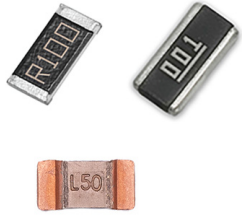


Use case Eaton current sense resistors (CSRs)



Eaton provides reliable current sensing in battery-powered electronics

Battery-powered devices have transformed the way people communicate, work, and play in the digital age. The latest advancements in device miniaturization include a vast range of features, like expanded data connectivity, remote sensing, and much more. Rechargeable batteries, such as lithium-ion and nickel-metal types, are ubiquitous energy storage devices in today's electronic applications.

One of the most essential considerations for engineers designing battery-powered circuits is to prevent short-circuiting and overcurrent events that could damage sensitive components. For example, overcharging and thermal runaway (due to internal short-circuiting and overheating) can also pose safety hazards to

users and significantly deplete battery lifetimes. Current sense resistors (CSRs) are electronic components designed to monitor current flow in electric circuits. Their basic working principle follows Ohm's Law, which states that the voltage drop across a resistor is proportional to the amount of current flowing through the circuit. In battery packs, a CSR can be utilized alongside other overcurrent protection components, such as fuses and NTC thermistors to monitor the charging rate and charge level of a battery. CSRs provide a low-cost sensing solution that determines the state of charge (SoC) of batteries by monitoring charge and discharge currents. Ultimately, CSRs help to improve overall system efficiency and minimize power consumption.

An important consideration for selecting CSRs is that they should contribute minimal resistance to electrical circuits. Moreover, CSRs must also offer a low temperature coefficient of resistance (TCR) for current sensing accuracy and temperature stability. Due to increasing miniaturization of electronic devices, CSRs should also be sufficiently small and lightweight to be integrated into space-constrained or component-dense PCBs.

Eaton's CSRs provide high-accuracy current sensing with low resistance values and high power and current handling capability. The CSR series is available in metal foil or plate constructions. The metal foil type offers high accuracy and lower tolerances which comes at higher resistances, while the

strip CSRs offer lower resistance and higher power.

Eaton metal foil CSR series are constructed using high accuracy foil on a substrate to provide industry-leading thermal performance, low inductance, and low noise. They are offered in 0603 to 2512 EIA footprints as well as short or wide terminal configurations. Eaton's metal foil CSRs have power ratings up to 3 W and resistances up to nearly 1 ohm. Eaton metal plate CSRs are designed using a metal plate with epoxy overcoat and end terminations to provide low temperature coefficient of resistance (TCR), low resistance, and high power capability. They are offered in standard 0603 to 2512 EIA footprints with short and wide terminal configurations.

**Eaton
Electronics Division**
1000 Eaton Boulevard
Cleveland, OH 44122
United States
Eaton.com/electronics

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