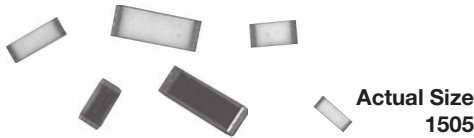
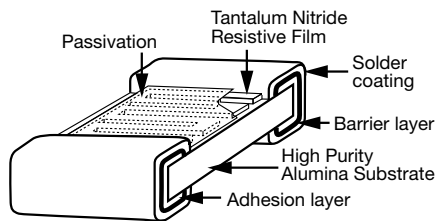


## Precision Thin Film Non-Magnetic Resistor, Surface Mount Chip, $\pm 25 \text{ ppm}/^\circ\text{C}$ , Tolerances to 0.1 %



These devices eliminate materials that would disturb magnetic fields applications such as in MRI magnetic resonance imaging machines. The PNM series chip resistor has been carefully engineered with non-magnetic materials to eliminate the effects of these stray magnetic fields on circuit performance, thereby resulting in simplified shielding requirements and improved sound quality in audio applications. Providing signal conditioning without distortion from magnetic fields.

### CONSTRUCTION



### FEATURES

- Non-magnetic
- Moisture resistant
- High purity alumina substrate
- Non-standard values available
- MIL-STD-202 method 106 moisture resistance with 10 % power
- 100 % visual inspected per MIL-PRF-55342
- Very low noise and voltage coefficient ( $< -30 \text{ dB}$ )
- Non-inductive
- Laser-trimmed tolerances to  $\pm 0.1 \%$
- Wraparound resistance less than  $10 \text{ m}\Omega$
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

### TYPICAL PERFORMANCE

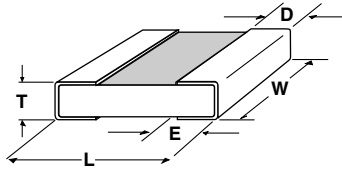
|      | ABSOLUTE |
|------|----------|
| TCR  | 25       |
| TOL. | 0.1      |

| STANDARD ELECTRICAL SPECIFICATIONS |   |   |
|------------------------------------|---|---|
| TEST                               | SPECIFICATIONS  | CONDITIONS                                  |
| Material                           | Tantalum nitride  | -   |
| Resistance Range                   | $10 \Omega$ to $3 \text{ M}\Omega$  | -   |
| TCR: Absolute                      | $\pm 25 \text{ ppm}/^\circ\text{C}$ to $\pm 100 \text{ ppm}/^\circ\text{C}$ | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ |
| Tolerance: Absolute                | $\pm 0.1 \%$ to $\pm 1.0 \%$  | $+25^\circ\text{C}$                         |
| Stability: Absolute                | $\Delta R \pm 0.03 \%$  | -   |
| Stability: Ratio                   | -   | -   |
| Voltage Coefficient                | $0.1 \text{ ppm}/\text{V}$  | -   |
| Working Voltage                    | $75 \text{ V}$ to $200 \text{ V}$   | -   |
| Operating Temperature Range        | $-55^\circ\text{C}$ to $+155^\circ\text{C}$                                 | -   |
| Storage Temperature Range          | $-55^\circ\text{C}$ to $+155^\circ\text{C}$                                 | -   |
| Noise                              | $< -30 \text{ dB}$  | -   |
| Shelf Life Stability: Absolute     | -   | -   |

| COMPONENT RATINGS        |                   |                     |                               |
|--------------------------|-------------------|---------------------|-------------------------------|
| CASE SIZE <sup>(1)</sup> | POWER RATING (mW) | WORKING VOLTAGE (V) | RESISTANCE RANGE ( $\Omega$ ) |
| 0402                     | 50                | 75                  | 20 to 35K                     |
| 0502                     | 100               | 75                  | 20 to 65K                     |
| 0505                     | 150               | 75                  | 20 to 130K                    |
| 0603                     | 150               | 75                  | 10 to 130K                    |
| 0805                     | 200               | 100                 | 10 to 301K                    |
| 0705                     | 200               | 100                 | 10 to 301K                    |
| 1005                     | 250               | 100                 | 10 to 301K                    |
| 1010                     | 500               | 150                 | 50 to 600K                    |
| 1206                     | 400               | 200                 | 10 to 1M                      |
| 1505                     | 400               | 150                 | 10 to 1M                      |
| 2208                     | 750               | 150                 | 10 to 1.75M                   |
| 2010                     | 800               | 200                 | 10 to 2M                      |
| 2512                     | 1000              | 200                 | 10 to 3M                      |

### Note

<sup>(1)</sup> 0705 and 0805 are the same (only use 0805 when ordering)

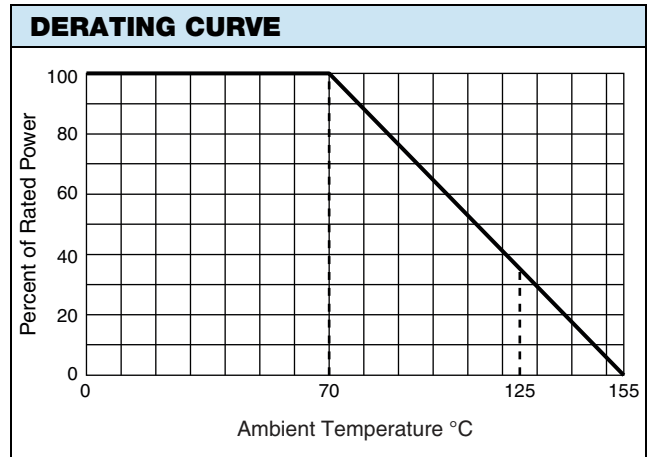
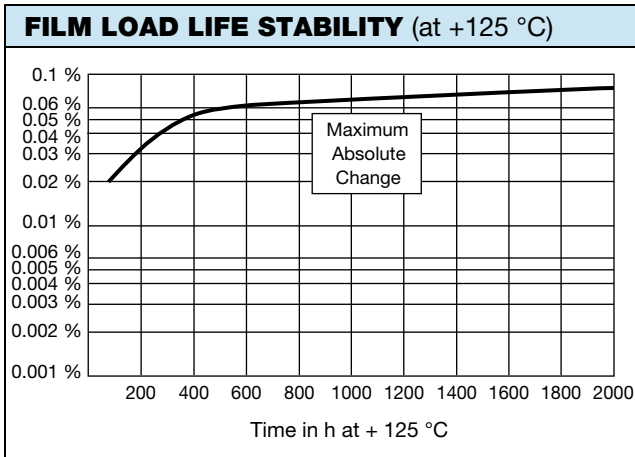
**DIMENSIONS** in inches


| CASE SIZE                 | L             | W             | T              | D                     | E                     |
|---------------------------|---------------|---------------|----------------|-----------------------|-----------------------|
| 0402                      | 0.042 ± 0.008 | 0.022 ± 0.005 | 0.012 to 0.033 | 0.010 ± 0.005         | 0.010 ± 0.005         |
| 0502                      | 0.055 ± 0.006 | 0.025 ± 0.005 | 0.012 to 0.033 | 0.010 ± 0.005         | 0.015 ± 0.005         |
| 0505                      | 0.055 ± 0.006 | 0.050 ± 0.005 | 0.012 to 0.033 | 0.010 ± 0.005         | 0.015 ± 0.005         |
| 0603                      | 0.064 ± 0.006 | 0.032 ± 0.005 | 0.020 Max.     | 0.012 ± 0.005         | 0.015 ± 0.005         |
| 0705, 0805 <sup>(1)</sup> | 0.080 ± 0.006 | 0.050 ± 0.005 | 0.015 to 0.033 | 0.015 ± 0.005         | 0.015 ± 0.005         |
| 1005                      | 0.105 ± 0.007 | 0.050 ± 0.005 | 0.015 to 0.033 | 0.015 ± 0.005         | 0.015 ± 0.005         |
| 1010                      | 0.105 ± 0.007 | 0.100 ± 0.005 | 0.015 to 0.033 | 0.015 ± 0.005         | 0.015 ± 0.005         |
| 1206                      | 0.126 ± 0.008 | 0.063 ± 0.005 | 0.015 to 0.033 | 0.020 + 0.005/- 0.010 | 0.020 + 0.005/- 0.010 |
| 1505                      | 0.155 ± 0.007 | 0.050 ± 0.005 | 0.015 to 0.033 | 0.015 ± 0.005         | 0.015 ± 0.005         |
| 2010                      | 0.209 ± 0.009 | 0.098 ± 0.005 | 0.015 to 0.033 | 0.020 ± 0.005         | 0.020 ± 0.005         |
| 2208                      | 0.230 ± 0.007 | 0.075 ± 0.005 | 0.015 to 0.033 | 0.020 ± 0.005         | 0.020 ± 0.005         |
| 2512                      | 0.259 ± 0.009 | 0.124 ± 0.005 | 0.015 to 0.033 | 0.020 ± 0.005         | 0.020 ± 0.005         |

**Note**
<sup>(1)</sup> 0705 and 0805 are the same (only use 0805 when ordering)

**ENVIRONMENTAL TESTS** (Vishay Performance vs. MIL-PRF-55342 Requirements)

| ENVIRONMENTAL TEST                         | LIMITS MIL-PRF-55342 CHARACTERISTIC "H" | TYPICAL VISHAY PERFORMANCE |
|--|---|----------------------------|
| Resistance Temperature Characteristic      | ± 50 ppm/°C                             | ± 35 ppm/°C                |
| Max. Ambient Temperature at Rated Wattage  | +70 °C                                  | +70 °C                     |
| Max. Ambient Temperature at Power Derating | +150 °C                                 | +150 °C                    |
| Thermal Shock                              | ΔR ± 0.25 %                             | ± 0.040 %                  |
| Low Temperature Operation                  | ΔR ± 0.25 %                             | ± 0.005 %                  |
| Short Time Overload                        | ΔR ± 0.10 %                             | ± 0.010 %                  |
| High Temperature Exposure                  | ΔR ± 0.20 %                             | ± 0.150 %                  |
| Resistance to Bonding Exposure             | ΔR ± 0.25 %                             | ± 0.005 %                  |
| Moisture Resistance                        | ΔR ± 0.40 %                             | ± 0.029 %                  |
| Life + 70 °C at 1000 hours                 | ΔR ± 0.50 %                             | ± 0.03 %                   |
| Insulation Resistance                      | 10 000 Ω minimum                        | > 100 000 MΩ               |



### GLOBAL PART NUMBER INFORMATION

| <b>P</b>                            | <b>N</b>   | <b>M</b>   | <b>1</b>   | <b>2</b> | <b>0</b> | <b>6</b>  | <b>E</b>  | <b>1</b> | <b>0</b>  | <b>0</b> | <b>2</b> | <b>B</b> | <b>B</b> | <b>T</b> | <b>1</b> |
|-------------------------------------|--|--|--|----------|----------|---|---|----------|---|----------|----------|----------|----------|----------|----------|
| GLOBAL MODEL                        | CASE SIZE  | TCR CHARACTERISTIC   | RESISTANCE   |          |          | TOLERANCE   | TERMINATION   |          | PACKAGING   |          |          |          |          |          |          |
| <b>PNM</b><br>non-magnetic resistor | <b>0402</b><br><b>0502</b><br><b>0505</b><br><b>0603</b><br><b>0805</b><br><b>1005</b><br><b>1010</b><br><b>1206</b><br><b>1505</b><br><b>2208</b><br><b>2010</b><br><b>2512</b> | <b>E</b> = 25 ppm<br>( $R > 100 \Omega$ )<br><b>H</b> = 50 ppm<br>( $R > 50 \Omega$ )<br><b>K</b> = 100 ppm<br>( $R > 10 \Omega$ ) | The first 3 digits are significant figures and the last digit specifies the number of zeros to follow. "R" designates the decimal point.<br><br>Example:<br>10R0 = 10 $\Omega$<br>1000 = 100 $\Omega$<br>1001 = 1 k $\Omega$ |          |          | <b>B</b> = $\pm 0.1\%$ <sup>(1)</sup><br><b>D</b> = $\pm 0.5\%$<br><b>F</b> = $\pm 1\%$<br><b>G</b> = $\pm 2\%$<br><b>J</b> = $\pm 5\%$ | <b>B</b> = wraparound Sn/Pb solder<br>63 % Sn/ 37 % Pb<br><b>S</b> = wraparound lead (Pb)-free solder<br>96.5 % Sn/3.0 % Ag/<br>0.5 % Cu<br>RoHS compliant - e1 |          | <b>BS</b> = BULK<br>100 min., 1 mult<br><b>WS</b> = WAFFLE<br>100 min., 1 mult<br><br>TAPE AND REEL<br><b>T0</b> = 100 min., 100 mult<br><b>T1</b> = 1000 min., 1000 mult <sup>(2)</sup><br><b>T3</b> = 300 min., 300 mult<br><b>T5</b> = 500 min., 500 mult<br><b>TF</b> = Full reel<br><b>TS</b> = 100 min., 1 mult |          |          |          |          |          |          |

**Notes**

- (1) B = 0.1 % tolerance available only above 100  $\Omega$
- (2) Preferred packaging code



## Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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 in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

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. Product names and markings noted herein may be trademarks of their respective owners.