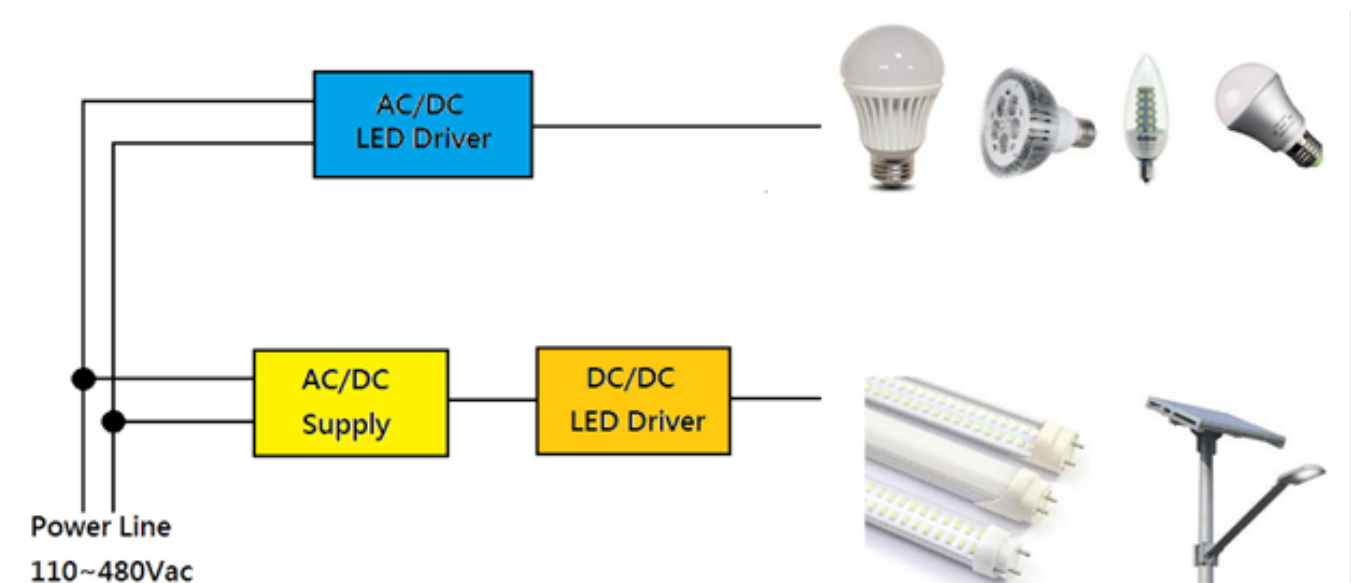


LED Lighting

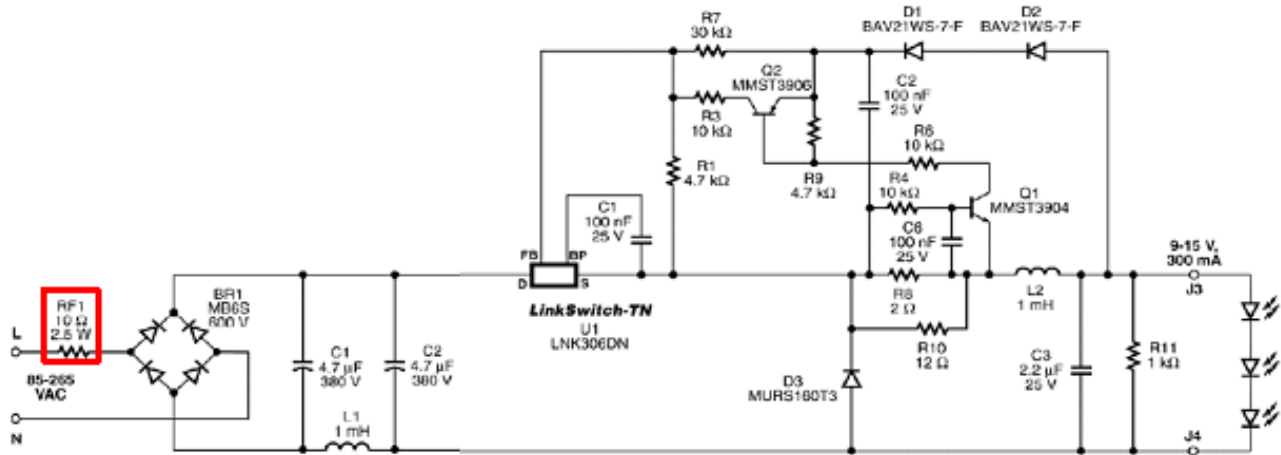
This application highlight will discuss LED lighting applications and the important non-commodity resistors that are regularly required for them. The LED lighting market is rapidly expanding and Stackpole has several different types of resistors that offer ideal solutions for LED lights. This document will provide a basic overview of the circuit components and blocks used and why certain resistor types are used in each part of the circuit.



LED Lighting Basics

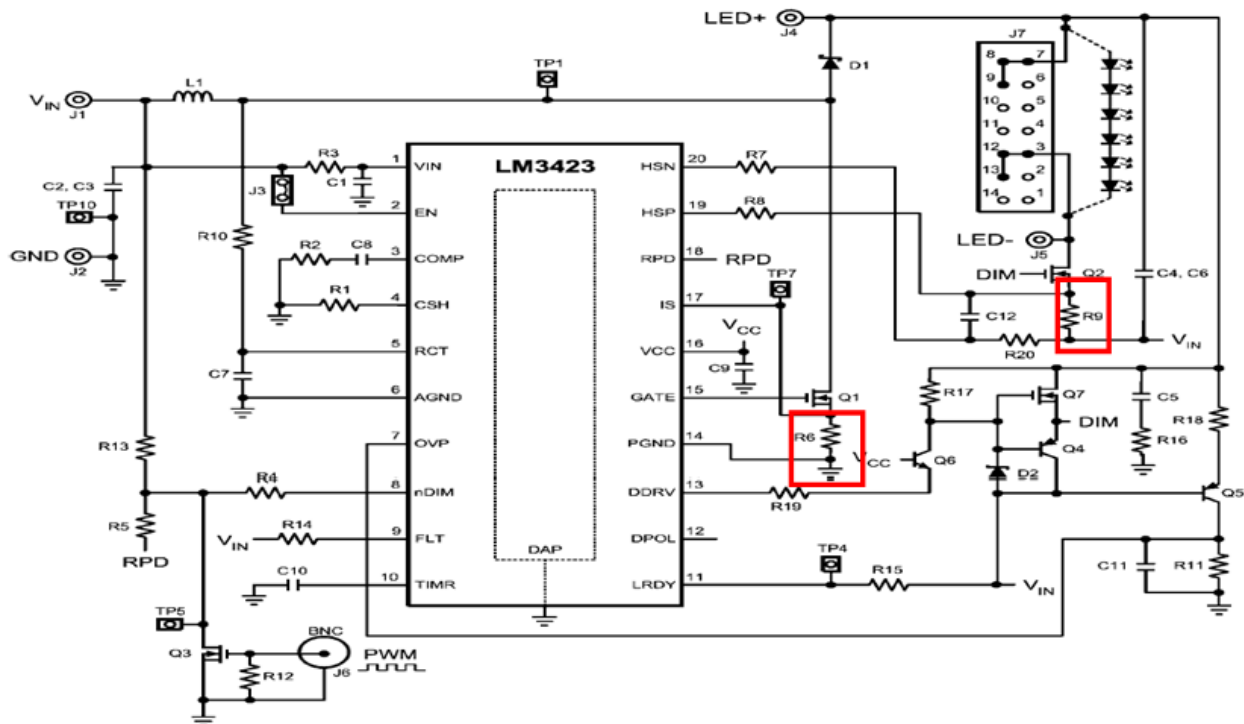
LED's require some basic circuit components to function properly and reliably. The first component is typically an AC to DC converter. Many times this is accomplished by using a diode bridge rectifier but there are also plenty of AC to DC converter IC's that will work as well. A power factor correction block is sometimes used for higher efficiency and for electromagnetic interference compliance. Buck converters / controllers are commonly used as the basic power block because they provide the constant current needed to maintain LED brightness. Finally, a DC to DC converter and transformer driver may be utilized to provide the proper power levels and isolation for the LED light string.

Many semiconductor suppliers have LED Driver IC's that integrate two or more of the blocks noted above and will simplify the circuitry. Those driver IC's however are typically more complex and expensive so there is a tradeoff between simplicity or smaller size and cost.



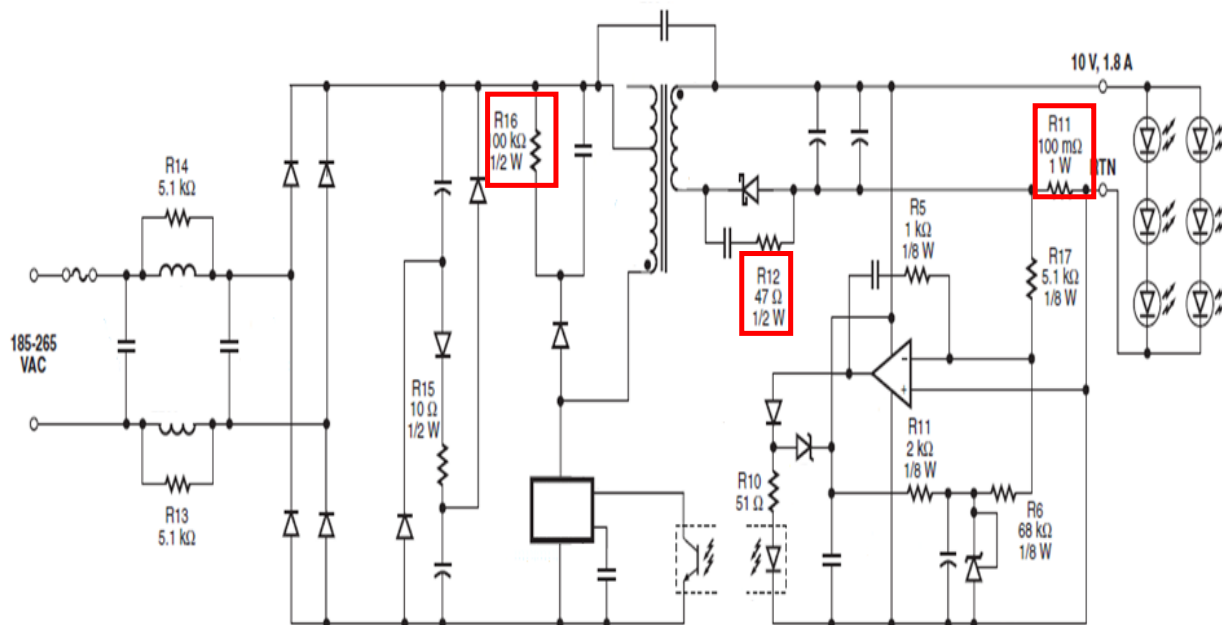
AC to DC Conversion

When a diode bridge rectifier is used for the AC to DC conversion, there may be a need for a fuse or fusible wirewound resistor for overcurrent protection. The fuses are typically rated for somewhere between 2.5 and 5 amps. The fusible wirewounds will typically be in the 2 to 5 watt range and have resistance values around 10 ohms as seen in the above schematic. Stackpole's WWF & SP3A series of fusible wirewounds are ideal for this type of high current fusible resistor requirement.



Buck Converter / Controller

Many common reference designs for buck converters will utilize a current sense resistor. The current sense resistor is used for power control and monitoring. Typically, these chip resistors are larger case sizes – 1206 to 2512. However, due to the relatively low current levels and only moderate efficiency requirements typically, the resistance values are usually relatively high (1Ω to 5Ω) for these current sense resistors and thus can usually be realized with commodity thick film chips. Some applications will either require a low resistance value, or a high power rating for a given package size for efficiency purposes or due to higher current levels from longer or multiple LED strings. For these instances, current sense resistors such as Stackpole's CSR / CSRN, CSRF, HCS, CSNL or CSSH would be chosen. Normally these are some of the larger SMD components on the driver board.



DC to DC Converter / Transformer Driver

This is the final stage before power is delivered to the LED or LED string. Transformers are typically used when isolation is desired. In many cases, a resistor is used to limit current through the transformer, noted as R12 and R16 in the above schematic. Because of the surges seen during power up and down, these resistors must be able to withstand surges. Stackpole's RPC is an ideal solution here and provides outstanding reliable performance in a relatively inexpensive SMD package.

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.