

Q.: When and how do you need to use an external sense resistor in a lithium ion charging circuit?

A.: When you need more options than what's provided by an ASIC.

What the resistor does in the circuit:

Resist current flow in a circuit and converts electrical energy into heat energy, which corresponds to a voltage signal that is used for monitoring and control.

Current sensing is used to perform two essential circuit functions. First, it is used to measure “how much” current is flowing in a circuit, which may be used for power management in a DC/DC power supply to determine essential peripheral loads to conserve power. The second function is to determine when it is “too much,” or a fault condition. If current exceeds safe limits, then a software or hardware interlock condition is met and provides a signal to turn off the application, as in a motor stall or short circuit condition in a battery. It is essential to choose the appropriate technology with a robust design to properly withstand the extreme conditions that can exist during a fault. The appropriate component performing the measurement function would need to sustain an accurate voltage signal as well as prevent damage to the printed circuit board.

Why it provides options to an ASIC:

The ASIC approach can save board space by using a single IC with an internal sense resistor for charge integration. This solution can be quite accurate, but it has a defined current limit and can be damaged by surge events that come from closure of a mechanical switch, battery insertion, or even short circuit.

External sense resistors allows engineers to specify the characteristics and technology of the resistor that is most suited to their performance and cost requirements. When compared to the ASIC approach. The external current sense resistor provides the designer with a greater range of options than being locked in with the limits of an ASIC,

Resistance is calibrated to a value, which allows for precise detection and monitoring within a control circuit.

Q.: What makes one sense resistor better than another for a lithium ion charging circuit?

A.: For the current sense function, the most important attributes you should look for in a resistor are :

1. Temperature Stability - stable temperature coefficient of resistance (TCR) of < 100 ppm/°C or 0.01 %/°C and does not suffer the potential of avalanche multiplication or thermal runaway.
2. Low-resistance (< 1 mΩ is available) minimizes power loss.
3. Metal alloy current sense products offer superior surge performance for reliable protection during short circuit and overcurrent events.

Q.: Given that the same power ratings, case sizes, resistance values and tolerances are available in components using various resistor technologies, such as thick film or metal film, and why would I want to choose one resistor technology over another?

A.: It depends on what your goals are. If the application is very cost sensitive, the least expensive option is likely going to be a thick film resistor. However, if you need to be sure your charging circuit is absolutely robust against voltage transients, then you need to be looking at technologies like metal strip with more robust, pulse-tolerant performance.