

## PLEDxUSW Series, Unidirectional, White DO-214AA



**OBSOLETE** DATE: 03/26/2020 PCN/ECN# 41325  
REPLACED BY: PLED series



### Description

The PLEDxUSW open LED protectors provide an electronic switching shunt path around a single LED that fails as an open circuit. This ensures the remaining string of LEDs will continue to function even though a single LED in the string has failed open. It also provides reverse battery or reverse power polarity protection.

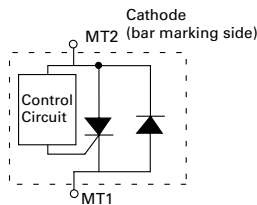
It is designed to enable higher reliability in outdoor LED lighting applications such as street lighting, outdoor signage, aircraft runway lighting, roadside warning lights and other applications. Additionally, it is molded from white material to make it less visible in the LED fixture and the white molding also reflects more light to improve overall light engine efficiency.

This component is compatible with one, two and three watt LEDs that have a nominal 3V forward characteristic, PLEDxUSW is available in SMB surface mount package. The DO-214AA (SMB) low profile package is ideal for dense board applications.

### Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
|        | E133083            |

### Schematic Symbol



### Features & Benefits

- Fast switching
- Reverse Battery/Power Protection
- Automatically resets after power cycle
- Low profile, small foot print standard DO-214AA package
- Compatible with industrial lighting environments
- IEC-61000-4-2 ESD 30kV (Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- Compatible with PWM frequencies up to 10 kHz
- RoHS compliant and halogen-free
- Moisture Sensitivity Level(MSL -1)

### Electrical Characteristics (All parameters are measured at $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Part Number | Marking | $V_{BR}$ breakdown |     | $V_{DRM}$ breakdown | $I_H$ | $I_S$ | $I_T @ V_T$ | $V_T @ I_T = 1A$ | $I_F @ V_F$ | $V_F @ I_F = 1A$ | $I_O^1$ | Critical rate of rise dV/dt |
|-------------|---------|--------------------|-----|---------------------|-------|-------|-------------|------------------|-------------|------------------|---------|-----------------------------|
|             |         | Volts              |     | Volts               | mAmps | mAmps | Amps        | Volts            | Amps        | Volts            | Amps    | Volts                       |
|             |         | Min                | Max | Min                 | Max   | Max   | Max         | Max              | Max         | Max              | Min     | Max                         |
| PLED6USW    | PL6UW   | 6                  | 16  | 6                   | 30    | 50    | 1.0         | 1.2              | 1.0         | 1.0              | 1.0     | 250V/ $\mu$ s               |

note:

1.  $I_O$  - Operation current tested @ aluminum boards, ambient temp  $85^\circ\text{C}$

### Thermal Considerations

| Package                                                                                                | Symbol          | Parameter                               | Value                                                  | Unit |
|--------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|--------------------------------------------------------|------|
| DO-214AA in White<br> | $T_J$           | Operating Junction Temperature Range    | -40 to +150                                            | °C   |
|                                                                                                        | $T_S$           | Storage Temperature Range               | -65 to +150                                            | °C   |
|                                                                                                        | $R_{\theta JA}$ | Thermal Resistance: Junction to Ambient | DO-214AA: 90 <sup>1</sup><br>DO-214AA: 40 <sup>2</sup> | °C/W |

Notes:

1) Standard FR-4 PCB with Copper Pads (Recommended Size)

2) Aluminum PCB

Thickness: 1.6mm

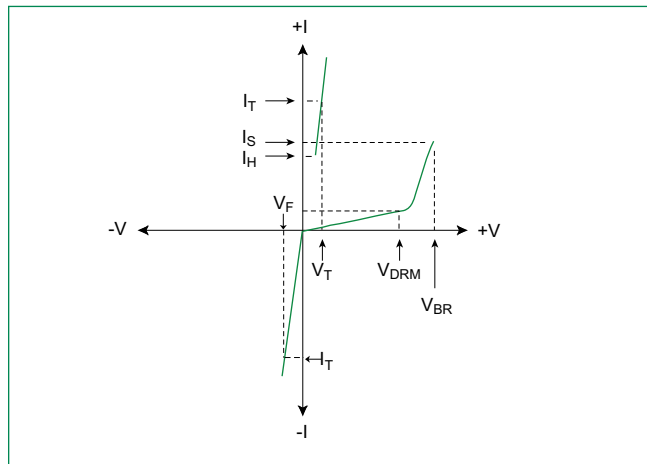
Grade: 1-2 W/mK Thermal Conductivity

Trace thickness: 2 oz

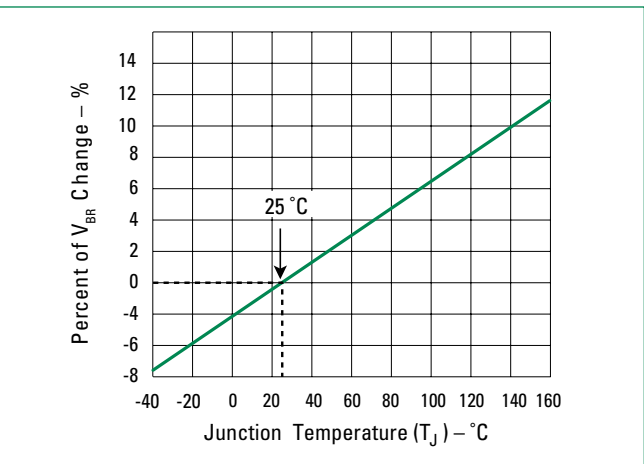
Insulation layer thickness: 215  $\mu$ m

Solder Pad Dimensions: 2.0mm x 2.8mm (Recommended Size)

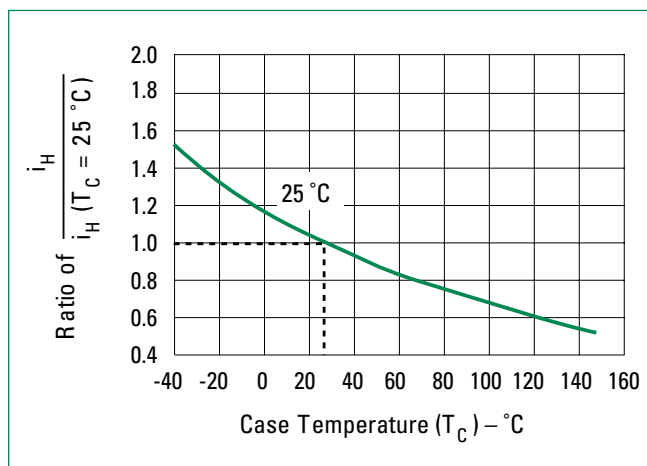
### V-I Characteristics



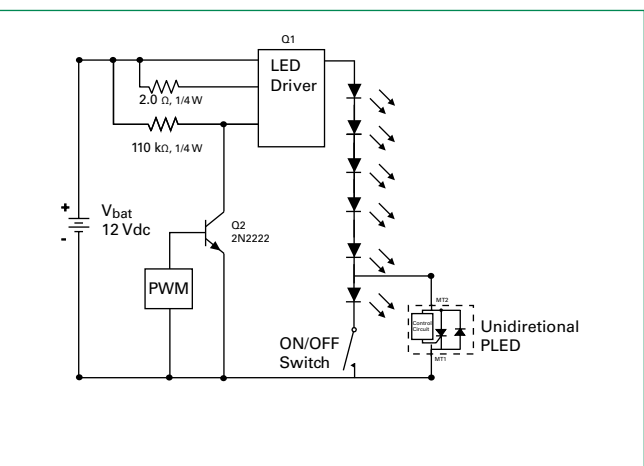
### $V_{BR}$ vs. Junction Temperature



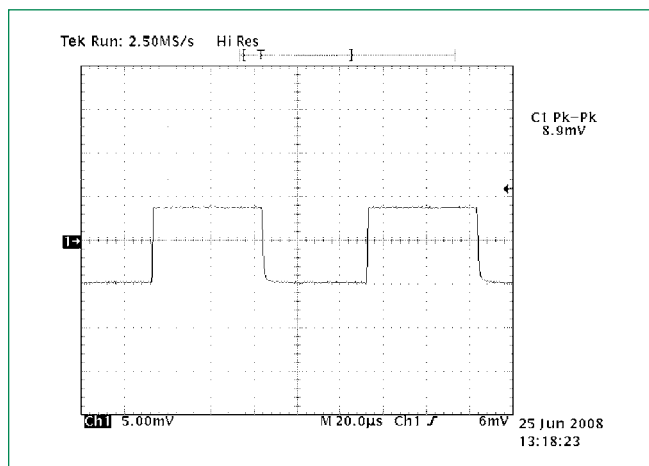
### Normalized DC Holding Current vs. Case Temperature



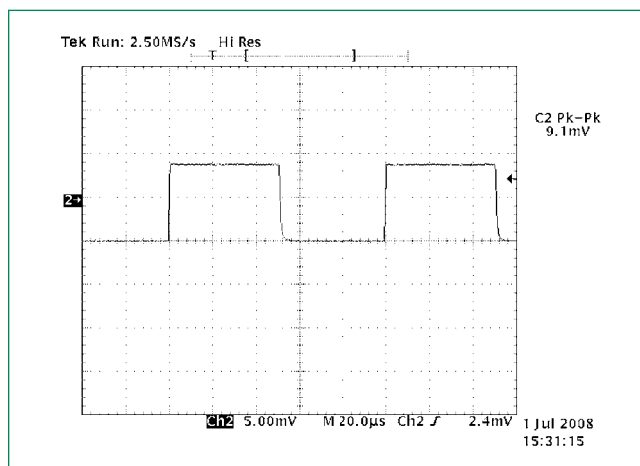
### LED Interference Test Circuit



### 6 LEDs in Series 50% Duty Cycle 10kHz

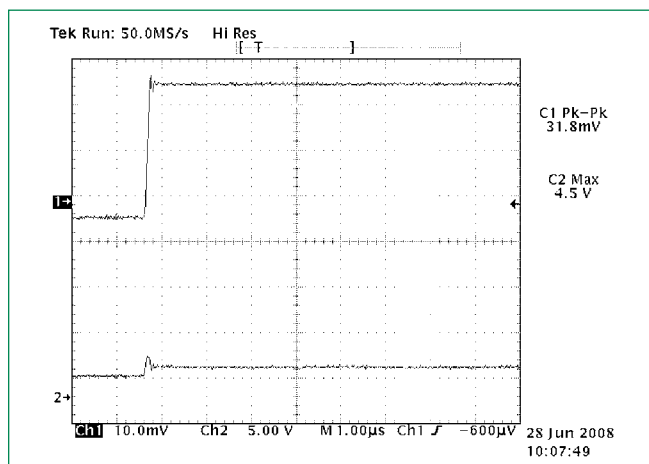


### 5 LEDs and 1 PLED in Series 50% Duty Cycle 10kHz



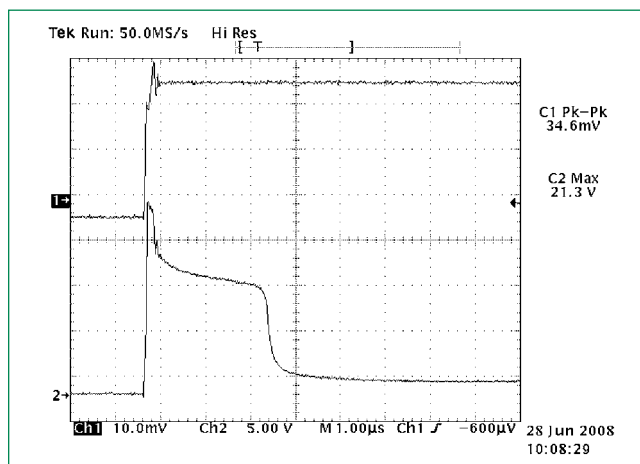
Note: These two graphs show the current magnitude through the LED string with and without the PLED included. There is no noticeable effect on the LED current magnitude when the PLED is included in the circuit as compared to the LED current magnitude when the PLED is not in the circuit. (The conversion factor for the test measurement in the graphs above is 10mA/mV for the Pearson coil measurement, therefore, the current magnitude in the first figure is  $10\text{mA} \times 8.9 = 89\text{mA}$ , while the second figure is 91mA.)

### PLED in the Off-State 10kHz



Channel 1: current through LEDs (318 mA)  
Channel 2: voltage across PLED device (4.5 V)

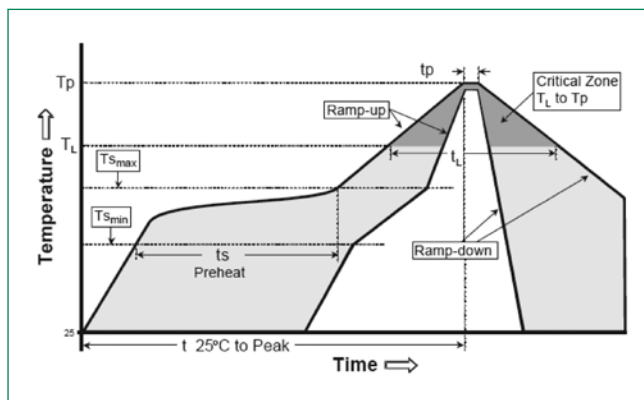
### PLED device zeners and then turns fully on 10kHz



Channel 1: current through LEDs (346 mA) and PLED device once it is fully turned on 2.5 µsec later  
Channel 2: voltage across PLED device (21.3 V before PLED crowbars with 2 V drop)

### 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                   |



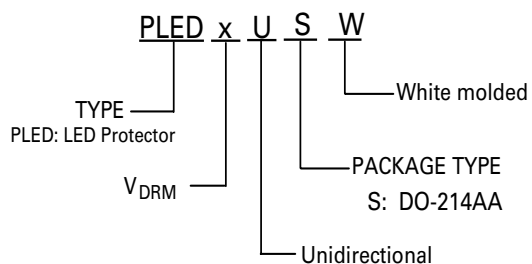
### Physical Specifications

|                          |                                                                |
|--------------------------|----------------------------------------------------------------|
| <b>Terminal Material</b> | Copper Alloy                                                   |
| <b>Terminal Finish</b>   | 100% Matte Tin Plated                                          |
| <b>Body Material</b>     | UL recognized compound meeting flammability classification V-0 |

### Environmental Specifications

|                                          |                                                                                         |
|------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>High Temperature Voltage Blocking</b> | MIL-STD-750: Method 1040, Condition A<br>80% min $V_{DRM}$ (VAC-peak), 150°C, 504 hours |
| <b>Temperature Cycling</b>               | MIL-STD-750: Method 1051<br>-65°C to 150°C, 15-minute dwell, 100 cycles                 |
| <b>Biased Temperature &amp; Humidity</b> | EIA/JEDEC: JESD22-A101<br>52VDC, 85°C, 85%RH, 1008 hours                                |
| <b>High Temperature Storage</b>          | MIL-STD-750: Method 1031<br>150°C, 1008 hours                                           |
| <b>Low Temperature Storage</b>           | -65°C, 1008 hours                                                                       |
| <b>Thermal Shock</b>                     | MIL-STD-750: Method 1056<br>0°C to 100°C, 5-minute dwell, 10-second transfer, 10 cycles |
| <b>Resistance to Solder Heat</b>         | MIL-STD-750: Method 2031<br>260°C, 10 seconds                                           |

### Part Numbering System



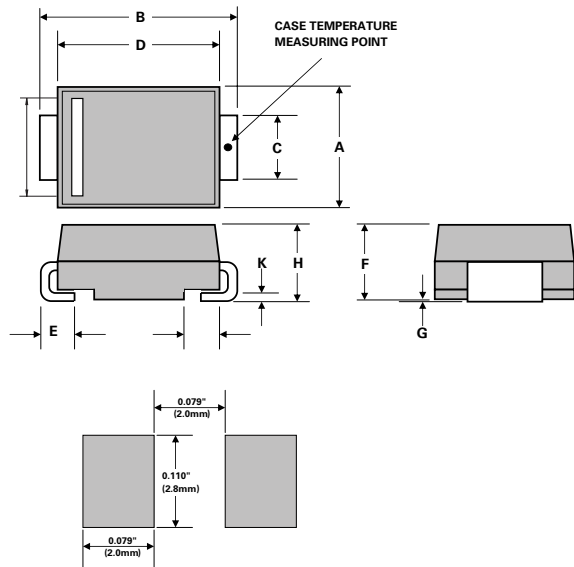
### Part Marking System



### Packaging

| Package | Description | Packaging Quantity | Industry Standard |
|---------|-------------|--------------------|-------------------|
| S       | DO-214AA    | 2500               | EIA-481-1         |

### Dimensions - DO-214 AA Package

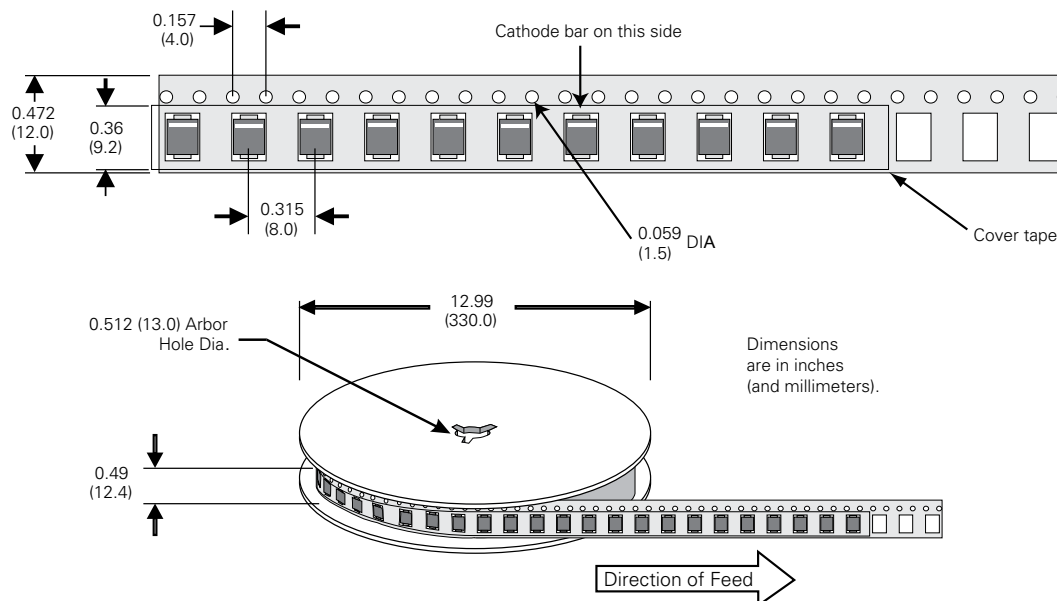


Recommended solder pad layout  
(Reference Only)

| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| A          | 0.130  | 0.156 | 3.30        | 3.95 |
| B          | 0.201  | 0.220 | 5.10        | 5.60 |
| C          | 0.077  | 0.087 | 1.95        | 2.20 |
| D          | 0.159  | 0.181 | 4.05        | 4.60 |
| E          | 0.030  | 0.063 | 0.75        | 1.60 |
| F          | 0.075  | 0.096 | 1.90        | 2.45 |
| G          | 0.002  | 0.008 | 0.05        | 0.20 |
| H          | 0.077  | 0.104 | 1.95        | 2.65 |
| K          | 0.006  | 0.016 | 0.15        | 0.41 |

### DO-214AA Embossed Carrier Reel Pack (RP)

#### Meets all EIA-481-1 Standards



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