



### Hi-Rel Thin Film Chip Resistors



#### KEY BENEFITS

- High-reliability product
- ESA-approved to ESCC 4001/029
- Advanced thin film technology
- SnPb termination plating, minimum 6 % Pb

#### APPLICATIONS

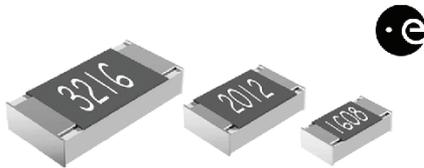
- Aerospace
- Avionics
- Military

#### RESOURCES

- Datasheet: TNPS....ESCC: <http://www.vishay.com/doc?28789>
- For technical questions contact [specialresistors@vishay.com](mailto:specialresistors@vishay.com)



### Hi-Rel Thin Film Chip Resistors



TNPS .... ESCC high-reliability thin film chip resistors are the premium choice for design and manufacture of equipment where a mature technology and proven reliability are of utmost importance. They are regularly used in communication and research satellites and fit equally well into aircraft and military electronic systems.

Approval of the TNPS .... ESCC products is granted by the European Space Components Coordination and registered in the ESCC Qualified Parts List, REP005.

#### FEATURES

- High-reliability product
- ESA approved to ESCC 4001/029
- Advanced thin film technology
- SnPb termination plating, minimum 6 % Pb

#### APPLICATIONS

- Aerospace
- Avionics
- Military

METRIC SIZE			
IMPERIAL	0603	0805	1206
METRIC	RR1608M	RR2012M	RR3216M

TECHNICAL SPECIFICATIONS			
DESCRIPTION	TNPS0603 .... ESCC	TNPS0805 .... ESCC	TNPS1206 .... ESCC
Metric size	RR1608M	RR2012M	RR3216M
Resistance range	10.0 Ω to 221 kΩ	10.0 Ω to 422 kΩ	10.0 Ω to 1.00 MΩ
Resistance tolerance	± 1 %; ± 0.5 %; ± 0.1 %		
Temperature coefficient	± 50 ppm/K; ± 25 ppm/K; ± 15 ppm/K		
Rated dissipation $P_{70}$	0.1 W	0.125 W	0.25 W
Operating voltage, $U_{max}$ , AC <sub>RMS</sub> or DC	75 V	150 V	200 V
Permissible film temperature, $\vartheta_{F max}$ .	125 °C		
Operating temperature range	- 55 °C to 125 °C		
Max. resistance change at $P_{70}$ , $ \Delta R $ max., after:			
1000 h	≤ (0.05 % $R$ + 10 mΩ)		
2000 h	≤ (0.1 % $R$ + 20 mΩ)		
Permissible voltage against ambient (insulation)	100 V	200 V	300 V
Storage temperature range	-55 °C to +125 °C		

#### Note

- These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE				
DESCRIPTION		RESISTANCE RANGE		
TCR	TOLERANCE	TNPS0603 .... ESCC	TNPS0805 .... ESCC	TNPS1206 .... ESCC
± 50 ppm/K	± 1 %	10.0 Ω to 221 kΩ	10.0 Ω to 422 kΩ	10.0 Ω to 1.00 MΩ
	± 0.5 %	10.0 Ω to 221 kΩ	10.0 Ω to 422 kΩ	10.0 Ω to 1.00 MΩ
± 25 ppm/K	± 0.1 %	10.0 Ω to 221 kΩ	10.0 Ω to 422 kΩ	10.0 Ω to 1.00 MΩ
	± 0.1 %	10.0 Ω to 221 kΩ	10.0 Ω to 422 kΩ	10.0 Ω to 1.00 MΩ
± 15 ppm/K	± 0.1 %	10.0 Ω to 221 kΩ	10.0 Ω to 422 kΩ	10.0 Ω to 1.00 MΩ

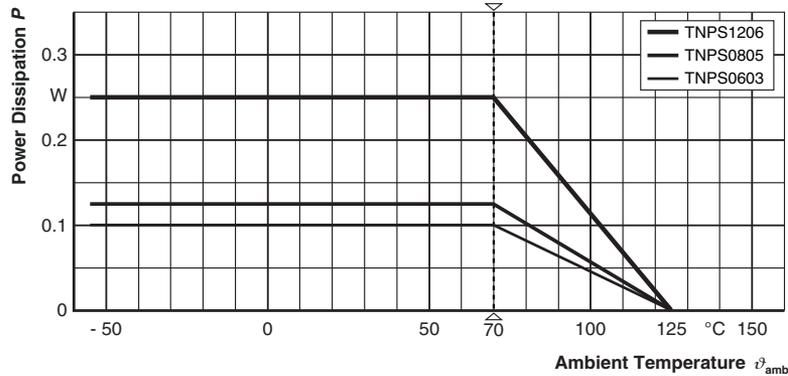
#### Notes

- The indicated combinations of TCR, tolerance and resistance range are a subset of those combinations approved to ESCC 4001/029
- According to ESCC 4001/029, resistance values are to be selected from the E96 series only

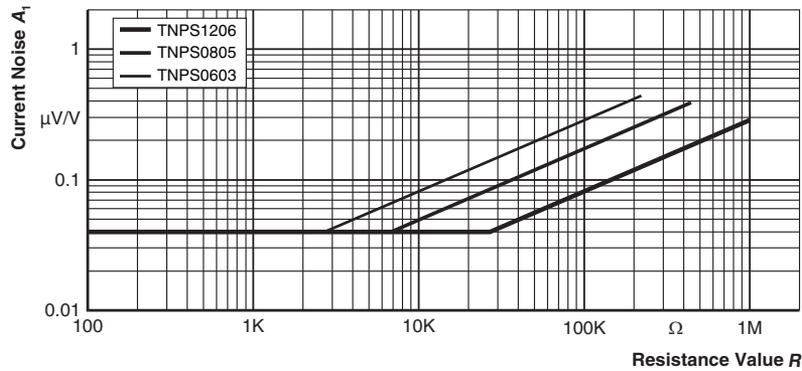


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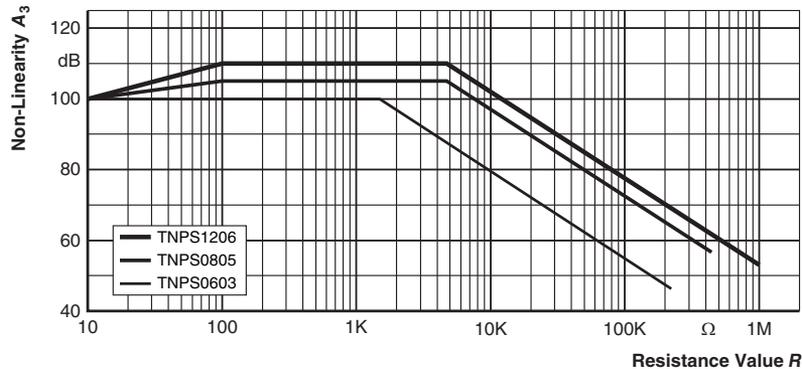
### FUNCTIONAL PERFORMANCE



### Derating



Current Noise  $A_1$  in accordance with IEC 60195



Non-Linearity  $A_3$  in accordance with IEC/TR 60440



## Hi-Rel Thin Film Chip Resistors

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of metal alloy is deposited on a high grade ceramic substrate ( $Al_2O_3$ ) and conditioned to achieve the desired temperature coefficient. Specially designed inner contacts are deposited on both sides. A special laser is used to achieve the target value by smoothly fine trimming resistive layer without damaging the ceramics. A further conditioning is applied in order to stabilize the trimming result. The resistor elements are covered by a protective coating designed for electrical, mechanical, and climatic protection. The terminations receive a final SnPb plating, controlled for a minimum lead content of 6 %. The resistance value is stamped on the coating with a four-character code system according to **IEC 60062** <sup>(1)</sup>. The result of the determined production is verified by an extensive testing procedure performed on 100 % of the individual chip resistors. Only accepted products are placed into a special matrix case packaging or into antistatic blister tape in accordance with **IEC 60286-3** <sup>(1)</sup>.

### ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow, or vapor phase as shown in **IEC 61760-1** <sup>(1)</sup>. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters, and aqueous solutions. The suitability of conformal coatings, if applied, shall be qualified by appropriate means to ensure the long-term stability of the whole system. Solderability is specified for 2 years after production. The permitted storage time is 20 years.

### APPROVALS

The resistors are approved to **ESCC 4001/029**. Conformity is indicated by the **ESCC Qualified Components** logo on the package label. Approval is granted by the European Space Components Coordination and registered in the ESCC Qualified Parts List, REP005.

The detail specification **ESCC 4001/029** has been established after successful completion of an **Evaluation Test Programme** according to **ESCC 2264000**.

These products are subjected to a screening test according to the ruling of the generic specification **ESCC 4001** and the detail specification **ESCC 4001/029**.

The production is succeeded by production test sequences for resistance, plating properties, solderability, and dimensions. This sequence is followed by screening tests for overload, non-linearity, temperature coefficient, resistance at room temperature, and a visual inspection. A Certificate of Conformity provides summary information by reporting the numbers of rejects for each test or inspection.

### LOT VALIDATION TESTS

Execution of Lot Validation Tests according to the ruling of **ESCC 4001** is available as a separate order item. This is to be combined with the dedicated order line for the required amount of samples, using packaging code "LX".

The applicable scope of the Lot Validation Tests, graduated to Group 1, Group 2, and Group 3, is illustrated in the datasheet with the number of samples required for each level.

Deliverable item to the Lot Validation Tests is the test report together with the used samples, shipped in waffle tray package.

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