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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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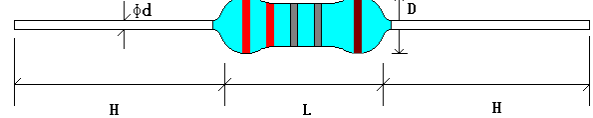
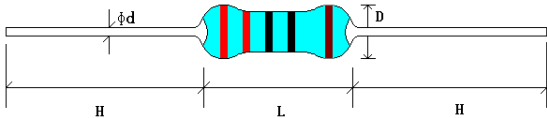
## 1.0 Scope

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



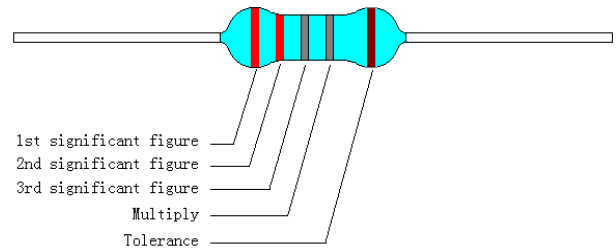
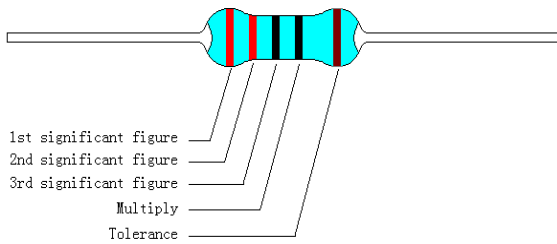
No.	Name	Material
1	Basic body	Rod type ceramics
2	Resistance layer	Metal Film
3	End cap	Cold steel plated with copper/tin
4	Lead wire	Tin solder coated copper wire
5	Joint	By Welding
6	Coating	1. Inner paint: Celluloid resin 2. Outer paint: 2.1 Inflammable resin for normal size and 1/2W small size: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

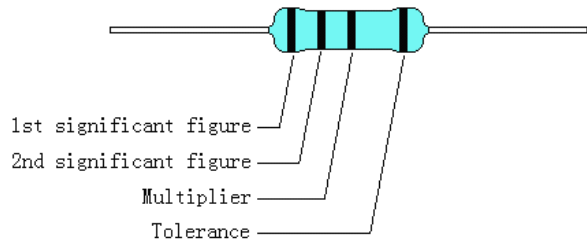
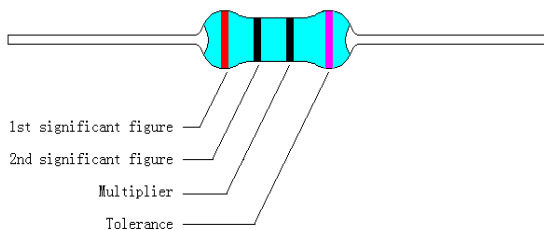
For 1/8W, 1/4WS, 0.4WSS ( $\pm 1\%$ )

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

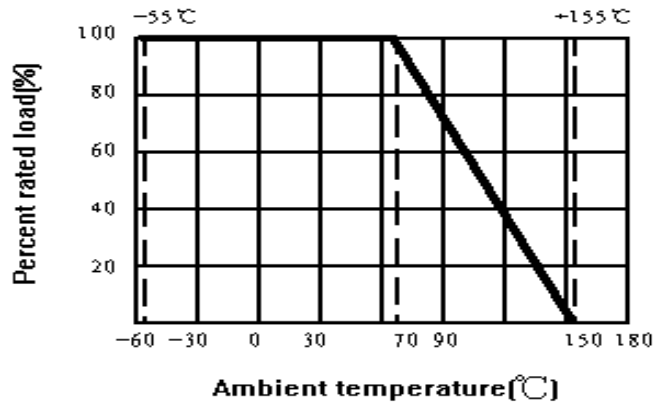
Example:

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  $\frac{R_2 - R_1}{R_1(T_2 - T_1)} * 10^6 (PPM/°C)$ R1: resistance value at room temp. (T1) R2: resistance value at room temp. +100°C (Tt2) 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: 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	95% coverage Min.		4.17 The area covered with a new, smooth, clean, shiny and continuous surface free from concentrated pinholes. Test temp. Of solder:245°C±3°C 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%; 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%; 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 ( $\geq 1W$ )

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

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= $\pm 0.1\%$  C= $\pm 0.25\%$  D= $\pm 0.5\%$  F= $\pm 1\%$  G= $\pm 2\%$  J= $\pm 5\%$

### 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

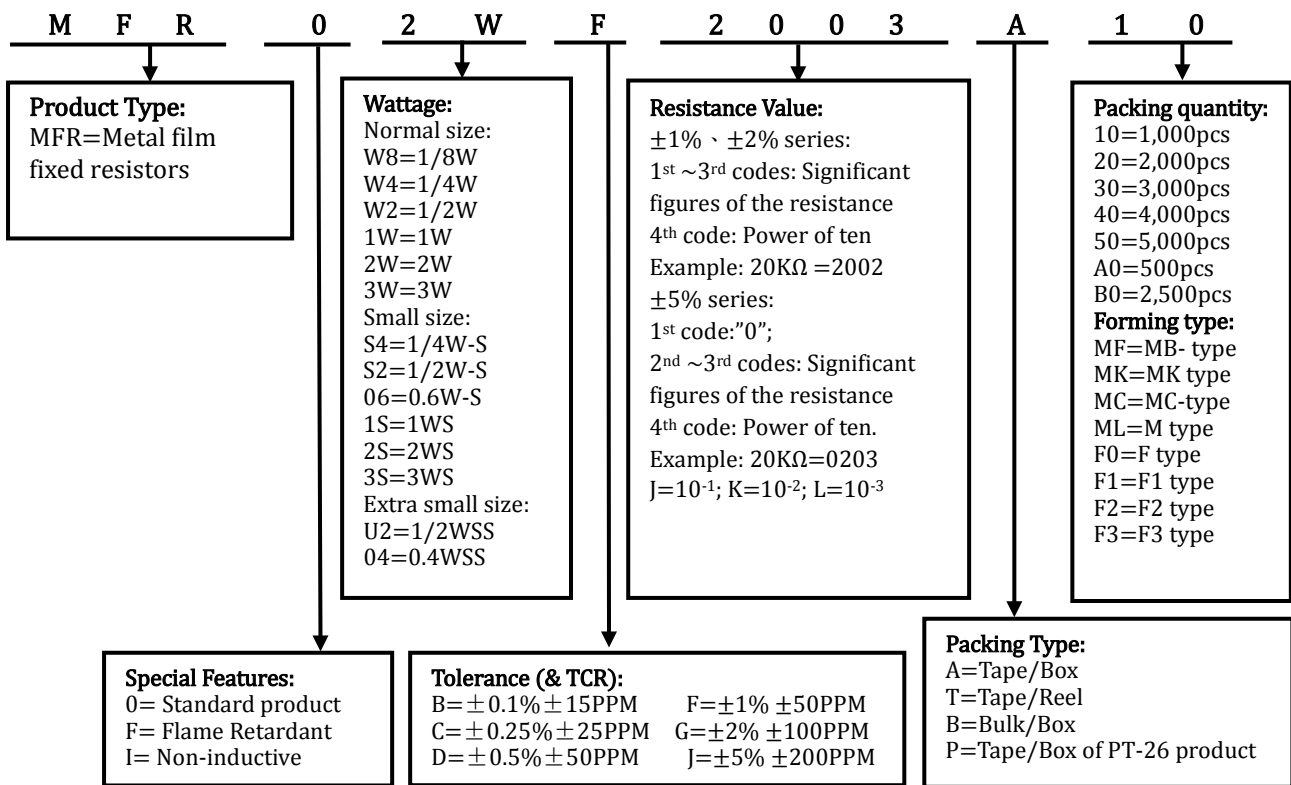
8.5.3 If product is FORMED, 13<sup>th</sup>~14<sup>th</sup> codes are forming types

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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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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