Never stop thinking

Ultra Low Voltage Drop LED Controller for Low Power LEDs -- BCR205W Application Notes

Application Note AN256

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LED Driver & AF Discretes

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Revision History: 06 June 2011	
Previous Revision: Previous_Revision_Number	
Page	**Subjects (major changes since last revision)**

1 Introduction

1.1 Features

- Wide input voltage range 1.8V – 18V
- Ultra low voltage overhead of only 0.2V
- 5mA - 80mA LED drive current with external transistor
- Tailored to drive LED up to 200 mW
- Typical 3% LED current accuracy
- No EMI
- RoHS compliant (pb-free)
- small SOT343 package

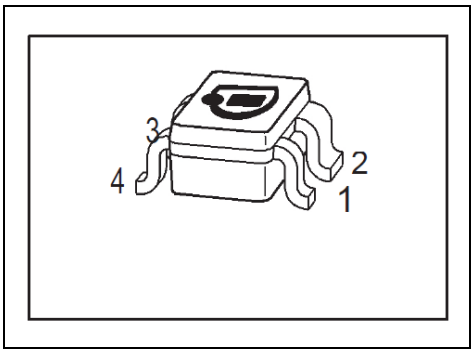

Figure 1 BCR205W

1.2 Applications

- Channel letters
- Decorative lighting
- Architectural lighting
- Gambling & vending machines lighting
- Refrigerator/freezer lighting for appliances and retail use

1.3 Description

The BCR205W is a simple and low cost LED controller with an Ultra Low voltage overhead providing to possibility to use the maximum amount of LEDs in series despite following constraints

- LED forward voltage variation
- Voltage drop along long LED chains
- Tolerances in power supplies
- Varying battery voltage

The LED current is adjustable from 5mA to 80mA with a sense resistor. By using a digital transistor as the power stage the number of external parts can be reduced to a minimum. The small SOT-343 package allows the whole circuit to be realized on a very small PCB area.

1.4 Check List before powering up

Before powering on the BCR205 demo board, please verify the following:

- Make sure that the input voltage supply is less than 18V.
- Polarity of power supply must be correct.
- LED anode must connect to LED+, LED cathode must connect to LED-
- Be sure R7 and R9 is only one of them is on board.
- Please avoid reconnecting the LED array between LED+ and LED- terminals without powering down first.

2 PCB Design

2.1 Schematic

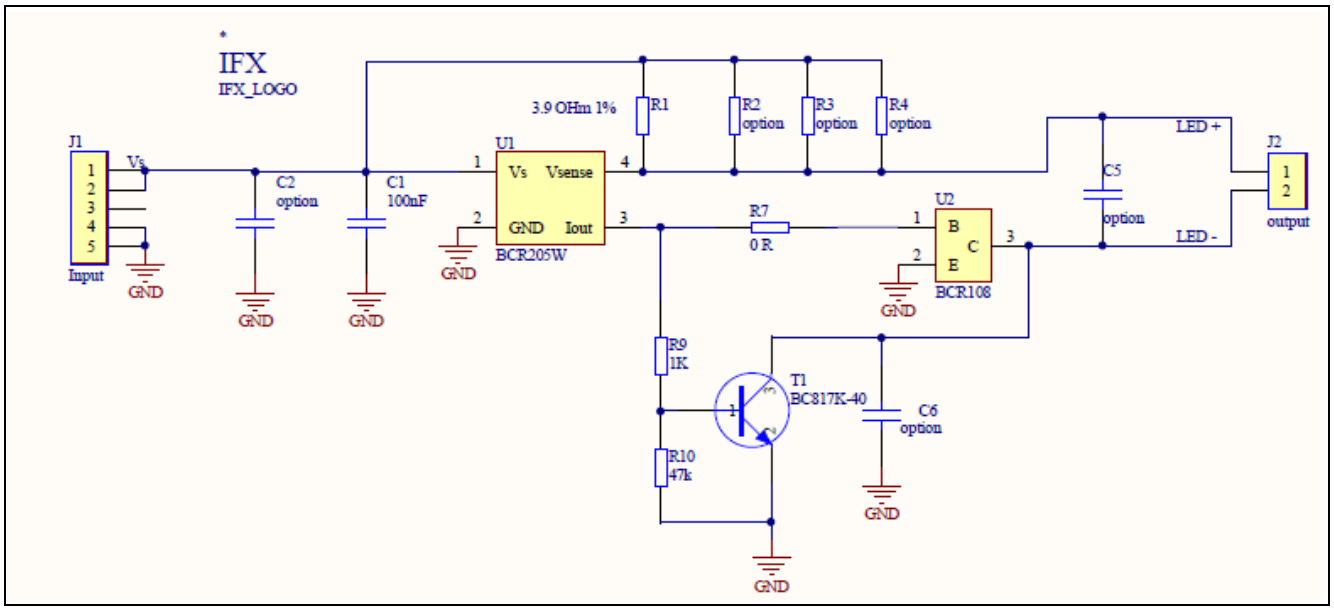

Figure 2 Schematic of the BCR205W Demo Board

Table 1 Bill-of-Materials

Comment	Description	Designator	Footprint	Quantity
100nF	Ceramic Capacitor	C1	0805	1
option	Capacitor, option, Resistor (1%)	C2, C5, C6	0805	6
Input	5Pins Connector	J1	EDGE_CON_TOP	1
output	2 pins Connector	J2	Edge Connector -2	1
3.9 OHm 1%	Resistor (1%)	R1 (R2, R3, R4 optional)	0805	1
0 R	Resistor 0805	R7 (optional)	0805	1
1K	Resistor 0805	R9	0805	1
47k	Resistor 0805	R10	0805	1
BC817K-40	NPN AF Transistor	T1	SOT-23	1
BCR205W	LED driver	U1	SOT343	1
BCR108	NPN Digital Transistor	U2(optional)	SOT23	1

2.2 PCB Layout

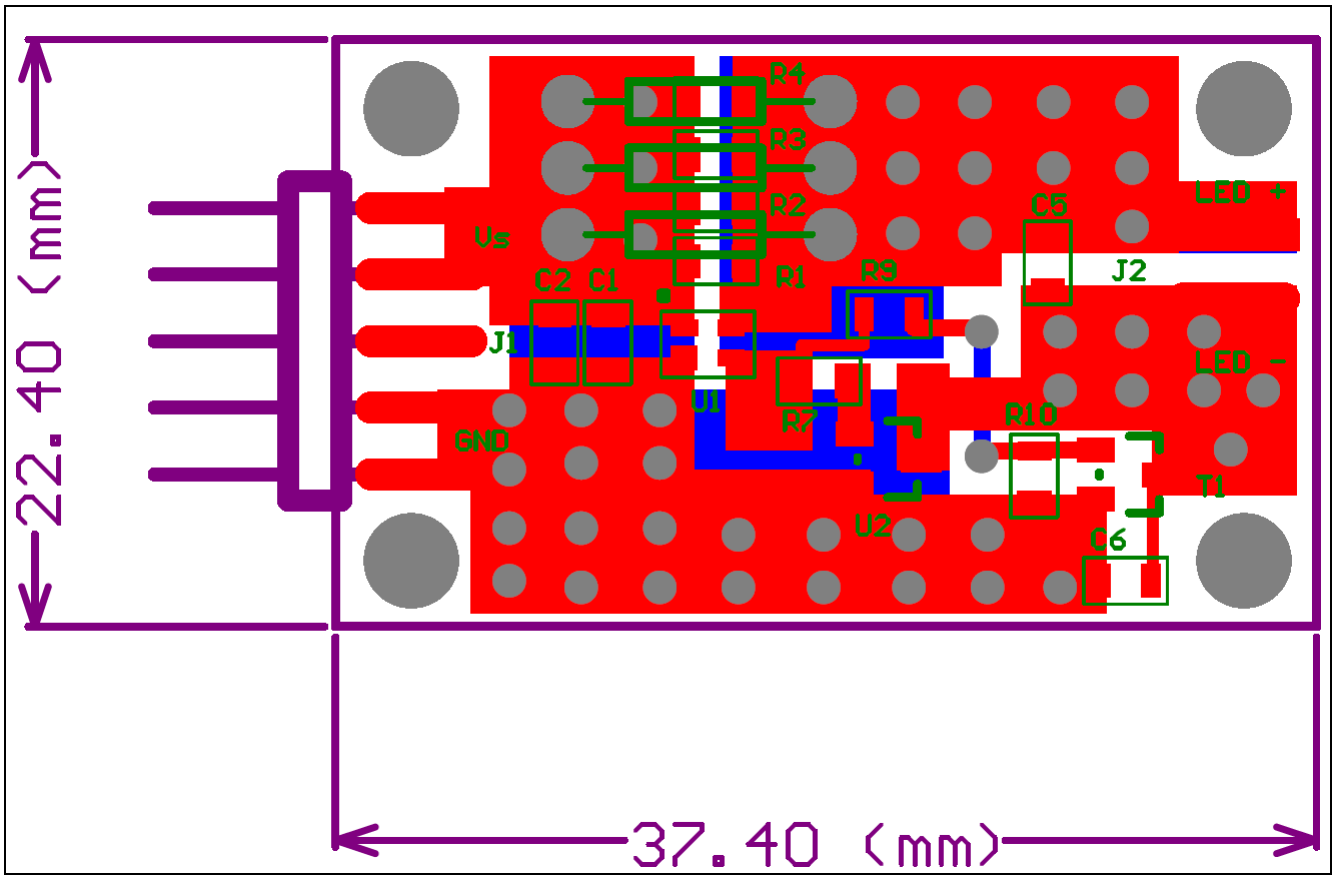

Figure 3 PCB Layer information Bottom View

2.3 PCB Photograph

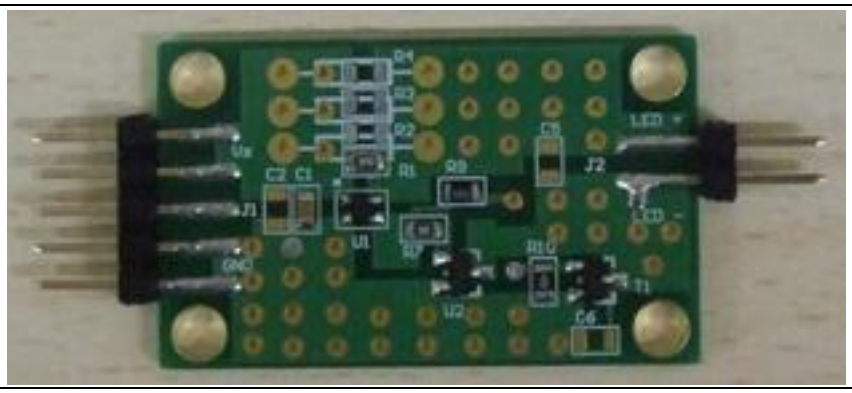

Figure 4 Photograph of BCR205W Demo Board

3 Application

3.1 Description

In order to allowing user to test BCR205 LED driver performance in different power rating, we configured two type transistors, BCR108 and BC817K-40 on demo board. But user can only connect one of them at one time. In other words, can only connected R7 or R9. This demo board can driver from 5mA to 60mA LED current with different Rsense value. To increase current accuracy, four resisitors of Rsense were placed in parallel on PCB (R1, R2, R3, and R4).

3.2 LED Current vs. Input Voltage

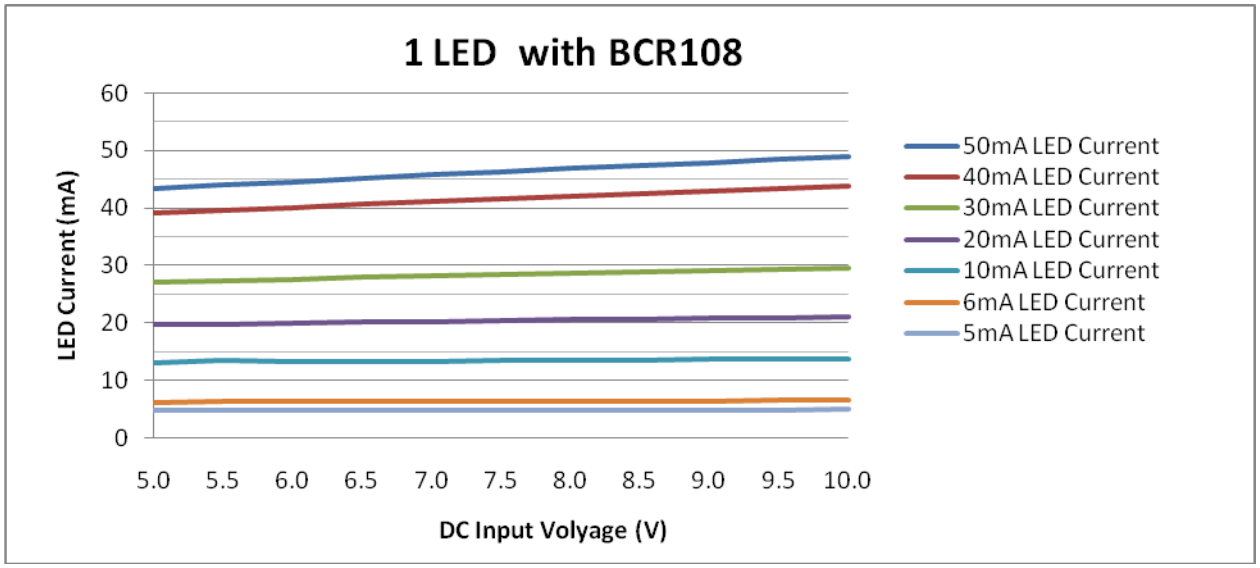

Figure 5 1 LED Current Vs. Input Voltage (with BCR108)

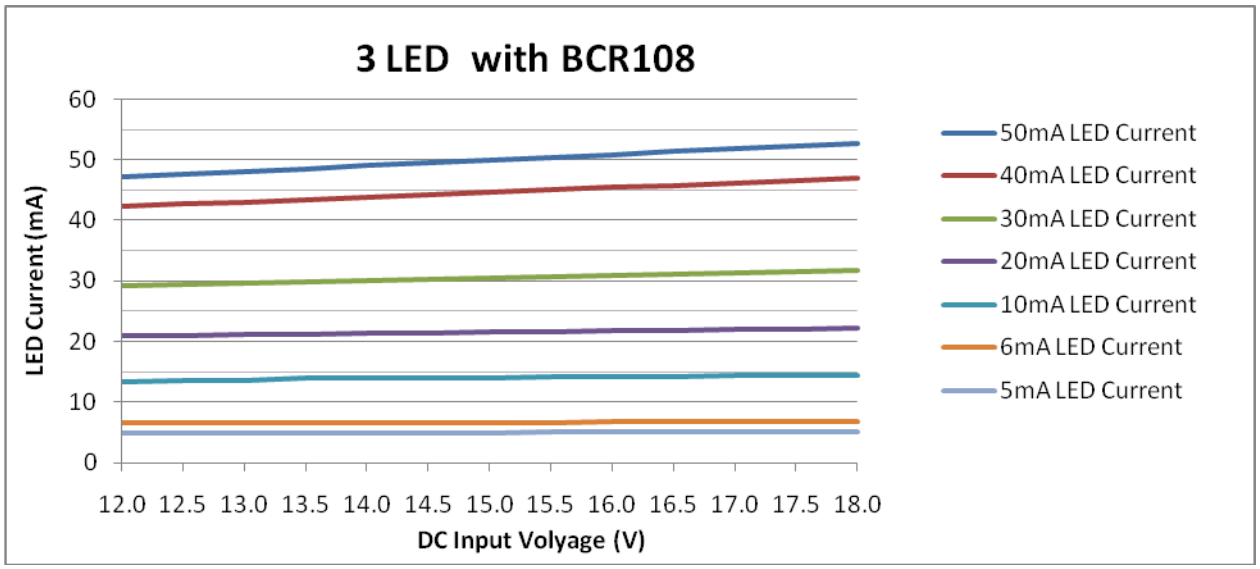

Figure 6 3 LED Current Vs. Input Voltage (with BCR108)

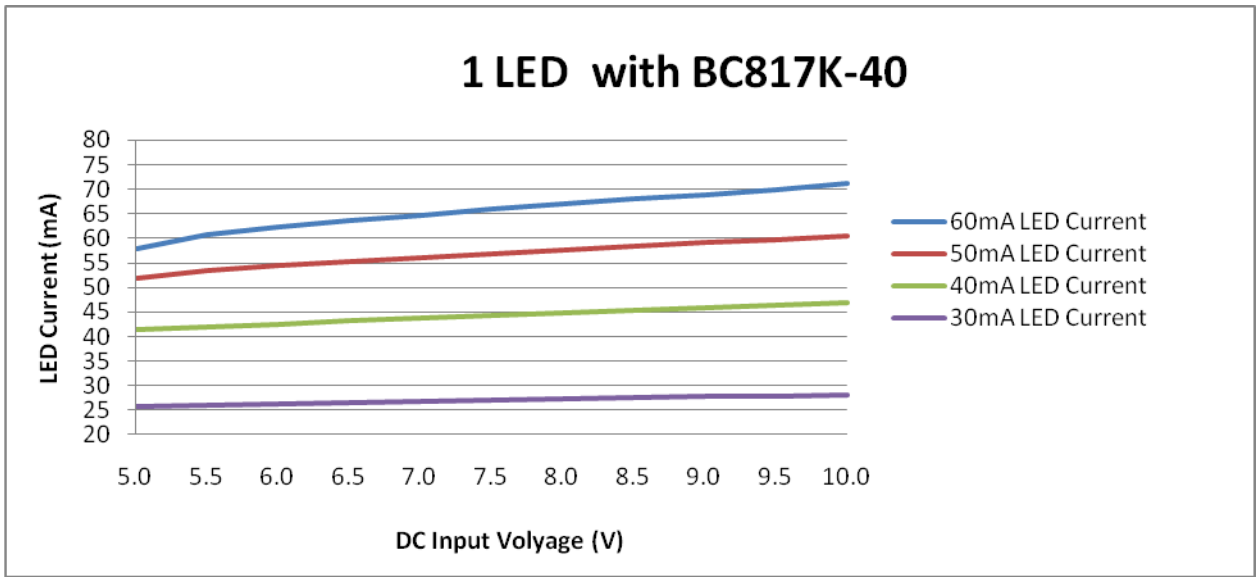

Figure 7 1 LED Current Vs. Input Voltage (with BC817K-40)

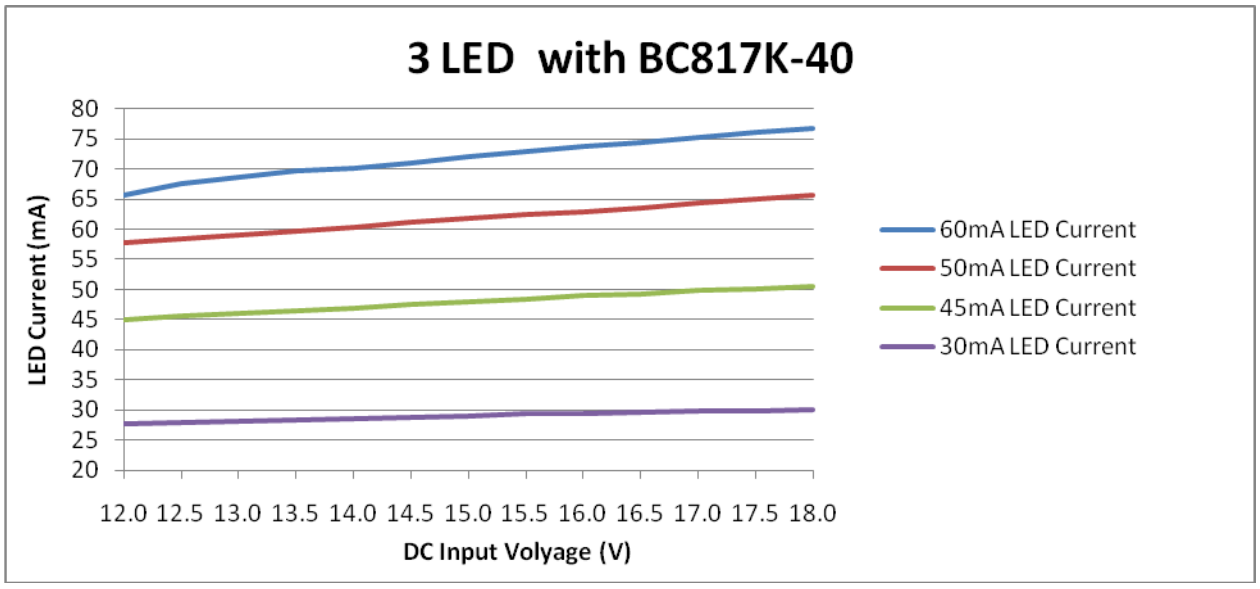

Figure 8 3 LED Current Vs. Input Voltage (with BC817K-40)

3.3 LED Current vs. Rsense

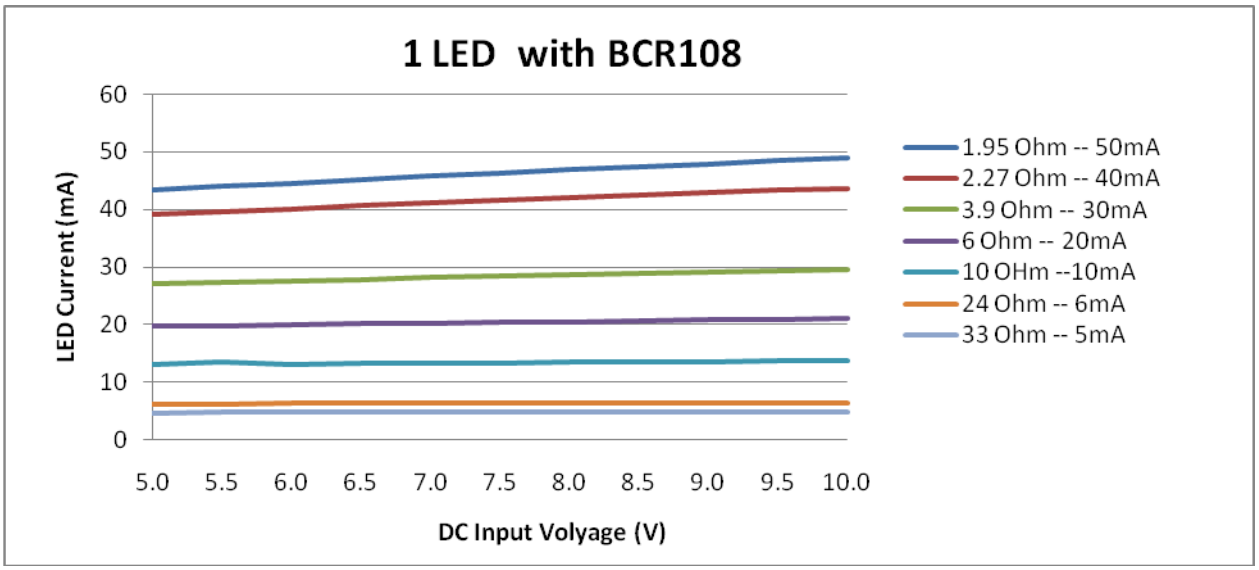

Figure 9 1 LED Current Vs. Rsense (with BCR108)

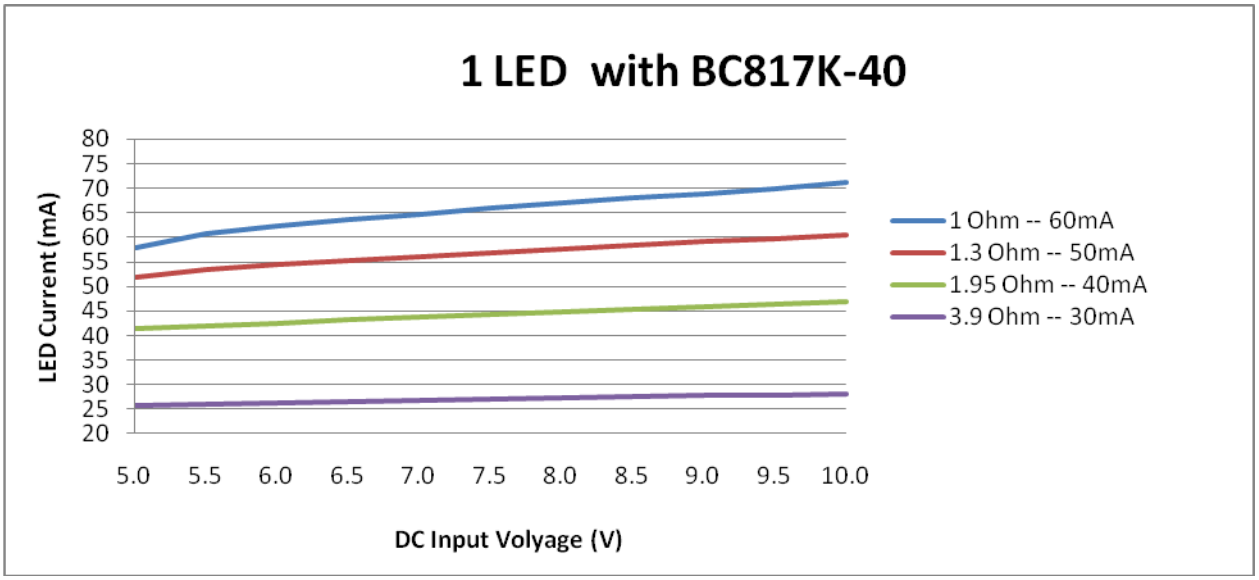

Figure 10 1 LED Current Vs. Rsense (with BC817K-40)

3.4 LED Current vs. Ambient Temperature in 3 LED

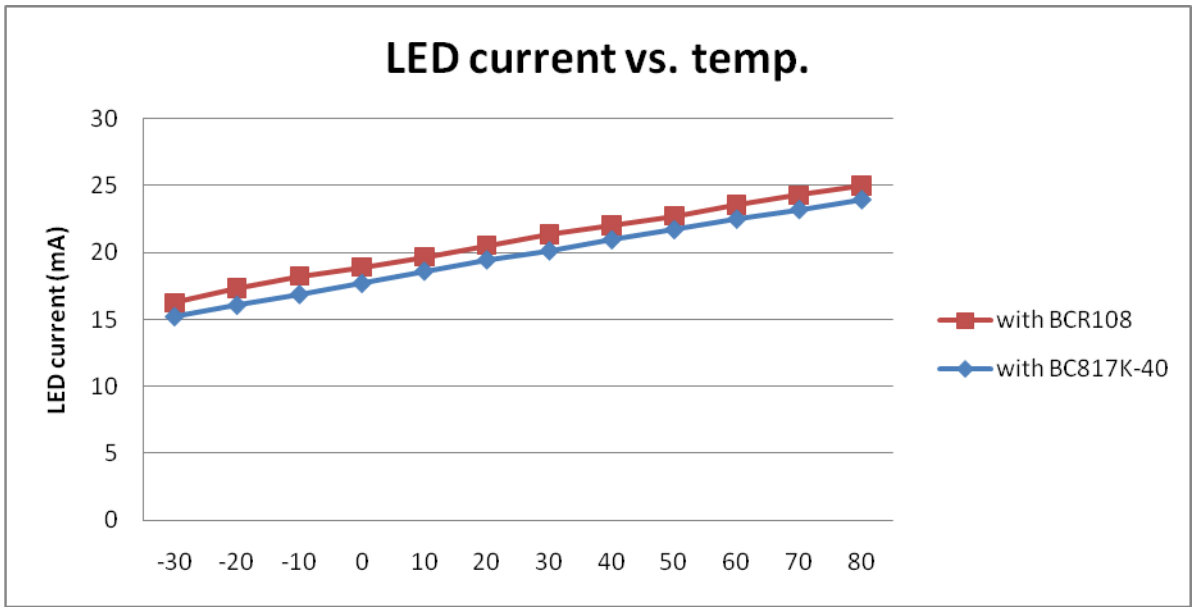

Figure 11 3 LED Current Vs. Ambient temperature

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