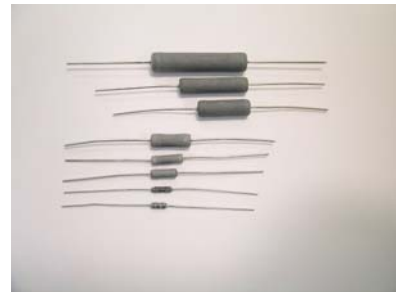


Surge Withstanding Wirewound Resistor Solutions

This product highlight will discuss Stackpole's wirewounds and their capabilities to handle high energy, or high power pulses. Surge withstanding wirewounds present an opportunity to reduce size, weight and cost, provided the correct pulse withstanding resistor is chosen. It is important that design engineers dealing with surge events understand the significant difference between pulse voltage withstanding and pulse power withstanding resistors. This product highlight will explain the differences in design and manufacture for pulse power handling wirewounds and pulse voltage handling wirewounds. It will define how to order wirewounds with these special attributes and discuss pricing as well.



Standard Wirewound Resistor Limitations

Wirewound resistors are well known for their robust pulse power handling. Film resistors regardless of materials or design can't compete with a wirewound resistor of similar size in terms of pulse energy handling. Energy handling, no matter what the component is, requires mass. For resistors regardless of what type of film is used, there is very little effective mass even in the largest parts. However, it should be noted that standard wirewound resistors have their limitations. One limitation is that several different wire diameters can be used for a given size / resistance value combination. One lot of a certain resistor might use a larger diameter wire and thus have better pulse handling than a lot in which a smaller diameter wire is used. In addition, standard wirewound resistors are often trimmed or calibrated to achieve their nominal resistance value. This trimming process is typical for resistors with tolerances of 1% and tighter. The trim process inversely affects the pulse handling of the part because it reduces the effective wire diameter. Wirewound resistors are also inherently inductive; the same process is used to create a wirewound resistor as to create a wirewound inductor. Because of this inductance, wirewound resistors are not suitable for high speed pulse trains or high speed switching power supplies. Even non-inductively wound wirewounds will still exhibit more inductance than a typical film resistor.

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Wirewound Resistors for Pulse Power Handling

A part can be designed, however, to optimize the pulse power handling. For these applications, the wire to be used would be defined as the largest diameter wire of all options, and that calibration trimming is not allowed. These two design changes not only improve the pulse power handling, but create a part that has very uniform pulse handling and thermal characteristics from one part to another. Obviously these benefits can be extremely valuable to a customer that has a product with a long lifetime. One tradeoff for this improved pulse power handling is that this part will have the high inductance. In general, larger diameter wire will have a lower resistance per unit length meaning there will be more turns of wire required to achieve any given resistance value. Typically, the Stackpole part number for a pulse power handling version of any series is obtained by simply adding a P to the end of the series designation. The WW would become WWP and SM becomes SMP and so on. Pricing for this type of part is typically 30% higher than its standard counterpart.

Wirewound Resistors for High Voltage Pulse Handling

It is critical to understand the pulse conditions and parameters that a customer has. The reason for this is that the process defined above will typically have lower absolute voltage handling than usual. Again, a larger diameter wire means lower resistance per unit length, which means more turns are needed to achieve the resistance value. More turns implies the spacing between adjacent windings is reduced and in some cases, consecutive windings may touch each other. For pulse voltage handling, the part must be designed with smaller diameter wire to maximize the distance between consecutive windings. This process will lower the pulse power handling of the part, however. For customers with application requirements for both pulse power and high voltage handling, the part must be designed using a coated wire. This coating allows for consecutive windings to be touching without sacrificing the voltage handling of the part. This type of wire is more difficult to manufacture and thus will be a more expensive part. Typically, the Stackpole part number for pulse voltage handling wirewounds is obtained by adding a V to the end of the series designation. In this case the WW would become the WWV and SM would become SMV and so on. Pricing for a part using smaller diameter wire would again have only a modest increase in price. Pricing for a part that requires the coated wire can be significantly more expensive depending on many factors. Contact Stackpole directly for applications such as these to ensure the right part is being designed in.

More Information and Data Sheets Available At: www.seielect.com

For questions on these and any other Stackpole product please contact Stackpole at: marketing@seielect.com.

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