



厦门华联电子股份有限公司

Xiamen Hualian Electronics Corp., Ltd.

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# 产品规格书

## SPECIFICATION

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产品名称：光 MOS 固态继电器

**DESCRIPTION: Photo MOSFET Solid State Relay**

产品型号：HSSR-16S1A0D-2

**PART NO.: HSSR-16S1A0D-2**

拟制 Prepared	审核 Verified	批准 Approved

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## 1 概述 General

产品 HSSR-16S1A0D-2 由砷化铝镓红外发光二极管作为输入级耦合到高压输出光探测电路。光探测电路由高速光电二极管阵列和驱动电路构成，用以开启/关断两个独立的高压金属氧化物半导体场效应管 (MOSFET)。一个最小 5mA 的电流流经输入级红外发光二极管可确保继电器动作。当加在输入级红外发光二极管的正向压降为 0.8V 或更小值时，继电器可确保复位。产品见图 1。



图 1 产品 Figure 1-Product

The HSSR-16S1A0D-2 consists of a AlGaAs infrared emitting diode input stage optically coupled to a high-voltage output detector circuit. The detector consists of a high-speed photovoltaic diode array and driver circuitry to switch on/off two discrete high voltage MOSFETs. The relay action with a minimum input current of 5mA through the input LED. The relay reset with an input voltage of 0.8V or less. Products shown in Figure 1.

## 2 特点 Features

- 单通道常开型单刀单掷继电器。Single Channel Normally on Single-Pole-Single-Throw (SPST) Relay.
- SOP16L 塑料封装 (SOP16L Plastic Package)
- 1700V 输出耐压产品。1700V Output Withstand Voltage.
- 低输入电流，CMOS 兼容。Low Input Current: CMOS Compatibility.
- 250  $\Omega$  低通态电阻。250  $\Omega$  Low On-Resistance.
- 非常快的开关速度。High Speed Switching.
- 高输入输出绝缘耐压：5000Vrms for 1 min. High Input-to-Output Insulation Voltage: 5000 Vrms for 1 min.
- 产品内部间隙 Insulation Thickness  $\geq 0.5\text{mm}$
- 根据 IEC 60112 漏电起痕指数:CTI $\geq 600$  According to IEC 60112 comparative tracking index: CTI $\geq 600$ .
- 产品通过 AEC-Q101 测试认证。Products has passed AEC-Q101 test certification.
- 符合 RoHS 指令最新要求及 REACH 法规最新要求。Compliance with the latest requirements of the RoHS Directive and the latest REACH requirements.

## 3 应用 Applications

- 储能。Accumulation.
- 电池管理系统。Automotive Battery Management System.
- 汽车电池和动力系统绝缘检测。Automobile battery and power system insulation testing.
- 工业控制。Industrial Controls.
- EMR/机械继电器替代。EMR / Reed Relay Replacement.

#### 4 电原理图与及布线方式 Circuit Diagram and Wiring Diagram

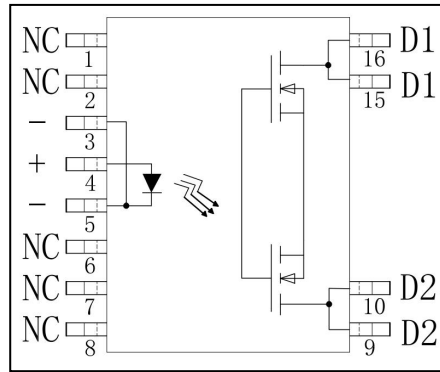


图 2 电原理图 Figure 2-Schematic

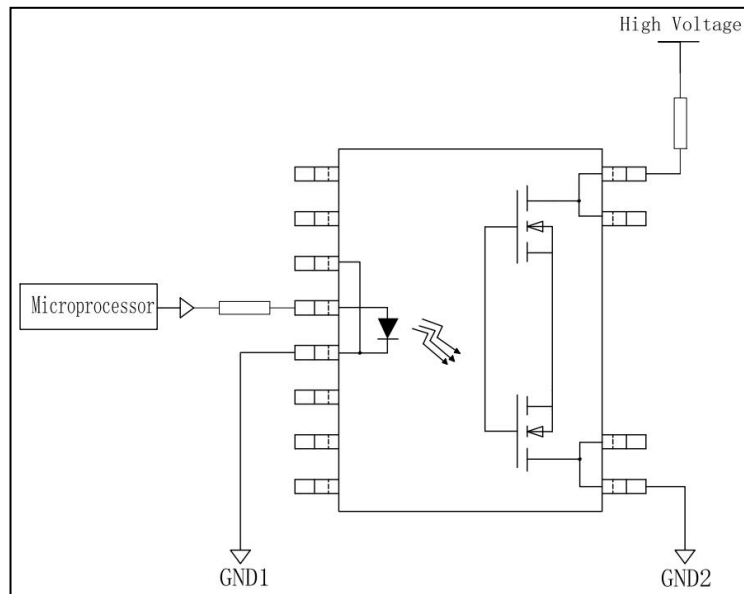


图 3 典型布线图 Figure 3-Typical wiring diagram

#### 5 极限参数 Absolute Maximum Ratings

表 1 极限参数

Table 1-Absolute Maximum Ratings

参数名称 Characteristic		符号 Symbol	额定值 Rating	单位 Unit
输入端 Input	正向电流 Forward Current	$I_F$	25	mA
	反向电压 Reverse Voltage	$V_R$	6	V
	正向脉冲电流 Pulse Forward Current ( $<1\mu s$ pulse width, 300 pps)	$I_{FP}$	1	A
	耗散功率 Power Dissipation (Single channel)	$P_M$	100	mW
输出端 Output	开关电压 Switching Voltage	$V_{O(MAX)}$	1700	V
	连续通态电流 Continuous load current	$I_{O(MAX)}$	20	mA

	雪崩电流 Avalanche current ( $t_m = 1 \text{ min}$ , duty cycle = 0.1%, cumulative of 5 minutes over lifetime)	$I_{AV}$	0.3	mA
	耗散功率 Power dissipation	$P_C$	360	mW
工作温度 Operating temp.		$T_{aop}$	-40 ~ +125	°C
贮存温度 Storage temp.		$T_{stg}$	-55 ~ +125	°C
焊接温度 Soldering Temperature	手工焊 Hand Soldering (3 Sec.)	$T_{sld}$	360	°C
	回流焊 Reflow Soldering (10Sec.)		250	
绝缘电压 Isolation voltage (RH≤60%,交流 1 分钟) (RH≤60%, AC 1min.)		$V_{ISO}$	5000	$V_{rms}$

## 6 推荐工作条件 Recommended Operating Conditions

表 2 推荐工作条件

Table 2-Recommended Operating Conditions

参数名称 Characteristic	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit.
LED 工作电流 LED operating current	$I_{F(ON)}$	7	14	mA
开关电压 Switching voltage	$V_O$	0	1200	V
连续通态电流 Continuous load current	$I_O$	0	10	mA
工作温度 Operating temp.	$T_{aop}$	-40	+125	°C

## 7 光电参数 Opto-Electrical Characteristics

表 3 光电参数

Table 3-Opto-Electrical Characteristics

$T_a = 25^\circ\text{C}$

参数名称 Characteristic	符号 Symbol	测试条件 Test conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit	
输入端 Input	正向电压 Forward voltage	$I_F = 10\text{mA}$	1.1	1.35	1.6	V	
	反向电流 Reverse current	$V_R = 5\text{V}$	-	-	10	uA	
	反向击穿电压 Reverse Breakdown Voltage	$I_R = 10\mu\text{A}$	5			V	
	输入端子电容 Input Capacitance	$V = 0\text{V}$ $F = 1\text{MHz}$		30		pF	
	动作电流 Action Current	$I_{F(ON)}^a$	$I_O = I_{O(MAX)}$			5	mA
	复位电流 Reset Current	$I_{F(OFF)}$	$I_O = I_{O(MAX)}$	0.4			mA

输出端 Output	输出端耐压 Output Withstand Voltage	$V_{O(OFF)}$	$I_O=250\mu A$	1700		V
	断态漏电流 OFF-State Leakage Current	$I_{O(OFF)}$	$V_O=1700V$		10	$\mu A$
	导通电阻 ON Resistance	$R_{ON}$	$I_O=I_{O(MAX)}$	100	250	$\Omega$
传输 Xfer	动作时间 Action Time	$T_{ON}^b$	$I_F=10\text{ mA}, V_{CC}=40V,$ $R_L=20\text{ k}\Omega$		4.0	ms
	复位时间 Reset Time	$T_{OFF}^b$	$I_F=10\text{ mA}, V_{CC}=40V,$ $R_L=20\text{ k}\Omega$		0.5	ms
隔离 Isolation	耦合电容 Coupled Capacitance	$C_{I/O}$	$f_O=1\text{ MHz}$	0.6		pF
	绝缘电阻 Isolation Resistance	$R_{I-O}$	$V_{I-O}=1000V, DC$	$10^9$		$\Omega$
	绝缘电压 Isolation voltage	$V_{ISO}$	$I_{off}\leq 0.3\text{ mA},$ AC, 60s	5000		V
<p><sup>a</sup> 保证所有器件在 <math>I_F</math> 值小于或等于最大的 <math>I_{F(ON)}</math> 时动作。 It is guaranteed that all devices active when <math>I_F</math> value is less than or equal to the maximum value of <math>I_{F(ON)}</math>.</p> <p><sup>b</sup> <math>T_{ON}</math> 与 <math>T_{OFF}</math> 测试电路见图 4。 Figure 4. is the test circuit of <math>T_{ON}</math> and <math>T_{OFF}</math>。</p>						

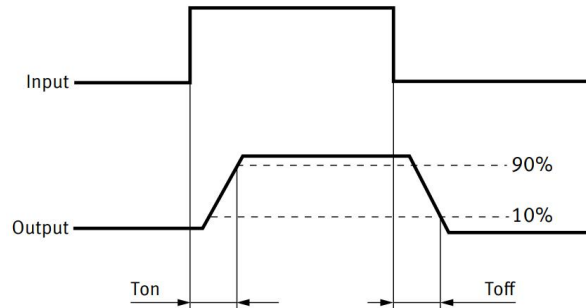


图 4  $T_{ON}$  与  $T_{OFF}$  测试方法 Figure 4- The test method of  $T_{ON}$  and  $T_{OFF}$

## 8 特性曲线图 Characteristic Curve

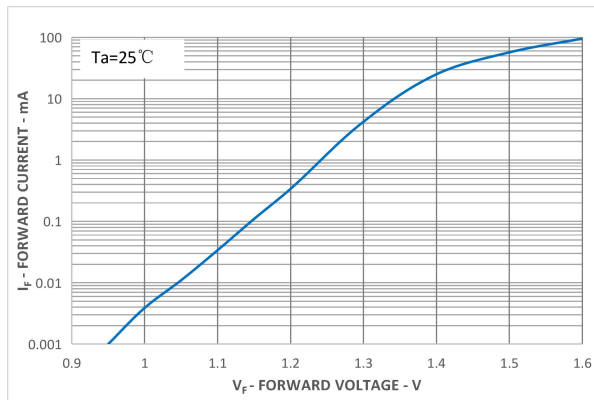


图 5  $V_F$ -  $I_F$  特性曲线

Figure 5-Typical input diode forward characteristic

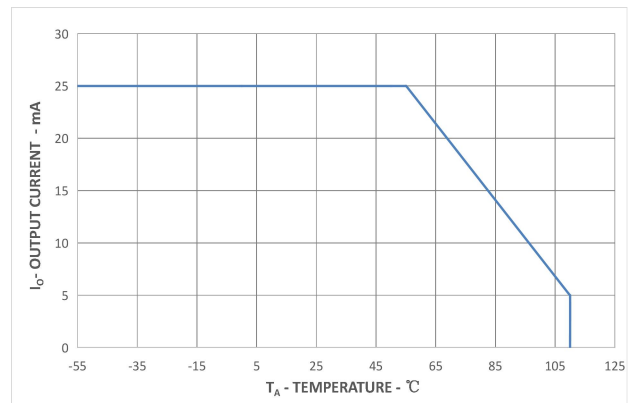


图 6  $I_{F(max)}$ -  $T_A$  特性曲线

Figure 6- $I_{F(max)}$  vs. Temperature

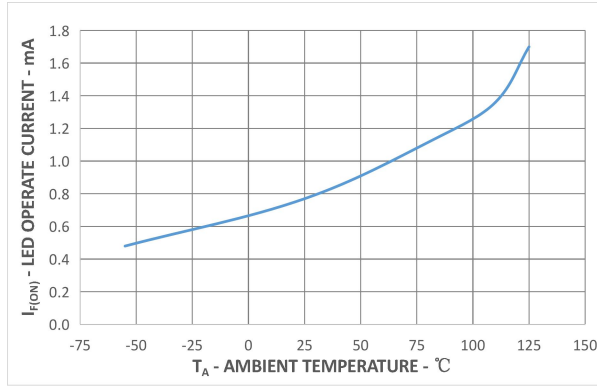


图 7 I<sub>F(ON)</sub> - T<sub>A</sub> 特性曲线  
Figure7-LED operate current vs. Temperature

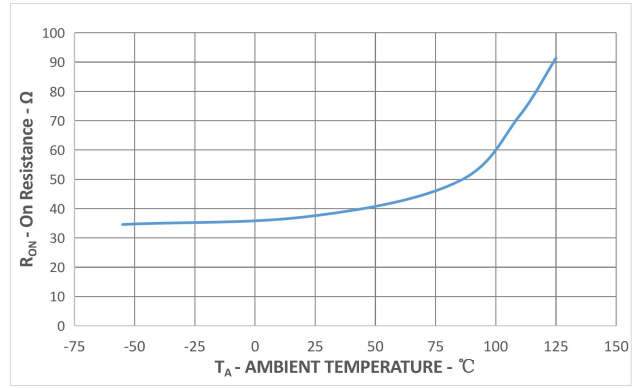


图 8 R<sub>on</sub> - T<sub>A</sub> 特性曲线  
Figure8-On resistance vs. Temperature

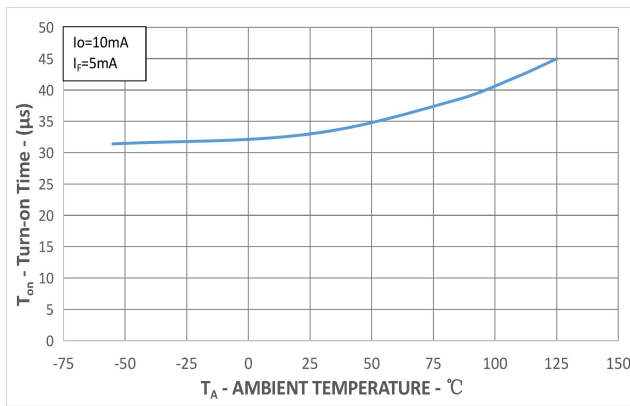


图 9 T<sub>on</sub> - T<sub>A</sub> 特性曲线  
Figure9-Turn on time vs. Temperature

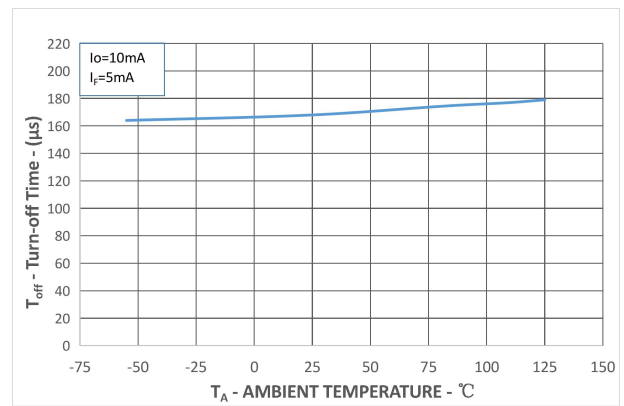


图 10 T<sub>off</sub> - T<sub>A</sub> 特性曲线  
Figure10-Turn off time vs. Temperature

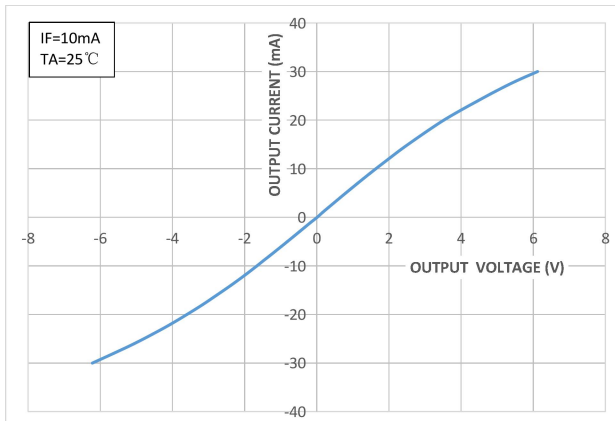


图 11 I<sub>O</sub> - V<sub>O</sub> 特性曲线  
Figure11-Current vs. Voltage characteristics of output at MOS portion

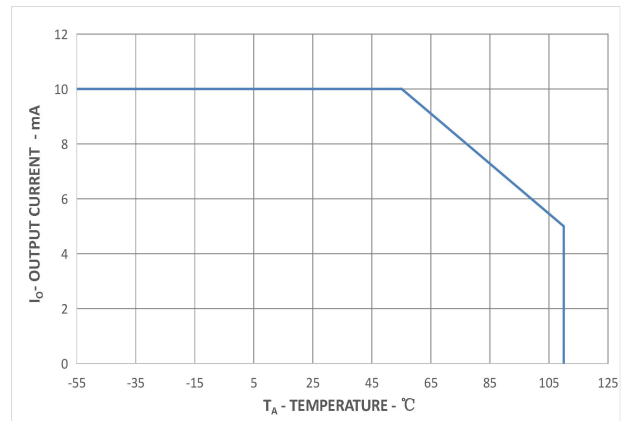


图 12 I<sub>O</sub> - T<sub>A</sub> 特性曲线  
Figure12-Output current vs. Temperature

## 9 外形尺寸 Dimensions

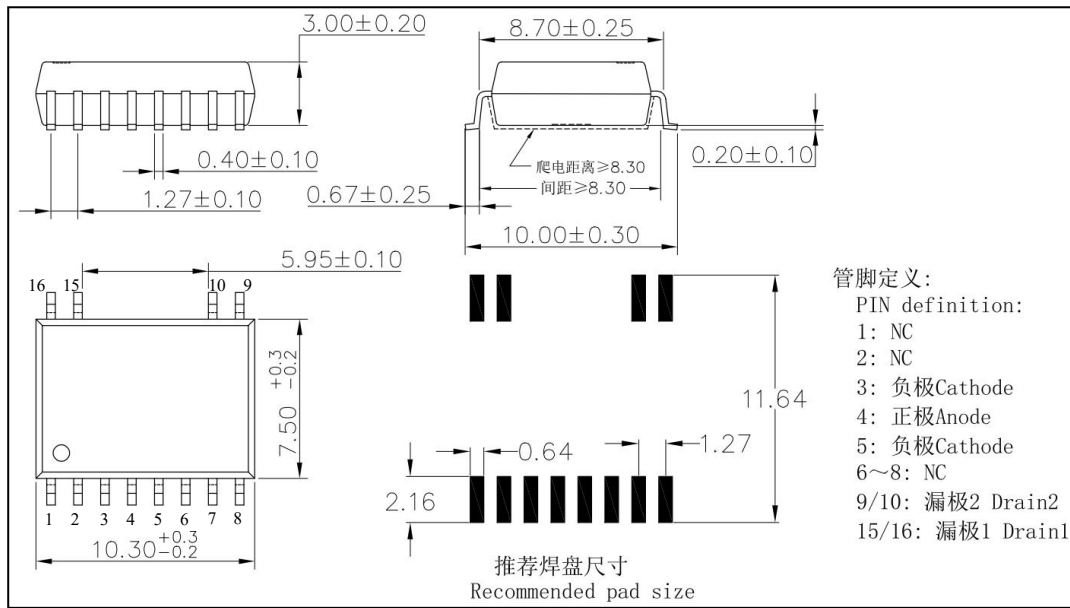


图 13 HSSR-16S1A0D-2 外形尺寸

Figure 13- The dimensions of HSSR-16S1A0D-2

## 10 标志 Mark

产品上应有型号、公司商标、生产日期代码、引出端识别标记。例如：HSSR-16S1A0D-2 产品印章如图 14。

Print type characters ,trade mark and Lot.No.on the Photo Coupler.For example the marking of product HSSR-16S1A0D-2 is shown as figure 14.

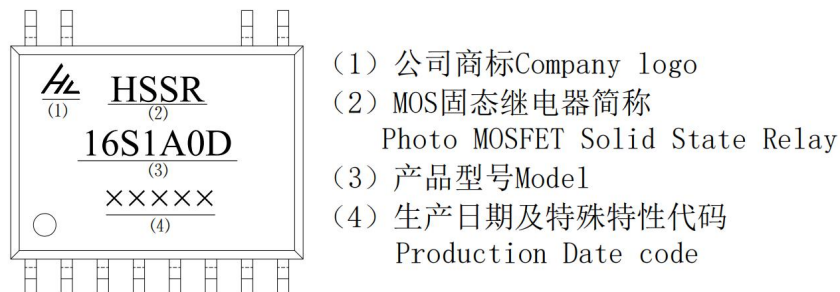


图 14 产品印章 Figure 14- Marking

## 11 包装方式 Packing

11.1 编带包装 (Tape and reel) : 适用于 For HSSR-16S1A0D-2。

11.1.1 每卷数量 (Qty/reel) : 1000 只 (pcs) 。每箱数量 (Qty/ctn) : 10000 只 (pcs) 。

11.1.2 内包装 (Inner packing) :

每卷盘 1000 只, 贴合格证 (型号、生产日期代号、检验员代号) 。

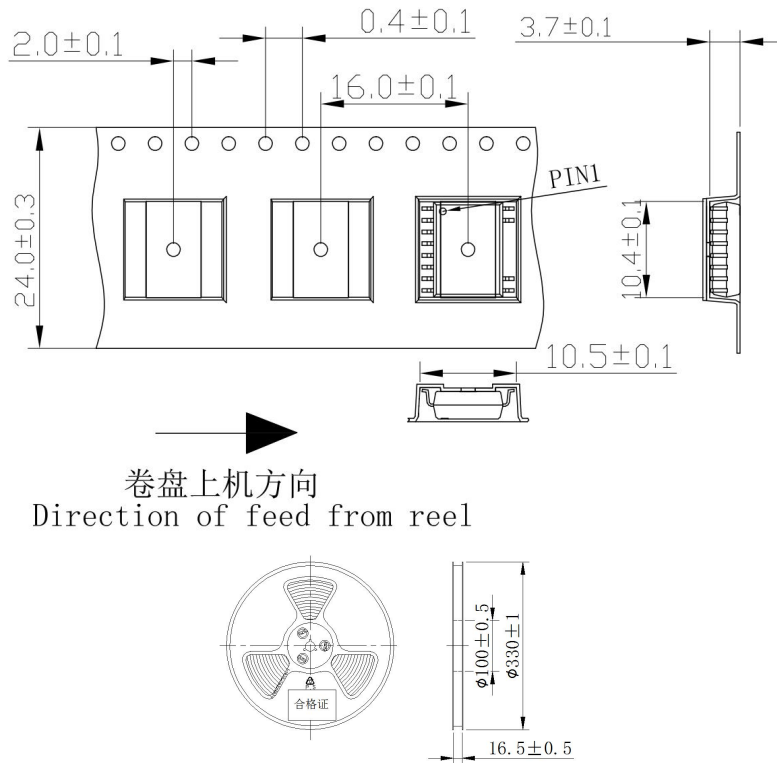
1000pcs/reel, certificate on reel (model, code of product date, Inspector's code)

11.1.3 外包装(Outer packing):

公司名称、地址、商标、产品型号、数量等标志。

Indication of company name, address, trade mark, model and quantity.

11.1.4 示意图 (Schematic) :



卷盘上机方向

Direction of feed from reel

图 15 编带包装示意图

Figure 15- Taping Packing Schematic

11.2 标识 Label



图 16 标识(仅供参考)

Figure 16-Label (For Reference Only)

12 使用注意事项 Note

12.1 标准仓储条件下贮存有效期一年。One year storage period under standard storage conditions.

湿气敏感度等级 1 级。MSL level: MSL 1.

12.2 静电防护等级 (人体模式) ESD(HBM): H2.

静电防护等级 (元件充电模式) ESD(CDM): C4.

12.3 引脚镀锡厚度: 大于等于 5μm。

Thickness of Sn which plated on lead frame: ≥5μm.

12.4 推荐焊接条件 Recommended Soldering Conditions

12.4.1 请勿使用超过最高贮存温度的物体直接接触环氧本体。

Do not contact the epoxy body directly with objects exceeding the maximum storage temperature.

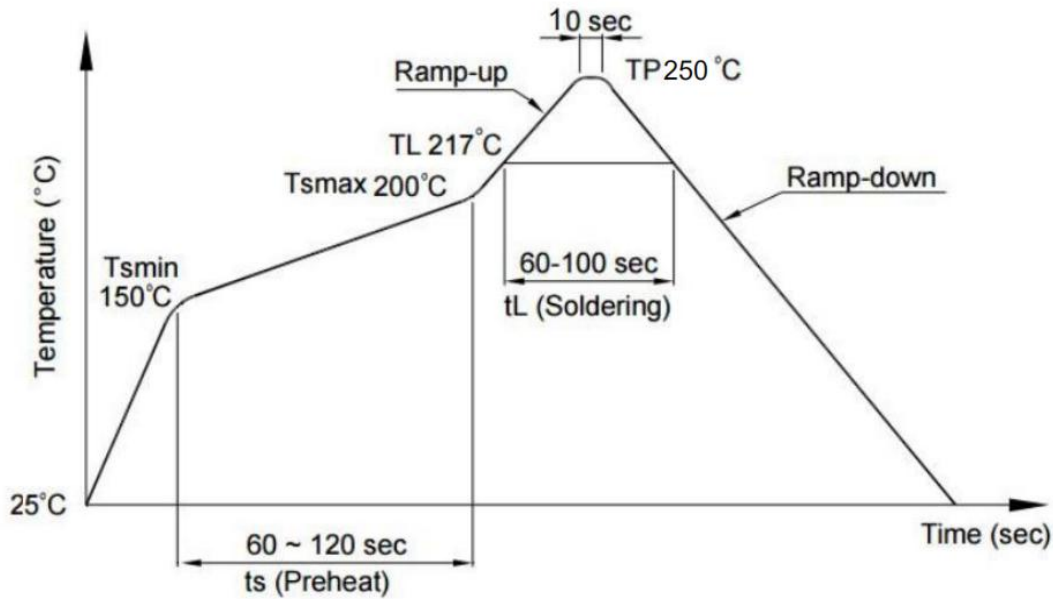
12.4.2 在高温下不要对环氧本体施加压力, 特殊情况下施加的力不应超过2.5N。

Do not apply pressure to the epoxy at high temperatures, and in special cases do not apply more than 2.5N.



### 12.4.3 回流焊 Reflow soldering

- 1) 推荐锡膏规格 Recommend tin glue specifications:
  - a) 熔点 Melting temperature: 217°C
  - b) 组分 Contains: SnAg3Cu0.5
- 2) 回流焊工序必须在器件冷却至室温后进行。Never take next process until the component is cooled down to room temperature after reflow.
- 3) 推荐回流焊接参数，如下图所示： The recommended reflow soldering profile is following:



项目 Items		条件 Conditions
预热 Preheat	Temperature Min ( $T_{Smin}$ )	150°C
	Temperature Max ( $T_{Smax}$ )	200°C
	Time (min to max) ( $t_s$ )	90±30 sec
焊接区 Soldering zone	Temperature ( $T_L$ )	217°C
	Time ( $t_L$ )	60 ~ 100 sec
最高温度 Peak Temperature ( $T_P$ )		250°C
升温速率 Ramp-up rate		3°C / sec max.
降温速率 Ramp-down rate		1~3°C / sec

图 17 回流焊参数

Figure 17-Recommended reflow soldering profile

4) 建议在所示的温度和时间条件下进行一次回流焊，最多不能超过三次。One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

### 12.4.4 手工烙铁焊 Manual soldering

- 1) 手工烙铁焊仅用于产品返修或样品测试。Manual soldering is only applicable to product repair.
- 2) 手工烙铁焊要求：温度 $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ，时间 $\leq 3\text{s}$ ，返修次数 $\leq 2$ 次。Manual soldering requirements: temperature  $\leq (360^{\circ}\text{C} \pm 5^{\circ}\text{C})$ , time  $\leq 3\text{s}$ , repair times  $\leq 2$  times.

12.5 本说明书所展示的产品是为一般电子应用而设计的，如办公自动化设备、通讯设备、视听设备、电气应用和仪器仪表等。对于需要高可靠性或安全性的设备，如空间应用、核动力控制设备、医疗设备等，请与我们的销售代表联系。The products shown in this publication are designed for the general use in electronic applications such as office automation equipment, communications devices, audio/visual equipment, electrical application and instrumentation. For equipment/devices where high reliability or safety is required, such as space

applications, nuclear power control equipment, medical equipment, etc, please contact our sales representatives.

### 13 产地 Production Place

**13.1 产地 Production Place:** 中国厦门 Xiamen China;

**13.2 工厂名称 Production NO.:** 厦门华联电子股份有限公司; Xiamen Hualian Electronics Corp. , Ltd.;

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