

## High Pulse Load MELF Resistor



CMB 0207 speciality MELF resistors with advanced pulse load capability are the perfect choice for the protection of circuitry with signal and mains input lines from surge pulses. The resistors are also suitable for circuits exposed to high levels of electromagnetic interference or electro-static discharge. The applications are in all fields of automotive, telecommunication, industrial and medical equipment.

### FEATURES

- Approved to the safety requirements of IEC 60065, 14.1.a\* (= VDE 0860, 14.1.a) VDE-REG.-Nr. B583
- Special carbon film technology
- Up to 10 kV or 17 kW single pulse capability
- Up to tbf. continuous pulse load capability
- ESD capability: 16 kV, Human Body Model
- Compatible with lead (Pb)-free and lead containing soldering processes
- Lead (Pb)-free and RoHS compliant



### APPLICATIONS

- Automotive
- Telecommunication
- Industrial
- Medical equipment

### METRIC SIZE

DIN:	0207
CECC:	RC 6123M

### TECHNICAL SPECIFICATIONS

DESCRIPTION	CMB 0207	
CECC size	RC 6123M	
Resistance range	2.2 $\Omega$ to 1.5 M $\Omega$	
Resistance tolerance	$\pm 5 \%$ ; $\pm 2 \%$	
Temperature coefficient	see TCR graph	
Operation mode	standard	power
Climatic category (LCT/UCT/days)	55/125/56	55/155/56
Rated dissipation, $P_{70}^{(1)}$	0.4 W	1.0 W
Operating voltage, $U_{max}$ AC/DC	500 V	
Film temperature <sup>(3)</sup>	125 $^{\circ}\text{C}$	155 $^{\circ}\text{C}$
Max. resistance change at $P_{70}$ for resistance range, $ \Delta R/R $ after:	2.2 $\Omega$ to 10 k $\Omega$	
	1000 h	$\leq 0.5 \%$
	8000 h	$\leq 1 \%$
	225 000 h	t.b.f
Permissible voltage against ambient (insulation): 1 minute; $U_{ins}$ continuous	750 V	
	75 V	
Failure rate	$\leq 1 \times 10^{-9}/\text{h}$	

### Notes

- 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.
- 1. The power dissipation on the resistor generates a temperature rise against the local ambient, depending on the heatflow support of the printed-circuit board (thermal resistance). The rated dissipation applies only if the permitted film temperature is not exceeded. Furthermore, a high level of ambient temperature or of power dissipation may raise the temperature of the solder joint, hence special solder alloys or board materials may be required to maintain the reliability of the assembly.
- 2. Specified power rating requires dedicated heat-sink pads.
- 3. Film temperatures above the specified range may be permissible, e.g. 175  $^{\circ}\text{C}$ . Please contact the factory for details.

**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
1 $\Omega$ to 9.99 $\Omega$	8
10 $\Omega$ to 99.9 $\Omega$	9
100 $\Omega$ to 999 $\Omega$	1
1 k $\Omega$ to 9.99 k $\Omega$	2
10 k $\Omega$ to 99.9 k $\Omega$	3
100 k $\Omega$ to 999 k $\Omega$	4
1 M $\Omega$ to 9.99 M $\Omega$	5

**12NC Example**

The 12NC of a CMB 0207 resistor, value 47 k $\Omega$  with  $\pm 2\%$  tolerance, supplied in blister tape of 2000 units per reel is: 2312 199 24703.

**12NC - resistor type and packaging**

DESCRIPTION		ORDERING CODE 2312 ... ..	
		BLISTER TAPE ON REEL	
TYPE	TOL.	B2 2000 UNITS	B7 7000 UNITS
CMB 0207	$\pm 5\%$	... 199 3....	... 189 3....
	$\pm 2\%$	... 199 2....	... 189 2....

**PART NUMBER AND PRODUCT DESCRIPTION<sup>1)</sup>**

PART NUMBER<sup>2)</sup>: CMB02070X4701GB200

C	M	B	0	2	0	7	0	X	4	7	0	1	G	B	2	0	0
MODEL/SIZE	SPECIAL CHARACTER		TCR		VALUE			TOLERANCE		PACKAGING <sup>3)</sup>		SPECIAL					
CMB0207	0 = neutral		X = no indication					G = ± 2 % J = ± 5 %		B2 B7		up to 2 digits 00 = standard					
3 digit value 1 digit multiplier Multiplier 8 = *10 <sup>-2</sup> 9 = *10 <sup>-1</sup> 0 = *10 <sup>0</sup> 1 = *10 <sup>1</sup> 2 = *10 <sup>2</sup> 3 = *10 <sup>3</sup> 4 = *10 <sup>4</sup>																	

PRODUCT DESCRIPTION<sup>4)</sup>: CMB 0207 2% B2 4K7

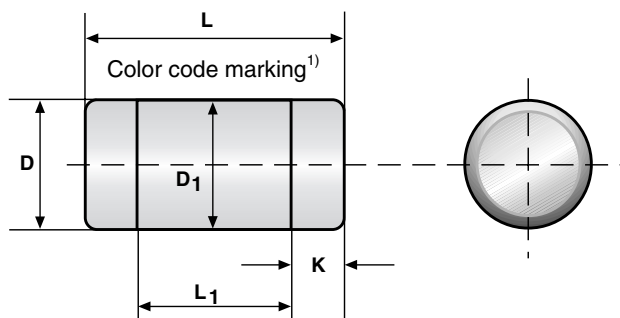
CMB	0207	2%	B2	4K7
MODEL	SIZE	TOLERANCE	PACKAGING <sup>3)</sup>	RESISTANCE VALUE
CMB	0207	$\pm 2\%$ $\pm 5\%$	B2 B7	100R = 100 $\Omega$ 4K7 = 4.7 k $\Omega$

**Notes**

1. Products can be ordered using either the PRODUCT DESCRIPTION or the 12NC.
2. The PART NUMBER is shown to facilitate the introduction of the unified part numbering system. Currently, this PART NUMBER is applicable in the Americas and in Asia/Pacific only.
3. Please refer to table PACKAGING, see below.
4. For CMB 0207 the temperature coefficient is not identified in the PRODUCT DESCRIPTION.

PACKAGING			
MODEL	BLISTER TAPE ON REEL ACC. IEC 60286-3		
	DIAMETER	PIECES/REEL	CODE
CMB0207	180 mm/7"	2000	B2
	330 mm/13"	7000	B7

## DIMENSIONS



DIMENSIONS - MELF resistor types, mass and relevant physical dimensions						
TYPE	L (mm)	D (mm)	L <sub>1</sub> min (mm)	D <sub>1</sub> (mm)	K (mm)	MASS (mg)
CMB 0207	5.8 + 0/- 0.15	2.2 + 0/- 0.2	3.2	D + 0/- 0.2	1.15 ± 0.1	79

### Note

- Color code marking is applied according to IEC 60062\* in four bands. Each color 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 color band for tolerance is approximately, 50 % wider than the other bands. A brown interrupted band between the 2nd and 3rd full band indicates the special carbon film type.

TOLERANCE AND RESISTANCE RANGE	
DESCRIPTION	RESISTANCE VALUE <sup>2)</sup>
TOLERANCE	CMB 0207
± 5 %	2.2 Ω to 15 Ω
± 2 %	16 Ω to 1.5 MΩ

### Note

- Please select resistance values for ± 5 % and ± 2 % tolerance from the E24 series.

**DESCRIPTION**

Production of the CMB 0207 speciality MELF resistor 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 (96 %  $\text{Al}_2\text{O}_3$ ). Nickel plated steel termination caps are firmly pressed on the coated rods. Products with a resistance of 15  $\Omega$  or lower are made without trimming, whereas a special laser is used to achieve a target value of 16  $\Omega$  or above 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 color code rings designate the resistance value and tolerance in accordance with **IEC 60 062<sup>3)</sup>**.

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 60 286-3<sup>3)</sup>**.

**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<sup>3)</sup>**. Excellent solderability is proven, even after extended storage in excess of 10 years. 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 soldering processes. The immunity of the plating against tin whisker growth has been proven under extensive testing.

All products comply with the **GADSL<sup>1)</sup>** and the **CEFIC-EECA-EICTA<sup>2)</sup>** 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)

**Notes**

1. Global Automotive Declarable Substance List, see [www.gadsl.org](http://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](http://www.eicta.org) -> issues -> environment policy -> chemicals -> chemicals for electronics

**APPROVALS**

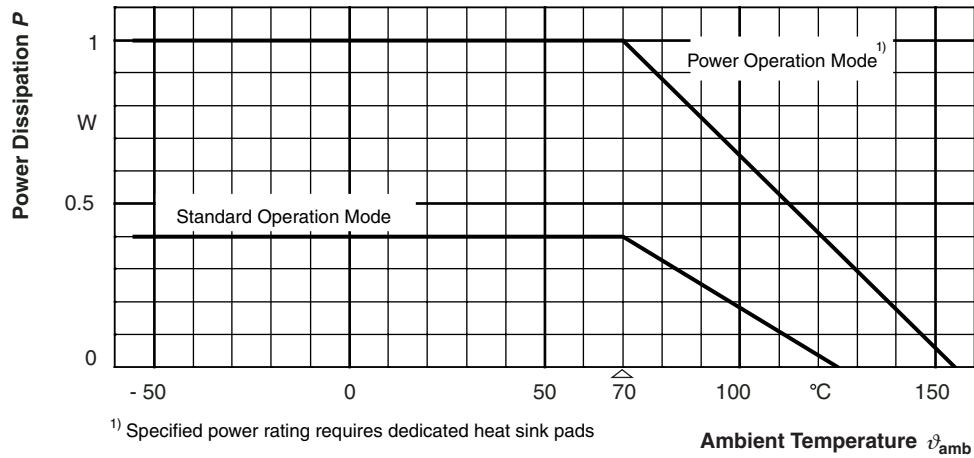
Where applicable the resistors are tested in accordance with **EN 140401-803** which refers to **EN 60115-1**, **EN 140400** and the variety of environmental test procedures of the **IEC 60068<sup>3)</sup>** series.

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.

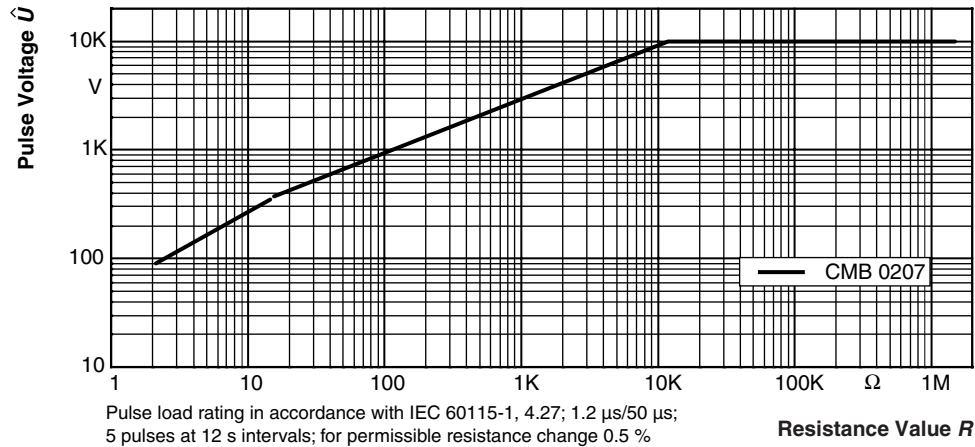
**Note**

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

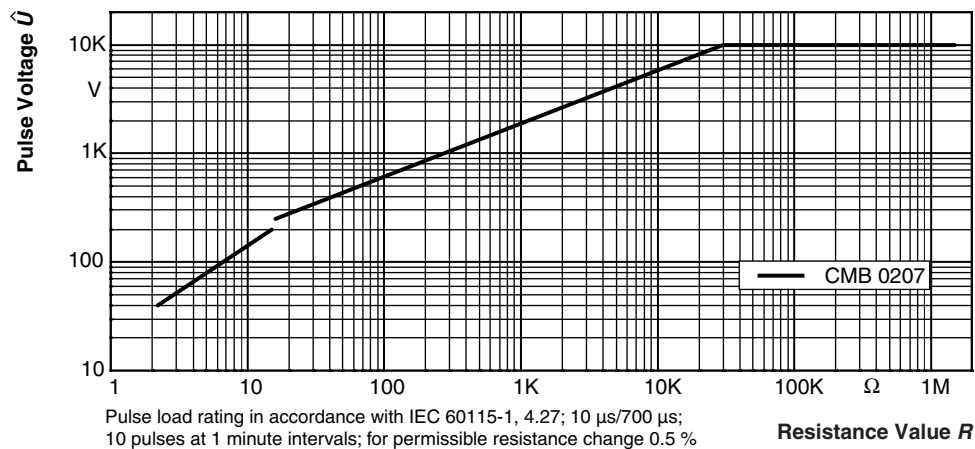
## FUNCTIONAL PERFORMANCE



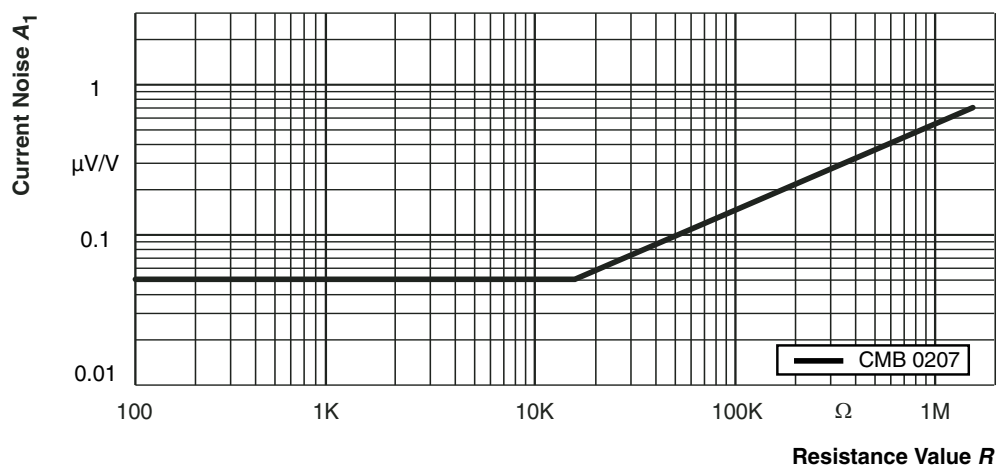
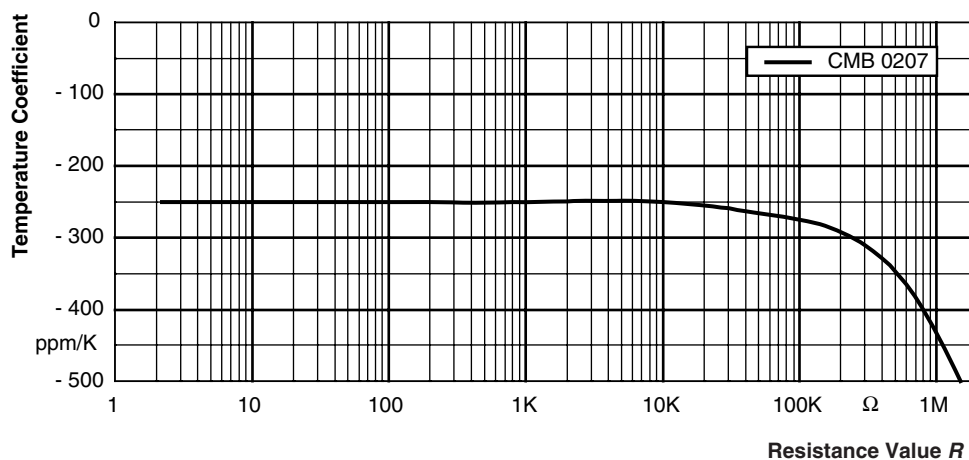
### Derating



### 1.2/50 Pulse



### 10/700 Pulse



## REVISION HISTORY

Compared to the prior revision of this datasheet, short rev3, the following changes have been applied:

- Transfer into Vishay format for publication on the internet
- Introduction of a standardized part numbering system
- Additional emphasis on the clean balance of materials and on the compliance with various EU directives
- Revision of the 1.2/50 pulse load diagram
- Introduction of diagrams on 10/700 pulse load and on current noise
- Introduction of information on electrostatic discharge (ESD) capability
- No other change of technical contents
- No product change



### Disclaimer

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

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.