

## Ultra Precision Thin Film MELF Resistors



### FEATURES

- Most advanced thin film technology
- Long term stability down to 0.02 %
- TCR down to  $\pm 5$  ppm/K
- High precision tolerance down to  $\pm 0.02$  %
- Operating voltage 350 V for UMB 0207
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**  
**GREEN**  
(5-2008)

### LINKS TO ADDITIONAL RESOURCES



UMA 0204 and UMB 0207 ultra precision thin film MELF resistors combine the proven reliability of precision MELF products with the most advanced level of precision and stability first achieved with axial thin film precision resistors. This unique combination makes the product perfectly suited for all applications with outstanding requirements towards reliable precision and stability.

### APPLICATIONS

- Measuring and calibration equipment
- Industrial process control systems
- Space and aircraft electronics
- Medical equipment

| TECHNICAL SPECIFICATIONS                                              |                                                       |                                |
|-----------------------------------------------------------------------|-------------------------------------------------------|--------------------------------|
| DESCRIPTION                                                           | UMA 0204                                              | UMB 0207                       |
| DIN size                                                              | 0204                                                  | 0207                           |
| Metric size code                                                      | RC3715M                                               | RC6123M                        |
| Resistance range                                                      | 10 $\Omega$ to 332 k $\Omega$                         | 100 $\Omega$ to 390 k $\Omega$ |
| Resistance tolerance                                                  | $\pm 0.25$ %; $\pm 0.1$ %; $\pm 0.05$ %; $\pm 0.02$ % |                                |
| Temperature coefficient                                               | $\pm 15$ ppm/K; $\pm 10$ ppm/K; $\pm 5$ ppm/K         |                                |
| Rated dissipation, $P_{70}$ <sup>(1)</sup>                            | 0.25 W                                                | 0.4 W                          |
| Operating voltage, $U_{max}$ AC <sub>RMS</sub> /DC                    | 200 V                                                 | 350 V                          |
| Permissible film temperature, $\vartheta_{max}$ <sup>(1)</sup>        | 125 °C                                                |                                |
| Operating temperature range <sup>(1)</sup>                            | -55 °C to 125 °C                                      |                                |
| Permissible voltage against ambient (insulation):<br>1 min; $U_{ins}$ | 300 V                                                 | 500 V                          |
| Internal thermal resistance <sup>(1)</sup>                            | 46 K/W                                                | 26 K/W                         |
| Failure rate: FIT <sub>observed</sub>                                 | $\leq 0.05 \times 10^{-9}/h$                          |                                |

#### Note

<sup>(1)</sup> Please refer to APPLICATION INFORMATION below

### APPLICATION INFORMATION

When the resistor dissipates power, a temperature rise above the ambient temperature occurs, dependent on the thermal resistance of the assembled resistor together with the printed circuit board. The rated dissipation applies only if the permitted film temperature is not exceeded.

Please consider the application note “Thermal Management in Surface-Mounted Resistor Applications” ([www.vishay.com/doc?28844](http://www.vishay.com/doc?28844)) for information on the general nature of thermal resistance.

These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.



| MAXIMUM RESISTANCE CHANGE AT RATED DISSIPATION                                 |           |                                |                                |
|--------------------------------------------------------------------------------|-----------|--------------------------------|--------------------------------|
| OPERATION MODE                                                                 |           | PRECISION                      | STANDARD                       |
| Rated dissipation, $P_{70}$                                                    | UMA 0204  | 0.07 W                         | 0.25 W                         |
|                                                                                | UMB 0207  | 0.11 W                         | 0.4 W                          |
| Operating temperature range                                                    |           | -55 °C to 85 °C                | -55 °C to 125 °C               |
| Permissible film temperature, $\vartheta_f$ max.                               |           | 85 °C                          | 125 °C                         |
| Max. resistance change at $P_{70}$ for resistance range, $ \Delta R/R $ after: | UMA 0204  | 10 $\Omega$ to 332 k $\Omega$  | 10 $\Omega$ to 332 k $\Omega$  |
|                                                                                | UMB 0207  | 100 $\Omega$ to 390 k $\Omega$ | 100 $\Omega$ to 390 k $\Omega$ |
|                                                                                | 1000 h    | $\leq 0.02$ %                  | $\leq 0.05$ %                  |
|                                                                                | 8000 h    | $\leq 0.05$ %                  | $\leq 0.1$ %                   |
|                                                                                | 225 000 h | $\leq 0.15$ %                  | $\leq 0.3$ %                   |

| TEMPERATURE COEFFICIENT AND RESISTANCE RANGE <sup>(1)</sup> |                |              |                                |           |
|-------------------------------------------------------------|----------------|--------------|--------------------------------|-----------|
| TYPE / SIZE                                                 | TCR            | TOLERANCE    | RESISTANCE                     | E-SERIES  |
| UMA 0204                                                    | $\pm 15$ ppm/K | $\pm 0.05$ % | 47 $\Omega$ to 332 k $\Omega$  | E24; E192 |
|                                                             | $\pm 10$ ppm/K | $\pm 0.25$ % | 10 $\Omega$ to 332 k $\Omega$  |           |
|                                                             |                | $\pm 0.1$ %  | 43 $\Omega$ to 332 k $\Omega$  |           |
|                                                             |                | $\pm 0.05$ % | 75 $\Omega$ to 221 k $\Omega$  |           |
|                                                             | $\pm 5$ ppm/K  | $\pm 0.25$ % | 33 $\Omega$ to 221 k $\Omega$  |           |
|                                                             |                | $\pm 0.1$ %  | 56 $\Omega$ to 221 k $\Omega$  |           |
|                                                             |                | $\pm 0.05$ % | 75 $\Omega$ to 150 k $\Omega$  |           |
|                                                             |                | $\pm 0.02$ % | 75 $\Omega$ to 100 k $\Omega$  |           |
| UMB 0207                                                    | $\pm 15$ ppm/K | $\pm 0.05$ % | 100 $\Omega$ to 390 k $\Omega$ |           |
|                                                             | $\pm 10$ ppm/K | $\pm 0.25$ % | 100 $\Omega$ to 390 k $\Omega$ |           |
|                                                             |                | $\pm 0.1$ %  | 100 $\Omega$ to 390 k $\Omega$ |           |
|                                                             |                | $\pm 0.05$ % | 100 $\Omega$ to 390 k $\Omega$ |           |
|                                                             | $\pm 5$ ppm/K  | $\pm 0.25$ % | 270 $\Omega$ to 390 k $\Omega$ |           |
|                                                             |                | $\pm 0.1$ %  | 270 $\Omega$ to 390 k $\Omega$ |           |
|                                                             |                | $\pm 0.05$ % | 270 $\Omega$ to 390 k $\Omega$ |           |
|                                                             |                | $\pm 0.02$ % | 270 $\Omega$ to 390 k $\Omega$ |           |

**Notes**

<sup>(1)</sup> For the approved IECQ-CECC resistance range, please refer to [www.vishay.com/doc?28945](http://www.vishay.com/doc?28945)

| PACKAGING   |         |          |                                                   |       |       |                            |
|-------------|---------|----------|---------------------------------------------------|-------|-------|----------------------------|
| TYPE / SIZE | CODE    | QUANTITY | PACKAGING STYLE                                   | WIDTH | PITCH | PACKAGING DIMENSIONS       |
| UMA 0204    | AU      | 100      | Antistatic blister tape acc. IEC 60286-3, Type 2a | 8 mm  | 4 mm  | Box                        |
|             | A1      | 1000     |                                                   |       |       | $\varnothing$ 180 mm / 7"  |
|             | A3 = AL | 3000     |                                                   |       |       | $\varnothing$ 330 mm / 13" |
|             | A0      | 10 000   |                                                   |       |       |                            |
| UMB 0207    | BU      | 100      | Antistatic blister tape acc. IEC 60286-3, Type 2a | 12 mm | 4 mm  | Box                        |
|             | B1      | 1000     |                                                   |       |       | $\varnothing$ 180 mm / 7"  |
|             | B2      | 2000     |                                                   |       |       | $\varnothing$ 330 mm / 13" |
|             | B7      | 7000     |                                                   |       |       |                            |



## PART NUMBER AND PRODUCT DESCRIPTION

Part Number: UMB02070F5620AB200

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| U | M | B | 0 | 2 | 0 | 7 | 0 | F | 5 | 6 | 2 | 0 | A | B | 2 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

|                      |
|----------------------|
| TYPE / SIZE          |
| UMA 0204<br>UMB 0207 |

|              |
|--------------|
| VERSION      |
| 0 = standard |

|                                                               |
|---------------------------------------------------------------|
| TCR                                                           |
| G = $\pm 5$ ppm/K<br>F = $\pm 10$ ppm/K<br>E = $\pm 15$ ppm/K |

|                                                                                                          |
|----------------------------------------------------------------------------------------------------------|
| RESISTANCE                                                                                               |
| 3 digit value<br>1 digit multiplier                                                                      |
| Multiplier                                                                                               |
| 9 = $\times 10^{-1}$<br>0 = $\times 10^0$<br>1 = $\times 10^1$<br>2 = $\times 10^2$<br>3 = $\times 10^3$ |

|                                                                             |
|-----------------------------------------------------------------------------|
| TOLERANCE                                                                   |
| H = $\pm 0.02$ %<br>A = $\pm 0.05$ %<br>B = $\pm 0.1$ %<br>C = $\pm 0.25$ % |

|                                              |
|----------------------------------------------|
| PACKAGING                                    |
| AU<br>A1<br>A3<br>A0<br>BU<br>B1<br>B2<br>B7 |

Product Description: UMB 0207-10 0.05 % B2 562R

|            |
|------------|
| UMB        |
| TYPE       |
| UMA<br>UMB |

|              |
|--------------|
| 0207         |
| SIZE         |
| 0204<br>0207 |

|                                                   |
|---------------------------------------------------|
| 10                                                |
| TCR                                               |
| $\pm 5$ ppm/K<br>$\pm 10$ ppm/K<br>$\pm 15$ ppm/K |

|                                                             |
|-------------------------------------------------------------|
| 0.05 %                                                      |
| TOLERANCE                                                   |
| $\pm 0.02$ %<br>$\pm 0.05$ %<br>$\pm 0.1$ %<br>$\pm 0.25$ % |

|                                              |
|----------------------------------------------|
| B2                                           |
| PACKAGING                                    |
| AU<br>A1<br>AL<br>A0<br>BU<br>B1<br>B2<br>B7 |

|                     |
|---------------------|
| 562R                |
| RESISTANCE          |
| 562R = 562 $\Omega$ |

### Note

- Products can be ordered using either the PART NUMBER or the PRODUCT DESCRIPTION



## DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of special metal alloy is deposited on a high grade ceramic body ( $\text{Al}_2\text{O}_3$ ) and conditioned to achieve the desired temperature coefficient. Nickel plated steel termination caps are firmly pressed on the metallized rods. A special laser is used to achieve the target value by smoothly cutting a helical groove in the resistive layer without damaging the ceramics. The resistor elements are covered by a unique protective coating designed for electrical, mechanical, and climatic protection. The terminations receive a final pure matte tin on nickel plating. Five color code rings designate the resistance value and tolerance in accordance with **IEC 60062** <sup>(1)</sup>.

The result of the determined production is verified by an extensive testing procedure and optical inspection performed on 100 % of the individual resistors. This includes full screening for the elimination of products with a potential risk of early field failures. Only accepted products are laid directly into the blister tape in accordance with **IEC 60286-3, Type 2a** <sup>(1)</sup>.

## ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapor phase as shown in **IEC 61760-1** <sup>(1)</sup>. 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, potting compounds and their processes, if applied, shall be qualified by appropriate means to ensure the long term stability of the whole system.

The resistors are completely lead (Pb)-free, the pure matte tin plating provides compatibility with lead (Pb)-free and lead containing soldering processes. Solderability is specified for 2 years after production or requalification, however, excellent solderability is proven after extended storage in excess of 10 years. The permitted storage time is 20 years. The immunity of the plating against tin whisker growth has been proven under extensive testing.

## MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein <sup>(2)</sup>
- The Global Automotive Declarable Substance List (GADSL) <sup>(3)</sup>
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) <sup>(4)</sup> for its supply chain

The products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see [www.vishay.com/how/leadfree](http://www.vishay.com/how/leadfree).

Hence the products fully comply with the following directives:

- 2000/53/EC End-of-Life Vehicle Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the Use of Hazardous Substances Directive (RoHS) with amendment 2015/863/EU
- 2012/19/EU Waste Electrical and Electronic Equipment Directive (WEEE)

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at [www.vishay.com/doc?49037](http://www.vishay.com/doc?49037).

## APPROVALS

Where applicable the resistors are approved within the IECQ-CECC Quality Assessment System for Electronic Components to the detail specification **EN 140401-803** which refers to **EN 60115-1**, **EN 60115-8** and the variety of environmental test procedures of the **IEC 60068** <sup>(1)</sup> series.

Conformity is attested by the use of the **CECC** logo (Ⓔ) as the mark of conformity on the package label.

Vishay Beyschlag has achieved “**Approval of Manufacturer**” in accordance with **IECQ 03-1**. The release certificate for “**Technology Approval Schedule**” in accordance with **CECC 240001** based on **IECQ 03-3-1** is granted for the Vishay Beyschlag manufacturing process.

## RELATED PRODUCTS

For products with a wider range of TCR, tolerance and resistance, see the datasheets:

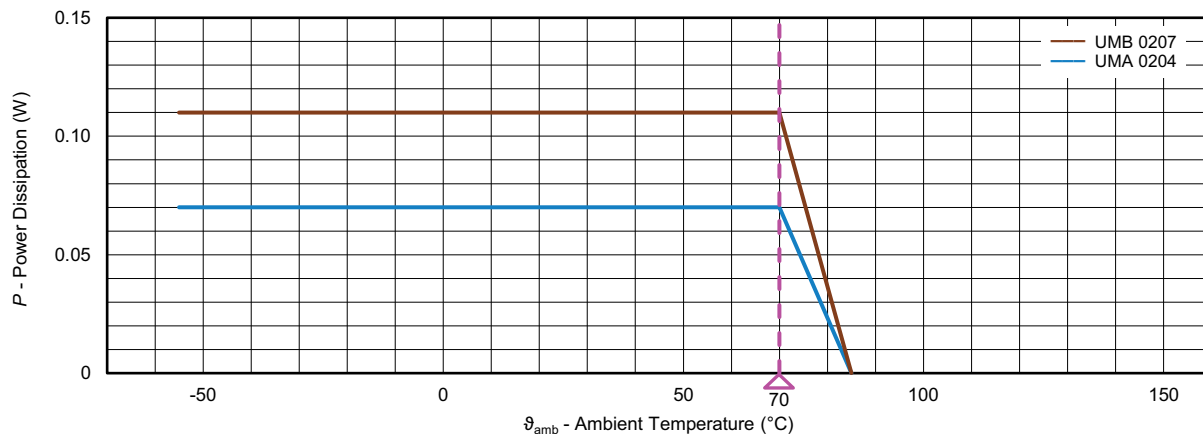
- “Professional Thin Film MELF Resistors”  
([www.vishay.com/doc?28713](http://www.vishay.com/doc?28713))
- “Precision Thin Film MELF Resistors”  
([www.vishay.com/doc?28714](http://www.vishay.com/doc?28714))

## Notes

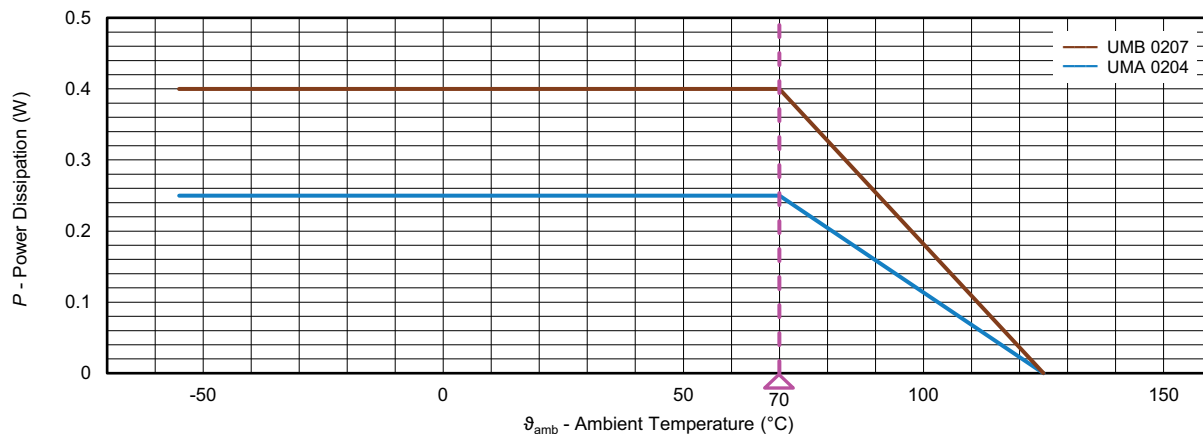
- (1) The quoted IEC standards are also released as EN standards with the same number and identical contents
- (2) The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at <http://std.iec.ch/iec62474>.
- (3) The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council and available at [www.gadsl.org](http://www.gadsl.org)
- (4) The SVHC list is maintained by the European Chemical Agency (ECHA) and available at <http://echa.europa.eu/candidate-list-table>



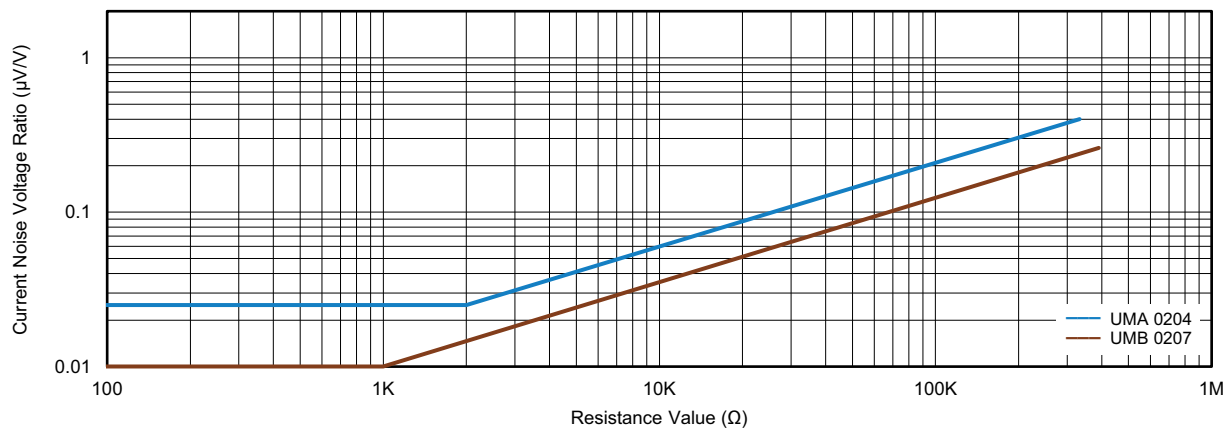
## FUNCTIONAL PERFORMANCE



### Derating - Precision Operation Mode



### Derating - Standard Operation Mode



### Current Noise - A<sub>1</sub>

**TESTS AND REQUIREMENTS**

All tests are carried out in accordance with the following specifications:

EN 60115-1, generic specification

EN 60115-8, sectional specification

EN 140401-803, detail specification

IEC 60068-2-xx, test methods

The components are approved under the IECQ-CECC quality assessment system for electronic components according to table "Temperature Coefficient and Resistance Range".

The parameters stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140401-803. The table presents only the most important tests, for the full test schedule refer to the documents listed above. However, some additional tests and a number of improvements against those minimum requirements have been included.

The testing also covers most of the requirements specified by EIA/ECA-703 and JIS-C-5201-1.

The tests are carried out under standard atmospheric conditions in accordance with IEC 60068-1, 4.3, whereupon the following values are applied:

Temperature: 15 °C to 35 °C

Relative humidity: 25 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar)

A climatic category LCT / UCT / 56 is applied, defined by the lower category temperature (LCT), the upper category temperature (UCT), and the duration of exposure in the damp heat, steady state test (56 days).

The components are mounted for testing on printed circuit boards in accordance with EN 60115-8, 2.4.2, unless otherwise specified.

| TEST PROCEDURES AND REQUIREMENTS |                             |                                              |                                                                                                                                                                         |                                                                                |                                                                               |                                                                               |
|----------------------------------|-----------------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| EN 60115-1 CLAUSE                | IEC 60068-2 (1) TEST METHOD | TEST                                         | PROCEDURE                                                                                                                                                               | REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R$ )                                 |                                                                               |                                                                               |
|                                  |                             |                                              | Stability for product types:                                                                                                                                            | <b>STABILITY CLASS 0.05 OR BETTER</b>                                          | <b>STABILITY CLASS 0.1 OR BETTER</b>                                          | <b>STABILITY CLASS 0.25 OR BETTER</b>                                         |
|                                  |                             |                                              | UMA 0204                                                                                                                                                                | 100 $\Omega$ to 100 k $\Omega$                                                 | 43 $\Omega$ to 221 k $\Omega$                                                 | 10 $\Omega$ to 332 k $\Omega$                                                 |
|                                  |                             |                                              | UMB 0207                                                                                                                                                                | 270 $\Omega$ to 100 k $\Omega$                                                 | 100 $\Omega$ to 390 k $\Omega$                                                | -                                                                             |
| 4.5                              | -                           | Resistance                                   | -                                                                                                                                                                       | $\pm 0.25 \% R$ ; $\pm 0.1 \% R$ ; $\pm 0.05 \% R$ ; $\pm 0.02 \% R$           |                                                                               |                                                                               |
| 4.8                              | -                           | Temperature coefficient                      | At (20/-10/20) °C and (20/85/20) °C                                                                                                                                     | $\pm 10$ ppm/K; $\pm 5$ ppm/K                                                  |                                                                               |                                                                               |
|                                  |                             |                                              | At (20/-55/20) °C and (20/125/20) °C                                                                                                                                    | $\pm 15$ ppm/K                                                                 |                                                                               |                                                                               |
| 4.25.1                           | -                           | Endurance at 70 °C: Precision operation mode | $U = \sqrt{P_{70}} \times \bar{R}$ or $U = U_{max}$ ; whichever is the less severe; 1.5 h on; 0.5 h off; 70 °C; 1000 h<br>70 °C; 8000 h                                 | $\pm (0.02 \% R + 1 \text{ m}\Omega)$<br>$\pm (0.05 \% R + 1 \text{ m}\Omega)$ |                                                                               |                                                                               |
|                                  |                             | Endurance at 70 °C: Standard operation mode  | $U = \sqrt{P_{70}} \times \bar{R}$ or $U = U_{max}$ ; whichever is the less severe; 1.5 h on; 0.5 h off; 70 °C; 1000 h<br>70 °C; 8000 h                                 | $\pm (0.05 \% R + 1 \text{ m}\Omega)$<br>$\pm (0.1 \% R + 1 \text{ m}\Omega)$  |                                                                               |                                                                               |
| 4.25.3                           | -                           | Endurance at upper category temperature      | 85 °C; 1000 h<br>125 °C; 1000 h                                                                                                                                         | $\pm (0.01 \% R + 1 \text{ m}\Omega)$<br>$\pm (0.05 \% R + 1 \text{ m}\Omega)$ | $\pm (0.05 \% R + 1 \text{ m}\Omega)$<br>$\pm (0.1 \% R + 1 \text{ m}\Omega)$ | $\pm (0.1 \% R + 1 \text{ m}\Omega)$<br>$\pm (0.15 \% R + 1 \text{ m}\Omega)$ |
| 4.24                             | 78 (Cab)                    | Damp heat, steady state                      | (40 $\pm$ 2) °C; 56 days; (93 $\pm$ 3) % RH                                                                                                                             | $\pm (0.03 \% R + 1 \text{ m}\Omega)$                                          | $\pm (0.05 \% R + 1 \text{ m}\Omega)$                                         | $\pm (0.1 \% R + 1 \text{ m}\Omega)$                                          |
| 4.37                             | 67 (Cy)                     | Damp heat, steady state, accelerated         | (85 $\pm$ 2) °C; (85 $\pm$ 5) % RH; $U = 0.3 \times \sqrt{P_{70}} \times \bar{R} \leq 100 \text{ V}$ and $U = 0.3 \times U_{max}$ ; (the smaller value is valid) 1000 h | $\pm (0.1 \% R + 1 \text{ m}\Omega)$                                           | $\pm (0.25 \% R + 1 \text{ m}\Omega)$                                         |                                                                               |

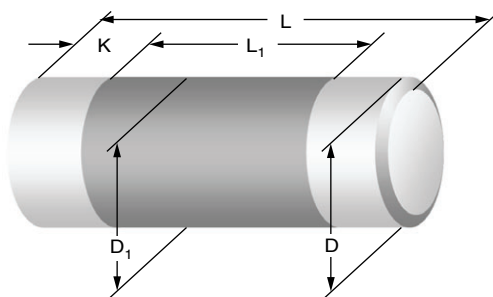
| TEST PROCEDURES AND REQUIREMENTS |                                                 |                                                                      |                                                                                                                                                                |                                                                                          |                                                                                          |                                                                                          |
|----------------------------------|-------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| EN<br>60115-1<br>CLAUSE          | IEC<br>60068-2 <sup>(1)</sup><br>TEST<br>METHOD | TEST                                                                 | PROCEDURE                                                                                                                                                      | REQUIREMENTS<br>PERMISSIBLE CHANGE ( $\Delta R$ )                                        |                                                                                          |                                                                                          |
|                                  |                                                 |                                                                      | Stability for product types:                                                                                                                                   | <b>STABILITY<br/>CLASS 0.05<br/>OR BETTER</b>                                            | <b>STABILITY<br/>CLASS 0.1<br/>OR BETTER</b>                                             | <b>STABILITY<br/>CLASS 0.25<br/>OR BETTER</b>                                            |
|                                  |                                                 |                                                                      | <b>UMA 0204</b>                                                                                                                                                | 100 $\Omega$ to 100 k $\Omega$                                                           | 43 $\Omega$ to 221 k $\Omega$                                                            | 10 $\Omega$ to 332 k $\Omega$                                                            |
|                                  |                                                 |                                                                      | <b>UMB 0207</b>                                                                                                                                                | 270 $\Omega$ to 100 k $\Omega$                                                           | 100 $\Omega$ to 390 k $\Omega$                                                           | -                                                                                        |
| 4.23                             |                                                 | Climatic<br>sequence:                                                |                                                                                                                                                                |                                                                                          |                                                                                          |                                                                                          |
| 4.23.2                           | 2 (Bb)                                          | Dry heat                                                             | UCT; 16 h                                                                                                                                                      |                                                                                          |                                                                                          |                                                                                          |
| 4.23.3                           | 30 (Db)                                         | Damp heat,<br>cyclic                                                 | 55 °C; 24 h; $\geq 90$ % RH;<br>1 cycle                                                                                                                        |                                                                                          |                                                                                          |                                                                                          |
| 4.23.4                           | 1 (Ab)                                          | Cold                                                                 | LCT; 2 h                                                                                                                                                       |                                                                                          |                                                                                          |                                                                                          |
| 4.23.5                           | 13 (M)                                          | Low air pressure                                                     | 8.5 kPa; 2 h; (25 $\pm$ 10) °C                                                                                                                                 |                                                                                          |                                                                                          |                                                                                          |
| 4.23.6                           | 30 (Db)                                         | Damp heat,<br>cyclic                                                 | 55 °C; 24 h; $\geq 90$ % RH;<br>5 cycles                                                                                                                       |                                                                                          |                                                                                          |                                                                                          |
| 4.23.7                           | -                                               | DC load                                                              | $U = \sqrt{P_{70} \times R} \leq U_{\max.};$<br>1 min.<br><br>LCT = -10 °C; UCT = 85 °C<br>LCT = -55 °C; UCT = 125 °C                                          | $\pm (0.03 \% R + 1 \text{ m}\Omega)$<br>-                                               | $\pm (0.05 \% R + 1 \text{ m}\Omega)$<br>-                                               | -<br>$\pm (0.1 \% R + 1 \text{ m}\Omega)$                                                |
| -                                | 1 (Aa)                                          | Cold                                                                 | -55 °C; 2 h                                                                                                                                                    | $\pm (0.02 \% R + 0.1 \text{ m}\Omega)$                                                  |                                                                                          |                                                                                          |
| 4.19                             | 14 (Na)                                         | Rapid change<br>of temperature                                       | 30 min at LCT;<br>30 min at UCT;<br>LCT = -10 °C; UCT = 85 °C<br><br>5 cycles<br>1000 cycles<br><br>LCT = -55 °C; UCT = 125 °C<br>5 cycles<br>1000 cycles      | $\pm (0.01 \% R + 1 \text{ m}\Omega)$<br>$\pm (0.05 \% R + 1 \text{ m}\Omega)$<br>-<br>- | $\pm (0.02 \% R + 1 \text{ m}\Omega)$<br>$\pm (0.05 \% R + 1 \text{ m}\Omega)$<br>-<br>- | -<br>-<br>$\pm (0.025 \% R + 1 \text{ m}\Omega)$<br>$\pm (0.1 \% R + 1 \text{ m}\Omega)$ |
| 4.13                             | -                                               | Short time<br>overload;<br>Precision<br>operation mode               | $U = 2.5 \times \sqrt{P_{70} \times R}$ or<br>$U = 2 \times U_{\max.};$<br>whichever is the less severe;<br>5 s                                                | $\pm (0.005 \% R + 1 \text{ m}\Omega)$                                                   | $\pm (0.01 \% R + 1 \text{ m}\Omega)$                                                    |                                                                                          |
|                                  |                                                 | Short time<br>overload;<br>Standard<br>operation mode                |                                                                                                                                                                | $\pm (0.01 \% R + 1 \text{ m}\Omega)$                                                    |                                                                                          |                                                                                          |
| 4.27                             | -                                               | Single pulse high<br>voltage overload;<br>Standard<br>operation mode | Severity no. 4:<br>$U = 10 \times \sqrt{P_{70} \times R}$ or<br>$U = 2 \times U_{\max.};$<br>whichever is the less severe;<br>10 pulses 10 $\mu$ s/700 $\mu$ s | $\pm (0.25 \% R + 5 \text{ m}\Omega)$                                                    |                                                                                          |                                                                                          |
| 4.39                             | -                                               | Periodic electric<br>overload;<br>Standard<br>operation mode         | $U = \sqrt{15 \times P_{70} \times R}$ or<br>$U = 2 \times U_{\max.};$<br>whichever is the less severe;<br>0.1 s on; 2.5 s off;<br>1000 cycles                 | $\pm (0.5 \% R + 5 \text{ m}\Omega)$                                                     |                                                                                          |                                                                                          |

| TEST PROCEDURES AND REQUIREMENTS |                                                 |                                                     |                                                                                                                                   |                                                                                               |                                              |                                               |
|----------------------------------|-------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------------------------------|
| EN<br>60115-1<br>CLAUSE          | IEC<br>60068-2 <sup>(1)</sup><br>TEST<br>METHOD | TEST                                                | PROCEDURE                                                                                                                         | REQUIREMENTS<br>PERMISSIBLE CHANGE ( $\Delta R$ )                                             |                                              |                                               |
|                                  |                                                 |                                                     | Stability for product types:                                                                                                      | <b>STABILITY<br/>CLASS 0.05<br/>OR BETTER</b>                                                 | <b>STABILITY<br/>CLASS 0.1<br/>OR BETTER</b> | <b>STABILITY<br/>CLASS 0.25<br/>OR BETTER</b> |
|                                  |                                                 |                                                     | <b>UMA 0204</b>                                                                                                                   | 100 $\Omega$ to 100 k $\Omega$                                                                | 43 $\Omega$ to 221 k $\Omega$                | 10 $\Omega$ to 332 k $\Omega$                 |
|                                  |                                                 |                                                     | <b>UMB 0207</b>                                                                                                                   | 270 $\Omega$ to 100 k $\Omega$                                                                | 100 $\Omega$ to 390 k $\Omega$               | -                                             |
| 4.22                             | 6 (Fc)                                          | Vibration                                           | Endurance by sweeping;<br>10 Hz to 2000 Hz;<br>no resonance; amplitude<br>$\leq 1.5$ mm or $\leq 200$ m/s <sup>2</sup> ;<br>7.5 h | $\pm (0.01 \% R + 1 \text{ m}\Omega)$                                                         |                                              |                                               |
| 4.38                             | -                                               | Electrostatic<br>discharge<br>(Human Body<br>Model) | IEC 61340-3-1 <sup>(1)</sup> ;<br>3 pos. + 3 neg. discharges<br>UMA 0204: 2 kV<br>UMB 0207: 4 kV                                  | $\pm (0.5 \% R + 50 \text{ m}\Omega)$                                                         |                                              |                                               |
| 4.17                             | 58 (Td)                                         | Solderability                                       | Solder bath method;<br>SnPb40; non-activated flux;<br>(215 $\pm$ 3) °C; (3 $\pm$ 0.3) s                                           | Good tinning ( $\geq 95 \%$ covered); no visible damage                                       |                                              |                                               |
|                                  |                                                 |                                                     | Solder bath method;<br>SnAg3Cu0.5 or SnAg3.5;<br>non-activated flux;<br>(235 $\pm$ 3) °C; (2 $\pm$ 0.2) s                         | Good tinning ( $\geq 95 \%$ covered); no visible damage                                       |                                              |                                               |
| 4.18                             | 58 (Td)                                         | Resistance to<br>soldering heat                     | Solder bath method;<br>(260 $\pm$ 5) °C; (2 $\pm$ 0.2) s                                                                          | <sup>(2)</sup>                                                                                |                                              | $\pm (0.05 \% R + 10 \text{ m}\Omega)$        |
|                                  |                                                 |                                                     | Reflow method 2<br>(IR/forced gas convection);<br>(260 $\pm$ 5) °C; (10 $\pm$ 1) s                                                | $\pm (0.01 \% R + 1 \text{ m}\Omega)$                                                         | $\pm (0.02 \% R + 1 \text{ m}\Omega)$        |                                               |
| 4.29                             | 45 (XA)                                         | Component<br>solvent<br>resistance                  | Isopropyl alcohol; 50 °C;<br>method 2                                                                                             | No visible damage                                                                             |                                              |                                               |
| 4.30                             | 45 (XA)                                         | Solvent<br>resistance of<br>marking                 | Isopropyl alcohol; 50 °C;<br>method 1, toothbrush                                                                                 | Marking legible; no visible damage                                                            |                                              |                                               |
| 4.32                             | 21 (Ue <sub>3</sub> )                           | Shear (adhesion)                                    | 45 N                                                                                                                              | No visible damage                                                                             |                                              |                                               |
| 4.33                             | 21 (Ue <sub>1</sub> )                           | Substrate<br>bending                                | Depth 2 mm, 3 times                                                                                                               | No visible damage, no open circuit in bent position<br>$\pm (0.02 \% R + 10 \text{ m}\Omega)$ |                                              | $\pm (0.05 \% R + 10 \text{ m}\Omega)$        |
| 4.7                              | -                                               | Voltage proof                                       | $U_{\text{RMS}} = U_{\text{ins}}$ ; 60 s                                                                                          | No flashover or breakdown                                                                     |                                              |                                               |
| 4.35                             | -                                               | Flammability                                        | IEC 60695-11-5 <sup>(1)</sup> ,<br>needle flame test; 10 s                                                                        | No burning after 30 s                                                                         |                                              |                                               |

**Notes**
<sup>(1)</sup> The quoted IEC standards are also released as EN standards with the same number and identical contents

<sup>(2)</sup> Wave soldering is not recommended

## DIMENSIONS



| DIMENSIONS AND MASS |                |               |                             |                        |            |              |
|---------------------|----------------|---------------|-----------------------------|------------------------|------------|--------------|
| TYPE / SIZE         | L<br>(mm)      | D<br>(mm)     | L <sub>1</sub> min.<br>(mm) | D <sub>1</sub><br>(mm) | K<br>(mm)  | MASS<br>(mg) |
| UMA 0204            | 3.6 + 0/- 0.2  | 1.4 + 0/- 0.1 | 1.8                         | D + 0/- 0.15           | 0.75 ± 0.1 | 22           |
| UMB 0207            | 5.8 + 0/- 0.15 | 2.2 + 0/- 0.2 | 3.2                         | D + 0/- 0.2            | 1.15 ± 0.1 | 80           |

### Notes

- Color code marking is applied according to IEC 60062 in five bands. Each color band appears as a single solid line, voids are permissible if at least  $\frac{2}{3}$  of the band is visible from each radial angle of view. The last color band for tolerance is approximately 50 % wider than the other bands. An interrupted band between the 4<sup>th</sup> and 5<sup>th</sup> full band indicates the temperature coefficient (orange = TCR 15 ppm/K, blue = TCR 10 ppm/K, violet = TCR 05 ppm/K)

(1) The quoted IEC standards are also released as EN standards with the same number and identical contents

## SOLDERING RECOMMENDATIONS

For recommended solder pad dimensions please refer to [www.vishay.com/doc?28950](http://www.vishay.com/doc?28950).

For recommended soldering profiles please refer to [www.vishay.com/doc?31090](http://www.vishay.com/doc?31090).



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