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ACAS AT

Thin Film Chip Resistor Array

Product Overview

Dec-04-2020

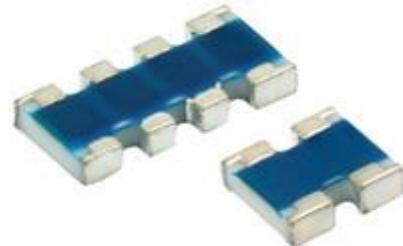
Introduction

Purpose

- Introduction of the Vishay ACAS AT Precision Thin Film Chip Resistor Array series

Objectives

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



Welcome to the Vishay ACAS AT Precision Thin Film Chip Resistor Arrays product overview. This tutorial will provide an overview of the ACAS AT precision thin film chip resistor array family. The key functional performance parameters of the ACAS AT series will be discussed as well as design, features, and benefits when compared to standard chip resistors. A selection of potential applications from typical market segments will be presented.

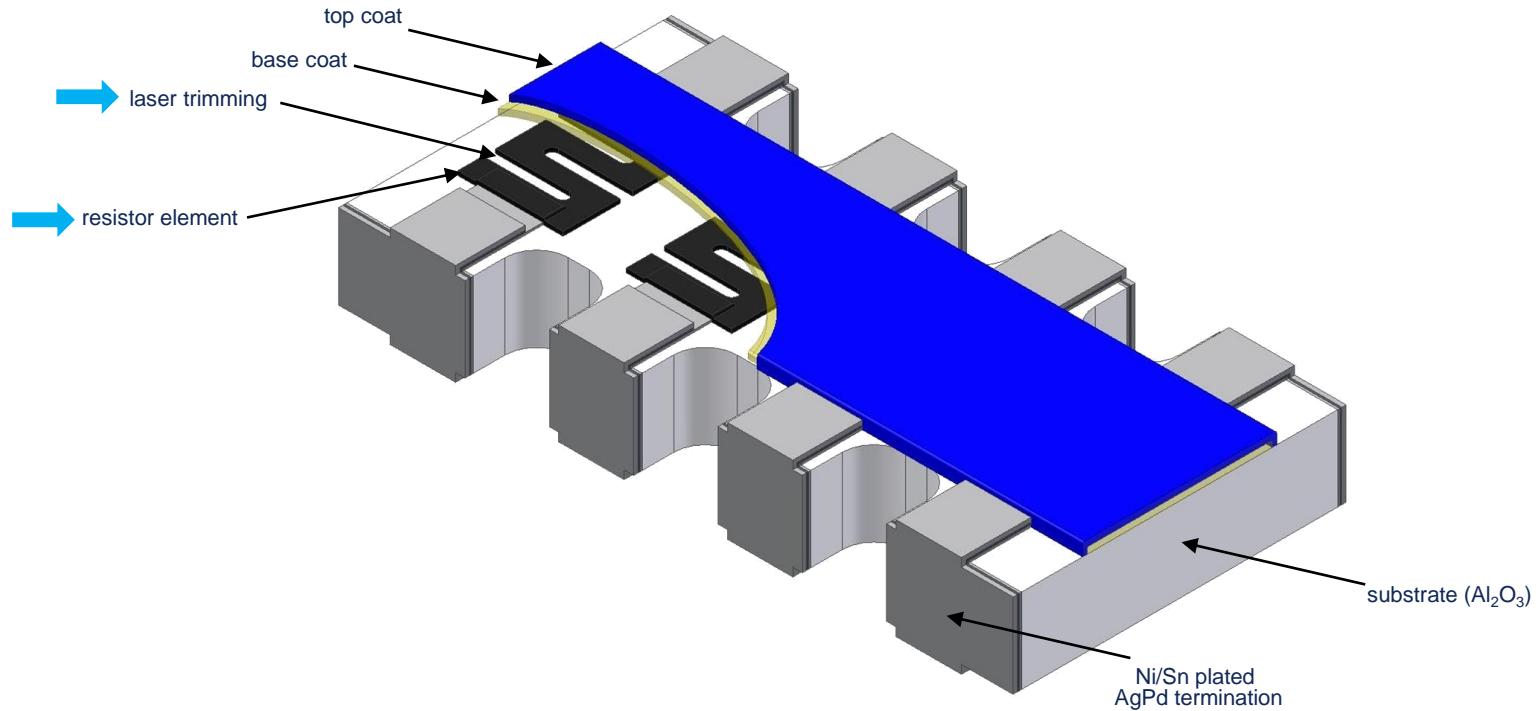
Functional Performance of the ACAS AT Series

Key Properties

- Two or four resistors on one substrate in case sizes 0606 and 0612
- Tolerance matching down to $\pm 0.05\%$ and TCR tracking down to $\pm 5 \text{ ppm/K}$
- Resistance values from $47 \text{ }\Omega$ to $150 \text{ k}\Omega$ with a ratio of up to 100:1
- Rated dissipation P_{70} of 0.125 W per resistor
- Excellent absolute long term stability of $\leq \pm 0.1\%$ and relative of $\leq \pm 0.05\%$ after 1000 h life test
- Operating temperature up to $155 \text{ }^{\circ}\text{C}$
- AEC-Q200 qualified

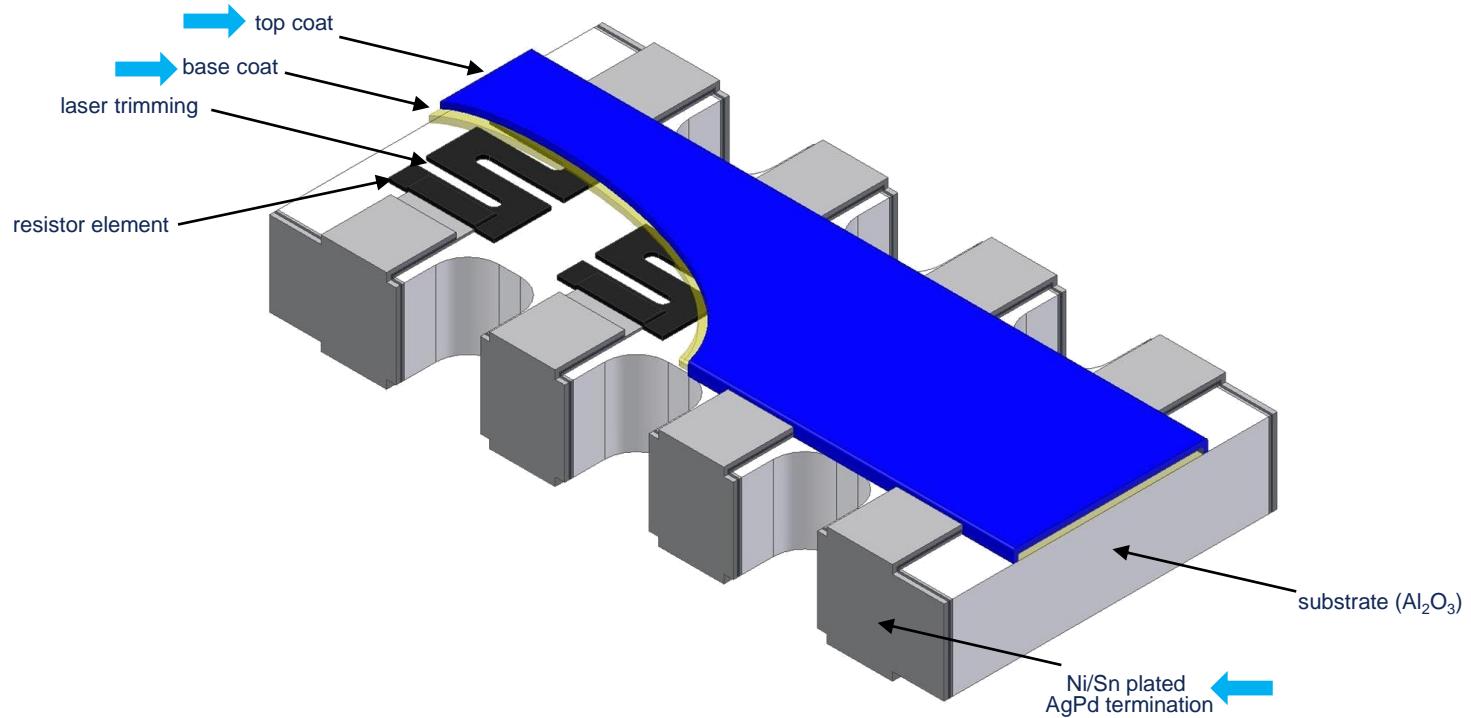
The ACAS AT Precision Thin Film Chip Resistor Array series from Vishay is an excellent choice for today's modern electronics where high accuracy, reliability and a stable fixed resistance ratio are of major concern. The series offers tight relative precision characteristics that allow to replace costly high-precision discrete resistors. High-reliability applications will benefit from excellent moisture resistance and AEC-Q200 qualification. The ACAS AT thin film series is RoHS compliant and halogen free.

Design of ACAS AT components



The ACAS AT design offers significant advantages compared to discrete resistor types. The resistive elements are of extremely stable NiCr alloy with meander trimming. The trimming geometry allows the resistor to homogeneously dissipate power and distribute thermal energy across the entire resistive element. This enhances the stability of the ACAS AT components to low resistance drifts $\leq 0.1\%$ after 1000 h load life test by reducing the intensity of single hot spots on the resistive film elements.

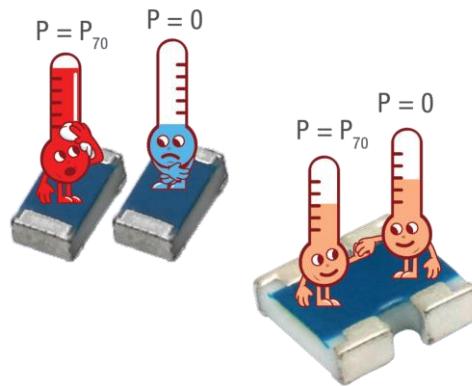
Design of ACAS AT components



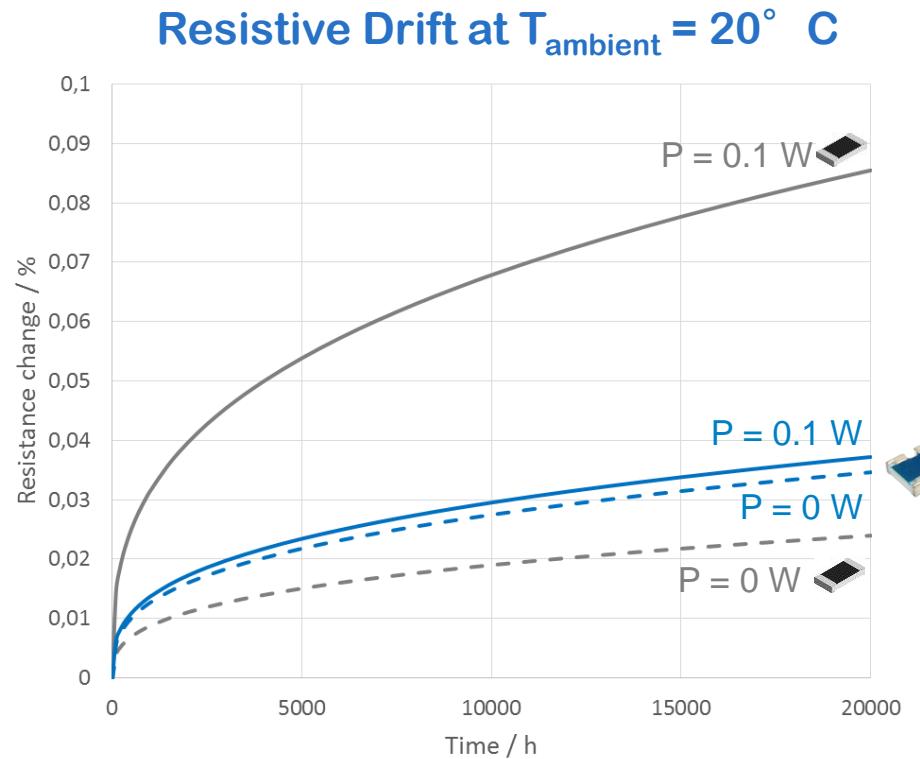
With respect to moisture resistivity, a special two-layer passivation provides excellent protection of the resistive elements from humid atmospheres as verified according to the 85 °C / 85% biased humidity test for 42 days. Furthermore, with silver palladium inner terminations, the ACAS AT series is 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 ACAS AT series is best suited for applications which require sulfur resistant resistors.

Technical Advantage: Resistive Drift

Thermal Coupling



Thermal coupling ensures homogeneous heat distribution across the entire array.

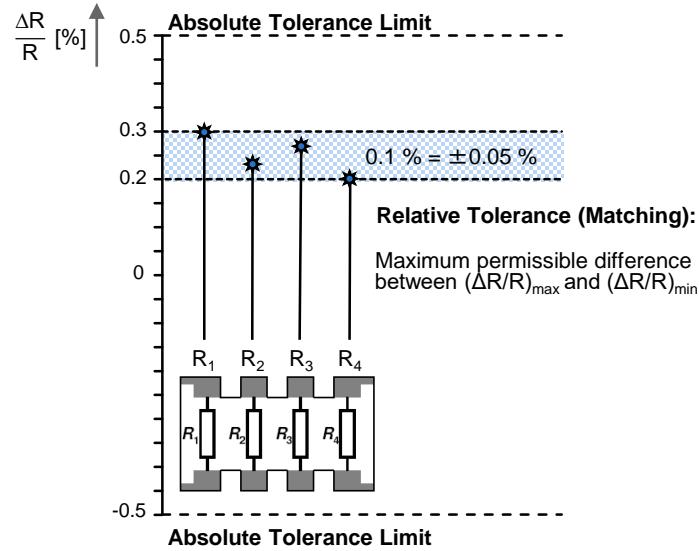


Resistive drifts shown are considering endurance specification in product datasheets for standard discrete thin film chip resistors and the ACAS AT series. Resistive film temperatures are considered according to power load. Resistive drift after 1000 h has been projected.

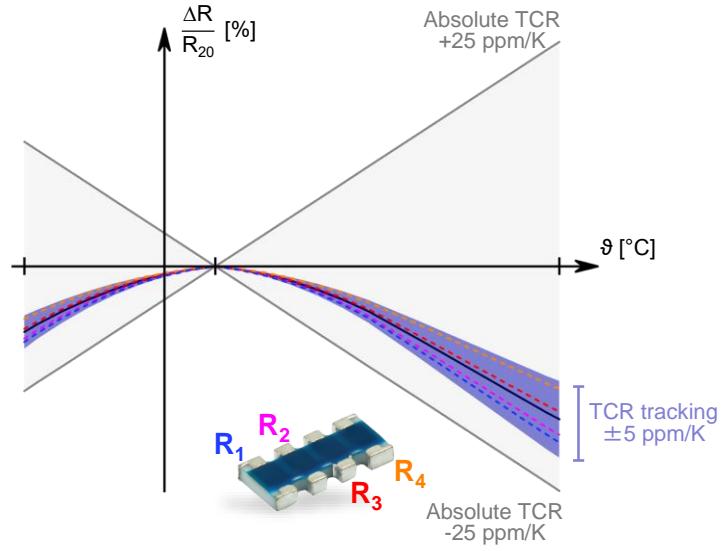
For the ACAS AT resistor arrays, the good heat conductivity of the alumina substrate results in an excellent thermal coupling of the individual resistive elements and ensures a homogeneous heat distribution across the entire array. The temperature of the resistive element determines the magnitude of resistive drift over time. Due to the homogeneous heat distribution, the resistors of the array will drift at virtually the same rate, even under different load conditions. Consequently the resistive drift of the ACAS AT array's resistance ratio is extremely low, specified at a maximum of $\pm 0.05\%$ after 1000 h, and typically being much smaller.

Technical Advantage: Relative Characteristics

Tolerance Matching



TCR Tracking



The advanced laser trimming process allows for a precise trimming of each resistor of the array, with a perfect ratio of resistance values, i.e. a tolerance matching down to $\pm 0.05\%$. The homogeneous manufacturing conditions for the resistors of the array and the homogeneous heat distribution within the array during operation result in very close temperature behavior of all resistors on the array, with a TCR tracking of down to $\pm 5 \text{ ppm/K}$, allowing for a virtually temperature independent resistance ratio.

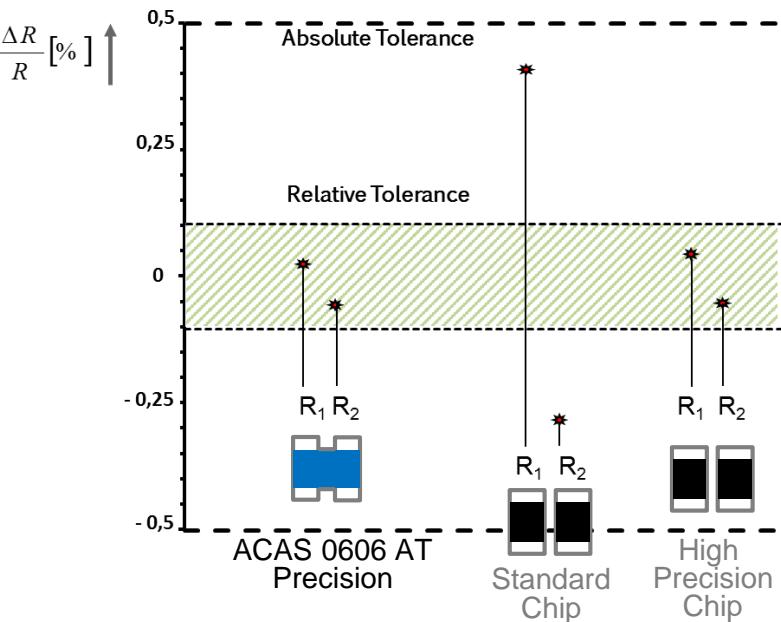
Commercial Benefits

The ACAS AT Precision Thin Film Chip Resistor Array series allows the user to...

- Replace costly high precision discrete resistors in high accuracy electronics applications

| Product | Relative Costs |
|-------------------------|-------------------|
| ACAS 0606 AT Prec. | \$ |
| 2 x High Precision Chip | \$\$ - \$\$\$\$\$ |

- Greatly reduce pick and place costs
- Save board space or increase PCB integration density



The Vishay ACAS AT Precision Thin Film Chip Resistor Array series' tight relative tolerance and TCR characteristics allow to replace more costly discrete resistors of high precision. The combination of two or four resistors in one device greatly reduces pick and place costs and allows for board space savings. The ACAS AT series thus enables developers to design cost-sensitive, accurate and reliable applications.

Applications

High Accuracy Electronics

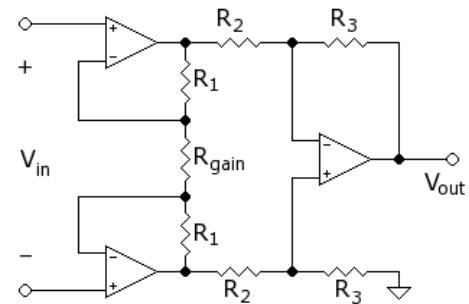
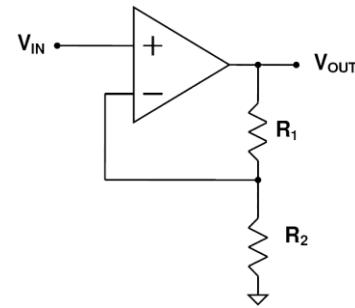
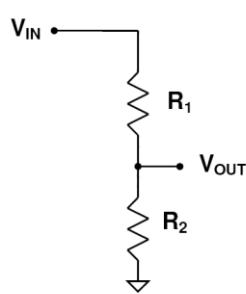


Automotive



Industrial

- Precision voltage dividers
- Feedback circuits
- Converter applications
- Instrumentation amplifiers
- Measurement bridge circuitry
- Signal conditioning



Today, many applications require an accurate and stable ratio of resistance. The ACAS AT series from Vishay offers tight relative tolerance and TCR characteristics, and an excellent long-term stability in compact case size, making the devices suited for a variety of high accuracy electronics applications. From automotive electronics to industrial applications the ACAS AT Precision Thin Film Chip Resistor Arrays are the perfect choice for feedback circuits, voltage dividers or measurement bridge circuitry, where high accuracy and a stable fixed resistance ratio are of major concern.

Summary

- ACAS AT series features two or four resistors on one substrate
- Tight relative tolerance and TCR characteristics
- Excellent relative long-term stability
- Impervious to sulfur exposure and superior moisture resistivity
- Excellent choice for high accuracy electronics where high accuracy and a stable divider ratio are of major concern

In summary, the Vishay ACAS AT Precision Thin Film Chip Resistor Array series offers tight relative tolerance and TCR characteristics and an excellent long-term stability that allow to replace high precision discrete resistors and lower costs in high accuracy electronics. Important high-reliability applications will benefit from AEC-Q200 qualification as well as from the excellent moisture and sulfur resistivity. Combining high accuracy and excellent long-term stability, the ACAS AT is the perfect choice for most fields of today's and tomorrow's emerging high accuracy electronics.