

Bourns® Resistive Products

Selecting the Right Resistor for Your Application



CR Series



CRT/CRL Series



CAT/CAY Series



4816P



CHF9838CNF Series

Introduction

Science and engineering students typically experiment with axial leaded resistors, learning a color code to identify the resistor value based on the stripes around the resistor body. In practice, however, axial leaded resistors are overshadowed in board fabrication by resistors for which the construction, package styles, and materials are targeted for specific applications.

Bourns offers a wide variety of resistive products that include devices that range from industry standard size chip resistors to very high frequency (RF) power resistors in order to meet today's broad market requirements. There are many advantages to incorporating Bourns® resistors into today's designs including custom values, miniature component size, higher power ratings, and the highest quality materials and construction. Since it is far more than just the resistor value that drives the decision of which resistor to use in a circuit design, Bourns is committed to ensuring designers' needs are met with the company's extensive portfolio of resistive products. In this white paper, the various types of resistors will be briefly explained, and tables are provided as a quick reference for the available range of resistive products.



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Overview of Resistor Families

Regardless of the application, a resistor is essentially a current control, voltage drop product. Additionally, Bourns® components can be designed to withstand unique application challenges like an overcurrent pulse for a short duration without significant changes of resistor characteristics. Bourns® Fixed Resistors can be defined by construction type (thick film, wirewound, etc.), the way they are processed, (through-hole, surface mount, etc.) the intended use (current sense, high frequency, etc.), accuracy, size, power or many other ways. Each resistor does two main things: control current and control a drop in voltage.

Bourns also has a very broad offering of resistor network (Model 4xxx Series), in a wide selection of industry standard models. Therefore, they can be used with an industry standard footprint for seamless placement in printed circuit board designs.

Bourns® chip resistors are available in various package sizes, standard values and technologies which are designed to meet most market requirements including those for specific application and performance characteristics.

Bourns® CRL series resistors offer total resistance values less than those required by industry standards providing engineers enhanced circuit design flexibility.

When more precision is desired, Bourns® CRT series provides tight tolerance and high precision over a wide range of resistance values. These resistors are typically used in current sense applications and precision circuits, with specific ordering characteristics for size and performance selection.

Table 1 CRT Series Chip Resistors

| Model | Power | Max. Voltage | Max. Overload | TCR Options (PPM/°C) | TR Range | Absolute Tolerance |
|---------|---------|--------------|---------------|----------------------|---------------|--------------------|
| CRT0402 | 0.063 W | 25 V | 50 V | 5, 10, 15, 20, 25 | 10 Ω - 205 kΩ | 0.01 % - 1 % |
| CRT0603 | 0.1 W | 50 V | 100 V | | 10 Ω - 1 M | |
| CRT0805 | 0.125 W | 100 V | 200 V | | 2 Ω - 2 M | |
| CRT1206 | .25 W | 150 V | 300 V | | 1 Ω - 2.5 M | |



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Overview of Resistor Families (Continued)

Bourns® resistor networks and chip resistor arrays are available to meet a variety of needs, and the figures below illustrate possible configurations inside Bourns® resistor networks. CAT/CAY resistor arrays are offered in isolated and various bussed configurations.

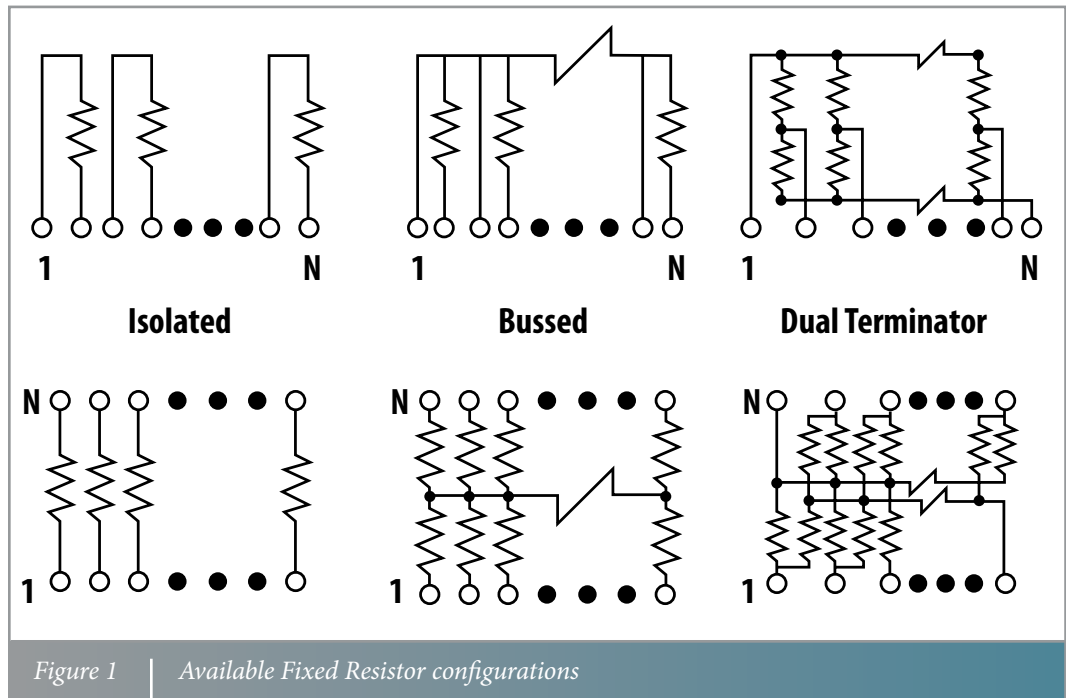


Figure 1 | Available Fixed Resistor configurations

Bourns offers general purpose resistors with uniform value as well as dual termination resistors, intended for specialized applications such as gigabit communication networks. Designs that feature field programmable gate arrays (FPGAs) harness the miniaturized circuitry and superior quality of the high performance Bourns® CAT16 series for low voltage differential signal (LVDS) interfaces.

| Table 2 | | Chip Resistors | | | |
|-----------------------------|----------------|--------------------------------|-----------|------------|--------------------------------|
| Model | Package | Description | TCR | Tolerance | Resistance |
| CR | 0201 - 2512 | Standard Chip Resistor | 200 | 1%, 5% | 1 - 10 MΩ |
| CRL | 0603 - 2512 | Current Sense Resistor | 200 - 600 | 1%, 5% | 0.01 - 9 Ω |
| CAT16PC4F12, CAT16LV4F12 | 2506 | LVDS Termination (Xilinx FPGA) | 200 | 5% | Special Values (Check Website) |
| CAY/CAT | 0804/1206/1608 | Resistor Array | 200 | 1%, 5% | 10 - 1 MΩ |
| CRT | 0402 - 1206 | Thin Film Chip Resistor | 5 - 50 | 0.01% - 1% | 1 Ω - 2.5 M |



CR Series

Overview of Resistor Families (*Continued*)

Bourns® pulse resistors and current sense resistors are highly specialized for applications such as motor drives and industrial equipment. The resistor typically has a very small value and provides a measure of current in critical areas of the circuit. Bourns® pulse resistors are capable of withstanding surges without a material change in the characteristics of the resistor.



CRT/CRL Series

Bourns offers the CRA, CRE, CRM and PWR pulse and current sense resistors in typical package styles such as through-hole, bent metal and TO-220 configurations. DPAK and D²PAK are available as well.



CAT/CAY Series

Bourns® CHF series are high frequency RF power resistors. Specialized for RF applications and high frequency signals, they are commonly used in GSM, UMTS, and WiMax interfaces with standard circuits such as isolators, combiners, and duplexers and in television and radio applications in combiner and divider interfaces. These parts are available in the 9 GHz range with power ratings up to 1 kW. The Bourns® CHF series is set apart from other high frequency resistors by its material and construction. High quality copper and solid construction provide superior characteristics. Bourns® CHF resistors are constructed with a thick film process. Bourns has decades of successful experience with this process, and a customized resistor can be created if a specific requirement is not met by a standard part.



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Overview of Resistor Families (Continued)

Bourns® CHF resistors are provided in a standard surface mount package. These parts can be either electrically insulated or terminated. Generally, there is one exposed lead while the other lead is tied to the ground plane or to a heat sink. The substrates used in the surface mount Bourns® CHF resistors are Aluminum Nitride and Beryllium Oxide. Higher power parts with flanged packages have substrates of Beryllium Oxide, Alumina, and Aluminum Nitride. While the substrates help to dissipate heat, operation at higher power levels may require a heat sink to handle the dissipation. In some designs, the CHF series is bolted to the heat sink, printed circuit board, or ground plane. The power ratings of Bourns® CHF resistors make it possible to absorb very high pulses in high power situations.

Table 3 High Frequency Resistors

| Model | Power (W) | Frequency (GHz) | VSWR | Substrate | Resistor Values (Ohms) |
|--------------|-----------|-----------------|------|-----------------|---------------------------|
| CHF2010CNP | 10 | 2 | 1.2 | ALN | 50, 100 +/- 5 % |
| CHF1206CNT | 20 | 3 | 1.25 | ALN | 50 +/- 5 % |
| CHF2525CNT | 40 | 9 | 1.25 | ALN | 50 +/- 5 % |
| CHF3725CNP | 40 | 4 | 1.2 | ALN | 50 +/- 5 % |
| CHF3523CNT | 150 | 3 | 1.1 | ALN | 50 +/- 5 % |
| CHF3020CBF | 10 | 4 | 1.35 | BEO | 50, 100, 200 +/- 5 % |
| CHF5225xxF | 60/30/20 | 4 | 1.2 | ALN, AL203, BEO | 50, 100 +/- 5 % |
| CHF8838CNF | 150 | 4 | 1.2 | ALN | 50, 100 +/- 5 % |
| CHF9838CxF | 250 | 4 | 1.2 | ALN, BEO | 50 +/- 5 % |
| CHF12545CBF | 500 | 1 | 1.1 | BEO | 50, 100 +/- 5 % |
| CHR190104CBF | 800 | 1 | 1.2 | BEO | 12.5, 25, 50, 100 +/- 5 % |
| CHF190104KBF | 1000 | 1 | 1.2 | BEO | 50 +/- 5 % |



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Benefits of Working with Bourns

Bourns offers standard resistors for vast applications needs, and when one is not available it is likely that it can be created by customizing an existing, proven part. Bourns has lead in the development and innovation of resistive products for decades and continues to expand its product offerings based on the needs of designers and on emerging market applications. As an example, certain applications including consumer goods require a resistor that is fuseable. This fuseable resistor will become an open circuit during a surge to prevent the electronics from catching fire. This is just one example of Bourns being ready to meet evolving requirements with a high quality solution. Designers' concerns about size, power and quality of the component have been addressed when they select a resistor from Bourns.

For further technical support and for more information on Bourns® Resistive Products, please visit

www.bourns.com

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