Hybrid Surge Protection Module for Power Line Mains

Design Imperative

The Power Line Module (PLM) is a Hybrid Surge Protection Module designed to provide long lasting and effective protection against Voltage and Current Surges on Power Line Mains (120 VAC, 240VAC and phase to phase systems) circuits. Within appliances, the PLM can be mounted directly on the PCB before other power supply components. The PLM can also be used in adaptors and connectors to be connected externally (outside the appliance) as in Surge Protector Strips and Power Extension Strips with inbuilt Surge Protection.

The most common form of protection used today is the Metal Oxide Varistor (MOV) which suffers from the following three problems:-

a) High Clamping Voltage
b) Thermal Runaway
c) High Capacitance

The Power Line Module seeks to address these problems and provides an excellent solution.

Features of PLM

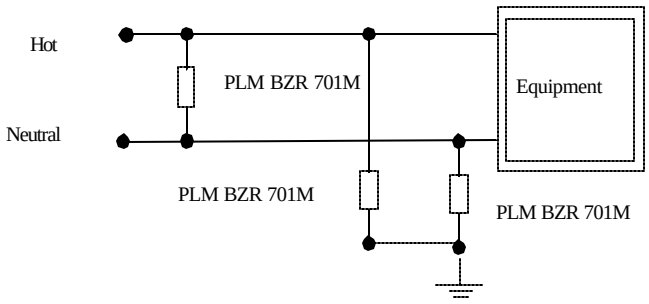
- **Low Clamping Voltage**
- **No Thermal Runaway**
- **No Leakage Current at steady state operating conditions**
- **Long Life**
- **Extremely Low Capacitance**
- **High Insulation Resistance**
- **Stability Against Repeated Surge**
- **UL 1449 Approved**

E300611

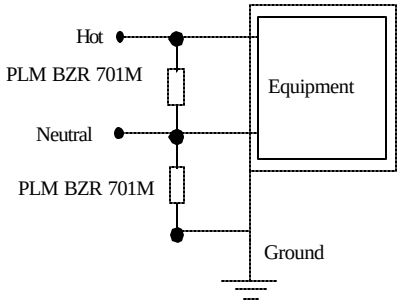
Typical Application

Protection of Power Supplies

Full Line Protection



Alternate Protection



For Line to Neutral Protection

For 125 VAC : PLM-BZR 501M For 250VAC: PLM-BZR 701M

For Phase to Phase Protection

For 125 VAC: PLM BZR 601M For 250VAC: PLM BZR 102M

Product Guide

Model		DC Spark-over Voltage Vs (in Volts)	Insulation Resistance	Clamping Voltage @ 50A	Surge Life test	Surge Current Capacity	AC withstand voltage	Capacitance
PLM BZR	301L	255-345	> 100 MΩ @ 100VDC	275 V	8x20µs, 100A, 30sec, 500 times	8x20µs, 5 min. 3kA, 3 times	140 V	<2pF
	401M	320-480		275 V			175 V	
	501M	400-600		500 V			250 V	
	601M	480-720	> 100 MΩ @ 250VDC	600 V			275 V	
	701M	560-840		750 V			330 V	
	102M	800-1200		850 V			500 V	
PLM CZR	501M	400-600	> 100 MΩ @ 100VDC	500 V	8x20µs, 100A, 30sec, 300 times	8x20µs, 5 min. 2kA, 3 times	275 V	<2pF
	701M	560-840	> 100 MΩ @ 250VDC	750 V			330 V	
PLM DZR	501M	400-600	> 100 MΩ @ 100VDC	500 V	8x20µs, 100A, 30sec, 200 times	8x20µs, 5 min. 1kA, 3 times	275 V	<2Pf
	701M	560-840	> 100 MΩ @ 250VDC	750 V			330 V	

AC Withstand Voltage: Maximum RMS Voltage that can be safely applied between the leads of the PLM

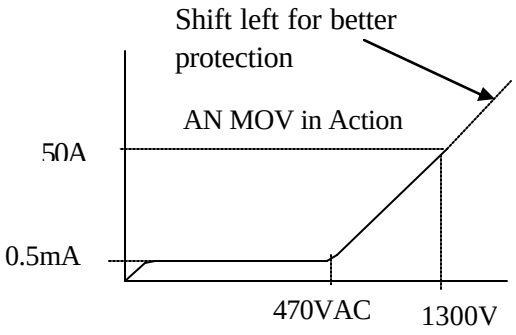
Theory of operation

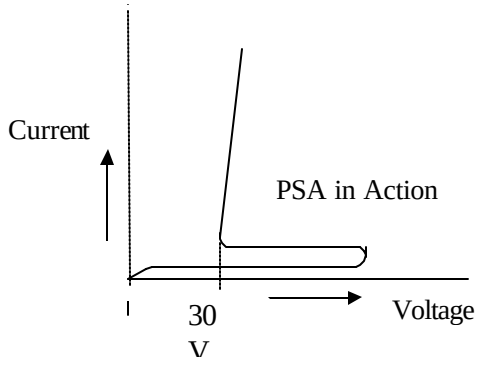
In using MOVs, the important decision for designers is of balancing the level of protection (Clamping voltage) and life of protection.

To reduce costs most designers in India use a 300VAC , 14mm MOV which offers good protection but a very short life. It succumbs to thermal runaway relatively quickly. Experts recommend an MOV rating of at least twice the nominal main voltage and an MOV dia of 20mm or in other words a 470VAC , 20mm dia MOV for India.

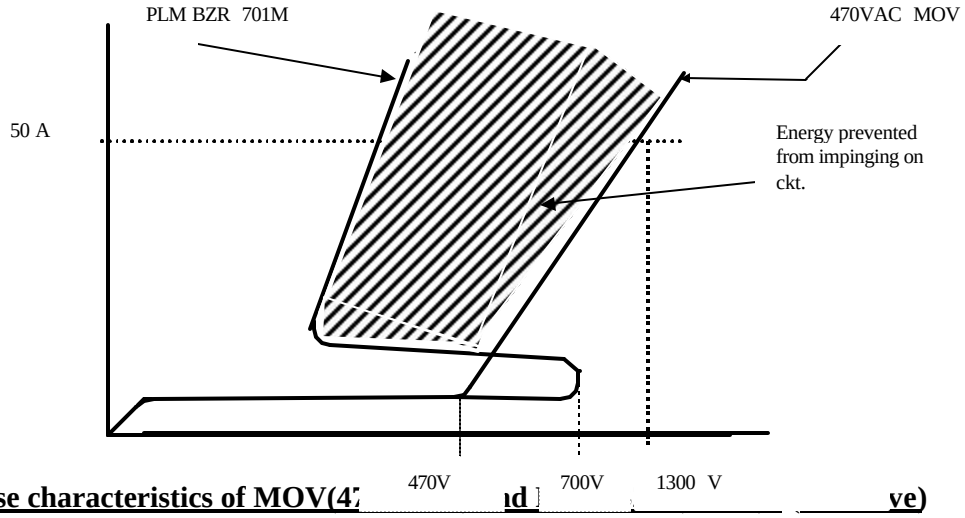
With this MOV the clamping voltage at 50A is specified in most catalogs at 1300V. For real life surges of about 500A of surge current the clamping voltage at 500A can be imagined.

Punsumi's PLM BZR offers the best solution to this life vs protection trade off. Due to the fold back action of the PSA the clamping voltage of the PLM BZR can be kept low and the high insulation resistance cuts off the follow-on current preventing thermal runaway and providing a long protection life.



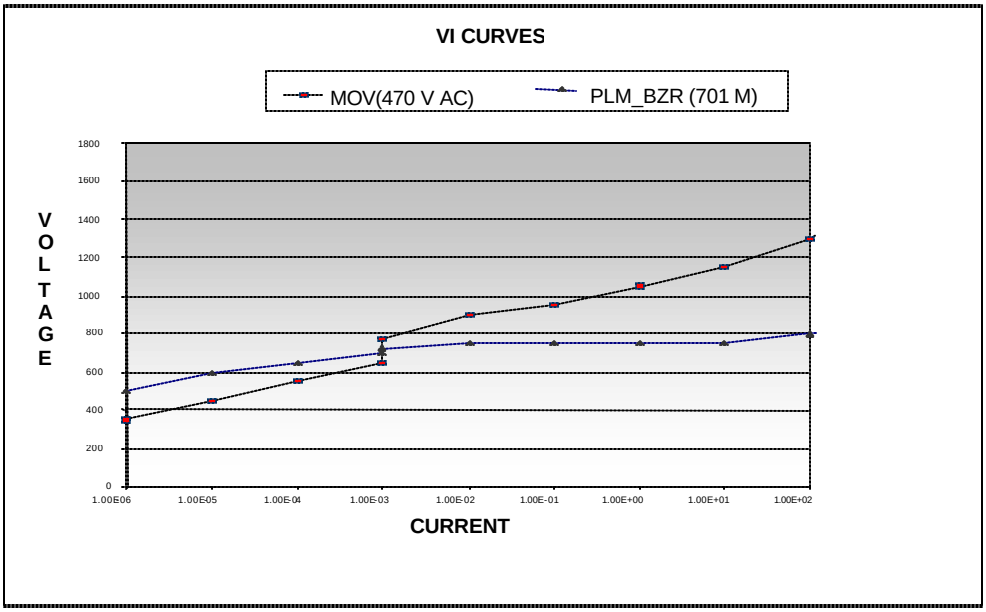


The work ing of MOV (470 V AC) vs PLM BZR 701M

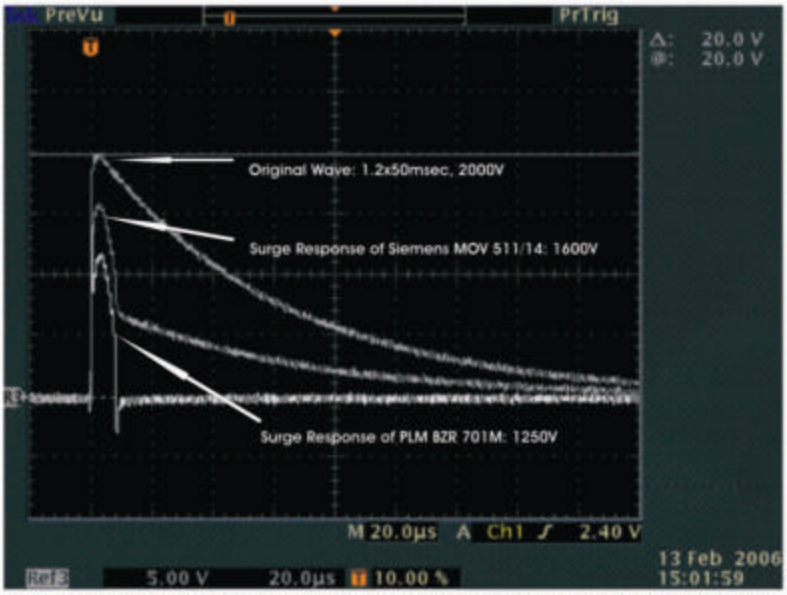


Response characteristics of MOV(47 ıd ve)

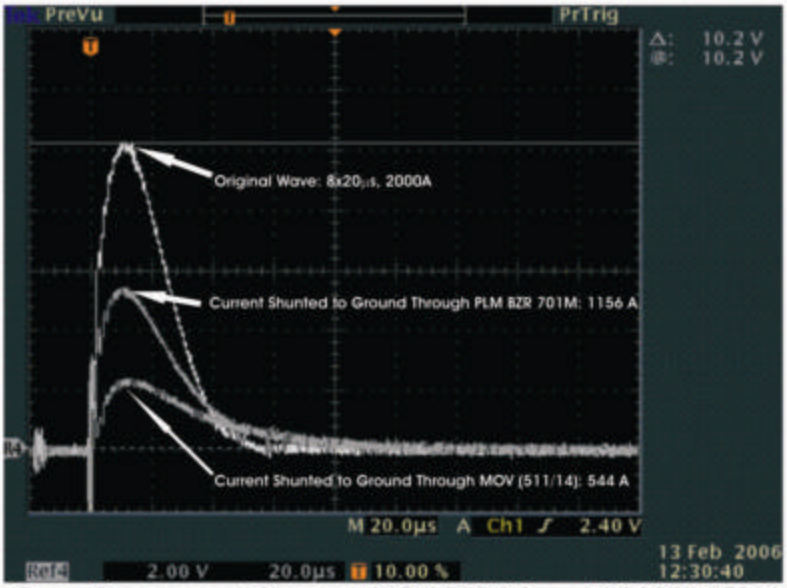
Surge Current (A)	MOV(470 V AC) (V)	PLM_BZR (701 M) (V)
1.00E-06	350	500
1.00E-05	450	600
1.00E-04	550	650
1.00E-03	650	700
1.00E-03	775	725
1.00E-02	900	750
1.00E-01	950	750
1.00E-00	1050	750
1.00E+01	1150	750
1.00E+02	1300	800
1.00E+03	1550	825



Performance: PLM vs MOV



Surge Response of Siemens MOV 511/14 and PLM BZR 701M
on
1.2x50 µsec, 2000V



Surge Response of Siemens MOV 511/14 and PLM BZR 701M
on
8x20 µ sec, 2000A