CBB 0207

Vishay Beyschlag

High Pulse Load Carbon Film 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.

METRIC SIZE	
DIN	0207
CECC	B

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 Ω to 1.5 MΩ
- Lead (Pb)-free solder contacts
- Pure tin plating provides compatibility with lead (Pb)-free and lead containing soldering processes
- Compliant to RoHS directive 2002/95/EC

Pb-free RoHS COMPLIANT

APPLICATIONS

- Automotive
- Telecommunication
- Industrial equipment

TECHNICAL SPECIFICATIONS

DESCRIPTION	CBB 0207	
CECC Size	B	
Resistance Range	10 Ω to 1.5 MΩ	
Resistance Tolerance	± 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 °C	155 °C
Max. Resistance Change at P_{70} for Resistance Range, $\Delta R/R$ max., after:	10 Ω to 100 kΩ	
1000 h	± 1 %	± 2 %
8000 h	+ 3 %/- 1 %	+ 5 %/- 2 %
Permissible Voltage Against Ambient:		
1 Minute; U_{ins}	500 V	
Continuous	75 V	
Failure Rate: $FIT_{observed}$	≤ 0.1 x 10^{-9}/h	

Note

- 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.

For technical questions, contact: filmresistorsleaded@vishay.com

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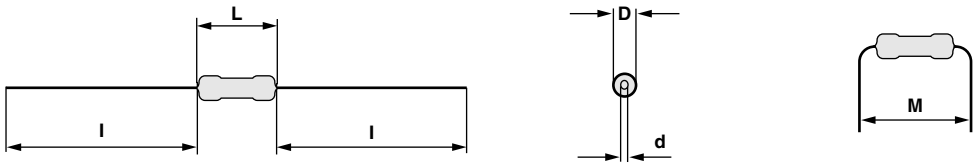
DIMENSIONS



DIMENSIONS - Leaded resistor types, mass and relevant physical dimensions						
TYPE	$D_{max.}$ (mm)	$L_{max.}$ (mm)	$d_{nom.}$ (mm)	$l_{min.}$ (mm)	$M_{min.}$ (mm)	MASS (mg)
CBB 0207	2.5	6.3	0.6	28.0	10.0	220

PART NUMBER AND PRODUCT DESCRIPTION

PART NUMBER: CBB0207001501GC100

C	B	B	0	2	0	7	0	0	1	5	0	1	G	C	1		

MODEL/SIZE	VARIANT	TCR	VALUE	TOLERANCE	PACKAGING (1)	SPECIAL
CBB0207	**0** = Neutral	**0** = Standard **See TCR graph**	**3 digit value** **1 digit multiplier** MULTIPLIER **7** = $*10^{-3}$ **2** = $*10^{2}$ **8** = $*10^{-2}$ **3** = $*10^{3}$ **9** = $*10^{-1}$ **4** = $*10^{4}$ **0** = $*10^{0}$ **5** = $*10^{5}$ **1** = $*10^{1}$ **6** = $*10^{6}$	**G** = ± 2 %	**CT** **C1**	Up to 2 digits **00** = Standard

PRODUCT DESCRIPTION: CBB 0207 2 % C1 1K5

CBB	0207	2 %	C1	1K5
MODEL	SIZE	TOLERANCE	PACKAGING (1)	RESISTANCE VALUE
CBB	**0207**	**± 2 %**	**CT** **C1**	**47K** = 47 kΩ **51R1** = 51.1 Ω

Notes

(1) Please refer to table PACKAGING

- The PART NUMBER is shown to facilitate the introduction of the unified part numbering system for ordering products

PACKAGING

MODEL	BOX	
	PIECES/BOX	CODE
CBB 0207	1000 5000	C1 CT

TOLERANCE AND RESISTANCE RANGE

TOLERANCE	RESISTANCE VALUE (1)
	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_2O_3) 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. Five color code rings designate the resistance value and tolerance in accordance with **IEC 60062.**

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 60286-1.**

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 suitability of conformal coatings, 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 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 **GADSL** [1] and the **CEFIC-EECA-EICTA** [2] list of legal restrictions on hazardous substances. This includes full compliance with the following directives:

- 2000/53/EC End of Vehicle Life Directive (ELV) and Annex II (ELVII)
- 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 **EN 140101-806 (successor of CECC 40101-806)** which refers to **EN 60115-1** and **EN 140100.**

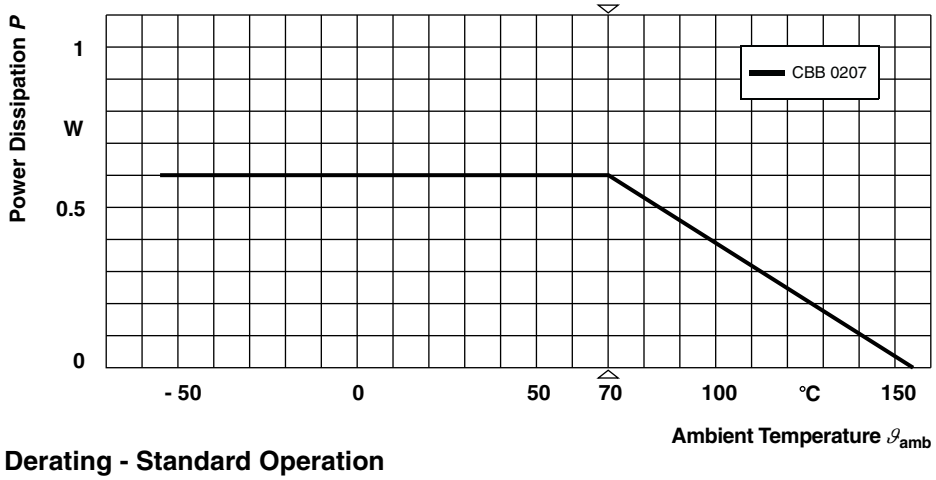
Vishay Beyschlag has achieved **"Approval of Manufacturer"** in accordance with **IEC QC 001002-3, clause 2**. The release certificate for **"Technology Approval Schedule"** in accordance with **CECC 240001** based on **IEC QC 001002-3, clause 6** is granted for the Vishay Beyschlag manufacturing process.

Notes

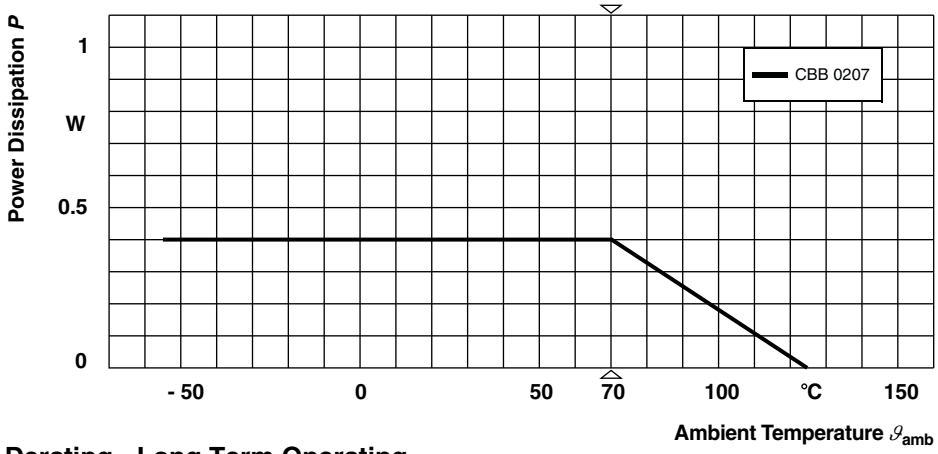
[1] Global Automotive Declarable Substance List, see www.gadsl.org

[2] CEFIC (European Chemical Industry Council), EECA (European Electronic Component Manufacturers Association), EICTA (European trade organisation representing the information and communications technology and consumer electronics), see www.eicta.org/index.php?id=1053&id_article=340

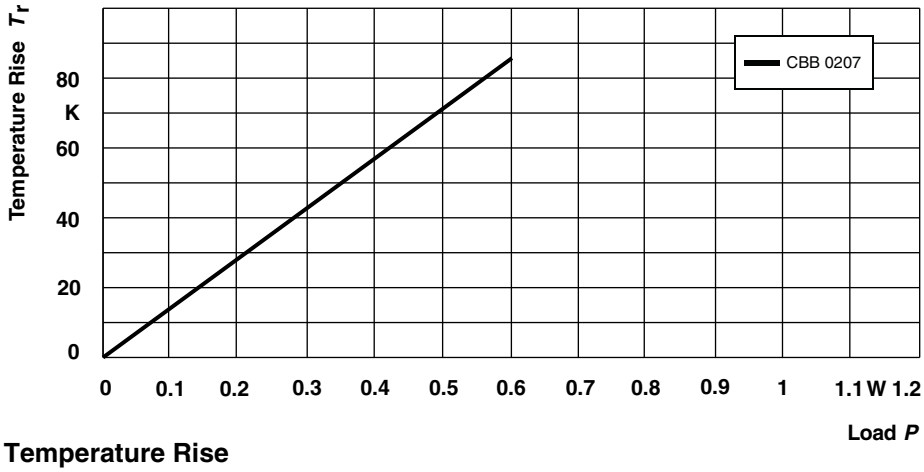
FUNCTIONAL DESCRIPTION



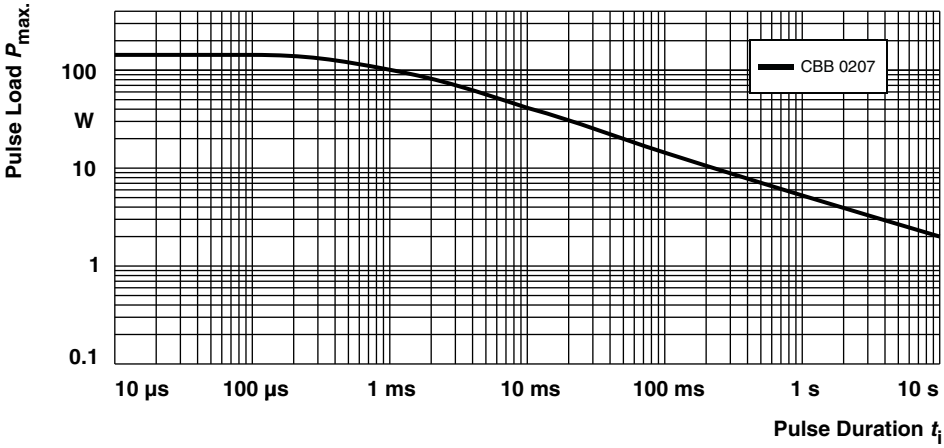
Derating - Standard Operation



Derating - Long Term Operating

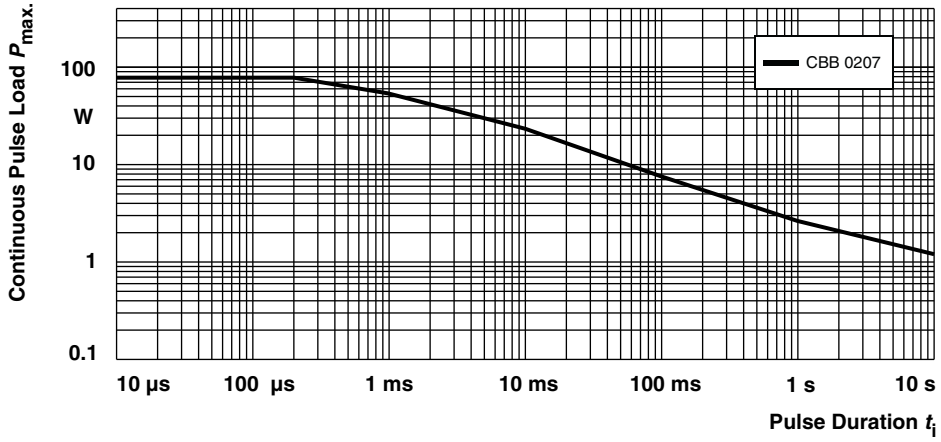


Temperature Rise



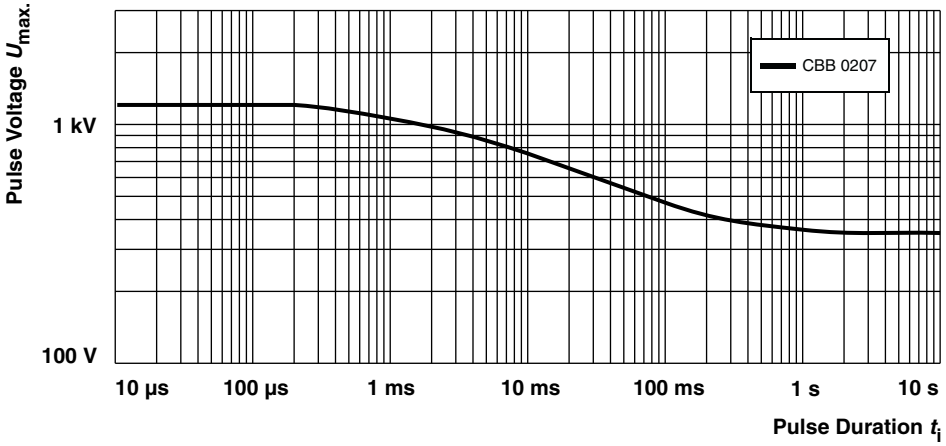
Maximum pulse load, single pulse; for permissible resistance change equivalent to 8000 h operation.

Single Pulse



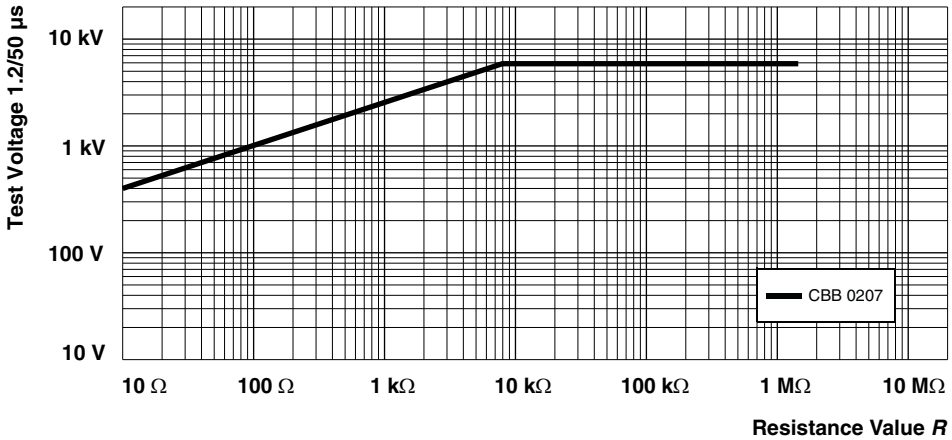
Maximum pulse load, continuous pulses; for permissible resistance change equivalent to 8000 h operation.

Continuous Pulse



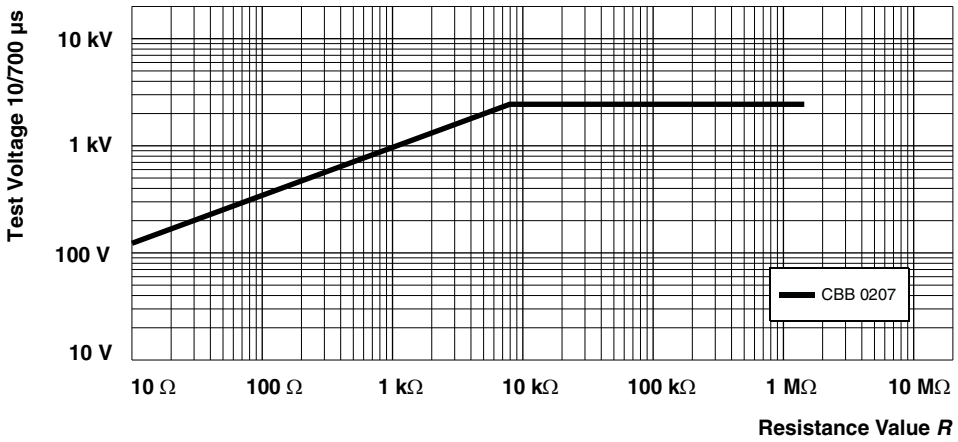
Maximum pulse voltage, single and continuous pulses; for permissible resistance change equivalent to 8000 h operation.

Pulse Voltage



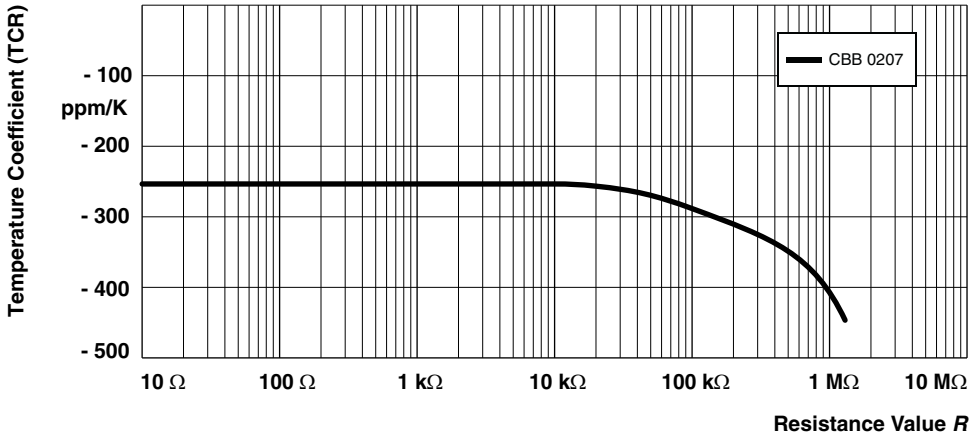
Pulse load rating in accordance with IEC 60115-1, 4.27; 1.2 µs/50 µs; 5 pulses at 12 s intervals; for permissible resistance change 0.5 %.

1.2/50 Pulse

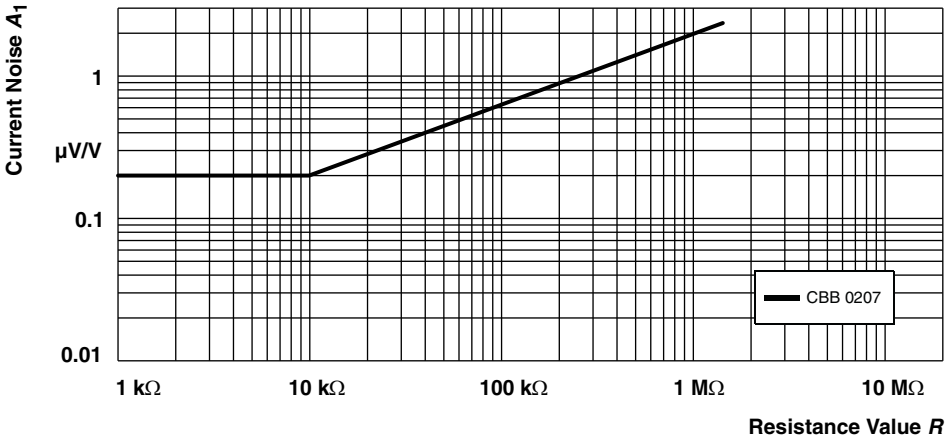


Pulse load rating in accordance with IEC 60115-1, 4.27; 10 µs/ 700 µs; 10 pulses at 1 minute intervals; for permissible resistance change 0.5 %.

10/700 Pulse



Temperature Coefficient (TCR)



Current Noise - A_1 in accordance with IEC 60195

TESTS AND REQUIREMENTS

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

EN 60115-1, generic specification (includes tests)

EN 140100, sectional specification (includes schedule for qualification approval)

EN 140101-806 (successor of 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 60068-2-xx test method 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).

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-xx test methods. A short description of the test procedure is also given.

TEST PROCEDURES AND REQUIREMENTS

IEC 60115-1 CLAUSE	IEC 60068-2-xx TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)
			Stability for product types:	
			CBB 0207	10 Ω to 1.5 MΩ
4.5	-	Resistance		± 2 %
4.8	-	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; 1000 h	± (2 % R + 0.05 Ω)
			70 °C; 8000 h	± (4 % R + 0.05 Ω)
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; 1000 h	± (1 % R + 0.05 Ω)
			70 °C; 8000 h	± (2 % R + 0.05 Ω)
4.25.3	-	Endurance at upper category temperature	125 °C; 1000 h	± (2 % R + 0.05 Ω)
			155 °C; 1000 h	± (4 % R + 0.1 Ω)
4.24	78 (Cab)	Damp heat, steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH	± (1 % R + 0.1 Ω)
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 °C to 35 °C	
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; 5 days; 95 % to 100 % RH; 5 cycles	± (1 % R + 0.1 Ω) no visible damage
-	1 (Aa)	Cold	- 55 °C; 2 h	± (0.5 % R + 0.1 Ω)
4.13	-	Short time overload	Room temperature; $U = 2.5 \times \sqrt{P_{70} \times R}$ or $U = 2 \times U_{max.}$; 5 s	± (0.5 % R + 0.1 Ω) no visible damage

TEST PROCEDURES AND REQUIREMENTS				
IEC 60115-1 CLAUSE	**IEC 60068-2-xx TEST METHOD**	**TEST**	**PROCEDURE**	**REQUIREMENTS PERMISSIBLE CHANGE (ΔR)**
			Stability for product types:	
			CBB 0207	10 Ω to 1.5 MΩ
4.19	14 (Na)	Rapid change of temperature	30 min at LCT = - 55 °C and 30 min at UCT = 155 °C; 200 cycles	± (0.5 % R + 0.05 Ω) 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 ± 3) °C; (10 ± 1) s	± (0.5 % R + 0.05 Ω) no visible damage
4.17	20 (Ta)	Solderability	+ 235 °C; 2 s solder bath method SnPb40	Good tinning (≥ 95 % covered, no visible damage)
			+ 245 °C; 3 s solder bath method SnAg3Cu0.5	
4.22	6 (B4)	Vibration	6 h; 10 Hz to 2000 Hz 1.5 mm or 196 m/s^2	± (0.5 % R + 0.05 Ω)
4.16	21 (Ua_1) 21 (Ub) 21 (Uc)	Robustness of terminations	Tensil, bending and torsion	± (0.5 % R + 0.05 Ω)
4.7	-	Voltage proof	$U_{RMS} = U_{ins}$; 60 s	No flashover or breakdown
4.40	-	Electrostatic discharge (human body model)	IEC 61340-3-1; 3 pos. + 3 neg. 16 kV	± (0.5 % R + 0.05 Ω)

HISTORICAL 12NC INFORMATION

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

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 was: 2312 955 24703.

HISTORICAL 12NC - Resistor type and packaging			
DESCRIPTION		**2312 ... .**	
		BANDOLIER IN BOX	
TYPE	**TOL.**	**C1 1000 units**	**CT 5000 units**
CBB 0207	± 2 %	950 2....	955 2....

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Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.