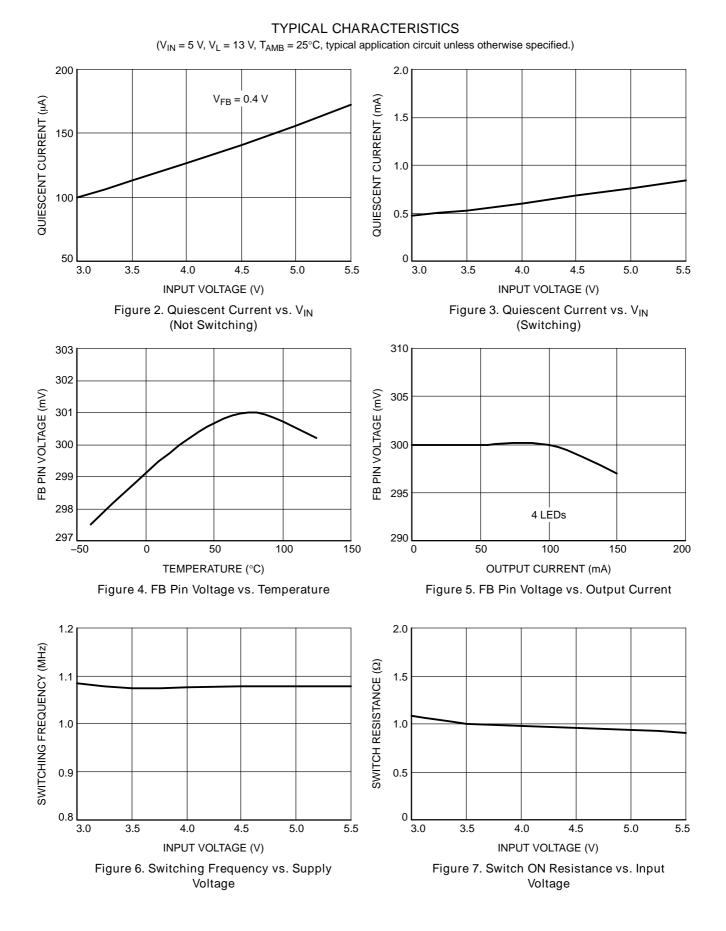
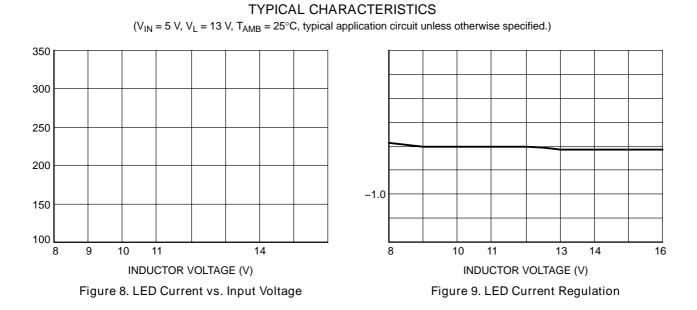
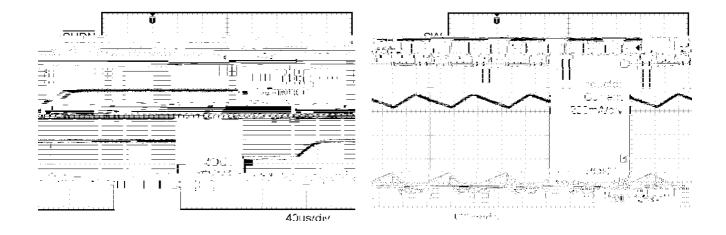
6 Watt Boost LED Driver







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TYPICAL CHARACTERISTICS

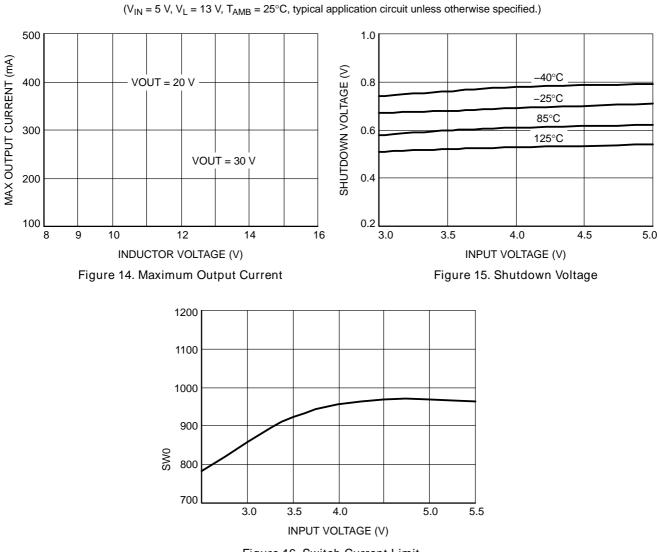


Figure 16. Switch Current Limit

Pin Description

VIN is the supply input for the internal logic. The device is compatible with supply voltages down to 2.8 V and up to 5.5 V. It is recommended that a small bypass ceramic capacitor (4.7 μ F) be placed between the VIN and GND pins near the device. If the supply voltage drops below 1.9 V, the device stops switching.

SHDN is the shutdown logic input. When the pin is tied to a voltage lower than 0.4 V, the device is in shutdown mode, drawing nearly zero current. When the pin is connected to a voltage higher than 1.5 V, the device is enabled.

GND is the ground reference pin. This pin should be connected directly to the ground plane on the PCB.

SW pin is connected to the drain of the internal CMOS power switch of the boost converter. The inductor and the Schottky diode anode should be connected to the SW pin. Traces going to the SW pin should be as short as possible with minimum loop area. An over-voltage detection circuit is connected to the SW pin. When the voltage reaches 40 V, the device enters a low power operating mode preventing the SW voltage from exceeding the maximum rating.

FB feedback pin is regulated at 0.3 V. A resistor connected between the FB pin and ground sets the LED current according to the formula:

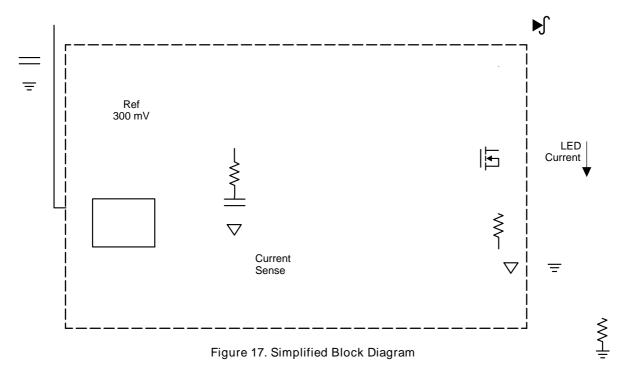
$$I_{\text{LED}} = \frac{0.3 \text{ V}}{\text{R1}}$$

The lower LED cathode is connected to the FB pin.

Pin #	Name	Function
1	SW	Switch pin. This is the drain of the internal power switch.
2	GND	Ground pin. Connect the pin to the ground plane.
3	FB	Feedback pin. Connect to the last LED cathode.
4	SHDN	Shutdown pin (Logic Low). Set high to enable the driver.
5	VIN	Power Supply input.

Table 4. PIN DESCRIPTIONS

Simplified Block Diagram



Device Operation

The CAT4240 is a fixed frequency (1 MHz), low noise, inductive boost converter that provides a constant current with excellent line and load regulation. The device uses a high-voltage CMOS power switch between the SW pin and ground to energize the inductor. When the switch is turned off, the stored energy in the inductor is released into the load via the Schottky diode.

The on/off duty cycle of the power switch is internally adjusted and controlled to maintain a constant regulated voltage of 0.3 V across the feedback resistor connected to the feedback pin (FB). The value of the resistor sets the LED current accordingly (0.3 V/R_1) .

During the initial power up stage, the duty cycle of the internal power switch is limited to prevent excessive in rush currents and thereby provide a "soft start" mode of operation.

When the inductor is connected to a 9 V supply or higher, the CAT4240 can drive 6 LEDs in series at 300 mA delivering a total power of 6 Watts into the load. A separate 5 V supply voltage is connected to the VIN pin.

In the event of an "Open LED" fault condition, where the feedback control loop becomes open, the output voltage will continue to increase. Once this voltage exceeds 40 V, an internal protection circuit will become active and place the device into a very low power safe operating mode.

Thermal overload protection circuitry has been included to prevent the device from operating at unsafe junction temperatures above 150°C. In the event of a thermal overload condition the device will automatically shutdown and wait till the junction temperatures cools to 130°C before normal operation is resumed.

Application Information

Open LED Protection

In the event of an "Open LED" fault condition, the CAT4240 will continue to boost the output voltage with maximum power until the output voltage reaches approximately 40 V. Once the output exceeds this level, the internal circuitry immediately places the device into a very low power mode where the total input power is limited to about 6 mW (about 1.6 mA input current with a 3.6 V supply). The SW pin clamps at a voltage below its maximum rating of 60 V. There is no need to use an external zener diode between Vout and the FB pin. A 50 V rated C₂ capacitor is required to prevent any overvoltage damage in the open LED condition.

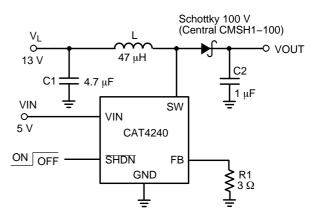
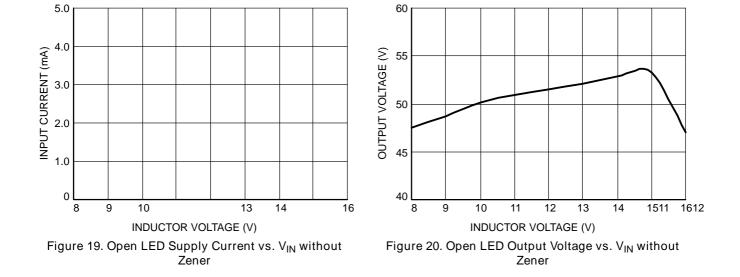


Figure 18. Open LED Protection without Zener



Board Layout

The CAT4240 is a high frequency switching regulator. The traces that carry the high frequency switching current have to be carefully laid out on the board in order to minimize EMI, ripple and noise in general. The thicker lines on Figure 26 show the switching current path. All these traces have to be short and wide enough to minimize the parasitic inductance and resistance. The loop shown on Figure 26 corresponds to the current path when the CAT4240 internal switch is closed. On Figure 27 is shown the current loop, when the CAT4240 switch is open. Both loop areas should be as small as possible.

Capacitor C₁ has to be placed as close as possible to the V_{IN} pin and GND. The capacitor C₂ has to be connected separately to the top LED anode. A ground plane under the CAT4240 allows for direct connection of the capacitors to ground. The resistor R₁ must be connected directly to the GND pin of the CAT4240 and not shared with the switching current loops and any other components.

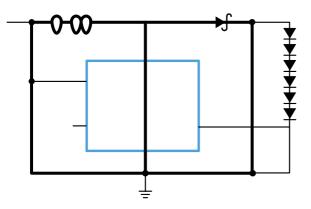
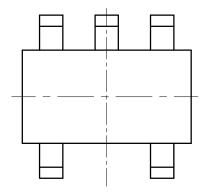


Figure 26. Closed switch Current Loop

Figure 27. Open switch Current Loop

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