



MM HV

HIGH VOLTAGE THIN FILM MELF RESISTORS

MM HV

DRALORIC BEYSCHLAG RESISTORS

A **WORLD OF**
SOLUTIONS





INTRODUCTION

Purpose

- Introduction of the Vishay MM HV High Voltage Thin Film MELF Resistor Series

Objectives

- Present an overview of this product's special performance properties
- Explain product design and features
- Discuss product advantages
- Present typical applications



Welcome to the Vishay MM HV High Voltage Thin Film MELF Resistors product overview. This tutorial will provide an overview of the MM HV High Voltage Thin Film MELF resistor family. The key functional performance parameters of this MELF resistor series will be discussed as well as design, features, and benefits. A selection of potential applications from typical market segments will be presented.



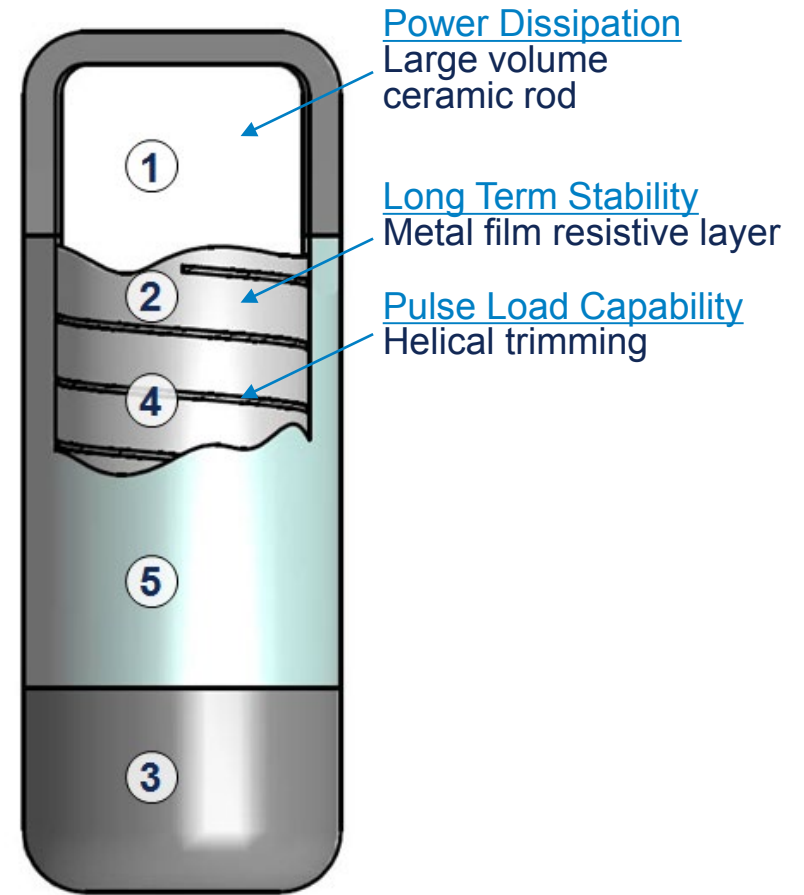
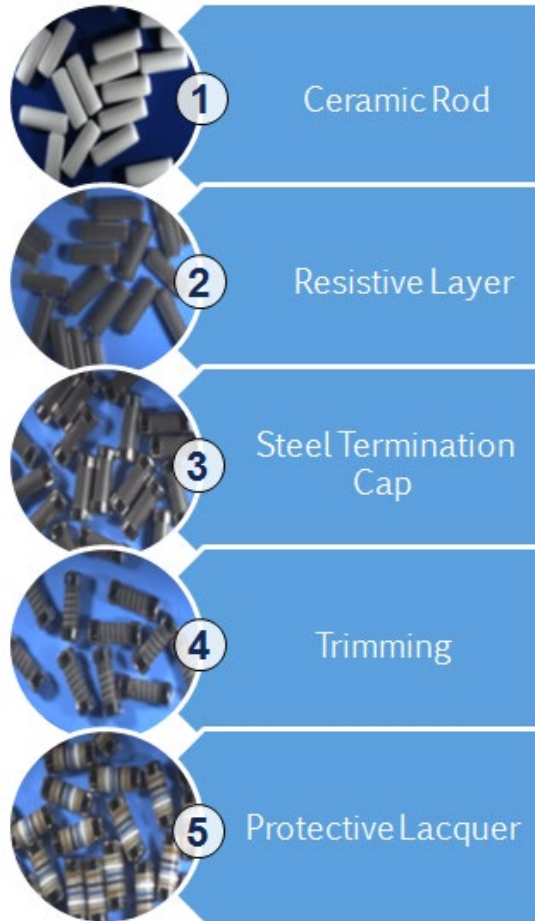
FUNCTIONAL PERFORMANCE OF THE MM HV SERIES

Key Properties

- High operating voltage up to 1000 V for case size 0207
- Low voltage coefficient of < 2 ppm/V
- High power dissipation P_{70} up to 1 W for case size 0207
- Excellent pulse load capability up to 230 W for single pulses
- Tolerance of 1% and TCR of ± 50 ppm/K
- Operating temperature up to 155 °C
- Resistance range from 340 k Ω to 10 M Ω
- Intrinsic sulfur resistance

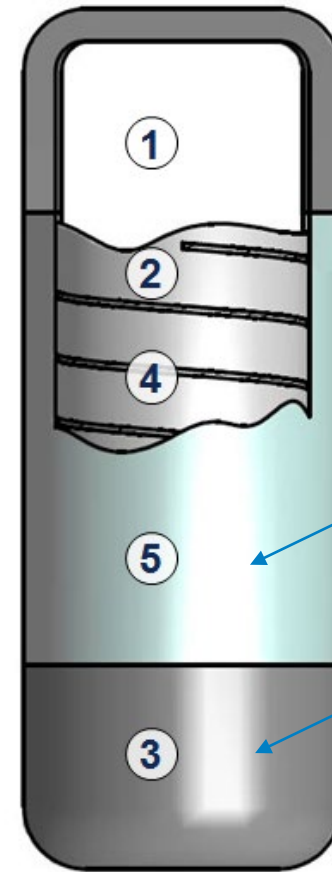
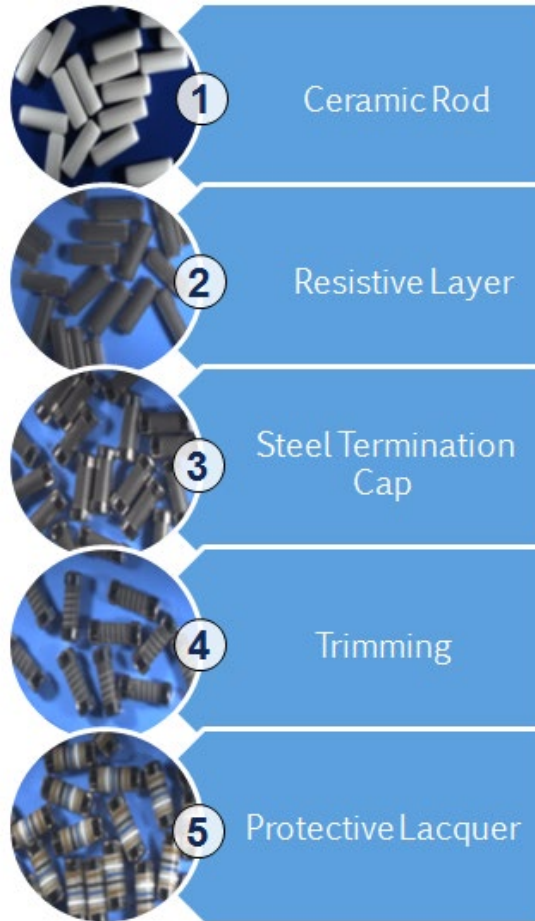
The MM HV High Voltage Thin Film MELF resistor series from Vishay is an excellent choice for modern electronics at increased voltage levels. The series offers an operating voltage about 3 times higher as compared to equivalent case size standard MELF resistors. High-reliability applications will benefit from a low voltage coefficient < 2 ppm/V. The MM HV MELF resistor series offers excellent sulfur resistivity, is RoHS compliant and halogen free.

DESIGN OF MM HV COMPONENTS



The MM HV MELF resistor series offers significant advantages compared to conventional thin film chip resistors. The cylindrical ceramic substrate is covered by a high-quality homogeneous metal film resistive layer. Its cylindrical shape results in a larger substrate volume and resistive element area as compared to chip resistors, allowing for a higher power dissipation. A modified helical laser trimming cut applied to the resistive film allows for operation at high voltages, and uniform distribution of thermal energy across the entire resistive element, when the resistor is in use. As a result the MELF resistors stability is enhanced and its pulse load capability increased.

DESIGN OF MM HV COMPONENTS



Moisture Resistivity
Protective lacquer

Excellent Solderability
Steel termination cap
plated pure tin on nickel

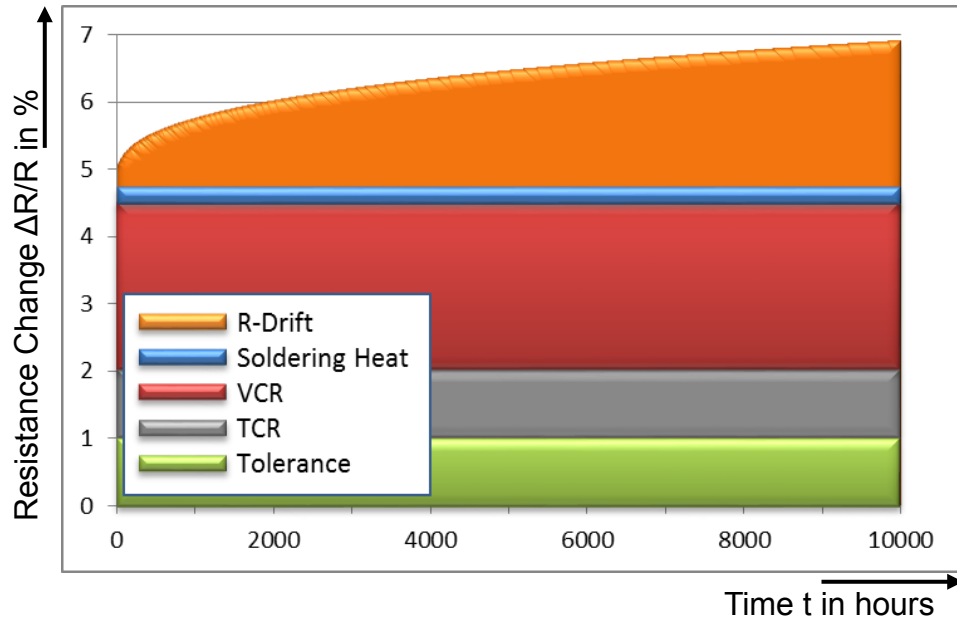
The MELF resistor's contacts are built from steel termination caps, plated with pure matte tin on nickel, and support excellent solderability. The protective lacquer ensures the component's moisture resistivity. The MELF resistors reliability has been proven in various automotive and industrial applications, in which the resistor is exposed to harsh operating environments, including high temperature.



HIGH PRECISION OVER LIFETIME AT HIGH VOLTAGES

Typical High Voltage Thick Film Chip Resistor

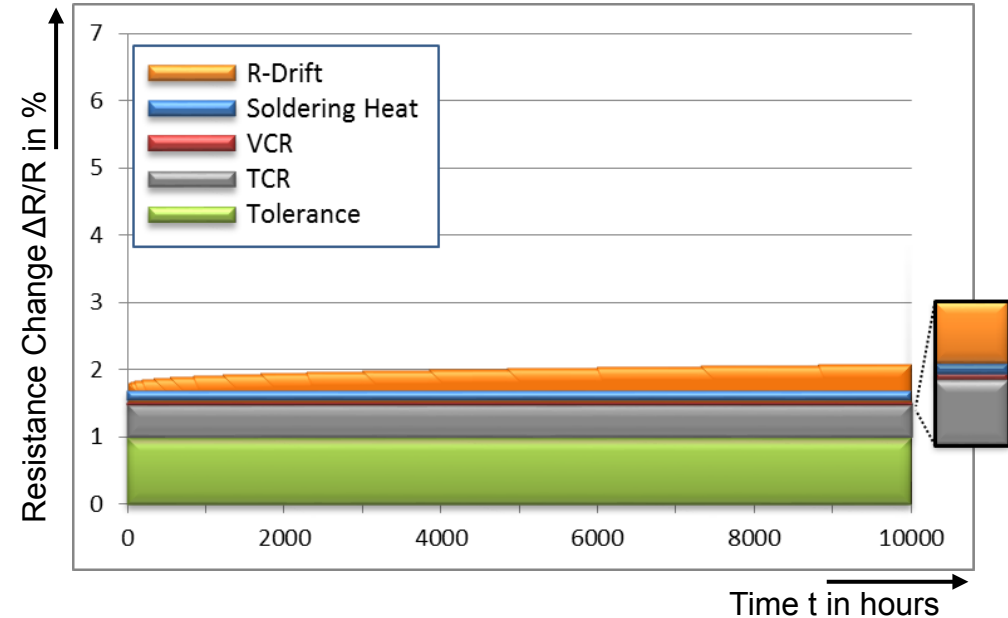
- TCR ± 100 ppm/K, tolerance $\pm 1\%$,
VCR < 25 ppm/V



MMB 0207 HV

High Voltage Thin Film MELF Resistor

- TCR ± 50 ppm/K, tolerance $\pm 1\%$,
VCR < 2 ppm/V



Note: Worst case long-term stability is obtained by summing up resistance change caused by typical effects present during resistor application or mounting, including initial tolerance, TCR, VCR, resistance change due to soldering heat and resistance drift due to aging caused by operation at rated voltage of 1000 V resulting in a resistor film temperature of 125 °C.

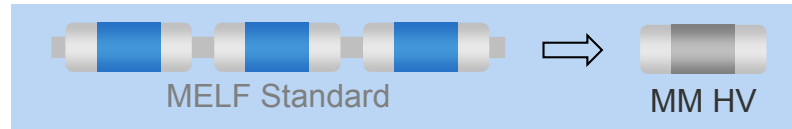
For high voltage applications, besides temperature coefficient of resistance (TCR) and tolerance, the voltage coefficient of resistance (VCR) is of major importance to guarantee precise electrical performance at high voltages. Due to advanced thin film technology the VCR is largely reduced for the MM HV series compared to standard thick film high voltage resistors. The effect of voltage-induced resistance change is less than 0.2% for operation at 1000 V. Considering also its low load life drift at full rated power, the long term stability of the MM HV series is more than three times better than standard high voltage thick film resistors. The charts shown here illustrate worst case performance of market standard high voltage thick film resistors compared to the MM HV MELF resistors with typical specification.



COMMERCIAL BENEFITS

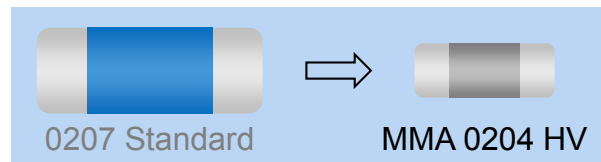
MM HV High Voltage Thin Film MELF Resistor Series allows the user to...

- greatly reduce the number of components in high voltage electronics applications:
One! MM HV can replace up to three same case size standard MELF resistors



- save board space or increase PCB integration density

The MMA 0204 HV can replace the next case size 0207 standard MELF resistor



- greatly reduce pick and place costs
- increase application reliability by reducing the number of solder joints

The MM HV high voltage thin film MELF resistor series offers significantly higher operating voltages as compared to standard MELF resistors of same case size. This allows for a reduction in component count by replacing multiple devices of same case size or larger case size resistors, consequently saving board space and lowering costs. The MM HV series thus enables engineers to design cost-saving and reliable high voltage applications.



APPLICATIONS

Accurate High Voltage Measurement



Alternative Energy

- Solar Inverter
- Power Meters



Automotive

- Battery Management
- Inverter for Electric and Hybrid-Electric Vehicles



Industrial

- DC-DC/AC-DC Converter
- LED drivers and lighting ballasts
- Transducers

Today, various applications operate at voltages, which are significantly higher than the permissible operating voltage of a single standard resistor. Typically, either several resistors in series or special high voltage thick film resistors are used. However, both possibilities are disadvantageous solutions due to large component counts or limited long-term stability. The MM HV series from Vishay allows the user to overcome these limitations and may be used in various applications of many market segments. From electric vehicles to alternative energy, there is a place for the MM HV series in a wide variety of circuitry types where long-term stability or pulse load capability at high operating voltages are required.



SUMMARY

- Greatly increases operating voltages as compared to standard thin film MELF resistors
- High rated dissipation and pulse load capability
- Significantly reduces component counts and saves board space
- Excellent choice for most fields of modern electronics where long-term stability and reliability at increased operating voltages are required

In summary, the Vishay MM HV High Voltage Thin Film MELF resistor series offers operating voltages up to 1000 V, which allows for a reduction in component count to save board space and lower costs in high voltage circuits. Due to the cylindrical design, the MM HV also allows for high rated dissipation and features an excellent pulse load capability, making the MM HV series an excellent choice for most fields of today's and tomorrow's emerging high voltage electronics, including alternative energy, automotive, and industrial applications.