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UNIROYAL ELECTRONICS INDUSTRY CO., LTD.



ISO14001



ISO/TS16949



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REG.-Nr.A759



CQC04001010056



Specification for Approval

Product Name: **LEAD-FREE METAL GLAZE FILM FIXED RESISTORS**

Part Name : **MGR SERIES $\pm 1\%$ 、 $\pm 5\%$ 、 $\pm 10\%$**

Part No. : **MGR0**F*****0**

MGR0J*****0**

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Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyuan	CX-01-061	1	2016/08/19	1/11



ISO14001



ISO/TS16949



244546



245468



REG.-Nr.A759



CQC04001010656



Content

Index.....	Page
1.0 Scope.....	4
2.0 Ratings & Dimension.....	4
3.0 Construction.....	5
4.0 Marking.....	5
5.0 Power Rating.....	6
6.0 Voltage rating.....	6
7.0 Performance.....	6
8.0 Explanation of Part No. System	8
9.0 Ordering Procedure.....	10
10.0 Standard Packing	10
11.0 Precaution for storage/Transportation.....	11

Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyuan	CX-01-061	1	2016/08/19	2/11

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File Name: MGR SERIES $\pm 1\%$、$\pm 5\%$、$\pm 10\%$		Date 2016/08/19	Edition No. 1		
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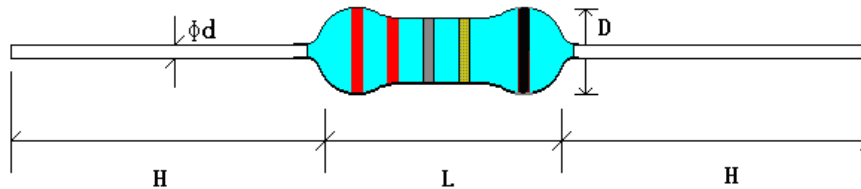
Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyuan	CX-01-061	1	2016/08/19	3/11



1.0 Scope:

This file is the specification of Lead-Free Metal Glaze Film Fixed Resistors manufactured by UNIOHM.

2.0 Ratings & Dimension:



2.1 Normal size

Type	Dimension(mm)				Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance	Resistance Range
	D	L	d±0.05	H±3					
MGR 1/4W	2.2±0.5	6.5±1.0	0.54	28	500V	700V	500V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~100MΩ
MGR 1/2W	3.0±0.6	9.5±1.0	0.54	28	700V	1000V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~100MΩ
MGR 1W	4.0±0.6	11.5±1.0	0.65	28	1000V	1400V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~100MΩ
MGR 2W	5.0±0.6	15.5±1.0	0.75	28	1000V	1400V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~100MΩ
MGR 3W	6.0±0.6	17.5±1.0	0.75	28	1000V	1400V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~100MΩ

2.2 Small Size & ultra-small size

Type	Dimension(mm)				Max Working Voltage	Max Overload Voltage	Dielectric Withstanding Voltage	Tolerance	Resistance Range
	D	L	d±0.05	H±3					
MGR 1/2WSS	2.2±0.5	6.5±1.0	0.54	28	500V	700V	500V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~33MΩ
MGR 1/2WS	3.0±0.5	9.0±1.0	0.54	28	500V	700V	500V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~33MΩ
MGR 1WSS	3.5±0.6	9.5±1.0	0.54	28	700V	1000V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~33MΩ
MGR 1WS	3.5±0.6	9.5±1.0	0.60	28	700V	1000V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~33MΩ
MGR 2WSS	4.0±0.6	11.5±1.0	0.65	28	1000V	1400V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~33MΩ
MGR 2WS	4.5±0.6	11.5±1.0	0.65	28	1000V	1400V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~33MΩ
MGR 3WSS	4.5±0.6	11.5±1.0	0.75	28	1000V	1400V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~33MΩ
MGR 3WS	5.0±0.6	15.5±1.0	0.75	28	1000V	1400V	700V	±1%	100KΩ~1MΩ
								±5%,±10%	1KΩ~33MΩ

Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyan	CX-01-061	1	2016/08/19	4/11



ISO14001



ISO/TS16949



244546



245468



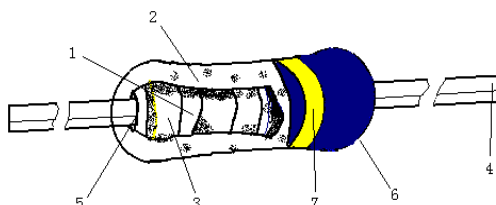
REG.-Nr.A759



CQC04001010656



3.0 Construction:



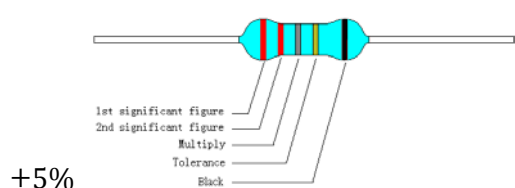
No.	Name	Material
1	Basic Body	Filmed ceramics rod
2	Resistor	Metal Glaze Film (Ruthenium Oxide)
3	End Cap	Steel (Tin-Plated iron surface)
4	Lead Wire	Tin solder coated copper wire
5	Joint	By Welding
6	Coating	Color: 1/4W: (Blue) 1/2WSS,1/2WS,1/2W,1WSS,1WS, 1W, 2WSS,2WS,2W, 3WSS,3WS 3W: (Light Sky Blue)
7	Color Code	Blue coating: Epoxy resin / Light sky blue coating: silicon resin

4.0 Marking:

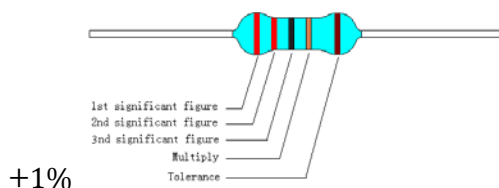
Resistors shall be marked with color coding.

4.1 Color bands:

Color shall be in accordance with JIS-C-0802



±5%



±1%

4.2 Label:

Label shall be marked with following items:

- (1) Type and style
- (2) Nominal resistance
- (3) Resistance tolerance
- (4) Quantity
- (5) Lot number
- (6) TCR

Example:

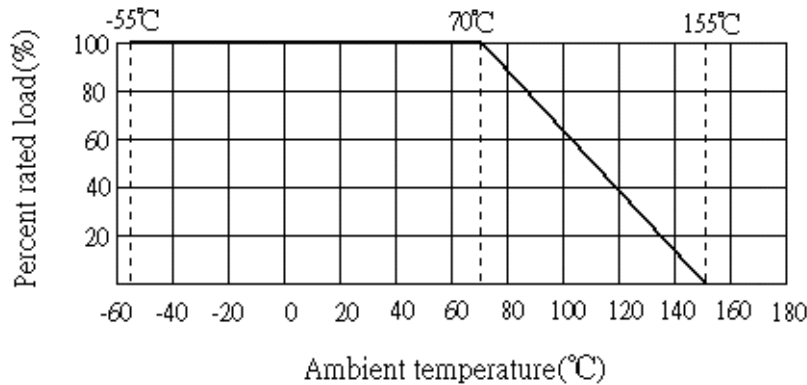
METAL GLAZE FILM FIXED RESISTORS	
WATT: 1/2W	VAL: 750KΩ
Q'TY: 1,000	TOL: 5%
LOT: 2021548	PPM:

Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyan	CX-01-061	1	2016/08/19	5/11

5.0 Derating Curve:

Resistors shall have a power rating based on continuous load operation at an ambient temperature from -55°C to 70°C. If the ambient temperature risen over 70°C, the power rating would be derate as shown in figure 1.

Figure1



6.0 Voltage rating:

Resistors shall have one voltage specifications:

1. Rated direct-current (DC) continuous working voltage
2. Approximate single-wave root-mean-square (RMS) alternating-current (AC) continuous working voltage

We can calculate the Voltage from the following formula:

$$RCWV = \sqrt{P \times R}$$

Remark:

RCWV=Rate continuous working voltage. (Volt)

P=Power Rating (WATT)

R=Nominal Resistance (Ohm)

7.0 Performance:

Characteristic	Limits	Test Method (JIS-C-5201&JIS-C-5202)
Temperature Coefficient	±200PPM/°CMax..	Resistance value will change when temperature changes per centigrade. $\frac{R_2 - R_1}{R_1 (T_1 - T_2)} \times 10^6 (PPM/°C)$ R1: Resistance value at room temp. (t ₁) R2: Resistance value at room temp.+100°C (t ₂) Test condition: 1 st condition: room temp. (t ₁), 2 nd condition: room temp. +100°C(t ₂)

Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyan	CX-01-061	1	2016/08/19	6/11



ISO14001



ISO/TS16949



244546



245468



REG.-Nr.A759



CQC04001010656



Characteristic	Limits	Test Method (JIS-C-5201&JIS-C-5202)															
Short-time overload	Resistance change rate must be in $\pm(1\%+0.05\Omega)$, and no mechanical damage.	4.13 Permanent resistance change after the application of a potential of 2.5 times rcwv for 5 seconds.															
Dielectric withstanding voltage	No evidence of flashover mechanical damage, arcing or insulation break down.	4.7 Resistors shall be clamped in the trough of a 90°metallic v-block and shall be tested at ac potential respectively specified in the above list for 60-70 seconds.															
Pulse overload	Resistance change rate must be in $\pm(2\%+0.05\Omega)$, and no mechanical damage.	4.28 Resistance change after 10,000 cycles (1 second "ON", 25 seconds "OFF") at 4 timesRCWV.															
Resistance to soldering heat	Resistance change rate must be in $\pm(1\%+0.05\Omega)$, and no mechanical damage.	4.18 Permanent resistance change when leads immersed to a point 2.0-2.5mm from the body in $260^{\circ}\text{C}\pm 5^{\circ}\text{C}$ solder for 10 ± 1 seconds.															
Resistance to solvent	No deterioration of protective coatings & markings	4.29 Specimens shall be immersed in a bath of alcohol completely for 3 min. With ultrasonic															
Terminal strength	No evidence of mechanical damage	4.16 Direct load: Resistance to a 2.5 kg direct load for 10 seconds in the direction of the longitudinal axis of the terminal leads. Twist test: Terminal leads shall be bent through 90°at a point of about 6mm from the body of the resistor and shall be rotated through 360° about the original axis of the bent terminal in alternating direction for a total of 3 rotations.															
Solderability	Over 95% coverage rate	4.17 The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes. Test temp. Of solder: $245^{\circ}\text{C}\pm 3^{\circ}\text{C}$ Dwell time in solder: 2~3seconds.															
Temperature cycling	Resistance change rate must be in $\pm(1\%+0.05\Omega)$, and no mechanical damage.	4.19 Resistance change after continuous five cycles for duty cycle specified: <table border="1"> <thead> <tr> <th>Step</th><th>Temperature</th><th>Time</th></tr> </thead> <tbody> <tr> <td>1</td><td>$-55^{\circ}\text{C}\pm 3^{\circ}\text{C}$</td><td>30 mins</td></tr> <tr> <td>2</td><td>Room temp.</td><td>1 - 15 mins</td></tr> <tr> <td>3</td><td>$+155^{\circ}\text{C}\pm 2^{\circ}\text{C}$</td><td>30 mins</td></tr> <tr> <td>4</td><td>Room temp.</td><td>10 - 15 mins</td></tr> </tbody> </table>	Step	Temperature	Time	1	$-55^{\circ}\text{C}\pm 3^{\circ}\text{C}$	30 mins	2	Room temp.	1 - 15 mins	3	$+155^{\circ}\text{C}\pm 2^{\circ}\text{C}$	30 mins	4	Room temp.	10 - 15 mins
Step	Temperature	Time															
1	$-55^{\circ}\text{C}\pm 3^{\circ}\text{C}$	30 mins															
2	Room temp.	1 - 15 mins															
3	$+155^{\circ}\text{C}\pm 2^{\circ}\text{C}$	30 mins															
4	Room temp.	10 - 15 mins															
Load life in humidity	Resistance change rate must be in $\pm(5\%+0.05\Omega)$, and no mechanical damage.	7.9 resistance change after 1,000 hours (1.5 hours "ON", 0.5 hour "OFF") at RCWV in a humidity test chamber controlled at $40^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and 90 to 95% relative humidity.															
Load life	Resistance change rate must be in $\pm(5\%+0.05\Omega)$, and no mechanical damage.	4.25.1 Permanent resistance change after 1,000 hours operating at RCWV with duty cycle of 1.5 hours "ON", 0.5 hour "OFF" at $70^{\circ}\text{C}\pm 2^{\circ}\text{C}$ ambient.															

Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyuan	CX-01-061	1	2016/08/19	7/11



ISO14001



ISO/TS16949



244546



245468

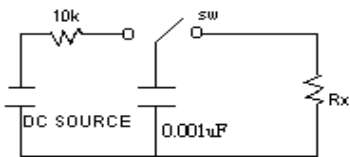
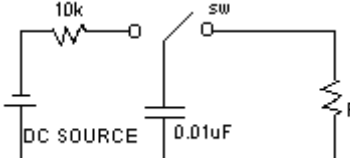


REG.-Nr.A759



CQC04001010656



Characteristic	Limits	Test Method (JIS-C-5201&JIS-C-5202)																																								
Surge Withstanding voltage	Allowable resistance change: $\pm 20\%$ Test circuit: 	The following discharge cycle is repeated in the circuit in the left fig. 2.5 sec. ON, 2.5 sec. OFF, 50 cycles Applied voltage (DC source) <table><tr><td>Resistance Range</td><td>1/4W, 1/2W, 1W, 2W, 3W,</td></tr><tr><td>100KΩ-100MΩ</td><td>10KV</td></tr></table>	Resistance Range	1/4W, 1/2W, 1W, 2W, 3W,	100K Ω -100M Ω	10KV																																				
	Resistance Range	1/4W, 1/2W, 1W, 2W, 3W,																																								
100K Ω -100M Ω	10KV																																									
	Allowable resistance change: $\pm 10\%$ Test circuit: 	The following discharge cycle is repeated in the circuit in the left fig. 2.5 sec. "ON", 2.5 sec "OFF", 10 cycles Applied voltage (DC source) <table><tr><th>Resistance range</th><th>1/2WSS</th><th>1/2WS</th><th>1WSS</th><th>1WS</th></tr><tr><td>100K-1M</td><td>3000V</td><td>3000V</td><td>4000V</td><td>4000V</td></tr><tr><td>1M1-6M2</td><td>4000V</td><td>4000V</td><td>5000V</td><td>5000V</td></tr><tr><td>$\geq 6M8$</td><td>6000V</td><td>6000V</td><td>8000V</td><td>8000V</td></tr><tr><th>Resistance range</th><th>2WSS</th><th>2WS</th><th>3WSS</th><th>3WS</th></tr><tr><td>100K-1M</td><td>5000V</td><td>5000V</td><td>5000V</td><td>8000V</td></tr><tr><td>1M1-6M2</td><td>6000V</td><td>6000V</td><td>6000V</td><td>9000V</td></tr><tr><td>$\geq 6M8$</td><td>9000V</td><td>9000V</td><td>9000V</td><td>10000V</td></tr></table>	Resistance range	1/2WSS	1/2WS	1WSS	1WS	100K-1M	3000V	3000V	4000V	4000V	1M1-6M2	4000V	4000V	5000V	5000V	$\geq 6M8$	6000V	6000V	8000V	8000V	Resistance range	2WSS	2WS	3WSS	3WS	100K-1M	5000V	5000V	5000V	8000V	1M1-6M2	6000V	6000V	6000V	9000V	$\geq 6M8$	9000V	9000V	9000V	10000V
Resistance range	1/2WSS	1/2WS	1WSS	1WS																																						
100K-1M	3000V	3000V	4000V	4000V																																						
1M1-6M2	4000V	4000V	5000V	5000V																																						
$\geq 6M8$	6000V	6000V	8000V	8000V																																						
Resistance range	2WSS	2WS	3WSS	3WS																																						
100K-1M	5000V	5000V	5000V	8000V																																						
1M1-6M2	6000V	6000V	6000V	9000V																																						
$\geq 6M8$	9000V	9000V	9000V	10000V																																						

8.0 Explanation of Part No. System:

The standard Part No. includes 14 digits with the following explanation:

8.1 1st~4th codes: Product type

Example: MGR0= Metal Glaze film fixed Resistors; 0: standard type.

8.2 5th~6th digits: Power rating

8.2.1 Size or Power codes

W=Normal Size; S=Small Size; U= Ultra Small Size; "1"~"G" meanings: "1"~"16" as Hexadecimal:
1/16W~1/2W ($< 1W$)

Wattage	1/2	1/3	1/4	1/5	1/6	1/8	1/10	1/16
Normal size	W2	W3	W4	W5	W6	W8	WA	WG
Small size	S2	S3	S4	S5	S6	S8	SA	SG
Ultra-small size	U2	U3	U4	U5	U6	U8	UA	UG

1W~16W ($\geq 1W$)

Wattage	1	2	3	5	7	8	9	10	15
Normal size	1W	2W	3W	5W	7W	8W	9W	AW	FW
Small size	1S	2S	3S	5S	7S	8S	9S	AS	FS
Ultra-small size	1U	2U	3U	5U	7U	8U	9U	AU	FU

Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyan	CX-01-061	1	2016/08/19	8/11



8.2.2 If power rating less than 1 watt, the 5th code will be a letter, such as “W”, “S” or “U” which means size and the 6th code will be a number or a letter code.

Example: WA=1/10W; U2=1/2W-SS.

8.2.3 If power rating is between 1 to 16 watts, the 5th code will be a number or a letter and the 6th code will be a letter, such as “W”, “S” or “U”.

Example: AW=10W; 3S=3W-S

8.3 7th: Resistance tolerance.

The following letter code is to be used for indicating the standard Resistance Tolerance.

F=±1% G=±2% J=±5% K= ±10%

8.4 8th~11th: Resistance value.

8.4.1 If the value belongs to E-24 series standard resistance value, the 8th code will be “0”, and the 9th~10th codes will be the significant figure, and the 11th code is the Power of ten.

8.4.2 If the value belongs to E-96 series standard resistance value, the 8th~10th codes will be the significant figure, and the 11th code will be the power of ten.

8.4.3 11th code: Power of ten.

0=10⁰ 1=10¹ 2=10² 3=10³ 4=10⁴ 5=10⁵
6=10⁶ J=10⁻¹ K=10⁻² L=10⁻³ M=10⁻⁴

8.5 12th~14th

8.5.1 12th: Packaging Type

A=Tape/Box (Ammo pack)

B=Bulk/Box

T=Tape/Reel

P=Tape/Box of PT-26 products

8.5.2 13th: Packing Quantity

A=500pcs B=2500pcs C=10000pcs D=20000pcs G=25000pcs H=50000pcs

8.5.3 For FORMED type products, the 13th & 14th codes will be forming types shown as below:

MF=M-type with flattened lead wire

F0= F-type

MK= M-type with kinked lead wire

F1= F1-type

ML= M-type with normal lead wire

F2= F2-type

MC= M type with kinked lead and narrow pitch wire

F3= F3-type

8.5.4 14th: Special features of additional information with the following codes:

P=PANAsert type

1=AVIsert type 1

2=Avisert type 2

3=AVIsert type 3

A=Cutting type CO 1/4W-A type

B= Cutting type CO 1/4W-B type

Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyan	CX-01-061	1	2016/08/19	9/11



ISO14001

ISO/TS16949

244546

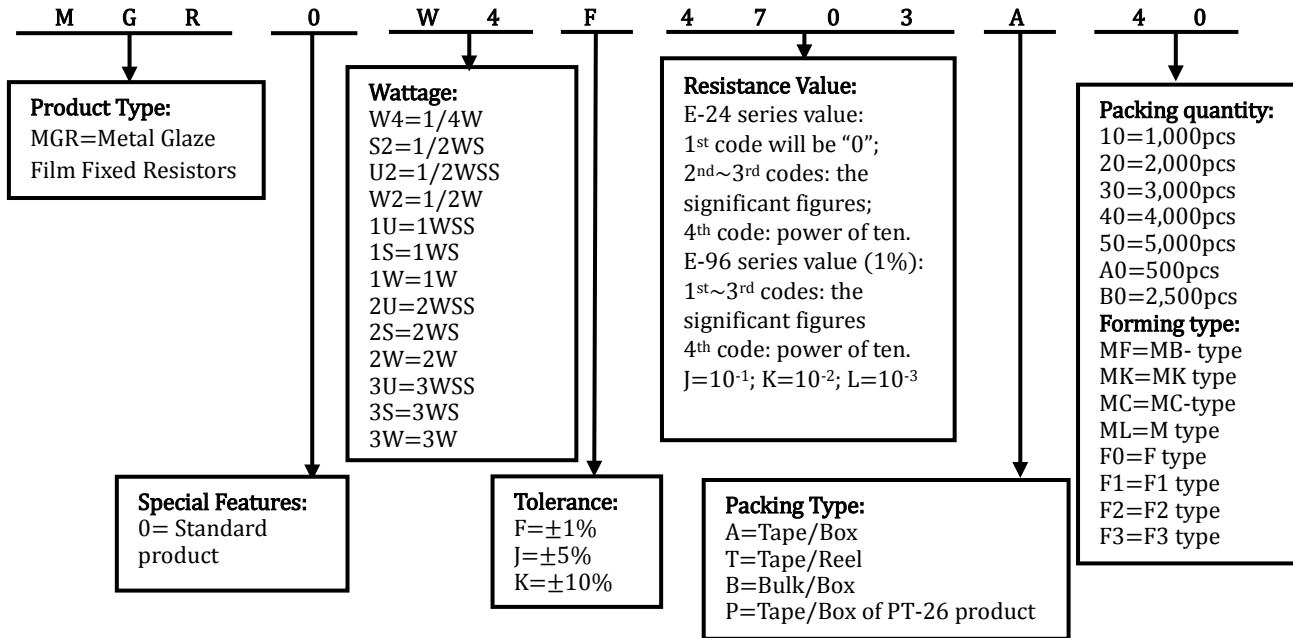
245468

REG.-Nr.A759

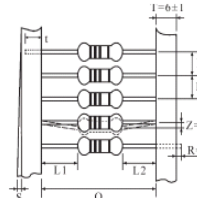
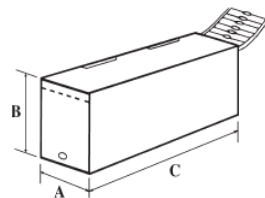
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9.0 Ordering Procedure (Example: MGR 1/4W $\pm 1\%$ 470K Ω T/B-4000)



10.0 Standard Packing:



*L1-L2=1.0 Max.
ZW: 0
**S=0.5 Max.
PT-26: 0.8 Max.

Dimension of T/B (mm)

Part No.	O	P	A ± 5	B ± 5	C ± 5	Qty/Box
MGR 1/4W	52 ± 1	5 ± 0.3	75	116	255	4000 PCS
MGR 1/2WSS	52 ± 1	5 ± 0.3	75	116	255	4000 PCS
MGR 1/2WS	52 ± 1	5 ± 0.3	75	45	255	1000 PCS
MGR 1/2W	52 ± 1	5 ± 0.3	75	70	255	1000 PCS
MGR 1WSS	52 ± 1	5 ± 0.3	75	70	255	1000 PCS
MGR 1WS	58 ± 1	5 ± 0.3	80	82	255	1000 PCS
MGR 1W	58 ± 1	5 ± 0.3	80	82	255	1000 PCS
MGR 2WSS	58 ± 1	5 ± 0.3	80	82	255	1000 PCS
MGR 2WS	58 ± 1	5 ± 0.3	80	82	255	1000 PCS
MGR 2W	65 ± 5	10 ± 0.5	90	119	255	1000 PCS
MGR 3WSS	58 ± 1	5 ± 0.3	80	82	255	1000 PCS
MGR 3WS	65 ± 5	10 ± 0.5	90	119	255	1000 PCS
MGR 3W	65 ± 5	10 ± 0.5	90	88	255	500 PCS

Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyan	CX-01-061	1	2016/08/19	10/11



ISO14001



ISO/TS16949



244546



245468



REG.-Nr.A759



CQC04001010656



11.0 Precaution for storage/Transportation:

11.1 UNIOHM recommend the storage condition temperature: 15°C~35°C, humidity: 25%~75%. (Put condition for individual product)

Even under UNIOHM recommended storage condition, solderability of products over 1 year old will be degraded.

11.2 Store / transport cartons in the correct direction, which is indicated on a carton as a symbol.

Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

11.3 Product's performance and soldered connections may deteriorate if the products are stored in the following places:

11.3.1 Storage in high Electrostatic

11.3.2 Storage in direct sunshine 、rain and snow or condensation

11.3.3 Where the products are exposed to sea winds or corrosive gases, including Cl₂, H₂S, NH₃, SO₂, NO₂.

Approved	Checked	Prepared	File NO.	Edition	Date	Page
William Zhao	Apple Liu	WangZiyuan	CX-01-061	1	2016/08/19	11/11