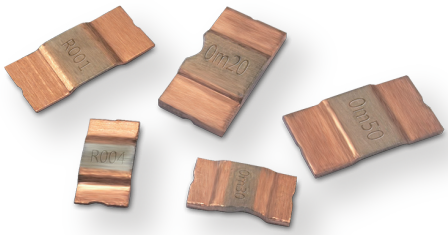
Low Thermal EMF for Shunt Resistors - PU Series

High power and excellent heat dissipation shunt resistor (metal current sensor) – PU series, 3921 & 5931



The Yageo shunt resistor - PU series is a perfect solution for current sensing applications with a high power rating (up to 10W) requirement. Welding technology is introduced to combine the center metal alloy and copper (Cu) together at the terminations. The central open air design is the key for achieving good heat dissipation (Fig.1). The selection of metal alloy provides a very low thermal EMF which can help to minimize the current sensing error.

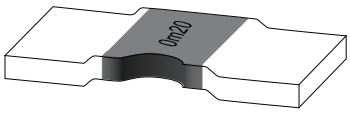


Fig. 1 *The structure of a shunt resistor. The central portion does not have contact with the PCB after mounting.*

Thermal EMF is an abbreviation of thermal electromotive force. When two dissimilar metals contact with each other and are heated, a voltage is generated at the intermetallic junction due to the temperature change which causes different molecular activity in the two different metals. Thermal EMF is expressed in the voltage change rate with temperature and is usually measured in microvolt per degree Celsius (μV/℃). In fact, thermal EMF exists in all resistors. For resistors, since they are soldered on the PCB, the terminations of resistors are connected to the copper circuit trace and form metallic junctions which induce thermal EMF.

Thermal EMF is a source of signal noise and it is a negligible factor for low ohmic resistors. For current sensing applications, a low ohmic resistor is used to monitor current alteration and the voltage is usually at minivolt (mV) level. As a result, the thermal EMF might be large enough to impact the measurement and become a sensing error. However, precision is the most important requirement in current sensing, so a low thermal EMF is an essential characteristic of a current sensor.

A simple experiment was implemented in order to establish the real thermal EMF level of a shunt resistor and a thick film current sensor. The testing resistor samples were mounted on a PCB and powered under room temperature. Then a finger was placed on the copper termination to simulate a slight rise in the temperature condition. Figure 2 shows the thermal EMF test results of a shunt resistor and a thick film current sensor. The thermal EMF of the shunt resistor is visibly lower than the thick film current sensor.

Yageo provides high power metal current sensor - shunt resistor PU series in sizes 3921 and 5931. The advantages of good heat dissipation, low thermal EMF, and wide operational temperature range (-65°C~275°C) are ideal for precise current sensing applications under a high temperature environment such as E car battery management systems or power supply module.

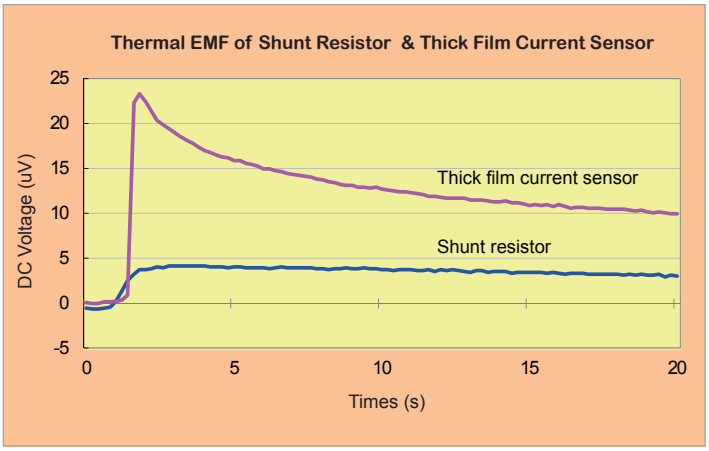


Fig. 2 *Thermal EMF of a shunt resistor and a thick film current sensor. The thermal EMF (DC voltage) of the shunt resistor is obviously lower than the value of the thick film current sensor.*

Low Thermal EMF for Shunt Resistors - PU Series

Features

- High rated power (3 ~ 10W)
- Resistance down to 0.2mR
- Sulfur resistant due to no Ag in the structure
- Low thermal EMF
- Excellent heat dissipation
- AEC-Q200 qualified

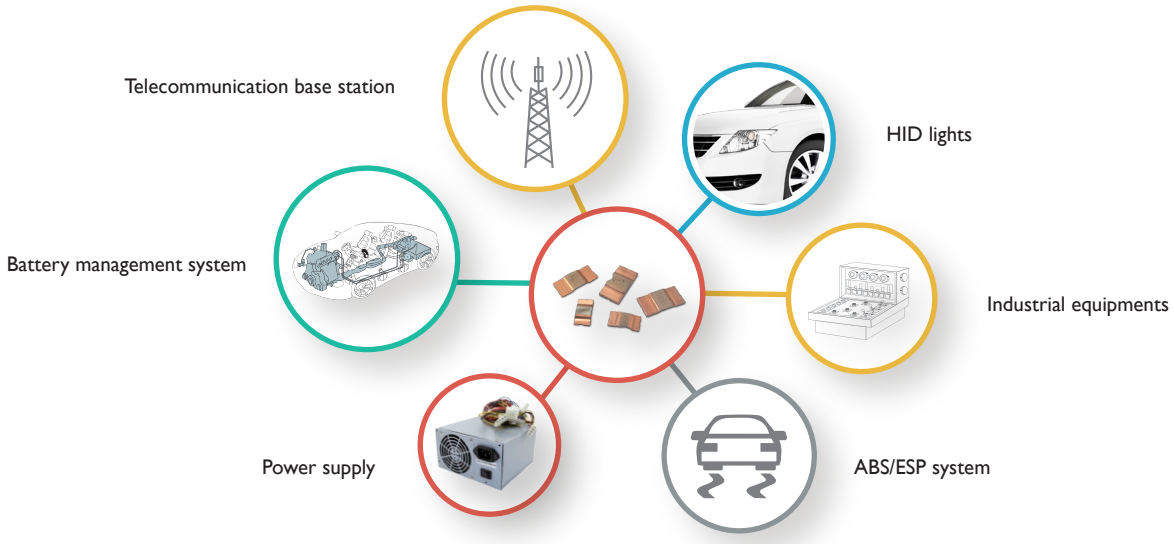
Benefits

- Open-Air design provides good heat dissipation which is able to work under high ambient temperature
- Perfect for current sensing applications with a high power rating requirement

Applications

- Power supply
- Industrial equipments
- Telecommunication base station
- HID lights
- Battery management system
- ABS/ESP system

Yageo's PU Series Application Map



About Yageo

Established in 1977, the Yageo Corporation has become the world's leading total service provider of passive components with capabilities on a global scale, including production and sales facilities in Asia, Europe and the Americas. Yageo's broad product offerings are targeting at key vertical markets, including applications for consumer electronics, computer & peripherals, industrial/ power, alternative energy, and automotive.

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