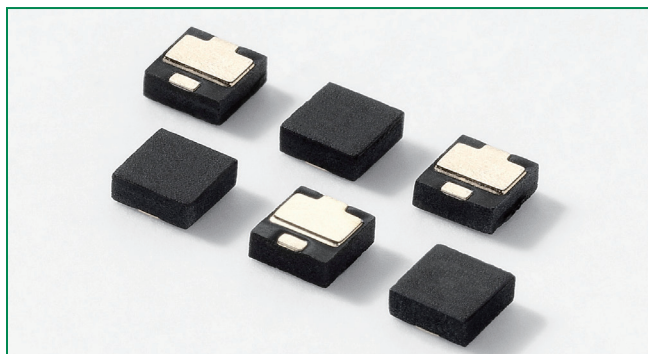


## PLED5 QFN Series

RoHS



### Description

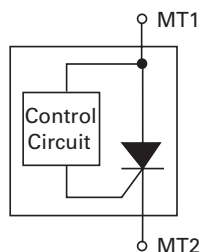
This PLED5 Open LED Protector device provides three methods for increasing the reliability of LED lighting:

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

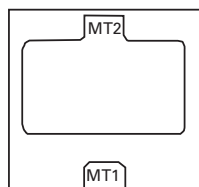
High reliability of lighting functions such as traffic lighting, aircraft lighting, advertising lighting, and runway lighting demand the use of a device such as the PLED5.

Littelfuse offers overcurrent devices for implementation in power circuits that can also enhance the reliability of circuit operation. Our full line of circuit protection products can be viewed at [www.littelfuse.com](http://www.littelfuse.com).

### Schematic Symbol



### Pinout



### Features & Benefits

- Reverse Battery/Power Protection
- ESD, IEC 61000-4-2,  $\pm 8$  kV contact,  $\pm 15$  kV air
- Open LED bypass up to 500 mA
- Fast Switching
- Resets After Power Cycle
- Low Turn-On (Trigger Voltage)
- Ideal for MR16, PAR type lamps
- RoHS Compliant


### Electrical Characteristics

Part	Marking	Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit	
PLED5Q12	Px5	$V_{AK}$	Input Voltage				40	V	
		$V_{TO}$	Turn-On Voltage		4.65	4.9	5.15	V	
		$I_S$	Switching Current				20	mA	
		$V_{OS}$	On-State Voltage	$I_{AK} = 350$ mA		1	1.3	V	
		$I_{OS}$	On-State Current	(with adequate heat sinking)			500	mA	
		$V_{OSR}$	Reverse On-State Voltage	$I = 350$ mA		1	1.4	V	
		$I_{OSR}$	Reverse On-State Current				500	mA	
		$I_{DRM}$	Leakage Current	$V_{AK} = 3.5$ V			100	150	$\mu$ A
		$V_{ESD}$	ESD Withstand Voltage <sup>1</sup>	IEC61000-4-2 (Contact)	$\pm 8$			kV	
IEC61000-4-2 (Air)	$\pm 15$				kV				

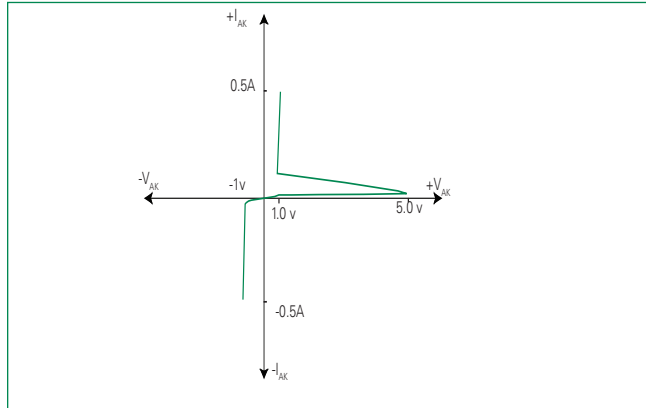
Notes:

<sup>1</sup>Parameter is guaranteed by design and/or device characterization.

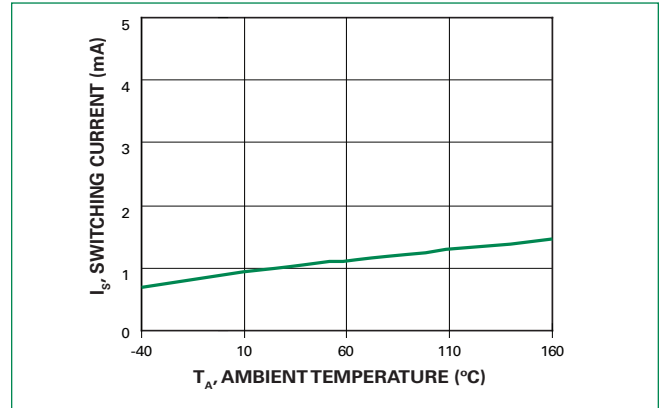
## Thermal Considerations

Package	Symbol	Parameter	Value	Unit
 <b>QFN</b>	$T_{OP}$	Operating Temperature	-40 to 85	°C
	$T_J$	Maximum Junction Temperature	150	°C
	$T_{STOR}$	Storage Temperature	-65 to 150	°C

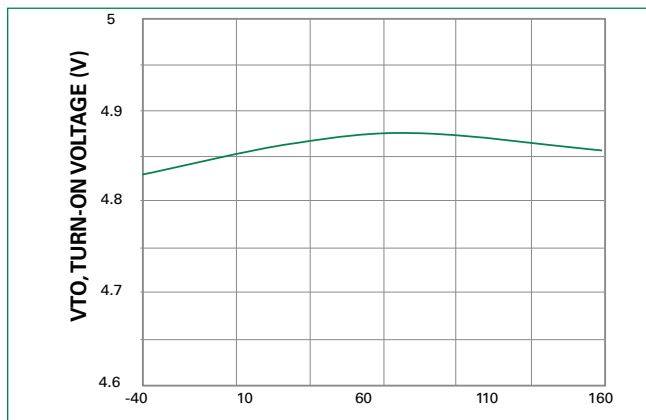
## V-I Characteristics



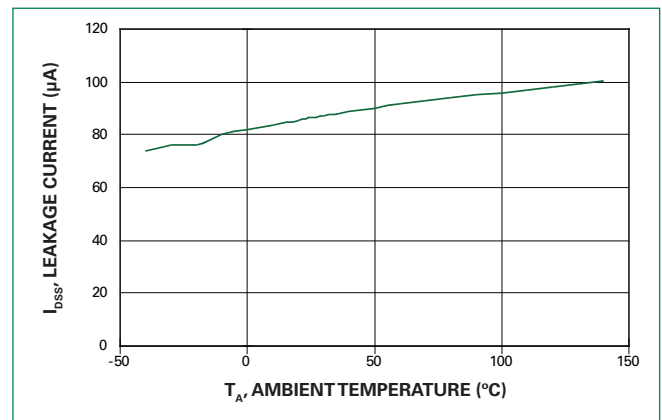
## Switching Current vs Temperature



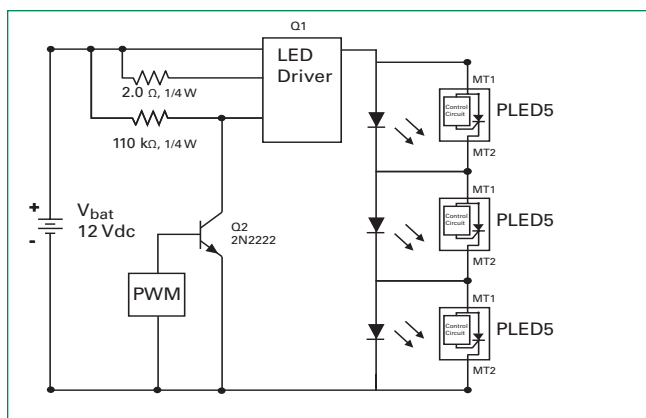
## Turn On Voltage vs Temperature



## Leakage Current vs Temperature

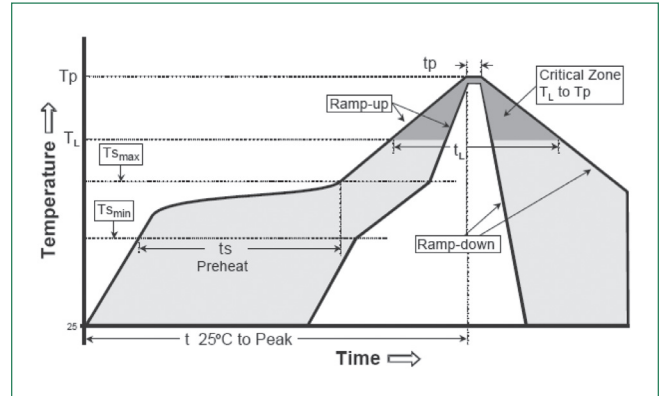


## LED Application and Interference Test Circuit



## Soldering Parameters

Reflow Condition	Pb – Free assembly	
Pre Heat	- Temperature Min ( $T_{s(min)}$ )	150°C
	- Temperature Max ( $T_{s(max)}$ )	200°C
	- Time (min to max) ( $t_s$ )	60 – 180 secs
Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak)	3°C/second max	
$T_{s(max)}$ to $T_L$ - Ramp-up Rate	3°C/second max	
Reflow	- Temperature ( $T_L$ ) (Liquidus)	217°C
	- Temperature ( $t_L$ )	60 – 150 seconds
Peak Temperature ( $T_p$ )	260 <sup>+0/-5</sup> °C	
Time within 5°C of actual peak Temperature ( $t_p$ )	30 seconds	
Ramp-down Rate	6°C/second max	
Time 25°C to peak Temperature ( $T_p$ )	8 minutes max	
Do not exceed	260°C	



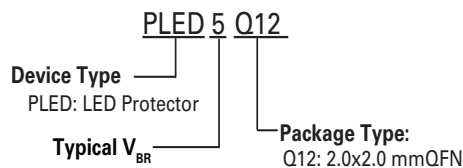
## Physical Specifications

Terminal Material	Copper Alloy
Terminal Finish	100% Matte Tin Plated
Body Material	UL recognized epoxy meeting flammability classification 94V-0

## Ordering Information

Catalog Number	Package Type	Quantity Per Reel
PLED5Q12	QFN	3000 Pieces

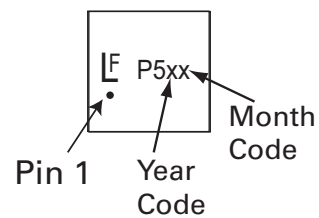
## Part Numbering System



## Environmental Specifications

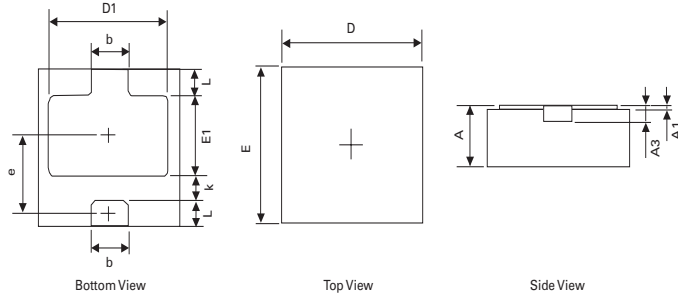
High Temperature Voltage Blocking	MIL-STD-750: Method 1040, Condition A 80% min $V_{BR}$ DC, 150°C, 504 hours
Temperature Cycling	MIL-STD-750: Method 1051 -65°C to 150°C, 15-minute dwell, 100 cycles
Biased Temperature & Humidity	EIA/JEDEC: JESD22-A101 80% min $V_{BR}$ , 85°C, 85% RH, 1008 hours
Resistance to Solder Heat	MIL-STD-750: Method 2031 260°C, 10 seconds
Moisture Sensitivity Level	JEDEC-J-STC-020D, Level 1
Burn-In Test	$T_j = 150^\circ\text{C}$ , $I_T = 0.350 \text{ Adc}$ , 1008 hours

## Part Marking System



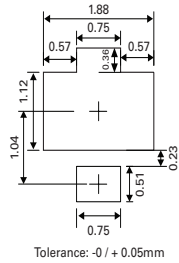
## Package Dimensions - QFN

### Device Dimensions:



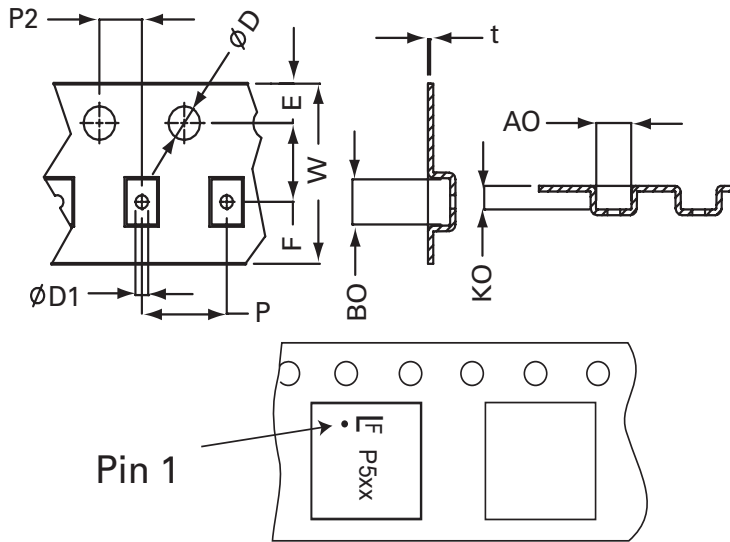
Dimension Symbol	Millimetres	
	Min	Max
A	0.700/0.800	0.800/0.900
A1	0.000	0.050
A3	0.203REF	
D	1.924	2.076
E	1.924	2.076
D1	1.580	1.780
E1	0.820	1.020
k	0.200MIN.	
b	0.550	0.650
e	1.045TYP.	
L	0.254	0.406

### Recommended Soldering Pad Dimensions:



Tolerance: -0 / + 0.05mm

## Tape and Reel Specification - QFN



	Millimetres		Inches	
	Min	Max	Min	Max
E	1.65	1.85	0.065	0.073
F	3.45	3.55	0.136	0.140
D1	1.00	-	0.040	-
D	1.50 min		0.059 min	
P	3.90	4.10	0.154	0.161
W	7.70	8.30	0.303	0.327
P2	1.95	2.05	0.077	0.081
A0	2.20	2.30	0.086	0.090
B0	2.20	2.30	0.086	0.090
K0	0.64	0.74	0.025	0.029
t	0.20 typ		0.007 typ	