

1. 適用範圍 / SCOPE

此份規格書涵蓋 MSU 分流器系列相關規格。

This specification covers MSU2512/3921/5931 series, which are Metal Type Current Shunt Resistor.

2. 產品型號/TYPE NUMBER

MSU	3921	M/F	xWx	Rxxx	x	*
	(1)	(2)	(3)	(4)	(5)	(6)

- (1) 產品系列號 / SERIES NUMBER : Ex.MSU3921 = 短電極/ Short electrode ; 兩端子 / two terminal ; 尺寸 / size "0.39×0.21"
- (2) 產品材質 / Material : M = 錳銅合金 / MnCu alloy ; F = 铁铬铝合金 / Complex alloy
- (3) 產品瓦特數 / Power Rating : Ex. 5W0=5.00 Watt · 3W5=3.50Watt
- (4) 產品阻值 / Nominal Resistance Value : Ex. 1mΩ → R001 ; 0.5mΩ → 0M50
- (5) 元件電阻偏差值 / Resistance Tolerance : Ex. F=±1% ; D=±0.5%
- (6) 產品碼/Product code:Ex. S→Special design

3. 產品尺寸 / PRODUCT DIMENSIONS

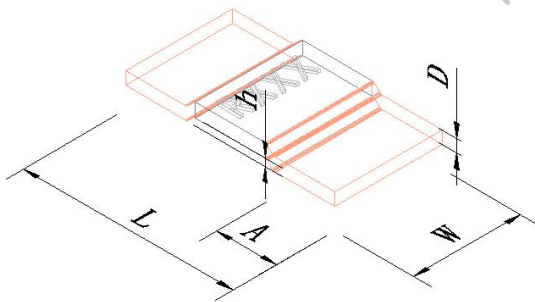


圖 1 / Fig.1A

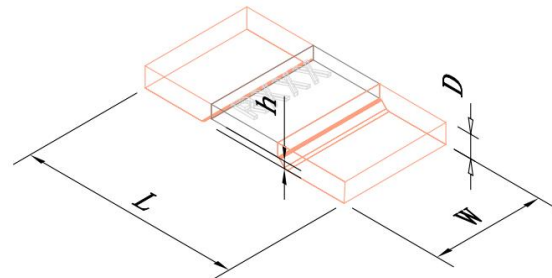


圖 1 / Fig.1B

Unit(mm)

Part Number	W	L	A	D Typical	h	示意图	金属类型
MSU2512-M-0M20	3.20±0.25	6.40±0.20	2.20±0.30	1.70	0.50±0.15	B	錳銅
MSU2512-M-0M30			1.20±0.30	0.83			
MSU2512-M-0M50	3.02±0.25	6.35±0.20	1.0±0.30	0.85	0.35±0.05	A	铁铬铝
MSU2512-M-R001				0.42			
MSU2512-F-R002				0.65			
MSU2512-F-R003				0.42			

Part Number	W	L	A	D Typical	h	示意图	金属类型
MSU3921-M-0M20	5.20±0.30	10.0±0.30	2.00±0.30	1.40	0.5±0.10	A	锰铜
MSU3921-M-0M30				1.28			
MSU3921-M-0M50				0.80			
MSU3921-M-0M75				0.56			
MSU3921-M-R001				0.42			铁铬铝
MSU3921-F-R002				0.58			
MSU3921-F-R003				0.38			
MSU3921-F-R004				0.30			

Part Number	W	L	A	D Typical	h	示意图	金属类型
MSU5931-M-0M20	7.75±0.30	15.0±0.30	4.00±0.30	1.40	0.5±0.10	A	锰铜
MSU5931-M-0M30				1.13			
MSU5931-M-0M50				0.62			
MSU5931-M-0M70				0.43			
MSU5931-M-0M75				0.40			铁铬铝
MSU5931-F-R001				1.10			
MSU5931-F-R002				0.50			
MSU5931-F-R003				0.33			

4. 產品結構及使用材料說明(參考圖 2) / STRUCTURE & MATERIAL (Ref to Fig.2)

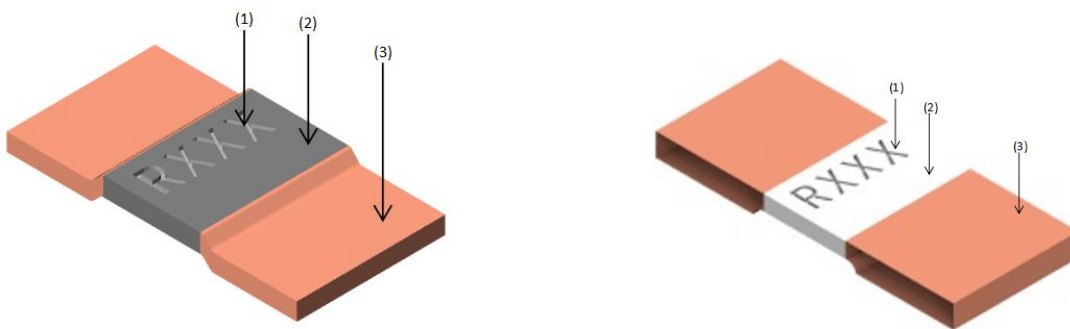


圖 2 / Fig.2

4.1 文字 / Marking(1) : 激光打印 / Laser

4.2 電阻本體 / Resistive element(2) : 銅合金 / Cu - alloy ; 铁铬铝合金 / Complex alloy

4.3 端電極 / Terminal electrode(3) : 銅 / Cu

5.電氣特性 / ELECTRICAL CHARACTERISTICS

Part Number	Resistance Value (mΩ)	Power Rating (Watt)	Resistance Tolerance (%)	TCR (ppm/°C)
MSU2512-M-0M20	0.2	3\5	±1% / ±5%	±200
MSU2512-M-0M30	0.3	3\5		±200
MSU2512-M-0M50	0.5	3\5\6		±175
MSU2512-M-R001	1.0	3\5		±150
MSU2512-F-R002	2.0	3\4		±100
MSU2512-F-R003	3.0	3\4		±100

Part Number	Resistance Value (mΩ)	Power Rating (Watt)	Resistance Tolerance (%)	TCR (ppm/°C)
MSU3921-M-0M20	0.2	5\7\9	±1% / ±5%	±150
MSU3921-M-0M30	0.3	5\7\9		±150
MSU3921-M-0M50	0.5	5\7		±150
MSU3921-M-R001	1.0	5		±100
MSU3921-F-R002	2.0	5		±100
MSU3921-F-R003	3.0	5		±100
MSU3921-F-R004	4.0	4		±100

Part Number	Resistance Value (mΩ)	Power Rating (Watt)	Resistance Tolerance (%)	TCR (ppm/°C)
MSU5931-M-0M20	0.2	7\8\10\15	±1% / ±5%	±175
MSU5931-M-0M30	0.3	7\8\10		±175
MSU5931-M-0M50	0.5	7\8		±150
MSU5931-M-0M70	0.7	6		±100
MSU5931-M-0M75	0.75	6		±100
MSU5931-F-R001	1.0	7\8\10		±100
MSU5931-F-R002	2.0	7\8		±100
MSU5931-F-R003	3.0	7		±100

6. 產品特性及信賴性測試規範 / PRODUCT CHARACTERISTICS AND RELIABILITY TEST STANDARD

測試方法 Parameter	條件 Conditions	允收標準 Requirements
瞬間過載測試 / Short Time Over Load	$P = 5P_r$ ; $T = 25 \pm 2^\circ\text{C}$ , $t = 5\text{sec.}$	$\pm 2.0\%$ IEC60115-1 4.13
高溫測試 / High Temp. Exposure	$T = +170 \pm 2^\circ\text{C}$ ; $t = 1000\text{h}$	$\pm 2.0\%$ IEC60115-1 4.25
低溫測試 / Low Temp. Storage	$T = -55 \pm 2^\circ\text{C}$ ; $t = 1000\text{h}$	$\pm 1.0\%$ IEC60115-1 4.25
Biased Humidity Test / 高温高湿测试	$+85^\circ\text{C}$ , 85 %R.H., 10% Rated power 1000 Hours	$\pm 1.0\%$ IEC60115-1 4.25
冷熱衝擊測試 / Thermal Shock	$[-55^\circ\text{C} \ 30\text{min.} \rightarrow \text{R.T.} \ 3\text{min.} \rightarrow +155^\circ\text{C} \ 30\text{min.} \rightarrow \text{R.T.} \ 3\text{min.}]$ , 100 個連續循環 / 100Cycles	$\pm 1.0\%$ IEC60115-1 4.19
在 $70^\circ\text{C}$ 下負載壽命測試 / Load Life at $70^\circ\text{C}$	$T = 70 \pm 2^\circ\text{C}$ ; $t = 90\text{min ON}$ , $30\text{min OFF}$ , 1000h, Rated power	$\pm 2.0\%$ IEC60115-1 4.25
機械衝擊測試 / Mechanical Shock	加速度 $a = 100\text{G}$ , 振幅時間 $t = 6\text{ms}$ $a = 100\text{G}$ , $t = 6\text{ms}$	$\pm 1.0\%$ IEC60115-1 4.21

7. 環境特性 / ENVIRONMENTAL CHARACTERISTIC

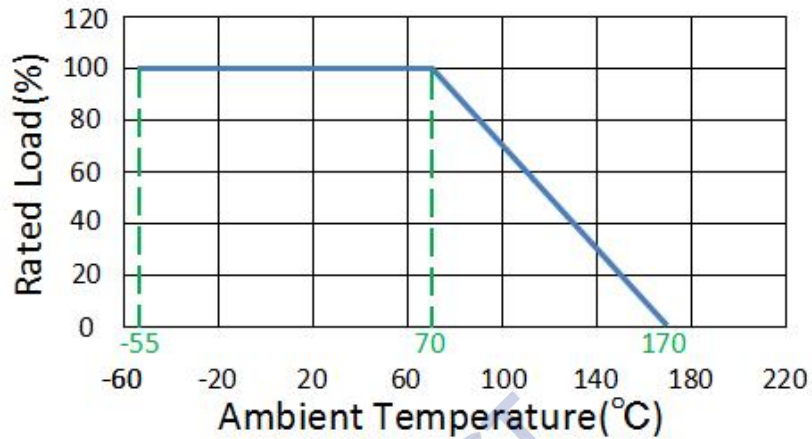
7.1 操作溫度範圍:  $-55^\circ\text{C} \sim 155^\circ\text{C}$  / Operating Temperature:  $-55^\circ\text{C} \sim 155^\circ\text{C}$

額定功率溫度衰變曲線 / Typical Thermal Derating Curve

額定功率乃指於  $70^\circ\text{C}$  以內可連續滿額功率使用的術語。

下圖為當操作溫度高於  $70^\circ\text{C}$  時的可使用功率衰減曲線。

Power rating is based on continuous full load operation at rated ambient temperature of  $70^\circ\text{C}$ . For resistors operated at ambient temp. in excess of  $70^\circ\text{C}$ , the max. load shall be derated in accordance with the following curve.



### 7.2 存儲條件 / STORAGE CONDITIONS

在溫度+10°C ~ 40°C、相對濕度≤60%的密閉條件下可存放2年。 /

Under airtight in temperature+10°C ~ 40°C、relative humidity ≤60% can store 2 years.

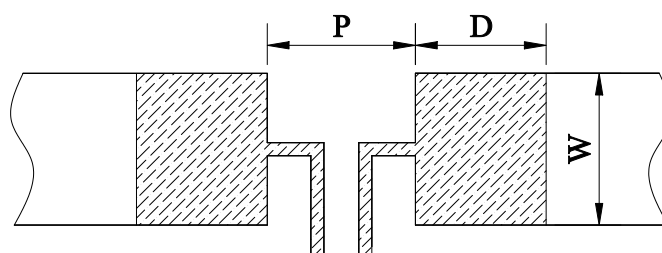
### 8. 焊錫墊尺寸及焊接條件 / SOLDER PAD SIZE AND WELDING CONDITIONS

8.1 建議如下圖焊接方式焊接，並滿足所要求的尺寸。 / Propose that the following picture installation way is installed, and satisfied the required size.

Part Number	P	W	D
MSU2512-series 0M20	1.60	3.85	3.85
MSU2512-series 其他	3.60	3.40	1.60
MSU3921-series	5.60	6.20	2.70
MSU5931-series	5.60	8.75	5.20

Unit:mm

loading : 適用於本司建議焊墊設計並使用於限定穩定電流下 / suit for specific pad layout and specific steady current



8.2 建议客户焊接参数 / Recommended Customer Soldering Parameters

8.2.1 波峰焊温度曲线 / Wave solder Temperature condition (图 3 / Fig.3)

预热段 / Preheating : 100°C~130°C, max.100 sec ◦

焊锡段 / Soldering: 250°C~265°C max. 10 sec ◦

允许最高温度 / Maximum temperature : 260±5°C, max. 10sec ◦

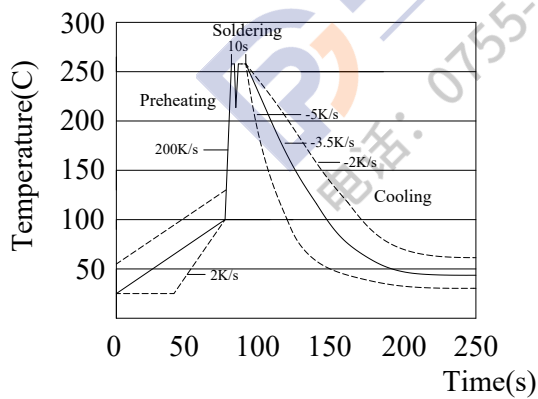


图 3 / Fig.3

8.2.2 回流焊温度曲线 / Solder reflow Temperature condition (图 4 / Fig.4)

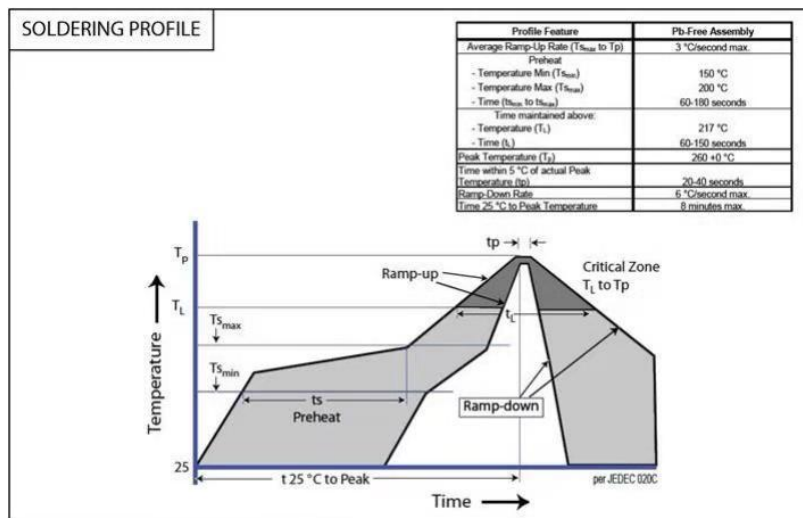


图 4 / Fig.4

8.2.3 允许烙铁焊接条件(热风设备) / Rework temperature ( hot air equipment ) : 350°C,  
3~5seconds

8.2.4 焊接方法建议 / Recommended reflow methods

焊接热源方式可用红外线, 热蒸气, 热风. / IR, vapor phase oven, hot air oven

如果焊锡温度超过允许最高温度, 则产品本身会有功能损坏的疑虑。 / If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements。

## 9. 批量生产后出货测试项目 / Lot ACCEPTANCE TEST REQUIREMENTS

每一批生产均须作入库检验, 每一批生产单量不可超过500Kpcs。 /

Qualification shall consist of passing a program of following tests. Parts shall be pulled from each lot and maximum lot quantity shall be within 500Kpcs。

### 9.1 外观 / Visual

方法 / Procedure : 利用放大镜进行检查 / Visual

标准 / Acceptance Criteria : 不能有脏污、不洁、文印错误、破损等 / No parts are outstandingly stained

### 9.2 尺寸 / Dimensions

方法 / Procedure : 使用合适且经校正的标尺 / As appropriate, calipers, micrometers, optical comparator, or approved gages

标准 / Acceptance Criteria : 尺寸均在标准范围内 / No parts outside specific dimensions

### 9.3 单体组件电阻(Ro) / Resistance (Ro)

方法 / Procedure : 在 25°C 下利用四线量测技术量测之 / Resistance shall be measured with 25°C in the 4-wire resistance test

标准 / Acceptance Criteria : 电阻值均在标准范围内 / The resistance of the test device shall

be within the limits specified

#### 9.4 电阻温度系数 / TCR

方法 / Procedure : 利用四线法量测出组件分别在 25°C 及125°C 下的电阻值, 并将其带入下面公式中即可得出 TCR值 / Getting the sampling device resistance values measured in 25°C and 125°C and put them in to the following equation to calculate the TCR

标准 / Acceptance Criteria : 温度系数值均在规定标准范围内 / All parts must within the specific

$$TCR = (R_b - R_a) / R_a \times 1 / (T_b - T_a) \times 10^6$$

### 10. 包装讯息 / PACKAGING INFORMATION

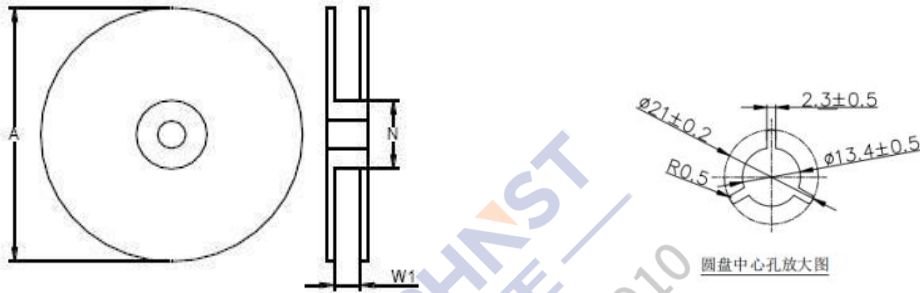
#### 10.1 包装数量、重量 / QUANTITY & WEIGHT

型号 / Type Number	数量 / Quantity (pcs)	重量 / Weight ( g )
MSU2512-M-0M20	4000	1400
MSU2512-M-0M30		900
MSU2512-M-0M50	3000	650
MSU2512-M-R001		400
MSU2512-F-R002		600
MSU2512-F-R003		450
MSU3921-M-0M20	3000	2100
MSU3921-M-0M30		1900
MSU3921-M-0M50		1250
MSU3921-M-R001		900
MSU3921-F-R002		750
MSU3921-F-R003		1000
MSU3921-F-R004		700
MSU5931-M-0M20	1500	2300
MSU5931-M-0M30		1900
MSU5931-M-0M50		1200
MSU5931-M-0M70		850
MSU5931-M-0M75		850



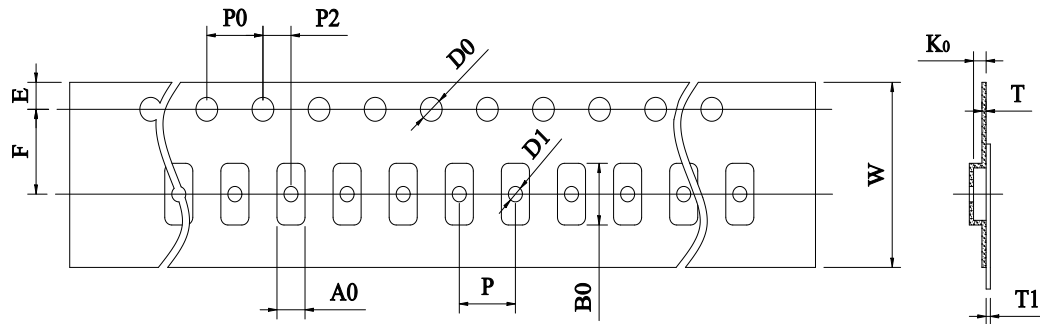
MSU5931-F-R001	2000
MSU5931-F-R002	950
MSU5931-F-R003	700

10.2 卷轮规格 / Reel & Tape specifications



Unit(mm)

型号 / Type Number	A $\pm$ 5 (mm)	N $\pm$ 2 (mm)	W1 $\pm$ 1 (mm)
MSU2512-0.2/0.3m $\Omega$	330	60	17.0
MSU2512-Series	178	60	13
MSU3921-Series	330	100	24.5
MSU5931-Series	330	100	24.5



MSU2512-1							
W	12.00 $\pm$ 0.30	P0	4.00 $\pm$ 0.10	P	4.00 $\pm$ 0.10	P2	2.00 $\pm$ 0.10
A0	3.40 $\pm$ 0.20	B0	6.75 $\pm$ 0.20	D0	1.55 $\pm$ 0.10	F	5.50 $\pm$ 0.10
E	1.75 $\pm$ 0.10	T	0.20 $\pm$ 0.10	T1	Max. 0.1	K0	1.50 $\pm$ 0.20
MSU2512-2							
W	12.00 $\pm$ 0.30	P0	4.00 $\pm$ 0.10	P	4.00 $\pm$ 0.10	P2	2.00 $\pm$ 0.10
A0	3.40 $\pm$ 0.20	B0	6.75 $\pm$ 0.20	D0	1.55 $\pm$ 0.10	F	5.50 $\pm$ 0.10
E	1.75 $\pm$ 0.10	T	0.20 $\pm$ 0.10	T1	Max. 0.1	K0	0.98 $\pm$ 0.20

MSU2512-3							
W	16.00 ± 0.30	P0	4.00 ± 0.10	P	8.00 ± 0.10	P2	2.00 ± 0.10
A0	3.50 ± 0.20	B0	6.80 ± 0.20	D0	1.55 ± 0.10	F	7.50 ± 0.10
E	1.75 ± 0.10	T	0.20 ± 0.10	T1	Max. 0.1	K0	2.00 ± 0.20
MSU3921-1							
W	24.00 ± 0.30	P0	4.00 ± 0.10	P	8.00 ± 0.10	P2	2.00 ± 0.10
A0	5.70 ± 0.20	B0	11.5 ± 0.20	D0	1.55 ± 0.10	F	11.5 ± 0.10
E	1.75 ± 0.10	T	0.30 ± 0.10	T1	Max. 0.1	K0	1.5 ± 0.10
MSU3921-2							
W	24.00 ± 0.30	P0	4.00 ± 0.10	P	8.00 ± 0.10	P2	2.00 ± 0.10
A0	5.70 ± 0.20	B0	11.5 ± 0.20	D0	1.55 ± 0.10	F	11.5 ± 0.10
E	1.75 ± 0.10	T	0.30 ± 0.10	T1	Max. 0.1	K0	2.1 ± 0.10
MSU5931-1							
W	24.00 ± 0.30	P0	4.00 ± 0.10	P	12.00 ± 0.10	P2	2.00 ± 0.10
A0	8.25 ± 0.20	B0	15.5 ± 0.20	D0	1.55 ± 0.10	F	11.5 ± 0.10
E	1.75 ± 0.10	T	0.30 ± 0.10	T1	Max. 0.1	K0	1.5 ± 0.10
MSU5931-2							
W	24.00 ± 0.30	P0	4.00 ± 0.10	P	12.00 ± 0.10	P2	2.00 ± 0.10
A0	8.25 ± 0.20	B0	15.5 ± 0.20	D0	1.55 ± 0.10	F	11.5 ± 0.10
E	1.75 ± 0.10	T	0.30 ± 0.10	T1	Max. 0.1	K0	2.1 ± 0.10

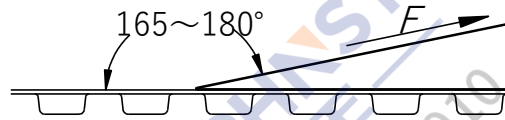
MSU2512		MSU3921		MSU5931	
型号 Type Number	载带型号	型号 Type Number	载带型号	型号 Type Number	载带型号
MSU2512-M-0M20	MSU2512-3	MSU3921-M-0M20	MSU3921-2	MSU5931-M-0M20	MSU5931-2
MSU2512-M-0M30	MSU2512-3	MSU3921-M-0M30	MSU3921-2	MSU5931-M-0M30	MSU5931-2
MSU2512-M-0M50	MSU2512-1	MSU3921-M-0M50	MSU3921-1	MSU5931-M-0M50	MSU5931-1
MSU2512-M-R001	MSU2512-2	MSU3921-M-R001	MSU3921-1	MSU5931-M-0M70	MSU5931-1
MSU2512-F-R002	MSU2512-1	MSU3921-F-R002	MSU3921-1	MSU5931-M-0M75	MSU5931-1
MSU2512-F-R003	MSU2512-2	MSU3921-F-R003	MSU3921-1	MSU5931-F-R001	MSU5931-2

-	-	MSU3921-F-R004	MSU3921-1	MSU5931-F-R002	MSU5931-1
-	-	-	-	MSU5931-F-R003	MSU5931-1

10.3 密封胶膜剥离强度要求 / Peeling Strength of Seal Tape

F = 剥离强度 : 0.1 – 1.0N ( 10 - 100gf )

F = Peeling Strength: 0.1 – 1.0N (10 - 100gf)



11. 其他 / OTHERS

11.1 如果在使用中有超出本规格书的要求，必须经由双方协商确认。 / In the event that an impropriety is found beyond this specification, it shall be fixed by mutual agreement between the parties。

11.2 如果本规格书有不适当的情况，必须通过双方协商并由本公司修改。 / In the event that an impropriety is found in this specification, Juneway Electronic Technology Co., Ltd. shall amend it by mutual agreement between the parties。