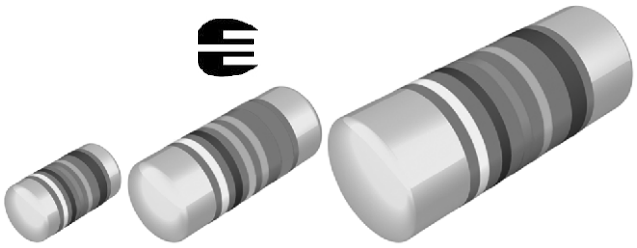
MMU 0102 VG03, MMA 0204 VG03, MMB 0207 VG03

Vishay Beyschlag

MELF Resistors with Established Reliability



FEATURES

- Approved according to EN 140401-803, version E
- Established reliability, failure rate level E6
- Advanced thin film technology
- Excellent overall stability: Class 0.25
- Force fitted steel caps, tin plated on nickel barrier
- Pure Sn termination on Ni barrier layer
- Compatible with lead (Pb)-free and lead containing soldering processes
- Lead (Pb)-free and RoHS compliant

MMU 0102 VG03, MMA 0204 VG03 and MMB 0207 VG03 thin film MELF resistors with established reliability are the perfect choice for all high-reliability applications typically found in the fields of military, aircraft and spacecraft electronics. These versions supplement the families of professional and precision MELF resistors MMU 0102, MMA 0204 and MMB 0207.

APPLICATIONS

- Military
- Avionics
- Space

METRIC SIZE			
DIN:	0102	0204	0207
CECC:	RC 2211M	RC 3715M	RC 6123M

TECHNICAL SPECIFICATIONS			
DESCRIPTION	**MMU 0102**	**MMA 0204**	**MMB 0207**
CECC size, style	RC 2211M	RC 3715M	RC 6123M
Resistance range	100 Ω to 2.21 MΩ	1 Ω to 5.11 MΩ	1 Ω to 10 MΩ
Resistance tolerance	± 1 %; ± 0.1 %		
Temperature coefficient	± 50 ppm/K; ± 15 ppm/K		
Climatic category (LCT/UCT/days)	55/125/56	55/125/56	55/125/56
Rated dissipation, P_{70}	0.2 W	0.25 W	0.4 W
Operating voltage, U_{max} AC/DC	150 V	200 V	300 V
Film temperature	125 °C	125 °C	125 °C
Max. resistance change at P_{70} for resistance range,	100 Ω to 221 kΩ	1 Ω to 332 kΩ	1 Ω to 1 MΩ
$\lvert\Delta R/R\rvert$ after 1000 h	≤ 0.15 %		
8000 h	≤ 0.3 %		
225 000 h	≤ 1 %		
Permissible voltage against			
1 minute; U_{ins}	200 V	300 V	500 V
continuous	75 V	75 V	75 V
Assessed failure rate level	E6		
Failure rate	≤ 2×10^{-9}/h	≤ 0.7×10^{-9}/h	≤ 0.7×10^{-9}/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.

- The failure rate level E6 corresponds to MIL Level P.

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 Resistance Decade table.

Resistance Decade

RESISTANCE DECADE	LAST DIGIT
1 Ω to 9.99 Ω	8
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
10 MΩ	6

12NC Example

The 12NC of a MMU 0102 VG03 resistor, value 287 k and TC 50 with ± 1 % tolerance, supplied in blister tape of 3000 units per reel is: 2312 165 02874.

12NC - resistor type and packaging

DESCRIPTION			ORDERING CODE 2312			
			BLISTER TAPE ON REEL			BULK CASE
TYPE	**TCR**	**TOL.**	**B1 1000 UNITS**	**BL 3000 UNITS**	**B0 10 000 UNITS**	**M8 8000 UNITS**
MMU 0102 VG03	± 50 ppm/K	± 1 %	170 0....	165 0....	175 0....	060 0....
	± 15 ppm/K	± 0.1 %	172 0....	167 0....	177 0....	062 0....
	jumper		172 90001	167 90001	177 90001	062 90001
TYPE	**TCR**	**TOL.**	**B1 1000 UNITS**	**BL 3000 UNITS**	**B0 10 000 UNITS**	**M3 3000 UNITS**
MMA 0204 VG03	± 50 ppm/K	± 1 %	140 0....	155 0....	145 0....	040 0....
	± 15 ppm/K	± 0.1 %	142 0....	157 0....	147 0....	042 0....
	jumper		142 90001	157 90001	147 90001	042 90001
TYPE	**TCR**	**TOL.**	**B1 1000 UNITS**	**B2 2000 UNITS**	**B7 7000 UNITS**	
MMB 0207 VG03	± 50 ppm/K	± 1 %	180 0....	195 0....	185 0....	
	± 15 ppm/K	± 0.1 %	182 0....	197 0....	187 0....	
	jumper		182 90001	197 90001	187 90001	

PART NUMBER AND PRODUCT DESCRIPTION[1)]

PART NUMBER[2)]: MMA02040WC4999FBL00
PART NUMBER[2)]: MMA02040WZ0000ZBL00

M	**M**	**A**	**0**	**2**	**0**	**4**	**W**	**C**	**4**	**9**	**9**	**9**	**F**	**B**	**L**	**0**	**0**
M	**M**	**A**	**0**	**2**	**0**	**4**	**W**	**Z**	**0**	**0**	**0**	**0**	**Z**	**B**	**L**	**0**	**0**

MODEL/SIZE	SPECIAL CHARACTER	TCR	VALUE	TOLERANCE	PACKAGING[3)]	SPECIAL
MMU0102 **MMA0204** **MMB0207**	**W** = VG03 CECC E6	**E** = ± 15 ppm/K **C** = ± 50 ppm/K **Z = Jumper**	3 digit value 1 digit multiplier **0000** = Jumper **Multiplier** 8 = $*10^{-2}$ 2 = $*10^{2}$ 9 = $*10^{-1}$ 3 = $*10^{3}$ 0 = $*10^{0}$ 4 = $*10^{4}$ 1 = $*10^{1}$ 5 = $*10^{5}$	**B** = ± 0.1 % **F** = ± 1 % **Z** = Jumper	B1 B3 B0 B2 B7 M3 M8	up to 2 digits **00** = standard

PRODUCT DESCRIPTION: MMA 0204 - 50 1 % VG03 BL 49R9
PRODUCT DESCRIPTION: MMA 0204 VG03 BL 0R0

MMA	**0204**	**- 50**	**1 %**	**VG03**	**BL**	**49R9**
MMA	**0204**	**-**	**-**	**VG03**	**BL**	**0R0**
MODEL	**SIZE**	**TC**	**TOLERANCE**	**ESTABLISHED RELIABILITY**	**PACKAGING[3)]**	**RESISTANCE VALUE**
MMU **MMA** **MMB**	**0102** **0204** **0207**	± **15** ppm/K ± **50** ppm/K	± **0.1** % ± **1** %	**VG03** = CECC E6[4)]	B1 BL B0 B2 B7 M3 M8	**49R9** = 49.9 Ω **0R0** = Jumper

Notes

1. Products can be ordered using either the PRODUCT DESCRIPTION, the 12NC or the EN ordering information.
2. The PART NUMBER is shown to facilitate the introduction of a 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. Reference to EN140401-803 Version E.

EN 140401-803 ORDERING INFORMATION

Example of the ordering information for a resistor: MMA 0204-50 1 % VG03 287K
CECC40401-803EZRC3715MC287KFE6

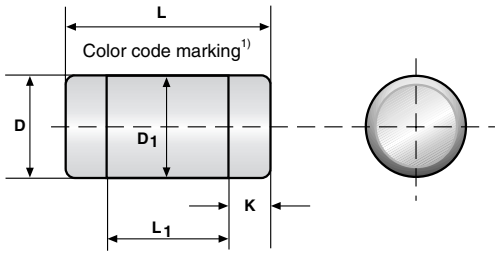
Example of the ordering information for jumpers: MMA 0204 VG03 0R0
CECC40401-803EZRC3715M-0R00-E6

The elements used in this ordering information have the following meaning:

CECC40401-803	CECC Detail specification number
EZ	Assessment level
RC3715M	Style (see table Technical Specification)
C	Temperature coefficient (C = ± 50 ppm/K; E = ± 15 ppm/K)
287K	Resistance value according to EN 60062, 4 characters
F	Tolerance on rated resistance (B = ± 0.1 %; F = ± 1 %)
E6	Failure rate level according to EN 60115-1, Table ZB.1

PACKAGING					
MODEL	BLISTER TAPE ON REEL ACC. IEC 60286-3			BULK CASE ACC. IEC 60286-6	
	DIAMETER	PIECES/REEL	CODE	PIECES/BULK CASE	CODE
MMU 0102 VG03	180 mm/7"	1000	B1	8000	M8
	180 mm/7"	3000	B3 = BL		
	330 mm/13"	10 000	B0		
MMA 0204 VG03	180 mm/7"	1000	B1	3000	M3
	180 mm/7"	3000	B3 = BL		
	330 mm/13"	10 000	B0		
MMB 0207 VG03	180 mm/7"	1000	B1	-	-
	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)	$L_{1\ min}$ (mm)	D_1 (mm)	K (mm)	MASS (mg)
MMU 0102	2.2 + 0/- 0.1	1.1 + 0/- 0.1	1.2	D + 0/- 0.1	0.4 ± 0.05	7
MMA 0204	3.6 + 0/- 0.2	1.4 + 0/- 0.1	1.8	D + 0/- 0.15	0.8 ± 0.1	19
MMB 0207	5.8 + 0/- 0.2	2.2 + 0/- 0.2	2.8	D + 0/- 0.2	1.25 ± 0.15	79

Note: Color code marking is applied according to EN 60062* in four bands (E24 series) or five bands (E96 or E192 series). 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. An interrupted blue band between the 1st and 2nd full band indicates the failure rate level E6. An interrupted orange band between the 4th and 5th full band indicates the temperature coefficient of 15 ppm/K.

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 (85 % Al_2O_3, for MICRO-MELF: 96 % 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 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 laid directly into the blister tape in accordance with **IEC 60286-3*** or bulk case in accordance with **IEC 60286-6*.**

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***. 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**[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)

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 -> issues -> environment policy -> chemicals -> chemicals for electronics

APPROVALS

The resistors are tested in accordance with **EN 140401-803** (superseding **CECC 40401-803**) which refers to **EN 60115-1, EN 140400** and the variety of environmental test procedures of the **IEC 60068*** series. Approval of conformity is indicated by the **CECC** logo on the package label.

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 240 001** based on **IEC 001002-3, clause 6** is granted for the Vishay BEYSCHLAG manufacturing process.

SPECIALS

This product family of thin film MELF resistors with established reliability is complemented by **Zero Ohm Jumpers**.

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

FUNCTIONAL PERFORMANCE

Further information on the performance of these products may be found in the following Data Sheets:

"Professional MELF Resistors"
Document No. 28713
"Precision MELF Resistors"
Document No. 28714

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE

DESCRIPTION		RESISTANCE VALUE		
TCR	TOLERANCE	MMU 0102	MMA 0204	MMB 0207
± 50 ppm/K	± 1 %	100 Ω to 2.21 MΩ	1 Ω to 5.11 MΩ	1 Ω to 10 MΩ
± 15 ppm/K	± 0.1 %	100 Ω to 100 kΩ	75 Ω to 100 kΩ	75 Ω to 499 kΩ
Jumper		≤ 10 mΩ; I_{max} = 2 A	≤ 10 mΩ; I_{max} = 3 A	≤ 10 mΩ; I_{max} = 5 A

Note

1. Resistance values to be selected for ± 1 % tolerance from E96 only and for ± 0.1 % tolerance from E192 only.

REVISION HISTORY

Compared to the prior revision of this datasheet, 05-Aug-05, the following changes have been applied:

- Introduction of a standardized part numbering system
- No change of technical contents
- No product change

Notice

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