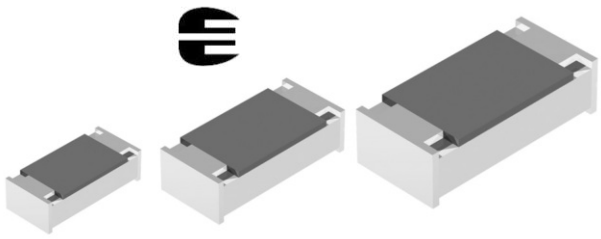
Flat Chip Resistors with Established Reliability



MCS 0402 VG01, MCT 0603 VG01 and MCU 0805 VG01 thin film flat chip 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 thin film flat chip resistors MCS 0204, MCT 0603 and MCU 0805.

FEATURES

- Approved according to EN 140401-801, version E
- Established reliability, failure rate level E6
- Advanced thin film technology
- Advanced dissipation rating: 100 mW
- Excellent overall stability: Class 0.5
- Green product, supports lead (Pb)-free soldering

RoHS COMPLIANT

APPLICATIONS

- Military
- Avionics
- Space

METRIC SIZE			
INCH:	0402	0603	0805
METRIC:	RR 1005M	RR 1608M	RR 2012M

TECHNICAL SPECIFICATIONS			
DESCRIPTION	**MCS 0402**	**MCT 0603**	**MCU 0805**
CECC size, style	RR 1005M	RR 1608M	RR 2012M
Resistance range	100 Ω to 100 kΩ	10 Ω to 1 MΩ	1 Ω to 1 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}	0.063 W	0.1 W	0.125 W
Operating voltage, $U_{max.}$ AC/DC	50 V	75 V	150 V
Film temperature	125 °C	125 °C	125 °C
Max. resistance change at P_{70} for resistance range, $\Delta R/R$ after:	100 Ω to 100 kΩ	10 Ω to 1 MΩ	1 Ω to 1 MΩ
1000 h	≤ 0.25 %		
8000 h	≤ 0.5 %		
225 000 h	≤ 1.5 %		
Permissible voltage against ambient (insulation):			
1 min; U_{ins}	75 V	100 V	200 V
continuous	75 V	75 V	75 V
Assessed failure rate level	E6		
$FIT_{observed}$	≤ 0.1 x 10^{-9}/h	≤ 0.1 x 10^{-9}/h	≤ 0.1 x 10^{-9}/h

Notes

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

PART NUMBER AND PRODUCT DESCRIPTION (1)

PART NUMBER: MCT0603HC2871FP500
PART NUMBER: MCT0603HZ0000ZP500

M	**C**	**T**	**0**	**6**	**0**	**3**	**H**	**C**	**2**	**8**	**7**	**1**	**F**	**P**	**5**	**0**	**0**	
M	**C**	**T**	**0**	**6**	**0**	**3**	**H**	**Z**	**0**	**0**	**0**	**0**	**Z**	**P**	**5**	**0**	**0**	

MODEL/SIZE	SPECIAL CHARACTER	TCR	VALUE	TOLERANCE	PACKAGING (2)	SPECIAL
MCS0402 **MCT0603** **MCU0805**	**H** = VG01 CECC E6	**E** = ± 15 ppm/K **C** = ± 50 ppm/K **Z** = Jumper	**3 digit value** **1 digit multiplier** MULTIPLIER **8** = $*10^{-2}$ **9** = $*10^{-1}$ **0** = $*10^{0}$ **1** = $*10^{1}$ **2** = $*10^{2}$ **3** = $*10^{3}$ **4** = $*10^{4}$	**B** = ± 0.1 % **F** = ± 1 % **Z** = Jumper	**P1** **P5** **E1** **E0** **PW**	Up to 2 digits **00** = Standard

PRODUCT DESCRIPTION: MCT 0603-50 1 % VG01 P5 287K
PRODUCT DESCRIPTION: MCT 0603 VG01 P5 0R0

MCT	**0603**	**- 50**	**1 %**	**VG01**	**P5**	**287K**
MCT	**0603**	**-**	**-**	**VG01**	**P5**	**0R0**
MODEL	SIZE	TCR	TOLERANCE	ESTABLISHED RELIABILITY	PACKAGING (2)	RESISTANCE VALUE
MCS **MCT** **MCU**	**0402** **0603** **0805**	± **15** ppm/K ± **50** ppm/K	**± 0.1 %** **± 1 %**	**VG01** = CECC E6 (3)	**P1** **P5** **E1** **E0** **PW**	**562R = 562** Ω **287K =** 287 kΩ **1M0 =** 1 MΩ **0R0 =** Jumper

Notes

(1) Products can be ordered using the PART NUMBER, PRODUCT DESCRIPTION or EN ordering information

(2) Please refer to table PACKAGING, see next page

(3) Reference to EN140401-801 Version E

EN 140401-801 ORDERING INFORMATION

Example of the ordering information for a resistor: MCT 0603-50 1 % VG01 287K
CECC40401-801EZRR1608MC287KFE6

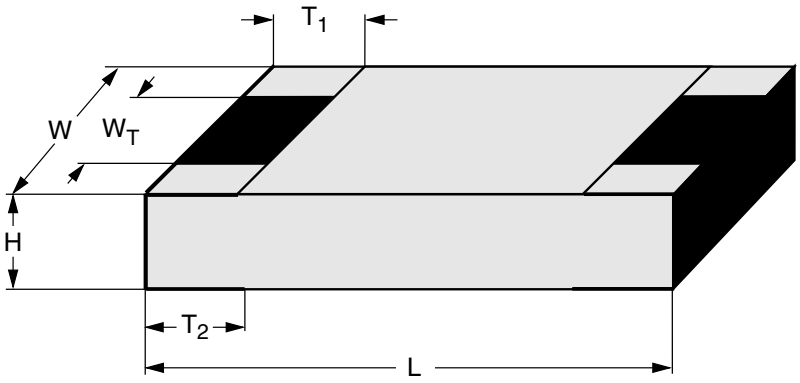
Example of the ordering information for jumpers: MCT 0603 VG01 0R0
CECC40401-801EZRR1608M-0R00-E6

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

CECC40401-801	CECC Detail specification number
EZ	Assessment level
RR1608M	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	REEL		
	DIAMETER	PIECES/ PAPER TAPE ON REEL	CODE
MCS 0402 VG01	180 mm/7"	1000	E1
	180 mm/7"	10 000	E0
MCT 0603 VG01	180 mm/7"	1000	P1
	180 mm/7"	5000	P5
	330 mm/13"	20 000	PW
MCU 0805 VG01	180 mm/7"	1000	P1
	180 mm/7"	5000	P5
	330 mm/13"	20 000	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)
MCS 0402	0.32 ± 0.05	1.0 ± 0.05	0.5 ± 0.05	> 75 % of W	0.2 + 0.1/- 0.15	0.2 ± 0.1	0.6
MCT 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
MCU 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

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 (96 % Al_2O_3) ceramic substrate and conditioned to achieve the desired temperature coefficient. Specially designed inner contacts are deposited on both sides. A special laser is used to achieve the target value by smoothly cutting a meander groove in the resistive layer without damaging the ceramics. For the high ohmic range, optimized Cermet products provide comparable properties. 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 as shown in **IEC 61760-1***. 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 RoHS compliant; the pure tin plating provides compatibility with lead (Pb)-free and lead-containing soldering processes. Solderability is specified for 2 years after production or requalification. The permitted storage time is 20 years. 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)

APPROVALS

The resistors are tested in accordance with **EN 140401-801** (superseding **CECC 40401-801**) which refers to **EN 60115-1** and **EN 140400**. Approval of conformity is indicated by the **CECC** logo on the package label.

Vishay BEYSCHLAG has achieved **"Approval of Manufacturer"** in accordance with **EN 100114-1**. The release certificate for **"Technology Approval Schedule"** in accordance with **CECC 240 001** based on **EN 100114-6** is granted for the Vishay BEYSCHLAG manufacturing process.

SPECIALS

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

FUNCTIONAL PERFORMANCE

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

- "Professional Chip resistors"
  Document No. 28705
- "Precision Chip resistors"
  Document No. 28700

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

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE				
DESCRIPTION		RESISTANCE VALUE		
TCR	TOLERANCE	MCS 0402	MCT 0603	MCU 0805
± 50 ppm/K	± 1 %	100 Ω to 100 kΩ	10 Ω to 1 MΩ	1 Ω to 1 MΩ
± 15 ppm/K	± 0.1 %	100 Ω to 33.2 kΩ	100 Ω to 47.5 kΩ	100 Ω to 100 kΩ
Jumper	-	≤ 20 mΩ; $I_{max.}$ = 0.63 A	≤ 20 mΩ; $I_{max.}$ = 1 A	≤ 20 mΩ; $I_{max.}$ = 1.5 A

Note

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

12NC INFORMATION FOR HISTORICAL CODING REFERENCE ONLY

Part Number

- The resistors have a 12-digit ordering code starting with 2312.
- The subsequent 4 digits indicate the resistor type, specification and packaging; see the Part Number 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	5

Ordering example

The Part Number of a MCT 0603 VG01 resistor, value 287K and TCR 50 with ± 1 % tolerance, supplied in cardboard tape of 5000 units per reel is: 2312 215 02874.

PART NUMBER - RESISTOR TYPE AND PACKAGING					
DESCRIPTION			ORDERING CODE 2312		
			CARDBOARD TAPE ON REEL		
TYPE	TCR	TOL.	E1 1000 UNITS	E0 10 000 UNITS	
MCS 0402	± 50 ppm/K	± 1 %	260 0....	**275 0....**	
	± 15 ppm/K	± 0.1 %	262 0....	**277 0....**	
	Jumper	-	262 90001	**277 90001**	
TYPE	TCR	TOL.	P1 1000 UNITS	P5 5000 UNITS	PW 20 000 UNITS
MCT 0603	± 50 ppm/K	± 1 %	200 0....	215 0....	205 0....
	± 15 ppm/K	± 0.1 %	202 0....	217 0....	-
	Jumper	-	202 90001	217 90001	207 90001
MCU 0805	± 50 ppm/K	± 1 %	240 0....	255 0....	245 0....
	± 15 ppm/K	± 0.1 %	242 0....	257 0....	-
	Jumper	-	242 90001	257 90001	247 90001

Disclaimer

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

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