BOURNS®

CIRCUIT PROTECTION SOLUTIONS FOR POWER MANAGEMENT APPLICATIONS

To help enhance reliability and fulfill regulatory requirements in power supplies, it is recommended that engineers include circuit protection in their designs. Areas where circuit protection may be needed include the power input port, the power output port, or control/sensing ports.

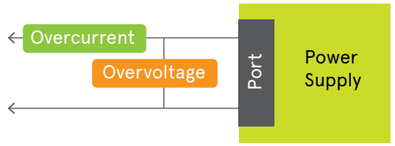


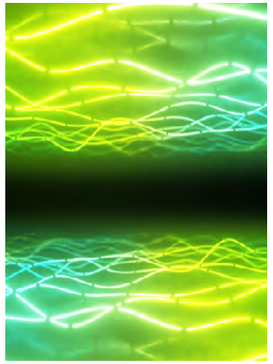
Figure 1

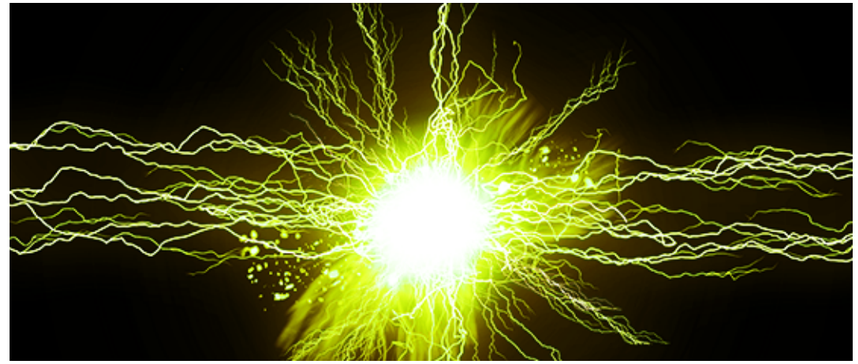
Circuit protection encompasses both overvoltage and overcurrent protection. Overvoltage protection works to limit the voltage applied to the supply to levels that can be tolerated without damage. Overcurrent protection is used to limit the current when it exceeds a specified maximum level chosen by the designer.

The typical circuit protection arrangement at the power supply input is shown in Figure 1.

The overcurrent device is first so that it protects against failures of the overvoltage element as well as the rest of the power supply.

This can pose a challenge to designers because lightning and other surge events will activate the overvoltage element and the resulting surge current will be passed through the overcurrent device. Therefore, a minimum overcurrent trip value will need to be specified to allow this surge current to pass without permanently taking the power supply offline.





OVERCURRENT PROTECTION TECHNOLOGIES

The most common overcurrent technology found at the power input port is a conventional fuse.

Bourns offers a wide range of SinglFuse™ surface mount fuses. These are available in fast-acting, slow blowing and high inrush current tolerant reaction time profiles to allow designers the ability to tailor the fuse response to meet their overcurrent protection needs. For designs that can benefit from circuit protection that offers series resistance to limit inrush currents, Bourns offers a range of fusible resistors.

In various power supply applications, occasional overcurrent events at the input may be expected due to accidental temporary shorts and overloads. To eliminate nuisance fuse blowing in these applications, Bourns offers self-resetting polymer and ceramic PTC (positive temperature coefficient resistor) devices.

OVERVOLTAGE PROTECTION TECHNOLOGIES

Bourns also has a broad portfolio of overvoltage product technologies. Metal Oxide Varistors (MOVs) are popular overvoltage protection solutions where designers select the proper voltage rating to match their line voltage rating.

Designers will typically add a suitable safety margin to the power supply rated voltage input to allow for temporary line voltage swells. It is also important to choose the surge rating of the MOV to make sure the voltage does not exceed requirements during a surge of a certain intensity. Larger diameter MOV devices can handle higher surge currents and better limit the surge voltage allowed into the power supply.

To reduce the stress on the MOV, designers can place a GDT in series with the MOV. This effectively keeps the MOV disconnected until a significant voltage surge occurs at which point the GDT triggers and reconnects the MOV for the duration of the surge which virtually eliminates the aging of the MOV and greatly enhances reliability. Correctly designed, this arrangement also allows designers to reduce the voltage margin as temporary overvoltage events will not trigger the GDT.

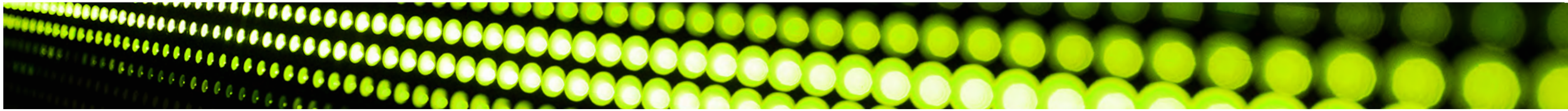
Bourns has innovatively designed two product lines that integrate the GDT/MOV functionality into a single device with matched MOV and GDT ratings.

- ***The Bourns® GMOV™ helps developers save board space and reduce placement costs.***
- ***The Bourns® IsoMOV™ hybrid protector offers the further advantage of enhanced surge ratings for the same diameter MOV or GMOV.***

Bourns has two other product line solutions that may be suitable for power management protection. An AC Transient Protector (ACTP) is effectively a solid-state version of a GDT that, when paired with an MOV, allows for precise voltage triggering.

The Bourns® Model ACTP250J1BJ bidirectional thyristor is an optimal solution to protect a power supply from damage due to an overvoltage condition on its AC input lines. Power TVS (PTVS) devices are another premium option that deliver the inherent reliability a silicon solution with lower, precisely controlled clamping voltages.

For ultra-fast and efficient in-line overvoltage protection, Bourns offers a protection circuit that combines its IsoMOV™ protectors, Bourns® TBU® (Transient Blocking Unit) devices and TISP thyristor technologies together. This solution can not only offer assured limits to voltage let through to the power supply, but can also protect against sustained overvoltage events without damage and often without interrupting the operation of the power supply.



BOURNS CURRENT SENSE RESISTORS FOR POWER MANAGEMENT

For power management applications, current sense resistors from Bourns give designers a simple and cost-effective direct method of accurate current measurement.

These resistors detect and convert current to an easily measured voltage, which is proportional to the current through the device.

New model series feature Bourns' metal foil technology construction that provide low TCR, low inductance, low noise, excellent reliability and very low resistance values for long-term stability.

These attributes make it possible to achieve best-in-class measurement precision delivering an optimal current sensing solution for power supply, stepper motor drive, and input amplifier applications.

Plus, Bourns also offers new smaller package sizes that are particularly well-suited to meet space-constrained requirements.

With extensive expertise in current sense resistor development, Bourns continues to design products with low TCR, which is determined by characteristics such as the materials used in the resistive element, power rating, and physical size of the component. Bourns has leveraged metal foil technology to achieve lower resistance values, ranging from 5 to 40 milliohms, and still provide power ratings of 0.25 to 1 W in components small enough for mobile applications.

Bourns offers efficient, reliable, cost-effective and accurate measurement solutions for battery management system (BMS), industrial control and other high current applications that feature:

WIDE FREQUENCY RANGE

Enables reliable AC and DC current measurement. Limitation mainly by lead inductance depending on shunt style. Can be compensated for MHz measurements.

LOW DRIFT OVER TEMPERATURE AND LIFETIME

Delivers repeatable measurement at cold start, system working temperature range and under overload conditions.

LINEAR BEHAVIOUR

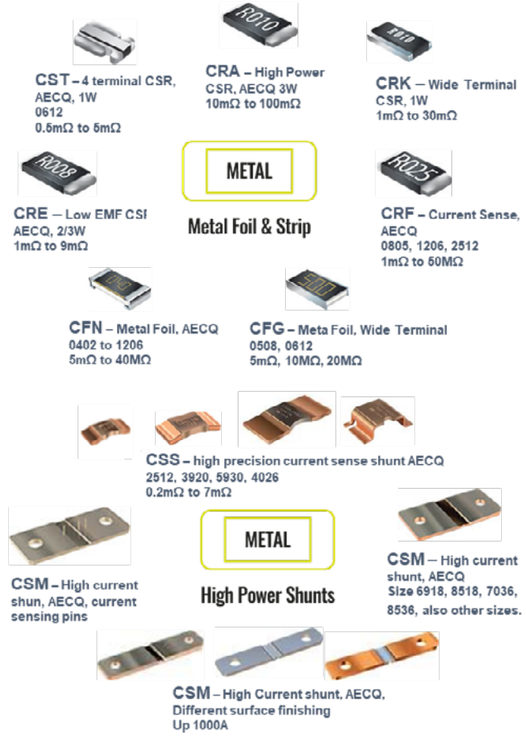
Makes signal conditioning simple and offers compatibility at different operating points.

AEC-Q200 COMPLIANCE

Ideal for harsh environmental designs.

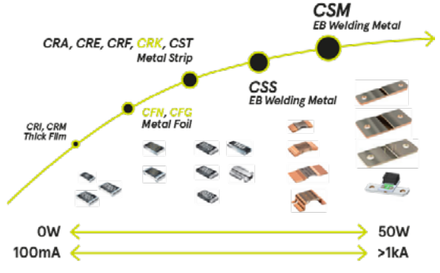
BOURNS THICK FILM CHIP RESISTOR PORTFOLIO

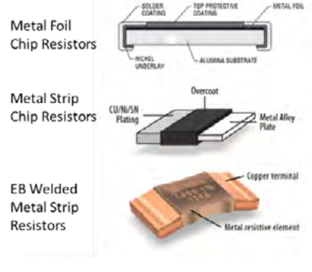
BOURNS CURRENT SENSE RESISTORS PORTFOLIO



BOURNS CURRENT SENSE RESISTORS TECHNOLOGIES

From chip to high power customised welded metal type





BOURNS ADVANCED MAGNETICS SOLUTIONS FOR POWER, EMC & SIGNAL LINE DESIGNS

The global semiconductor industry continues to significantly advance its integrated circuits (ICs) designs to meet increasing power conversion application requirements.

Because these new ICs offer higher switching speeds and reduced switching losses, they are driving demand for equally significant power, signal and EMC magnetic component advancements.

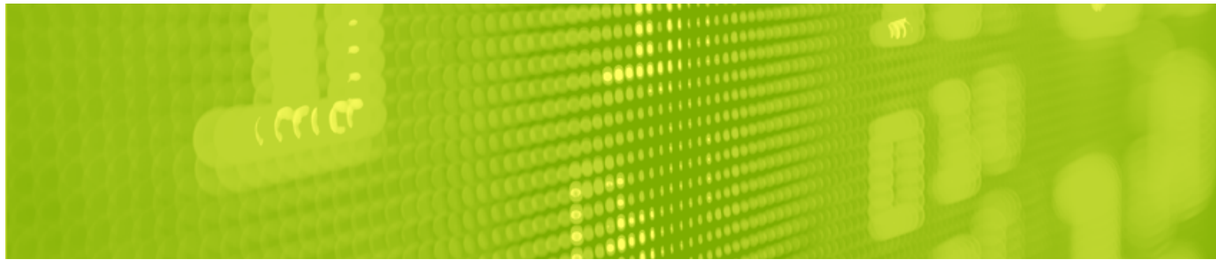
Helping to ensure efficient and safe, highly reliable power, magnetics solutions are necessary elements in many of today's breakthrough electric vehicle, high power battery charging, e-mobility, renewable energy, energy storage, Internet of Things (IoT) and industrial infrastructure designs.

Magnetics for Efficient Power Management

Meeting this demand, Bourns has more than 50 years of magnetic components development experience and continues to innovate and expand its portfolio of advanced magnetic components. By offering one of the industry's most comprehensive lines of magnetic components gives circuit designers the breadth they need to select the right components to meet their increasingly complex and demanding customer requirements.

Bourns advanced magnetics components are designed to meet essential power application requirements for superior power conversion efficiency, isolation, EMC compliance, signal integrity, increased power density, low noise, miniaturization and excellent thermal management.

And, Bourns automotive grade components are manufactured in accordance with the International Automotive Task Force (IATF) 16949 standard in ISO 14000 certified factories.



SOURCING ADVANCED MAGNETICS FEATURES& SIGNAL LINE DESIGNS

Today's power management applications require magnetics that support higher switching frequencies and ever-more performance in more compact designs.

Engineers need to consider sourcing components that offer:

- **Miniaturization** – Smaller form factors for space-constrained designs
- **Low EMI noise** – Inductors that mitigate EMI noise while maintaining high efficiency
- **Thermal management** – For temperature stability
- **High robustness and reliability** – To help maximize product lifespan
- **Advanced materials and construction (advanced metal alloy powder cores/ molded techniques)** – Provide highly efficient and ultra-low DC resistance

Meeting Application-specific Requirements

From design to spec and build to print – all the way to volume production, Bourns' custom Magnetics team can design and manufacture transformers and inductors for almost any power level. Customers are able to leverage Bourns' engineering expertise and advanced software design tools to expedite the development of an optimized design. Custom capabilities include ferrite cores, designs for EMI reduction, high frequency power topologies, custom bobbins and cores, aluminium housing, flat wire windings, Litz wire and support for finite element analysis and simulations. In addition, Bourns' engineering lab can provide fast turnaround prototype samples and can support volume production manufacturing goals.

Leading Power Conversion & Energy Storage Solutions

With a strong and growing product portfolio that matches increasingly complex and demanding application needs, look to Bourns for power conversion and energy storage solutions. The company's high creepage and clearance isolation transformers, BMS signal transformers, chip LAN transformers, power inductors, and high current common mode chokes are backed by Bourns' in-house AEC-Q200 testing and are all produced in the company's IATF 16949 and ISO 14000 certified factories.

These solutions plus its ongoing magnetics innovation, Bourns helps engineers satisfy their high reliability, safety and isolated communications requirements in broad range of power management applications.

Bourns has partnerships and reference designs with all the major power electronics IC providers such as Texas Instruments, ADI and PI helping customers save time and minimize risk. Strict automotive grade requirements including AEC-Q200 and PPAP are also supported. Plus, Bourns designs for compliance with UL and IES safety standards for isolation and creepage and clearance.

To learn more about Bourns solutions for Power Management applications CLICK HERE