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UNIROYAL ELECTRONICS INDUSTRY CO., LTD.



ISO14001



ISO/TS16949



244546



245468



REG.-Nr.A759



CQC04001010658



## Specification for Approval

Customer : 深圳市立创电子商务有限公司

Product Name : LEAD-FREE METAL FILM FIXED RESISTORS

Part Name : MFR SERIES  $\pm 0.1\%$   $\pm 0.25$   $\pm 0.5\%$   $\pm 1\%$ 、 $\pm 2\%$ 、 $\pm 5\%$

Part No. : MFRO\*\*\*\*\*0

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| William Zhao | Apple Liu | Wu Yiyun | JLC-01-008 | 1       | 2016/5/9 | 1/13 |



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| File Name:<br><b>MFR SERIES</b> |             | Date | <b>2016/5/9</b> | Edition No. | <b>1</b>   |
|---------------------------------|-------------|------|-----------------|-------------|------------|
| Amendment Record                |             |      |                 | Signature   |            |
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|                                 |             |      |                 |             |            |

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## 1.0 Scope

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

## 2.0 Ratings and dimensions

For 1/8W, 1/4WS, 0.4WSS



Other



### 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 |                     |                      |                                 |           |                  |
| MF 1/8W | 1.9±0.3       | 3.3±0.3  | 0.45   | 28  | 200V                | 400V                 | 400V                            | ±1%、±2%   | 10Ω~1MΩ          |
|         |               |          |        |     |                     |                      |                                 | ±5%       | 1Ω~1MΩ           |
| MF 1/4W | 2.2±0.3       | 6.5±1.0  | 0.54   | 28  | 250V                | 500V                 | 500V                            | ±1%、±2%   | 10Ω~1MΩ          |
|         |               |          |        |     |                     |                      |                                 | ±5%       | 1Ω~1MΩ           |
| MF 1/2W | 3.0±0.6       | 9.5±1.0  | 0.54   | 28  | 350V                | 700V                 | 700V                            | ±1%、±2%   | 10Ω~1MΩ          |
|         |               |          |        |     |                     |                      |                                 | ±5%       | 1Ω~1MΩ           |
| MF 1W   | 4.5±0.6       | 11.5±1.0 | 0.65   | 28  | 500V                | 1000V                | 1000V                           | ±1%、±2%   | 51.1Ω~1MΩ        |
|         |               |          |        |     |                     |                      |                                 | ±5%       | 1Ω~1MΩ           |
| MF 2W   | 5.0±0.6       | 15.5±1.0 | 0.70   | 28  | 500V                | 1000V                | 1000V                           | ±1%、±2%   | 51.1Ω~1MΩ        |
|         |               |          |        |     |                     |                      |                                 | ±5%       | 1Ω~1MΩ           |
| MF 3W   | 6.0±0.6       | 17.5±1.0 | 0.75   | 28  | 500V                | 1000V                | 1000V                           | ±1%、±2%   | 51.1Ω~1MΩ        |
|         |               |          |        |     |                     |                      |                                 | ±5%       | 1Ω~1MΩ           |

### 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 |                     |                      |                                 |             |                  |
| MF 1/4WS  | 1.9±0.5       | 3.3±0.3  | 0.45   | 28  | 200V                | 400V                 | 200V                            | ±1%、±2%     | 10Ω~1MΩ          |
|           |               |          |        |     |                     |                      |                                 | ±5%         | 1Ω~1MΩ           |
| MF 0.4WSS | 1.9±0.5       | 3.3±0.3  | 0.45   | 28  | 200V                | 400V                 | 200V                            | ±1%、±2%     | 10Ω~1MΩ          |
|           |               |          |        |     |                     |                      |                                 | ±5%         | 1Ω~1MΩ           |
| MF 1/2WSS | 2.2±0.5       | 6.5±0.5  | 0.54   | 28  | 250V                | 500V                 | 250V                            | ±1%         | 10Ω~1MΩ          |
|           |               |          |        |     |                     |                      |                                 | ±2%、±5%     | 1Ω~1MΩ           |
| MF 1/2WS  | 2.7±0.5       | 9.0±1.0  | 0.54   | 28  | 350V                | 700V                 | 700V                            | ±1%、±2%     | 10Ω~1MΩ          |
|           |               |          |        |     |                     |                      |                                 | ±5%         | 1Ω~1MΩ           |
| MF 0.6WS  | 2.2±0.5       | 6.5±1.0  | 0.54   | 28  | 250V                | 500V                 | 250V                            | ±1%         | 10Ω~1MΩ          |
|           |               |          |        |     |                     |                      |                                 | ±2%、±5%     | 1Ω~1MΩ           |
| MF 1WS    | 3.5±0.6       | 9.5±1.0  | 0.60   | 28  | 350V                | 700V                 | 350V                            | ±1%、±2%、±5% | 10Ω~1MΩ          |
| MF 2WS    | 4.0±0.6       | 11.5±1.0 | 0.65   | 28  | 500V                | 1000V                | 350V                            | ±1%、±2%、±5% | 10Ω~1MΩ          |
| MF 3WS    | 5.0±0.6       | 15.5±1.0 | 0.70   | 28  | 500V                | 1000V                | 350V                            | ±1%、±2%、±5% | 10Ω~1MΩ          |

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### 3.0 Structure



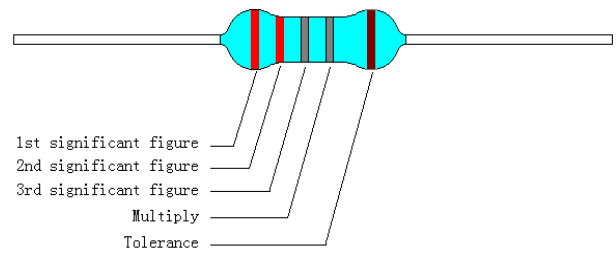
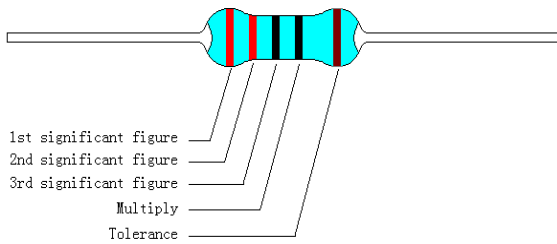
| No. | Name             | Material  |
|-----|------------------|---|
| 1   | Basic body       | Rod type ceramics   |
| 2   | Resistance layer | Metal Film  |
| 3   | End cap          | Cold steel plated with copper/tin   |
| 4   | Lead wire        | Tin solder coated copper wire   |
| 5   | Joint            | By Welding  |
| 6   | Coating          | 1. Inner paint: Celluloid resin<br>2. Outer paint:<br>2.1 Inflammable resin for normal size and 1/2W small size: Blue<br>2.2 Non-inflammable resin for other small size: Light Green<br>2.3 Non-inflammable resin for ultra-small size-0.4WSS: Deep Green |
| 7   | Color bands      | Epoxy resin   |

### 4.0 Mark

Resistors shall be marked with color bands which in accordance with JIS C 0802

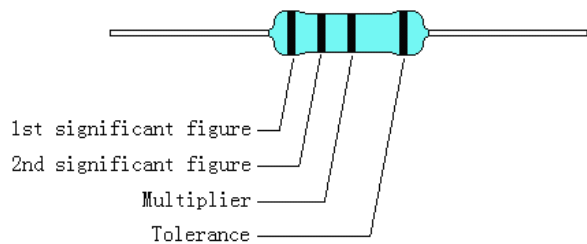
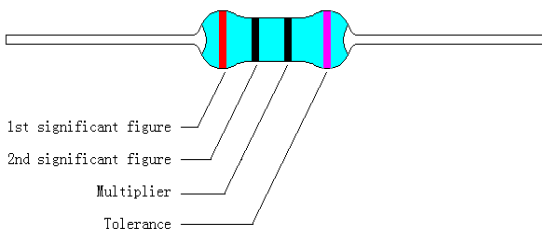
For 1/8W, 1/4WS, 0.4WSS ( $\pm 1\%$ )

Another



For 1/8W, 1/6W, 1/4WS, 0.4WSS ( $\pm 2\%$ ,  $\pm 5\%$ )

Another



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4.1 Label: Label includes following items:

- 4.1.1 Type and style
- 4.1.2 Nominal resistance
- 4.1.3 Resistance tolerance
- 4.1.4 Quantity
- 4.1.5 Lot. No.
- 4.1.6 TCR: PPM

Example:

|                            |            |
|----------------------------|------------|
| METAL FILM FIXED RESISTORS |            |
| WATT: 2W                   | VAL: 200KΩ |
| Q'TY: 1,000                | TOL: 1%    |
| LOT: 3021548               | PPM: 50    |

**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 temperature is above 70°C, the load shall be derate as shown in figure 1

Figure1



**6.0 Voltage rating:**

Resistors should have a power rating based on direct-current (DC) continuous voltage rating and an alternating-current (AC) continuous voltage rating which calculating formula shown as below:

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

RCWV: Rated DC or RMS AC continuous working voltage (Volt.)

P: Power Rating (Watt.)

R: Nominal Resistance (Ohm)

Resistors will be burned out if it overload, such as higher than the maximum value of series' RCWV. And we named 2.5 times RCWV is OVERLOAD Voltage.

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7.0 Specification

| Item                            | Limits  |                  | Test Method (JIS-C-5201&5202)   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
|---------------------------------|---|------------------|---|------|-------------|------|---|-------------|-------|---|------------|------------|---|--------------|-------|---|------------|------------|
| Temperature Coefficient         | ± 0.1%  | ± 15 PPM/°CMax.. | 4.8 Natural resistance changes per temp. Degree centigrade<br><br>$\frac{R_2 - R_1}{R_1(T_2 - T_1)} * 10^6 (PPM/°C)$ R1: resistance value at room temp. (T1)<br>R2: resistance value at room temp. +100°C (Tt2)<br>Test pattern: room temp. (T1), room temp. +100°C(T2)   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
|                                 | ± 0.25%   | ± 25 PPM/°CMax.. |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
|                                 | ± 0.5%  | ± 50PPM/°CMax..  |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
|                                 | ±1%   | ±50PPM/°CMax..   |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
|                                 | ±2%   | ±100PPM/°CMax.   |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
|                                 | ±5%   | ±200PPM/°CMax..  |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| Short-time overload             | Resistance change rate is: ±(0.5%+0.05Ω)Max. With no evidence of 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 is: ± (1%+0.05Ω) Max. With no evidence of mechanical damage. |                  | 4.28 Resistance change after 10,000 cycles (1 second "ON ", 25 seconds "OFF ") at 4 times RCWV.   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| Resistance to soldering heat    | Resistance change rate is: ± (1%+0.05Ω) Max. With no evidence of mechanical damage  |                  | 4.18 Permanent resistance change when leads immersed to a point 2.0-2.5mm from the body in 260°C±5°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 trichloroethylene completely for 3 min. With ultrasonic   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| Terminal strength               | No evidence of mechanical damage  |                  | 4.16 Direct load:<br>Resistance to a 2.5 kg direct load for 10 seconds in the direction of the longitudinal axis of the terminal leads.<br>Twist test:<br>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                   | 95% coverage Min.   |                  | 4.17 The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes.<br>Test temp. Of solder:245°C±3°C<br>Dwell time in solder: 2~3seconds.   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| Temperature cycling             | Resistance change rate is: ±(1%+0.05Ω) Max.. With no evidence of mechanical damage. |                  | 4.19 Resistance change after continuous five cycles for duty cycle specified: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Step</th> <th>Temperature</th> <th>Time</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-55°C ± 3°C</td> <td>30min</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>10 - 15min</td> </tr> <tr> <td>3</td> <td>+155°C ± 2°C</td> <td>30min</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>10 - 15min</td> </tr> </tbody> </table> | Step | Temperature | Time | 1 | -55°C ± 3°C | 30min | 2 | Room temp. | 10 - 15min | 3 | +155°C ± 2°C | 30min | 4 | Room temp. | 10 - 15min |
| Step                            | Temperature   | Time             |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| 1                               | -55°C ± 3°C   | 30min            |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| 2                               | Room temp.  | 10 - 15min       |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| 3                               | +155°C ± 2°C  | 30min            |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| 4                               | Room temp.  | 10 - 15min       |   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| Load life in humidity           | Normal type: ±1.5%;<br>flame retardant type: ±5%                                    |                  | 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°C±2°C and 90 to 95% relative humidity.  |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |
| Load life                       | Normal type: ±1.5%;<br>flame retardant type: ±5%                                    |                  | 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°C±2°C ambient.   |      |             |      |   |             |       |   |            |            |   |              |       |   |            |            |

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## 8.0 Explanation of Part No. System:

The standard Part No. includes 14 codes which explained as below:

### 8.1 1<sup>st</sup> ~ 4<sup>th</sup> codes: Item type

8.1.1 The 1<sup>st</sup> to 3<sup>rd</sup> codes: Product type;

8.1.2 The 4<sup>th</sup> code: Special feature.

Example: MFRF= Metal Film Fixed Resistors Non-flame type;

### 8.2 5<sup>th</sup>~6<sup>th</sup> codes: Power rating.

8.2.1 W=Normal Size; S=Small Size; U=Ultra Small Size;

1/16W~1/2W (<1W)

|                  |     |     |     |     |     |     |     |     |
|------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| Wattage          | 1/2 | 1/3 | 1/4 | 1/5 | 1/6 | 1/8 | 0.6 | 0.4 |
| Normal Size      | W2  | W3  | W4  | W5  | W6  | W8  | /   | /   |
| Small Size       | S2  | S3  | S4  | S5  | S6  | S8  | 06  | /   |
| Ultra-Small Size | U2  | U3  | U4  | U5  | U6  | U8  | /   | 04  |

1W~16W (≥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 |

8.2.2 If power rating is less than 1 watt, 5<sup>th</sup> code would be the letters W, S or U and 6<sup>th</sup> code would be a number or a letter code.

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

8.2.3 If power rating is between 1~16 watt, 5<sup>th</sup> code would be a number or a letter code and 6<sup>th</sup> code will be the letters of W, S or U.

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

### 8.3 7<sup>th</sup> code: Resistance Tolerance.

B=±0.1% C=±0.25% D=±0.5% F=±1% G=±2% J=±5%

### 8.4 8<sup>th</sup> ~ 11<sup>th</sup> codes: Resistance Value

8.4.1 If resistance value belongs to E-24 series:

8.4.1.1 8<sup>th</sup> code must be "0"

8.4.1.2 9<sup>th</sup> & 10<sup>th</sup> codes: Significant figures of the resistance;

8.4.1.3 11<sup>th</sup> code: Power of ten.

8.4.2 If resistance value belongs to E-96 series:

8.4.2.1 8<sup>th</sup> ~10<sup>th</sup> codes: Significant figures of the resistance

8.4.2.2 11<sup>th</sup> code: Power of ten.

|              |           |          |            |         |          |      |
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8.4.2.3 We use this code in 11<sup>th</sup> code:

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>      5=10<sup>5</sup>  
 J=10<sup>-1</sup>      K=10<sup>-2</sup>      L=10<sup>-3</sup>      M=10<sup>-4</sup>

8.5 12<sup>th</sup>~14<sup>th</sup> codes.

8.5.1 12<sup>th</sup> code: Packaging Type

A=Tape/Box (Ammo pack)    B=Bulk/Box    T=Tape/Reel    P=Tape/Box of PT-26

8.5.2 13<sup>th</sup> code: Packing Quantity of Tape/Box & Tape/Reel packaging types.

A=500pcs    B=2500pcs    1=1000pcs    2=2000pcs

8.5.3 If product is FORMED, 13<sup>th</sup>~14<sup>th</sup> codes are forming types

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 14<sup>th</sup> code: Special features of additional information

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 typ

9.0 Order procedure ( Example: MFR 2W ±1% 200KΩ T/B-1000 )



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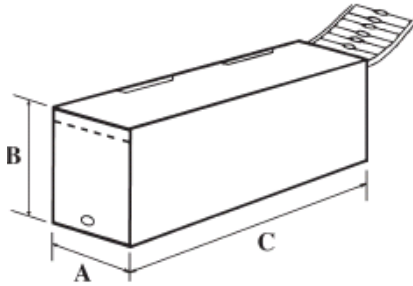
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10.0 Standard Packing:

10.1 Tapes in Box 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  |
|-----------|------|--------|-----|-----|-----|----------|
| MF 1/8W   | 52±1 | 5±0.3  | 75  | 70  | 255 | 5,000pcs |
| MF 1/4WS  | 52±1 | 5±0.3  | 75  | 70  | 255 | 5,000pcs |
| MF 1/4W   | 52±1 | 5±0.3  | 75  | 98  | 255 | 5,000pcs |
| MF 0.4WSS | 52±1 | 5±0.3  | 75  | 70  | 255 | 5,000pcs |
| MF 1/2WSS | 52±1 | 5±0.3  | 75  | 116 | 255 | 5,000pcs |
| MF 1/2WS  | 52±1 | 5±0.3  | 75  | 70  | 255 | 2,000pcs |
| MF 1/2W   | 52±1 | 5±0.3  | 75  | 45  | 255 | 1,000pcs |
| MF 0.6WS  | 52±1 | 5±0.3  | 75  | 116 | 255 | 5,000pcs |
| MF 1WS    | 58±1 | 5±0.3  | 80  | 70  | 255 | 1,000pcs |
| MF 1W     | 58±1 | 5±0.3  | 80  | 82  | 255 | 1,000pcs |
| MF 2WS    | 58±1 | 5±0.3  | 80  | 82  | 255 | 1,000pcs |
| MF 2W     | 65±5 | 10±0.5 | 90  | 88  | 255 | 1000pcs  |
| MF 3WS    | 65±5 | 10±0.5 | 90  | 119 | 255 | 1000pcs  |
| MF 3W     | 65±5 | 10±0.5 | 90  | 88  | 255 | 500pcs   |

|              |           |          |            |         |          |       |
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10.2 Tapes in Reel Packing



Dimension of Reel (mm)

| Part No.  | A    | W±5 | H±5 | L±5 | Qty/Box  |
|-----------|------|-----|-----|-----|----------|
| MF 1/8W   | 73±2 | 85  | 295 | 293 | 5,000pcs |
| MF 1/4WS  | 73±2 | 85  | 295 | 293 | 5,000pcs |
| MF 1/4W   | 73±2 | 85  | 295 | 293 | 5,000pcs |
| MF 0.4WSS | 73±2 | 85  | 295 | 293 | 5,000pcs |
| MF 1/2WSS | 73±2 | 85  | 295 | 293 | 5,000pcs |
| MF 1/2WS  | 73±2 | 85  | 295 | 293 | 4,000pcs |
| MF 1/2W   | 73±2 | 85  | 295 | 293 | 4,000pcs |
| MF 0.6WS  | 73±2 | 85  | 295 | 293 | 5,000pcs |
| MF 1WS    | 73±2 | 85  | 295 | 293 | 2,500pcs |
| MF 1W     | 73±2 | 85  | 295 | 293 | 2,500pcs |
| MF 2WS    | 73±2 | 85  | 295 | 293 | 2,500pcs |
| MF 2W     | 80±5 | 95  | 295 | 293 | 1,000pcs |
| MF 3WS    | 80±5 | 95  | 295 | 293 | 1,000pcs |
| MF 3W     | 80±5 | 95  | 295 | 293 | 1,000pcs |

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10.3 Bulk in Box Packing



Dimension of Box (mm)

| Part No.  | A±5 | B±5 | C±5 | Qty/Box         |
|-----------|-----|-----|-----|-----------------|
| MF 1/8W   | 140 | 80  | 240 | 1,000/20,000pcs |
| MF 1/4WS  | 140 | 80  | 240 | 1,000/20,000pcs |
| MF 1/4W   | 140 | 80  | 240 | 500/20,000pcs   |
| MF 0.4WSS | 140 | 80  | 240 | 1,000/20,000pcs |
| MF 1/2WSS | 140 | 80  | 240 | 500/10,000pcs   |
| MF 1/2WS  | 140 | 80  | 240 | 500/8,000pcs    |
| MF 1/2W   | 140 | 80  | 240 | 250/2,000pcs    |
| MF 0.6WS  | 140 | 80  | 240 | 500/10,000pcs   |
| MF 1WS    | 140 | 80  | 240 | 200/4,000pcs    |
| MF 1W     | 140 | 80  | 240 | 100/2,500pcs    |
| MF 2WS    | 140 | 80  | 240 | 100/2,500pcs    |
| MF 2W     | 140 | 80  | 240 | 100/1,500pcs    |
| MF 3WS    | 140 | 80  | 240 | 100/1,500pcs    |
| MF 3W     | 140 | 80  | 240 | 100/1,500pcs    |

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## 11.0 Note

11.1 UNIOHM strongly recommend the storage condition:

Temperature: 15°C~35°C; Humidity :25%~75%.

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

11.2 Store / transport cartons in the correct direction, otherwise bent leads would be occurred due to excessive stress applied when dropping of a carton.

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

11.3.1 In high electrostatic;

11.3.2 In direct sunshine, rain, snow or condensation;

11.3.3 Exposed to sea winds or corrosive gases which contains Cl<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>

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