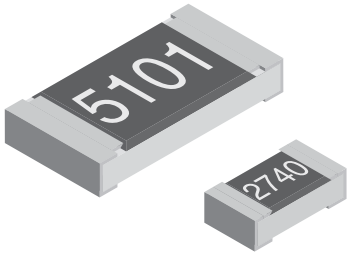
High Stability Thin Film Chip Resistors



TNPW precision thin film flat chip resistors are the perfect choice for most fields of modern electronics where reliability and stability is of major concern. Typical applications include industrial, medical equipment, and those, which are not necessarily subject to the RoHS directive like military and avionics.

FEATURES

- Excellent overall stability at different environmental conditions ≤ 0.05 % (1000 h rated power at 70 °C)
- Low temperature coefficient and tight tolerances (± 0.1 %; ± 10 ppm/K)
- Metal film layer on high quality ceramic
- SnPb termination plating, minimum 6 % Pb

APPLICATIONS

- Avionics
- Military
- Medical equipment
- Industrial equipment

STANDARD ELECTRICAL SPECIFICATIONS

	TNPW0402	TNPW0603	TNPW0805	TNPW1206	TNPW1210 (1)	TNPW2010	TNPW2512 (1)
Metric size	RR 1005M	RR 1608M	RR 2012M	RR 3216M	RR 3225M	RR 5025M	RR 6332M
Resistance range	10 Ω to 100 kΩ	10 Ω to 332 kΩ	10 Ω to 1 MΩ	10 Ω to 2 MΩ	10 Ω to 3.01 MΩ	10 Ω to 4.99 MΩ	10 Ω to 8.87 MΩ
Resistance tolerance	± 1 %; ± 0.5 %; ± 0.1 %						
Temperature coefficient	± 50 ppm/K; ± 25 ppm/K; ± 15 ppm/K; ± 10 ppm/K					± 50 ppm/K; ± 25 ppm/K	
Rated dissipation, P_{70} (2)	0.063 W	0.1 W	0.125 W	0.25 W	0.33 W	0.4 W	0.5 W
Operating voltage, $U_{max.}$ AC/DC	50 V	75 V	150 V	200 V	200 V	300 V	300 V
Permissible film temperature, ϑ_F max.	125 °C (155 °C)						
Operating temperature range	- 55 °C to 125 °C (155 °C)						
Thermal resistance (3)	870 K/W	550 K/W	440 K/W	220 K/W	170 K/W	140 K/W	110 K/W
Insulation voltage:							
U_{ins} 1 min	75 V	100 V	200 V	300 V	300 V	300 V	300 V
continuous	75 V	75 V	75 V	75 V	75 V	75 V	75 V
Failure rate: $FIT_{observed}$	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h	≤ 0.3 x 10^{-9}/h

Notes

- TNPW 0402 without marking.

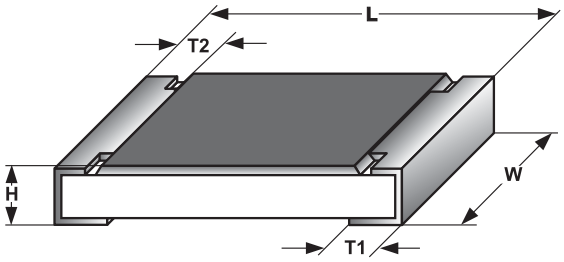
(1) Size not specified in EN 140401-801.

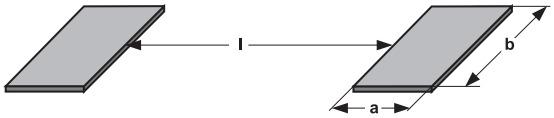
(2) Rated voltage $\sqrt{P \times R}$. The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature is not exceeded.

(3) Measuring conditions in accordance with EN 140401-801.

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DIMENSIONS





DIMENSIONS AND MASS

TYPE	L (mm)	W (mm)	H (mm)	T1/T2 (mm)	MASS (mg)
TNPW0402	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.2 ± 0.10	0.65
TNPW0603	1.6 ± 0.10	0.85 ± 0.10	0.45 ± 0.10	0.3 ± 0.20	2
TNPW0805	2.0 ± 0.15	1.25 ± 0.15	0.45 ± 0.10	0.4 ± 0.20	5.5
TNPW1206	3.2 ± 0.15	1.6 ± 0.15	0.55 ± 0.10	0.5 ± 0.25	10
TNPW1210	3.2 ± 0.15	2.45 ± 0.15	0.60 ± 0.15	0.5 ± 0.25	16
TNPW2010	5.0 ± 0.15	2.5 ± 0.15	0.60 ± 0.15	0.6 ± 0.25	28
TNPW2512	6.3 ± 0.20	3.1 ± 0.15	0.60 ± 0.15	0.6 ± 0.25	39

SOLDER PAD DIMENSIONS

TYPE	REFLOW SOLDERING			WAVE SOLDERING		
	a (mm)	b (mm)	l (mm)	a (mm)	b (mm)	l (mm)
TNPW0402	0.4	0.6	0.5	-	-	-
TNPW0603	0.5	0.9	1.0	0.9	0.9	1.0
TNPW0805	0.7	1.3	1.2	0.9	1.3	1.3
TNPW1206	0.9	1.7	2.0	1.1	1.7	2.3
TNPW1210	0.9	2.5	2.0	1.1	2.5	2.3
TNPW2010	1.0	2.5	3.9	1.2	2.5	3.9
TNPW2512	1.0	3.2	5.2	1.2	3.2	5.2

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE

TYPE	TCR	TOLERANCE	RESISTANCE	E-SERIES
TNPW0402	± 50 ppm/K	± 1 %	10R to 100K	24; 96
		± 0.5 %	10R to 100K	24; 192
		± 0.1 %	47R to 100K	
	± 25 ppm/K	± 1 %	10R to 100K	24; 96
		± 0.5 %	10R to 100K	24; 192
		± 0.1 %	47R to 100K	
	± 15 ppm/K	± 0.1 %		
	± 10 ppm/K	± 0.1 %		
TNPW0603	± 50 ppm/K	± 1 %	10R to 332K	24; 96
		± 0.5 %	10R to 332K	24; 192
		± 0.1 %		
	± 25 ppm/K	± 1 %	10R to 332K	24; 96
		± 0.5 %	10R to 332K	24; 192
		± 0.1 %		
	± 15 ppm/K	± 0.1 %	47R to 332K	
	± 10 ppm/K	± 0.1 %		
TNPW0805	± 50 ppm/K	± 1 %	10R to 1M0	24; 96
		± 0.5 %	10R to 1M0	24; 192
		± 0.1 %		
	± 25 ppm/K	± 1 %	10R to 1M0	24; 96
		± 0.5 %	10R to 1M0	24; 192
		± 0.1 %		
	± 15 ppm/K	± 0.1 %	47R to 1M0	
	± 10 ppm/K	± 0.1 %		

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TEMPERATURE COEFFICIENT AND RESISTANCE RANGE

TYPE	TCR	TOLERANCE	RESISTANCE	E-SERIES
TNPW1206	± 50 ppm/K	± 1 %	10R to 2M0	24; 96
		± 0.5 %	10R to 2M0	24; 192
		± 0.1 %		
	± 25 ppm/K	± 1 %	10R to 2M0	24; 96
		± 0.5 %	10R to 2M0	24; 192
		± 0.1 %		
	± 15 ppm/K	± 0.1 %	47R to 2M0	
	± 10 ppm/K	± 0.1 %		
TNPW1210	± 50 ppm/K	± 1 %	10R to 3M01	24; 96
		± 0.5 %	10R to 3M01	24; 192
		± 0.1 %	47R to 2M13	
	± 25 ppm/K	± 1 %	10R to 3M01	24; 96
		± 0.5 %	10R to 3M01	24; 192
		± 0.1 %	47R to 2M13	
	± 15 ppm/K	± 0.1 %		
	± 10 ppm/K	± 0.1 %		
TNPW2010	± 50 ppm/K	± 1 %	10R to 4M99	24; 96
		± 0.5 %	10R to 4M99	24; 192
		± 0.1 %	47R to 1M0	
	± 25 ppm/K	± 1 %	10R to 4M99	24; 96
		± 0.5 %	10R to 4M99	24; 192
		± 0.1 %	47R to 1M0	
TNPW2512	± 50 ppm/K	± 1 %	10R to 8M87	24; 96
		± 0.5 %	10R to 8M87	24; 192
		± 0.1 %	47R to 1M0	
	± 25 ppm/K	± 1 %	10R to 8M87	24; 96
		± 0.5 %	10R to 8M87	24; 192
		± 0.1 %	47R to 1M0	

PART NUMBER AND PRODUCT DESCRIPTION

Part Number: TNPW12061K32DETA

T	N	P	W	1	2	0	6	1	K	3	2	D	E	T	A		

TYPE/SIZE	RESISTANCE	TOLERANCE	TCR	PACKAGING	SPECIAL
TNPW0402 **TNPW0603** **TNPW0805** **TNPW1206** **TNPW1210** **TNPW2010** **TNPW2512**	**R** = Decimal **K** = Thousand **M** = Million (4 digits)	**B** = ± 0.1 % **D** = ± 0.5 % **F** = ± 1.0 %	**H** = ± 50 ppm/K **E** = ± 25 ppm/K **X** = ± 15 ppm/K **Y** = ± 10 ppm/K	**TA** **TD** **CN** **TY** **TC**	Up to 2 digits Blank = Standard

Product Description: TNPW-1206 1.32K 0.5 % T-9 RT1

TNPW-1206	1.32K	0.5 %	T-9	RT1
TYPE	RESISTANCE	TOLERANCE	TCR	PACKAGING
TNPW-0402 **TNPW-0603** **TNPW-0805** **TNPW-1206** **TNPW-1210** **TNPW-2010** **TNPW-2512**	Examples: **1K32** = 1320 Ω **99.68K** = 99 680 Ω **360** = 360 Ω	± **0.1 %** ± **0.5 %** ± **1.0 %**	**T-2** = ± 50 ppm/K **T-9** = ± 25 ppm/K **T-10** = ± 15 ppm/K **T-13** = ± 10 ppm/K	**RT1** **RT7** **R52** **R75** **RT6**

Note

- The product can be ordered using either the PART NUMBER or the PRODUCT DESCRIPTION.
- For ordering TNPW e3 with lead free terminations please refer to latest edition of datasheet TNPW e3, document number 28758.

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PACKAGING						
TYPE	CODE	QUANTITY	CARRIER TAPE	WIDTH	PITCH	REEL DIAMETER
TNPW0402	RT7 = TD	10 000	Paper tape acc. IEC 60286-3 Type I	8 mm	2 mm	180 mm/7"
TNPW0603 TNPW0805 TNPW1206 TNPW1210	R52 = CN	1000 (1)		8 mm	4 mm	
	RT1 = TA	5000				
	RT6 = TC	20 000				330 mm/13"
TNPW2010 TNPW2512	R75 = TY	1000	Blister tape acc. IEC 60286-3 Type II	12 mm	4 mm	180 mm/7"

Note
(1) 1000 pieces packaging is available only for precision resistors with tolerance ± 0.1 % and temperature coefficient ≤ ± 25 ppm/K.

DESCRIPTION

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 and conditioned to achieve the desired temperature coefficient. A special laser is used to achieve the target value by smoothly cutting a meander groove in the 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 result of the determined production is verified by an extensive testing procedure on 100 % of the individual chip resistors. This includes pulse load screening for the elimination of products with a potential risk of early life failures according to EN 140401-801, 2.1.2.2. Only accepted products are laid directly into the tape in accordance with EN 60286-3.

ASSEMBLY

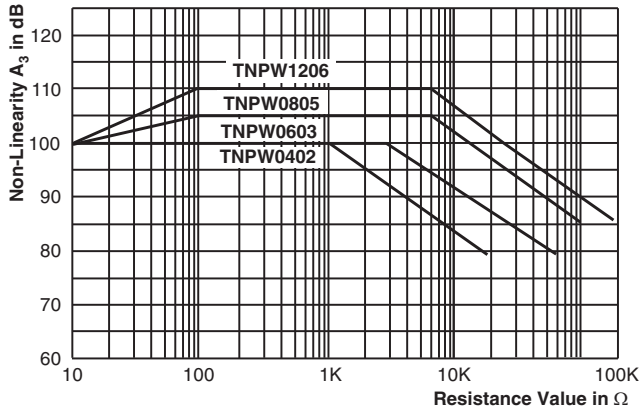
The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapour phase as shown in IEC 61760-1. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters 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 or re-qualification. The permitted storage time is 20 years.

RELATED PRODUCTS

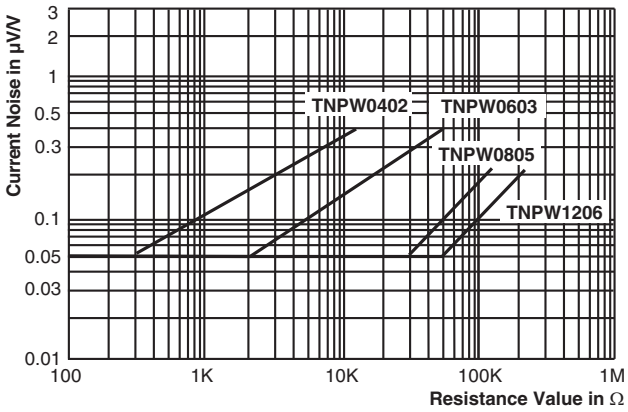
The lead free version TNPW e3 can be used as drop in replacement for the TNPW whenever lead bearing terminations are not mandatory. For ordering TNPW e3 please refer to latest edition of datasheet TNPW e3, document number 28758.

TNPS .... ESCC high-reliability thin film chip resistors are the premium choice for design and manufacture of equipment, where matured 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, document number 28789.

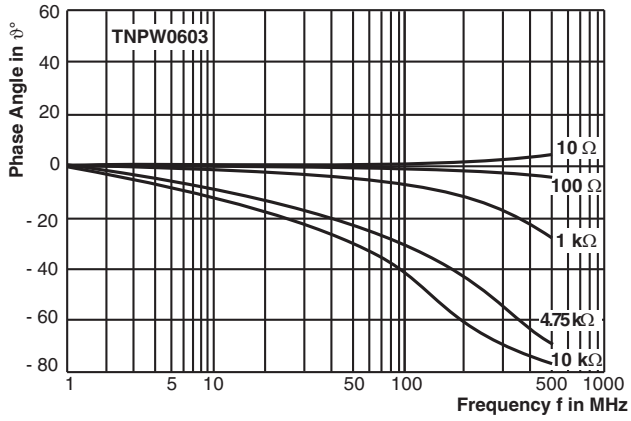
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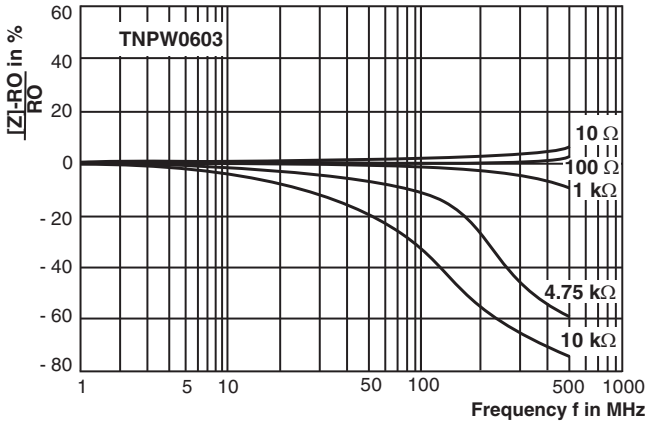
Non-Linearity



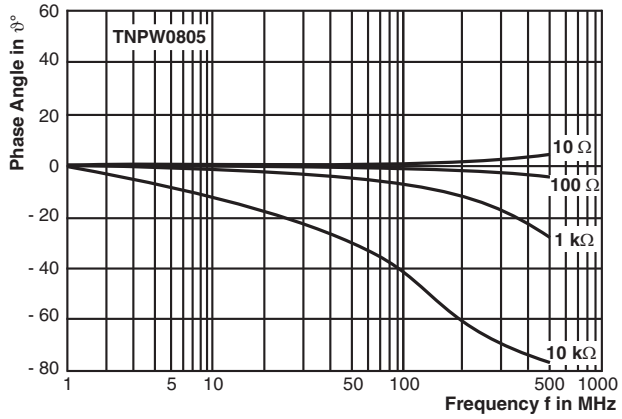
Current Noise



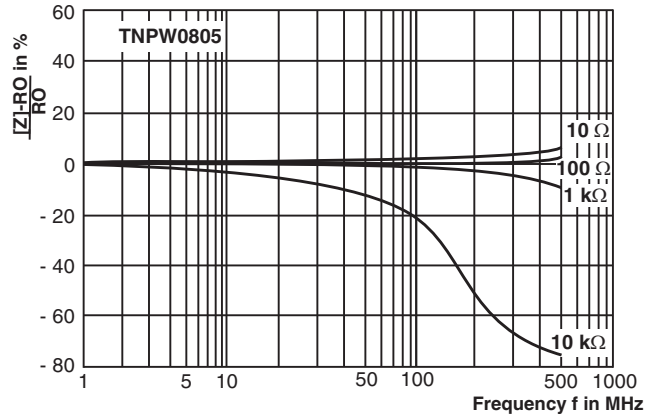
HF Performance



HF Performance

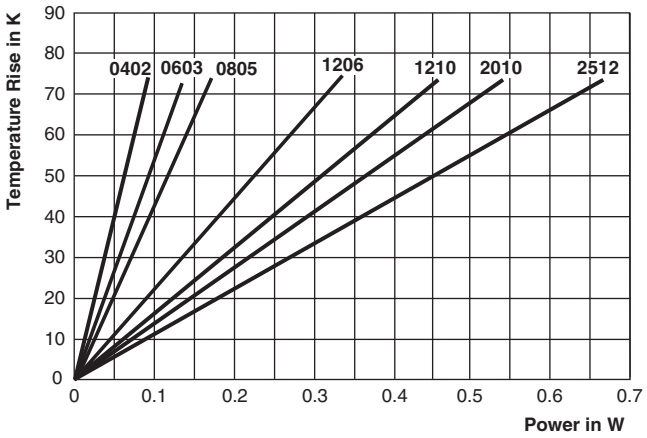


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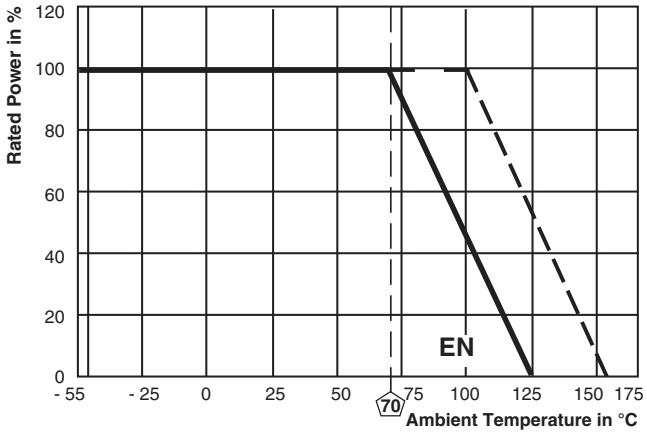


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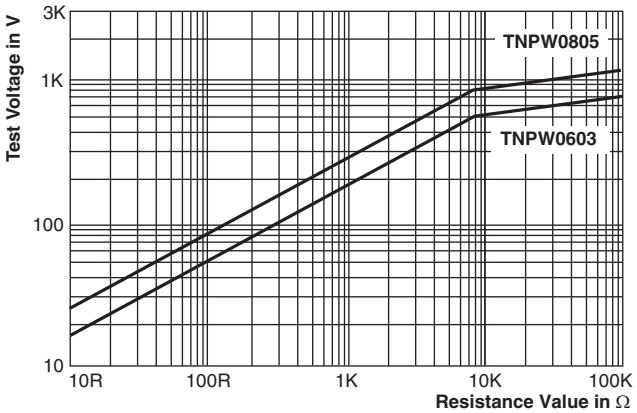
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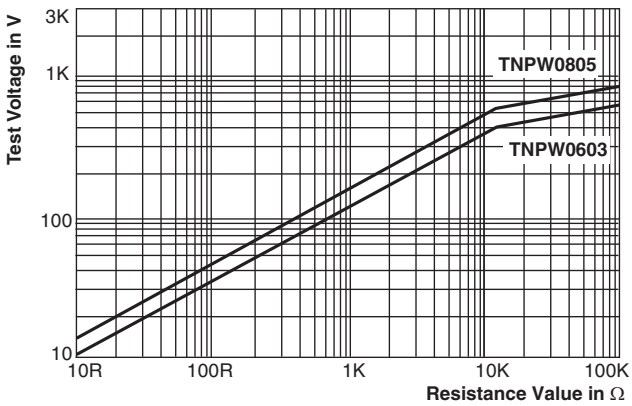
Temperature Rise



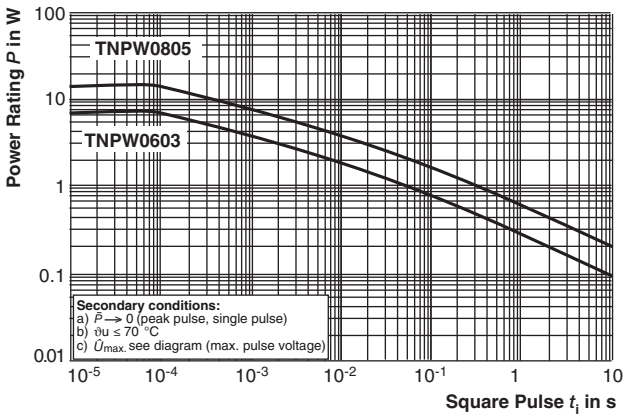
Derating



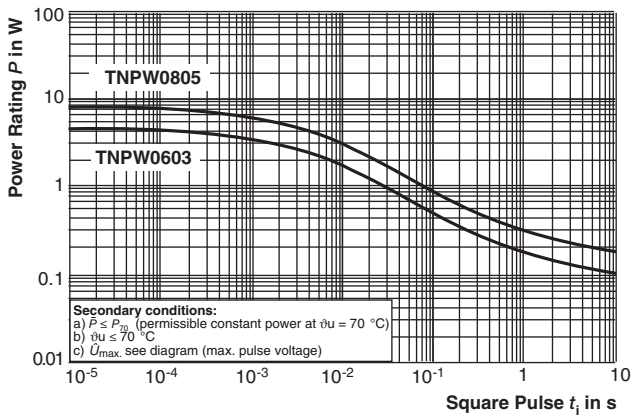
Single-Pulse High Voltage Overload Test
1.2/50 µs EN 140000 4.27



Single-Pulse High Voltage Overload Test
10/700 µs EN 140000 4.27

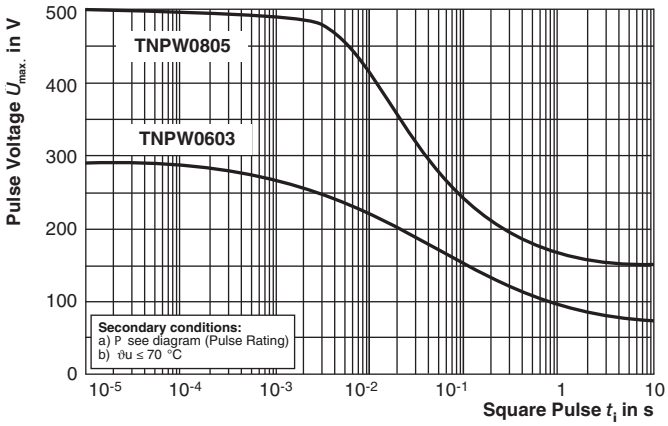


Pulse Rating $\overline{P} \rightarrow 0$



Pulse Rating $\overline{P} \leq P_{70}$

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Maximum Pulse Voltage

TEST AND REQUIREMENTS

All tests are carried out in accordance with the following specifications:
IEC 60115-1, generic specification (includes tests)
EN 140400, sectional specification (includes schedule for qualification approval)
EN 140401-801, detail specification (includes schedule for conformance inspection)

The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5202. The tests are carried out under standard atmospheric conditions in accordance with IEC 60068-1, 5.3. Climatic category LCT/UCT/56 (rated temperature range: Lower category temperature, upper category temperature; damp heat, long term, 56 days) is valid. Unless otherwise specified the following values apply:
Temperature: 15 °C to 35 °C
Relative humidity: 45 % to 75 %
Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

The components are mounted for testing on boards in accordance with EN 60115-1, 4.31 unless otherwise specified. The parameters stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140401-801.

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TEST PROCEDURES AND REQUIREMENTS						
EN 60115-1 CLAUSE	**IEC 60068-2 TEST METHOD**	**TEST**	**PROCEDURE**	**REQUIREMENTS PERMISSIBLE CHANGE (ΔR)**		
			Stability for product types:			
			TNPW0402	10 Ω to < 100 Ω	100 Ω to 100 kΩ	10 Ω to 100 kΩ
			TNPW0603		100 Ω to 332 kΩ	10 Ω to 332 kΩ
			TNPW0805		100 Ω to 1 MΩ	10 Ω to 1 MΩ
			TNPW1206		100 Ω to 2 MΩ	10 Ω to 2 MΩ
			TNPW1210		100 Ω to 3.01 MΩ	10 Ω to 3.01 MΩ
			TNPW2010		100 Ω to 4.99 MΩ	10 Ω to 4.99 MΩ
			TNPW2512		100 Ω to 8.87 MΩ	10 Ω to 8.87 MΩ
4.5	-	Resistance		± 0.1 %		± 0.5 %; ± 1.0 %
4.8.4.2	-	Temperature coefficient	At (20/- 55/20) °C and (20/125/20) °C	± 50 ppm/K; ± 25 ppm/K; ± 15 ppm/K; ± 10 ppm/K		
4.25.1	-	Endurance at 70 °C	$U = \sqrt{P_{70} \times R}$ or $\leq U_{max.}$; 1.5 h on; 0.5 h off; 70 °C; 1000 h	± (0.1 % R + 0.02 Ω)	± (0.05 % R + 0.01 Ω)	± (0.25 % R + 0.05 Ω)
4.25.3	-	Endurance at upper category temperature	125 °C; 1000 h	± (0.1 % R + 0.02 Ω)	± (0.05 % R + 0.01 Ω)	± (0.5 % R + 0.05 Ω)
4.13	-	Short time overload	$U = 2.5 \times \sqrt{P_{70} \times R}$ $\leq 2 \times U_{max.}$; 5 s	± (0.05 % R + 0.01 Ω)	± (0.02 % R + 0.01 Ω)	± (0.1 % R + 0.02 Ω)
4.19	14 (Na)	Rapid change of temperature	30 min at LCT: 30 min at UCT; LCT = - 55 °C; UCT = 125 °C; 5 cycles	± (0.05 % R + 0.01 Ω)	± (0.02 % R + 0.01 Ω)	± (0.1 % R + 0.02 Ω)
4.24	78 (Cab)	Damp heat steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH	± (0.1 % R + 0.02 Ω)	± (0.05 % R + 0.01 Ω)	± (0.5 % R + 0.05 Ω)
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method; (260 ± 5) °C; (10 ± 1) s	± (0.05 % R + 0.01 Ω)	± (0.02 % R + 0.01 Ω)	± (0.1 % R + 0.02 Ω)

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Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

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Общество с ограниченной ответственностью «МосЧип» ИНН 7719860671 / КПП 771901001
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Данный компонент на территории Российской Федерации

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