AL5809QEV1-XXX User Guide

15-150mA 60V Constant Current Regulator

General Description

The AL5809Q is a two terminal constant current linear LED driver and it provides a cost-effective solution. It offers an excellent temperature stability 20 ppm/°C and the current accuracy ±5% regulated over a wide voltage range. The AL5809Q simplifies the design for linear LED drivers allowing it to be designed as a high or low-side constant current regulator without any external components.

The AL5809Q turns on immediately and can swing from 2.5V up to 60V enabling it drive long LED chains. The floating ground, 60V Voltage rating between Input and Output pins designed to withstand the high peak voltage incurred in DC and offline applications.

The AL5809QEV1-XXX (from 15 to 150 mA) is available in thermally robust POWERDI-123 package with different current options, please see ordering information section.

Key Features

- Low Minimum Operating Voltage (2.5V to 60V)
- -40˚C to 125˚C Temperature Range
- ±5% LED Current Accuracy
- PDI-123 package

Applications

- Constant LED Current Driver
- Isolated Offline LED Converters
- LED Signs
- Instrumentation Illumination

Specifications

Parameter	Value
Input Voltage	2.5V – 60V
LED Current Options	15 to 150mA
XYZ Dimension	0.69” x 0.77” x 0.1”
ROHS Compliance	Yes

Top-View EVM (AL5809QEV1)

AL5809QEV1 (PDI123)

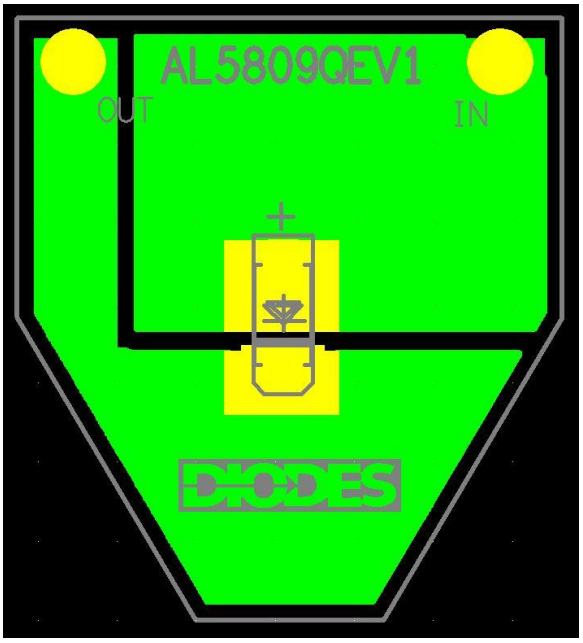
Bottom-View EVM (AL5809QEV1)

Connection Instructions

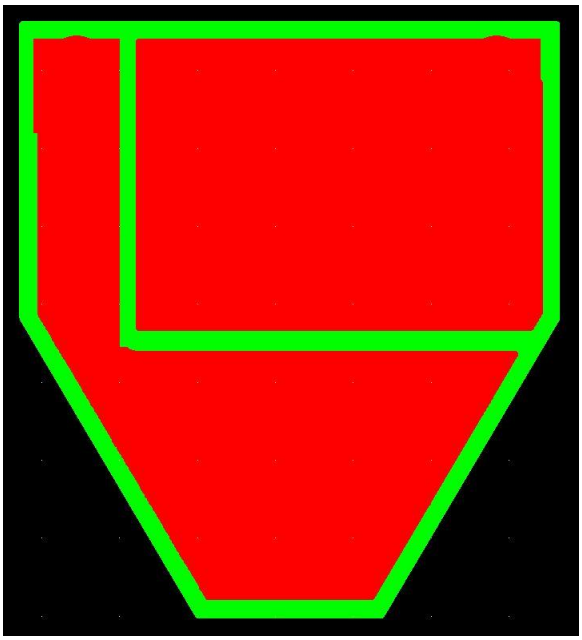
IN: Red Wire (LED connection)
OUT: Black Wire

Board Layout

(a) Top View



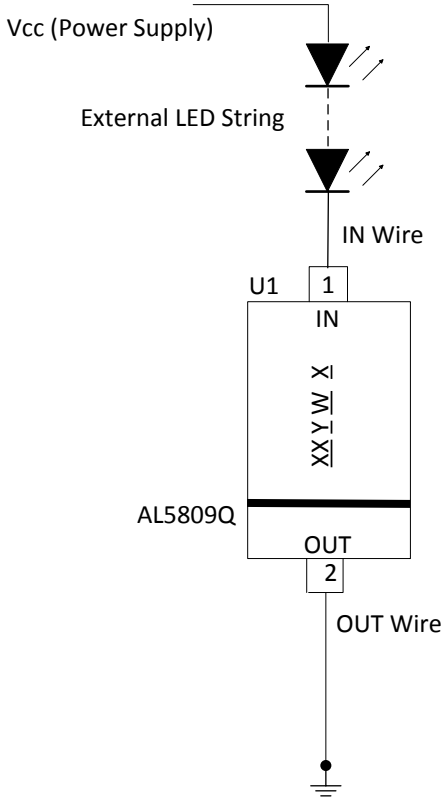
(b) Bottom View



Note: This evaluation board provides design flexibility, multiple application circuits can be derived in both Low and High Side Current LED configurations. The footprint of U1 is compatible to both of **PDI-123 and SOD-123** packages. In addition, it can be hooked up with use of PWM dimming.

Connection Setup and Power-up Procedures

Current LED String Procedure to Evaluation Board in Low side current LED configuration



1. Depends on the current options, the evaluation board is as low side current LED configuration.
2. Ensure that the DC source is switched OFF or disconnected.
3. Connect the power supply to Anode terminal of external LED string in the Low side LED configuration.
4. Connect the Cathode terminals of external LED string to IN terminal of the board and connect OUT wire to GND.
5. 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.
6. Turn on the main switch. LED string should light up and the LED current should be regulated according to the current options of the device.

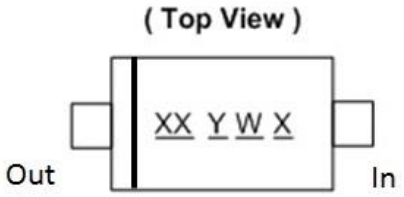
Bill of Material

#	Name	Quantity	Part number	Manufacturer	Description
1	U1	1	AL5809Q-xxxP1-7	Diodes Inc	Constant Current Regulator in PDI123

Ordering Information

AL5809 - XXX Q P1 - XX

Current Option	Qualification	Package	Packing
15 : 15mA 20 : 20mA 25 : 25mA 30 : 30mA 40 : 40mA 50 : 50mA 60 : 60mA 90 : 90mA 100 : 100mA 120 : 120mA 150 : 150mA	Q : Automotive Compliant	P1 : PDI123	7 : 7" Tape & Reel



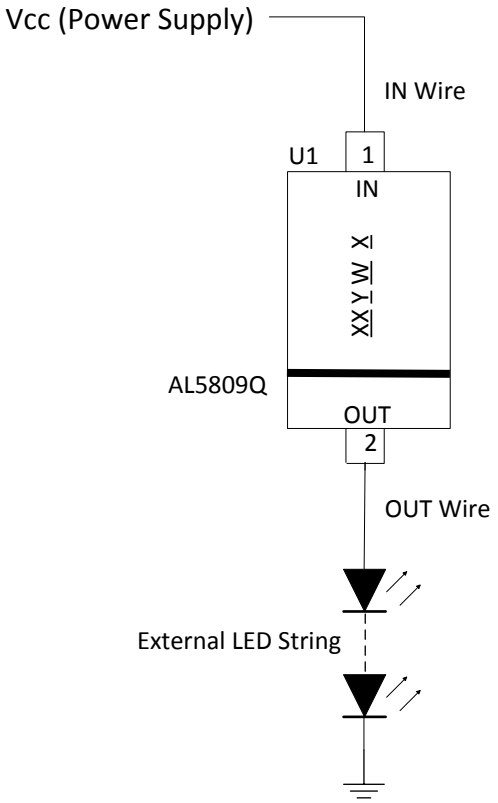
XX : Identification code
Y : Year 0 to 9
W : Week : A to Z : 1 to 26 week;
a to z : 27 to 52 week; z represents
52 and 53 week
X : Internal code

Part Number	LED Current Option	Package	Identification Code
AL5809Q-15P1-7	15mA	PDI123	C1
AL5809Q-20P1-7	20mA	PDI123	C2
AL5809Q-25P1-7	25mA	PDI123	CA
AL5809Q-30P1-7	30mA	PDI123	C3
AL5809Q-40P1-7	40mA	PDI123	C4
AL5809Q-50P1-7	50mA	PDI123	C5
AL5809Q-60P1-7	60mA	PDI123	C6
AL5809Q-90P1-7	90mA	PDI123	C7

AL5809Q-100P1-7	100mA	PDI123	CB
AL5809Q-120P1-7	120mA	PDI123	C8
AL5809Q-150P1-7	150mA	PDI123	C9

Application Information

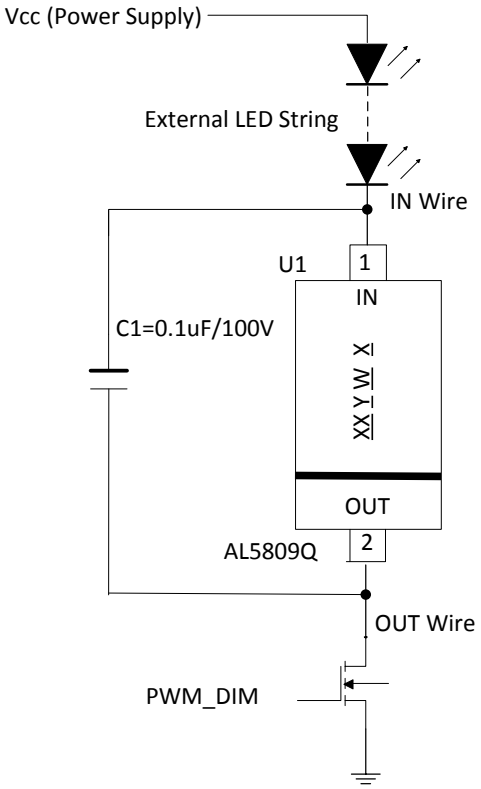
I) Current LED String Procedure in High side current LED configuration



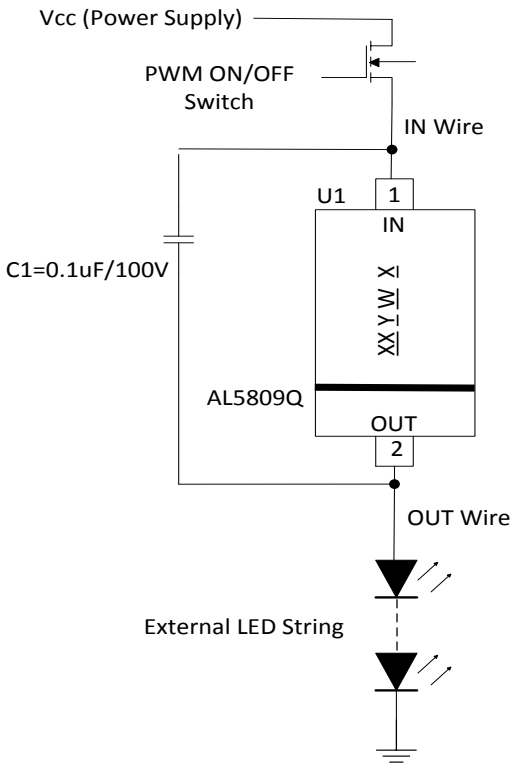
1. The evaluation can also be configured as High side current LED configuration.
2. Ensure that the DC source is switched OFF or disconnected.
3. Connect the power supply to IN terminal wire on the board.
4. Connect the Anode and Cathode terminals of external LED string between OUT terminal and GND in the High side LED configuration.
5. Observe MAX 60V differential between IN and OUT terminals when applied Vcc > 60V.
6. **In the high side circuit configuration, extreme high voltage may be present. Please use caution and try not to touch any components on the board or input leads.**
7. Turn on the main switch. LED string should light up and the LED current should be regulated according to the current options of the device.

II) PWM Dimming

The AL5809Q can be used to provide LED current dimming driving the Out pin via the MOSFET switch to ground. The Out pin current is then effectively switched on and off causing the LED current to turn on and off



(a) PWM Dimming by External MOSFET



(b) PWM Dimming by Power Supply VIN ON/OFF

1. The evaluation board can be configured as Low side current LED configuration with use of PWM dimming.
2. Ensure that the DC source is switched OFF or disconnected.
3. Connect the power supply to Anode terminal of external LED string in the Low side LED configuration.
4. Connect the Cathode terminals of external LED string to IN terminal of the board and connect OUT wire to GND.
5. Insert external MOSFET across OUT terminal and GND of the board for PWM dimming control.
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 and the LED current should be regulated according to the current options of the device.

Typical Performance Curves - 15mA, 20mA, 30mA, 40mA, and 50mA PDI123

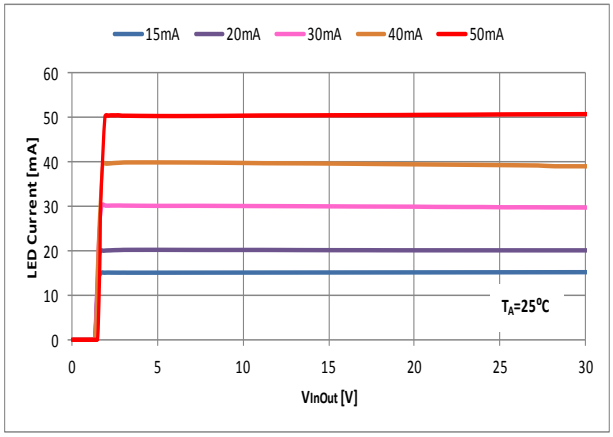


Figure 1. LED Current vs. VInOut

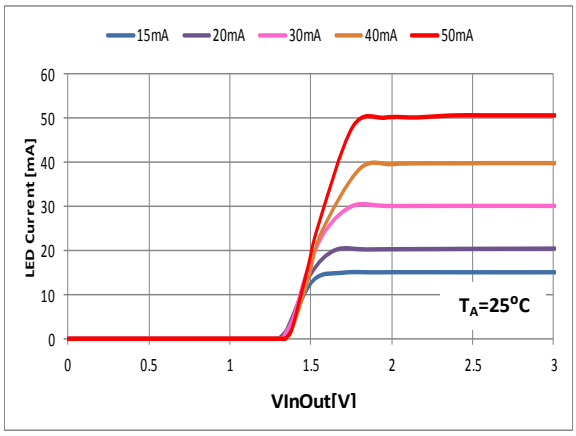


Figure 2. Startup Minimum Operating Voltage

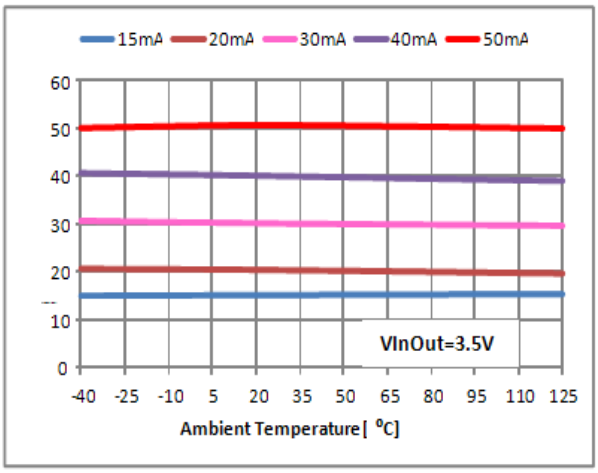


Figure 3. LED Current vs. Ambient Temperature

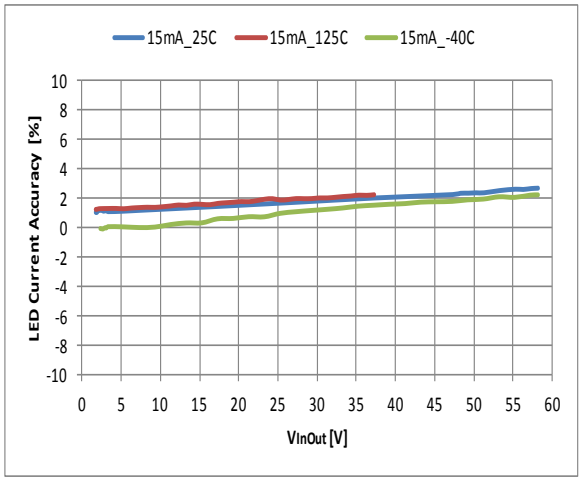


Figure 4 LED Current Accuracy (%) vs. VInOut across Temp

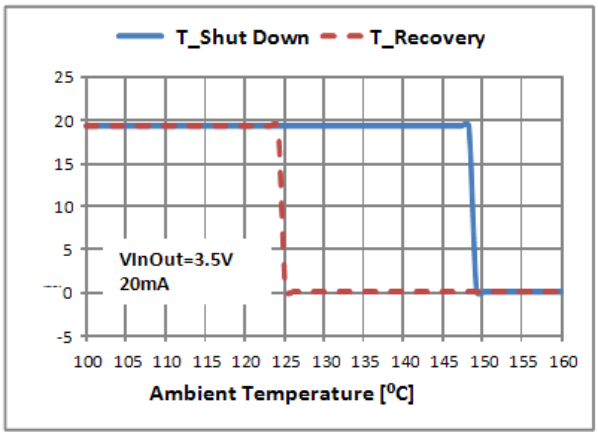


Figure 5. THSD of 20mA Current Option

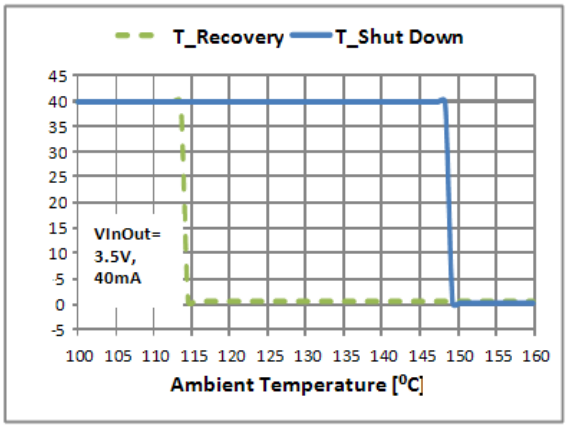


Figure 6. THSD of 40mA Current Option

Typical Performance Curves- 60mA, 90mA, and 150mA PDI123

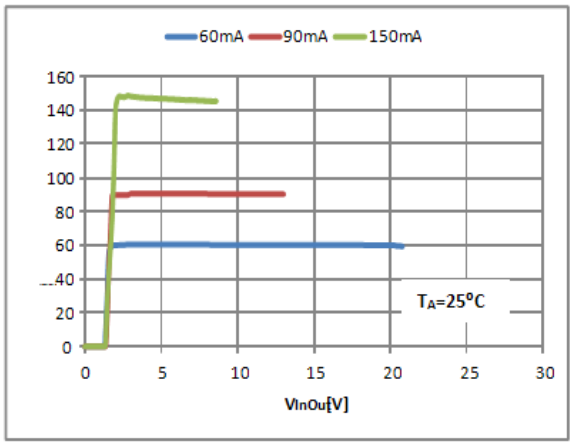


Figure 7. LED Current vs. VInOut

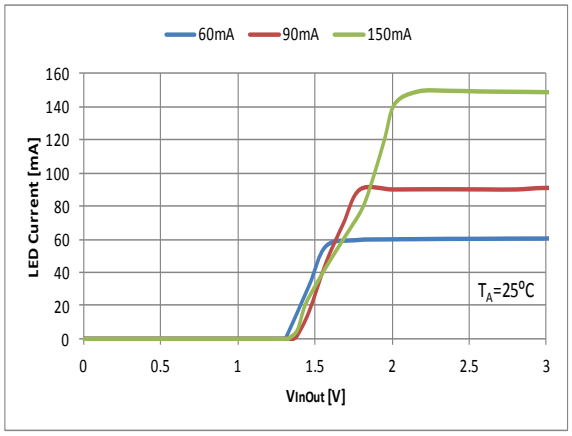


Figure 8. Startup Minimum Operating Voltage

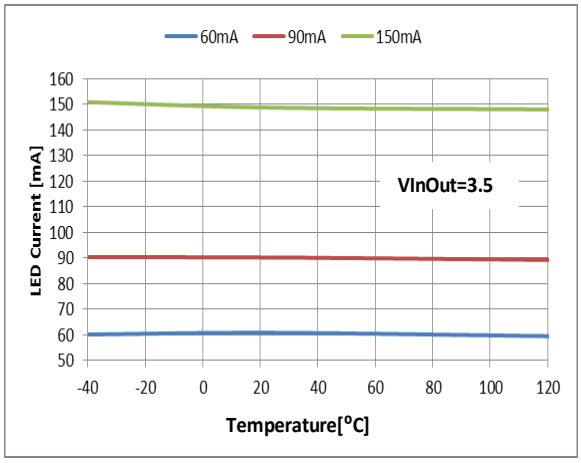


Figure 9. LED Current vs. Ambient Temperature

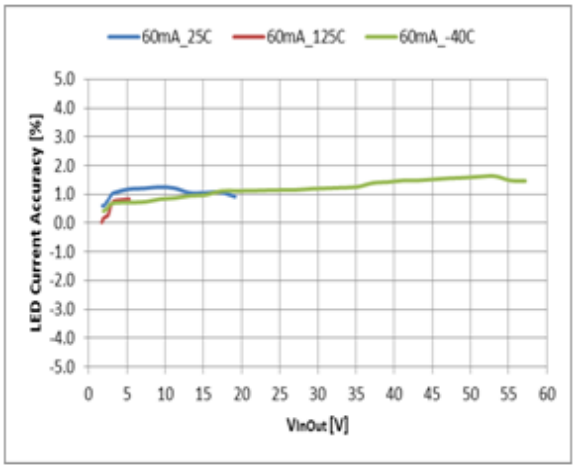


Figure 10 LED Current Accuracy (%) vs. VInOut across Temp

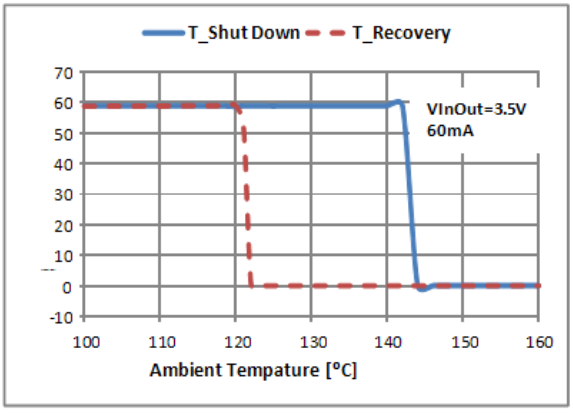


Figure 11. THSD of 20mA Current Option

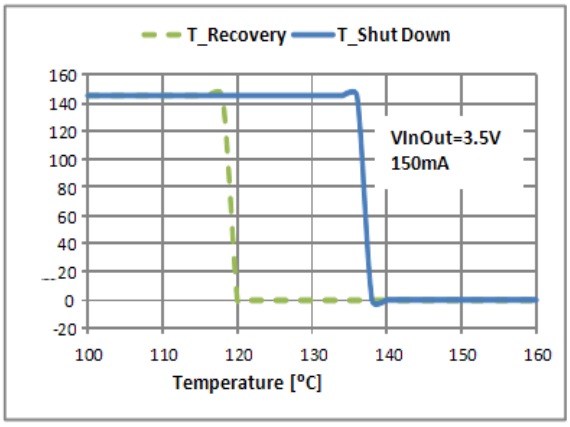


Figure 12. THSD of 40mA Current Option

Typical Performance Characteristics

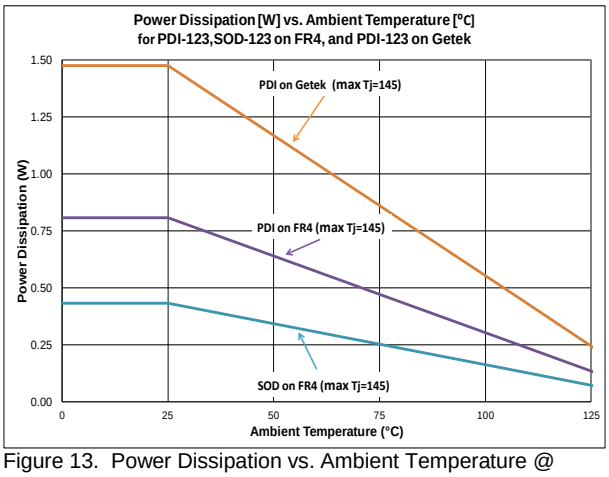


Figure 13. Power Dissipation vs. Ambient Temperature @ T_J = 160°C

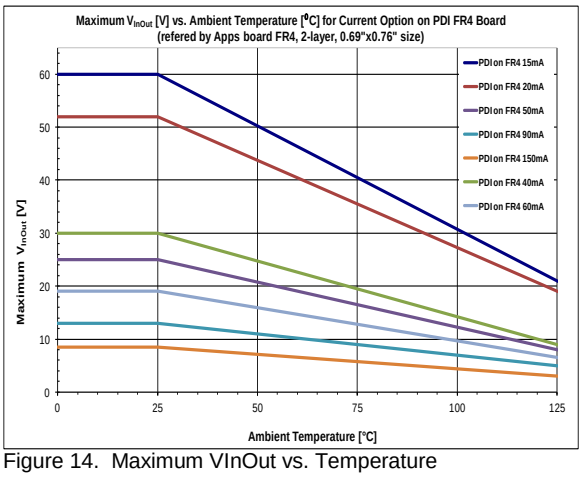


Figure 14. Maximum VInOut vs. Temperature

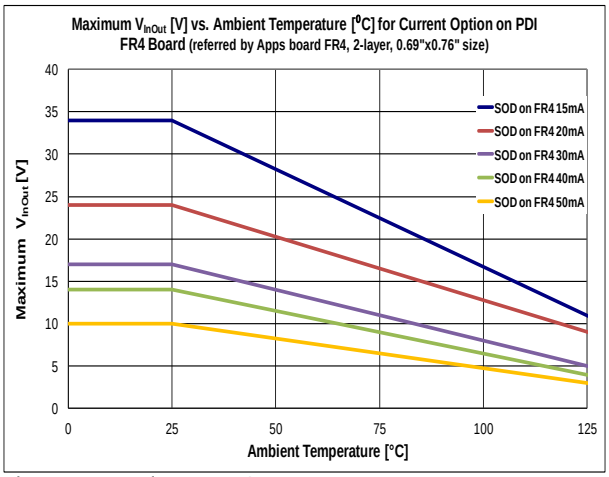


Figure 15. Maximum VInOut vs. Temperature

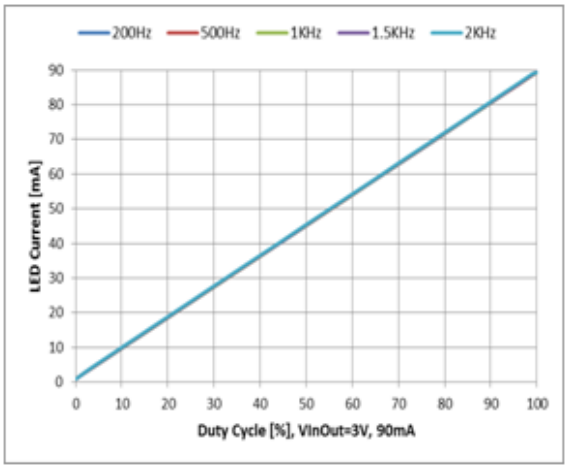


Figure 16 PWM Dimming 90mA vs. Duty Cycle

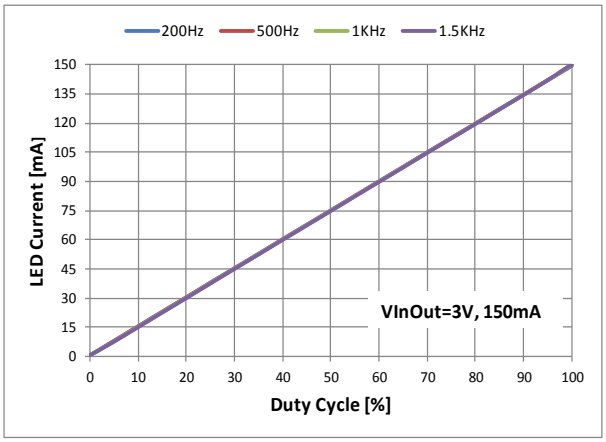


Figure 17. PWM Dimming 150mA vs. Duty Cycle

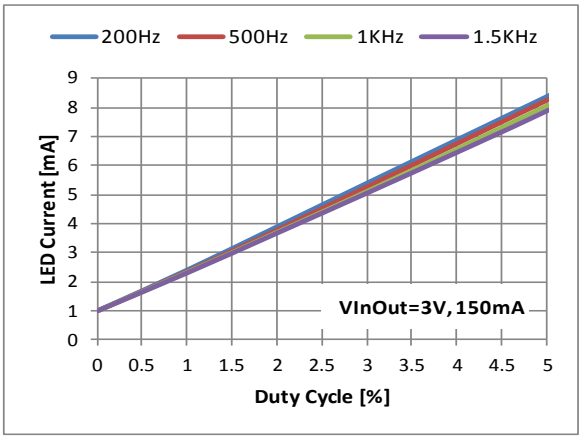


Figure 18. Area Zoom In within Duty Cycle 5% of Figure 17

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