



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



Description

The AL5802LPL combines a high-gain NPN transistor with a pre-biased NPN transistor to make a simple, small footprint LED driver.

The LED current is set by an external resistor connected from the R_{EXT} Pin (4) to the GND Pin (6), and the internal high gain transistor develops approximately 0.6V across the external resistor.

The AL5802LPL's open-collector output can operate from 0.8V to 30V making it suitable for industry standard 5V to 24V power supplies without additional components.

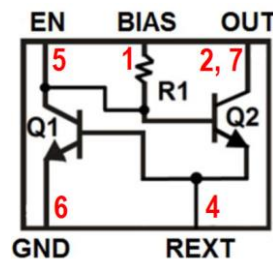
PWM dimming of the LED current can be achieved by either driving the BIAS Pin (1) with a low impedance voltage source, or driving the EN Pin (5) with an external open-collector NPN transistor or open-drain N-Channel MOSFET.

The AL5802LPL is available in a U-DFN3030-6 (Type B) package and is ideal for driving 10mA to 120mA LED currents.

Features

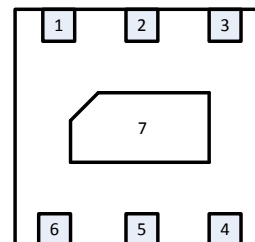
- Reference Voltage V_{REXT} = 0.65V
- 40 to +125°C Operating Temperature Range
- 0.8V to 30V Open-Collector Output
- Negative Temperature Coefficient – Automatically Reduces the LED Current at High Temperatures
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- Halogen and Antimony Free. "Green" Device (Note 3)**

Pin Assignments



3 = N/C

Internal Schematic
(Top View)



(Bottom View)

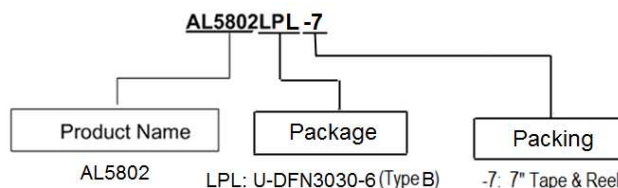
Package: U-DFN3030-6 (Type B)

- The Collector of Q2 is Connected to Pin 2 and Pad 7 which is on the Underside of the Package
- Pin 3 is Not Connected to Anything

Mechanical Data

- Case: U-DFN3030-6 (Type B)
- Case Material: Molded Plastic, "Green" Molding Compound. UL Flammability Classification Rating 94-V-0.
- Moisture Sensitivity: Level 1 per J-STD-020
- Terminals: Finish – NiPdAu over Copper Leadframe. Solderable per MIL-STD-202, Method 208 @4
- Weight: 0.0156 grams

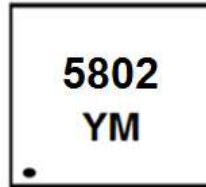
Ordering Information (Note 4)



Device	Qualification	Packaging	Tape and Reel	
			Quantity	Part Number Suffix
AL5802LPL	Commercial	U-DFN3030-6 (Type B)	3,000/Tape & Reel	-7

- Notes:
- No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 - See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 - Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
 - For packaging details, go to our website at <http://www.diodes.com/products/packages.html>.

Marking Information



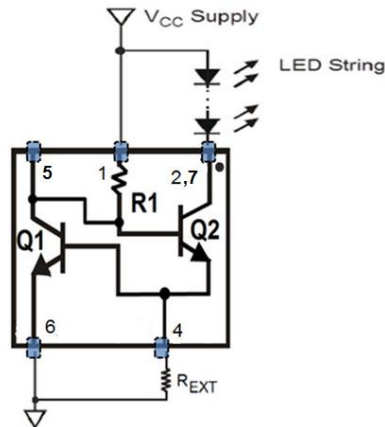
5802 = Product Type Marking Code
YM = Date Code Marking
Y = Year (ex: D = 2016)
M = Month (ex: 9 = September)

Date Code Key

Year	2016	2017	2018	2019	2020	2021	2022	2023	2024
Code	D	E	F	G	H	I	J	K	L

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Code	1	2	3	4	5	6	7	8	9	O	N	D

Typical Application Circuit



Pin Descriptions

Pin Number	Name	Function
1	BIAS	Biases the Open Collector Output Transistor
2	OUT	Open-Collector LED Driver Output
3	N/C	No Connection
4	R _{EXT}	Current Sense Pin LED current sensing resistor should be connected from here to GND
5	EN	Enable Pin for PWM Dimming Provides access to the base of Q2 and the collector of Q1
6	GND	Ground Reference Point for Setting LED Current

Functional Block Diagram

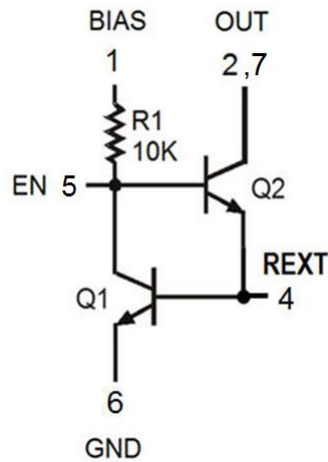


Figure 1 Block Diagram

Absolute Maximum Ratings (Note 5)

Symbol	Characteristics	Values	Unit
V_{OUT}	Output Voltage Relative to GND	30	V
V_{BIAS}	BIAS Voltage Relative to GND	30	V
V_{FB}	LED Voltage Relative to GND	6	V
V_{EN}	EN Voltage Relative to GND	6	V
V_{REXT}	REXT Voltage Relative to GND	6	V
I_{OUT}	Output Current	150	mA
T_{OP}	Operating Temperature	-40 to +150	°C
T_{STG}	Storage Temperature	-55 to +150	°C

Note: 5. These are stress ratings only. Operation outside the absolute maximum ratings may cause device failure. Operation at the absolute maximum rating for extended periods of time may reduce device reliability.

Package Thermal Data

Characteristic	Symbol	Value	Unit
Power Dissipation (Note 6) (@ $T_A = +25^\circ\text{C}$)	P_D	0.88	W
Thermal Resistance, Junction to Ambient Air (Note 6) (@ $T_A = +25^\circ\text{C}$)	$R_{\theta JA}$	145	°C/W

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Unit
V_{BIAS}	Supply Voltage Range	4.5	30	V
V_{OUT}	OUT Voltage Range	0.8	30	
I_{LED}	LED Pin Current (Note 7)	10	120	mA
T_A	Operating Ambient Temperature Range	-40	+125	°C

Notes: 6. Device mounted on FR-4 PCB, single-sided, 2oz copper trace weight with minimum recommended pad layout.
7. Subject to ambient temperature, power dissipation and PCB substrate material selection.

Electrical Characteristics – NPN Transistor – Q1 (@T_A = +25°C, unless otherwise specified.)

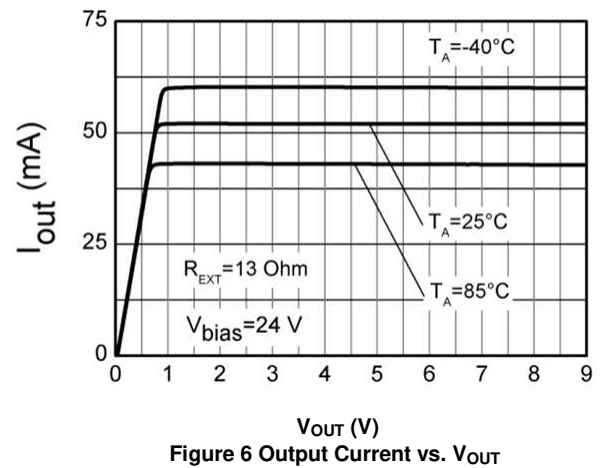
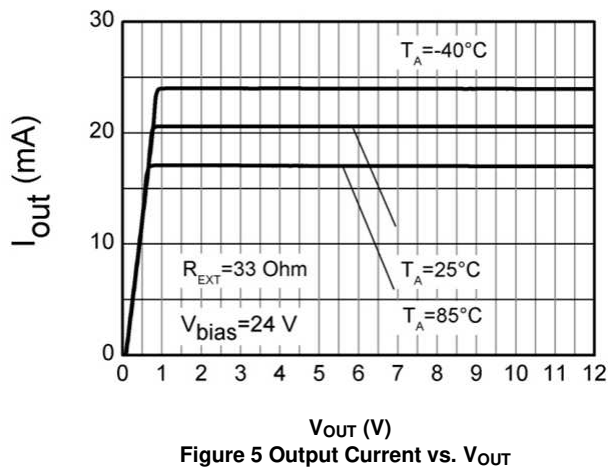
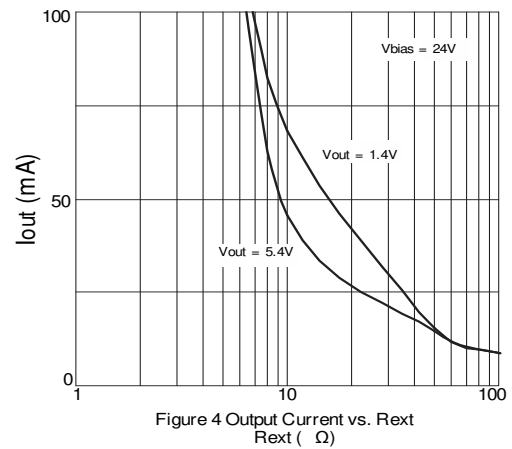
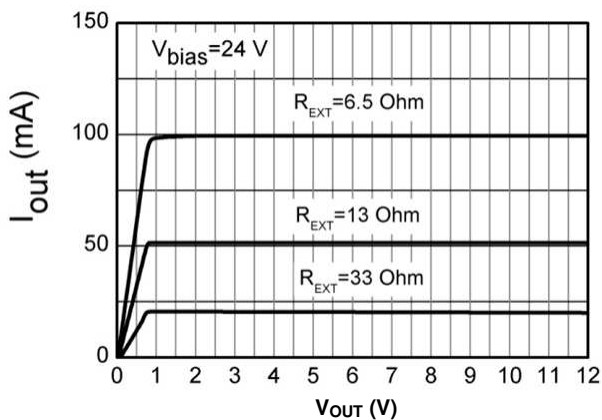
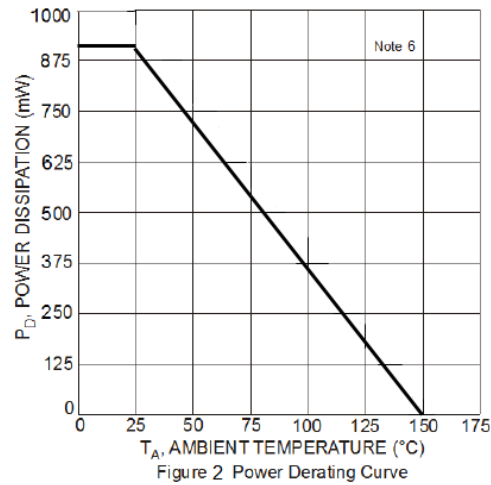
Symbol	Characteristic	Test Condition	Min	Typ	Max	Unit
V _{(BR)CEO}	Collector-Emitter Breakdown Voltage (Notes 8 & 9)	I _C = 1.0mA, I _B = 0	40	—	—	V
V _{(BR)EBO}	Emitter-Base Breakdown Voltage	I _E = 10μA, I _C = 0	6.0	—	—	V
I _{CEX}	Collector Cutoff Current (Note 9)	V _{CE} = 30V, V _{EB(OFF)} = 3.0V	—	—	50	nA
I _{BL}	Base Cutoff Current (Note 9)	V _{CE} = 30V, V _{EB(OFF)} = 3.0V	—	—	50	nA
h _{FE}	DC Current Gain	I _C = 1.0mA, V _{CE} = 1.0V I _C = 10mA, V _{CE} = 1.0V	70 100	—	— 300	—
V _{CE(SAT)}	Collector-Emitter Saturation Voltage (Note 8)	I _C = 10mA, I _B = 1.0mA	—	—	0.20	V
V _{BE(SAT)}	Base-Emitter Saturation Voltage	I _C = 10mA, I _B = 1.0mA	0.65	—	0.85	V
V _{BE(ON)}	Base-Emitter Turn-On Voltage	V _{CE} = 1.50V, I _C = 2.0mA	0.30	—	1.10	V

Electrical Characteristics – NPN Pre-Biased Transistor – Q2 (@T_A = +25°C, unless otherwise specified.)

Symbol	Characteristic	Test Condition	Min	Typ	Max	Unit
V _{(BR)CBO}	Collector-Base Breakdown Voltage	I _C = 50μA, I _E = 0	30	—	—	V
V _{(BR)CEO}	Collector-Emitter Breakdown Voltage (Note 8)	I _C = 1mA, I _B = 0	30	—	—	V
V _{(BR)EBO}	Emitter-Base Breakdown Voltage (Note 9)	I _E = 50μA, I _C = 0	5.0	—	—	V
I _{CBO}	Collector Cutoff Current	V _{CB} = 30V, I _E = 0	—	—	0.5	μA
I _{EBO}	Emitter Cutoff Current (Note 9)	V _{EB} = 4V, I _C = 0	—	—	0.5	μA
V _{CE(SAT)}	Collector-Emitter Saturation Voltage (Note 8)	I _C = 10mA, I _B = 1mA	—	—	0.3	V
V _{BE(ON)}	Base-Emitter Turn-On Voltage	V _{CE} = 5.0V, I _C = 2.0mA	0.30	—	1.10	V
h _{FE}	DC Current Gain (Note 8)	V _{CE} = 5V, I _C = 150mA	100	—	—	—
R ₁	Input Resistance	—	7	10	13	kΩ

- Notes:
8. Short duration pulse test used to minimize self-heating effect.
 9. Guaranteed by design and tested only at the wafer level for single die. These parameters cannot be tested at the finished goods level due to the testability of the device changed after packaging multiple dies to form an application circuit.

Thermal Characteristics



Typical Performance Characteristics

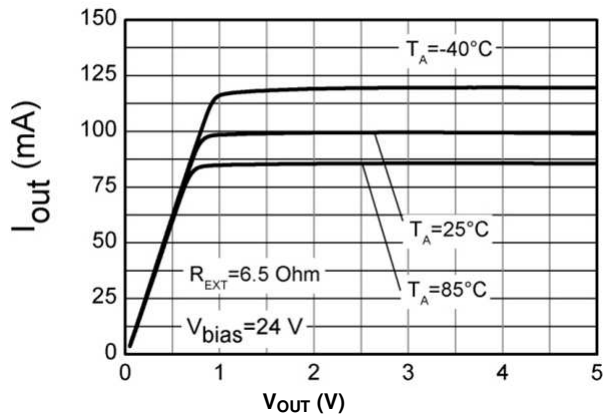


Figure 7 Output Current vs. V_{OUT}

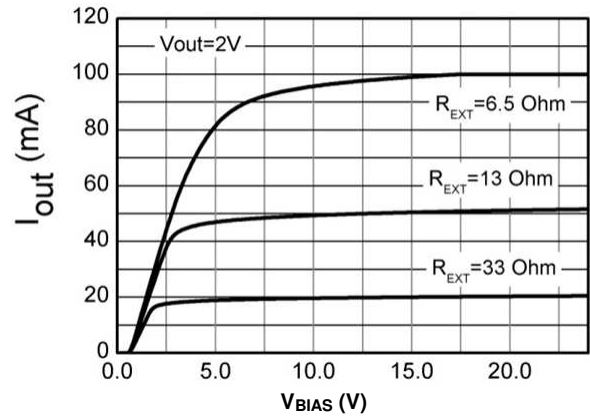


Figure 8 Output Current vs. V_{BIAS}

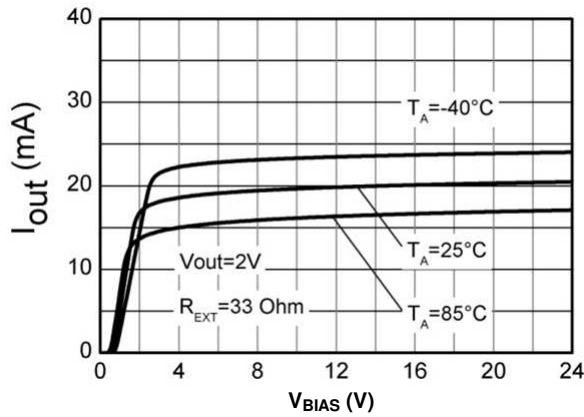


Figure 9 Output Current vs. V_{BIAS}

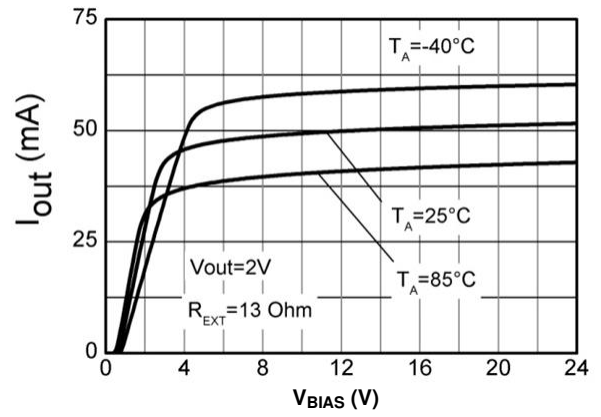


Figure 10 Output Current vs. V_{BIAS}

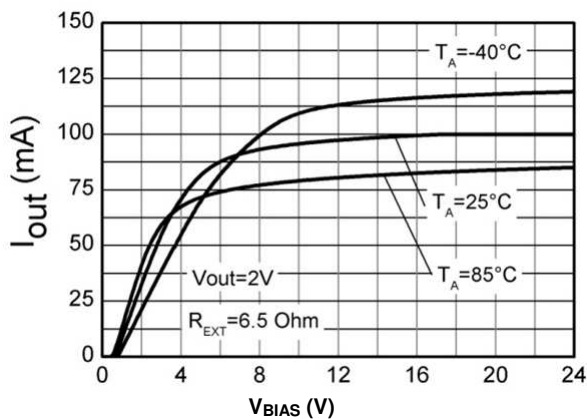


Figure 11 Output Current vs. V_{BIAS}

Application Information

The AL5802LPL is designed for driving low current LEDs with a typical LED current of 10mA to 100mA. It provides a cost-effective means for driving low current LEDs compared with more complex switching regulator solutions. Furthermore, it reduces the PCB board area of the solution as there is no need for external components like inductors, capacitors and switching diodes.

Figure 12 shows a typical application circuit diagram for driving an LED or string of LEDs. The NPN transistor Q1 measures the LED current by sensing the voltage across an external resistor R_{EXT} . Q1 uses its V_{BE} as a reference to set the voltage across R_{EXT} and controls the base current into Q2. Q2 operates in linear mode to regulate the LED current. The LED current is expressed as follows:

$$I_{LED} = V_{BE(Q1)} / R_{EXT}$$

From this, for any required LED current, the necessary external resistor R_{EXT} can be calculated as follows:

$$R_{EXT} = V_{BE(Q1)} / I_{LED}$$

Two or more AL5802LPL devices can be connected in parallel to construct higher current LED strings as shown in Figure 13.

Consideration of the expected linear mode power dissipation must be factored into the design, with respect to the AL5802LPL's thermal resistance.

The maximum voltage across the device can be calculated by taking the maximum supply voltage minus the voltage across the LED string.

$$V_{CE(Q2)} = V_{CC} - V_{LED} - V_{BE(Q1)}$$

$$P_D = V_{CE(Q2)} * I_{LED} + (V_{CC} - V_{BE(Q2)} - V_{BE(Q1)})^2 / R_1$$

As the output current of AL5802LPL increases, it is necessary to provide appropriate thermal relief to the device. The power dissipation supported by the device is dependent upon the properties of the PCB board material, the copper pad areas and the ambient temperature. The maximum dissipation the device can handle is given as follows:

$$P_D = (T_{J(MAX)} - T_A) / R_{\theta JA}$$

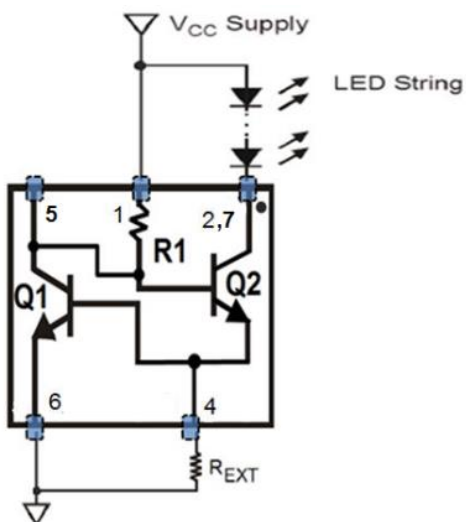


Figure 12 Typical Application Circuit for Linear Mode Current Sink LED Driver

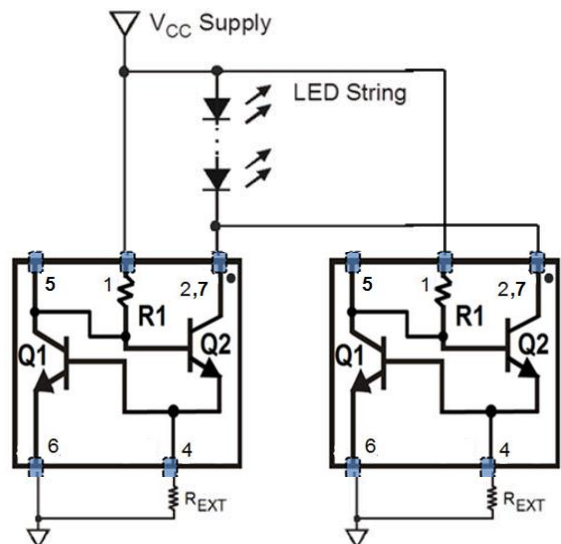


Figure 13 Application Circuit for Increasing LED Current

Application Information (Continued)

PWM dimming can be achieved by driving the EN Pin. An external open-collector NPN transistor or open-drain N-Channel MOSFET can be used to drive the EN Pin as shown in Figure 14. Dimming is achieved by turning the LEDs ON and OFF for a portion of a single cycle. The PWM signal can be provided by a micro-controller or analog circuitry. Figure 15 is a typical response of LED current vs. PWM duty cycle on the EN Pin.

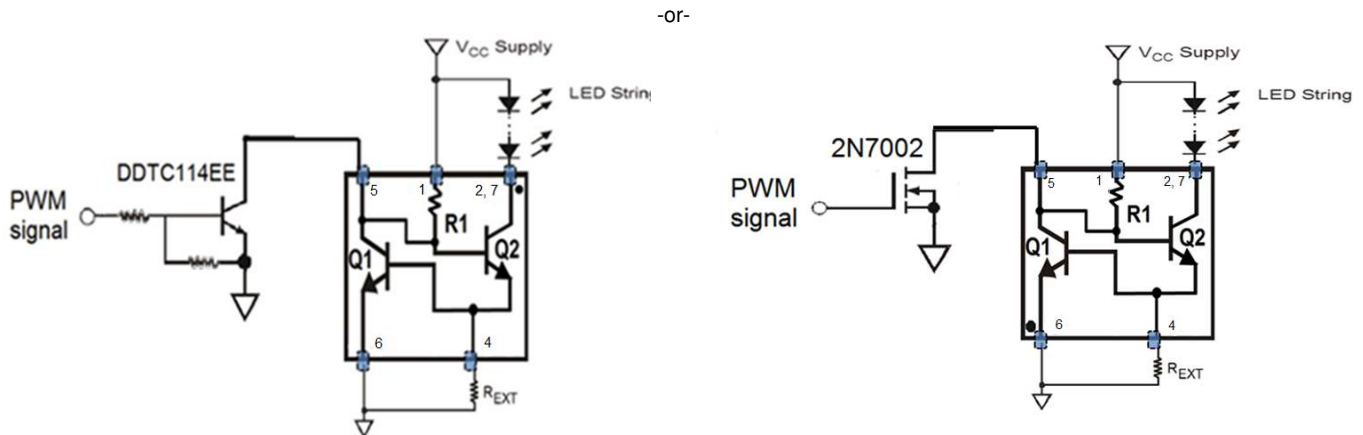


Figure 14 Application Circuits for LED Driver with PWM Dimming Functionality

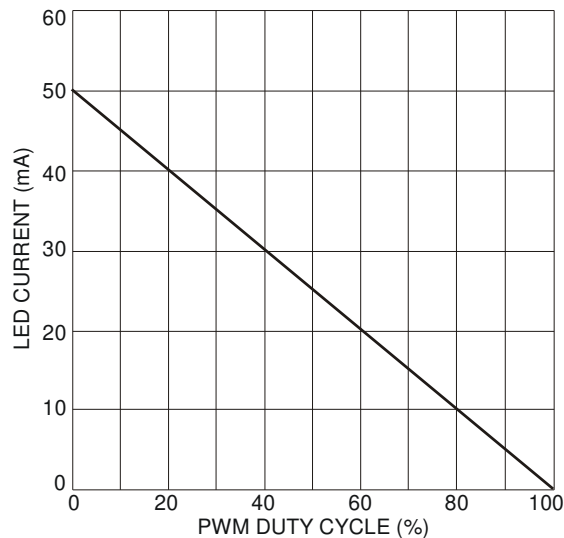


Figure 15 Typical LED Current Response vs. PWM Duty Cycle for $R_{EXT} = 13\Omega$ at 400Hz PWM Frequency

To remove the potential of incorrect connection of the power supply damaging the lamp's LEDs, many systems use some form of reverse polarity protection.

One solution for reverse input polarity protection is to simply use a diode with a low V_F in-line with the driver/LED combination. The low V_F of the series-connected diode increases the available voltage to the LED stack and dissipates less power. A circuit example is presented in Figure 16 using Diodes Inc. SBR[®] (Super Barrier Rectifier) technology. An SDM10U45LP (0.1A/45V) is shown, providing exceptionally low V_F for its package size of 1mm x 0.6mm, equivalent to an 0402 chip style package. Other reverse voltage ratings are also available on Diodes' website such as the SBR02U100LP (0.2A/100V) or SBR0220LP (0.2A/20V).

Automotive applications commonly use this method for reverse battery protection.

Application Information (Cont.)

A second approach, shown in Figure 17, improves upon the method shown in Figure 16. Whereas the method in Figure 16 protects the light engine, it will not function until the problem is diagnosed and corrected.

The method shown in Figure 17 not only provides reverse polarity protection, it also corrects the reversed polarity, allowing the light engine to function.

The BAS40BRW incorporates four low V_F , Schottky diodes into a single package and allows more voltage available for the LED stack and dissipates less power than standard rectifier bridges.

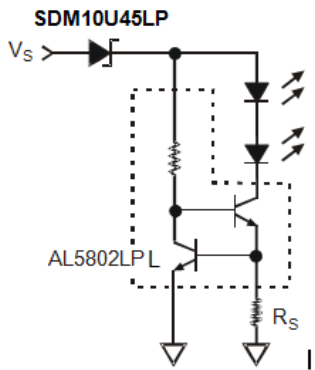


Figure 16 Application Circuit for LED Driver with Reverse Polarity Protection

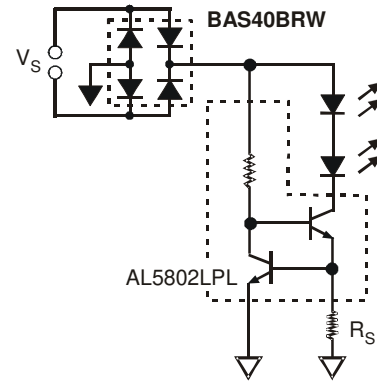
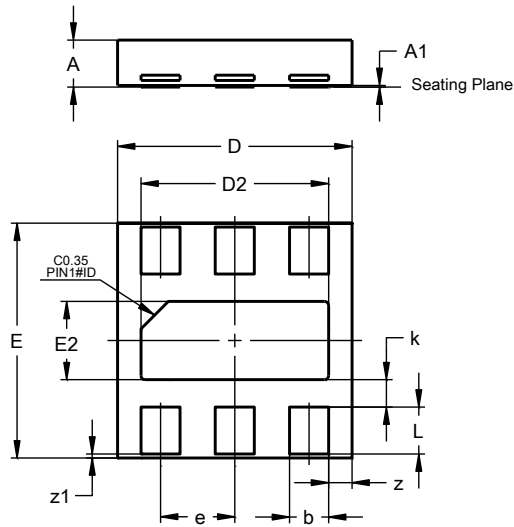


Figure 17 Application Circuit for LED Driver with Assured Operation Regardless of Polarity

Package Outline Dimensions

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

U-DFN3030-6 (Type B)

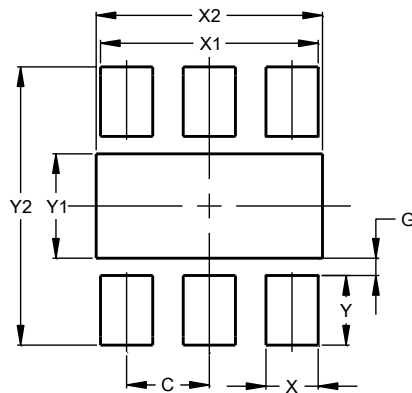


U-DFN3030-6 (Type B)			
Dim	Min	Max	Typ
A	0.57	0.63	0.60
A1	0.00	0.05	0.02
b	0.45	0.55	0.50
D	2.95	3.05	3.00
D2	2.30	2.50	2.40
e	—	—	0.95
E	2.95	3.05	3.00
E2	0.90	1.10	1.00
L	0.55	0.65	0.60
k	—	—	0.35
z	—	—	0.30
z1	—	—	0.05
All Dimensions in mm			

Suggested Pad Layout

Please see <http://www.diodes.com/package-outlines.html> for the latest version.

U-DFN3030-6 (Type B)



Dimensions	Value (in mm)
C	0.950
G	0.200
X	0.600
X1	2.500
X2	2.600
Y	0.800
Y1	1.200
Y2	3.200

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel.

Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2016, Diodes Incorporated

www.diodes.com