

### General Description

The DIODES AL5810Q is a Linear LED Driver offering an excellent temperature and voltage current stability with output adjustable handling capability. The AL5810Q simplifies the design of LED drivers by setting the LED current with an external resistor using standard value resistors.

The AL5810Q has an open drain output that can swing from 2.0V up to 60V supply voltage enabling it drive long LED chains for high side or low side LED strings. Its low 0.5V  $R_{SET}$  pin is outside of the LED current path and can maintain current accuracy while minimizing the required overheads to regulate the LED current. This reduces its power dissipation when compared to traditional linear LED drivers, making it ideal for driving LEDs up to 250mA.

The AL5810Q is available in the wettable flank W-DFN2020-3 (2mm x 2mm), power dissipation ( $P_D$ ) up to 2W and TO-252 (DPAK) package, ( $P_D$ ) up to 3.8W.

### Applications

- Interior and Exterior Automotive LED Lighting
- Puddle Lighting
- Automotive Mood Lighting
- Side Marker Lighting
- Automotive Mirror Turning Lights

- LED Strings for Dome and Mood Lighting
- Instrumentation Illumination

### Key Features

- 2.0V to 60V Wide Input Voltage Range
- An external resistor for 100mA setting (Typ. 7.5k $\Omega$ )
- Low Reference Voltage ( $VR_{SET} = 0.5V$ )
- Adjustable Sink or Source LED Current Up to 200mA/250mA (W-DFN2020/TO-252)
- $\pm 5\%$  LED Current Tolerance at Room Temperature
- Parallel Devices to Increase Regulated Current
- Overtemperature Shutdown
- -40°C to +105°C Ambient Temperature Range
- Wettable W-DFN2020-3 (2mm x 2mm), ( $P_D$ ) up to 1.62W, TO-252 (DPAK), ( $P_D$ ) up to 3.8W
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. “Green” Device (Note 3)

### AL5810QEV3 Specifications

Parameter	Value
Input Voltage	4.5VDC to 16VDC
LED Current	50mA
Number of LEDs	1~3 pcs
XY Dimension	46mm x 46mm

### EVB Physical Picture



Figure 1. Top View

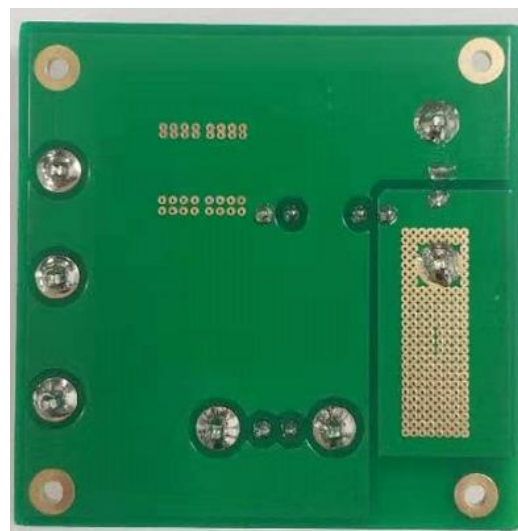


Figure 2. Bottom View

### Connection Instructions

Power Supply Input: 4.5~16Vdc (VIN, GND);

Connect LED string between “HS LED+” and “HS LED-” for high side connection;

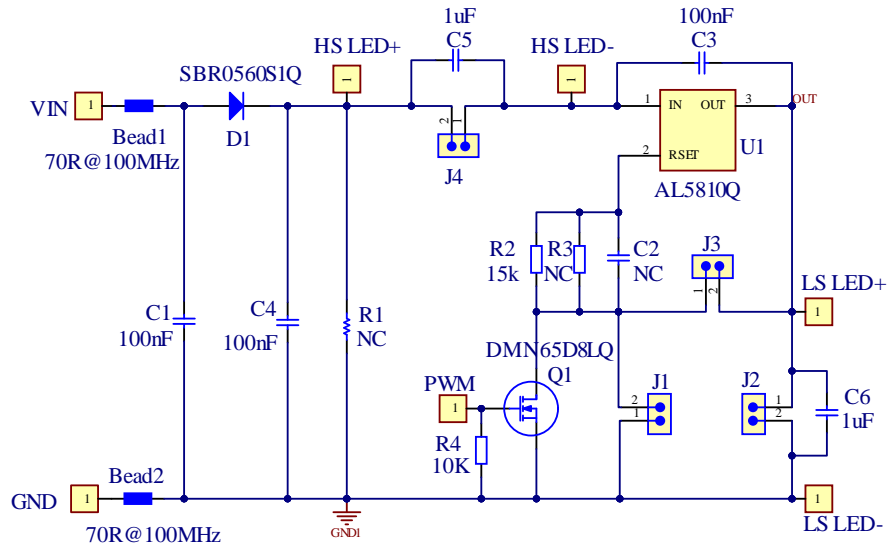
Connect LED string between “LS LED+” and “LS LED-” for low side connection;

For PWM dimming operation: supply a 0-3.3V 200Hz~500Hz signal between PWM & GND.

### Quick Start Guide

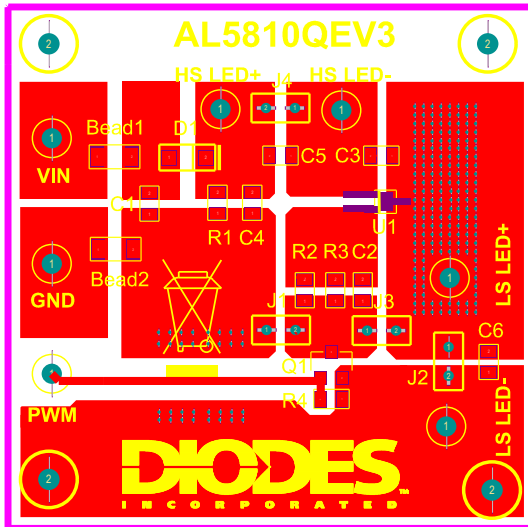
1. By default, the LED current of evaluation board is preset at 50mA per channel.
2. Ensure that the DC source is switched OFF or disconnected before soldering or connecting.
3. For LED high side connection:
  - Connect the anode wire of external LED string to **HS LED+**;
  - Connect the cathode wire of external LED string to **HS LED-**;
  - J1 & J4 are open, J2 & J3 are shorted by Jumper (default);
  - For PWM dimming operation, J1, J3 & J4 are open, J2 is shorted by Jumper.
4. For LED low side connection
  - Connect the anode wire of external LED string to **LS LED+**;
  - Connect the cathode wire of external LED string to **LS LED-**;
  - J1 & J2 are open, J3 & J4 are shorted by Jumper;
  - PWM dimming operation is **NOT** supported in low side connection.
5. Connect two DC line wires to the VIN and GND terminals on the evaluation board.
6. Ensure that the area around the board is clear and safe, and preferably that the board and LEDs are enclosed in a transparent safety cover.
7. Turn on the main switch. LED string should light up.

**Evaluation Board Schematic**

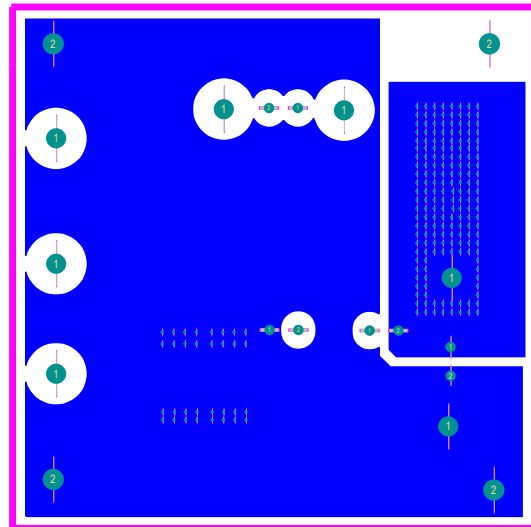


**Figure 3. Evaluation Board Schematic**

**Evaluation Board Layout**



**Figure 4. PCB Top Layer View**



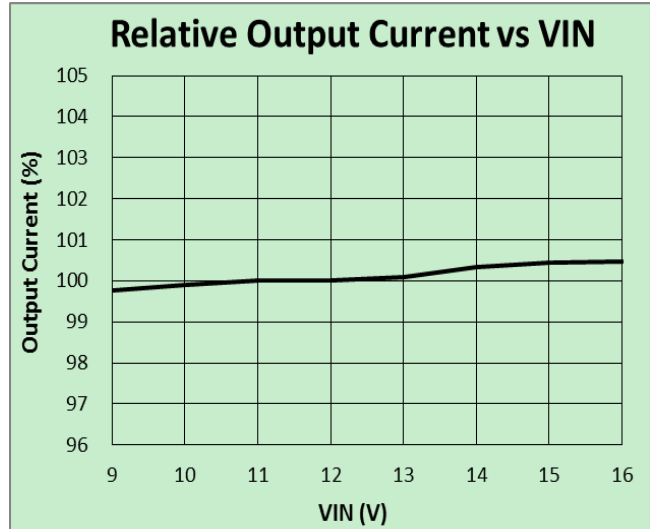
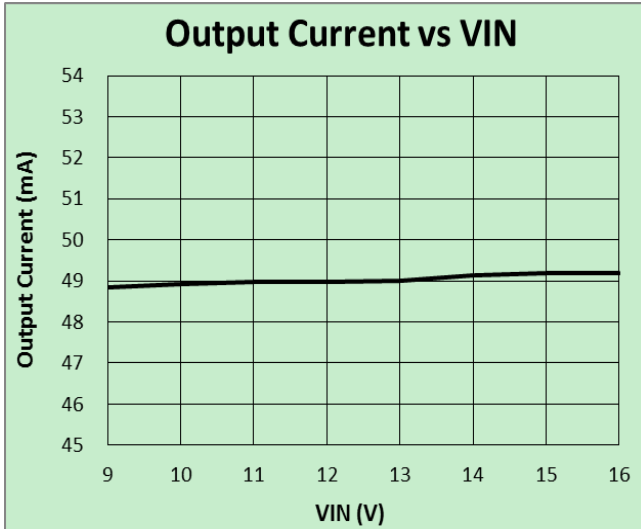
**Figure 5. PCB Bottom Layer View**

### Bill of Materials

Location	Description	Package
R2	15K ohm, 1%	0805
R4	10K ohm, 5%	0805
Bead1,Bead2	74279215, 70ohm@100MHz RDC=0.3Ohm, AEC-Q200	1206
C5,C6	MLCC, CGA4J3X7R1H105K125AB, 1uF, 50V, X7R, 0805, -55°C~150°C, AEC-Q200, TDK	0805
C1,C3,C4	MLCC, CGA4J2X7R2A104K125AA, 0.1uF,100V,X7R, 0805,-55°C~125°C, AEC-Q200,TDK	0805
U1	IC, AL5810QFJ3, DIODES	DFN2020-3
Q1	MOSFET, DMN65D8LQ, 60V, DIODES	SOT-23
D1	Diode, SBR0560S1Q, DIODES	SOD123
J1,J2,J3,J4	Connector, 2pin, pitch=2mm	DIP
PWM	Connector, Orange color	DIP
HS LED-,LS LED-	Connector, Black color	DIP
GND	Connector, White color	DIP
VIN, HS LED+,LS LED+	Connector, Red color	DIP
J3,J2	2-PIN Jumper, pitch=2mm	

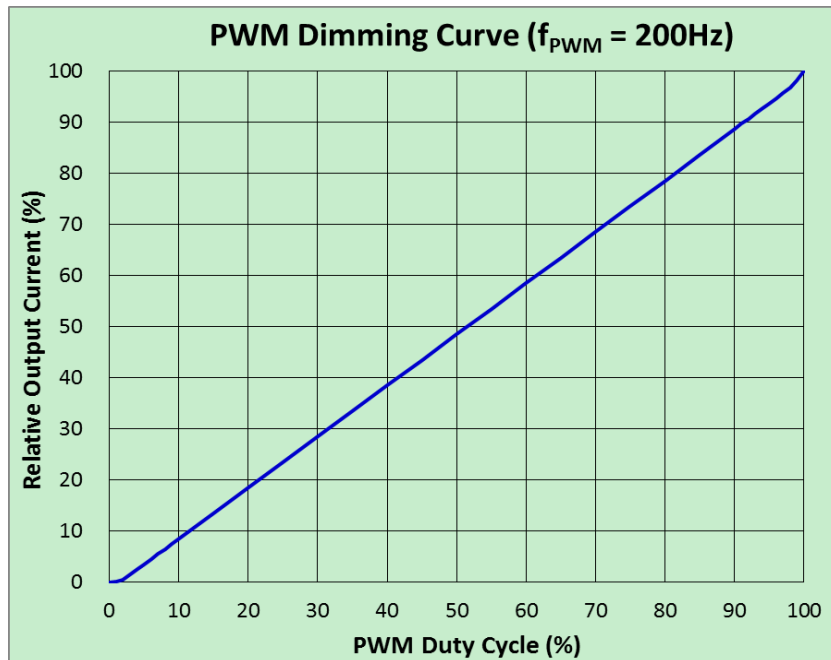
**System Performance**

Test @ LED voltage = 5.3V



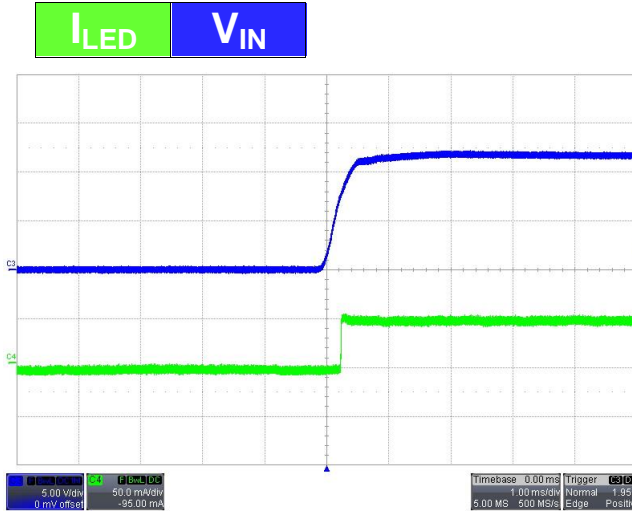
**PWM Dimming Curve**

Test @VIN=12V, LED voltage=5.3V

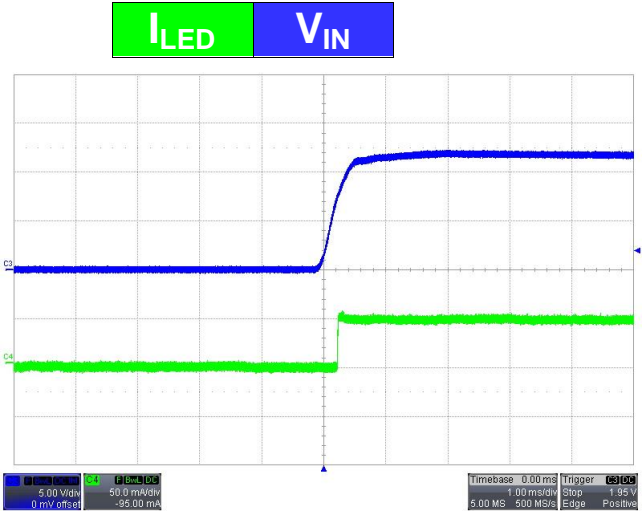


**Waveforms:**

**Turn ON:**

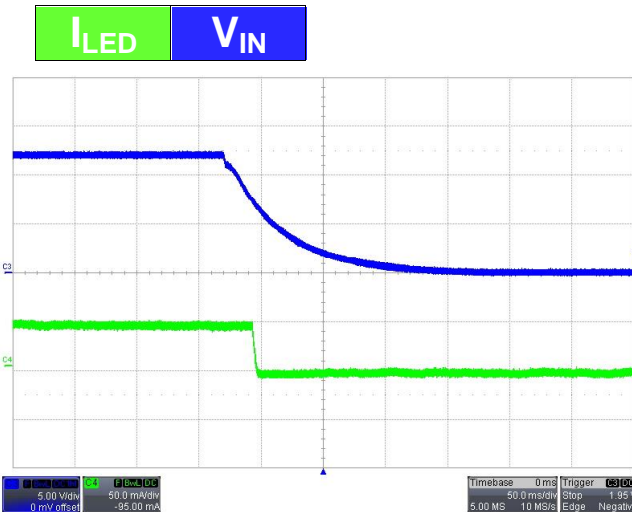


**Figure 6. High Side Startup**

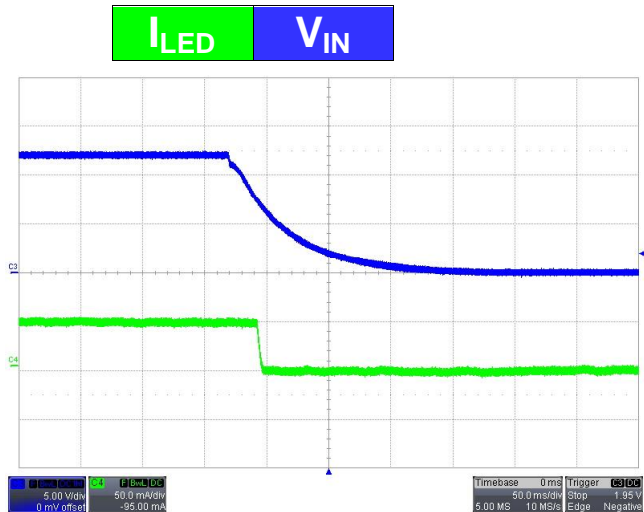


**Figure 7. Low Side Startup**

**Turn OFF:**



**Figure 8. High Side Turn Off**



**Figure 9. Low Side Turn Off**

**I<sub>LED</sub>** **V<sub>PWM</sub>**

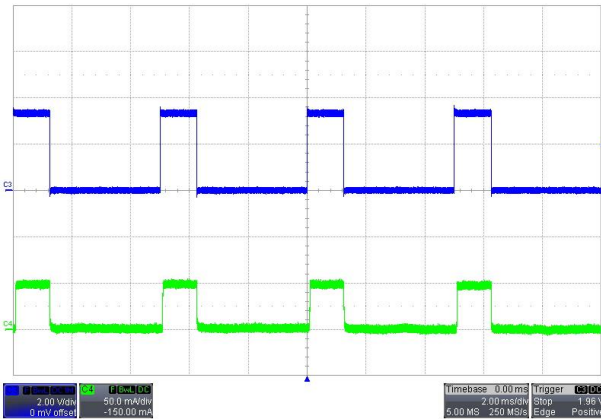


Figure 10. PWM Duty=25%

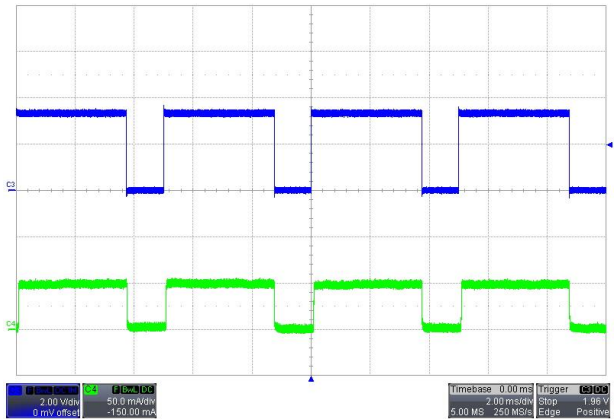


Figure 11. PWM Duty=75%

**I<sub>LED</sub>** **V<sub>PWM</sub>**

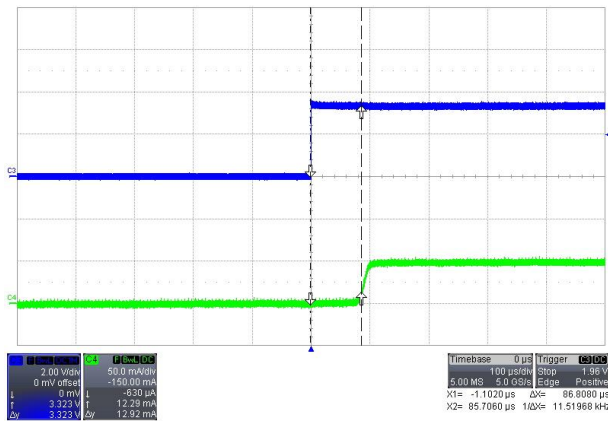


Figure 12. PWM Turn On Delay

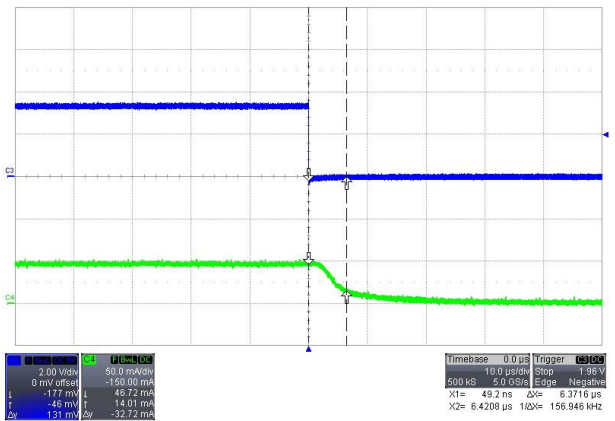
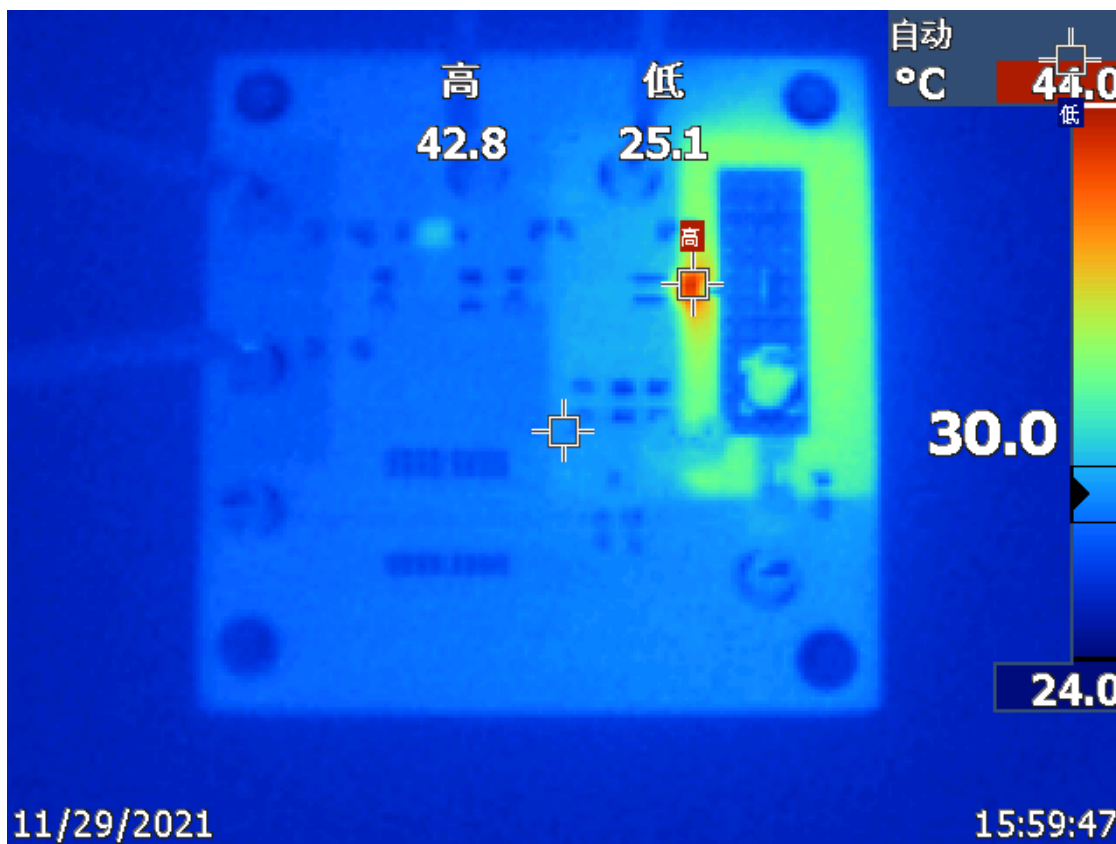


Figure 13. PWM Turn Off Delay

**Thermal Test:**



IC Tc = 42.8C degree @ ambient = 24C degree, temperature rise is about 19C degree.

Tested in VIN=12V, VLED=5.3V.

**BCI Test:**

EV3 can pass ISO11452-4 200mA BCI test without LED flicker and output current decrease.



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