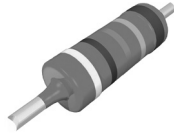


## Lead (Pb)-Free High Pulse Load Leaded Resistors



CBB 0207 leaded resistors with advanced pulse load capability, are the perfect choice for circuitries exposed to high levels of electromagnetic interference or electrostatic discharge. The resistors can also be used to protect the circuitry of signal and mains input lines from surge pulses. Applications are in all fields of automotive, telecommunication and industrial equipment.

### FEATURES

- Speciality product for EMC sensitive applications
- Special carbon film technology for maximum heat stress capability
- Up to 6 kV or 140 W pulse load capability
- Resistance range: 10  $\Omega$  to 1.5 M $\Omega$
- Lead (Pb)-free solder contacts
- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processes
- Compatible with "Restriction of the use of Hazardous Substances" (RoHS) directive 2002/95/EC (issue 2004)



### APPLICATIONS

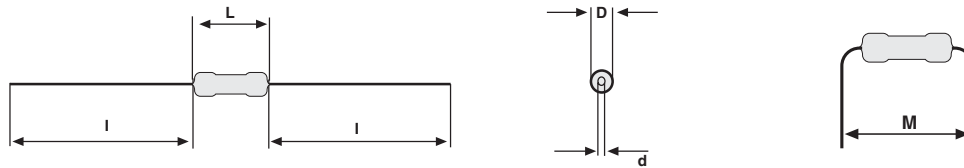
- Automotive
- Telecommunication
- Industrial equipment.

### METRIC SIZE

DIN:	0207
CECC:	B

### TECHNICAL SPECIFICATIONS

DESCRIPTION	CBB 0207	
CECC size	B	
Resistance range	10 $\Omega$ to 1.5 M $\Omega$	
Resistance tolerance	$\pm 2\%$	
Temperature coefficient	refer to Temperature Coefficient graph	
Operation mode	long term	standard
Climatic category (LCT/UCT/days)	55/125/56	55/155/56
Rated dissipation, $P_{70}$	0.4 W	0.6 W
Operating voltage, $U_{max}$ AC/DC	350 V	
Film temperature	125 $^{\circ}$ C	155 $^{\circ}$ C
Max. resistance change at $P_{70}$ for resistance range, $\Delta R/R$ max., after:	10 $\Omega$ to 100 k $\Omega$	
1 000 h	$\pm 1\%$	$\pm 2\%$
8 000 h	+3 %/-1 %	+5 %/-2 %
Specified lifetime	225 000 h	8000 h
Permissible voltage against ambient:	500 V	
1 minute	75 V	
continuous		
Failure rate	$\leq 0.3 \times 10^{-9}/h$	

**DIMENSIONS**


<b>DIMENSIONS</b> - leaded resistor types, mass and relevant physical dimensions						
TYPE	D <sub>max</sub> (mm)	L <sub>max</sub> (mm)	d <sub>nom</sub> (mm)	l <sub>min</sub> (mm)	M <sub>min</sub> (mm)	MASS (mg)
CBB 0207	2.5	6.3	0.6	28.0	10.0	220

**12NC INFORMATION**

- The resistors have a 12-digit numeric code starting with 2312.
- The subsequent 4 digits indicate the resistor type, specification and packaging; see the 12NC table.
- The remaining 4 digits indicate the resistance value:
  - The first 3 digits indicate the resistance value.
  - The last digit indicates the resistance decade in accordance with the 12NC Indicating Resistance Decade table.

**Last Digit of 12NC Indicating Resistance Decade**

RESISTANCE DECADE	LAST DIGIT
10 Ω to 99.9 Ω	9
100 Ω to 999 Ω	1
1 kΩ to 9.99 kΩ	2
10 kΩ to 99.9 kΩ	3
100 kΩ to 999 kΩ	4
1 MΩ to 9.99 MΩ	5

**12NC Example**

The 12NC of a CBB 0207 resistor, value 47 kΩ with ± 2 % tolerance, supplied on bandolier in a box of 5000 units is: 2312 955 24703.

<b>12NC</b> - resistor types and packing			
DESCRIPTION		ORDERING CODE 2312 ... ..	
		BANDOLIER IN BOX	
TYPE	TOL.	C1 1 000 units	CT 5 000 units
CBB 0207	± 2 %	950 2....	955 2....

Resistance ranges printed in bold are preferred T.C. / tolerance combinations with optimized availability.

<b>PART NUMBER AND PRODUCT DESCRIPTION</b>						
<b>PART NUMBER: CBB0207001501G C1</b>						
C	B	B	0	2	0	7
0	0	1	5	0	1	G
C	1					
MODEL/SIZE	SPECIAL CHARACTER	TC	VALUE	TOLERANCE	PACKING	SPECIAL
CBB0207	0 = neutral	0 = standard see TC graph	<b>3 digit value</b> <b>1 digit multiplier</b> <b>MULTIPLIER</b> 7 = *10 <sup>-3</sup> 2 = *10 <sup>2</sup> 8 = *10 <sup>-2</sup> 3 = *10 <sup>3</sup> 9 = *10 <sup>-1</sup> 4 = *10 <sup>4</sup> 0 = *10 <sup>0</sup> 5 = *10 <sup>5</sup> 1 = *10 <sup>1</sup> 6 = *10 <sup>6</sup>	G = ± 2 %	CT C1	up to 2 digits 00 = standard
<b>PRODUCT DESCRIPTION: CBB 0207 2% C1 1K5</b>						
CBB	0207	2 %	C1	1K5		
MODEL	SIZE	TOLERANCE	PACKING <sup>1)</sup>	RESISTANCE VALUE		
CBB	0207	± 2 %	CT C1	47K = 47KΩ 50R1 = 50.1Ω		

<sup>1)</sup> Please refer to table PACKING, page 3.

**NOTE:** Products can be ordered using either the PRODUCT DESCRIPTION or the 12NC. The PART NUMBER is shown to facilitate the introduction of the unified part numbering system. Currently, this PART NUMBER is applicable in the Americas only.



PACKING		
MODEL	BOX	
	PIECES/BOX	CODE
CBB 0207	1 000	C1
	5 000	CT

TOLERANCE AND RESISTANCE RANGE	
TOLERANCE	RESISTANCE VALUE <sup>(1)</sup>
	CBB 0207
± 2 %	10 Ω to 1.5 MΩ

**Note**

1. Resistance values to be selected from E24 series.

**DESCRIPTION**

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous and dense carbon film is deposited on a high grade ceramic body (85 % Al<sub>2</sub>O<sub>3</sub>) and conditioned to achieve the desired temperature coefficient. Nickel plated steel termination caps are firmly pressed on the 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. Connecting wires of electrolytic copper plated with 100% pure tin are welded to the termination caps. The resistors are covered by protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating. Five colour code rings designate the resistance value and tolerance in accordance with **IEC 60 062**.

The result of the determined production is verified by an extensive testing procedure performed on 100% of the individual resistors. Only accepted products are stuck directly on the adhesive tapes in accordance with **IEC 60 286-1**.

**ASSEMBLY**

The resistors are suitable for processing on automatic insertion equipment and cutting and bending machines. Excellent solderability is proven, even after extended storage. They are suitable for automatic soldering using wave or dipping. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The resistors are completely lead (Pb)-free, the pure tin plating

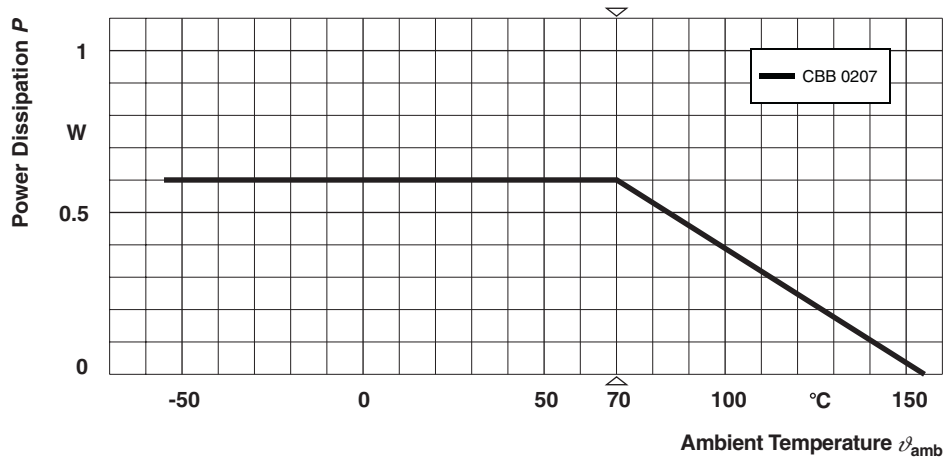
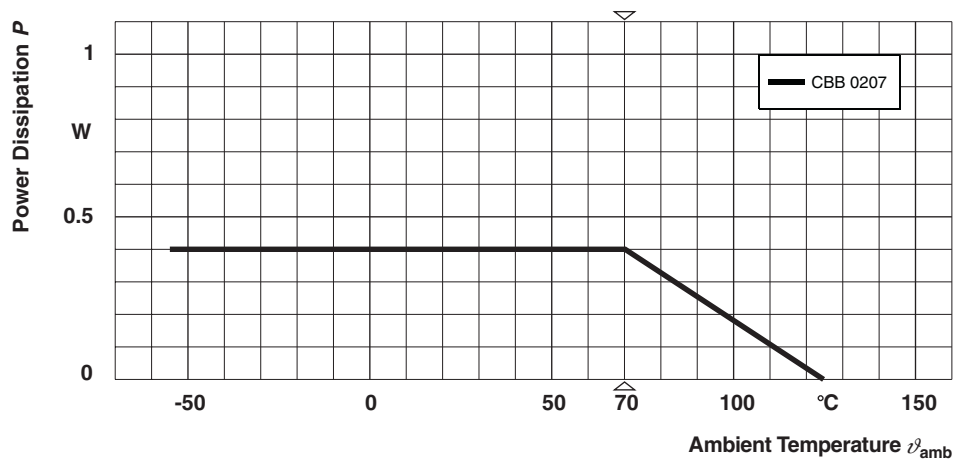
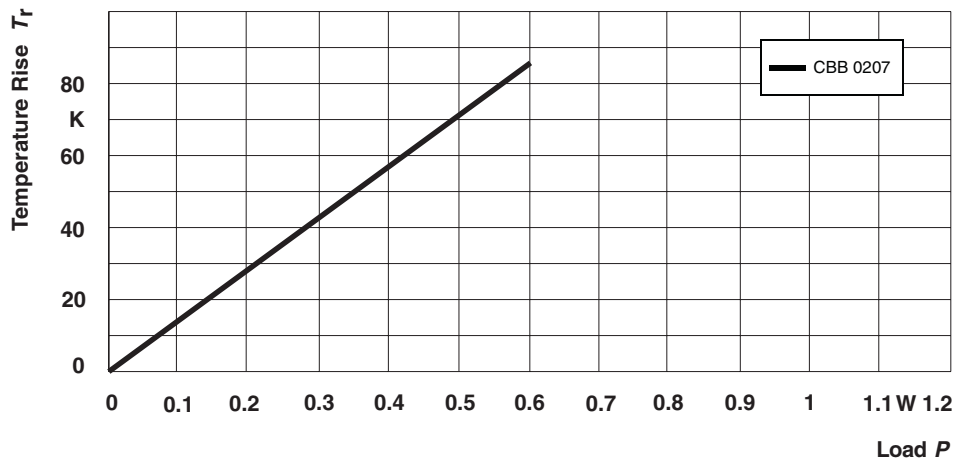
provides compatibility with lead (Pb)-free and lead-containing soldering processes. The immunity of the plating against tin whisker growth has been proven under extensive testing. All products comply with the CEFIC-EECA-EICTA list of legal restrictions on hazardous substances. This includes full compliance with the following directives:

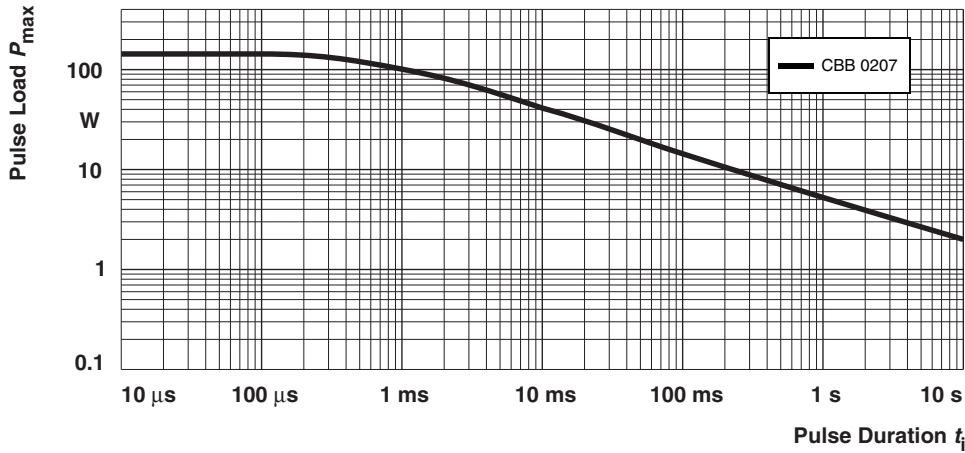
- 2000/53/EC End of Vehicle Life Directive (ELV)
- 2000/53/EC Annex II to End of Vehicle Life Directive (ELV II)
- 2002/95/EC Restriction of the use of Hazardous Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electrical Equipment Directive (WEEE)

**APPROVALS**

Where applicable, the resistors are tested in accordance with **CECC 40 101-806** which refers to **EN 60 115-1** and **EN 140 100**.

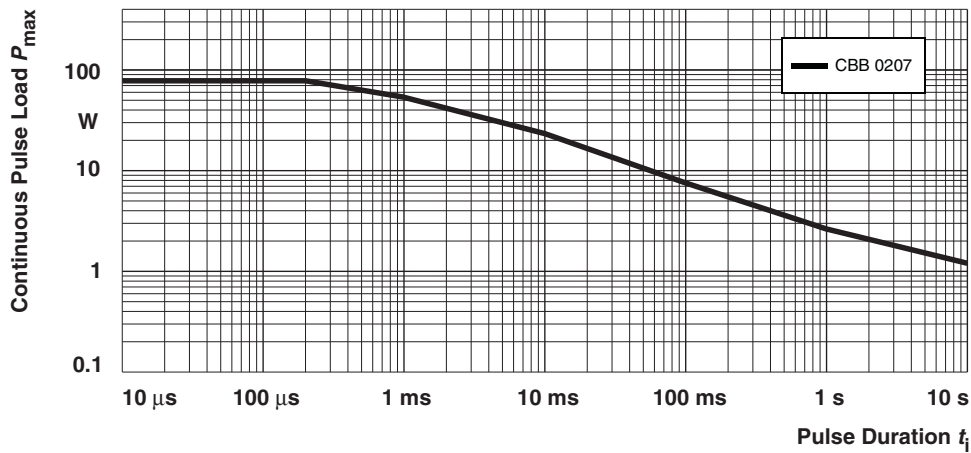
Vishay BEYSCHLAG has achieved "**Approval of Manufacturer**" in accordance with **EN 100 114-1**.

**FUNCTIONAL DESCRIPTION**

**Derating - Standard Operation**

**Derating - Long Term Operating**

**Temperature Rise**



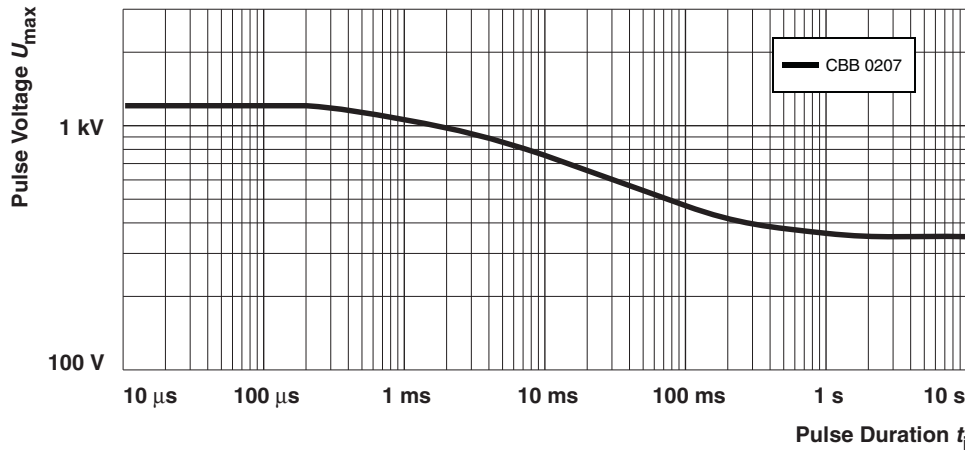
Maximum pulse load, single pulse; for permissible resistance change equivalent to 8000 h operation.

**Single Pulse**



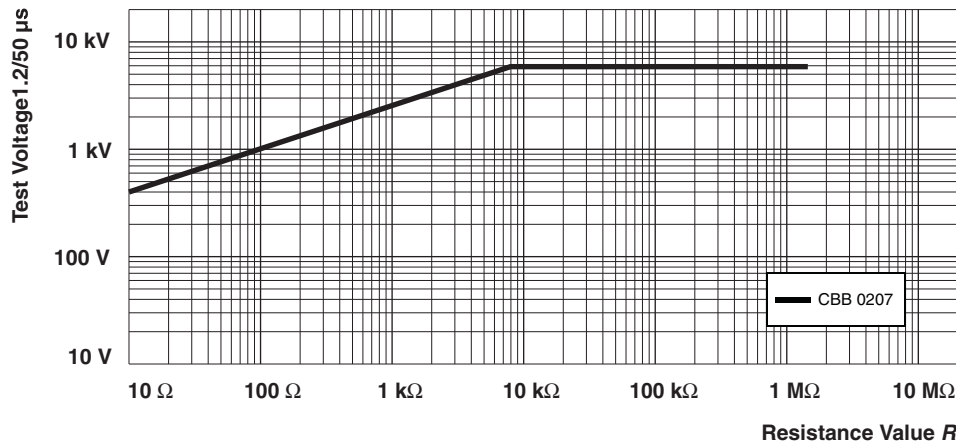
Maximum pulse load, continuous pulses; for permissible resistance change equivalent to 8 000 h operation.

**Continuous Pulse**



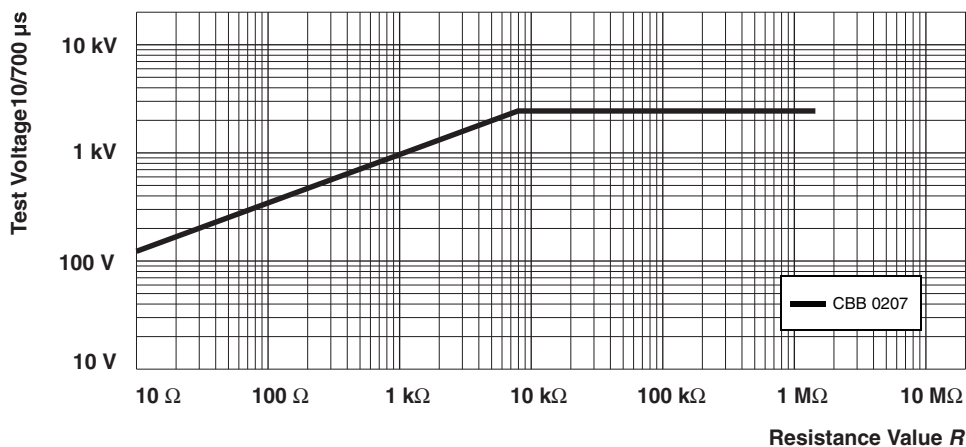
Maximum pulse voltage, single and continuous pulses; for permissible resistance change equivalent to 8000 h operation.

**Pulse Voltage**



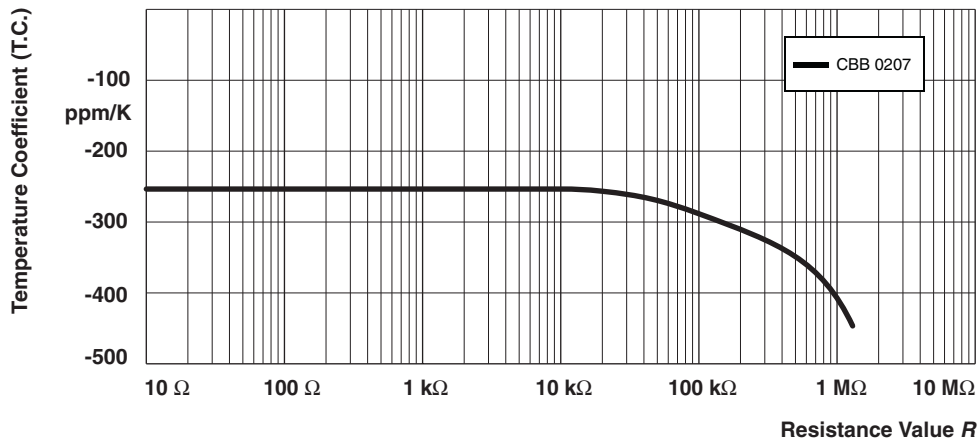
Pulse load rating in accordance with IEC 60115-1, 4.27; 1.2 μs / 50 μs; 5 pulses at 12 s intervals; for permissible resistance change 0.5 %.

**1.2/50 Pulse**

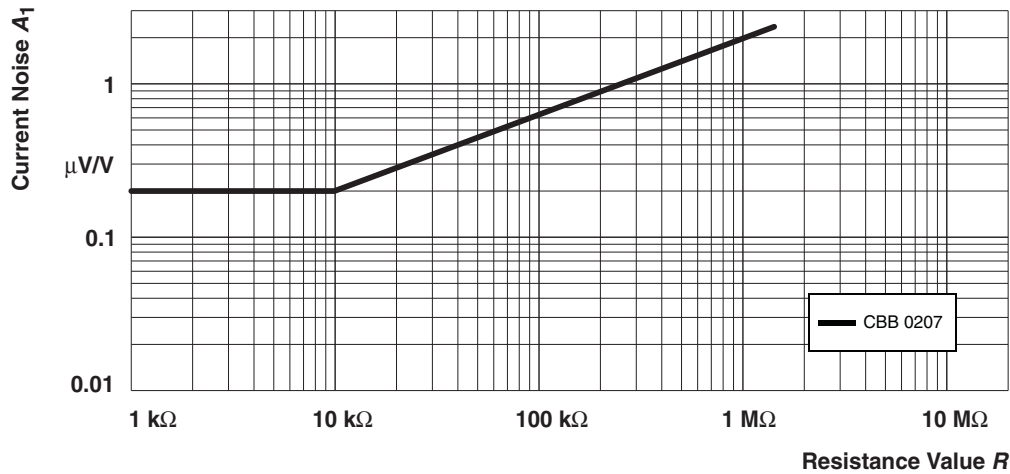


Pulse load rating in accordance with IEC 60115-1, 4.27; 10 μs / 700 μs; 10 pulses at 1 minute intervals; for permissible resistance change 0.5 %.

**10/700 Pulse**



**Temperature Coefficient (T.C.)**



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

In accordance with IEC 60195

**TESTS AND REQUIREMENTS**

Essentially all tests are carried out in accordance with the following specifications:

EN 140000 / IEC 60115-1, Generic specification (includes tests)

EN 140100 / IEC 60115-2, Sectional specification (includes schedule for qualification approval)

CECC 40101-806, Detail specification (includes schedule for conformance inspection)

The following table contains the applicable tests selected from the documents listed above.

The tests are carried out in accordance with IEC 60 068 and under standard atmospheric conditions in accordance with IEC 60068-1, 5.3. Climatic category LCT/UCT/56 (rated temperature range: Lower Category Temperature, Upper

Category Temperature; damp heat, long term, 56 days) is valid.

Unless otherwise specified the following values apply:

Temperature: 15 °C to 35 °C

Relative humidity: 45 % to 75 %

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

For testing the components are mounted on a test board in accordance with IEC 60115-1, 4.31 unless otherwise specified.

In the Test Procedures and Requirements table only the tests and requirements are listed with reference to the relevant clauses of IEC 60115-1 and IEC 60068-2; a short description of the test procedure is also given.

TEST PROCEDURES AND REQUIREMENTS				
IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R/R$ )
			Stability for product types: <b>CBB 0207</b>	10 $\Omega$ to 1.5 M $\Omega$
4.5	-	resistance		$\pm 2\%$
4.8.4.2	-	temperature coefficient	at 20 / LCT / 20 °C and 20 / UCT / 20 °C	-
4.25.1	-	endurance at 70 °C: standard operation mode	$U = \sqrt{P_{70} \times R}$ or $U = U_{max}$ 1.5 h on; 0.5 h off 70 °C; 1 000 h  70 °C; 8 000 h	$\pm (2\% + 0.05 \Omega)$  $\pm (4\% + 0.05 \Omega)$



TEST PROCEDURES AND REQUIREMENTS - continued				
IEC 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ( $\Delta R/R$ )
			Stability for product types: <b>CBB 0207</b>	10 $\Omega$ to 1.5 M $\Omega$
4.25.1	–	endurance at 70 °C: long term operation mode	$U = \sqrt{P_{70} \times R}$ or $U = U_{max}$ ; 1.5 h on; 0.5 h off  70 °C; 1 000 h 70 °C; 8 000 h	$\pm (1 \% + 0.05 \Omega)$ $\pm (2 \% + 0.05 \Omega)$
4.25.3	–	endurance at upper category temperature	125 °C; 1 000 h 155 °C; 1 000 h	$\pm (2 \% + 0.05 \Omega)$ $\pm (4 \% + 0.1 \Omega)$
4.24	78 (Cab)	damp heat, steady state	(40 $\pm$ 2) °C; 56 days; (93 $\pm$ 3) % RH	$\pm (1 \% + 0.1 \Omega)$
4.23		climatic sequence:		
4.23.2	2 (Ba)	dry heat	155 °C; 16 h	
4.23.3	30 (Db)	damp heat, cyclic	55 °C; 24 h; 90 to 100 % RH; 1 cycle	
4.23.4	1 (Aa)	cold	– 55 °C; 2 h	
4.23.5	13 (M)	low air pressure	8.5 kPa; 2 h; 15 to 35 °C	
4.23.6	30 (Db)	damp heat, cyclic	55 °C; 5 days; 95 to 100 % RH; 5 cycles	$\pm (1 \% + 0.1 \Omega)$ no visible damage
–	1 (Aa)	cold	– 55 °C; 2 h	$\pm (0.5 \% + 0.1 \Omega)$
4.13	–	short time overload	room temperature; $U = 2.5 \times \sqrt{P_{70} \times R}$ or $U = 2 \times U_{max}$ ; 5 s	$\pm (0.5 \% + 0.1 \Omega)$ no visible damage
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 cycles	$\pm (0.5 \% + 0.05 \Omega)$ no visible damage
4.29	45 (XA)	component solvent resistance	isopropyl alcohol + 23 °C; toothbrush method	marking legible; no visible damage
4.18.2	20 (Tb)	resistance to soldering heat	unmounted components; (260 $\pm$ 5) °C; (10 $\pm$ 1) s	$\pm (0.5 \% + 0.05 \Omega)$ no visible damage
4.17	20 (Ta)	solderability	+ 235 °C; 2 s solder bath method	good tinning ( $\geq$ 95 % covered); no visible damage
4.22	6 (B4)	vibration	6 h; 10 to 2000 Hz 1.5 mm or 196 m/s <sup>2</sup>	$\pm (0.5 \% + 0.05 \Omega)$
4.16	21 (Ua <sub>1</sub> ) 21 (Ub) 21 (Uc)	robustness of terminations	tensile, bending and torsion	$\pm (0.5 \% + 0.05 \Omega)$
4.7	–	voltage proof	$U_{rms} = 100$ V; 60 s	no flashover or breakdown





## Notice

Specifications of the products displayed herein are subject to change without notice. Vishay Intertechnology, Inc., or anyone on its behalf, assumes no responsibility or liability for any errors or inaccuracies.

Information contained herein is intended to provide a product description only. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document. Except as provided in Vishay's terms and conditions of sale for such products, Vishay assumes no liability whatsoever, and disclaims any express or implied warranty, relating to sale and/or use of Vishay products including liability or warranties relating to fitness for a particular purpose, merchantability, or infringement of any patent, copyright, or other intellectual property right.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications. Customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Vishay for any damages resulting from such improper use or sale.