

## Commercial Thin Film Chip Resistor, Surface-Mount Chip


 Actual Size  
1505

These chip resistors are available in both “top side” and “wraparound” termination styles in a variety of sizes. They incorporate self passivated, enhanced Tantalum Nitride films, to give superior performance on moisture resistance, voltage coefficient, power handling and resistance stability. The terminations consist of an adhesion layer, a leach resistant nickel barrier, and solder coating. This product will out-perform all requirements of characteristic E of MIL-PRF-55342.

### CONSTRUCTION



### FEATURES

- Moisture resistant
- High purity alumina substrate
- Non-standard values available
- Will pass +85 °C, 85 % relative humidity and 10 % rated power
- 100 % visual inspected per MIL-PRF-55342
- Non-inductive
- Very low noise and voltage coefficient (< -30 dB)
- Laser-trimmed tolerances to  $\pm 0.05$  %
- Wraparound resistance less than 10 m $\Omega$
- Epoxy bondable termination available
- Sulfur resistant (per ASTM B809-95 humid vapor test)
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS\***  
Available

**HALOGEN  
FREE**  
Available

**GREEN  
(5-2008)**  
Available

### 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  | 10       |
| TOL. | 0.05     |

### STANDARD ELECTRICAL SPECIFICATIONS

| TEST                           | SPECIFICATIONS  | CONDITIONS                            |
|--------------------------------|---|---------------------------------------|
| Material                       | Tantalum nitride  | -                                     |
| Resistance Range               | 1.0 $\Omega$ to 3 M $\Omega$                              | -                                     |
| TCR: Absolute                  | $\pm 10$ ppm/ $^{\circ}$ C to $\pm 100$ ppm/ $^{\circ}$ C | -55 $^{\circ}$ C to +125 $^{\circ}$ C |
| Tolerance: Absolute            | $\pm 0.05$ % to $\pm 5$ %                                 | +25 $^{\circ}$ C                      |
| Stability: Absolute            | $\Delta R \pm 0.03$ %                                     | 2000 h at 70 $^{\circ}$ C             |
| Stability: Ratio               | -   | -                                     |
| Voltage Coefficient            | 0.1 ppm/V   | -                                     |
| Working Voltage                | 75 V to 200 V   | -                                     |
| Operating Temperature Range    | -55 $^{\circ}$ C to +155 $^{\circ}$ C                     | -                                     |
| Storage Temperature Range      | -55 $^{\circ}$ C to +155 $^{\circ}$ C                     | -                                     |
| Noise                          | < -30 dB  | -                                     |
| Shelf Life Stability: Absolute | -   | -                                     |

### COMPONENT RATINGS

| CASE SIZE <sup>(1)</sup> | POWER RATING (mW) | WORKING VOLTAGE (V) | RESISTANCE RANGE ( $\Omega$ ) |
|--------------------------|-------------------|---------------------|-------------------------------|
| 0402                     | 50                | 75                  | 1.5 to 51.1K                  |
| 0502                     | 100               | 75                  | 1.5 to 65K                    |
| 0505                     | 150               | 75                  | 10 to 130K                    |
| 0603                     | 150               | 75                  | 1.5 to 130K                   |
| 0705                     | 200               | 100                 | 1.0 to 310K                   |
| 0805                     | 200               | 100                 | 1.0 to 310K                   |
| 1005                     | 250               | 100                 | 1.5 to 360K                   |
| 1010                     | 500               | 150                 | 1.0 to 600K                   |
| 1206                     | 400               | 200                 | 1.5 to 1M                     |
| 1505                     | 400               | 150                 | 1.25 to 1M                    |
| 2208                     | 750               | 150                 | 2.0 to 1.75M                  |
| 2010                     | 800               | 200                 | 1.0 to 2M                     |
| 2512 <sup>(2)</sup>      | 2000              | 200                 | 1.5 to 3M                     |

### Notes

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

<sup>(2)</sup> Reference environmental tests table for short time overload test parameters

**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 | 0.016 ± 0.008           | 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)

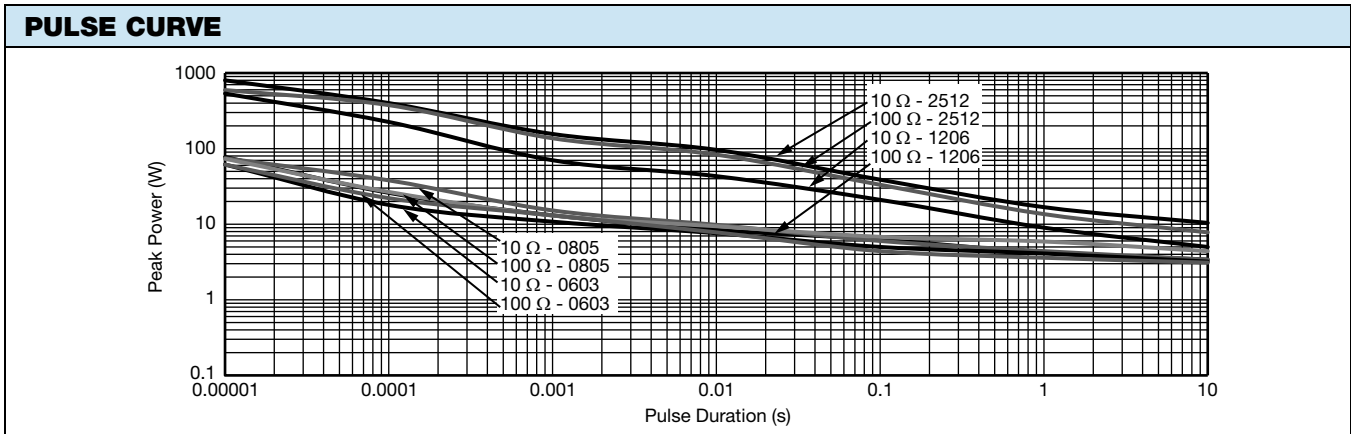
| ENVIRONMENTAL TEST                            | LIMITS MIL-PRF-55342 CHARACTERISTIC "E" | TYPICAL VISHAY PERFORMANCE |
|---|---|----------------------------|
| Resistance Temperature Characteristic         | ± 25 ppm/°C                             | ± 15 ppm/°C                |
| Max. Ambient Temp. at Rated Wattage           | +70 °C                                  | +70 °C                     |
| Max. Ambient Temp. at Power Derating          | +150 °C                                 | +150 °C                    |
| Thermal Shock $\Delta R$                      | ± 0.1 %                                 | ± 0.040 %                  |
| Low Temperature Operation $\Delta R$          | ± 0.1 %                                 | ± 0.001 %                  |
| Short Time Overload <sup>(1)</sup> $\Delta R$ | ± 0.10 %                                | ± 0.002 %                  |
| High Temperature Exposure $\Delta R$          | ± 0.1 %                                 | ± 0.04 %                   |
| Resistance to Soldering Heat $\Delta R$       | ± 0.2 %                                 | ± 0.008 %                  |
| Moisture Resistance $\Delta R$                | ± 0.2 %                                 | ± 0.004 %                  |
| Life +70 °C at 1000 h $\Delta R$              | ± 0.50 %                                | ± 0.02 %                   |
| Insulation Resistance                         | 10 000 $\Omega$ minimum                 | > 100 000 M $\Omega$       |

**Note**

<sup>(1)</sup> 2512 short time overload test is based on 1 W power level below critical value of 20 k $\Omega$

**FILM LOAD LIFE STABILITY** (at +125 °C)

**DERATING CURVE**

### GLOBAL PART NUMBER INFORMATION

New Global Part Numbering: **PTN1206E1002BBT1**

|          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>P</b> | <b>T</b> | <b>N</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>PTN</b>   | <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>D</b> = ± 15 ppm/°C <sup>(1)</sup><br><b>E</b> = ± 25 ppm/°C <sup>(2)</sup><br><b>H</b> = ± 50 ppm/°C <sup>(2)</sup><br><b>K</b> = ± 100 ppm/°C<br><b>L</b> = ± 200 ppm/°C<br><b>Y</b> = ± 10 ppm/°C <sup>(3)</sup> | 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 Ω<br>1000 = 100 Ω<br>1001 = 1 kΩ | <b>A</b> = ± 0.05 % <sup>(4)</sup><br><b>B</b> = ± 0.1 %<br><b>D</b> = ± 0.5 %<br><b>F</b> = ± 1 %<br><b>G</b> = ± 2 %<br><b>J</b> = ± 5 % | <b>B</b> = wraparound Sn/Pb solder Sn63 w/nickel barrier<br><b>G</b> = wraparound Au over Ni (gold) termination epoxy bondable RoHS-compliant - e4<br><b>S</b> = wraparound electroplated 100 % pure matte tin RoHS-compliant - e3 | <b>BS</b> = BULK 100 min., 1 mult.<br><b>WO</b> = WAFFLE 100 min., 100 mult.<br><b>WS</b> = WAFFLE 100 min., 1 mult.<br><b>WI</b> = 100 min., 1 mult. (item single lot date code)<br><b>WP</b> = 100 min., 1 mult. (package unit single lot date code)<br><br><b>TAPE AND REEL</b><br><b>T0</b> = 100 min., 100 mult.<br><b>T1</b> = 1000 min., 1000 mult. <sup>(5)</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.<br><b>TI</b> = 100 min., 1 mult. (item single lot date code)<br><b>TP</b> = 100 min., 1 mult. (package unit single lot date code) |

**Historical Part Number example: PTN0805H8801BBT (for reference purposes only)**

|            |             |                    |             |           |             |           |
|------------|-------------|--------------------|-------------|-----------|-------------|-----------|
| <b>PTN</b> | <b>0805</b> | <b>H</b>           | <b>8801</b> | <b>B</b>  | <b>B</b>    | <b>T</b>  |
| STYLE      | CASE SIZE   | TCR CHARACTERISTIC | OHMIC VALUE | TOLERANCE | TERMINATION | PACKAGING |

**Notes**

- (1) Not available below 50 Ω
- (2) Not available below 10 Ω
- (3) Not available below 100 Ω
- (4) Only available in ≥ 1 kΩ
- (5) Preferred packaging code

| RESISTANCE     | TCR (ppm/°C)             | TOLERANCE (%)           |
|----------------|--------------------------|-------------------------|
| 10 Ω to 49.9 Ω | 25, 50, 100, 200         | 0.1, 0.5, 1, 2, 5       |
| 50 Ω to 99 Ω   | 15, 25, 50, 100, 200     | 0.1, 0.5, 1, 2, 5       |
| 100 Ω to 999 Ω | 10, 15, 25, 50, 100, 200 | 0.1, 0.5, 1, 2, 5       |
| 1 kΩ to 3 MΩ   | 10, 15, 25, 50, 100, 200 | 0.05, 0.1, 0.5, 1, 2, 5 |
| 5 Ω to 10 Ω    | 100, 200                 | 1, 2, 5                 |
| 1.0 Ω to 5 Ω   | 200                      | 1, 2, 5                 |



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