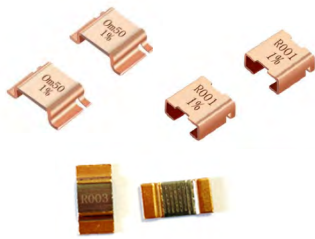


Use case Eaton current sense resistors (CSRs)



Eaton provides reliable current sensing in battery-powered electronics

Battery-powered devices have transformed how we communicate, work, and play in the digital age. The latest advancements in device miniaturization offer a broad range of features, such as expanded data connectivity, remote sensing, and much more. Rechargeable batteries, including lithium-ion and nickel-metal types, are ubiquitous energy storage devices in today's electronic applications. One of the most critical considerations for engineers designing battery-powered circuits is monitoring the state of charge of the battery during charging and discharging.

Current sense resistors (CSRs) are electronic components designed to monitor current flow in electric circuits. Their fundamental working principle is based on Ohm's Law, which states that the voltage drop

across a resistor is proportional to the current flow through the circuit. A CSR can be used in battery packs alongside other overcurrent protection components, such as fuses and NTC thermistors, to monitor the charging rate and charge level. CSRs provide a low-cost sensing solution that determines the state of charge (SoC) by monitoring charge and discharge currents. Ultimately, CSRs help to improve overall system efficiency and minimize power consumption.

When selecting CSRs, ensuring they contribute minimal resistance to electrical circuits is essential. Additionally, CSRs should offer a low-temperature coefficient of resistance (TCR) for current sensing accuracy and temperature stability. Given the increasing miniaturization of electronic devices, CSRs should also be small and lightweight

enough to integrate into space-constrained or component-dense PCBs.

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

Eaton's metal foil CSR series are constructed using high-accuracy foil on a substrate, providing industry-leading thermal performance, low inductance, and low noise. They are available in 0603 to 2512 EIA footprints and 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's metal plate CSRs are designed using a metal plate with epoxy overcoat and end terminations and offer a low-temperature coefficient of resistance (TCR), low resistance, and high power capability. They are available in standard 0603 to 2512 EIA footprints with short and wide terminal configurations.

Eaton's current shunts are high-power current sense products that have the benefit of simple and linear current measurement. They are compact and low-profile solutions with power ratings up to 15 W and resistances down to 0.1 mΩ. Eaton provides new 4-terminal Kelvin resistors with high power density in a compact package, size: 1206, 1216, 2726, 4026, with a low inductance (< 0.1 μH) construction. Eaton's current shunts are AEC-Q200 qualified for automotive and high-reliability applications.

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