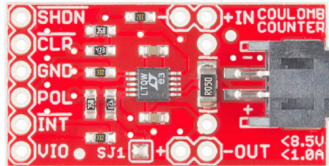


# Read data from coulomb counter & Check battery temperature

*I took some notes while I was working on the project. Hope the document can help you understand Coulomb Counting as well.* — Mivia

Q: How do mobile devices measure Soc?

A: Laptops, medical equipment and other professional portable devices use **coulomb counting** to estimate SoC by **measuring** the in-and-out-flowing **current**

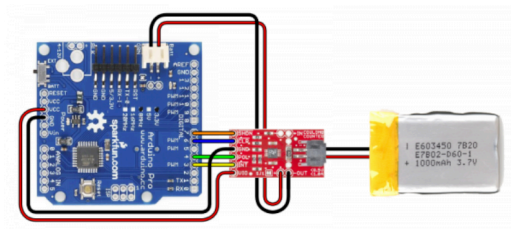


Q: How does coulomb counter work?

A: It measures amp-hours as you're using them, the coulomb counter makes it very easy to keep track of your battery's state-of-charge (how full it is):

1. First, assuming you're starting with a full battery, set a variable to your battery's initial state-of-charge (e.g. 1000.0 mAh).
2. Listen for the "tick" (low) signals from the INT pin.
3. Each time you detect a tick, check the direction signal, and add or subtract the above per-tick mAh value (0.1707 mAh) to your battery-state variable.

*Note: one "tick" from the device is equal to 0.0001707 amp-hours. Conversely, it takes 5859 ticks to equal one amp-hour.*



Coulomb counter sample output:

```
COM3
Send

LTC4150 Coulomb Counter BOB interrupt example
mAh: 1999.83 soc: 99.99% time: 0.06s mA: 10574.14
mAh: 1999.66 soc: 99.98% time: 21.14s mA: 29.06
mAh: 1999.49 soc: 99.97% time: 20.89s mA: 29.40
mAh: 1999.32 soc: 99.97% time: 20.96s mA: 29.31
mAh: 1999.15 soc: 99.96% time: 21.06s mA: 29.18
mAh: 1998.98 soc: 99.95% time: 21.18s mA: 29.01
mAh: 1998.81 soc: 99.94% time: 21.21s mA: 28.96
mAh: 1998.63 soc: 99.93% time: 21.18s mA: 29.01
mAh: 1998.46 soc: 99.92% time: 21.17s mA: 29.02
mAh: 1998.29 soc: 99.91% time: 21.19s mA: 29.00
mAh: 1998.12 soc: 99.91% time: 21.20s mA: 28.98

Autoscroll Carriage return 9600 baud
```

The columns from left to right are:

- mAh (milliamp-hours) remaining in the battery (subtracted from the battery size value at line 120)
- SoC (percentage remaining)
- Time delay between ticks
- Average mA computed from the last time delay.

### Temperature Sensor (Arduino based Thermistor)

How a Thermistor works: by changing their resistance with temperature

Build a basic thermistor circuit: The Arduino measures voltage only. After calculating the resistance of thermistor, Steinhart-Hart equation is used to convert the resistance of the thermistor to a temperature reading.

$$V_{out} = V_{in} \times \left( \frac{R2}{R1+R2} \right) \quad R2 = R1 \times \left( \frac{V_{in}}{V_{out}} - 1 \right)$$

Connect the circuit:

