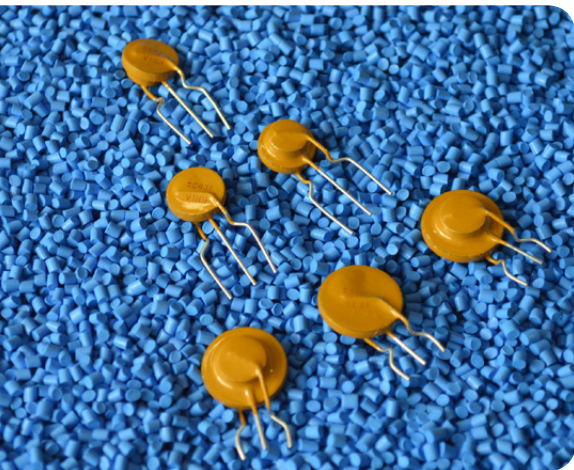


## Product Overview

### 2Pro AC Devices Provide Overcurrent/ Overvoltage/Overtemperature Protection for AC Industrial and Appliance Applications

The 2Pro AC family of devices provide integrated overcurrent/overvoltage/overtemperature circuit protection that helps protect a wide variety of low-power systems against damage caused by overvoltage faults, including lightning strikes, ESD surges, loss of neutral, incorrect input voltage and power induction.





## KEY FEATURES

- Single overcurrent, overvoltage, and overtemperature protection
- Resettable overcurrent protection
- Helps protect varistor and other components from damage caused by loss of neutral or abnormal AC input voltage
- Normal operating mode: Universal  
Input voltage range:  $85V_{AC}$  to  $265V_{AC}$
- RoHS-compliant
- Power range: up to 30VA for  $230V_{AC}$  input voltage at  $20^{\circ}C$
- High safe interrupt power up to:  $415V_{ACRMS}/40A_{RMS}$

## INTEGRATION PROVIDES ENHANCED PERFORMANCE

The 2Pro AC family of devices provide integrated overcurrent/overvoltage/overtemperature circuit protection that helps protect a wide variety of low-power systems against damage caused by overvoltage faults, including lightning strikes, ESD surges, loss of neutral, incorrect input voltage and power induction.

The RoHS-compliant 2Pro AC devices combine a PolySwitch polymeric positive temperature coefficient (PPTC) overcurrent device with a metal oxide varistor (MOV) component into one innovative, thermally protected device to help provide resettable current limiting for overcurrent protection and voltage clamping during overvoltage events. This single-device approach helps manufacturers meet industry test requirements, reduce component count, and improve equipment reliability.

The 2Pro AC family of devices help provide protection for AC input LED lighting systems, PLC network adapters, cell phone chargers, AC/DC power supplies\*, modem power supplies, ACpanel protection modules, AC power meters, white goods and home and professional appliances.

## APPLICATIONS

- Main LED lighting systems
- PLC network adapters (fast Ethernet, xDSL over the main)
- Cell phone chargers
- AC/DC power supplies up to:
  - 150VA as input power for  $240V_{AC}$  input voltage
  - 75VA as input power for  $120V_{AC}$  input voltage
- Modem power supply
- AC panel protection modules
- AC Line power supplies
- AC power meters
- White goods, appliances, industrial controls

## BENEFITS

Single, small form factor device helps to reduce component count and footprint.

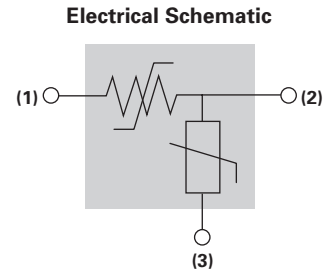
- Helps provide a safe failure mode in case of varistor overstress
- Helps reduce warranty returns
- Helps equipment comply with UL/IEC 60950/IEC60335
- Helps equipment comply with:
  - IEC61000-4-5 - Surge immunity test
  - IEC61000-4-4 - Electrical fast transient/burst immunity test
  - IEC61000-4-2 - Electrostatic discharge immunity test
- Reduces cost by eliminating need for additional fuse or power resistor in the power line

\* AC/DC power supplies up to 30VA as input power for  $230V_{AC}$  input voltage

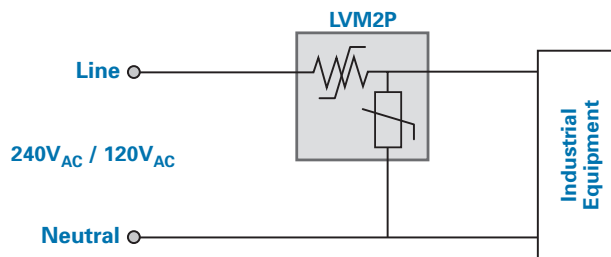
## HOW IT WORKS

Under normal operating conditions, the AC line voltage applied to an MOV is not expected to exceed the device's maximum continuous operating voltage rating,  $V_{ACRMS}$ . However, occasionally overvoltage transients may occur that exceed these limits. By integrating PPTC technology with the MOV, the 2Pro device helps provide increased overcurrent and thermal protection under conditions where the MOV is exposed to prolonged continuous overvoltage events that exceed its rated specifications. In the event of an overvoltage transient, the PPTC element of the 2Pro device heats up and goes into a high resistance state, helping to reduce the risk of MOV device failure.

2Pro AC devices are radial-leaded devices that utilize three leads. In the following electrical schematic, the lead (1) is connected to the PPTC element, lead (2) is connected to the MOV/ PPTC series connection (providing a path to ground), and lead (3) is connected to the MOV.



## TYPICAL CIRCUIT DIAGRAM UTILIZING THE 2PRO LVM2P-015R10431 DEVICE



## PROTECTING AGAINST THERMAL RUNAWAY

In AC line applications, loss of neutral may occur so that the MOV is exposed to a higher level of sustained overvoltage than it is rated for. One loss of neutral condition would be a voltage of  $400V_{AC}$  instead of  $230V_{AC}$ , derived from a loss of neutral. In an unlimited current condition the unprotected MOV will first fall to low impedance of a few Ohms, but due to the high amount of energy it is likely to rupture rather than protect. If there are devices used on the AC line return path that limit current flow these may also overheat due to the failure of the MOV.

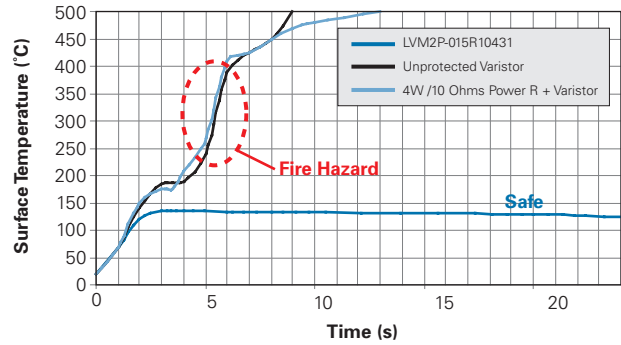
Standard unprotected MOVs are typically rated to  $275V_{ACRMS}$  for a universal input voltage range. In a loss of neutral condition they may overheat with disastrous consequences (see figure on next page), even if a fuse or power resistor is used upstream. The 2Pro AC device's PPTC element helps prevent thermal runaway, maintaining varistor surface temperature at less than  $150^{\circ}C$ , and preventing the device from reaching combustible temperatures caused by overvoltage transients.

The 2Pro AC devices help manufacturers comply with IEC60950 and IEC60335, and help equipment remain operational after specified lightning tests according to IEC61000-4-5. Also, because the PPTC element is in series with the MOV no additional overcurrent protection is required, which helps reduce component count and optimize board space.

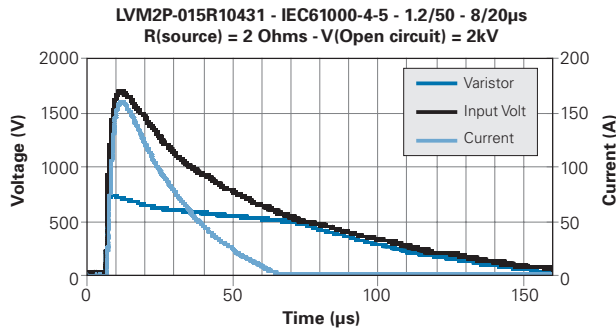
**TYPICAL SURFACE TEMPERATURE VS. TIME FOR VARIOUS PROTECTION SCHEMES**

The figure illustrates the effects of abnormal overvoltage conditions ( $400V_{RMS}$ ,  $4A_{SC}$ ) on three devices or a combination of devices:

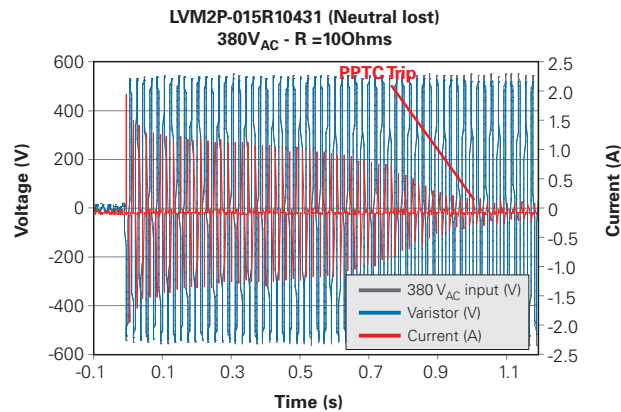
- 1) LVM2P-015R10431 combination (PPTC, MOV)
- 2) Single MOV (10mm,  $275V_{RMS}$  - ROV10-431K)
- 3) MOV/4W Power Resistor (10 Ohms)



**TYPICAL 2PRO LVM2P-015R10431 DEVICE RESPONSE UNDER IEC61000-4-5 SURGE IMMUNITY TEST**



**TYPICAL 2PRO LVM2P-015R10431 DEVICE RESPONSE TO LOSS OF NEUTRAL EVENT**



## ELECTRICAL CHARACTERISTICS

## Overcurrent (terminals 1 - 2) — Performance ratings @ 20°C

Part Number	$I_{HOLD}$	$I_{TRIP}$	Resistance ( $\Omega$ )			Time to Trip (s)
	(A)	(A)	$R_{MIN}$	$R_{MAX}$	$R_{1MAX}$ *	Typ.
LVM2P-015R10431	0.15	0.30	6.50	14.00	16.00	0.9 (@1A)
LVM2P-035R14431	0.35	0.75	1.40	2.20	2.80	0.5 (@3A)
LVM2P-075R14431	0.75	1.50	0.37	0.75	1.03	0.9 (@7A)

\* Maximum device resistance @ 20°C measured 1 hour post trip

## Overvoltage (terminals 2 - 3) Performance ratings @ 20°C

Part Number	Varistor Voltage V @ 1mA		DC Resistance @ 100V	Maximum Clamping Voltage	Rated Wattage
	DC (V)	Tolerance	(M $\Omega$ )	(V)	(W)
LVM2P-015R10431	430	+10% -10%	>10	710 (@ 25A)	0.25
LVM2P-035R14431	430	+10% -10%	>10	710 (@ 50A)	0.60
LVM2P-075R14431	430	+10% -10%	>10	711 (@ 50A)	1.00

## Surge Immunity for the Assembly (terminal 2-3) @ 20°C

Part Number	Parameter	Voltage - Open Circuit Voltage (waveform 1.2x50 $\mu$ s)	Current - Short Circuit Current (waveform 8x20 $\mu$ s)	Repetitions
		(V)	(A)	
LVM2P-015R10431	IEC / EN 61000-4-5	2000	1000	5 ea. Polarity
LVM2P-035R14431	IEC / EN 61000-4-5	2000	1000	5 ea. Polarity
LVM2P-075R14431	IEC / EN 61000-4-5	2000	1000	5 ea. Polarity

## FOR MORE INFORMATION

### TE Circuit Protection

308 Constitution Drive  
Menlo Park, CA USA 94025-1164  
Tel : (800) 227-7040, (650) 361-6900  
Fax : (650) 361-4600

[www.circuitprotection.com](http://www.circuitprotection.com)  
[www.circuitprotection.com.hk](http://www.circuitprotection.com.hk) (Chinese)  
[www.te.com/japan/bu/circuitprotection/](http://www.te.com/japan/bu/circuitprotection/) (Japanese)

#### Brazil

Tel : 55-11-2103-6090  
Fax : 55-11-2103-6216

#### UK / Eire / Benelux / Israel / South Africa / Nordic / Baltic / Others

Tel : 49-89-6089485  
Fax : 49-89-6089394

#### Germany / Austria / Switzerland / Eastern Europe / Russia

Tel : 49-89-6089584  
Fax : 49-89-6089394

#### France/ Italy / Iberia / Greece / Turkey

Tel : 33-1-34208455  
Fax : 33-1-34208479

#### Japan

Tel : 81-44-900-5110  
Fax : 81-44-900-5140

#### Korea

Tel : 82-2-3415-4654  
Fax : 82-2-3486-1786

#### Taiwan

Tel : 886-2-8768-2788 x 211  
Fax : 886-2-8768-1277

#### China, Hong Kong

Tel : 852-2738-8181  
Fax : 852-2735-1185

#### China, Beijing

Tel : 86-10-6569-3488 x 16526  
Fax : 86-10-6569-3206

#### China, Shanghai

Tel : 86-21-6106-7379  
Fax : 86-21-6485-3255

#### China, Shenzhen / Guangzhou

Tel : 86-755-2515-4797  
Fax : 86-755-2598-0419

#### Australia / Philippines

Tel : 63-2-988-9465  
Fax : 63-2-848-0205

#### Singapore / Indonesia Thailand / Malaysia / Vietnam

Tel : 60-4-8102112  
Mobile : 60-194725628  
Fax : 60-4-6433288

#### India

Tel : 91-80-4161-3745  
Mobile : 91-99-0248-8886

Part numbers in this brochure are RoHS Compliant\*, unless marked otherwise.  
\*as defined [www.te.com/leadfree](http://www.te.com/leadfree)

## te.com

© 2012 Tyco Electronics Corporation, a TE Connectivity Ltd. Company. All Rights Reserved.

RCPO140E 11/2012

2Pro, PolySwitch, TE Connectivity and TE connectivity (logo) are trademarks. Other logos, product and/or company names might be trademarks of their respective owners.

While TE has made every reasonable effort to ensure the accuracy of the information in this brochure, TE does not guarantee that it is error-free, nor does TE make any other representation, warranty or guarantee that the information is accurate, correct, reliable or current. TE reserves the right to make any adjustments to the information contained herein at any time without notice. TE expressly disclaims all implied warranties regarding the information contained herein, including, but not limited to, any implied warranties of merchantability or fitness for a particular purpose. The dimensions in this catalog are for reference purposes only and are subject to change without notice. Specifications are subject to change without notice. Consult TE for the latest dimensions and design specifications.

