



厦门华联半导体科技有限公司  
Xiamen Hualian Semiconductor Technology Co., Ltd.

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# 产品规格书

## SPECIFICATION

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产品名称: 高速逻辑门输出型光耦合器

DESCRIPTION: High Speed Logic Gate Opto-coupler

产品型号: HPL6S148

PART NO.: HPL6S148

拟制 Prepared	审核 Verified	批准 Approved

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## 1 概述 General

光耦产 HPL6S148 由 850nm 砷化铝镓红外发光二极管同超高速逻辑门光敏芯片耦合封装构成，产品输出端为 CMOS 输出，产品具有很强的共模抑制能力。正常工作温度可达-40°C~ +100°C。



图 1 产品 Figure 1-Product

The HPL6S148 optocouplers consist of a 850nm AlGaAS LED, optically coupled to a very high speed integrated photo-detector logic gate with a strobable output. The output end of the product is a CMOS output, and the product has a strong common mode rejection capability. The coupled parameters are guaranteed over the temperature range of -40°C to +100°C.

## 2 特点 Features

- 高共模抑制比 Very High Common Mode Rejection (CMR): 20 kV/μs;
- 图腾柱输出，无需上拉电阻 Totem Pole Output (No Pull-up Resistor Required);
- 隔离电压 Input-Output Momentary Withstand Voltage: 3750V;
- 工作电压范围 Power Supply Voltage: 4.5V~30V。

## 3 应用 Applications

- IPM 接口隔离 IPM Interface Isolation;
- IGBT/MOSFET 驱动 Isolated IGBT/MOSFET Gate Drive;
- 工业逆变器 Industrial Inverters;
- 数字隔离 General Digital Isolation;

## 4 电原理图 Schematic Diagram

表 1 真值表

Table 1-Truth Table

LED	OUTPUT
ON	H
OFF	L

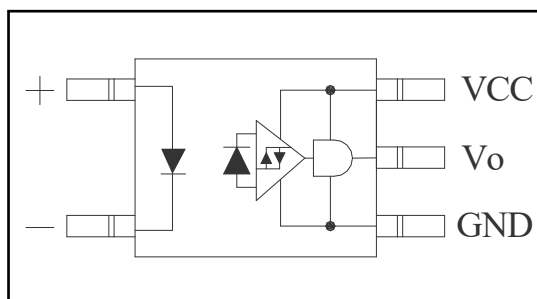


图 2 电原理图

Figure 2-Schematic

## 5 极限参数 Absolute Maximum Ratings

表 2 极限参数

Table 2-Absolute Maximum Ratings

Ta=(25±5)°C, RH=30~75%

参数名称	符号	额定值	单位
输入端 正向电流	I <sub>F</sub>	10	mA

	正向脉冲电流 ( $<200\mu s$ Pulse Width, $<1\%$ Duty Cycle)	$I_{FP}$	40	mA
	反向电压	$V_R$	5	V
	输入端功耗	$P_I$	25	mW
输出端	输出电流	$I_O$	25	mA
	电源电压 (1min Max)	$V_{DD}$	30	V
	输出电压	$V_O$	30	V
	输出端功耗	$P_O$	210	mW
工作温度		$T_{aop}$	-40~+100	°C
贮存温度		$T_{stg}$	-55~+125	°C
手工焊接温度 (3s)		$T_{sld}$	360	°C
回流焊接温度 (5 s)			260	°C
绝缘电压 [ $I_{IO-OFF} \leq 0.3mA$ , 交流 (50Hz) 60s]		$V_{ISO-1}$	3750	V

## 6 电参数 Electrical Parameters

表 3 光电参数

Table 3-Opto-Electrical Characteristics  $T_a=(25 \pm 5)^\circ C$ , RH=30~75%

参数 Parameter	符号 Symbol	测试条件 Test Condition	最小值 Min.	特征值 Typ.	最大值 Max.	单位 Unit
输入端 Input	正向电压 Input forward voltage	$V_F$ $I_F=10mA$	1.20	1.35	1.7	V
	二极管温度系数 Input forward voltage temperature coefficient	$\Delta V_F / \Delta T_A$ $I_F = 7mA$		-1.2		mV/°C
	输入端反向击穿电压 Reverse Input Voltage	$BV_R$ $I_R=10\mu A$	5			V
	反向电流 Input reverse current	$I_R$ $V_R = 6V$			5	$\mu A$
	输入端子电容 Input capacitance	$C_{IN}$ V=0V, F=1MHz			30	pF
输出端 Output	高电平电源电流 High-level supply current	$V_{CC}=5.5V, I_F=10mA$ $I_O=open$			3.0	mA
		$V_{CC}=20V, I_F=10mA$ $I_O=open$			3.0	mA
	低电平电源电流 Low-level supply current	$V_{CC}=5.5V, I_F=0mA$ $I_O=open$			2.5	mA
		$V_{CC}=20V, I_F=0mA$ $I_O=open$			2.5	mA
	高电平短路电流 High-level short-circuit output current	$V_{CC}=5.5V, I_F=10mA$ $V_O=open, T=1ms$			-25	mA
		$V_{CC}=20V, I_F=10mA$ $V_O=open, T=1ms$			-50	mA
低电平短路电流 Low-level short-circuit output current	$V_O=V_{CC}=5.5V, I_F=0mA$ $T=1ms$	25			mA	
	$V_O=V_{CC}=20V, I_F=0mA$ $T=1ms$	50			mA	
耦合 Coupler	高电平输出电压 High-level output voltage	$V_{OH}$ $I_F=10mA, V_{CC}=5.5V$ $I_{OH} = -1.6mA$	5.3	$V_{CC}-0.1$		V

	低电平输出电压 Low-level output voltage	$V_{OL}$	$I_F=0mA, V_{CC}=5.5V$ $I_{OL}=6.4mA$			0.5	V
	触发电流 Threshold Input Current Low to High	$I_{TH}$	$V_{CC}=5V, V_o>4.5V$			5.5	mA
开关 Switching	输出端逻辑由高到低的传输延迟时间 Propagation delay time (H/L)	$t_{PHL}$	$I_F=6mA, V_{CC}=5V$ $C_L=15pF$		150	350	ns
	输出端逻辑由低到高的传输延迟时间 Propagation delay time (L/H)	$t_{PLH}$	$I_F=6mA, V_{CC}=5V$ $C_L=15pF$		110	350	ns
	脉宽失真 Pulse width distortion	$ t_{PHL}-t_{PLH} $	$I_F=6mA, V_{CC}=5V$ $C_L=15pF$			250	ns
	输出端为高电平时的共模抑制能力 High-level common-mode transient immunity	$ C_{MI} $	$ V_{CM} =1000VP-P,$ $I_F=6mA, C_L=15pF,$ $V_{CC}=5V$	20000			V/ $\mu s$
	输出端为低电平时的共模抑制能力 Low-level common-mode transient immunity	$ C_{ML} $	$ V_{CM} =1000VP-P,$ $I_F=0mA, C_L=15pF$ $V_{CC}=5V$	20000			V/ $\mu s$
	输出端上升时间 Rise time (10%~90%)	$t_r$	$C_L=15pF, I_F=6mA$		16		ns
	输出端下降时间 Fall time (90%~10%)	$t_f$			20		
隔离 Isolation	绝缘电压 Input-Output Momentary Withstand Voltage	$V_{ISO}$	$I_{off}\leq 0.30mA,$ AC, 60s	5000			V
	常温绝缘电阻 Input-Output Resistance	$R_{I-O}$	$V_{I-O}=500VDC$	$10^{12}$			$\Omega$
	输入-输出电容 Input-Output Capacitance	$C_{I-O} *$	$f = 1MHz, V_{I-O}=0$		0.8		pF

\*  $C_{I-O}$ 测试是将PIN1, 3短接在一起, PIN4, 5, 6短接在一起。The  $C_{I-O}$  test is to short PIN1, 3 together and PIN4, 5, 6 together.

## 7 特性曲线图 Characteristic Curve

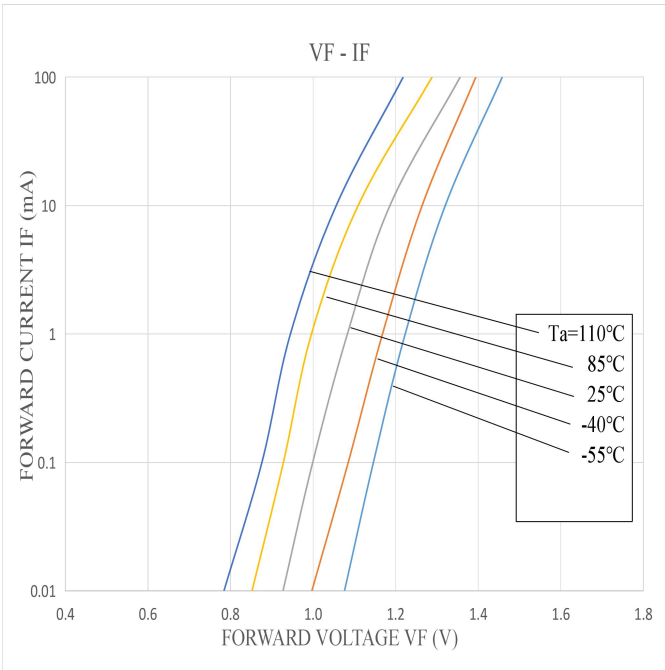


图 3  $I_F$ - $V_F$  特性曲线

Figure 3-Typical input diode forward characteristic

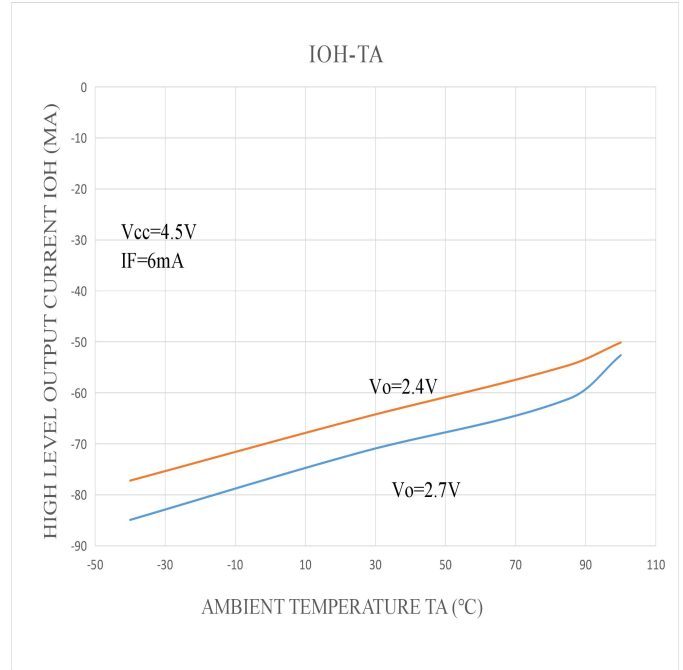


图 4  $I_{OH}$ - $T_a$  特性曲线

Figure 4-High Level Output Current  $I_{OH}$  Vs Temperature

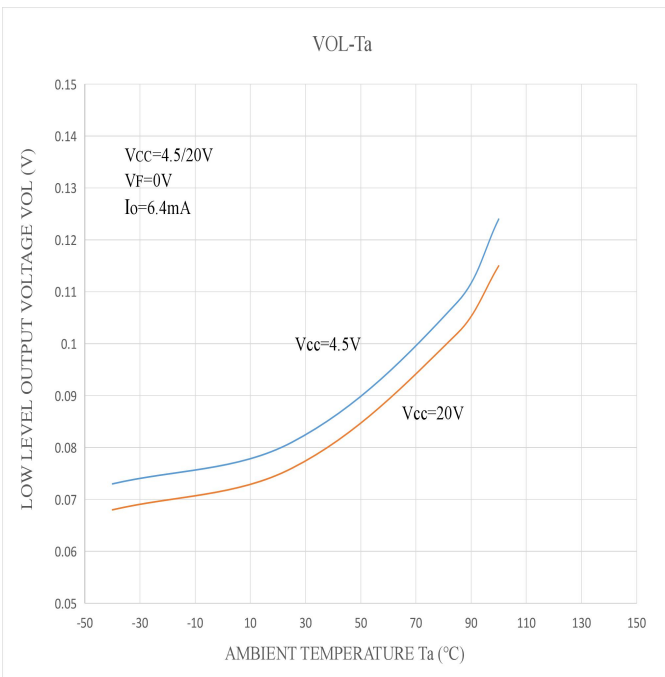


图 5  $V_{OL}$ - $T_a$  特性曲线

Figure 5-Low Level Output Voltage  $V_{OL}$  Vs Temperature

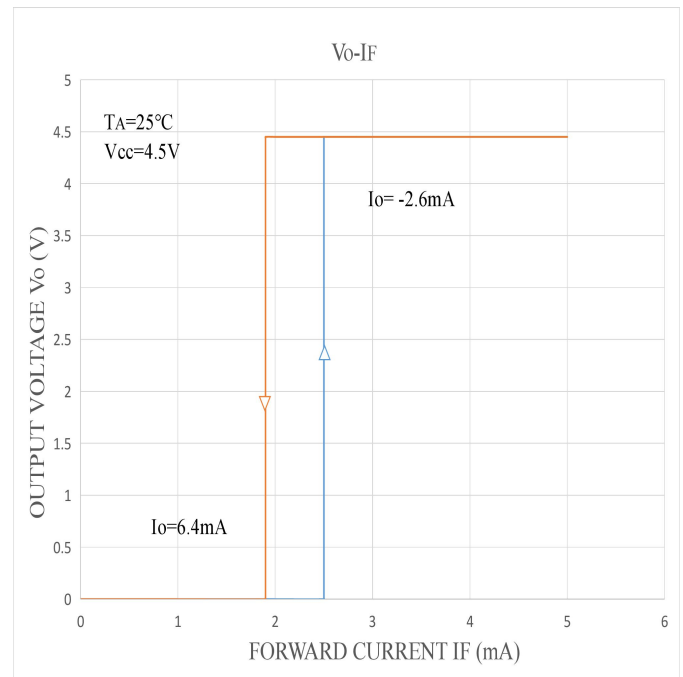


图 6  $V_o$ - $I_F$  特性曲线

Figure 6-Typical Output Voltage vs. Forward Input Current

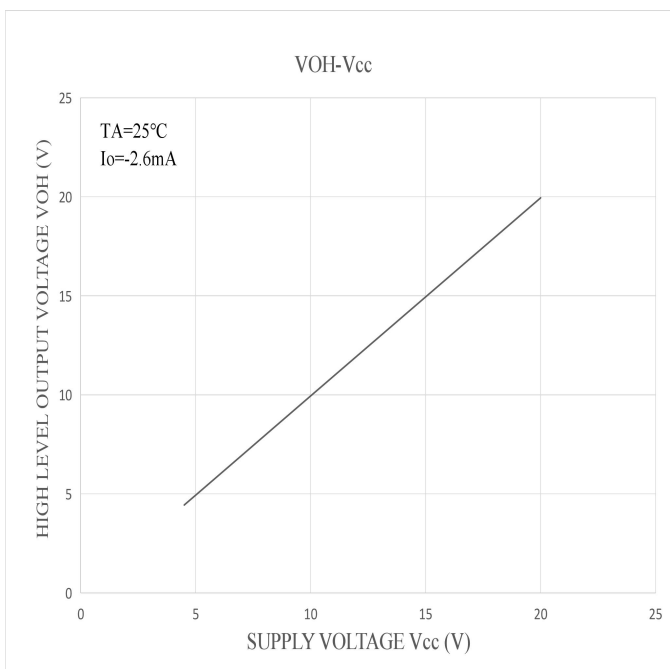


图 7  $V_{OH}-V_{CC}$  特性曲线

Figure 7-Typical Logic High Output Voltage vs. Supply Voltage

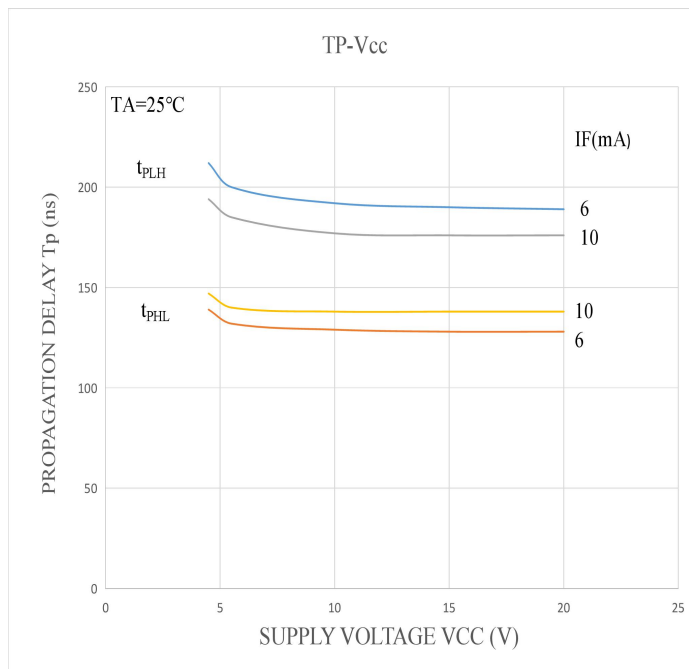


图 8  $T_p-V_{CC}$  特性曲线

Figure 8-Typical Propagation Delay vs. Supply Voltage

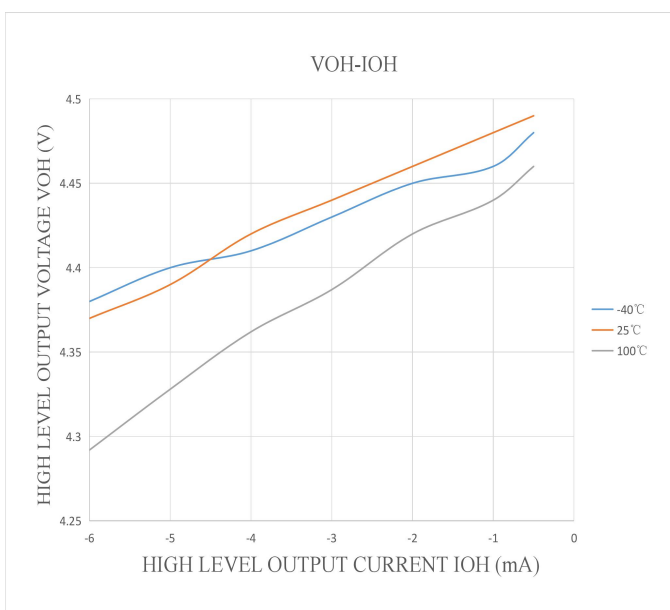


图 9  $V_{OH}-I_{OH}$  特性曲线

Figure 9- $V_{OH}$  vs.  $I_{OH}$  Across temperatures

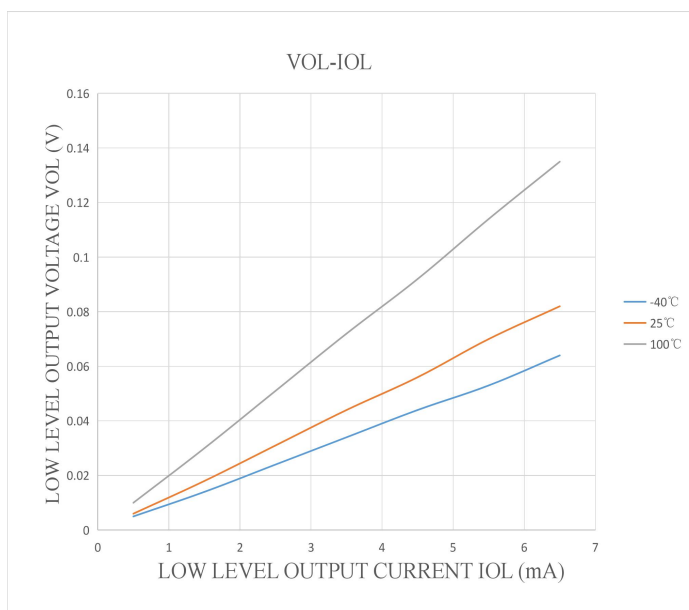


图 10  $V_{OL}-I_{OL}$  特性曲线

Figure 10- $V_{OL}$  vs.  $I_{OL}$  Across temperatures

## 8 外形尺寸图 Dimensions Diagram

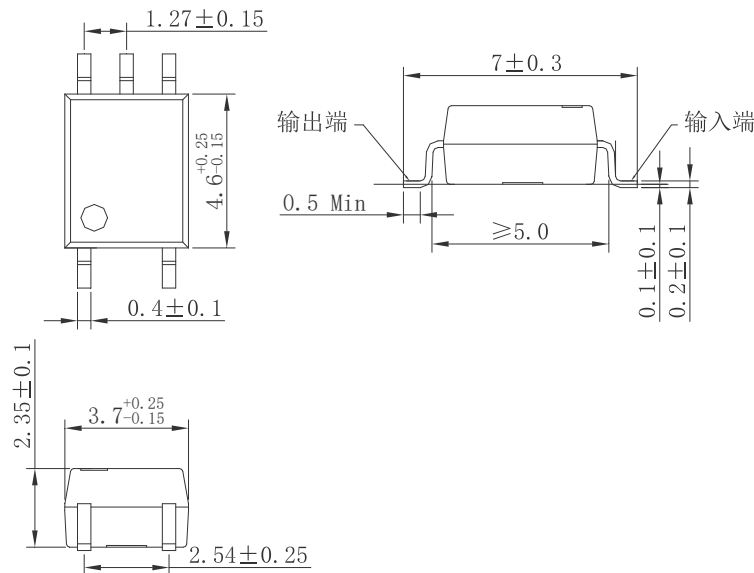


图 11 HPL6S148 外形尺寸  
Figure 11- The dimensions of HPL6S148

## 9 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：HPL6S148 产品印章如图 12。

Print type characters, trade mark and Lot. No. on the Photo-transistor Coupler. For example the marking of product HPL6S148 is shown as Figure 12.

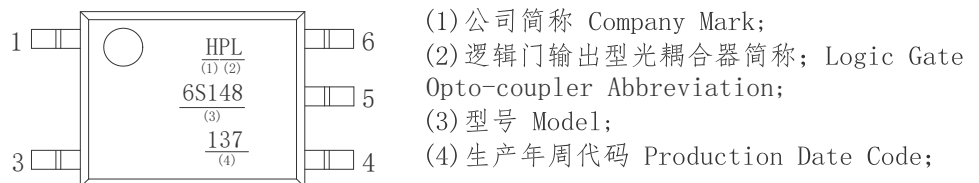


图 12 产品印章  
Figure 12- Marking

## 10 包装方式 Packing

10.1 编带包装 (Tape and reel) : 适用于 For HPL6S148

10.1.1 每卷数量 (Qty/reel) : 3000 只 (pcs)。每箱数量 (Qty/ctn) : 60000 只 (pcs)。

10.1.2 内包装 (Inner packing) :

每卷盘 3000 只, 贴合格证 (型号、生产日期代号、检验员代号)。

3000pcs/reel, certificate on reel (model, code of product date, Inspector' s code)

10.1.3 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.

10.1.4 示意图 (Schematic) :

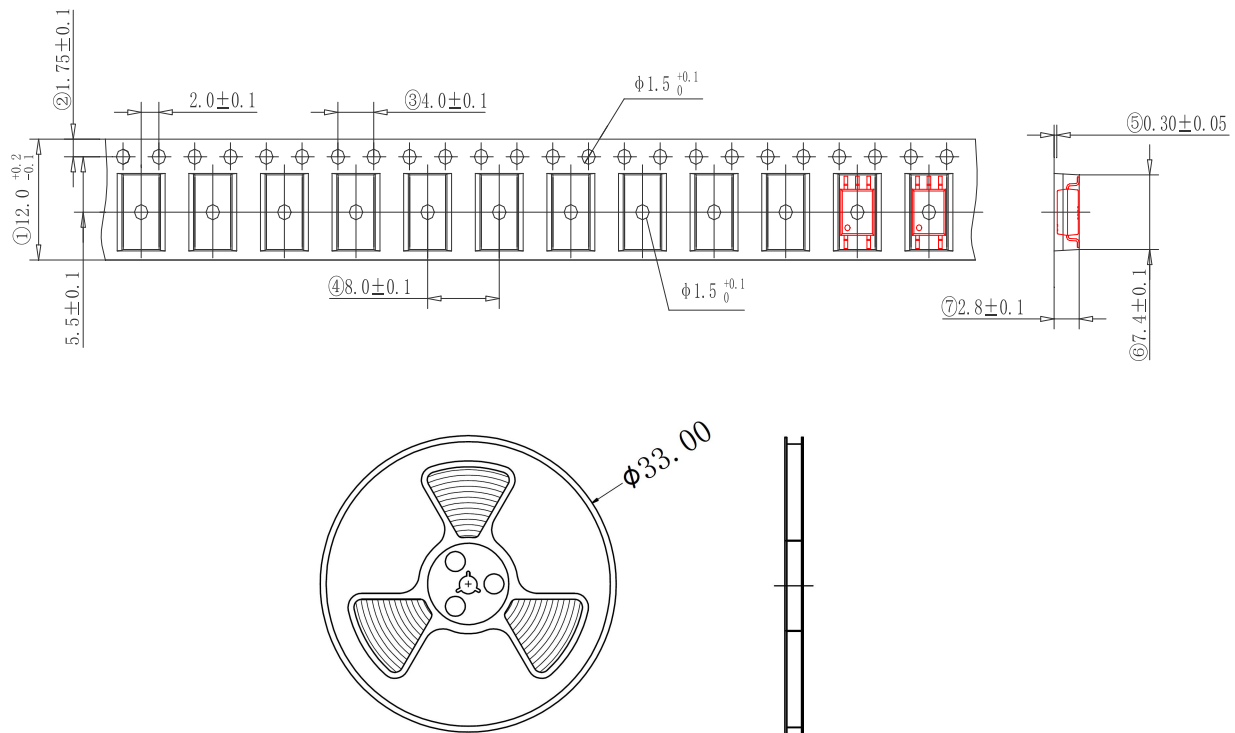


图 13 编带包装示意图

Figure 13- Taping Packing Schematic

## 11 使用注意事项 Note

11.1 推荐贮存温度 Recommend storage Temp.: 0~40°C;

推荐贮存湿度 Recommend storage humidity: <60%;

湿气敏感度等级 1 级。MSL level: MSL 1.

11.2 引脚镀锡厚度：大于等于 5μm。

Thickness of Sn which plated on lead frame:  $\geq 5\mu\text{m}$ .

11.3 推荐焊接条件 Recommended Soldering Conditions

11.3.1 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.

11.3.2 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.

11.3.3 回流焊 Reflow soldering

1) 推荐锡膏规格 Recommend tin glue specifications:

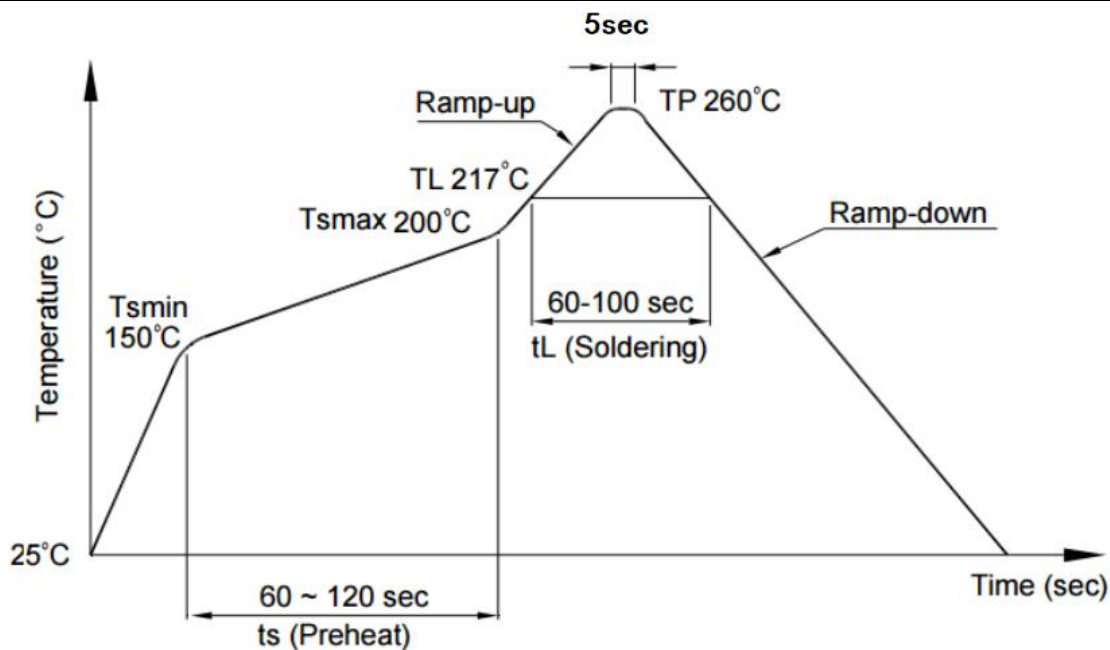
a) 熔点 Melting temperature: 217°C

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 ( $T_P$ )		260°C
升温速率 Ramp-up rate		3°C / sec max.
降温速率 Ramp-down rate		3~6°C / sec

图 14 回流焊参数

Figure 14-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.

### 11.3.4 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.

11.4 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.

## 12 产地 Production Place

12.1 产地 Production Place: 中国厦门 Xiamen China;

12.2 工厂名称 Production NO.: 门华联半导体科技有限公司; Xiamen Hualian Semiconductor Technology Co., Ltd.;

12.3 工厂地址 Production Add.: 厦门市翔安区舫阳南路 189 号 No.189, Fangyang South Road, Xiang'an District, Xiamen China.

更改记录表

Engineering Change Notice-Record

版次 Edition	更改日期 Date	主要更改内容 Main Content	拟制 Prepared	确认 Checked
1.0	2023-02-21	新版发行	张强龙	黄发宝
1.1	2023-06-07	工作电压由 25V 调整至 30V	张强龙	黄发宝
1.2	2023-11-02	1、公司名称变更	姚彭彭	黄发宝