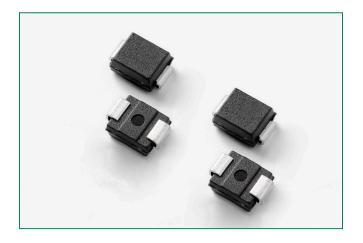
# Automotive PLED Series (PLEDxS-A)





## Description

Automotive PLED Series (PLEDxS-A) open LED protectors provide a switching electronic shunt path when an LED in an LED string fails as an open circuit. This ensures that the remaining string of LEDs will continue to function if a single LED does not.

This series is designed for automotive applications such as automotive car head lamp, tail lamp, LED indicator protection, aircraft runway lighting and other applications need high reliability requirements.

Compatible with one, two and three watt LEDs that have a nominal 3V forward characteristic.

### **Agency Approvals**

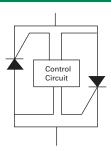
Agency	Agency File Number		
<b>71</b>	E133083		

#### **Features**

- Recognized to UL 497B as an Isolated Loop Circuit Protector
- AEC-Q101 Qualified and PPAP Capable
- Fast switching
- Automatically resets after power cycle
- Available in 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 30 kHz
- RoHS compliant and halogen-free

## **Schematic Symbol**



# **Electrical Characteristics** (All parameters are measured at T<sub>A</sub>=25°C unless otherwise noted)

		V <sub>DRM</sub> @I <sub>DRM</sub> =5µA	V <sub>s</sub> @100V/μs	I <sub>H</sub>	I <sub>s</sub>	$I_{T}@V_{T}$	V <sub>T</sub> @ I <sub>T</sub> = 1 Amp	Critical rate of rise dV/dt
Part Number	Marking	Volts	Volts	mAmps	mAmps	Amps	Volts	Volts
		Min	Max	Min	Max	Max	Max	Max
PLED6S-A	AL6	6	27	5	100	1.0	1.2	250V/µs
PLED9S-A	AL9	9	30	5	100	1.0	1.2	250V/µs
PLED13S-A	AL13	13	44	5	100	1.0	1.2	250V/µs
PLED18S-A	AL18	18	55	5	100	1.0	1.2	250V/µs

# **Thermal Considerations**

Symbol	Parameter	Value	Unit
T <sub>J</sub>	Operating Junction Temperature Range	-55 to +150	°C
T <sub>s</sub>	Storage Temperature Range	-65 to +150	°C
R <sub>eJA</sub>	Thermal Resistance: Junction to Ambient	DO-214AA: 125 <sup>1</sup> DO-214AA: 40 <sup>2</sup>	°C/W

#### Notes:

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

2) Aluminium PCB

Thickness: 1.6mm

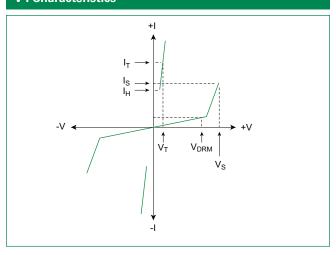
Grade: 1-2 W/mK Thermal Conductivity

Trace thickness: 2 oz

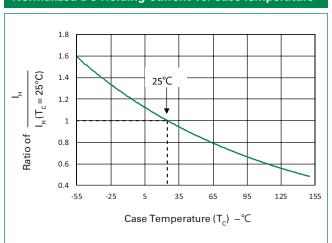
Insulation layer thickness: 215 µm

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

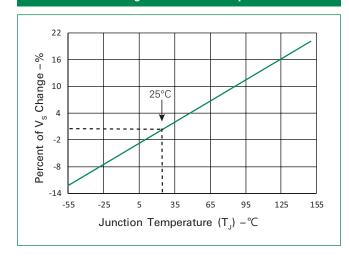
#### **V-I Characteristics**



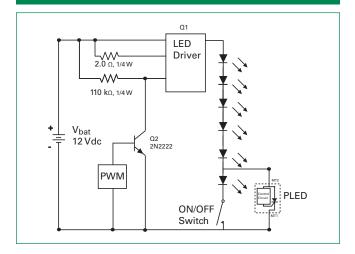
# Normalized DC Holding Current vs. Case Temperature



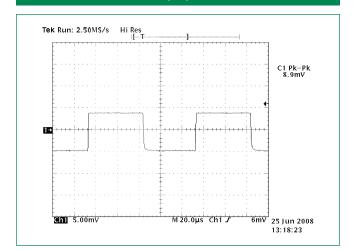
### Normalized VS Change vs. Junction Temperature



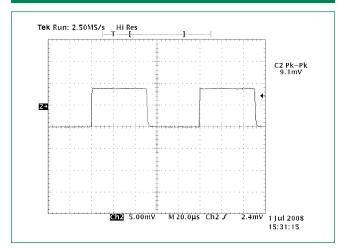
# **LED Interference Test Circuit**



# 6 LEDs in Series 50% Duty Cycle 10kHz

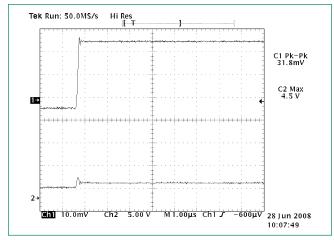


# 5 LEDs and 1 PLED in Series 50% Duty Cycle 10kHz



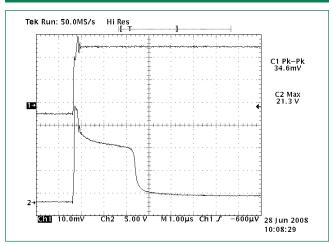
Note: These two graphs show the current magnitude through the LED string with and without the PLED included. There is no noticeable effect on the LED current magnitude when the PLED is included in the circuit as compared to the LED current magnitude when the PLED is not in the circuit. (The conversion 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 10mA\*8.9 = 89mA, while the second figure is 91mA.)

# PLED in the Off-State 10kHz



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

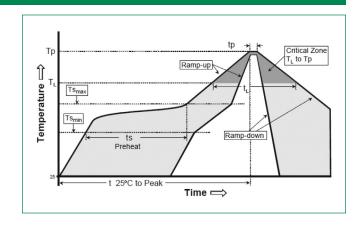
### PLED component zeners and then turns fully on 10kHz



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

### **Soldering Parameters**

Reflow Co	ndition	Pb – Free assembly	
	-Temperature Min (T <sub>s(min)</sub> )	150°C	
Pre Heat	-Temperature Max (T <sub>s(max)</sub> )	200°C	
	-Time (min to max) (t <sub>s</sub> )	60 – 180 secs	
Average ramp up rate (Liquidus Temp (T <sub>L</sub> ) to peak		3°C/second max	
$T_{S(max)}$ to $T_{L}$	- Ramp-up Rate	3°C/second max	
Reflow	-Temperature (T <sub>L</sub> ) (Liquidus)	217°C	
	-Temperature (t <sub>L</sub> )	60 – 150 seconds	
PeakTemp	erature (T <sub>P</sub> )	260+0/-5 °C	
Time within 5°C of actual peak Temperature (t <sub>p</sub> )		30 seconds	
Ramp-down Rate		6°C/second max	
Time 25°C to peak Temperature (T <sub>P</sub> )		8 minutes max	
Do not exceed		260°C	



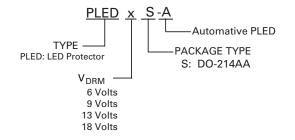
# **Physical Specifications**

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

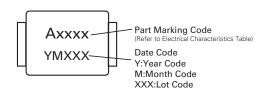
# **Environmental Specifications**

High Temp Voltage Blocking	80% Rated V <sub>DRM</sub> (V <sub>DC</sub> Peak) +150°C, 1008 hrs. MIL-STD-750 (Method 1040) JEDEC, JESD22-A-101		
Temp Cycling	-55°C to +150°C, 15 min. dwell, 1000 cycles. MILSTD-750 (Method 1051) EIA/JEDEC, JESD22-A104		
Biased Temp & Humidity	80% Rated V <sub>DRM</sub> (+85°C) 85%RH, 504 up to 1008 hrs. EIA/JEDEC, JESD22-A-101		
Unbiased Highly Accelerated Stress Test	+130°C,85%RH,2atm,96hrs.JESD22A-118		
Resistance to Solder Heat	+260°C, 10 secs. MIL-STD-750 (Method 2031)		
Moisture Sensitivity Level	85%RH, +85°C, 168 hrs., 3 reflow cycles (+260°C Peak). JEDEC-J-STD-020, Level 1		

# **Part Numbering System**

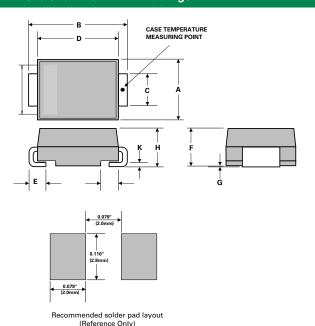


# **Part Marking System**



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

## **Dimensions - DO-214 AA Package**



Dimensions	Incl	Inches		neters
Dimensions	Min	Max	Min	Max
А	0.130	0.156	3.30	3.95
В	0.201	0.220	5.10	5.60
С	0.077	0.087	1.95	2.20
D	0.159	0.181	4.05	4.60
Е	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
Н	0.077	0.104	1.95	2.65
K	0.006	0.016	0.15	0.41

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

0.157 (4.0)0.472 (12.0) 0 0 0 0 0 0 0 0 0 000000 0 0 0 0 0000 0.36 (9.2) 0.315 0.059 DIA Cover tape (1.5)12.99 0.512 (13.0) Arbor (330.0)Hole Dia. Dimensions are in inches (and millimeters). 0.49 (12.4)Direction of Feed

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