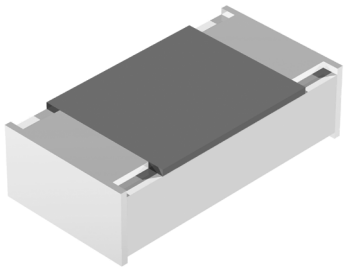
High Ohmic Flat Chip Resistors



FEATURES

- Unique very high ohmic chip resistor product
- Standard TC: ± 100 ppm/K
- Excellent overall stability
- Low voltage coefficient: 0.05 %/V
- Wide high ohmic range: > 10 MΩ to 130 MΩ
- Pure Sn termination on Ni barrier layer
- Compatible with lead (Pb)-free and lead containing soldering processes
- Lead (Pb)-free and RoHS compliant

APPLICATIONS

- Any kind of battery driven electronics
- Low consumption CMOS circuitry
- Small signal measurement

OCT 0603 and OCU 0805 high ohmic flat chip resistors are best suited where high resistance, high stability and high reliability are required. Typical applications include any kind of battery driven electronics, particularly low consumption CMOS circuitry.

METRIC SIZE		
INCH:	0603	0805
METRIC:	RR 1608M	RR 2012M

TECHNICAL SPECIFICATIONS				
DESCRIPTION	**OCT 0603**		**OCU 0805**	
Metric size	RR 1608M		RR 2012M	
Resistance range	11 MΩ to 130 MΩ		11 MΩ to 130 MΩ	
Resistance tolerance	± 5 %			
Temperature coefficient	± 250 ppm/K; ± 100 ppm/K			
Operation mode	standard	power	standard	power
Climatic category (LCT/UCT/days)	55/125/56	55/155/56	55/125/56	55/155/56
Rated dissipation, P_{70} [1)]	limited by U_{max}			
Operating voltage, U_{max} AC/DC	75 V	150 V	150 V	200 V
Film temperature	125 °C	155 °C	125 °C	155 °C
Max. resistance change at P_{70} for resistance range, ΔR/R max., after:	11 MΩ to 47 MΩ		11 MΩ to 47 MΩ	
1000 h	≤ 1 %	≤ 2 %	≤ 1 %	≤ 2 %
8000 h	≤ 2 %	≤ 4 %	≤ 2 %	≤ 4 %
Specified lifetime	8000 h			
Insulation voltage:				
1 minute; U_{ins}	100 V		200 V	
continuous	75 V		75 V	
Failure rate	≤ 2 × 10^{-9}/h		≤ 2 × 10^{-9}/h	

Note

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.

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 MΩ to 99.9 MΩ	6

Last Two Digits Indicating Sequential Code Number

RESISTANCE VALUE	LAST DIGITS
100 MΩ	01
110 MΩ	02
120 MΩ	03
130 MΩ	04

12NC Example

The 12 NC of a OCT 0603 resistor, value 51 MΩ and TC 250 with ± 5 % tolerance, supplied in cardboard tape of 20000 units per reel is: 2312 209 35106.

The 12 NC of a OCT 0603 resistor, value 130 MΩ and TC 250 with ± 5 % tolerance, supplied in cardboard tape of 5000 units per reel is: 2312 219 90104.

12NC - resistor type and packing

DESCRIPTION				ORDERING CODE 2312 ... . CARDBOARD TAPE ON REEL	
TYPE	T.C.	TOL.	RESISTANCE VALUE	P5 5 000 UNITS	PW 20 000 UNITS
OCT 0603	± 250 ppm/K	± 5 %	51 MΩ to 91 MΩ	219 3....	209 3....
			≥ 100 MΩ[1)]	219 901..	209 901..
	± 100 ppm/K	± 5 %	11 MΩ to 47 MΩ	**219 3....**	209 3....
OCU 0805	± 250 ppm/K	± 5 %	51 MΩ to 91 MΩ	259 3....	249 3....
			≥ 100 MΩ[1)]	259 901..	249 901..
	± 100 ppm/K	± 5 %	11 MΩ to 47 MΩ	**259 3....**	249 3....

Note

1. Readable coding of resistance values is restricted to values below 100 MΩ. For resistance values from 100 MΩ onwards, refer to the pre-defined Table of non-readable sequential numbers above.

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

PART NUMBER AND PRODUCT DESCRIPTION[2)]

PART NUMBER[3)]: OCT06030B5106JP500

O	C	T	0	6	0	3	0	B	5	1	0	6	J	P	5	0	0

MODEL/SIZE	SPECIAL CHARACTER	TC	VALUE	TOLERANCE	PACKING[4)]	SPECIAL
OCT0603 **OCU0805**	**0 =** neutral	**B =** ± 100 ppm/K **W =** ± 250 ppm/K	**For > 99.9 MΩ** 2 digit fix number = 01 2 digit annex **Annex** **01** = 100 MΩ **02** = 110 MΩ **03** = 120 MΩ **04** = 130 MΩ **For 10 MΩ to 99.9 MΩ** 3 digit value 1 digit multiplier **6** = *10^5	**J =** ± 5 %	**P5** **PW**	up to 2 digits **00** = standard

PRODUCT DESCRIPTION: OCT 0603 -100 5% P5 51M

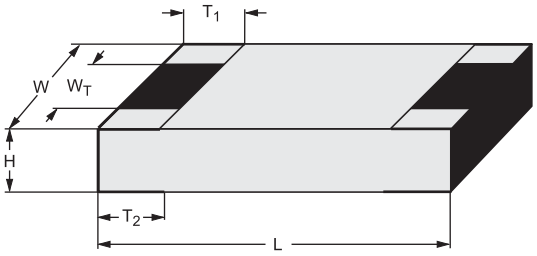
OCT	0603	-100	5 %	P5	51M
MODEL	SIZE	TC	TOLERANCE	PACKING[4)]	RESISTANCE VALUE
OCT **OCU**	**0603** **0805**	± **100** ppm/K ± **250** ppm/K	± **5** %	**P5** **PW**	**47M** = 47 MΩ **220M** = 220 MΩ

Note

2. Products can be ordered using either the PRODUCT DESCRIPTION or the 12 NC.
3. The PART NUMBER is shown to facilitate the introduction of a unified part numbering system. Currently, this PART NUMBER is applicable in the Americas only.
4. Please refer to table PACKING, page 112.

PACKING		
MODEL	REEL	
	PIECES/ PAPER TAPE ON REEL	CODE
OCT0603	5000	P5
	20000	PW
OCU0805	5000	P5
	20000	PW

DIMENSIONS



DIMENSIONS - CHIP resistor types, mass and relevant physical dimensions							
TYPE	H (mm)	L (mm)	W (mm)	W_T (mm)	T_1 (mm)	T_2 (mm)	MASS (mg)
OCT 0603	0.45 + 0.1/- 0.05	1.55 ± 0.05	0.85 ± 0.1	> 75 % of W	0.3 + 0.15/- 0.2	0.3 + 0.15/- 0.2	1.9
OCU 0805	0.45 + 0.1/- 0.05	2.0 ± 0.1	1.25 ± 0.15	> 75 % of W	0.4 + 0.1/- 0.2	0.4 + 0.1/- 0.2	4.6

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE			
DESCRIPTION		RESISTANCE VALUE(1)	
T.C.	TOLERANCE	OCT 0603	OCU 0805
± 250 ppm/K	± 5 %	51 MΩ to 130 MΩ	51 MΩ to 130 MΩ
± 100 ppm/K	± 5 %	11 MΩ to 47 MΩ	11 MΩ to 47 MΩ

Note

1. Resistance values to be selected from E24 series.

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

DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A newly developed cermet layer is deposited on a super high grade (Al_2O_3) ceramic substrate and conditioned to achieve the desired temperature coefficient. Inner contacts are built on both sides of the substrate. A special laser is used to achieve the target value by smoothly cutting 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.

The result of the determined production is verified by an extensive testing procedure and optical inspection performed on 100 % of the individual chip resistors. Only accepted products are laid directly into the paper tape in accordance with **EN 60286-3**.

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using wave, reflow or vapour phase. The encapsulation is resistant to all cleaning solvents commonly used in the electronics industry, including alcohols, esters and aqueous solutions. The resistors are 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 Electronic Equipment Directive (WEEE)

Solderability is specified for 2 years after production or re-qualification. The permitted storage time is 20 years.

APPROVALS

The resistors are tested in accordance with **EN 140 401-802** (superseding **CECC 40 401-802**) which refers to **EN 60115-1 and EN 140 400**.

Vishay BEYSCHLAG has achieved **"Approval of Manufacturer"** in accordance with **EN 100114-1**.

TESTS AND REQUIREMENTS

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

EN 60115-1, Generic specification (includes tests)

EN 140 400, Sectional specification (includes schedule for qualification approval)

EN 140 401-802, Detail specification (includes schedule for conformance inspection)

The components are approved in accordance with the European CECC-system, where applicable. The following table contains only the most important tests. 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 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 to1 060 mbar).

The components are mounted for testing on boards in accordance with EN 60115-1, 4.31 unless otherwise specified.

The requirements stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140 401-802. However, some additional tests and a number of improvements against those minimum requirements have been included.

TEST PROCEDURES AND REQUIREMENTS

EN 60115-1 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE ($\Delta R/R$)
			stability for product types:	
			OCT 0603	11 MΩ to 130 MΩ
			OCU 0805	11 MΩ to 130 MΩ
4.5	–	resistance	U = 100 V	± 5 %
4.8.4.2	–	temperature coefficient	at 20 / - 55 / 20 °C and 20 / 125 / 20 °C	± 250 ppm/K; ± 100 ppm/K
4.25.1	–	endurance at 70 °C: standard operation mode	$U = U_{max}$; 1.5 h on; 0.5 h off 70 °C; 1000 h 70 °C; 8000 h	 ± 1 % ± 2 %
4.25.3	–	endurance at upper category temperature	125 °C; 1000 h 155 °C; 1000 h	± 2 % ± 3 %
4.24	78 (Cab)	damp heat, steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH	± 1 %
4.23		climatic sequence:		
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; 5 days; > 95 to 100 % RH; 5 cycles LCT = - 55 °C; UCT = 125 °C	± 1 % no visible damage
–	1 (Aa)	cold	- 55 °C; 2 h	± 0.5 %

TEST PROCEDURES AND REQUIREMENTS - continued				
EN 60115-1 CLAUSE	**IEC 60068-2 TEST METHOD**	**TEST**	**PROCEDURE**	**REQUIREMENTS PERMISSIBLE CHANGE (ΔR/R)**
			stability for product types:	
			OCT 0603	11 MΩ to 130 MΩ
			OCU 0805	11 MΩ to 130 MΩ
4.19	14 (Na)	rapid change of temperature	30 minutes at LCT and 30 minutes at UCT; LCT = - 55 °C; UCT = 125 °C; 5 cycles LCT = - 55 °C; UCT = 125 °C; 1000 cycles	± 0.5 % no visible damage ± 1 % no visible damage
4.13	–	short time overload	$U = 2 \times U_{max}$; 5 s	± 0.5 %
4.27	–	single pulse high voltage overload; standard operation mode	severity no. 4, $U = 2 \times U_{max}$; 10 pulses 10 µs/700 µs	± 1 % no visible damage
4.22	6 (Fc)	vibration	endurance by sweeping; 10 to 2000 Hz; no resonance; amplitude ≤ 1.5 mm or ≤ 200 m/s²; 6 h	± 0.5 % no visible damage
4.17.2	58 (Td)	solderability	solder bath method; SnPb40; non-activated flux (215 ± 3) °C; (3 ± 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 ± 0.2) s	
4.18.2	58 (Td)	resistance to soldering heat	solder bath method; (260 ± 5) °C; (10 ± 1) s	± 0.5 % no visible damage
4.29	45 (XA)	component solvent resistance	isopropyl alcohol + 50 °C; method 2	no visible damage
4.32	21 (Ue_3)	shear (adhesion)	RR 1608M; 9 N	no visible damage
			RR 2012M; 45 N	
4.33	21 (Ue_1)	substrate bending	depth 2 mm, 3 times	± 0.5 % no visible damage, no open circuit in bent position
4.7	–	voltage proof	$U_{rms} = U_{ins}$; 60 ± 5 s	no flashover or breakdown
4.35	–	flammability	IEC 60695-2-2, needle flame test; 10 s	no burning after 30 s

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