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Fatman Hookup Information:

The picture below shows the production PCB.

VIN+ and VIN-(GND) provide the power input to the converter board.
Input voltage range is 2.7V to 12V.

Note, Fatman is a Boost regulator (step up), so input voltage must be less than the output voltage to ensure Fatman remains in regulation. If the input voltage exceeds the output voltage (at the dialed in drive current), Fatman will no longer regulate and the input voltage will go through the series inductor and schottky diode directly to the load. This will cause the output current to a LED to rise rapidly since LEDs have a very steep Current vs Voltage curve (Vf). Fatman **must never** be powered up without a load connected or it will be damaged.

POT(GND) and VIN-(GND) are electrically identical and connected together on the PCB.

LED+ and LED- provide the connection point to the LED(s). LED- is NOT the same as the GND connection.

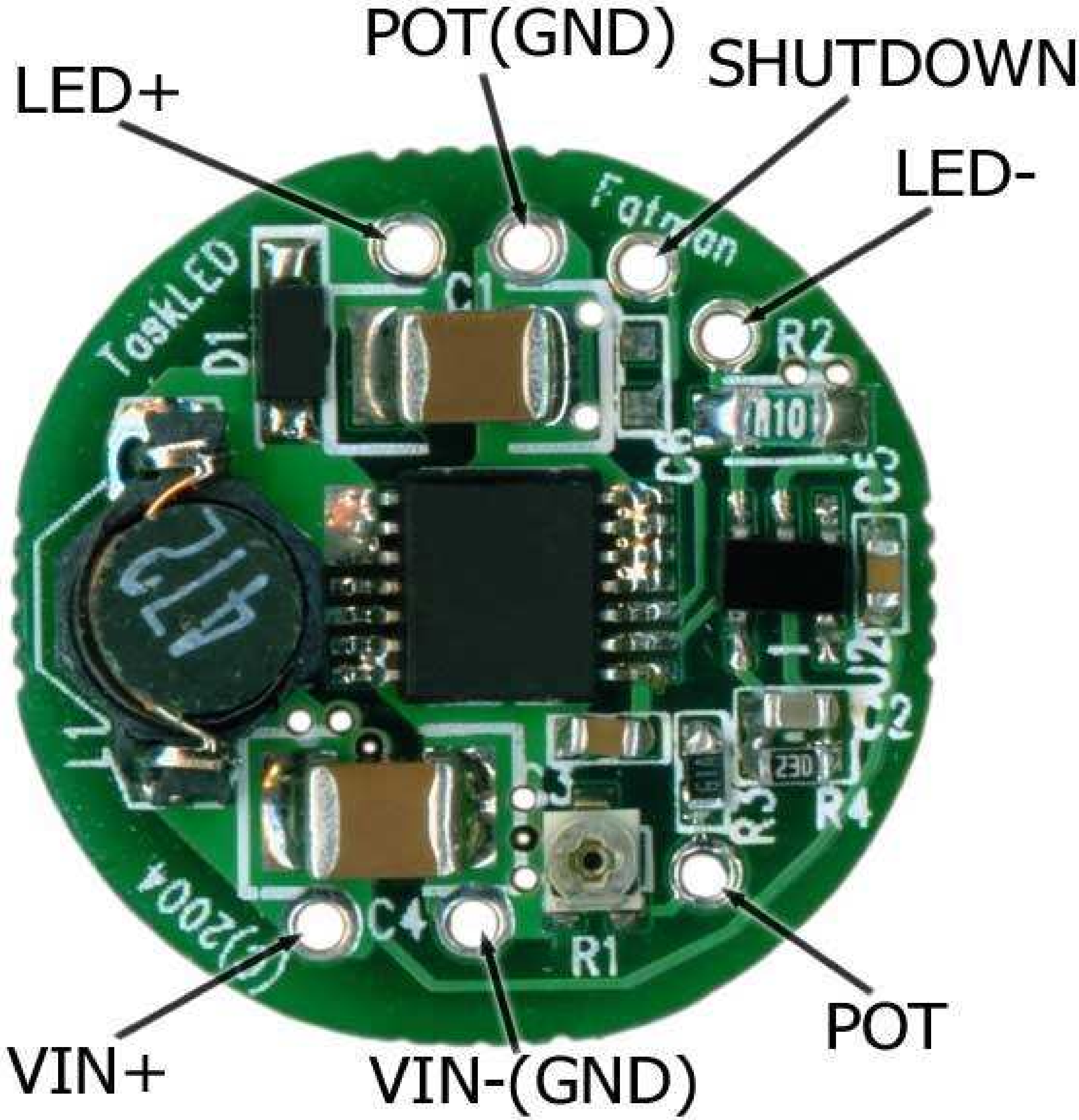
POT and POT(GND) provide an connection point for an optional external potentionmeter. To mimic the human eye logarithmic response to light intensity a 50kohm logarithimic taper potentionmeter is a good choice. A linear taper will not appear to the human eye to have a linear response in intensity and is not recommended.

Trimpot usage:

The trimpot (just to the left of POT pad) provides a way to adjust the current output of the driver. The minimum current output is a nominal 30mA (fixed resistor in series with the trimpot). The maximum current is dependent on the input voltage and the output voltage (total Vf of the LED load).

The trimpot is in parallel with the external potentiometer, so it can be adjusted to compensate for deviation in the potentiometer resistance. Most potentiometers have a +/- 20% or worse specification for their open circuit resistance.

Note, the trimpot has a nominal life specification of 20 sweeps - so it should only be used to configure the current limit, not to perform the dimming function. The newer V2 PCB has an uprated Schottky diode (D1) and a different looking Trimpot than what the picture below shows.


POT(GND)
LED+
SHUTDOWN
LED-
VIN+
VIN-(GND)
POT

Current setting table:

To adjust R1 (the trimpot), measure the resistance with an ohm meter with probes across VIN- and POT and then refer to the following table. Turning the trimpot clockwise increases the resistance and increases the output current.

LED Current	Resistance
1000 mA	13.50K
800 mA	10.84K
750 mA	10.10K
700 mA	9.37K
650 mA	8.70K
400 mA	5.22K
300 mA	3.82K

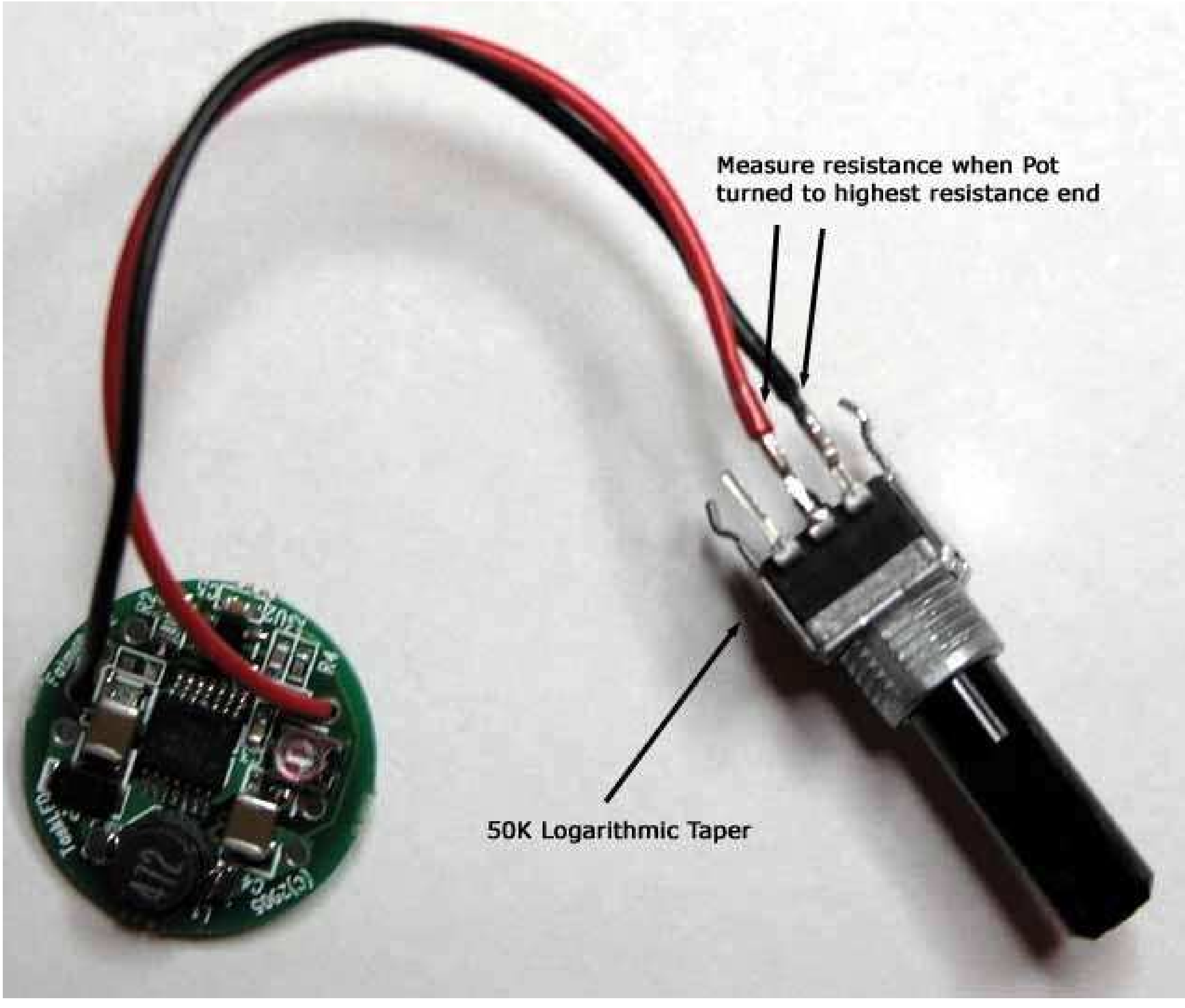
If you require a current output that is not in the above table, the following equation derived by a Linear fit works well:

Resistance_in_ohms = (13.87 * Current_in_mA) - 322.7

Using the Fatman driver with an external Potentiometer to provide dimming control.

The following picture shows the hookup to an external Pot. One wire connects to the Wiper contact of the Pot, the other wire connects to one end of the Pot. The Pot should have a Logarithmic Taper (similar to Audio pots), this will allow the intensity to appear to change linearly to the human eye. The onboard trimpot is adjusted as per the table and equation above. Prior to adjusting the trimpot ensure the external Pot is adjusted to its maximum resistance. Then the procedure is the same as above, measure the resistance across the VIN- and POT and adjust the trimpot as above.

Note: Fatman dims by lowering the output current. As the output current is lowered the Vf of the Luxeon(s) will also lower, so, it is possible that the output voltage (total of the Luxeon Vf's) becomes lower than the battery input voltage. When this occurs no further dimming can occur because there is a DC path through the inductor and schottky diode (typical of boost converters) between the battery and the load and thus Fatman will essentially go direct drive.


Measure resistance when Pot
turned to highest resistance end
50K Logarithmic Taper

Some possible configurations for Fatman:

Given the boost nature of Fatman and the Vin range of 2.7V to 12V and Vout range of Vin to 16V many possible battery/Luxeon configurations are possible. Below are some of the common ones that customers have implemented.

3.6V Li-ion cell driving 2 series connected Lux3's or a single LuxV.

4.8V 4 cell NiMH driving 2 or 3 series connected Lux3's or a single LuxV

6V SLA or 7.2V 6 cell NiMH driving 3 series connected Lux3's or 2 series connected LuxV's

Potting Warning:

Areas of the circuitry on Fatman utilize high impedance paths and if potting (not required) is to be utilized, the user must ensure than the compound is non-conductive and non-capacitive otherwise correct operation may be compromised.

Some preliminary efficiency and runtime measurements:

LED current	Led voltage	Input Voltage	Input current	Efficiency
30mA	11.0V	9.64V	43mA	80%
158mA	11.73V	4.12V	0.50A	90%
158mA	11.73V	9.61V	0.20A	96%
302mA	12.13V	4.06V	1.00A	90%
429mA	12.40V	4.00V	1.50A	88%
873mA	13.25V	8.94V	1.37A	94%
964mA	13.41V	9.46V	1.44A	95%

A runtime test was performed with 4 AA Powerex NiMH cells (2000mAHr capacity) driving 750mA into 3 series connected Luxeons. Continuous runtime was 57 minutes on the prototype Fatman converter board.

Examples on how to calculate battery/LED combinations:

Step 1: Determine output power

Power_output = Number_of_LEDS * Vf * Output_current

Step 2: Determine input power

Power_input = Power_output/efficiency

For calculation purposes we can assume efficiency will be around 90%

Step 3: Determine input current

Input_current = Power_input / Battery_voltage

Do this calculation for the lowest Battery_voltage you plan to run

Now, Input_current should be around 2A or less for optimal performance of Fatman. Fatman can run up to around 2.2A max. When running at high input power it is recommended to thermally epoxy the back of the Fatman PCB to a heatsink or the body of the flashlight.