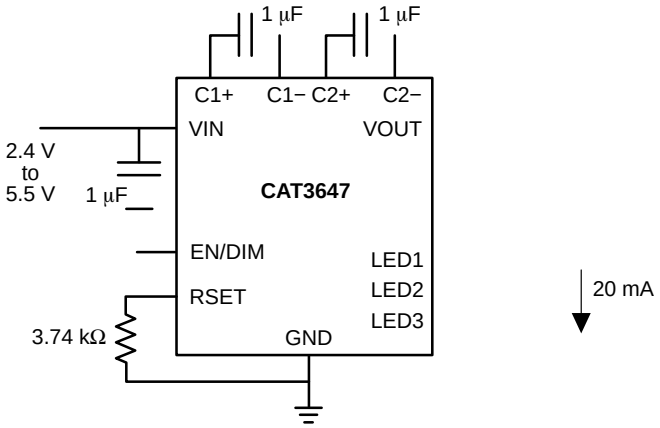

Figure 1. Typical Application Circuit

Table 3. ELECTRICAL OPERATING CHARACTERISTICS

(over recommended operating conditions unless specified otherwise) V_{IN} = 3.6 V, EN = High, T_{AMB} = 25°C

Symbol	Name	Conditions	Min	Typ	Max	Units
I_Q	Quiescent Current					

Table 4. RECOMMENDED EN/DIM TIMING

(For 2.4 V ≤ V_{IN} ≤ 5.5 V, over full ambient temperature range -40°C to +85°C.)

Symbol	Name	Conditions	Min	Typ	Max	Units
T_{LO}	EN/DIM program low time		0.2		100	μs
T_{HI}	EN/DIM program high time		0.2			μs
T_{PWRDWN}	EN/DIM low time to shutdown		1.5			ms
T_{LED}	LED current settling time			40		μs

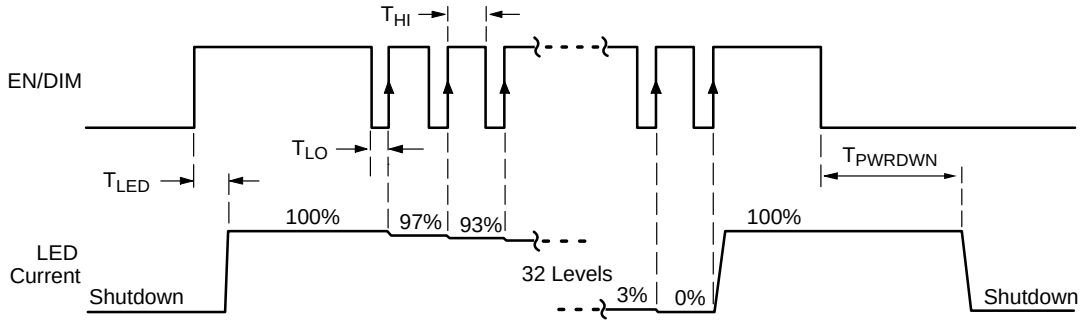

Figure 2. EN/DIM Digital Dimming Timing Diagram

TYPICAL PERFORMANCE CHARACTERISTICS

(V_{IN} = 3.6 V, I_{OUT} = 60 mA (3 LEDs at 20 mA), C_{IN} = C_{OUT} = C_1 = C_2 = 1 μF, T_{AMB} = 25°C unless otherwise specified.)

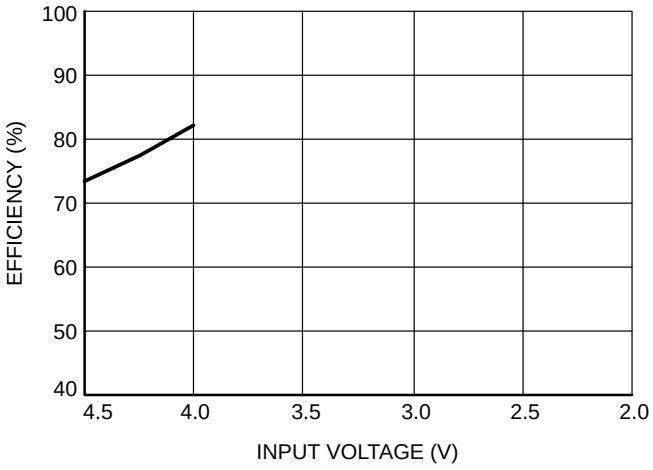

Figure 3. Efficiency vs. Input Voltage

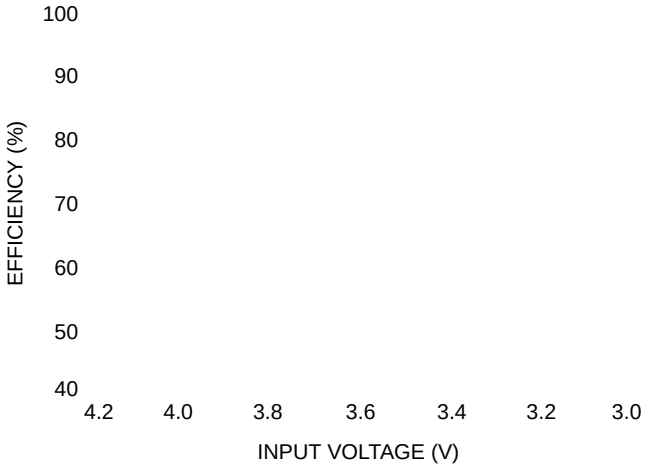

Figure 4. Efficiency vs. Li−Ion Voltage

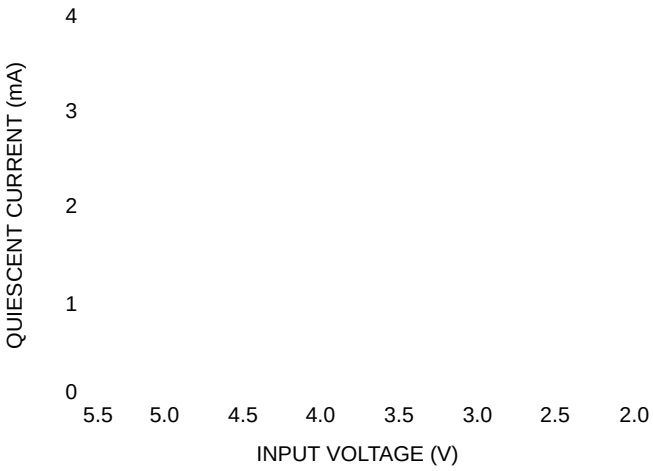

Figure 5. Quiescent Current vs. Input Voltage

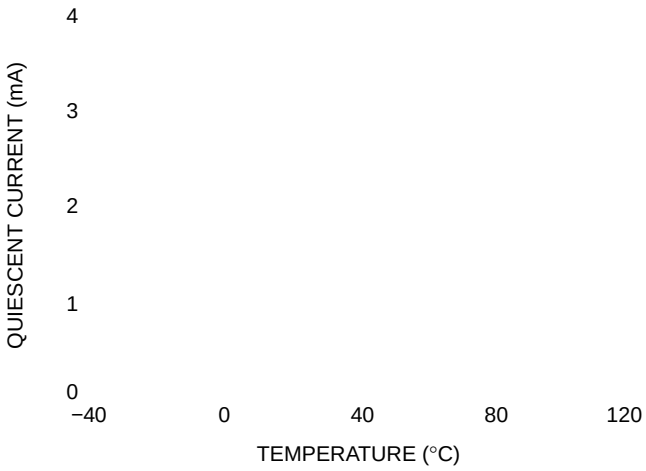

Figure 6. Quiescent Current vs. Temperature

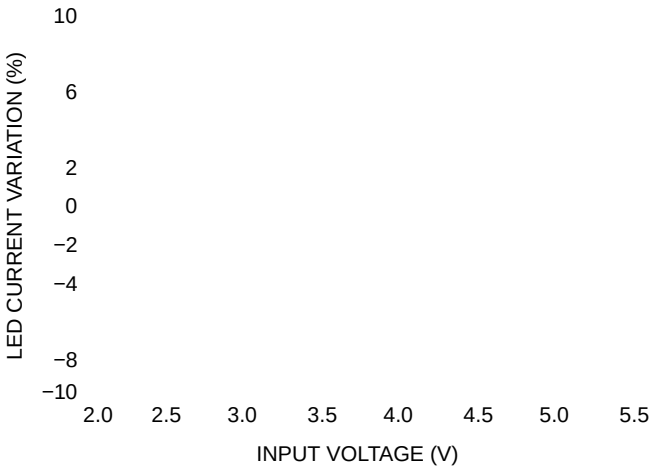

Figure 7. LED Current Change vs. Input Voltage

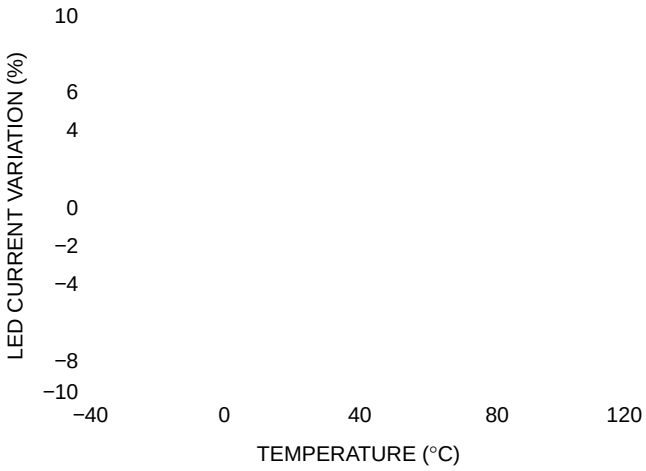

Figure 8. LED Current Change vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS

(V_{IN} = 3.6 V, I_{OUT} = 60 mA (3 LEDs at 20 mA), C_{IN} = C_{OUT} = C_1 = C_2 = 1 μF, T_{AMB} = 25°C unless otherwise specified.)

TYPICAL PERFORMANCE CHARACTERISTICS

(V_{IN} = 3.6 V, I_{OUT} = 60 mA (3 LEDs at 20 mA), C_{IN} = C_{OUT} = C_1 = C_2 = 1 μF, T_{AMB} = 25°C unless otherwise specified.)

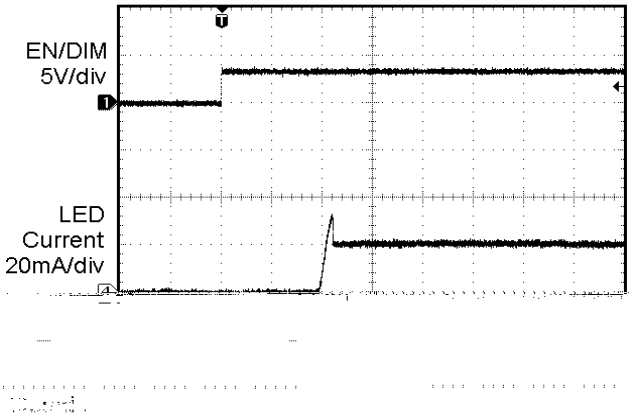

Figure 15. Power Up Delay (1x Mode)

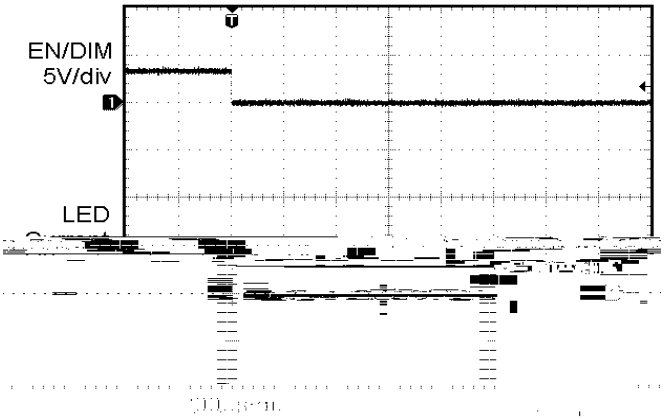

Figure 16. Power Down Delay (1x Mode)

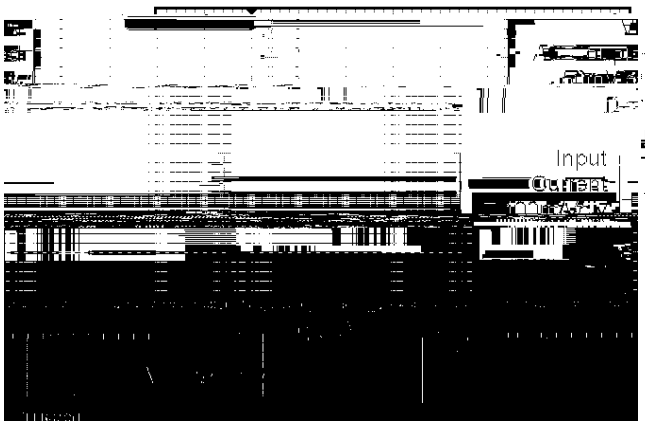

Figure 17. Operating Waveforms in 1x Mode

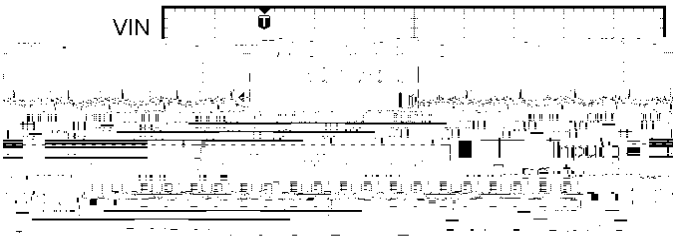

Figure 18. Switching Waveforms in 1.33x Mode

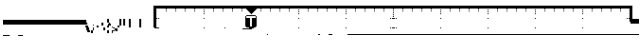

Figure 19. Switching Waveforms in 1.5x Mode

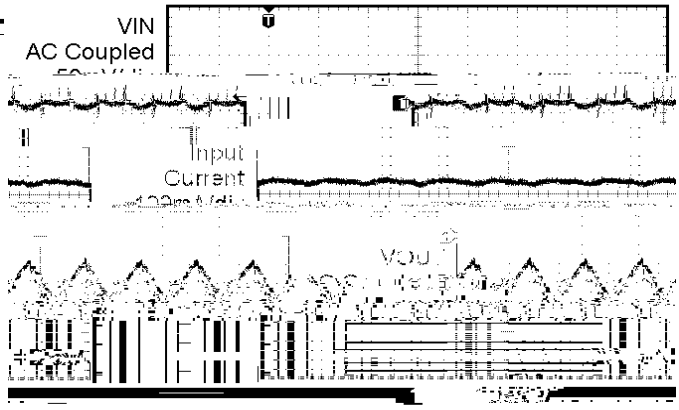

Figure 20. Switching Waveforms in 2x Mode

TYPICAL PERFORMANCE CHARACTERISTICS

(V_{IN} = 3.6 V, I_{OUT} = 60 mA (3 LEDs at 20 mA), C_{IN} = C_{OUT} = C_1 = C_2 = 1 μF, T_{AMB} = 25°C unless otherwise specified.)

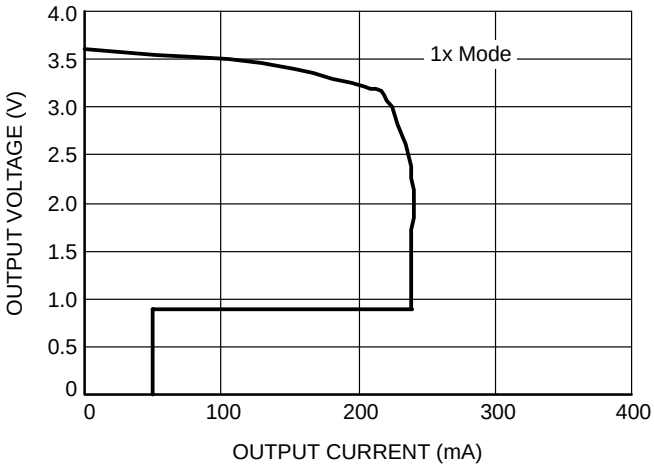

Figure 21. Foldback Current Limit

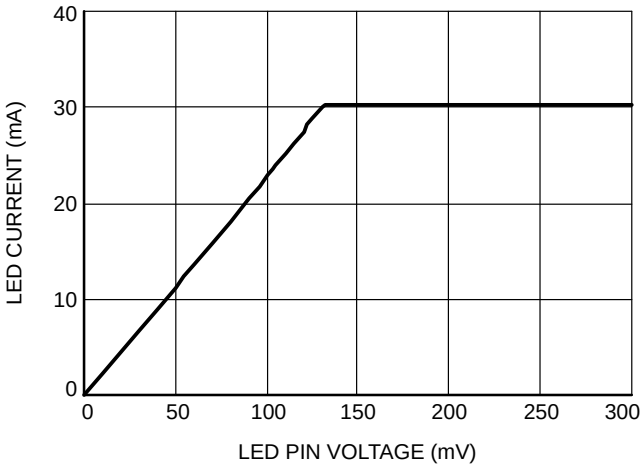

Figure 22. LED Current vs. LED Pin Voltage

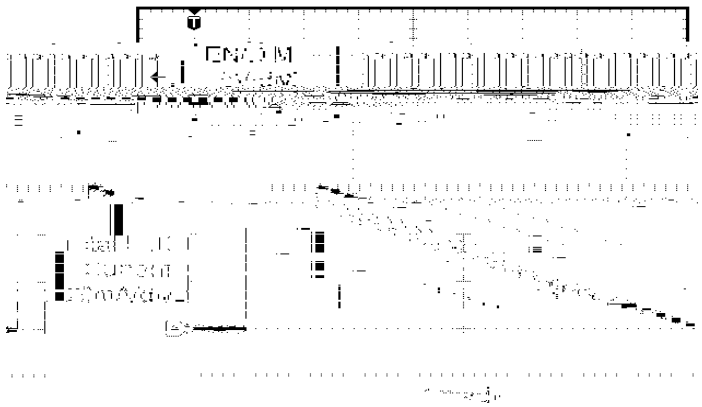

Figure 23. Dimming Waveform

Table 6. PIN DESCRIPTION

Name	Function
LED1	LED1 cathode terminal.
LED2	LED2 cathode terminal.
LED3	LED3 cathode terminal.
RSET	Connect resistor RSET to set the LED current.
EN/DIM	Device enable (active high) and Dimming Control.
VOUT	Charge pump output connected to the LED anodes.
VIN	Charge pump input, connect to battery or supply.
C1+	Bucket capacitor 1 Positive terminal
C1-	Bucket capacitor 1 Negative terminal
C2+	Bucket capacitor 2 Positive terminal
C2-	Bucket capacitor 2 Negative terminal
GND	Ground Reference
NC	Not connected inside package.
GND	Connect to GND on the PCB.

Pin Function

VIN is the supply pin for the charge pump. A small 1 μF ceramic bypass capacitor is required between the VIN pin and ground near the device. The operating input voltage range is from 2.5 V to 5.5 V. Whenever the input supply falls below the under-voltage threshold (1.8 V), all the LED channels are disabled and the device enters shutdown mode.

EN/DIM is the enable and one wire dimming input for all LED channels. Levels of logic high and logic low are set at 1.3 V and 0.4 V respectively. When EN/DIM is initially taken high, the device becomes enabled and all LED currents are set to the full scale according to the resistor R_{SET}. To place the device into “zero current” shutdown mode, the EN/DIM pin must be held low for at least 1.5 ms.

VOUT is the charge pump output that is connected to the LED anodes. A small 1 μF ceramic bypass capacitor is required between the VOUT pin and ground near the device.

GND is the ground reference for the charge pump. The pin must be connected to the ground plane on the PCB.

C1+, C1- are connected to each side of the ceramic bucket capacitor C_1.

C2+, C2- are connected to each side of the ceramic bucket capacitor C_2.

LED1, LED2, LED3 provide the internal regulated current sources for each of the LED cathodes. These pins enter high-impedance zero current state whenever the device is placed in shutdown mode.

TAB is the exposed pad underneath the package. For best thermal performance, the tab should be soldered to the PCB and connected to the ground plane.

RSET is connected to the resistor (R_{SET}) to set the full scale current for the LEDs. The voltage at this pin regulated to

Block Diagram

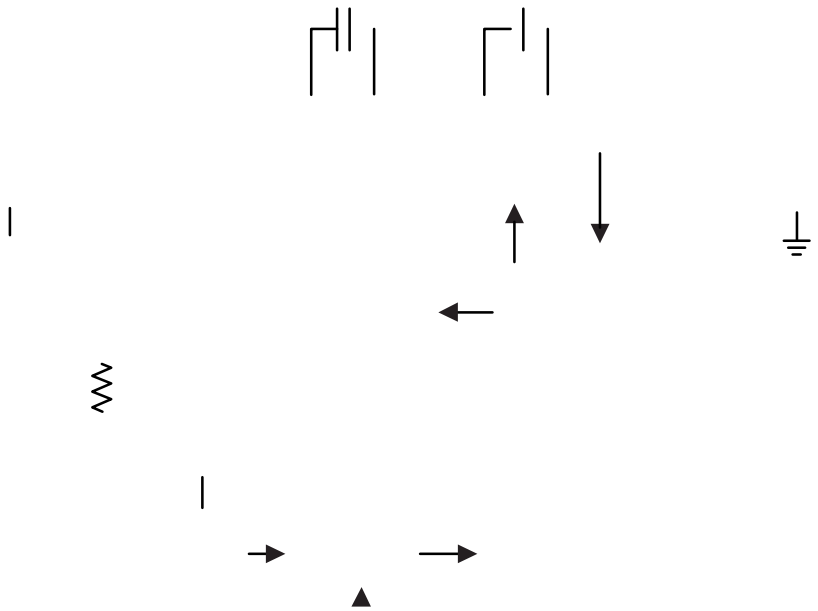

Figure 24. CAT3647 Functional Block Diagram

LED Current Selection

After power-up, the LED current is set by the external resistor (R_{SET}) value and the number of pulses (n) on the EN/DIM input as follows:

$$\text{LED current} = 125 \times \frac{0.6\ \text{V}}{R_{SET}} \times \left(\frac{31 - n}{31}\right)$$

Unused LED Channels

For applications not requiring all the channels, it is recommended the unused LED pins be tied directly to VOUT (see Figure 26).

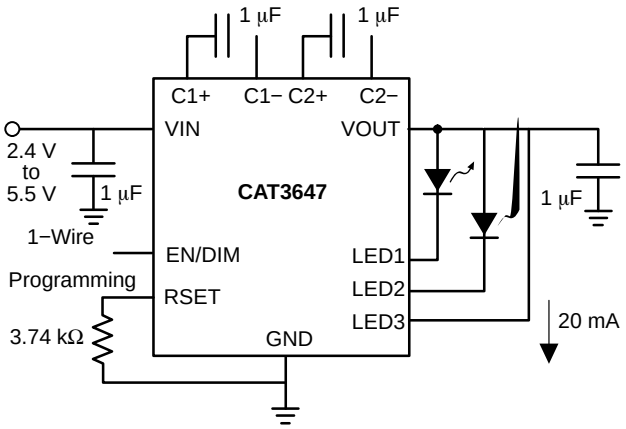

Figure 26. Application with 2 LEDs

TQFN16, 3x3
CASE 510AD