



## THIN FILM RESISTORS

TNPW e3 - Lead (Pb)-Free Solder Contacts



### High-Stability Thin Film Flat Chip Resistor

#### KEY BENEFITS

- High stability:  $\leq 0.05\%$  (1000 h rated power at 70 °C)
- Superior moisture resistivity:  $\leq 0.25\%$  (85 °C; 56 days; 85 % RH)
- AEC-Q200 qualified (sizes 0402 to 1206)
- Lead (Pb)-free solder contacts
- Compliant to RoHS directive 2002/95/EC
- Low temperature coefficient and tight tolerances ( $\pm 0.1\%$ ;  $\pm 10$  ppm/K)
- Waste gas resistant
- Industry standard sizes: 0402, 0603, 0805, 1206, 1210, 2010, 2512

#### APPLICATIONS

- Automotive
- Telecommunications
- Medical equipment
- Industrial equipment
- Instrumentation
- Test and measuring equipment

## High-Stability Thin Film Chip Resistor ≤ 0.05 % (1000 h rated power at 70 °C)

### FEATURES

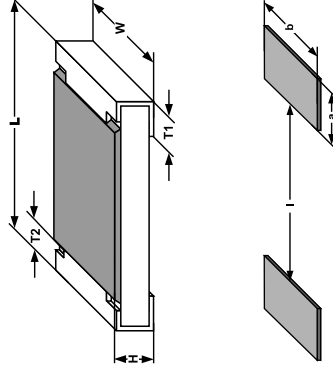
- Superior moisture resistivity ≤ 0.25 % (85 °C; 56 days; 85 % RH)
- AEC-Q200 qualified (sizes 0402 to 1206)
- Low temperature coefficient and tight tolerances (± 0.1 %, ± 10 ppm/K)
- Waste gas resistant
- Compliant to RoHS directive 2002/95/EC

### APPLICATIONS

- Test and measuring equipment
- Telecommunication
- Medical equipment
- Industrial equipment
- Instrumentation
- Automotive

TNPW e3 Precision Thin Film Flat Chip Resistors are the perfect choice for most fields of modern electronics where highest reliability and stability is of major concern. Typical applications include automotive, telecommunication, industrial, medical equipment, precision test and measuring equipment.

### DIMENSIONS



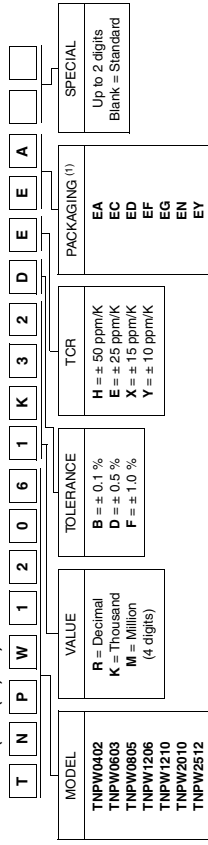
SIZE		DIMENSIONS in millimeters					
INCH	METRIC	L	W	H	T1	T2	
0402	1005	1.0 ± 0.05	0.5 ± 0.05	0.35 ± 0.05	0.2 ± 0.10		
0603	1608	1.6 ± 0.10	0.85 ± 0.10	0.45 ± 0.10	0.3 ± 0.20		
0805	2012	2.0 ± 0.15	1.25 ± 0.15	0.45 ± 0.10	0.4 ± 0.20		
1206	3216	3.2 ± 0.15	1.6 ± 0.15	0.55 ± 0.10	0.5 ± 0.25		
1210	3225	3.2 ± 0.15	2.45 ± 0.15	0.60 ± 0.15	0.5 ± 0.25		
2010	5025	5.0 ± 0.15	2.5 ± 0.15	0.60 ± 0.15	0.6 ± 0.25		
2512	6332	6.3 ± 0.20	3.1 ± 0.15	0.60 ± 0.15	0.6 ± 0.25		

SIZE		SOLDER PAD DIMENSIONS in millimeters					
INCH	METRIC	a	b	i	a	b	
0402	1005	0.4	0.6	0.5	-	-	
0603	1608	0.5	0.9	1.0	0.9	1.0	
0805	2012	0.7	1.3	1.2	0.9	1.3	
1206	3216	0.9	1.7	2.0	1.1	1.7	
1210	3225	0.9	2.5	2.0	1.1	2.5	
2010	5025	1.0	2.5	3.9	1.2	2.5	
2512	6332	1.0	3.2	5.2	1.2	3.2	

### PART NUMBER AND PRODUCT DESCRIPTION

Products can be ordered using either the Product Description or the Part Number. For ordering TNPW with SnPb contacts please refer to latest edition of data sheet TNPW lead bearing.

Part Number: (Lead (Pb)-free) TNPW12061K320.5%T9ET1e3



Product Description: TNPW1206 1K32 0.5 % T9 ET1 e3

MODEL	VALUE	TOLERANCE	TCR	PACKAGING (1)	SPECIAL
TNPW0402	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	EA EB EC ED EF EG EN EY	Up to 2 digits Blank = Standard
TNPW1206	1K32	0.5 %	T-9	ET1	e3
MODEL	RESISTANCE VALUE	TOLERANCE	TCR	PACKAGING (1)	LEAD (Pb)-FREE
TNPW0402	Examples: 54R1 = 54.1 Ω 1K32 = 1320 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	ET1 ET6 ET7 E02 E67 E52 E75	e3 = Pure tin termination finish

Note (1) Please refer to PACKAGING table.



RoHS COMPLIANT

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							
Climate category (LCT/UCT/days)	55/125/56	55/125/56	55/125/56	55/125/56	55/125/56	55/125/56	55/125/56	
Rated dissipation, P <sub>rated</sub> (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 <sub>max, AC/DC</sub>	50 V	75 V	150 V	200 V	200 V	300 V	300 V	
Maximum permissible film temperature	155 °C	155 °C	155 °C	155 °C	155 °C	155 °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	
Max. resistance change at P <sub>rated</sub> , ΔR/R	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	
1000 h	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %	≤ 0.05 %	
8000 h	≤ 0.10 %	≤ 0.10 %	≤ 0.10 %	≤ 0.10 %	≤ 0.10 %	≤ 0.10 %	≤ 0.10 %	
225 000 h	≤ 0.30 %	≤ 0.30 %	≤ 0.30 %	≤ 0.30 %	≤ 0.30 %	≤ 0.30 %	≤ 0.30 %	
Insulation voltage, U <sub>ins</sub> 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	
FT <sub>observed</sub>	≤ 0.1 x 10 <sup>9</sup> /h		≤ 0.1 x 10 <sup>9</sup> /h		≤ 0.1 x 10 <sup>9</sup> /h		≤ 0.1 x 10 <sup>9</sup> /h	
Weight/1000 pieces	0.65 g	2 g	5.5 g	10 g	16 g	28 g	39 g	

### Notes

- TNPW 0402 without marking.
- Size not specified in EN 140401-801.
- 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). Using advanced temperature level may require special considerations towards the choice of circuit board and solder material. The rated dissipation applies only if the permitted film temperature is not exceeded.
- Measuring conditions in accordance with EN 140401-801.

**DISCLAIMER** All product specifications and data are subject to change without notice. Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product. Vishay disclaims any and all liability arising out of the use or application of any product described herein or any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed herein, which apply to these products. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications. Product names and markings noted herein may be trademarks of their respective owners.

For technical questions, contact [thinfilmchip@vishay.com](mailto:thinfilmchip@vishay.com)

Build Vishay into your Design