

Professional Wide Terminal Thin Film Chip Resistors



MCW AT Professional Wide Terminal Resistors are the perfect choice for most fields of modern professional power measurement electronics where reliability, stability, power dissipation, and robust design is of major concern.

Besides extremely high power ratings, the MCW AT is characterized by extraordinary temperature cycling robustness, verified through extensive testing. Typical applications include power electronics in automotive and industrial appliances.

FEATURES

- Rated dissipation P_{85} up to 1 W
- Superior temperature cycling robustness
- Operating temperature up to 175 °C for 1000 h
- AEC-Q200 qualified
- Advanced sulfur resistance verified according to ASTM B 809
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT

APPLICATIONS

- Automotive
- Industrial
- High power and high temperature applications
- Replacement for larger case sizes

TECHNICAL SPECIFICATIONS		
DESCRIPTION	MCW 0406 AT	MCW 0612 AT
Imperial size	0406	0612
Metric size code	RR1016M	RR1632M
Resistance range	1 Ω to 100 kΩ	1 Ω to 100 kΩ
Resistance tolerance	± 0.5 %; ± 1 %	± 0.5 %; ± 1 %
Temperature coefficient	± 25 ppm/K; ± 50 ppm/K	± 25 ppm/K; ± 50 ppm/K
Rated dissipation P_{85} ⁽¹⁾	0.3 W	1.0 W
Operating voltage, U_{max} , AC _{RMS} /DC	50 V	75 V
Permissible film temperature, θ_F max. ⁽¹⁾	175 °C	175 °C
Operating temperature range ⁽¹⁾	-55 °C to 175 °C	-55 °C to 175 °C
Permissible voltage against ambient (insulation): 1 min; U_{ins}	75 V	100 V
Failure rate: FIT _{observed}	$\leq 0.1 \times 10^{-9}/h$	

Note

⁽¹⁾ Please refer to APPLICATION INFORMATION, see below

APPLICATION INFORMATION

When the resistor dissipates power, a temperature rise above the ambient temperature occurs, dependent on the thermal resistance of the assembled resistor together with the printed circuit board. The rated dissipation applies only if the permitted film temperature is not exceeded.

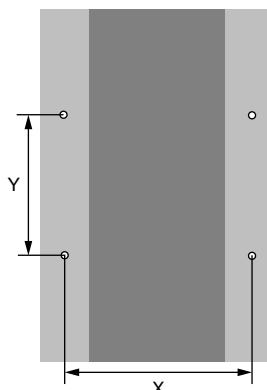
These resistors do not feature a limited lifetime when operated within the permissible limits. However, resistance value drift increasing over operating time may result in exceeding a limit acceptable to the specific application, thereby establishing a functional lifetime.

MAXIMUM RESISTANCE CHANGE AT RATED DISSIPATION				
OPERATION MODE		STANDARD	POWER	ADVANCED TEMPERATURE
Rated dissipation	MCW 0406 AT	P_{70}	P_{70}	P_{85}
	MCW 0612 AT	0.2 W	0.25 W	0.3 W
Operating temperature range		-55 °C to 125 °C	-55 °C to 155 °C	-55 °C to 175 °C
Permissible film temperature, θ_F max.		125 °C	155 °C	175 °C
Max. resistance change at rated dissipation for resistance range, $ \Delta R/R $, after: 1000 h 8000 h 225 000 h	MCW 0406 AT	1 Ω to 100 kΩ	1 Ω to 100 kΩ	1 Ω to 100 kΩ
	MCW 0612 AT	1 Ω to 100 kΩ	1 Ω to 100 kΩ	1 Ω to 100 kΩ
		≤ 0.1 %	≤ 0.2 %	≤ 0.4 %
		≤ 0.2 %	≤ 0.4 %	-
		≤ 0.6 %	-	-

Note

- The presented operation modes do not refer to different types of resistors, but actually show examples of different loads, that lead to different film temperatures and different achievable load-life stability (drift) of the resistance value. A suitable low thermal resistance of the circuit board assembly must be safeguarded in order to maintain the film temperature of the resistors within the specified limits. Please consider the application note "Thermal Management in Surface-Mounted Resistor Applications" (www.vishay.com/doc?28844) for information on the general nature of thermal resistance

The resistance value is influenced by the resistance of the terminations. The exact resistance value of the soldered part on the PCB may deviate depending on e.g. solder quantity, pad layout, and soldering method. The resistance value of the unmounted part can be verified for resistors $< 10 \Omega$ by a 4-point probe on the top side terminations as shown below.


Fig. 1

DIMENSIONS FOR 4-POINT PROBE		
TYPE / SIZE	X (μm)	Y (μm)
MCW 0406 AT	870	600
MCW 0612 AT	1300	1240

TEMPERATURE COEFFICIENT AND RESISTANCE RANGE				
TYPE / SIZE	TCR	TOLERANCE	RESISTANCE	E-SERIES
MCW 0406 AT	$\pm 50 \text{ ppm/K}$	$\pm 1 \%$	$1 \Omega \text{ to } 100 \text{ k}\Omega$	E24; E96
	$\pm 25 \text{ ppm/K}$	$\pm 0.5 \%$		E24; E192
MCW 0612 AT	$\pm 50 \text{ ppm/K}$	$\pm 1 \%$	$1 \Omega \text{ to } 100 \text{ k}\Omega$	E24; E96
	$\pm 25 \text{ ppm/K}$	$\pm 0.5 \%$		E24; E192

PACKAGING						
TYPE / SIZE	CODE	QUANTITY	PACKAGING STYLE	WIDTH	PITCH	PACKAGING DIMENSIONS
MCW 0406 AT	P5	5000	Tape and reel cardboard tape acc. IEC 60286-3, Type 1a	8 mm	4 mm	$\varnothing 180 \text{ mm} / 7"$
	PW	20 000				$\varnothing 330 \text{ mm} / 13"$
MCW 0612 AT	P5	5000				$\varnothing 180 \text{ mm} / 7"$

PART NUMBER AND PRODUCT DESCRIPTION						
Part Number: MCW0406MD4641DPW00						
M	C	W	0	4	0	6
M	D			4	6	4
TYPE / SIZE	VERSION	TCR	RESISTANCE	TOLERANCE	PACKAGING	
MCW0406	M = AT (automotive)	D = $\pm 25 \text{ ppm/K}$ C = $\pm 50 \text{ ppm/K}$	3 digit value 1 digit multiplier	D = $\pm 0.5 \%$ F = $\pm 1 \%$	P5 PW	
MCW0612			Multiplier 8 = $\ast 10^{-2}$ 9 = $\ast 10^{-1}$ 0 = $\ast 10^0$ 1 = $\ast 10^1$ 2 = $\ast 10^2$ 3 = $\ast 10^3$			
Product Description: MCW 0406-25 0.5 % AT PW 4K64						
MCW	0406	-25	0.5 %	AT	PW	4K64
TYPE	SIZE	TCR	TOLERANCE	VERSION	PACKAGING	RESISTANCE
MCW	0406 0612	$\pm 25 \text{ ppm/K}$ $\pm 50 \text{ ppm/K}$	$\pm 0.5 \%$ $\pm 1 \%$	AT = automotive	P5 PW	4K64 = 4.64 k Ω

Note

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

DESCRIPTION

Production is strictly controlled and follows an extensive set of instructions established for reproducibility. A homogeneous film of special metal alloy is deposited on a high grade ceramic substrate (Al_2O_3) 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. The resistor elements are covered by a unique protective coating designed for electrical, mechanical and climatic protection. The terminations receive a final pure matte 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. This includes full screening for the elimination of products with potential risk of early field failures (feasible for $R \geq 10 \Omega$). Only accepted products are laid directly into the paper tape in accordance with **IEC 60286-3 Type 1a** ⁽¹⁾.

ASSEMBLY

The resistors are suitable for processing on automatic SMD assembly systems. They are suitable for automatic soldering using reflow or vapor phase as shown in **IEC 61760-1** ⁽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, potting compounds and their processes, 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 matte 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.

MATERIALS

Vishay acknowledges the following systems for the regulation of hazardous substances:

- IEC 62474, Material Declaration for Products of and for the Electrotechnical Industry, with the list of declarable substances given therein ⁽²⁾
- The Global Automotive Declarable Substance List (GADSL) ⁽³⁾
- The REACH regulation (1907/2006/EC) and the related list of substances with very high concern (SVHC) ⁽⁴⁾ for its supply chain

The products do not contain any of the banned substances as per IEC 62474, GADSL, or the SVHC list, see www.vishay.com/how/leadfree.

Hence the products fully comply with the following directives:

- 2000/53/EC End-of-Life Vehicle Directive (ELV) and Annex II (ELV II)
- 2011/65/EU Restriction of the Use of Hazardous Substances Directive (RoHS) with amendment 2015/863/EU
- 2012/19/EU Waste Electrical and Electronic Equipment Directive (WEEE)

Vishay pursues the elimination of conflict minerals from its supply chain, see the Conflict Minerals Policy at www.vishay.com/doc?49037.

APPROVALS

Where applicable the resistors are tested within the IECQ-CECC Quality Assessment System for Electronic Components to the detail specification **EN 140401-801** which refers to **EN 60115-1**, **EN 60115-8** and the variety of environmental test procedures of the **IEC 60068** ⁽¹⁾ series. The detail specification refers to the climatic categories 55/125/56, which relates to the "standard operation mode" of this datasheet. The MCW AT Professional is AEC-Q200 qualified.

Vishay Beyschlag has achieved "**Approval of Manufacturer**" in accordance with **IECQ 03-1**. The release certificate for "**Technology Approval Schedule**" in accordance with **CECC 240001** based on **IECQ 03-3-1** is granted for the Vishay BEYSCHLAG manufacturing process.

RELATED PRODUCTS

For an alternative range of TCR and tolerance see the datasheet:

Precision Wide Terminal Thin Film Chip Resistors (www.vishay.com/doc?28847)

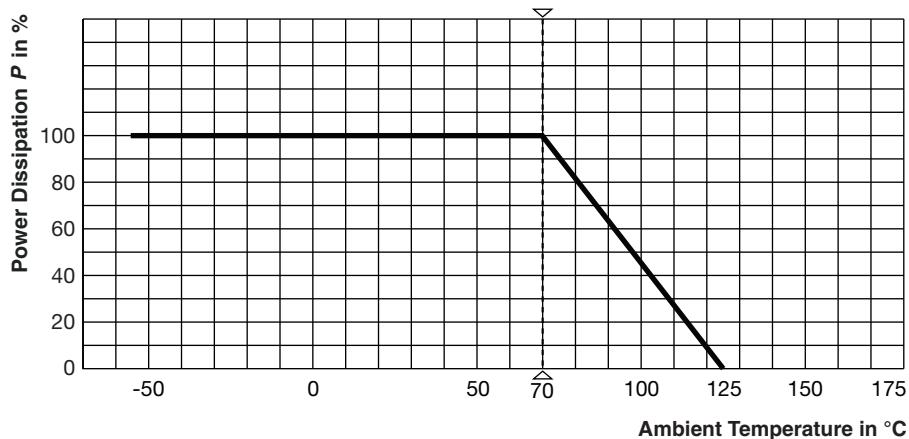
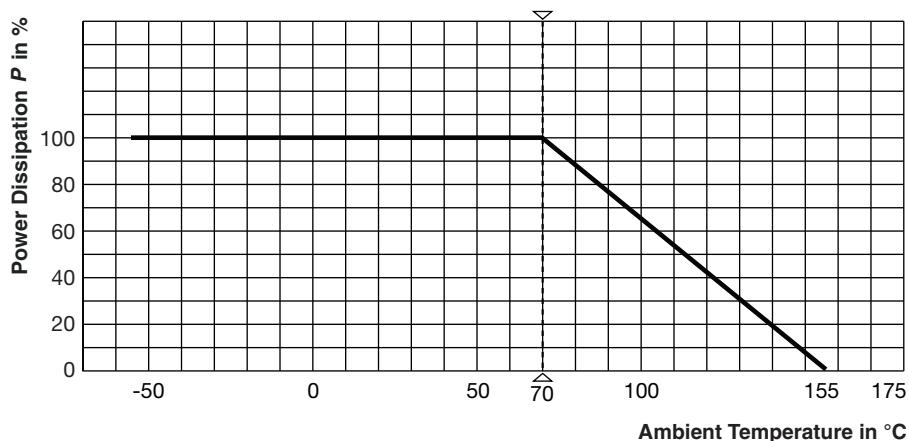
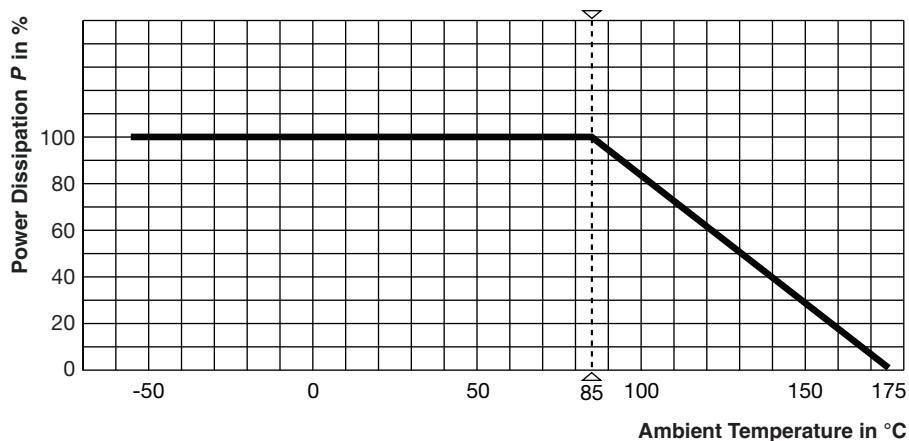
Notes

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

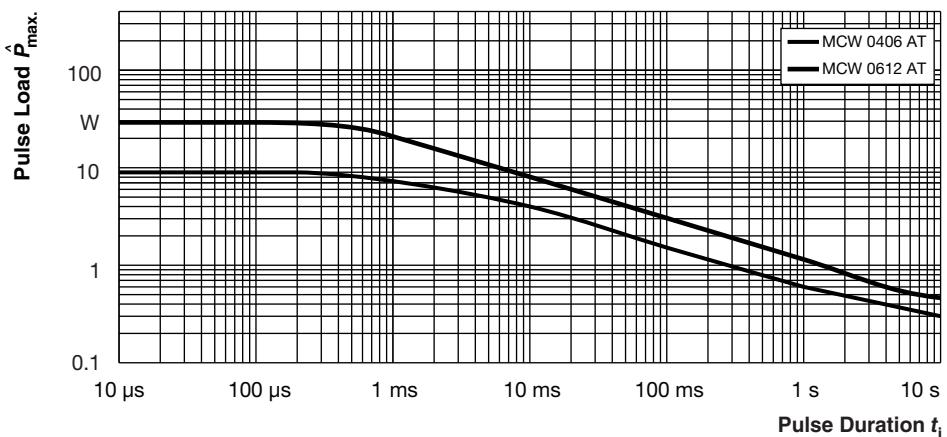
(2) The IEC 62474 list of declarable substances is maintained in a dedicated database, which is available at <http://std.iec.ch/iec62474>

(3) The Global Automotive Declarable Substance List (GADSL) is maintained by the American Chemistry Council and available at www.gadsl.org

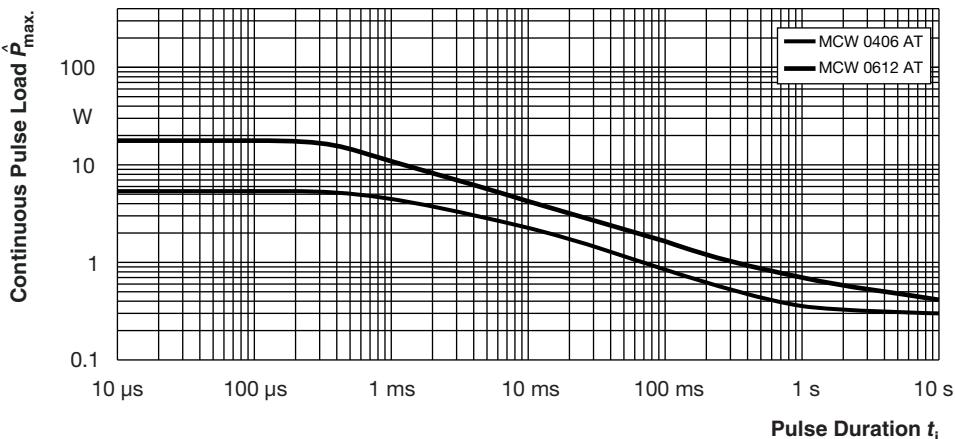
(4) The SVHC list is maintained by the European Chemical Agency (ECHA) and available at <http://echa.europa.eu/candidate-list-table>

FUNCTIONAL PERFORMANCE
Derating - Standard Mode

Derating - Power Mode

Derating - Advanced Temperature Mode


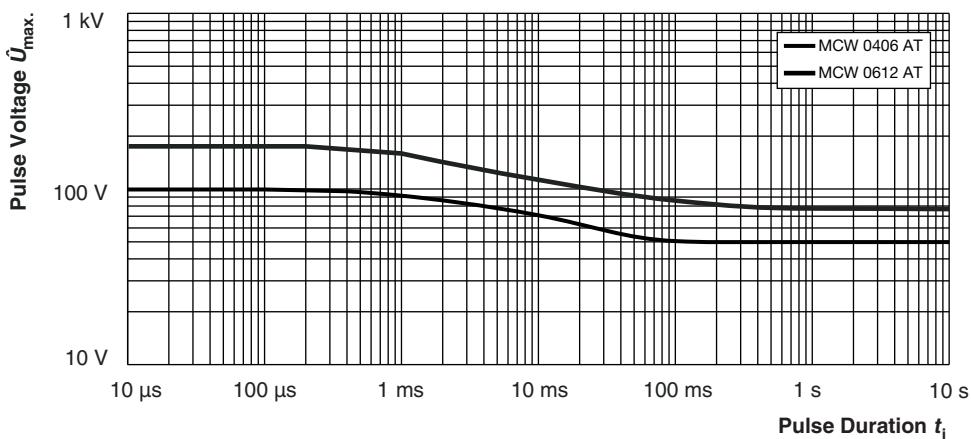
For the permissible resistance change in each operation mode please refer to table
MAXIMUM RESISTANCE CHANGE AT RATED DISSIPATION, above

Single Pulse


Maximum pulse load, single pulse; applicable if $\bar{P} \rightarrow 0$ and $n \leq 1000$ and $\hat{U} \leq \hat{U}_{\max}$;
for permissible resistance change $\pm (0.25 \% R + 0.05 \Omega)$

Continuous Pulse


Maximum pulse load, continuous pulses; applicable if $\bar{P} \leq P(\varrho_{\text{amb}})$ and $\hat{U} \leq \hat{U}_{\max}$;
for permissible resistance change $\pm (0.25 \% R + 0.05 \Omega)$

Pulse Voltage


Maximum pulse voltage, single and continuous pulses; applicable if $\hat{P} \leq \hat{P}_{\max}$;
for permissible resistance change $\pm (0.25 \% R + 0.05 \Omega)$

TESTS AND REQUIREMENTS

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

EN 60115-1, generic specification

EN 60115-8 (successor of EN 140400),
sectional specification

EN 140401-801, detail specification

IEC 60068-2-xx, test methods

The parameters stated in the Test Procedures and Requirements table are based on the required tests and permitted limits of EN 140401-801. The table presents only the most important tests, for the full test schedule refer to the documents listed above. However, some additional tests and a number of improvements against those minimum requirements have been included.

The testing also covers most of the requirements specified by EIA/ECA-703 and JIS-C-5201-1.

The tests are carried out under standard atmospheric conditions in accordance with IEC 60068-1, 4.3, whereupon the following values are applied:

Temperature: 15 °C to 35 °C

Relative humidity: 25 % to 75 %

Air pressure: 86 kPa to 106 kPa (860 mbar to 1060 mbar).

A climatic category LCT / UCT / 56 is applied, defined by the lower category temperature (LCT), the upper category temperature (UCT), and the duration of exposure in the damp heat, steady state test (56 days).

The components are mounted for testing on printed circuit boards in accordance with EN 60115-8, 2.4.2, unless otherwise specified.

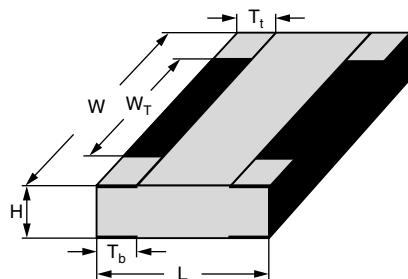
TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	IEC 60068-2 (1) TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)
			Stability for product types:	
			MCW 0406 AT	1 Ω to 100 kΩ
			MCW 0612 AT	1 Ω to 100 kΩ
4.5	-	Resistance		± 1 % R; ± 0.5 % R
4.8	-	Temperature coefficient	At (20 / -55 / 20) °C and (20 / 155 / 20) °C	± 50 ppm/K; ± 25 ppm/K
4.25.1	-	Endurance at 70 °C: standard operation mode	$U = \sqrt{P_{70} \times R}$ or $U = U_{\max.}$; whichever is the less severe; 1.5 h on; 0.5 h off; 70 °C; 1000 h 70 °C; 8000 h	± (0.1 % R + 0.05 Ω) ± (0.2 % R + 0.05 Ω)
		Endurance at 70 °C: power operation mode	$U = \sqrt{P_{70} \times R}$ or $U = U_{\max.}$; whichever is the less severe; 1.5 h on; 0.5 h off; 70 °C; 1000 h 70 °C; 8000 h	± (0.2 % R + 0.05 Ω) ± (0.4 % R + 0.05 Ω)
		Endurance at 85 °C: advanced temperature operation mode	$U = \sqrt{P_{85} \times R}$ or $U = U_{\max.}$; whichever is the less severe; 1.5 h on; 0.5 h off; 85 °C; 1000 h	± (0.4 % R + 0.05 Ω)
4.25.3	-	Endurance at upper category temperature	125 °C; 1000 h 155 °C; 1000 h 175 °C; 1000 h	± (0.15 % R + 0.02 Ω) ± (0.3 % R + 0.05 Ω) ± (0.5 % R + 0.05 Ω)
4.24	78 (Cab)	Damp heat, steady state	(40 ± 2) °C; 56 days; (93 ± 3) % RH	± (0.1 % R + 0.05 Ω)
4.37	67 (Cy)	Damp heat, steady state, accelerated: standard operation mode	$(85 \pm 2) °C$ $(85 \pm 5) % RH$ $U = \sqrt{0.1 \times P_{70} \times R}$; $U \leq 0.3 \times U_{\max.}$; 1000 h	± (0.5 % R + 0.05 Ω)

TEST PROCEDURES AND REQUIREMENTS				
EN 60115-1 CLAUSE	IEC 60068-2 (1) TEST METHOD	TEST	PROCEDURE	REQUIREMENTS PERMISSIBLE CHANGE (ΔR)
Stability for product types:				
		MCW 0406 AT		1 Ω to 100 k Ω
		MCW 0612 AT		1 Ω to 100 k Ω
4.23	2 (Bb) 30 (Db) 1 (Ab) 13 (M) 30 (Db) -	Climatic sequence: standard operation mode: dry heat damp heat, cyclic cold low air pressure damp heat, cyclic DC load	155 °C; 16 h 55 °C; 24 h; $\geq 90\%$ RH; 1 cycle -55 °C; 2 h 8.5 kPa; 2 h; (25 \pm 10) °C 55 °C; 24 h; $> 90\%$ RH; 5 cycles $U = \sqrt{P_{70} \times R} \leq U_{\max}; 1 \text{ min}$	$\pm (0.5\% R + 0.05 \Omega)$
4.23.2				
4.23.3				
4.23.4				
4.23.5				
4.23.6				
4.23.7				
-	1 (Ab)	Storage at low temperature	-55 °C; 2 h	$\pm (0.1\% R + 0.01 \Omega)$
4.19	14 (Na)	Rapid change of temperature	30 min at -55 °C and 30 min at 155 °C; 1000 cycles	$\pm (0.25\% R + 0.05 \Omega)$
		Extended rapid change of temperature	30 min at -40 °C and 30 min at 125 °C (2); MCW 0406 AT: 3000 cycles MCW 0612 AT: 1000 cycles	$\pm (0.25\% R + 0.05 \Omega)$ ($\geq 50\%$ of initial shear force)
4.13	-	Short time overload: standard operation mode	$U = 2.5 \times \sqrt{P_{70} \times R}$ or $U = 2 \times U_{\max};$ whichever is the less severe; 5 s	$\pm (0.1\% R + 0.01 \Omega)$
		Short time overload: power operation mode		$\pm (0.25\% R + 0.05 \Omega)$
4.38	-	Electro Static Discharge (Human Body Model)	IEC 61340-3-1 (1); 3 pos. + 3 neg. (equivalent to MIL-STD-833, method 3015) MCW 0406 AT: 500 V MCW 0612 AT: 1000 V	$\pm (0.5\% R + 0.05 \Omega)$
4.22	6 (Fc)	Vibration	Endurance by sweeping; 10 Hz to 2000 Hz; no resonance; amplitude ≤ 1.5 mm or $\leq 200 \text{ m/s}^2$; 7.5 h	$\pm (0.1\% R + 0.01 \Omega)$ no visible damage
4.17	58 (Td)	Solderability	Solder bath method; SnPb40; non-activated flux (215 \pm 3) °C; (3 \pm 0.3) s	Good tinning ($\geq 95\%$ covered); no visible damage
			Solder bath method; SnAg3Cu0.5 or SnAg3.5; non-activated flux; (235 \pm 3) °C; (2 \pm 0.2) s	Good tinning ($\geq 95\%$ covered); no visible damage
4.18	58 (Td)	Resistance to soldering heat	Solder bath method; (260 \pm 5) °C; (10 \pm 1) s	$\pm (0.1\% R + 0.02 \Omega)$ 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)	RR1016M: 9N RR1632M: 45N	No visible damage
4.33	21 (Ue ₁)	Substrate bending	Depth 2 mm, 3 times	$\pm (0.1\% R + 0.01 \Omega)$ no visible damage; no open circuit in bent position
4.7	-	Voltage proof	$U_{\text{RMS}} = U_{\text{ins}}; (60 \pm 5) \text{ s}$	No flashover or breakdown
4.35	-	Flammability	IEC 60695-11-5 (1) needle flame test; 10 s	No burning after 30 s

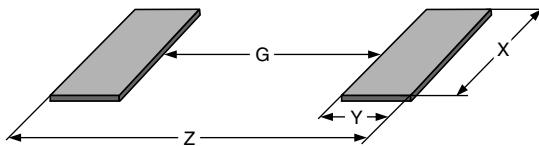
Notes

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

(2) Tested on a 4-layer printed circuit board with SAC micro alloy

DIMENSIONS


DIMENSIONS AND MASS							
TYPE / SIZE	H (mm)	L (mm)	W (mm)	W_T (mm)	T_t (mm)	T_b (mm)	MASS (mg)
MCW 0406 AT	0.3 ± 0.05	1.0 ± 0.15	1.5 ± 0.15	> 75 % of W	$0.2 + 0.1 / - 0.15$	0.2 ± 0.1	1.9
MCW 0612 AT	0.45 ± 0.15	1.6 ± 0.15	3.1 ± 0.15	> 75 % of W	0.25 ± 0.15	0.3 ± 0.15	9.0

SOLDER PAD DIMENSIONS


RECOMMENDED SOLDER PAD DIMENSIONS				
TYPE / SIZE	REFLOW SOLDERING			
	G (mm)	Y (mm)	X (mm)	Z (mm)
MCW 0406 AT	0.35	0.55	1.75	1.45
MCW 0612 AT	0.75	0.7	3.3	2.15

Notes

- The given solder pad dimensions reflect the considerations for board design and assembly as outlined e. g. in standards IEC 61188-5-x⁽¹⁾, or in publication IPC-7351

⁽¹⁾ The quoted IEC standards are also released as EN standards with the same number and identical contents

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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 in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Vishay:

MCW0612MC1009FP100	MCW0612MC3309FP100	MCW0612MC2002FP100	MCW0612MC1003FP100
MCW0612MC4709FP100	MCW0612MC2000FP100	MCW0612MC1001FP100	MCW0612MC1501FP100
MCW0612MC1000FP100	MCW0612MC1002FP100	MCW0612MC6809FP100	MCW0612MC4702FP100
MCW0612MC4701FP100	MCW0612MC2001FP100	MCW0612MC2209FP100	MCW0612MC2700FP100
MCW0612MC4700FP100	MCW0612MC4700FP500	MCW0612MC1001FP500	MCW0612MC2000FP500
MCW0612MC4701FP500	MCW0612MC4709FP500	MCW0612MC1009FP500	MCW0612MC2700FP500
MCW0406MC6049FP500	MCW0406MC3831FP500	MCW0612MC6199FP500	MCW0406MD2218DP500
MCW0406MC2551FP500	MCW0612MD2002DP500	MCW0612MC3000FP500	MCW0612MC2002FP500
MCW0406MC4709FP500	MCW0612MC3300FP500	MCW0406MC1001FP500	MCW0406MC1009FP500
MCW0612MC2001FP500	MCW0612MC2209FP500	MCW0406MC6049FPW00	MCW0612MC2400FP500
MCW0612MC3309FP500	MCW0612MC1002FP500	MCW0406MD1001DP500	MCW0612MC1003FP500
MCW0612MC6809FP500	MCW0406MC2942FP500	MCW0406MC4641FP500	MCW0612MC1000FP500
MCW0406MC3301FP500	MCW0406MC5109FP500	MCW0406MC9531FP500	MCW0612MC1501FP500
MCW0612MC4702FP500	MCW0406MC1003FP500	MCW0406MC2152FP500	MCW0406MC3902FP500
MCW0406MC2871FP500	MCW0406MC2702FP500	MCW0406MC2150FP500	MCW0406MC3900FP500
MCW0406MC3901FP500	MCW0406MC6809FP500	MCW0406MC5231FP500	MCW0612MC6209FP500
MCW0406MC8252FP500	MCW0406MC1502FP500	MCW0612MD6049DP500	MCW0406MC9099FP500
MCW0406MC9091FP500	MCW0406MC6192FP500	MCW0406MC3480FP500	MCW0406MC3831FPW00
MCW0406MC5111FP500	MCW0406MC6802FP500	MCW0406MC1620FP500	MCW0406MC8259FP500
MCW0406MC5119FP500	MCW0406MC1101FP500	MCW0406MC8200FP500	MCW0406MC8250FP500
MCW0406MC4220FP500	MCW0406MC1471FP500	MCW0406MC8202FP500	MCW0406MC6811FP500
MCW0406MC2610FP500	MCW0406MC2200FP500	MCW0612MD2492DP500	MCW0406MC4702FP500
MCW0406MC6819FP500	MCW0406MC1332FP500	MCW0406MC2202FP500	MCW0406MC1210FP500
MCW0406MC2612FP500	MCW0406MC4221FP500	MCW0406MC8209FP500	MCW0406MD1003DP500
MCW0406MC2210FP500	MCW0406MC2611FP500	MCW0406MC1200FP500	MCW0612MD4309DP500