + 1200 or greater.
‡ Reliable earth: permanently connected equipment, cord connected mains equipment used in a location having equipotential bonding (restricted access area, telecommunication center, and others), or stationary pluggable equipment that has instructions for installation of the conductor to a building by a skilled person.

Abbreviation:
V_R: rated voltage of AC mains or upper voltage of AC mains voltage range.

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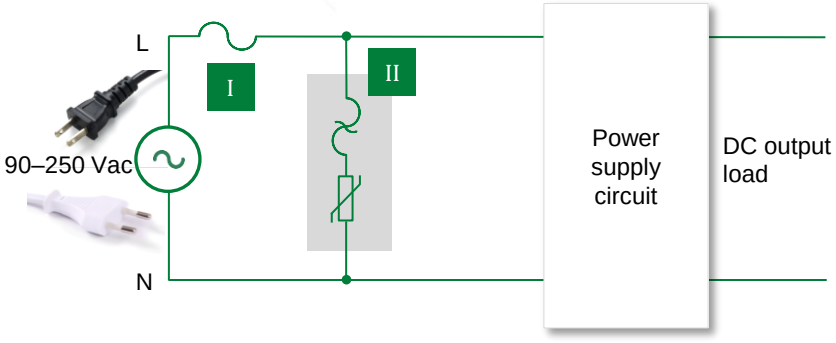
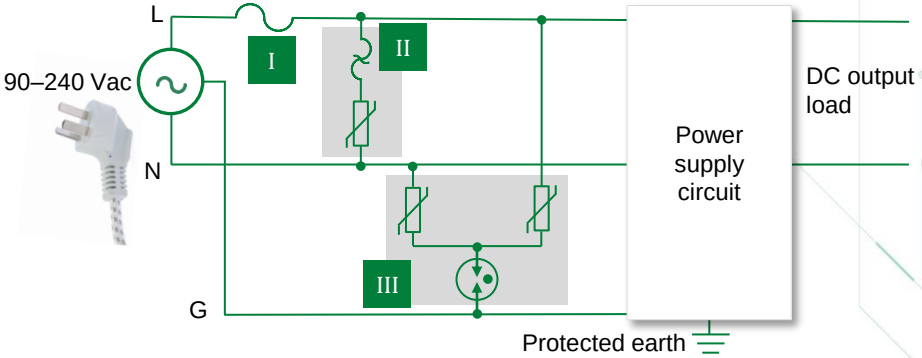
Solution recommendations for universal power adapters with two-prong and three-prong plugs

Click on the product series in the table below for more info

Differential mode protection



Differential & Common mode protection



	Technology	Product series	Function in application	Benefits and considerations
I	Fuse	2153.15*	Protects the power stage from overcurrent events	Small, through-hole device with high breaking capacity and high surge withstand capability
		39213150000		Multiple ampere ratings in compact design
II	TMOV	TMOV14RP300E*	Protects the power supply unit from voltage transients and lightning. Meets minimum allowable MCOV (1.25 x 240 V). Exceeds minimum surge requirements of Overvoltage category II	Integrated thermal protection avoids overheating caused during abnormal voltage events; low energy let-through and clamping voltage
	MOV	V10E420P		Smallest form-factor, higher clamping voltage than other solutions
	SIDACtor® + MOV	P2300 + V10E300P		Lowest leakage current (nA)
	TVS Diode	AK3-380C-Y		Best clamping and surge life
III	MOV + GDT	V10E300P + CG3 3.3*	Protects the power supply unit from voltage transients and lightning. Meets requirements for common mode protection	Only permitted solution for common mode protection; lowest leakage current

** This is the primary recommendation. Other products shown can be considered based on design requirements*

Surge protection solutions compared

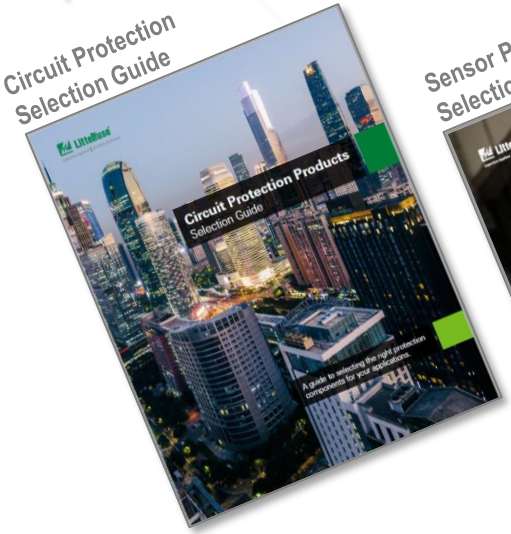
Features	TMOV	MOV	SIDACtor™ + MOV	High Power TVS Diode	GDT + MOV
Suggested Protection Modes (When ground is unreliable)	L-L L-N	L-L L-N	L-L L-N	L-L L-N	L-G & N-G (Mains to PE)
Continuous voltage withstand rating	300 V	420 V	480 V (180 V + 300 V)	380 V	2940 V (2640 V + 300 V)
Clamping voltage (combination surge: 6 kV/3 kA)	1.18 kV	1.66 kV	1.3 kV*	520 V	1.3 kV
Let-through energy during surge event	↯↯	↯↯↯	↯↯	↯	↯↯
Leakage current	Medium (µA)	Medium (µA)	Low (nA)	Medium (µA)	Very low (pA)
Lifetime after multiple surge events	Good	Fair	Very Good	Excellent	Good
PCB footprint surface area	■	■	■	■	■
Price	$$	$	$$$	$$$$	$$

- TMOV is recommended for most differential mode protection applications.
- GDT + MOV is the recommended solution between mains and protective earth (per IEC 62368-1, clause 5.5.7).

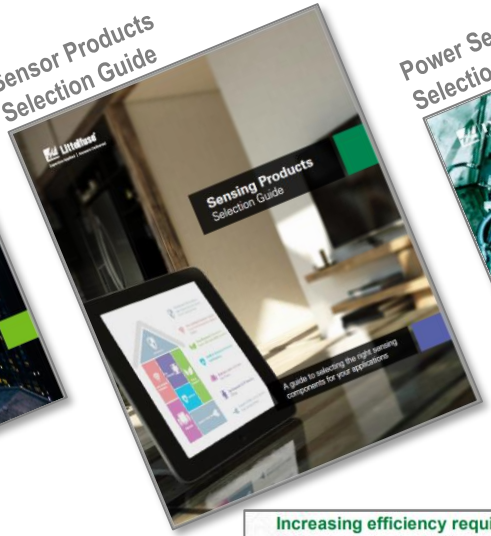
Note:
** Lower clamping is possible with use of a lower voltage MOV and higher rated SIDACtor. Requires review with agency providing certification to the standard*

Additional information can be found at Littelfuse.com

Circuit Protection Selection Guide



Sensor Products Selection Guide



Power Semiconductor Selection Guide

Designing with TMOV Application Note

Power Supply Spotlight

Click on images to open the catalog

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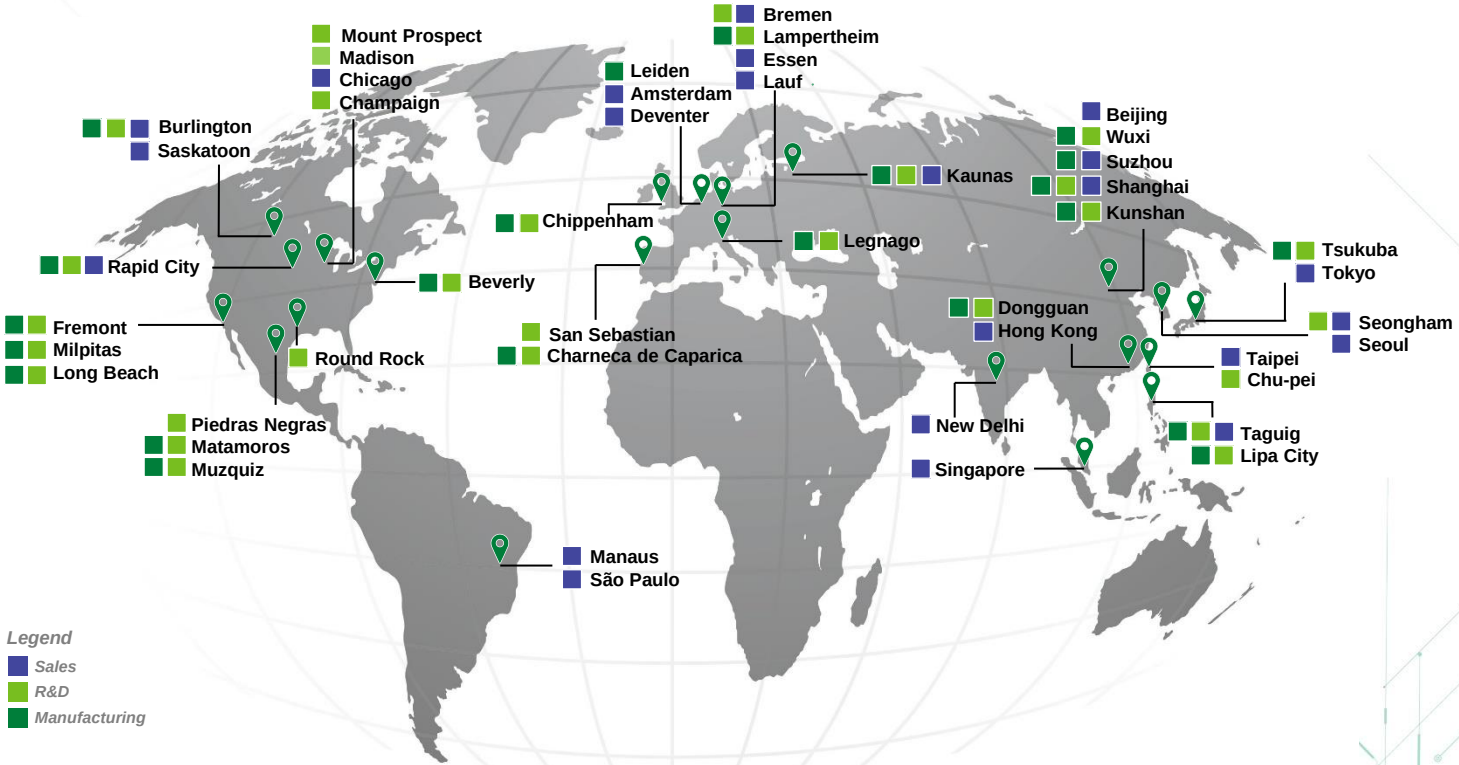
Local resources supporting our global customers



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Partner for tomorrow’s electronic systems

Broad product portfolio

A global leader with a broad product portfolio, covering every aspect of protection, sensing, and control

Application expertise

Our engineers partner directly with customers to help speed up product design and meet their unique needs

Global customer service

Our global customer service team is with you to anticipate your needs and ensure a seamless experience

Compliance & regulatory expertise

We help customers in the design process to account for requirements set by global regulatory authorities

Testing capabilities

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Global manufacturing

High-volume manufacturing that is committed to the highest quality standards

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