



# MC HP

## HIGH POWER THIN FILM CHIP RESISTOR PRODUCT OVERVIEW

## DRALORIC BEYSCHLAG RESISTORS





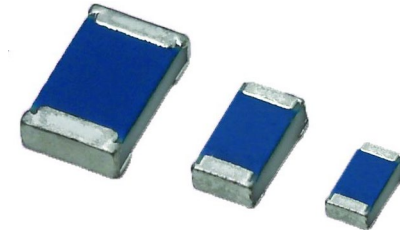
# INTRODUCTION

## Purpose

- Introduction of the Vishay MC HP High Power Thin Film Chip Resistor series

## Objectives

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



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Welcome to the Vishay MC HP High Power Thin Film Chip Resistors product overview. This tutorial will provide an overview of the MC HP high power thin film chip resistor family. The key functional performance parameters of the MC HP series will be discussed as well as design, features, and benefits when compared to standard chip resistors of same case size. A selection of potential applications from typical market segments will be presented.



# FUNCTIONAL PERFORMANCE OF THE MC HP SERIES

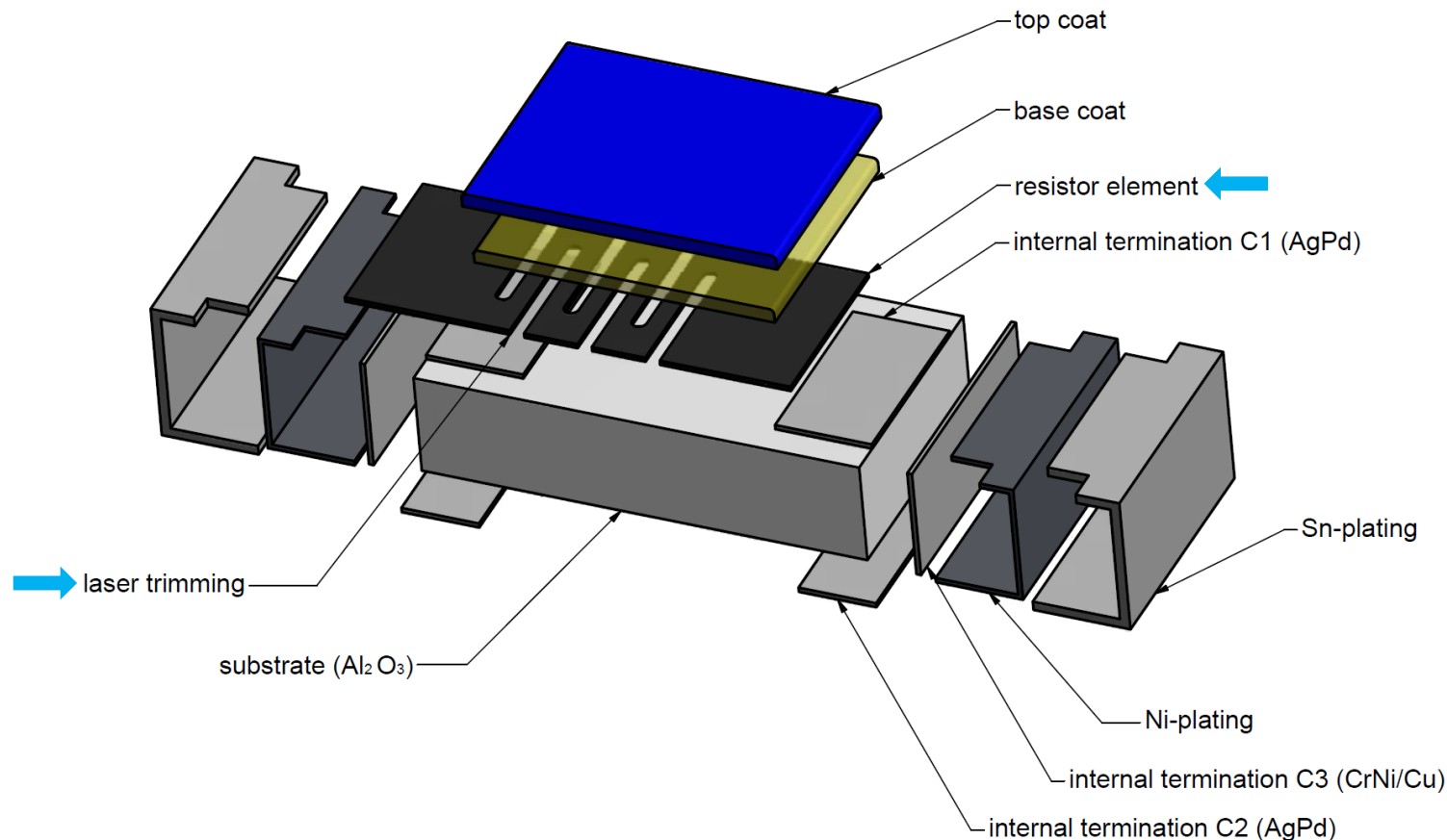
## Key Properties

- High power dissipation  $P_{85}$  up to 0.4 W for case size 0805
- Allows 1:1 replacement of next larger case size or up to 3:1 replacement of same case size standard resistors
- Excellent long term stability at increased power rating ( $\leq 0.2\%$  after 1000 h life test)
- Operating temperature up to 175 °C
- Tolerance down to  $\pm 0.1\%$  and TCR down to  $\pm 25$  ppm/K
- Advanced sulfur resistance verified according to ASTM B809, 1000 h at 90 °C
- AEC-Q200 qualified

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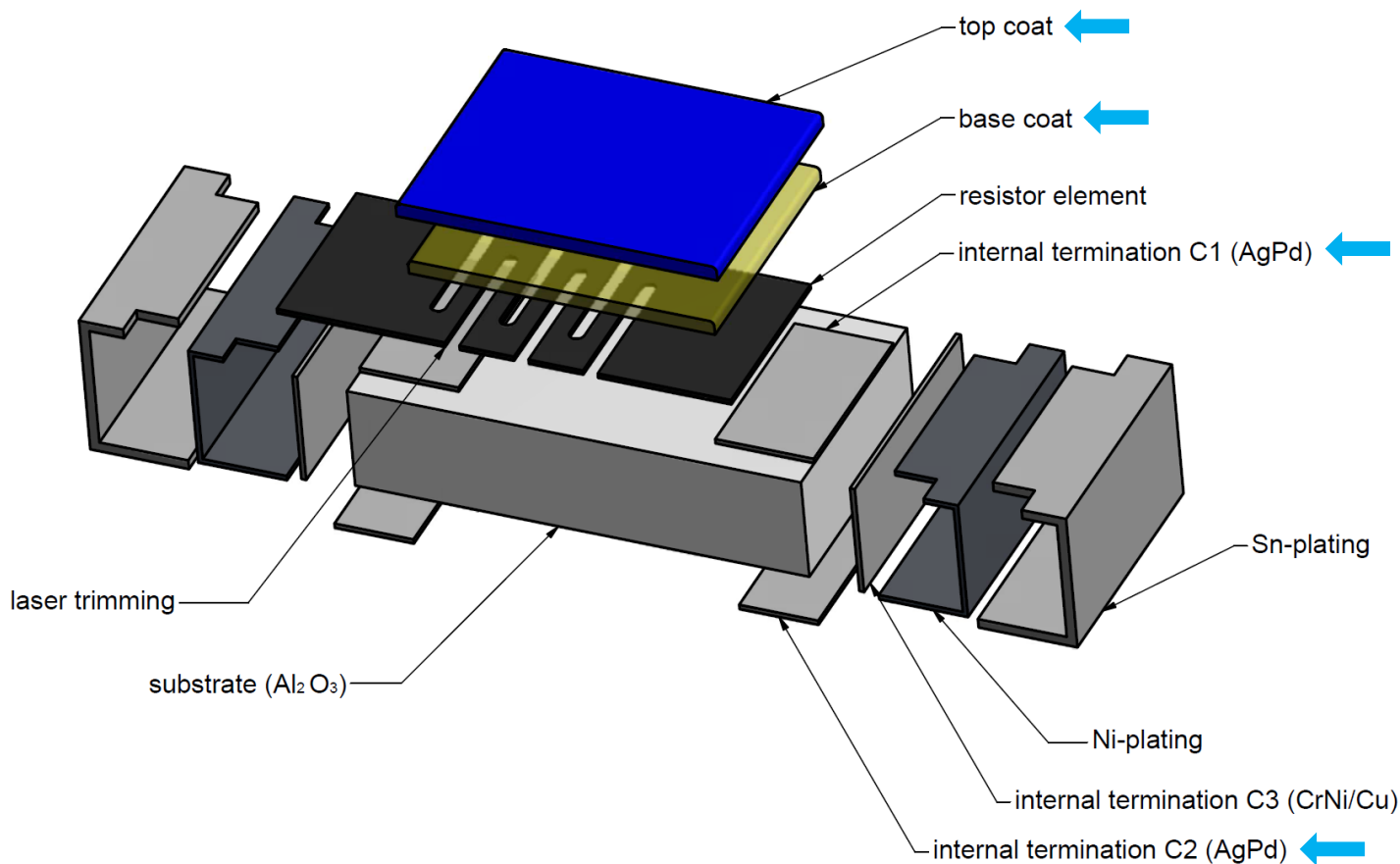
The MC HP High Power Thin Film series from Vishay is an excellent choice for today's modern electronics where power dissipation, high operating temperatures, and stability are of major concern. The series delivers a rated power dissipation up to 3 times as compared to same case size standard resistors, and is even exceeding the power rating of the next larger case size. High-reliability applications will benefit from low load life drift and AEC-Q200 qualification. The MC HP thin film series offers excellent moisture resistance, sulfur resistivity, and is RoHs compliant.

# DESIGN OF MC HP COMPONENTS



The MC HP design offers significant advantages compared to other resistor types. The resistive element is a high-quality homogeneous material with meander trimming. The trimming geometry allows the resistor to homogeneously dissipate power and distribute thermal energy across the entire resistive element when the resistor is in use. This enhances the stability of the MC HP components to low resistance drifts  $\leq 0.2\%$  after 1000 h load life test by reducing the intensity of any single hot spot on the resistive film.

# DESIGN OF MC HP COMPONENTS


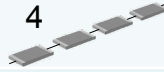
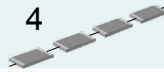
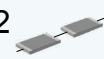


With respect to moisture resistivity, a special two-layer passivation provides excellent protection of the resistive element from humid atmospheres as verified according to the 85 °C / 85% biased humidity test for 42 days. Furthermore, with silver palladium inner terminations, the MC HP series is impervious to sulfur exposure as verified in accordance with the ASTM B809 standard. As an increase in incidents of corrosion failures related to high sulfur-containing environments has been observed in the electronics industry, the MC HP series is best suited for applications which require sulfur resistant resistors.



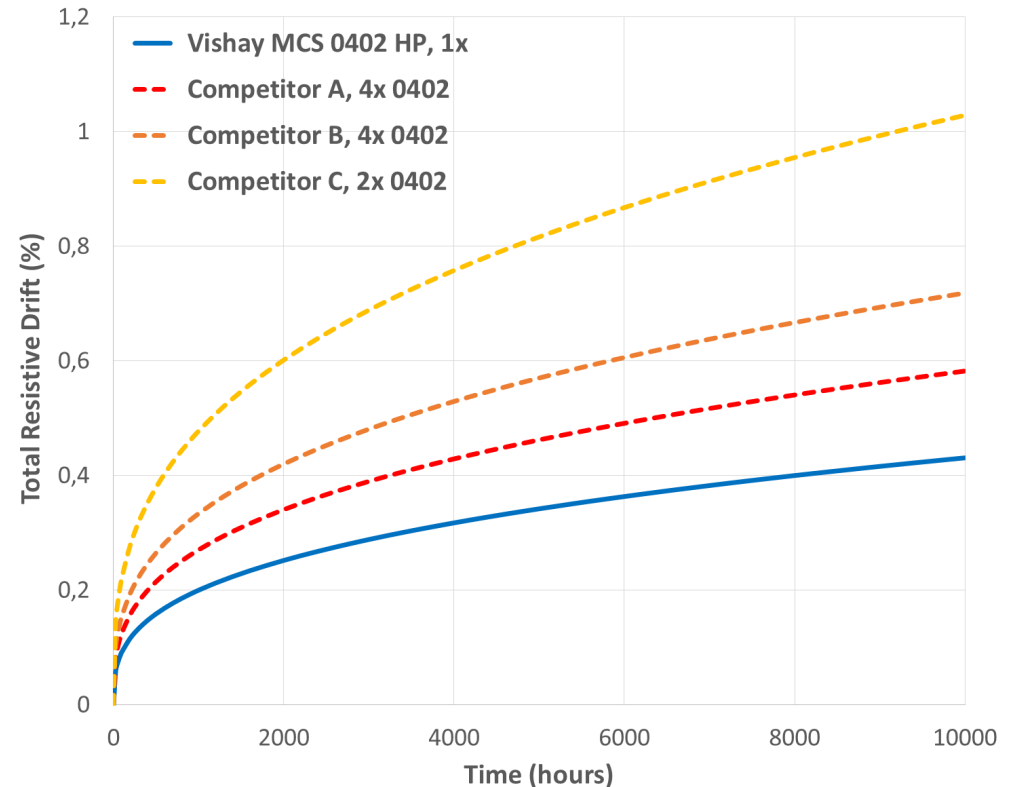
# TECHNICAL ADVANTAGE: RESISTANCE DRIFT

## Example: 0402 Case Size Resistor in 200 mW Application

| Product Case Size 0402       | Rated Dissipation $P_{70}$ | Maximum Resistance Drift after 1000 h | No. of Resistors required   |
|------------------------------|----------------------------|---------------------------------------|---|
| Vishay MCS HP                | 0.2 W                      | $\pm 0.2\%$                           | 1  |
| Competitor A                 | 0.063 W                    | $\pm 0.2\%$                           | 4  |
| Competitor B                 | 0.063 W                    | $\pm 0.25\%$                          | 4  |
| Competitor C High Power Mode | 0.125 W                    | $\pm 0.5\%$                           | 2  |

Note: Resistance drifts shown are considering endurance specification in product datasheets and maximum film temperature of 155 °C. Drift contributions by multiple resistors are considered to be of statistical nature. Resistance drift after 1000 h has been projected.

### Total Resistance Drift of Resistors in 200 mW Application



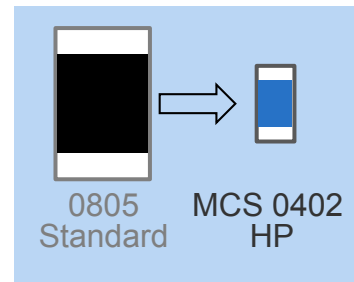
The meander trimming cut of the resistive element helps the MC HP to attain a specified resistance drift of less than 0.2% at doubled rated dissipation compared to standard components, when considering 1000 h of operation with full power applied to the resistor. The chart and table shown here illustrate the specified resistance drift over time of the MCS 0402 HP in a 200 mW application compared to standard thin film components from competitors of Vishay. For standard resistors more than one component is required in the application, each of them contributing to the resistance drift.



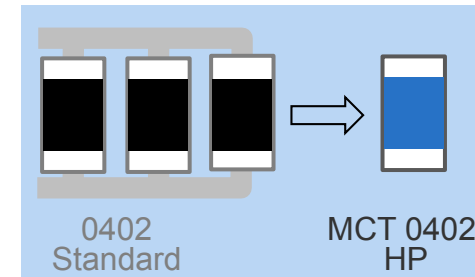
# COMMERCIAL BENEFITS

MC HP High Power Thin Film Series allows the user to...

- greatly reduce the number of components in power electronics applications:  
*One!* MC HP can replace up to three standard resistors of same case size
- Save board space or increase PCB integration density  
*One!* MC HP can replace larger case size standard resistor
- greatly reduce pick and place costs
- increase application reliability by reducing the number of solder joints



Example



Example

The MC HP High Power Thin Film Chip Resistor Series from Vishay offers significantly higher power ratings as compared to standard thin film resistors of same case size. This allows for a reduction of component counts by replacing up to three devices of the same case size or larger case size resistors, consequently saving board space and lowering costs. The MC HP series thus enables developers to design cost-sensitive, accurate and reliable applications.



# APPLICATIONS

## Reliable Power Electronics



### Automotive

- Engine and onboard power supply control units
- Electronic transmission control
- DC/DC converter



### Industrial

- Drives
- Power electronic systems
- Electronic interfaces



### Alternative Energy

- Inverter
- Power Engineering

Today, various applications require components with advanced power rating, face space restrictions, or experience high operating temperatures. The MC HP series from Vishay allows the user to combine the advantages of compact case size with enhanced power rating, making the devices suited for a variety of power electronics applications. From automotive electronics to industrial appliances, the MC HP High Power Thin Film Chip Resistors are the perfect choice for a wide variety of power circuitry types where precision, stability, and power dissipation are of major concern.





# SUMMARY

- MC HP series features up to 0.4 W power rating in case size 0805
- Superior load life stability at increased rated dissipation
- Significantly reduces component counts and saves board space
- Impervious to sulfur exposure and superior moisture resistivity
- Excellent choice for most fields of modern power electronics where increased power dissipation, high operating temperatures or space restrictions are of major concern

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In summary, the Vishay MC HP High Power Thin Film Chip resistor series offers a power rating up to 0.4 W in case size 0805 which allows for a reduction in component counts and replacement of larger case sizes to save board space and lower costs in power electronics circuits. Important high-reliability applications will benefit from AEC-Q200 qualification as well as from the excellent moisture and sulfur resistivity. Combining the advantage of high rated dissipation and small case size in one device, the MC HP series is the perfect choice for most fields of today's and tomorrow's emerging high power electronics.