

## Portable Electronics Protection using PolyZen Devices

Among the potential fault conditions that must be considered when designing the DC power port for portable electronics are incorrect voltage power supply connections (user error) and dirty power supply connections. Lack of adequate port protection can result in customer dissatisfaction and expensive warranty returns.

The most cost-effective way to implement a power bus for portable electronics is with a standard DC barrel jack. However, because this connector is so commonly used, the user may accidentally connect the incorrect power supply to his/her electronics at home or while traveling. Faults may also occur when using commercially available universal power supplies that come with a variety of connectors. These devices allow the user to dial in the voltage to levels as high as 24V, as well as switch polarity.

Custom connectors can mitigate this risk, but they are expensive to tool, and with the proliferation of portable devices and universal power supplies they are often easily defeated.

Needless to say, custom connectors do nothing to protect against dirty third-party supplies and related voltage transients. Transient protection is especially critical when designing peripherals that could be powered off computer buses and automotive power buses. On computer buses, inductively generated voltage spikes can exceed 8V on the 5V line and 16V on the 12V line, damaging unprotected peripherals.

Automotive power buses often supply dirty power. Although they are nominally 12V, they can range in normal operation from 8V to 16V. Still, battery currents can exceed 100 Amps, and be stopped instantly via a relay or fuse, generating large inductive spikes on the bus and increasing voltage by 5X or more.

In operation, automotive supplies are subject to damage from misconnected batteries and double battery jump-starts (24V). A condition known as "load dump" can also generate large potential voltages on the bus. Typical third-party power converters may filter some of these events, but Raychem Circuit Protection testing shows that the transient suppression capabilities of these power converters varies wildly. Devices being charged via the USB interface are not typically designed to handle this type of voltage fluctuation and require overvoltage protection.

PolyZen devices have been specifically designed to help lock out inappropriate power suppliers. In the case where an incorrect voltage power supply is connected, the PolyZen device helps clamp the voltage, shunt excess power to ground, and eventually lock out the wrong supply.

The PolyZen device is especially effective at helping clamp and smooth inductive voltage spikes. In response to an inductive spike the Zener diode element shunts current to ground until the voltage is reduced to the normal operating range. In the case of an incorrect voltage power supply, the device clamps the voltage, shunts excess power to ground, and eventually locks out the wrong supply.

The relatively flat voltage vs. current response of the PolyZen device helps clamp the output voltage, even when input voltage and source currents vary. PolyZen's unique ability to withstand high inrush currents makes it suitable for protecting portable electronics and other low-power DC devices.

### Benefits:

- Helps shield downstream electronics from overvoltage and reverse bias
- Trip events shut out overvoltage and reverse bias sources
- Analog nature of trip events minimize upstream inductive spikes
- Helps reduce design costs with single component placement and minimal heat sinking requirements

### Features:

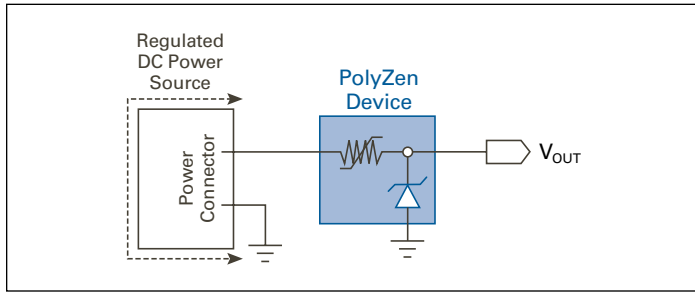
- Overvoltage transient suppression
- Stable VZ vs. fault current
- Time delayed, overvoltage trip
- Time delayed, reverse bias trip
- Power handling on the order of 100 watt
- Integrated device construction
- RoHS compliant

### Applications:

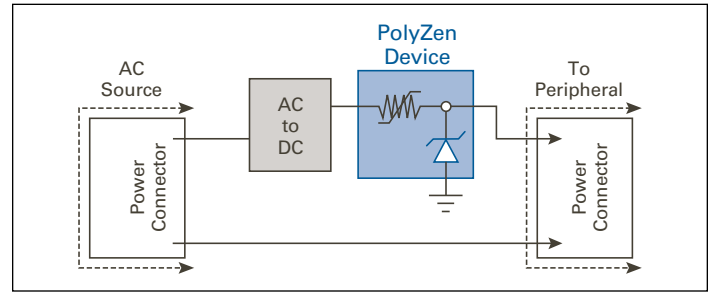
- Cell phones
- PDAs
- MP3 players
- DVD players
- Digital cameras
- USB hubs
- Printers
- Scanners
- Hard Drives
- Desk phones
- PBX phones



## Typical Circuit – “On Board” Protection



## Power Conditioning (AC to DC converter output)

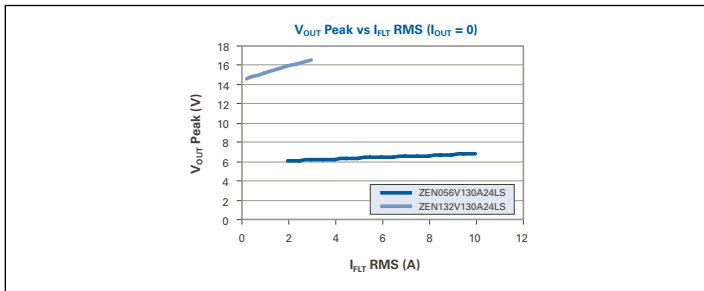


## Electrical Characteristics (Performance ratings @ 25°C unless otherwise specified)

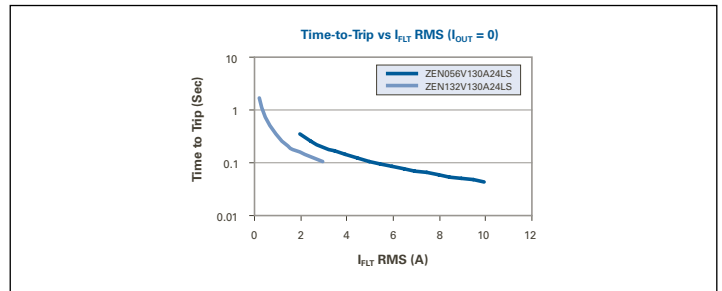
Part Number	V <sub>Typ</sub> (V)	I <sub>zt</sub> (A)	I <sub>HOLD</sub> @ 20°C (A)	R <sub>Typ</sub> (Ω)	R <sub>1Max</sub> (Ω)	V <sub>INT</sub> Max @ 3A (V)	I <sub>FLT</sub> Max @ 16V (A)	Power Dissipation (W)
ZEN056V130A24LS	5.6	0.1	1.3	0.12	0.16	24	+10 / -40	0.7
<b>Coming Soon</b> ZEN065V130A24LS	6.5	0.1	1.3	0.12	0.16	24	TBD / -40	0.7
<b>Coming Soon</b> ZEN098V130A24LS	9.8	0.1	1.3	0.12	0.16	24	TBD / -40	0.7
ZEN132V130A24LS	13.4	0.1	1.3	0.12	0.16	24	+3 / -40	0.7
<b>Coming Soon</b> ZEN164V130A24LS	16.4	0.1	1.3	0.12	0.16	24	TBD / -40	0.7

For specification terms and definitions, go to [www.circuitprotection.com/polyzen/](http://www.circuitprotection.com/polyzen/)

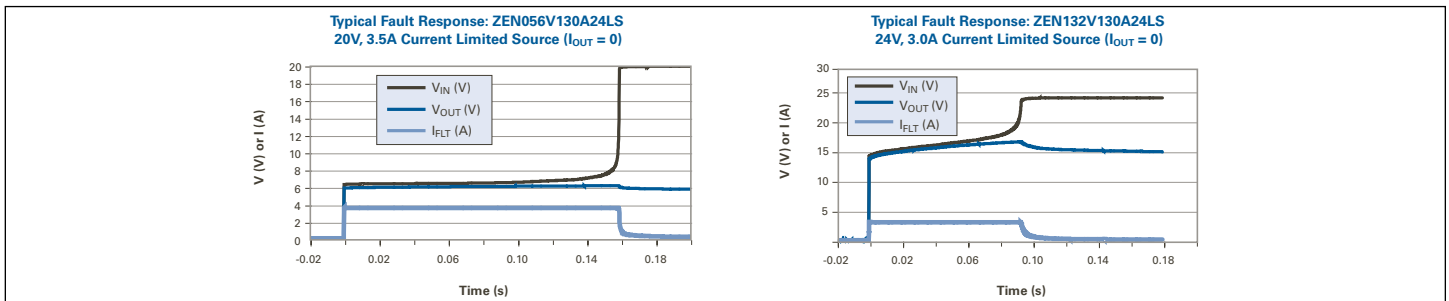
## V<sub>Peak</sub> vs I<sub>FLT</sub>



## Time-to-Trip



## Typical Overvoltage Response



## Summary

PolyZen device's unique ability to withstand high inrush currents make it suitable to protect portable electronics and other low-power DC devices such as cell phones, PDAs, MP3 players, digital cameras and USB hubs. Transient protection is particularly important for peripherals that can be powered off computer buses and automotive power buses. PolyZen devices are designed to help lock out inappropriate power supplies and are especially effective at clamping and smoothing inductive voltage spikes.

**tyco** Electronics

a vital part of your world

**Worldwide Headquarters**  
308 Constitution Drive, MS R21/2A  
Menlo Park, CA USA 94025-1164

Tel (800) 227-7040  
(650) 361-6900  
Fax (650) 361-2508

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