

# AL8807AEV1 EVALUATION BOARD USER GUIDE

## DESCRIPTION

The AL8807AEV1, Figure 1, is a double sided evaluation board for the AL8807A step-down, or 'buck', LED driver with internal switch. The evaluation board is preset to drive 680mA into a single LED, or multiple LEDs, the maximum number of which depends on their total forward voltage drop and the supply voltage. (The maximum drive current of the AL8807A is 1000mA)

The operating voltage of the board is nominally 36 volts, but it can be reduced to a minimum of 6 volts. The 68uH inductor used in the circuit is based on this nominal supply. The evaluation board should be connected as in Figure 1 below.

**Note: The evaluation board does not have reverse supply protection.**

The nominal current, 680mA, is set with the 0R15 sense resistor, R1.

Terminal CTRL provides a connection point for Analog dimming.

**Warning: At 36V nominal operation with 680mA output, the LED will be hot and very bright**

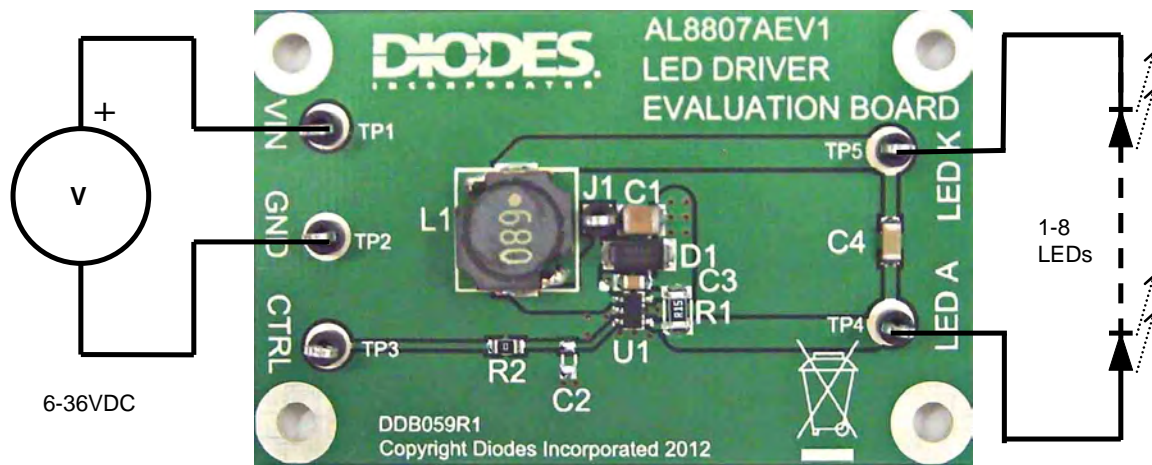


Figure 1: AL8807AEV1 evaluation board and connection diagram

AL8807AEV1 Connection Point Definition	
Name	Description
Vin	Positive supply voltage. 6 to 36V
GND	Supply Ground (0V).
CTRL	Internal voltage ref. pin (2.5V). This pin can be used to achieve dimming and for switching the output current off. Leave floating for normal operation.
LED A	LED A connects to the external LED anode
LED K	LED K connects to the external LED cathode

**AL8807A DEVICE DESCRIPTION**

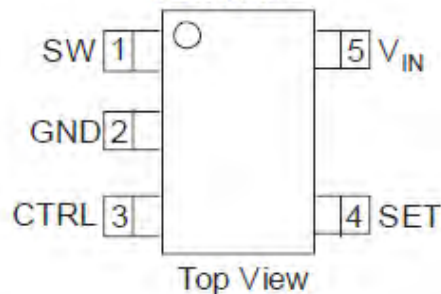
The AL8807A is a continuous mode inductive driver in a SOT25 package, for driving one or more series-connected LEDs efficiently from a voltage source higher than the LED voltage. The device includes the output switch and a current sense circuit, which requires an external sense resistor to set the nominal current up to 1000mA.

**AL8807A DEVICE FEATURES**

- Drives one or more series-connected LEDs
- LEDs up to 1000mA.
- Internal 36V switch.
- Wide input voltage: 6V to 36V.
- Inherent open circuit LED protection.
- Brightness control using DC.

**DEVICE APPLICATIONS**

- LED flashlights.
- High Power LED driving.
- Low-voltage halogen replacement LEDs.
- Automotive lighting.
- Illuminated signs.

**AL8807A Device Packages, Pin and Definitions****SOT25 pack****AL8807A Device Pin Definition**

Name	Pin No	Description
SW	1	Drain of NDMOS switch.
GND	2	Ground (0V).
CTRL	3	Internal voltage ref. pin (2.5V) : <ul style="list-style-type: none"> <li>• Leave floating for normal operation.</li> <li>• Drive with a DC voltage (0.25V to 2.5V to adjust output current</li> </ul>
SET	4	Connect a sense resistor, R1, from the SET pin to VIN to sense the nominal output current. Nominal $I_{out} = 0.1 / R1$
VIN	5	Input voltage: 6V to 36V. Decouple to ground with a 2.2uF or higher ceramic capacitor.

**ORDERING INFORMATION**

EVALBOARD ORDER NUMBER
AL8807AEV1

DEVICE ORDER NUMBER
AL8807AW5-7

**Please note: Evaluation boards are subject to availability and qualified sales leads.**

## AL8807AEV1 EVALUATION BOARD REFERENCE DESIGN

The AL8807AEV1 is configured to the reference design in Figure 2.

The operating voltage is a nominal 36V. The nominal current is set at 680mA with a 0R15 sense resistor R1. The circuit operates in continuous mode at approximately 188kHz, with a 68uH inductor and one LED.

For Analog dimming, the CTRL pin may be driven between 0.25V and 2.5V adjusting the output current from approximately 10% to 100% of  $I_{LED}$ . Shorting R3 will connect the test pin CTRL directly to device pin CTRL, if required.

For other reference designs or further applications information, please refer to the AL8807A datasheet.

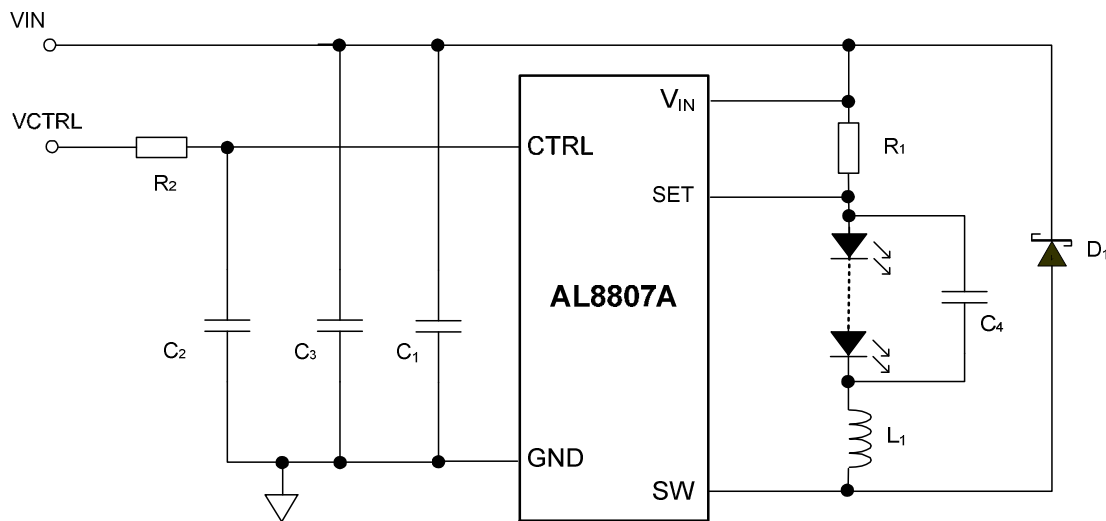


Figure 2: Schematic diagram

### AL8807A Operation

In normal operation, when a voltage is applied at +Vin, the AL8807A internal NDMOS switch is turned on. Current starts to flow through sense resistor R1, inductor L1, and the LED. The current ramps up linearly, the ramp rate being determined by the input voltage +Vin and the inductor L1. This rising current produces a voltage ramp across R1. The internal circuit of the AL8807A senses the voltage across R1 and applies a proportional voltage to the input of the internal comparator. When this voltage reaches an internally set upper threshold, the NDMOS switch is turned off. The inductor current continues to flow through R1, L1, the LED and the Schottky diode D1, and back to the supply rail, but it decays, with the rate of decay determined by the forward voltage drop of the LEDs and the Schottky diode. This decaying current produces a falling voltage at R1, which is sensed by the AL8807A. A voltage proportional to the sense voltage across R1 is applied at the input of the internal comparator. When this voltage falls to the internally set lower threshold, the NDMOS switch is turned on again. This switch-on-and-off cycle continues to provide the average LED current set by the sense resistor R1. Please refer to the datasheets for the threshold limits, AL8807A internal circuits, electrical characteristics and parameters.

### AL8807AEV1 Component list

Ref	Value	Package	Part Number	Manufacturer	Notes
U1	AL8807A	SOT25	AL8807AE5TA	Diodes	DC-DC converter
D1	40V, 3A		B240A	Diodes	Schottky diode
R1	0R15	0805		Generic	5%
R2,	0R0	0805		Generic	1%
C1	4.7uF 50V	1210	C1210X475K5RAC	Generic KEMET	X7R
C2	Not Fitted				Optional soft start capacitor
C3	100nF, 100V	0805	NMC0805X7R104K100 PF GRM21BR71H104KA01L	Generic NIC Comps MURATA	X7R
C4	100nF 100V	1206	NMC1206X7R104K100	Generic NIC Comps	X7R
L1	68uH		MSS1038-683ML NPIS24H680MTRF NPIS104F680MTRF	Coilcraft NIC Comps	

Note: The component part numbers are correct at the time of publication. Diodes Inc reserves the right to substitute other parts where necessary, without further notification.

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### AL8807AEV1 Basic operation at full voltage

1. Connect Vin and GND  
Warning: The board does not feature reverse battery/supply protection.
2. Set the PSU to 36V
3. Turn on the PSU and the LED will illuminate and the current should be approximately 680mA.  
Warning: Do not stare at the LED directly.

### Minimising the output current

Shorting the CTRL pin to GND will cause the LED current to be reduced. On some boards, however, the LED may not be completely turned off.

### Soft start

Adding a C2 capacitor will create a soft-start power-up sequence (0.1ms/nF).

### Changing the LED current

1. Remove R1.
2. Calculate and replace sense resistor, R1, the value of which is based on the required LED current without dimming. R1 can be calculated using following equation :

$$R1 = 0.1V/I_{OUT}$$

where  $I_{OUT}$  = the LED current.

R1 = the sense resistor value in ohms.

0.1V is the nominal sense voltage with 'CTRL' open circuit or set to 2.5V.

The device calculator at the address below can be used to speed up the redesign phase:

<http://www.diodes.com/destools/calculators.html>

### PERFORMANCE

The system efficiency depends on the sense resistor, supply voltage, switching frequency and the number of LEDs.

With a 36V supply and one LED, the switching frequency is typically 188kHz.

The efficiency level is >85% .

**For further advice, please contact your local Diodes Field Applications Engineer, or one of our sales offices listed on the back page of this document.**

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