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.

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
- Compatible with "Restriction of the use of Hazardous Substances" (RoHS) directive 2002/95/EC (issue 2004)

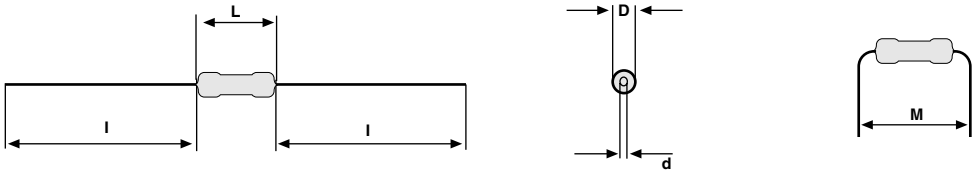
APPLICATIONS

- 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 hours	± 1 %	± 2 %
8000 hours	+ 3 %/-1 %	+ 5 %/-2 %
Specified lifetime	225 000 hours	8000 hours
Permissible voltage against ambient:		
1 minute	500 V	
continuous	75 V	
Failure rate	≤ 0.3 x 10^{-9}/hours	

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

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.

12NC - resistor types and packaging			
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.

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	SPECIAL CHARACTER	TCR	VALUE	TOLERANCE	PACKAGING	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 **51R0** = 51.0 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. 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 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 the CEFIC-EECA-EICTA list of legal restrictions on hazardous substances. This includes full compliance with the following directives:

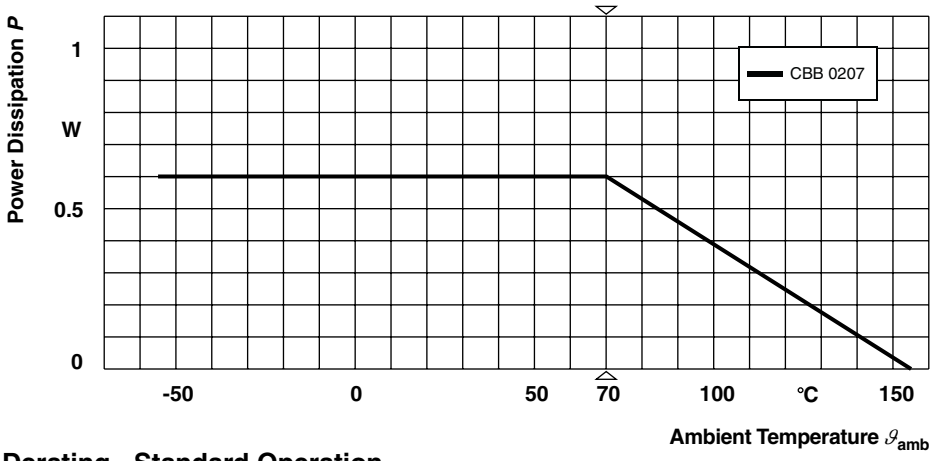
- 2000/53/EC End of Vehicle Life Directive (ELV)
- 2000/53/EC Annex II to End of Vehicle Life Directive (ELV II)
- 2002/95/EC Restriction of the use of Hazardous Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electrical Equipment Directive (WEEE)

APPROVALS

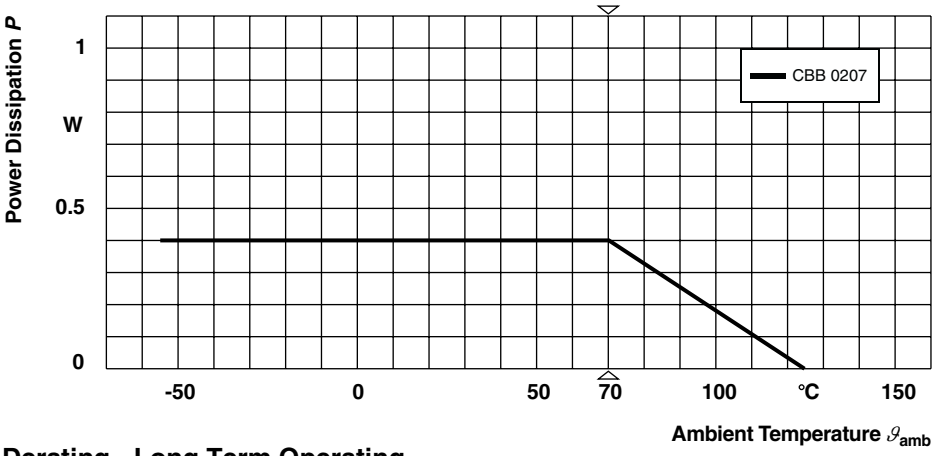
Where applicable, the resistors are tested in accordance with **CECC 40 101-806** which refers to **EN 60 115-1** and **EN 140 100.**

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

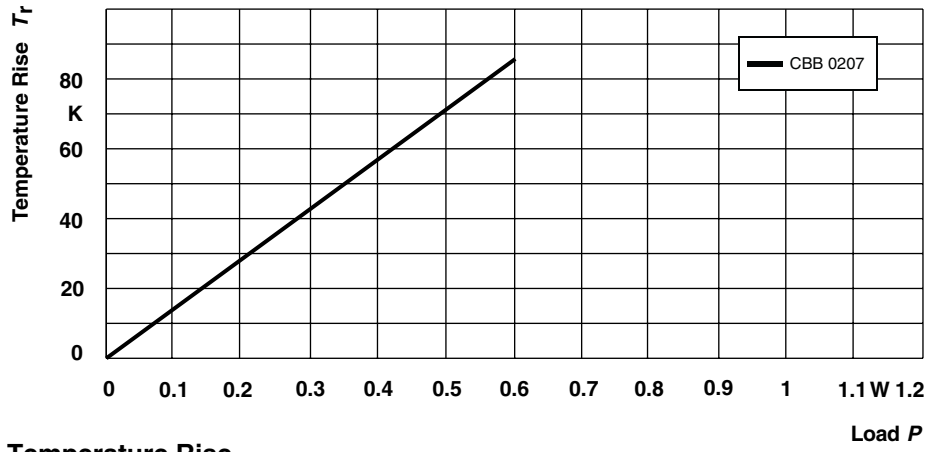
FUNCTIONAL DESCRIPTION



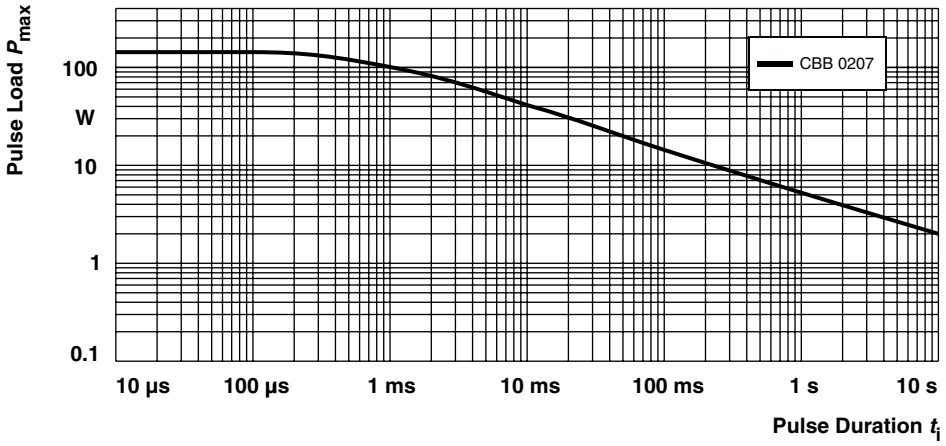
Derating - Standard Operation



Derating - Long Term Operating

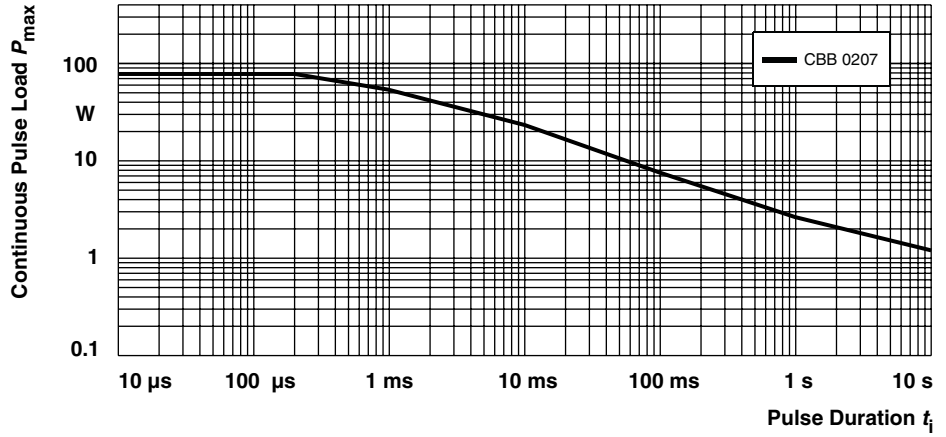


Temperature Rise



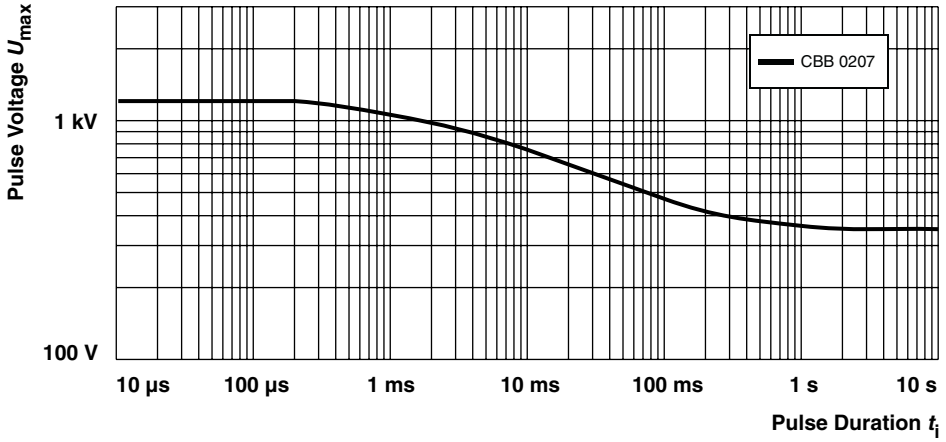
Maximum pulse load, single pulse; for permissible resistance change equivalent to 8000 hours operation.

Single Pulse



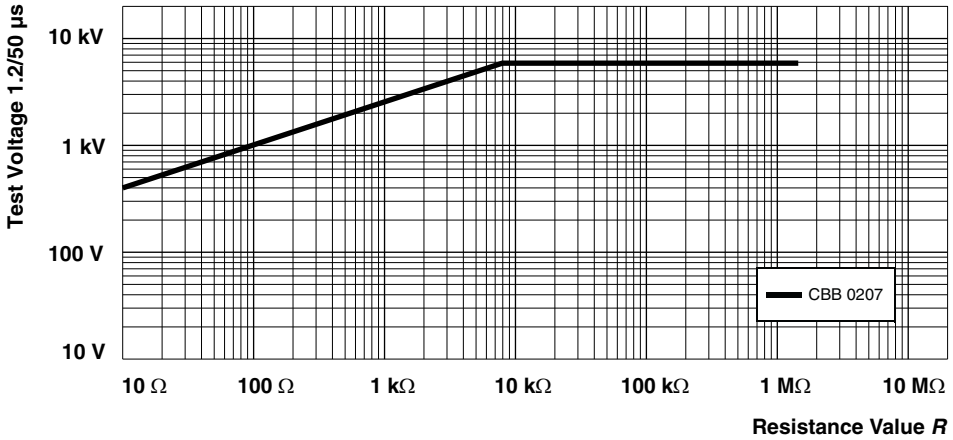
Maximum pulse load, continuous pulses; for permissible resistance change equivalent to 8 000 hours operation.

Continuous Pulse



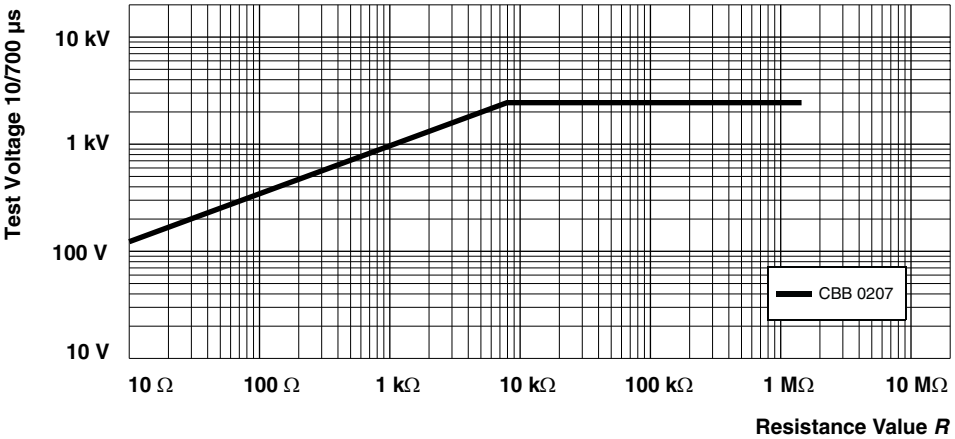
Maximum pulse voltage, single and continuous pulses; for permissible resistance change equivalent to 8000 hours operation.

Pulse Voltage



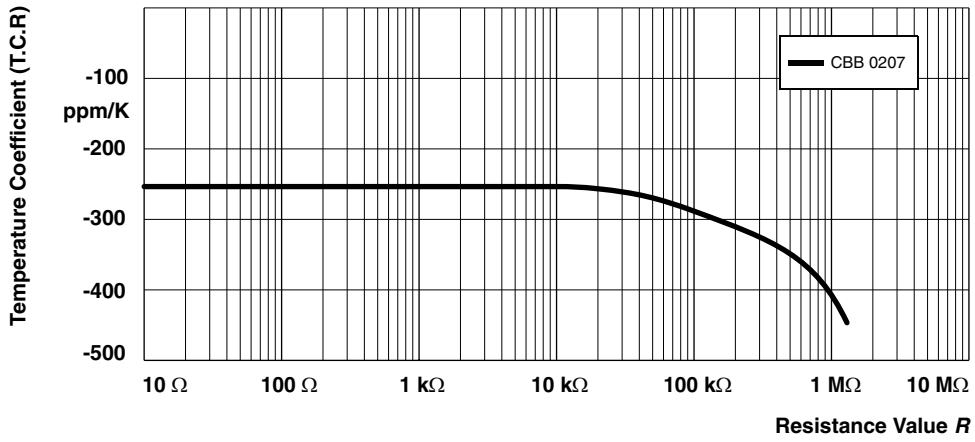
Pulse load rating in accordance with IEC 60115-1, 4.27; 1.2 µs/50 µs; 5 pulses at 12 s intervals; for permissible resistance change 0.5 %.

1.2/50 Pulse

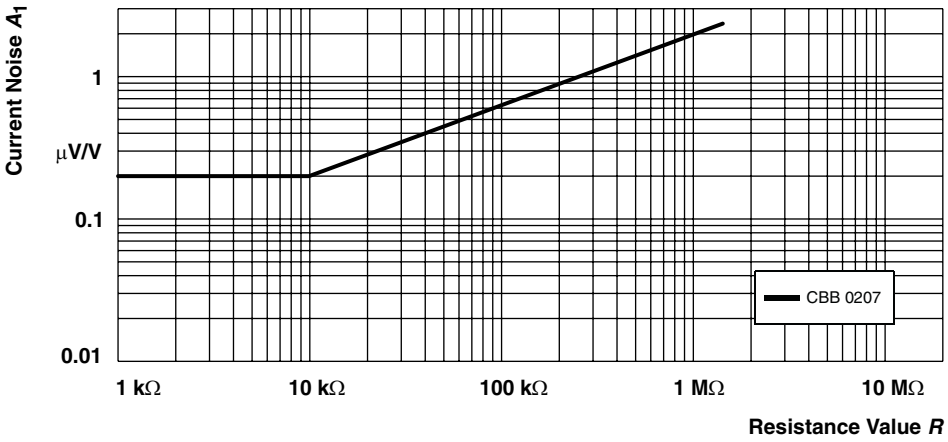


Pulse load rating in accordance with IEC 60115-1, 4.27; 10 µs/ 700 µs; 10 pulses at 1 minute intervals; for permissible resistance change 0.5 %.

10/700 Pulse



Temperature Coefficient (T.C.R)



In accordance with IEC 60195

Current Noise - A_1

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 (ΔR)
			Stability for product types:	
			CBB 0207	10 Ω to 1.5 MΩ
4.5	–	resistance		± 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 hours ON; 0.5 hours OFF	
			70 °C; 1000 hours	± (2 % R + 0.05 Ω)
			70 °C; 8000 hours	± (4 % R + 0.05 Ω)

TEST PROCEDURES AND REQUIREMENTS - continued				
IEC 60115-1 CLAUSE	**IEC 60068-2 TEST METHOD**	**TEST**	**PROCEDURE**	**Requirements Permissible chanGe (ΔR)**
			Stability for product types:	
			CBB 0207	10 Ω to 1.5 MΩ
4.25.1	–	endurance at 70 °C: long term operation mode	$U = \sqrt{P_{70} \times R}$ or $U = U_{max}$; 1.5 hours ON; 0.5 hours OFF	
			70 °C; 1000 hours	± (1 % R + 0.05 Ω)
			70 °C; 8000 hours	± (2 % R + 0.05 Ω)
4.25.3	–	endurance at upper category temperature		
			125 °C; 1000 hours	± (2 % R + 0.05 Ω)
			155 °C; 1000 hours	± (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 hours	
4.23.3	30 (Db)	damp heat, cyclic	55 °C; 24 hours; 90 to 100 % RH; 1 cycle	
4.23.4	1 (Aa)	cold	- 55 °C; 2 hours	
4.23.5	13 (M)	low air pressure	8.5 kPa; 2 hours; 15 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 hours	± (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 seconds	± (0.5 % R + 0.1 Ω) no visible damage
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; 5 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 ± 5) °C; (10 ± 1) seconds	± (0.5 % R + 0.05 Ω) no visible damage
4.17	20 (Ta)	solderability	+ 235 °C; 2 seconds solder bath method	good tinning (≥ 95 % covered); no visible damage
4.22	6 (B4)	vibration	6 hours; 10 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} = 100 V; 60 seconds	no flashover or breakdown

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