



Application of VR25 Resistor in Electronic Ballast

A ballast is a device intended to provide starting voltage for, and limit the amount of current flowing through an electric lamp.

The ballast provides the ignition voltage to establish an arc between the lamp's electrodes and then regulates the current flowing through the lamp once the lamp is illuminated.

The lamp requires current for a specified time to preheat the filaments, then a high-voltage for ignition and running power. The temperature of the lamp electrode must be kept at a level specified by the manufacturer in order to prevent premature deterioration and shortening of the lamp life.



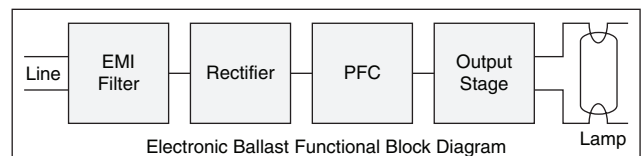
Electromagnetic Ballasts

An electromagnetic ballast is a device for restricting (or 'choking') the current running through a lamp. It is always connected in series with the lamp. In electrical terms, the ballast is a "self-inductor" and consists of a coil of copper wire wound around a heavy iron core.

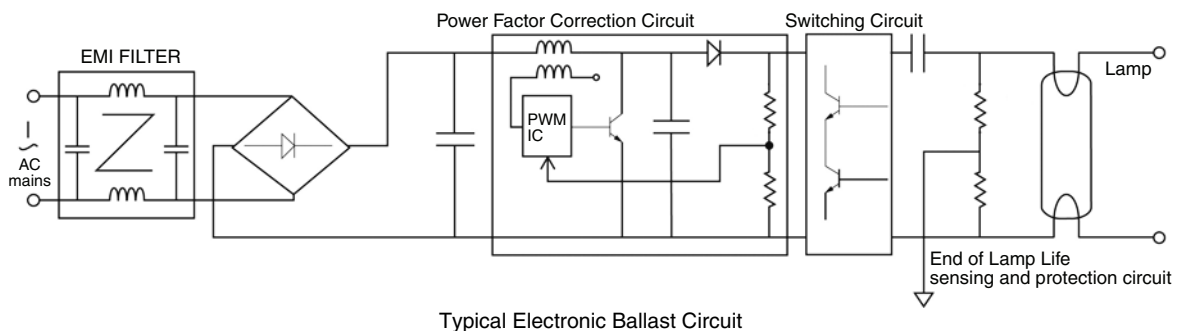
As the alternating mains current passes through the coil, it generates an alternating magnetic field in the iron core. This alternating magnetic field induces a current in the coil opposing the mains current. The net effect is a limited current through the ballast and the lamp. Due to their inductive nature, conventional commercial electromagnetic ballasts consume approximately 30 % of the rated lamp power, which is dissipated as heat.

Electronic Ballasts

Electronic ballasts consist of solid-state devices used to create a high-frequency AC voltage supplied to the lamp. The line voltage supplied to the ballast is converted into a DC voltage using a full-wave bridge rectifier and a filter capacitor. An EMI filter blocks noise generated by the ballast. The PFC circuit is for improving power factor (> 0.90) and the output stage consists of DC to AC inverter supplying high frequency AC voltage to the lamp.



Electronic ballasts see an inrush current during the initial start up that is several times greater than their normal operating current. In general, electronic ballasts have a higher inrush current than electromagnetic ballasts. Inrush current limiting resistors are designed to withstand these surges.

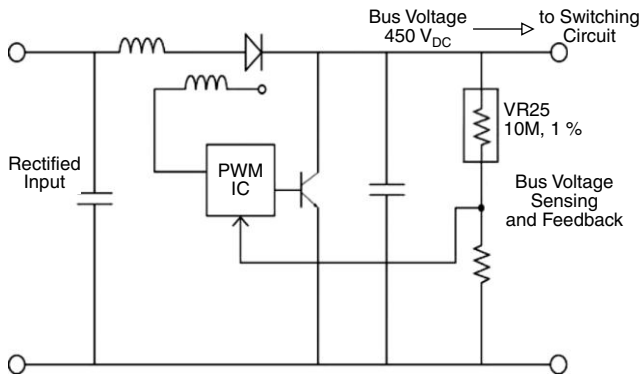


APPLICATION NOTE

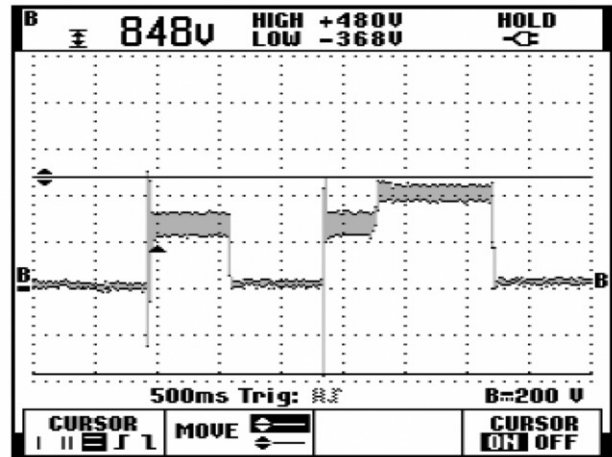
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High Voltage Resistor (VR25) Application in Ballast

• Power Factor Correction Circuit (PFC)

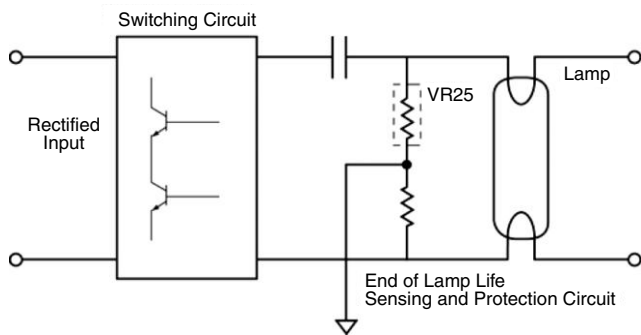


Power Factor is a measure of how effectively the ballast converts voltage and current supplied by the power source into watts of usable power for the lamp. The inductor causes voltage spikes at high frequencies which can increase the bus voltage to nearly 450 V. This voltage can be managed, however by a single VR25 resistor.



Typical waveform across VR25 in PFC

• End of Lamp Life (EOLL)



When a fluorescent lamp approaches the end of its useful life, the lamp voltage increases in order to keep the lamp running. The cathodes start to consume more power, making the ends of the lamp very hot. If this process goes unchecked, it can lead to severe overheating and damage to the lamp and ballast.

Protection circuits are designed to detect these voltage changes in the lamp and shut it down before serious overheating occurs.

VR25 High-Ohmic, High-Voltage Resistor

Features

- Thick Film (metal glaze) structure
- High ohmic range (100 kΩ to 22 MΩ)
- High continuous operating voltage (up to 1600 V_{DC})
- High pulse load capability (up to 7 kV)
- Good stability (1.5 %)
- High humidity resistance



APPLICATION NOTE