



CIRCUIT
PROTECTION
SOLUTIONS



Littelfuse Technologies: Power Thyristors • Protection Arrays • Fuses • PTCs • Varistors • TVS Diodes • GDTs • ESD Suppressors • SIDACTor Devices

Improved LED Reliability New Product Introduction PLED5HT Series

June 12



Expertise Applied | Answers Delivered



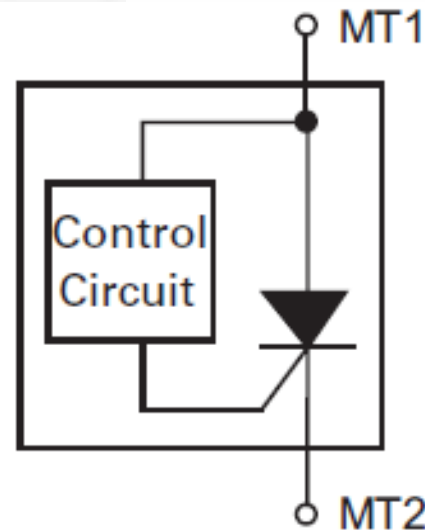
<http://www.panhao.com>



<http://www.semcor.com.cn>

PLED5HT Series Open LED Protector

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The PLED5HT Series is an electronic shunt which provides a current bypass in the case of a single LED going into an open circuit condition. LED are susceptible to failure due to heat, ESD, and other environmental conditions. These failures can result in the loss of LED lighting strings in critical applications. As LED lighting becomes more popular, there will be applications where high reliability and quality of the lighting must be maintained.



PLED5HT Series Open LED Protector

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- Improved LED lighting Reliability
- Three Modes of Improvement
 - Replaces defective (open) LED in an LED string
 - Reverse Battery/Power Supply Connection
 - ESD Protection

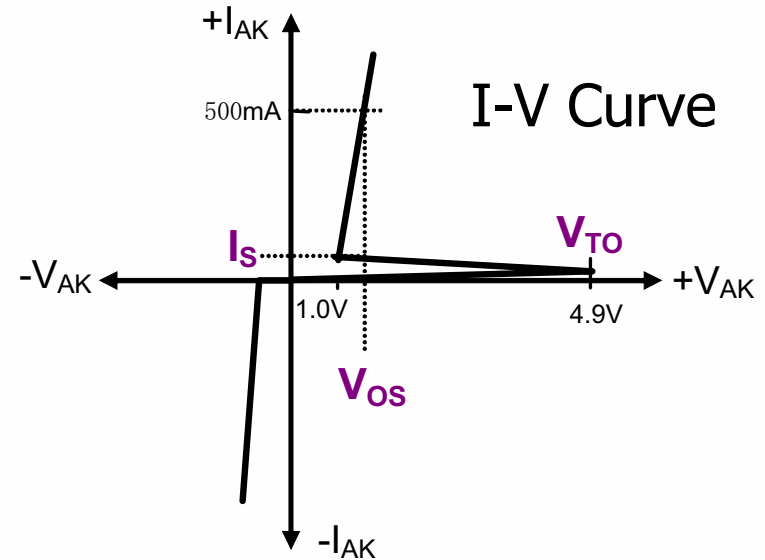


Characteristics

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First and third quadrant action!



Electrical Characteristics

Parameter	Symbol	PLED5HT	Unit
Turn-on Voltage	V_{TO}	4.9	V
On-State Voltage ($I_{AK}=700mA$)	V_{OS}	1.5	V
Reverse On-State Voltage	V_{OSR}	1.5	V
Leakage Current	I_L	150	μA
Switching Current	I_S	20	mA
Input Voltage	NA	40	V





Unique 3-in-1 protection

- If one of the LEDs in an array fails open, this device provides a substitute electronic path so that the LED array continues to function.
- It protects against ESD events up to ± 8 kV for contact discharges and ± 15 kV for air discharges per the IEC 61000-4-2 electrostatic immunity standard.
- It provides protection in the case of accidental reverse battery or power connection
 - Reverse Current up to 700 mA

Electrical Characteristics

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- Trigger voltage
 - 5.0 Volts (PLED5HT)
- On-state voltage
 - 1.6 Volts (PLED5HT)
- Leakage (monitoring) Current
 - 150 μ A maximum (PLED5HT)



Product Features & Benefits

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■ Features

- Available in SOT-89 package
- Internally triggered two terminal device
- Automatically resets if LED heals itself or is replaced
- ESD and lightning surge protection
- Reverse Battery/power supply polarity protection
- RoHS compliant
- Halogen Free

■ Benefits

- Simple to employ into any design
- Low On-State Voltage typically 1.6V
- Low Off-State Current
- Environmentally friendly package



LED Driver Circuit Concept (PLED5HT series)

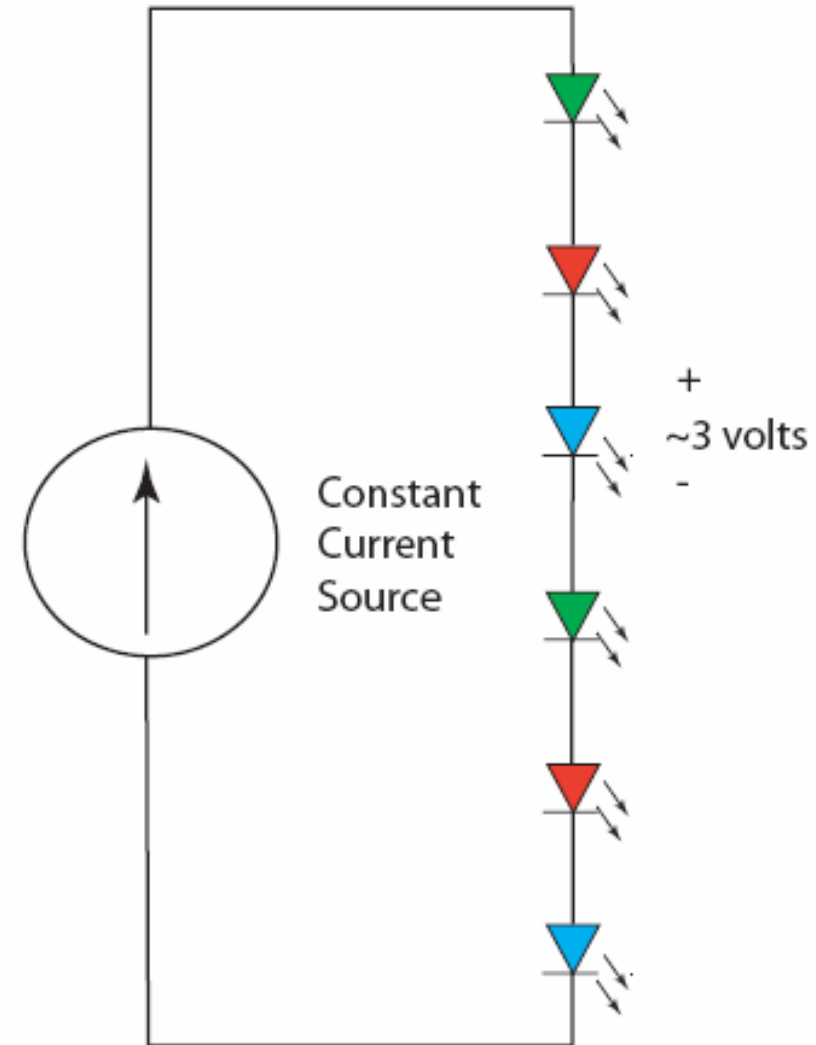
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LED's are connected in series and driven by a constant current source.

Protection Choice	LED Power	LED Voltage	Max LED Current
PLED5HT	3W	~3V	700mA

- The constant current source has a maximum (open circuit) output voltage called the “compliance voltage”.

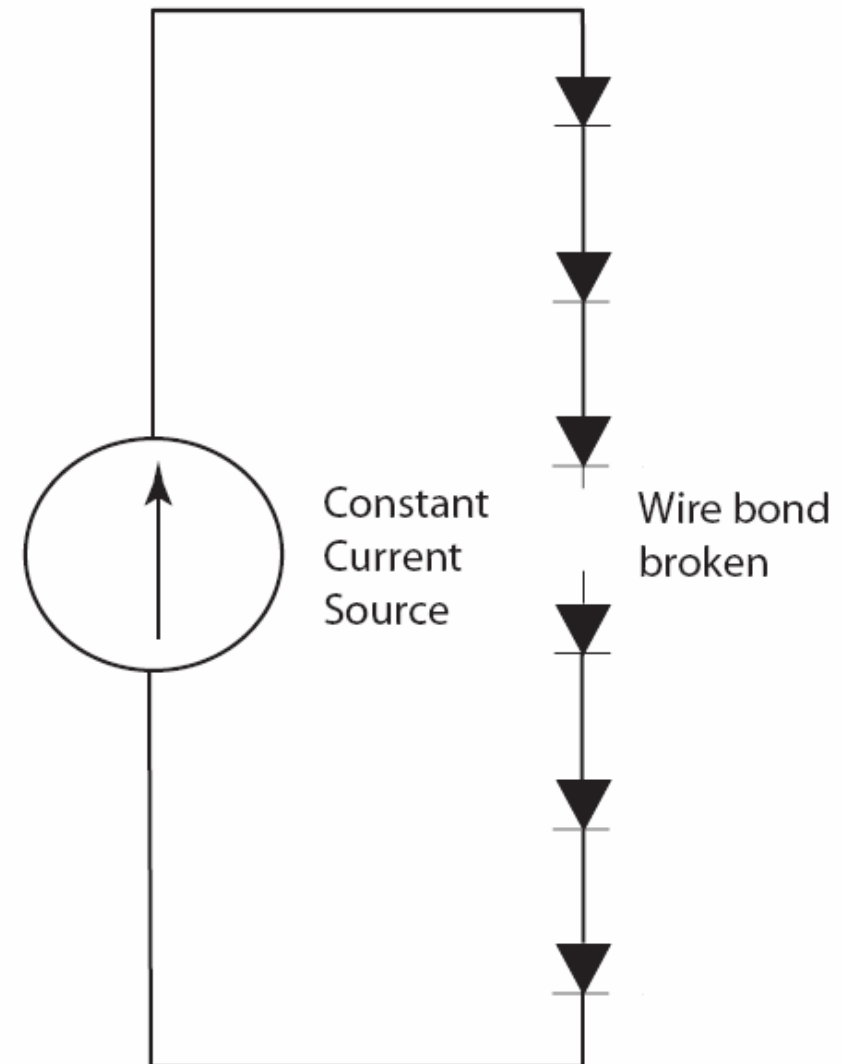


LED failure description



Heat, handling, ESD, surges, or aging may cause an LED wirebond to fail.

- A single LED failure causes an entire LED string to fail, resulting in
 - product returns
 - tarnishing of brandname
 - warranty expense
- **Reliability Problems!!!!**
- When this LED open, the “compliance voltage” develops across the single LED (this will trigger the PLED5HT device)

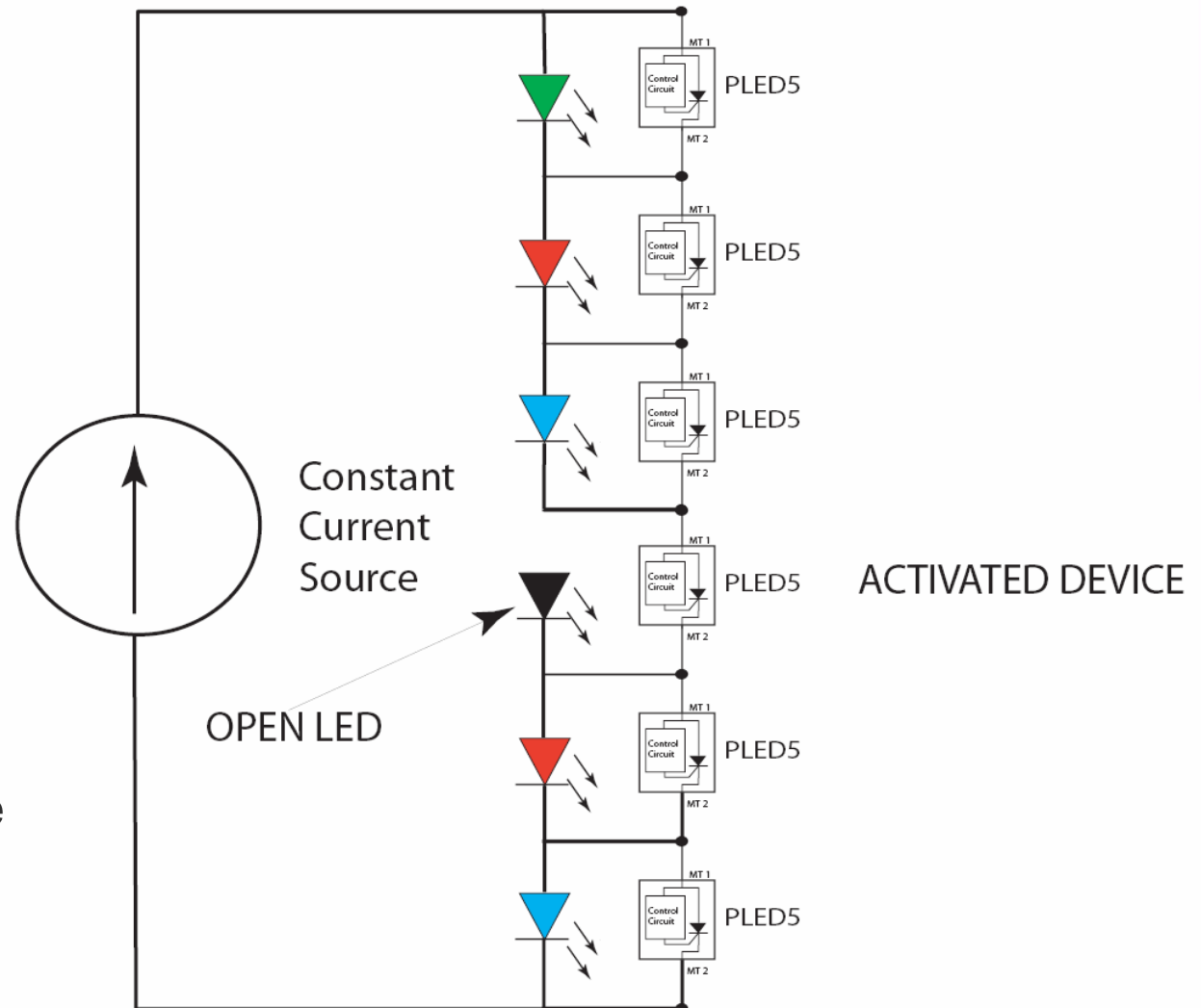


Open LED String Reliability Concept

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- Solution: PLED5HT devices will turn on and conduct current around the single open LED.
- Result: Remaining LED's stay illuminated. Replacing the bad LED will restore original function.
- In many applications, the failure of a single LED is not critical or even noticeable.
- Note that PLED5HT power dissipation is lower than the LED, lowering total system power.

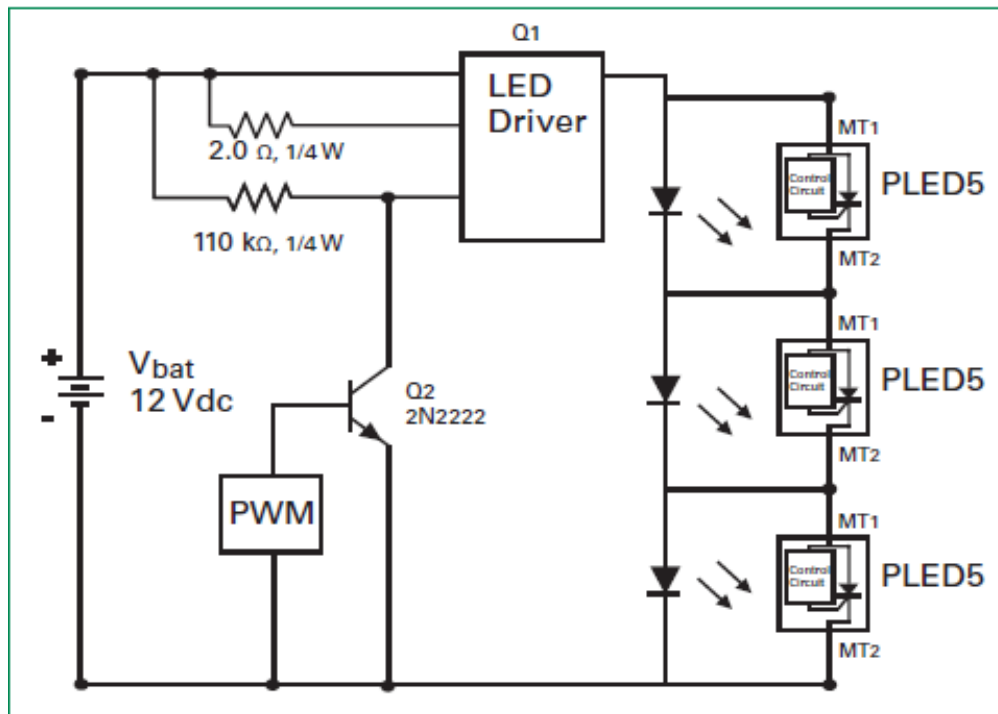


Application example

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LED Application and Interference Test Circuit



NOTES:

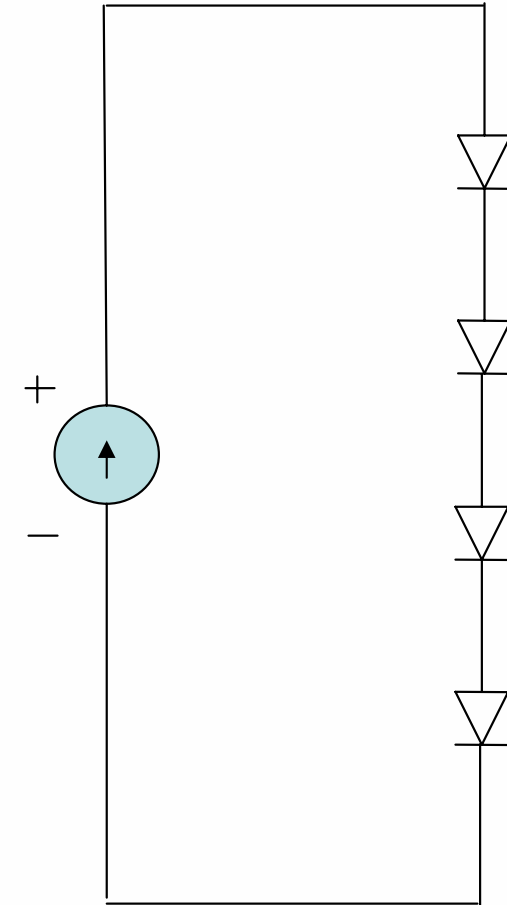
The PLED5HT is compatible with 3 watt LEDs that have nominal 700 mA



LED in Series string



- Most common connection
- Driven by constant current cc
- Maintain constant brightness
- One LED blackout = whole string LED blackout
- High input voltage
- Battery charging concepts



PLED5HT Ordering Information

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Catalogue Number	Package	Quantity
■ PLED5HT	SOT-89	1000



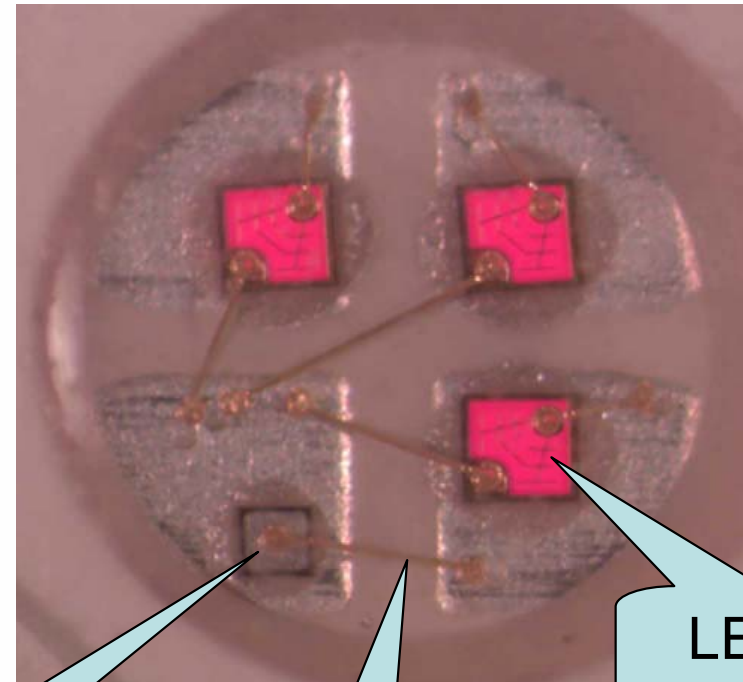
LED Devices May Have Integrated Zener Diode Protection

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Q: Some LED's have a zener diode on board. Do I still need a PLED device?

A: Yes. The on-board zener is capable of ESD protection only. It cannot handle the power required by open LED protection.



Zener
diode ESD
protection

Bond
wire

LED die



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