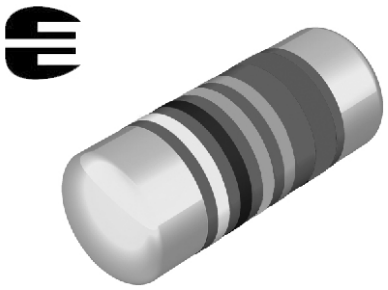
MMA 0204 HT - Professional

Vishay Beyschlag

Professional High Temperature MELF Resistors



MMA 0204 professional High Temperature MELF resistors are the perfect choice for most fields of modern professional electronics where high operating temperatures, power rating, reliability and stability is of major concern. These improved properties are enabled by a modified resistive film material. The typical applications in the fields of automotive telecommunication and medical equipment reflect the outstanding level of proven reliability.

FEATURES

- Operating temperature 175 °C for 1000 h
- Advanced thin film technology
- Excellent overall stability: Exceeds class 0.25
- AEC-Q200 qualified
- Approval to EN 140401-803
- Pure Sn termination on Ni barrier layer
- Green product, supports lead (Pb)-free soldering
- Compliant to RoHS directive 2002/95/EC

Pb-free RoHS COMPLIANT GREEN (5-2008)**

APPLICATIONS

- Automotive
- Telecommunication
- Industrial
- Medical equipment

METRIC SIZE	
DIN:	0204
CECC:	RC 3715M

TECHNICAL SPECIFICATIONS	
DESCRIPTION	**MMA 0204 HT**
CECC size	RC 3715M
Resistance range	47 Ω to 100 kΩ
Resistance tolerance	± 1 %; ± 0.5 %
Temperature coefficient	± 50 ppm/K; ± 25 ppm/K
Rated dissipation, P_{70} (1)	0.5 W
Operating voltage, $U_{max.}$ AC/DC	200 V
Permissible film temperature (2)	175 °C
Insulation voltage	
1 min; U_{ins}	300 V
continuous	75 V
$FIT_{observed}$	≤ 0.1 x 10^{-9}/h

Notes

(1) The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature is not exceeded.

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.

(2) Please refer to APPLICATION INFORMATION below

** Please see document “Vishay Green and Halogen-Free Definitions (5-2008)” www.vishay.com/doc?99902

APPLICATION INFORMATION

The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heat flow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature is not exceeded.

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. At the maximum permissible film temperature of 175 °C the useful lifetime is specified for 1000 h. The designer may estimate the performance of the particular resistor application or set certain load and temperature limits in order to maintain a desired stability.

MAXIMUM RESISTANCE CHANGE AT RATED POWER			
DESCRIPTION	**MMA 0204 HT**		
Metric size	RC3715M		
Operation mode	Standard	Power	High Temperature
Rated power	P_{70} = 0.25 W	P_{70} = 0.4 W	P_{70} = 0.5 W
Film temperature	125 °C	155 °C	175 °C
Max. resistance change at P_{70} for resistance range:	47 Ω to 100 kΩ		
$\Delta R/R$ max., after: 1000 h	≤ 0.10 %	≤ 0.15 %	≤ 0.25 %
8000 h	≤ 0.15 %	≤ 0.35 %	-
225 000 h	≤ 1.0 %	-	-

PART NUMBER AND PRODUCT DESCRIPTION

PART NUMBER: MMA0204TD5620DB300
PART NUMBER: MMA0204TZ0000ZB300

M	M	A	0	2	0	4	T	D	5	6	2	0	D	B	3	0	0
M	M	A	0	2	0	4	T	Z	0	0	0	0	Z	B	3	0	0

MODEL/SIZE	SPECIAL CHARACTER	TCR	VALUE	TOLERANCE	PACKAGING	SPECIAL
MMA0204	**T** = HT	**D** = ± 25 ppm/K **C** = ± 50 ppm/K **Z** = Jumper	3 digit value 1 digit multiplier **Multiplier** **9** = $*10^{-1}$ **0** = $*10^{0}$ **1** = $*10^{1}$ **2** = $*10^{2}$ **3** = $*10^{3}$ **4** = $*10^{4}$ **5** = $*10^{5}$	**D** = ± 0.5 % **F** = ± 1 % **Z** = Jumper	**B3** **B0**	Up to 2 digits **00** = Standard

PRODUCT DESCRIPTION: MMA 0204 - 25 0.5 % HT BL 562R
PRODUCT DESCRIPTION: MMA 0204 HT BL 0R0

MMA	**0204**	**- 25**	**0.5 %**	**HT**	**BL**	**562R**
MMA	**0204**	**-**	**-**	**HT**	**BL**	**0R0**
MODEL	SIZE	TCR	TOLERANCE	SPECIAL CHARACTER	PACKAGING	RESISTANCE VALUE
MMA	**0204**	± **25** ppm/K ± **50** ppm/K	± **0.5** % ± **1** %	**HT** = High temperature	**BL** **B0**	**562R** = 562 Ω **0R0** = Jumper

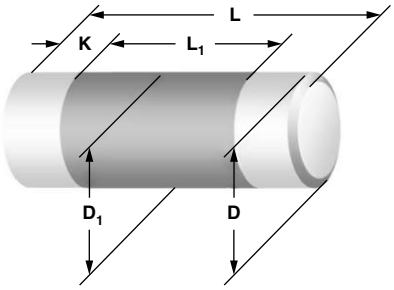
Note

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

PACKAGING

MODEL	BLISTER TAPE ON REEL ACC. IEC 60286-3		
	DIAMETER	**PIECES/REEL**	**CODE**
MMA 0204 HT	180 mm/7"	3000	B3 = BL
	330 mm/13"	10 000	B0

DIMENSIONS



DIMENSIONS - MELF resistor types, mass and relevant physical dimensions						
TYPE	**L (mm)**	**D (mm)**	**$L_{1\ min.}$ (mm)**	**D_1 (mm)**	**K (mm)**	**MASS (mg)**
MMA 0204 HT	3.6 + 0/- 0.2	1.4 + 0/- 0.1	1.8	D + 0/- 0.15	0.8 ± 0.1	19

Note

- Color code marking is applied according to IEC 60062* in four bands (E24 series) or five bands (E96 or E192 series). Each colour band appears as a single solid line, voids are permissible if at least $^2/_3$ of the band is visible from each radial angle of view. The last colour band for tolerance is approximately 50 % wider than the other bands. An interrupted yellow band between the 4th and 5th full band indicates the temperature coefficient of 25 ppm/K.

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE		
DESCRIPTION		**RESISTANCE VALUE**
TCR	**TOLERANCE**	**MMA 0204 HT**
± 50 ppm/K	**± 1 %**	**47 Ω to 100 kΩ**
	± 0.5 %	47 Ω to 100 kΩ
± 25 ppm/K	± 1 %	47 Ω to 100 kΩ
	± 0.5 %	**47 Ω to 100 kΩ**
Jumper		**≤ 10 mΩ, $I_{max.}$ = 3 A**

Resistance ranges printed in bold are preferred TCR/tolerance combinations.

Note

- Resistance values to be selected for ± 5 % and ± 2 % tolerance from E24, for ± 1 % tolerance from E24 and E96 and for ± 0.5 % tolerance from E24 and E192.

DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of metal alloy is deposited on a high grade ceramic body (Al_2O_3) and conditioned to achieve the desired temperature coefficient. Nickel plated steel termination caps are firmly pressed on the metallised 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 protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure tin on nickel plating. Four or five colour code rings designate the resistance value and tolerance in accordance with **IEC 60062** (3).

The result of the determined production is verified by an extensive testing procedure performed on 100 % of the individual resistors. Only accepted products are laid directly into the blister tape in accordance with **IEC 60286-3** (3) or bulk case in accordance with **IEC 60286-6** (3).

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapour phase as shown in **IEC 61760-1** (3). The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The suitablility of conformal coatings, if applied, shall be qualified by appropiate means to ensure the long-term stability of the whole system. The resistors are RoHS compliant, 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 **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 (ELV II)
- 2002/95/EC Restriction of the use of Hazardous Substances Directive (RoHS)
- 2002/96/EC Waste Electrical and Electronic Equipment Directive (WEEE)

Solderability is specified for 2 years after production or requalification. The permitted storage time is 20 years.

APPROVALS

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 140400** and the variety of environmental test procedures of the **IEC 60068*** 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 Manufacture"** 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.

RELATED PRODUCTS

This product family of thin film MELF High Temperature resistors is complemented by **Zero Ohm Jumpers**.

A wider range of TCR, tolerance and resistance values, plus the option of values from a different E series is available with products approved to **EN 140401-803**, Version A, without established reliability, nominal failure rate level E0 (Quality factor $\pi_Q = 3$). See the datasheets:

- "Professional MELF Resistors", document no. 28713
- "Precision MELF Resistors", document no. 28714
- "High Precision MELF Resistor", document no. 28715

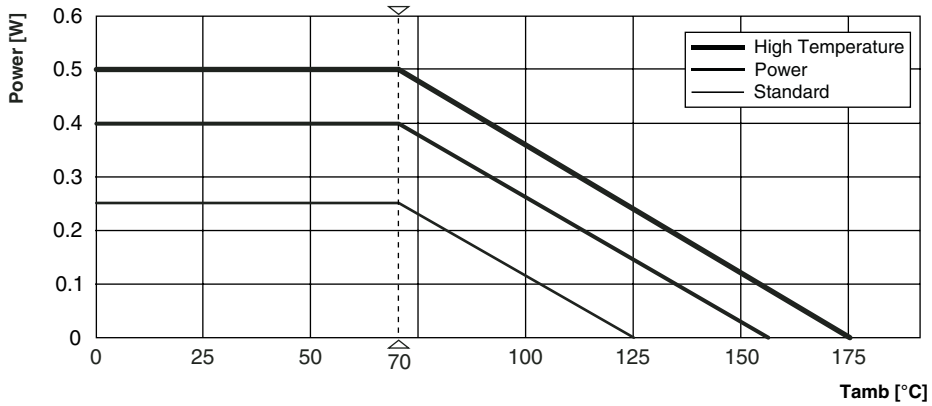
Notes

(1) Global Automotive Declarable Substance List, see www.gadsl.org

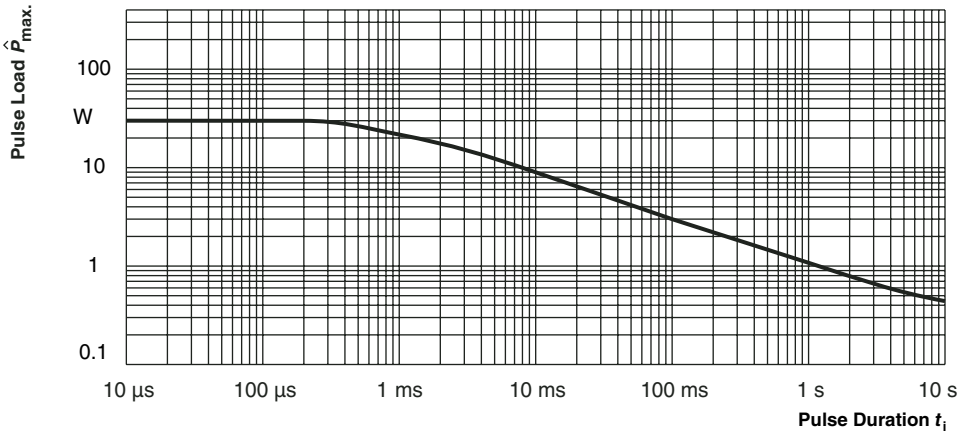
(2) CEFIC (European Chemical Industry Council), EECA (European Electronic Component Manufacturers Association), EICTA (European trade organisation representing the information and communications technology and consumer electronics), see www.eicta.org → issue → environment policy → chemicals → chemicals for electronics

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

FUNCTIONAL PERFORMANCE

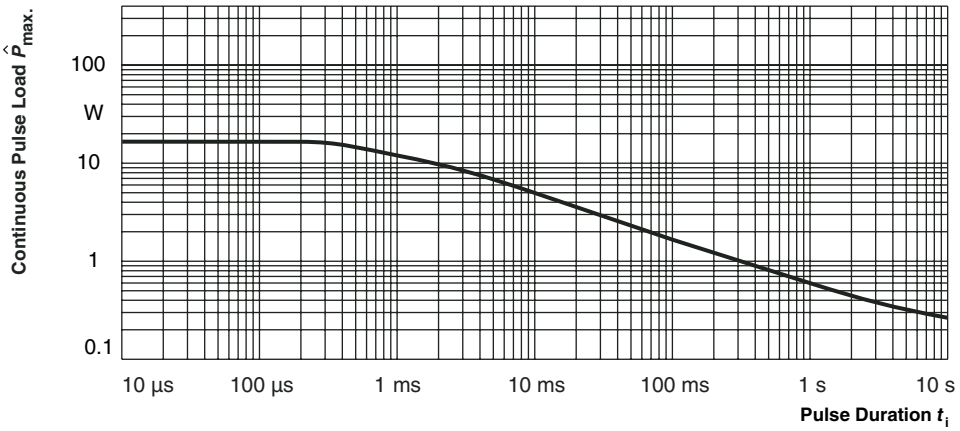


Derating for Operation Modes



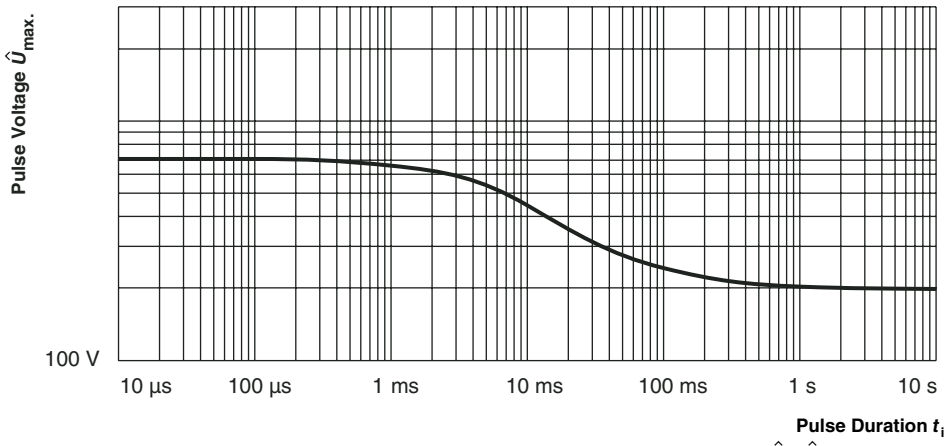
Maximum pulse load, single pulse; applicable if $\bar{P} \rightarrow 0$ and n ≤ 1000 and $\hat{U} \leq \hat{U}_{max.}$;
for permissible resistance change equivalent to 8000 h operation

Single Pulse



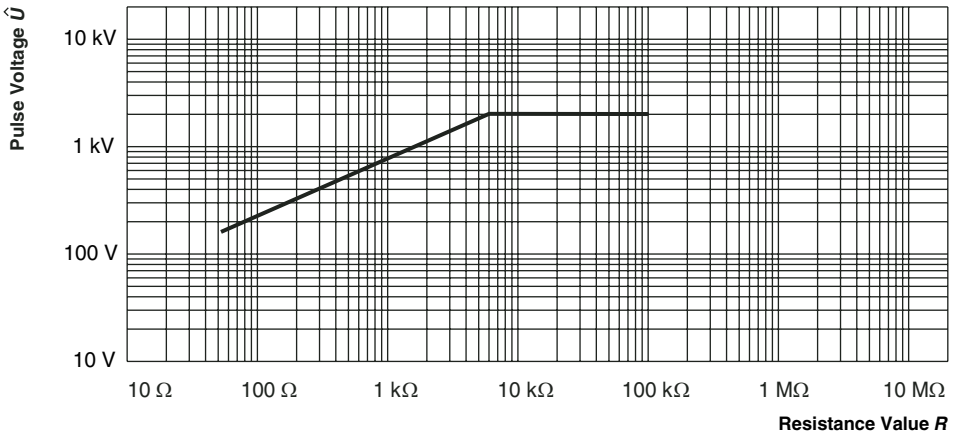
Maximum pulse load, continuous pulses; applicable if $\bar{P} \leq P\,(\vartheta_{amb})$ and $\hat{U} \leq \hat{U}_{max.}$;
for permissible resistance change equivalent to 8000 h operation

Continuous Pulse



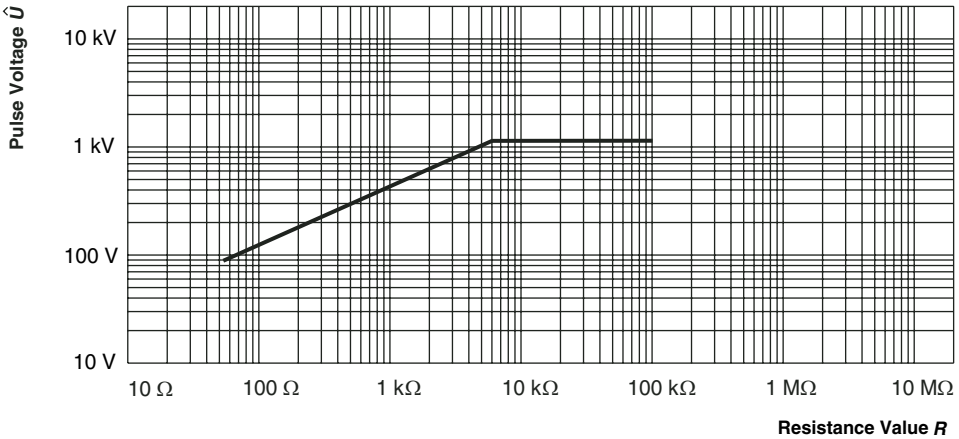
Pulse Voltage

Maximum pulse voltage, single and continuous pulses; applicable if $\hat{P} \leq \hat{P}_{max.}$;
for permissible resistance change equivalent to 8000 h operation



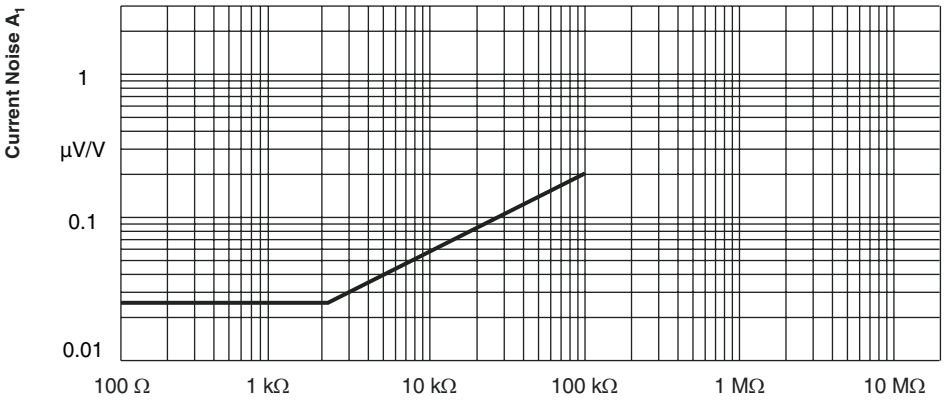
1.2/50 Pulse

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 %



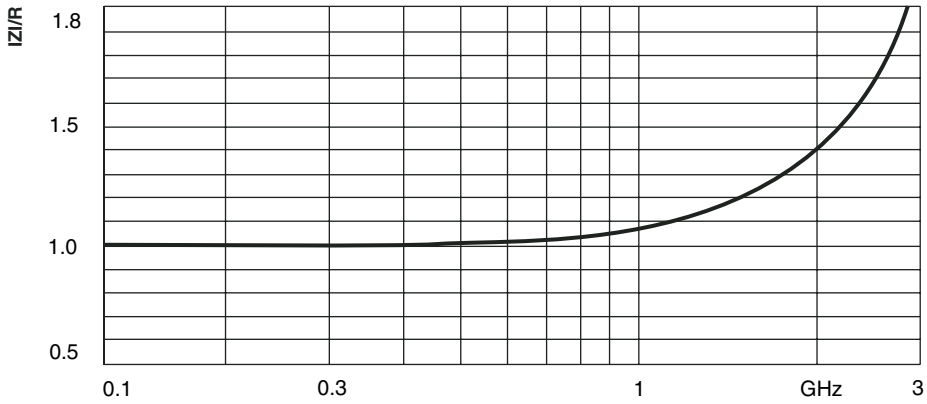
10/700 Pulse

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



In accordance with IEC 60195

Current Noise - A_1



|Z|/R for 49.9 Ω MELF resistors

RF - Behaviour

TEST AND REQUIREMENTS

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

EN 60115-1, generic specification

EN 140400, sectional specification

EN 140401-803, detail specification

The resistors are approved within the IECQ-CECC Quality Assessment System for Electronic Components. For the full test schedule refer to the documents listed above. The testing also covers most of the requirements specified by EIA/IS-703 and JIS-C-5202.

The tests are carried out in accordance with IEC 60068 (1) and under standard atmospheric conditions in accordance with IEC 60068-1, 5.3 (1). 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).

The components are mounted for testing on printed-circuit boards in accordance with EN 140400, 2.3.3, unless otherwise specified.

The requirements stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140401-803. However, some additional tests and a number of improvements against those minimum requirements have been included. The stated requirements for long-term tests are typically fulfilled with a statistical safety of at least $\bar{x}$ + 5 s.

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR) STABILITY CLASS 0.25 OR BETTER
			Stability for product types: **MMA 0204 HT**	47 Ω to 100 kΩ
4.5	-	Resistance	-	± 1 % R; ± 0.5 % R
4.8.4.2	-	Temperature coefficient	At 20/- 55/20 °C and 20/155/20 °C	± 50 ppm/K; ± 25 ppm/K
4.25.1	-	Endurance at 70 °C: Standard operation mode	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1.5 h on; 0.5 h off; 70 °C; 1000 h	± (0.10 % R + 10 mΩ)
			70 °C; 8000 h	± (0.20 % R + 10 mΩ)
		Endurance at 70 °C: Power operation mode	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1.5 h on; 0.5 h off; 70 °C; 1000 h	± (0.15 % R + 10 mΩ)
			70 °C; 8000 h	± (0.35 % R + 10 mΩ)
		Endurance at 70 °C: High temperature mode	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1.5 h on; 0.5 h off; 70 °C; 1000 h	± (0.25 % R + 10 mΩ)
4.25.3	-	Endurance at upper category temperature	125 °C; 1000 h	± (0.05 % R + 5 mΩ)
			155 °C; 1000 h	± (0.15 % R + 5 mΩ)
			175 °C; 1000 h	± (0.25 % R + 5 mΩ)
4.24	78 (Cab)	Damp heat, steady state (standard mode)	(40 ± 2) °C; 56 days; $U = 0.3 \times U_{rated}$; (93 ± 3) % RH	± (0.15 % R + 10 mΩ)
4.39	67 (Cy)	Damp heat, steady state, accelerated (standard mode)	(85 ± 2) °C; (85 ± 5) % RH; $U = 0.3 \times U_{rated}$; 1000 h	± (0.25 % R + 10 mΩ)
4.23		Climatic sequence:		± (0.15 % R + 10 mΩ)
4.23.2	2 (Ba)	Dry heat	UCT; 16 h	
4.23.3	30 (Db)	Damp heat, cyclic	55 °C; 24 h; ≥ 90 % RH; 1 cycle	
4.23.4	1 (Aa)	Cold	LCT; 2 h	
4.23.5	13 (M)	Low air pressure	8.5 kPa; 2 h; (25 ± 10) °C	
4.23.6	30 (Db)	Damp heat, cyclic	55 °C; 24 h; ≥ 90 % RH; 5 cycles	
4.23.7	-	D.C. load (High temperature mode)	$U = \sqrt{P_{70} \times R} \leq U_{max.}$; 1 min; LCT = - 55 °C; UCT = 155 °C	
-	1 (Aa)	Cold	- 55 °C; 2 h	± (0.05 % R + 5 mΩ)

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)
				STABILITY CLASS 0.25 OR BETTER
			Stability for product types:	
			MMA 0204 HT	47 Ω to 100 kΩ
4.19	14 (Na)	Rapid change of temperature	30 min at LCT; 30 min at UCT; LCT = - 55 °C; UCT = 125 °C 5 cycles	± (0.05 % R + 10 mΩ)
			1000 cycles	± (0.15 % R + 10 mΩ)
			LCT = - 55 °C; UCT = 155 °C 1000 cycles	± (0.25 % R + 10 mΩ)
4.13	-	Short time overload: Standard operation mode	$U = 2.5 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; 5 s	± (0.03 % R + 5 mΩ)
4.27	-	Single pulse high voltage overload; Standard operation mode	Severity no. 4: $U = 10 \times \sqrt{P_{70} \times R} \leq 2 \times U_{max.}$; 10 pulses 10 µs/700 µs	± (0.25 % R + 5 mΩ)
4.37	-	Periodic electric overload; Standard operation mode	$U = \sqrt{15 \times P_{70} \times R} \leq 2 \times U_{max.}$; 0.1 s on; 2.5 s off; 1000 cycles	± (0.5 % R + 5 mΩ)
4.22	6 (Fc)	Vibration	Endurance by sweeping; 10 Hz to 2000 Hz; No resonance; Amplitude ≤ 1.5 mm or ≤ 200 m/s^2; 6 h	± (0.05 % R + 5 mΩ)
4.40	-	Electrostatic discharge (Human body model)	IEC 61340-3-1*; 3 pos. + 3 neg. discharges MMA 0204: 2 kV	± (0.5 % R + 50 mΩ)
4.17.2	58 (Td)	Solderability	Solder bath method; SnPb40; Non-activated flux; (215 ± 3) °C; (2 ± 0.3) s	Good tinning (≥ 95 % covered); No visible damage
			Solder bath method; SnAg3Cu0,5 or SnAg3,5; Non-activated flux; (235 ± 3) °C; (2 ± 0.3) s	Good tinning (≥ 95 % covered); No visible damage
4.18.2	58 (Td)	Resistance to soldering heat	Solder bath method; (260 ± 5) °C; (10 ± 1) s	± (0.05 % R + 10 mΩ)
			Reflow method 2 (IR/forced gas convection); (260 ± 5) °C; (40 ± 1) s (3 times)	± (0.03 % R + 10 mΩ)
4.29	45 (XA)	Component solvent resistance	Isopropyl alcohol; 50 °C; method 2	No visible damage

TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	**IEC 60068-2 TEST METHOD**	**TEST**	**PROCEDURE**	**REQUIREMENTS PERMISSIBLE CHANGE (ΔR)**
				STABILITY CLASS 0.25 OR BETTER
			Stability for product types:	
			MMA 0204 HT	47 Ω to 100 kΩ
4.30	45 (XA)	Solvent resistance of marking	Isopropyl alcohol; 50 °C; Method 1, toothbrush	Marking legible; No visible damage
4.32	21 (Ue_3)	Shear	45 N	No visible damage
4.33	21 (Ue_1)	Substrate bending	Depth 2 mm, 3 times	No visible damage, no open circuit in bent position ± (0.05 % R + 5 mΩ)
4.7	-	Voltage proof	$U_{rms} = U_{ins}$; 60 s	No flashover or breakdown
4.35	-	Flammability	IEC 60 695-11-5, needle flame test; 10 s	No burning after 30 s

Note

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

Disclaimer

All product specifications and data are subject to change without notice.

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