

## DESCRIPTION

Demonstration circuit 672 is a single cell Li-Ion charger in a DFN3x3. Charge rates as high as 800mA can be achieved due to the LTC®4058 package's excellent thermal performance and internal die temperature control loop that prevents excessive PCB heating under worst-case conditions. The user is provided with a control jumper to enable the charger. An enable terminal is also provided to simplify wiring the demo board into a system. The user is also provided with 3 status outputs. The PROG terminal outputs a voltage proportional to the charge current. The  $\overline{ACPR}$  terminal is pulled low whenever sufficient input volt-

age is present to allow battery charging. The  $\overline{CHARGE}$  terminal is pulled low every time charge current is supplied to the output. The status of the  $\overline{ACPR}$  and  $\overline{CHARGE}$  outputs of the LTC4058 are also indicated visually by two LED's.

**Design files for this circuit board are available. Call the LTC factory.**

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**Table 1. Performance Summary**

PARAMETER	CONDITION	VALUE
Input Voltage		4.2-6.3V
I <sub>out</sub>	V <sub>in</sub> =5V, V <sub>bat</sub> =3.6V	800mA +- 7%
Float voltage	V <sub>in</sub> =5V	4.20v+-1%
Trickle Charge threshold	V <sub>IN</sub> = 5V	2.9V +-0.1V
C/10 detection	V <sub>IN</sub> =5V V <sub>bat</sub> =4.2	65mA-95mA
Recharge threshold	V <sub>in</sub> 5V	V <sub>float</sub> – 60mV – V <sub>float</sub> -150mV

## OPERATING PRINCIPLES

Demo 672 is a simple single cell Li-Ion charger. The circuit features the LTC4058-4.2 charger IC. This charger implements a constant die temperature, constant current, and constant voltage charge scheme. Charge termination occurs when the charge rate falls to beneath 10% of the programmed charge current. A topping charge will be applied if the cell voltage falls to 4.05V to insure long-term charge maintenance. Deeply discharged cells are conditioned with a low C/10 trickle current until the cell voltage

reaches 2.9V whereupon full charge current is applied. In the event that full charge current would result in excessive IC temperature, a die temperature control loop backs off the charge current to maintain a reasonable PC board temperature. Two LED's are provided for status indication. A charge LED is provided that illuminates every time the charger is charging the battery, and an AC power LED is provided to indicate that the part is out of under-voltage lockout. The peak charge current is 800mA.

## QUICK START PROCEDURE

Demonstration circuit 672 is easy to set up to evaluate the performance of the LTC4058-4.2. Refer to 0 for proper measurement equipment setup and follow the procedure below:

1. Connect input power supply, meters and output load as shown in figure 1.
2. Set the battery simulator voltage to zero, slowly raise the input voltage. When the supply voltage exceeds 3.9V the charger should activate and the charge LED will illuminate.

**NOTE:** Make sure that the input voltage does not exceed 6.3V.

3. Note that so long as the battery voltage is under the Trickle Charge threshold of 2.9V the charge current is 10% of the selected charge current or approximately 80mA.
4. Increase the battery voltage to about 3V and note that the charge current has increased beyond the trickle charge current. Verify that the LTC4058-4.2 thermal loop is working by touching a soldering iron to the PCB to heat up the LTC4058 and note that the charge current decreases. Remove the iron and the charge current will increase. This demonstrates the “constant die temperature” operating mode.
5. Continue to increase the battery voltage. Note that as the voltage drop across the LTC4058 decreases, the constant die temperature loop is no longer active and the charge current is the programmed charge current of 800mA
6. Continue to increase the battery voltage. As the battery voltage approaches the float voltage of 4.2V the charge current will begin to drop. Note that as the charge current drops to 10% of the programmed current the charger terminates. Charge current falls to 0 and the charge LED extinguishes.
7. Now slowly decrease the battery voltage to simulate a long term self-discharge of the battery. Note that as the battery voltage drops to 4.10V that another charge cycle is initiated.
8. Place the enable jumper in the OFF position. Note that the battery current draw is extremely low (approx 1uA). Also note that the supply current draw is low (approx 20uA).

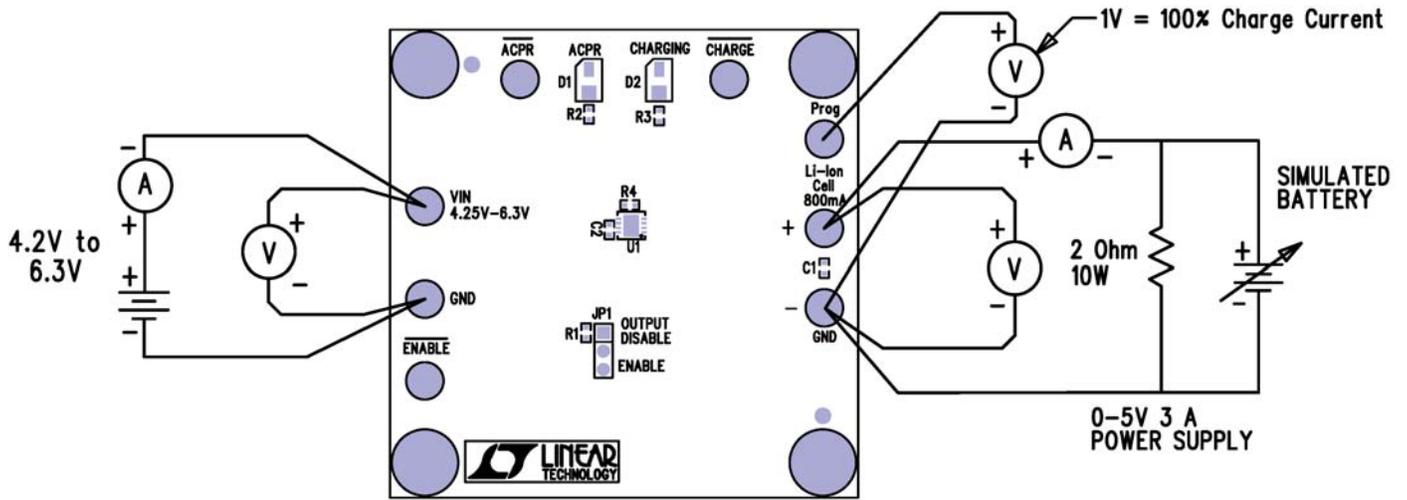


Figure 1. Proper Measurement Equipment Setup

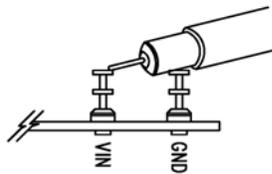
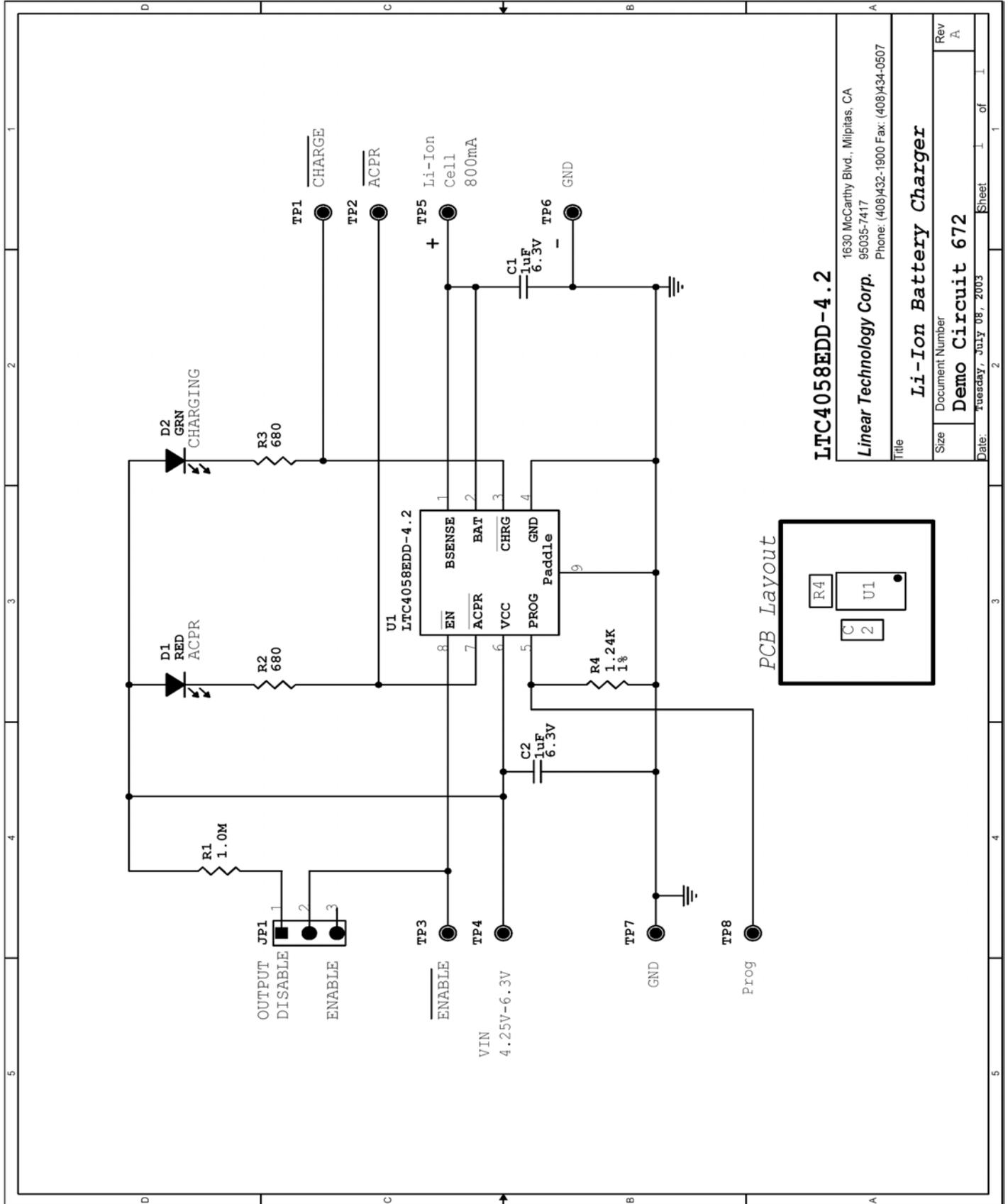


Figure 2. Scope Probe Placement for Measuring Input or Output Ripple

# QUICK START GUIDE FOR DEMONSTRATION CIRCUIT 672

## LI-ION CHARGER IN DFN 3X3



**LTC4058EDD-4.2**

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