



# TNPW

## THIN FILM CHIP RESISTOR PRODUCT OVERVIEW

## DRALORIC/BEYSCHLAG RESISTORS

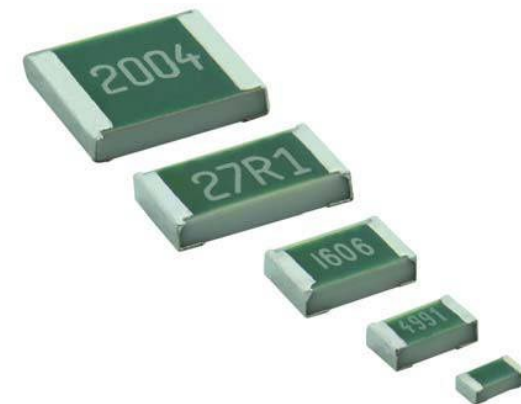
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# TNPW - Overview

- Main Electrical Properties of the TNPW
- Construction of TNPW
- Specified Resistive Drift & Long Term Stability
- Superior Moisture Resistance
- Superior Sulfur Resistance
- Applications
- Summary



Welcome to the Vishay TNPW Thin Film Chip Resistors product overview. This tutorial will provide an overview of the TNPW thin film chip resistor family. The key functional performance parameters of the TNPW series will be discussed as well as design, features and benefits. A selection of potential applications from typical market segments will be presented.



# Main Electrical Properties of the TNPW

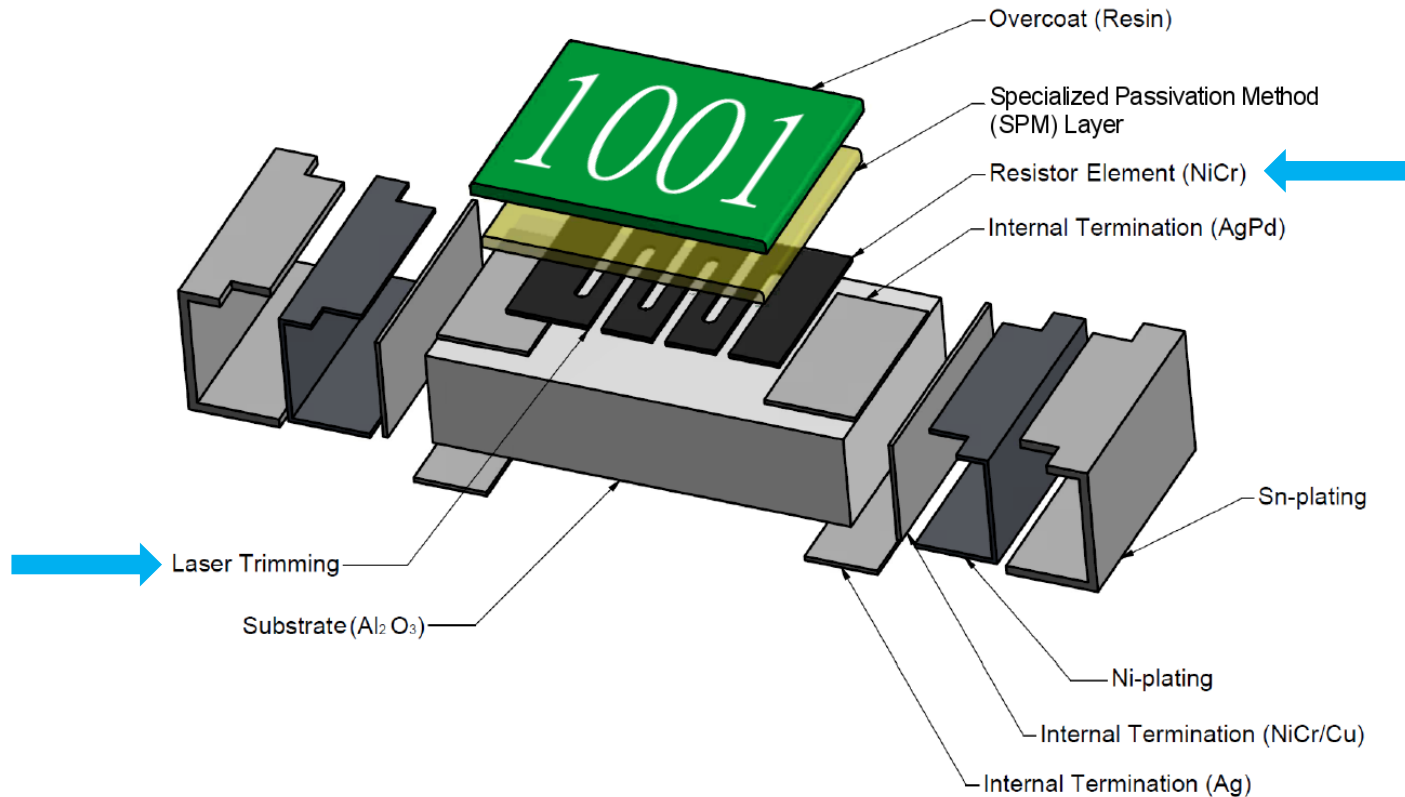
- Precision thin film technology
- Wide resistance range:  $4.7\Omega$  to  $3M\Omega$
- Tolerance options:  $\pm 1\%$ ,  $\pm 0.5\%$ , &  $\pm 0.1\%$
- TCR options:  $\pm 50$  ppm/ $^{\circ}\text{C}$ ,  $\pm 25$  ppm/ $^{\circ}\text{C}$ ,  $\pm 15$  ppm/ $^{\circ}\text{C}$ , &  $\pm 10$  ppm/ $^{\circ}\text{C}$
- Available case sizes: 0402, 0603, 0805, 1206, & 1210
- Excellent long-term stability
  - (low resistive drift:  $\leq 0.05\%$  after 1000h life test)
- Superior moisture resistivity
- Sulfur resistance tested according to ASTM B 809
- AEC-Q200 qualified
- Offered with pure tin termination (RoHS compliant) or tin-lead termination

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The TNPW thin film series from Vishay is an excellent choice where precision and long term stability is required. This thin film series offers superior moisture resistance and is resistant to Sulfur. AEC-Q200 qualification makes this product series an appropriate choice for important high reliability applications. The TNPW series is offered with pure Tin termination plating which is RoHS compliant, but the series is also offered with tin-lead termination.



# Construction of TNPW Components



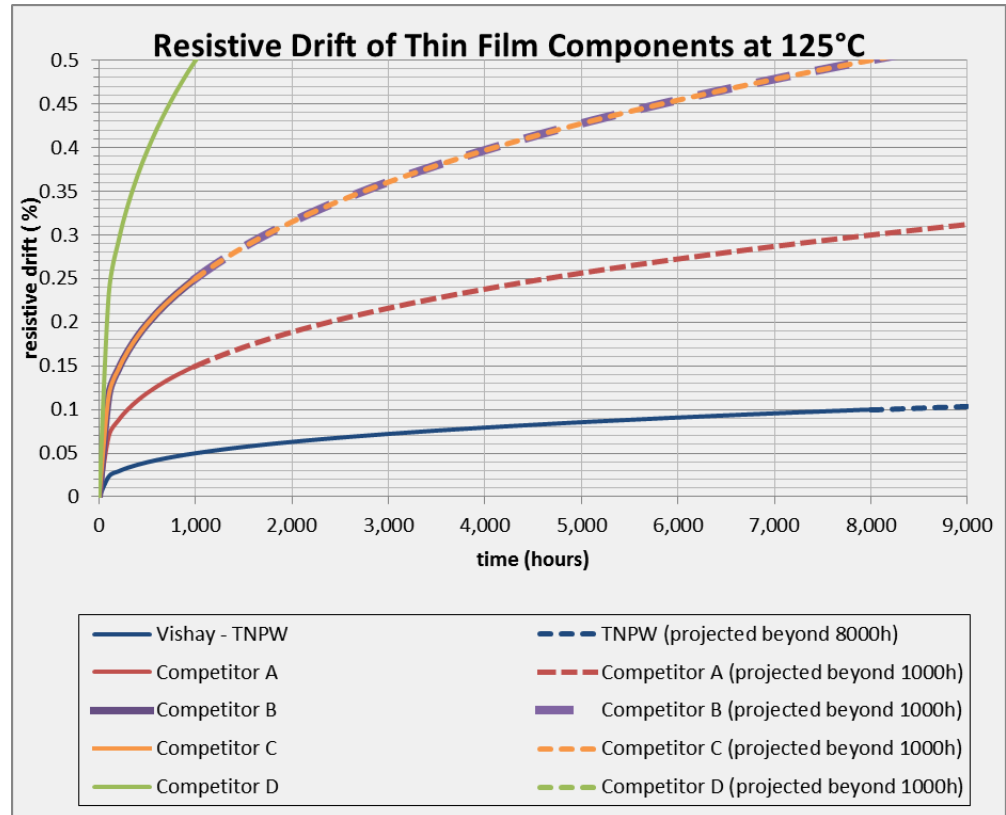
The TNPW thin film chip resistor construction offers significant advantages compared to other resistor types. The resistive element is a high quality homogeneous material with meandering laser trimming of the resistive element, shown here. This meander laser trimming allows the resistor to evenly distribute thermal energy across the entire resistive element when the resistor is in use. Evenly distributing power dissipation and thermal energy across the resistive element enhances the stability of TNPW components by reducing the intensity of any single hot spot on the resistive film.



# Specified Resistive Drift & Long Term Stability

Product	Maximum Resistive Drift after 1000 hours	Maximum Resistive Drift after 8000 hours
Vishay - TNPW	$\pm 0.05\%$	$\pm 0.1\%$
Competitor A	$\pm 0.15\%$	-
Competitor B	$\pm 0.25\%$	-
Competitor C	$\pm 0.25\%$	-
Competitor D	$\pm 0.5\%$	-

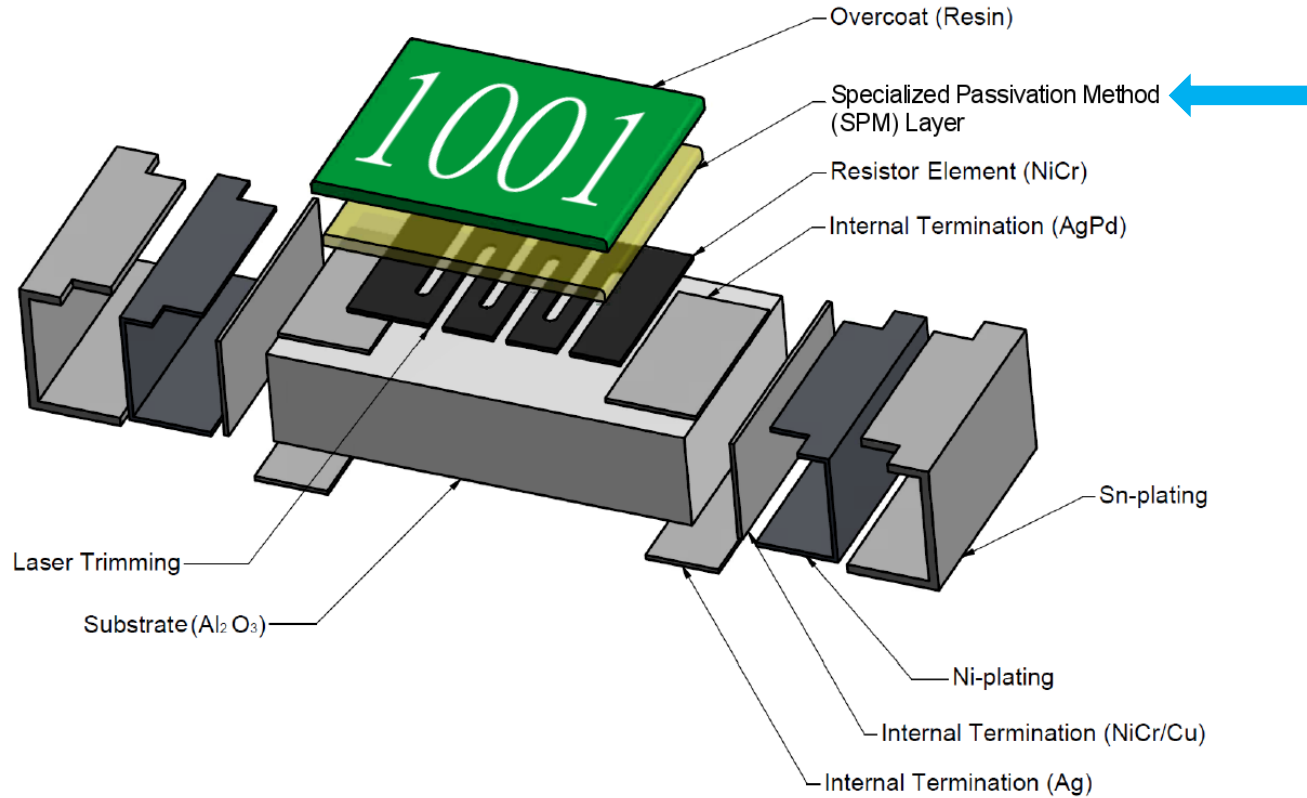
Note: Resistive drifts shown are considering endurance specification in product datasheets and/or maximum film temperature of 125° C. Resistive drift after 8000 hours is not shown on competitor datasheets.



The meander trimming cut of the resistive element helps the TNPW series to be specified to a best-in-class resistive drift of less than 0.1% when considering 8000 hours of operation with full power applied to the resistor. This is also known as the endurance at 70° C test as described on the product datasheet. The chart and table shown here illustrate the specified resistive drift over time of the TNPW series in comparison with thin film components from competitors of Vishay. Typical resistive drift over time for the TNPW series is much lower than the maximum specified resistive drift limit but should not be considered for worst case scenario analysis during the design process.



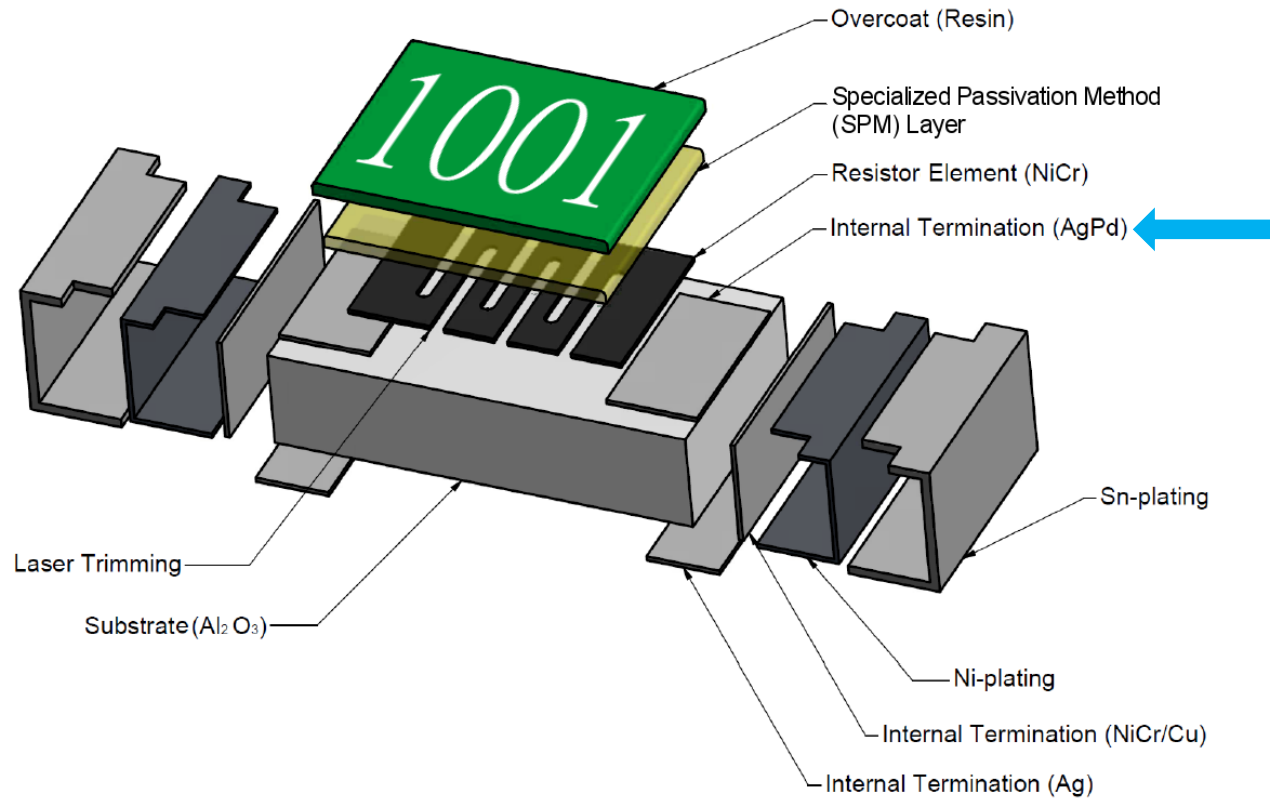
# Superior Moisture Resistance



Vishay's special passivation method, shown in the image here, is used during production of the TNPW series to provide the component with superior moisture resistivity, tested according to the 85°C/85% biased humidity test for 56 days. Additionally, the series has even been tested to 85°C/85% biased humidity for 30,000 hours without significant resistive drift.



# Superior Sulfur Resistance



The electronics industry has observed an increase in the incidents of corrosion failures related to high sulfur-containing environments, leading the designers toward sulfur resistant resistors. With silver palladium inner termination and a specialized design safeguarding for optimal coverage of the interface region of the product termination and coating, the TNPW series is impervious to sulfur exposure, verified in accordance with ASTM B 809 standard.



# Applications



## Alternative Energy

- Solar Inverter
- Power Meters



## AMS (Avionics, Military, Space)

- Land Mobile Radio
- Radar System
- GPS



## Automotive

- Battery Management
- Transmission Control
- Powertrain



## Computer

- Server
- Game Console
- Tablet and Adaptor



## Industrial

- DC-DC Converter
- Power Supply
- Welding equipment



## Medical

- Ultrasound Probe
- Endoscope
- MRI

The TNPW series from Vishay may be used in applications of many market segments. From avionics to alternative energy, there is a place for the TNPW series in a wide variety of circuitry types where long term stability and continuing precise voltage control is required.





# Summary

- Excellent choice where precision and long term stability is required
- Superior moisture resistivity
- The TNPW series is impervious to sulfur exposure
- Perfect choice for most fields of modern electronics

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In summary, the Vishay Thin Film TNPW is the best-in-class product for long term stability, offering a wide range of resistance value and superior moisture resistivity with the Vishay Specialized Passivation Method. The TNPW is sulfur impervious and automotive qualified, AEC-Q200 qualified, being suitable for most fields of modern electronics, including alternative energy, AMS, automotive, computer, medical and industrial applications.