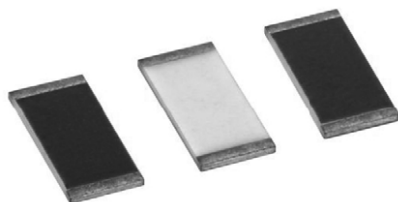
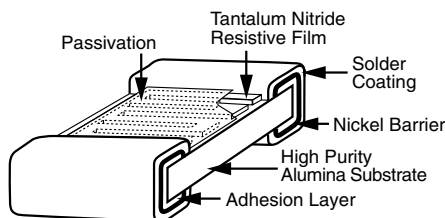


## Precision Automotive Thin Film Chip Resistors, AEC-Q200 Qualified, Hi-Rel COTS



These chip resistors are available in wraparound terminations styles in 8 case sizes. They incorporate self passivated enhanced tantalum nitride resistor film to give superior performance on moisture resistance, electrostatic discharge, voltage coefficient, power handling and resistance stability. The terminations consist of an adhesion layer, a leach resistant nickel barrier, and solder coating. Both, lead (Pb)-free solder (standard) and tin / lead solder (non-standard) options are available. This product will out-perform all requirements of AEC-Q200. Additional custom lot screening per MIL-PRF-55342 available upon request. Contact product marketing for an estimate.

### CONSTRUCTION



### FEATURES

- Resistance range: 2.5  $\Omega$  to 3 M $\Omega$
- AEC-Q200 qualified
- AEC-Q200 ESD rated class 1C (2 kV)
- Laser trimmed to any value
- Moisture resistant to MIL-STD-202, method 202
- Tantalum nitride resistor film on high purity alumina substrate
- 100 % visual inspected per MIL-PRF-55342
- 2 kV (HBM) ESD rating
- Sn / Pb solder version available
- Laser-trimmed tolerances to  $\pm 0.1$  %
- Load life stability < 0.05 % at 1000 h at 70 °C
- Very low noise and voltage coefficient (< -30 dB, < 0.1 ppm/V)
- 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)

### 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


**RoHS\***  
Available

**HALOGEN  
FREE**  
**GREEN**  
(5-2008)  
Available

### TYPICAL PERFORMANCE

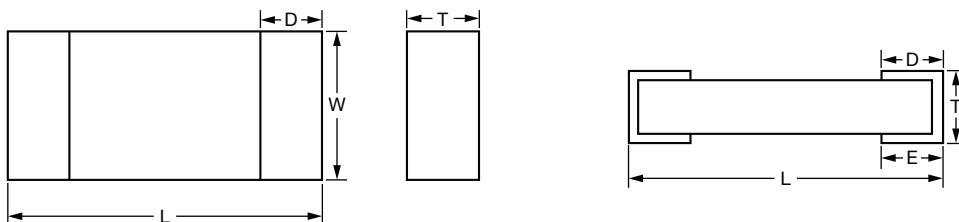
|      | ABSOLUTE |
|------|----------|
| TCR  | 25       |
| TOL. | 0.1      |

### STANDARD ELECTRICAL SPECIFICATIONS

| TEST                           | SPECIFICATIONS                                            | CONDITIONS                            |
|--------------------------------|-----------------------------------------------------------|---------------------------------------|
| Material                       | Tantalum nitride                                          | -                                     |
| Resistance Range               | 2.5 $\Omega$ to 3 M $\Omega$                              | -                                     |
| TCR: Absolute                  | $\pm 25$ ppm/ $^{\circ}$ C to $\pm 100$ ppm/ $^{\circ}$ C | -55 $^{\circ}$ C to +125 $^{\circ}$ C |
| Tolerance: Absolute            | $\pm 0.1$ % to $\pm 1.0$ %                                | +25 $^{\circ}$ C                      |
| Stability: Absolute            | $\pm 0.05$ %                                              | 2000 h at 70 $^{\circ}$ C rated power |
| Stability: Ratio               | Not applicable                                            | -                                     |
| Voltage Coefficient            | Less than 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 | 100 ppm                                                   | 1 year at 25 $^{\circ}$ C             |

### COMPONENT RATINGS

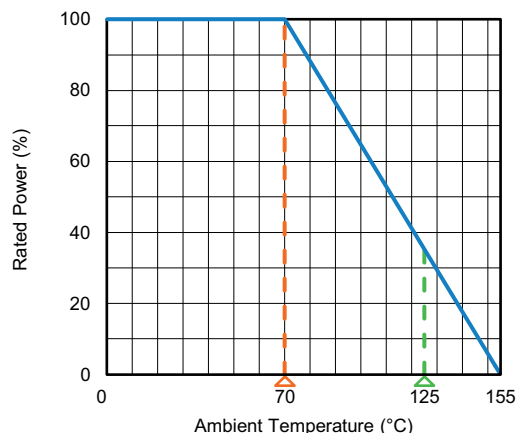
| CASE SIZE | POWER RATING (mW) | WORKING VOLTAGE (V) | RESISTANCE RANGE ( $\Omega$ ) |
|-----------|-------------------|---------------------|-------------------------------|
| 0402      | 50                | 75                  | 20 to 51K                     |
| 0603      | 150               | 75                  | 2.5 to 130K                   |
| 0805      | 200               | 100                 | 10 to 301K                    |
| 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                      |

**DIMENSIONS** in inches


| CASE SIZE | L             | W             | T             | D                       | E                       |
|-----------|---------------|---------------|---------------|-------------------------|-------------------------|
| 0402      | 0.041 ± 0.003 | 0.022 ± 0.003 | 0.015 ± 0.003 | 0.010 ± 0.005           | 0.010 ± 0.005           |
| 0603      | 0.064 ± 0.006 | 0.032 ± 0.005 | 0.015 ± 0.003 | 0.012 ± 0.005           | 0.015 ± 0.005           |
| 0805      | 0.080 ± 0.006 | 0.050 ± 0.005 | 0.015 ± 0.003 | 0.015 ± 0.005           | 0.015 ± 0.005           |
| 1206      | 0.126 ± 0.008 | 0.063 ± 0.005 | 0.015 ± 0.003 | 0.020 ± 0.005 / - 0.010 | 0.020 ± 0.005 / - 0.010 |
| 1505      | 0.155 ± 0.007 | 0.050 ± 0.005 | 0.015 ± 0.003 | 0.015 ± 0.005           | 0.015 ± 0.005           |
| 2010      | 0.209 ± 0.009 | 0.098 ± 0.005 | 0.015 ± 0.003 | 0.020 ± 0.005           | 0.020 ± 0.005           |
| 2208      | 0.230 ± 0.007 | 0.075 ± 0.005 | 0.015 ± 0.003 | 0.020 ± 0.005           | 0.020 ± 0.005           |
| 2512      | 0.259 ± 0.009 | 0.124 ± 0.005 | 0.015 ± 0.003 | 0.020 ± 0.005           | 0.020 ± 0.005           |

**ENVIRONMENTAL TESTS** (Vishay Performance vs. AEC-Q200 Requirements)

| ENVIRONMENTAL TEST                      | CONDITIONS                                         | LIMITS PER AEC-Q200 | TYPICAL VISHAY PERFORMANCE |
|-----------------------------------------|----------------------------------------------------|---------------------|----------------------------|
| Resistance Temperature Characteristic   | -55 °C to +125 °C                                  | ± 50 ppm/°C         | ± 35 ppm/°C                |
| Max. Ambient Temp. at Rated Wattage     |                                                    | +70 °C              | +70 °C                     |
| Max. Ambient Temp. at Power Derating    |                                                    | +150 °C             | +150 °C                    |
| High Temperature Storage $\Delta R$     | MIL-STD-202, 108, 1000 h at 125 °C                 | ± 0.1 %             | + 0.016 %                  |
| Temperature Cycling $\Delta R$          | JESD22, JA-104, 1000 cycles, -55 °C to +125 °C     | ± 0.15 %            | + 0.013 %                  |
| Moisture Resistance $\Delta R$          | MIL-STD-202, 106                                   | ± 0.20 %            | + 0.0010 %                 |
| Biased Humidity $\Delta R$              | MIL-STD-202, 103, 1000 h at 85 °C, 85 % RH, 10 % P | ± 0.10 %            | + 0.004 %                  |
| Life $\Delta R$                         | MIL-STD-202, 108 at 125 °C, 1000 h                 | ± 0.1 %             | + 0.0220 %                 |
| Mechanical Shock $\Delta R$             | MIL-STD-202, method 213, condition C               | ± 0.1 %             | + 0.004 %                  |
| Vibration $\Delta R$                    | MIL-STD-202 method 204, 10 Hz to 2 kHz             | ± 0.1 %             | + 0.0030 %                 |
| Resistance to Soldering Heat $\Delta R$ | MIL-STD-202 method 210, condition D                | ± 0.10 %            | + 0.0150 %                 |
| Electrostatic Discharge $\Delta R$      | AEC-Q200-002 at 2 kV, human body                   | ± 0.10 %            | - 0.032 %                  |
| Solderability                           | Visual                                             | 95 %                | Acceptable                 |
| Terminal Strength $\Delta R$            | AEC-Q200-006 at 1 kg for 60 s                      | ± 0.10 %            | + 0.009 %                  |
| Flame Retardance                        | Visual                                             |                     | Acceptable                 |

**DERATING CURVE**


**GLOBAL PART NUMBER INFORMATION**

New Global Part Numbering: PAT1206E1002BST1

|                     |                                                                                                                      |                                                                                                                                                                    |          |                                                                                                                                                                                                                               |          |                                                                                                                                |          |                                                                                                                |          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |          |          |          |          |          |
|---------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|
| <b>P</b>            | <b>A</b>                                                                                                             | <b>T</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>S</b> | <b>T</b> | <b>1</b> |
| <b>GLOBAL MODEL</b> | <b>CASE SIZE</b>                                                                                                     | <b>TCR CHARACTERISTIC</b>                                                                                                                                          |          | <b>RESISTANCE</b>                                                                                                                                                                                                             |          | <b>TOLERANCE</b>                                                                                                               |          | <b>TERMINATION</b>                                                                                             |          | <b>PACKAGING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |          |          |          |          |          |
| <b>PAT</b>          | <b>0402</b><br><b>0603</b><br><b>0805</b><br><b>1206</b><br><b>1505</b><br><b>2010</b><br><b>2208</b><br><b>2512</b> | <b>E</b> = $\pm 25$ ppm/ $^{\circ}$ C<br><b>H</b> = $\pm 50$ ppm/ $^{\circ}$ C<br><b>K</b> = $\pm 100$ ppm/ $^{\circ}$ C<br><b>L</b> = $\pm 200$ ppm/ $^{\circ}$ C |          | 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>1002 = 10 k $\Omega$ |          | <b>B</b> = $\pm 0.1$ %<br><b>D</b> = $\pm 0.5$ %<br><b>F</b> = $\pm 1.0$ %<br><b>G</b> = $\pm 2.0$ %<br><b>J</b> = $\pm 5.0$ % |          | <b>S</b> = wraparound lead (Pb)-free solder w/nickel barrier<br><b>B</b> = wraparound Sn / Pb w/nickel barrier |          | <b>BULK</b><br><b>BS</b> = 100 min., 1 mult.<br><br><b>WAFFLE</b><br><b>WS</b> = 100 min., 1 mult.<br><b>W0</b> = 100 min., 100 mult.<br><b>W1</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.<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) |          |          |          |          |          |

**Note**

(1) Preferred packaging code

| <b>RESISTANCE</b>           | <b>TCR (ppm/<math>^{\circ}</math>C)</b> | <b>TOLERANCE (%)</b> |
|-----------------------------|-----------------------------------------|----------------------|
| 10 $\Omega$ to 1 M $\Omega$ | 25, 50, 100, 200                        | 0.1, 0.5, 1, 2, 5    |
| 5 $\Omega$ to 10 $\Omega$   | 100, 200                                | 1, 2, 5              |
| 1.0 $\Omega$ to 5 $\Omega$  | 200                                     | 1, 2, 5              |



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