



厦门华联半导体科技有限公司

Xiamen Hualian Semiconductor Technology Co., Ltd.

产品规格书

SPECIFICATION

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：HPL6M257

PART NO.: HPL6M257

拟制 Prepared	审核 Verified	批准 Approved

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1 概述 General

光耦产品 HPL6M257 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 ~ +110°C。



图 1 产品 Figure 1-Product

The HPL6M257 optocouplers consist of a 850 nm 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 +110°C.

2 特点 Features

- 数据传输速率快。High speed (type):15 Mbit/s.
- 逻辑门输出。Logic gate output.
- 输入、输出间绝缘电压高。The isolation voltage between input and output is high: VISO ≥ 3750Vrms.
- 双列贴片式 8L 塑料封装。8L SOP plastic package.
- 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.
- 产品符合 UL/cUL、VDE 安规认证。The products comply with UL/cUL, VDE safety certification.

UL/cUL 证书编号：E178703；VDE 证书编号：40004708

UL/cUL Certificate No. E178703; VDE Certificate No. 40004708

3 应用 Applications

- 通讯接口：RS-485，CAN 总线。Communication Interface: RS-485, CAN Bus.
- 用于 A/D，D/A 转换的数字隔离。Digital isolation for A/D, D/A conversion.
- 可再生能源逆变器。Renewable energy inverters.
- 医学成像和病人监护。Medical imaging and patient monitoring.

4 真值表及电原理图 Truth Table and Schematic

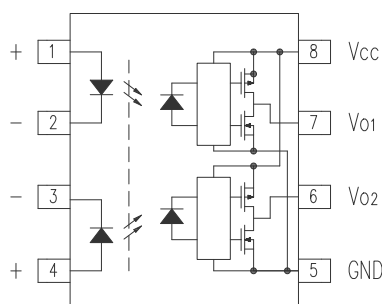


图 2 电原理图
Figure 2-Schematic

表 1 真值表
Table 1-Truth Table

LED	OUTPUT
ON	L
OFF	H

5 绝缘特性 IEC/EN/DIN EN 60747-5-5 Insulation Characteristics*

表 2 绝缘特性

Table 2-Insulation Characteristics

Description	Symbol	Value	Unit
Installation classification per DIN VDE 0110, Table 1			
for rated mains voltage ≤ 150 Vrms		I – IV	
for rated mains voltage ≤ 300 Vrms		I – IV	
for rated mains voltage ≤ 600 Vrms		I – IV	
Climatic Classification		40/85/21	
Pollution Degree (DIN VDE 0110/39)		2	
Maximum Working Insulation Voltage	V_{IORM}	565	Vpeak
Input to Output Test Voltage, Method b* $V_{IORM} \times 1.875 = V_{PR}$, 100% Production Test with $t_m=1$ sec, Partial discharge < 5 pC	V_{PR}	1060	Vpeak
Input to Output Test Voltage, Method a* $V_{IORM} \times 1.6 = V_{PR}$, Type and Sample Test, $t_m=10$ sec, Partial discharge < 5 pC	V_{PR}	904	Vpeak
Highest Allowable Overvoltage (Transient Overvoltage $t_{ini} = 60$ sec)	V_{IOTM}	4000	Vpeak
Case Temperature	T_s	150	°C
Input Current	I_s , INPUT	50	mA
Output Power	P_s , OUTPUT	250	mW
Insulation Resistance at T_s , $V_{IO} = 500$ V	R_s	$\geq 10^9$	Ω
Tracking Resistance (Comparative Tracking Index)	CTI	>175	V

*请参阅当前目录中 IEC/EN/DIN EN 60747-5-5 《产品安全条例》 章节的光耦合器部分前面的详细描述。

*Refer to the front of the optocoupler section of the current catalog, under Product Safety Regulations section IEC/EN/DIN EN 60747-5-5, for a detailed description.

注:隔离特性只保证在安全最大额定值内, 应用中的保护电路必须保证安全最大额定值。

Note: Isolation characteristics are guaranteed only within the safety maximum ratings which must be ensured by protective circuits in application.

6 极限参数 Absolute Maximum Ratings

表 3 极限参数

Table 3-Absolute Maximum Ratings (Ta=25°C, RH=30~75%)

参数名称 Characteristic	符号 Symbol	额定值 Rating	单位 Unit
正向电流 Forward Current	I_F	20	mA
正向脉冲电流 Pulse Forward Current ($t=1$ ms, 50% duty cycle)	I_{FP}	40	mA
反向电压 Reverse Voltage	V_R	5	V
输入端功耗 Input Power Dissipation	P_I	40*	mW
节温 Junction Temperature	T_J	125	°C

输出端 output	输出电流 Output Current	I_o	10*	mA
	电源电压 Supply Voltage (1min Max)	V_{DD}	6.5	V
	输出电压 Output Voltage	V_o	$V_{DD}+0.5$	V
	输出端功耗 Output Power Dissipation	P_o	100*	mW
	节温 Junction Temperature	T_j	125	°C
工作温度 Operating temp.		T_{aop}	-40 ~ +110	°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 (5 Sec.)		260	
绝缘电压 Isolation voltage (RH≤60%,交流 1 分钟) (RH≤60%, AC 1min.)		V_{ISO}	3750	V_{rms}

*单个通道。

*Each channel.

7 推荐工作条件 Recommended Operating Conditions

表 4 推荐工作条件

Table 4-Recommended Operating Conditions

参数名称 Characteristic	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit.
工作温度 Operating temp.	T_{aop}	-40	+105	°C
低电平输入电流 Input Current,Low Level	I_{FL}	0	250	μA
高电平输入电流 Input Current,High Level	I_{FH}	8	15	mA
输出端电源电压 Power Supply Voltage	V_{DD}	2.7	5.5	V
正向电压 Forward Voltage	$V_{F(OFF)}$		0.8	V

8 光电参数 Opto-Electrical Characteristics

表 5 光电参数

Table 5-Opto-Electrical Characteristics (Ta=25°C, RH=30~75%)

参数 Parameters		符号 Symb.	测试条件 Test Conditions	最小值 Min.	特征值 Typ.	最大值 Max.	单位 Unit
输入端 Input	正向电压 Forward Voltage	V_F	$I_F=10mA$	1.20	1.35	1.70	V
	二极管温度系数 Diode Temperature Coefficient	$\Delta V_F/\Delta T_A$	$I_F = 7 mA$		-1.2		mV/°C
	输入端反向击穿电压 Input Reverse Breakdown Voltage	BV_R	$I_R=10\mu A$	5			V
	反向电流 Reverse Current	I_R	$V_R =6V$			5	μA

	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	I_{DDH}	$V_{DD}=5V$ $I_F=0 mA$		10	13	mA
	低电平电源电流 Low Level Supply Current	I_{DDL}	$V_{DD}=5V$ $I_F=10 mA$		9.5	13	mA
耦合 Coupler	高电平输出电压 Logic High Output Voltage	V_{OH}	$I_F=0mA$ $I_O = -20 \mu A$ $V_{DD}=5V$	$V_{DD}-1$	$V_{DD}-0.1$		V
	低电平输出电压 Logic Low Output Voltage	V_{OL}	$I_F=7mA$ $I_O = 20 \mu A$ $V_{DD}=5V$		0.2	0.8	V
	触发电流 Input Threshold Current	I_{TH}	$V_{DD}=5V$		4.0	8.0	mA
开关 Switcing	输出端逻辑由高到低的传输延迟时间 Propagation Delay Time to Logic Low Output	t_{PHL}	$I_F=14mA$ $C_L=15pF$ $R_T=1.68K \Omega *$			60	ns
	输出端逻辑由低到高的传输延迟时间 Propagation Delay Time to Logic High Output	t_{PLH}	$I_F=14mA$ $C_L=15pF$ $R_T=1.68K \Omega *$			60	ns
	脉宽失真 Pulse Width Distortion	$ t_{PHL}-t_{PLH} $	$I_F=14mA$ $C_L=15pF$ $R_T=1.68K \Omega *$			30	ns
	输出端为高电平时的共模抑制能力 Common Mode Transient Immunity at Logic High Level Output	$ CM_H $	$ V_{CM} =1000V_{P-P}$ $I_F=0mA, C_L=15pF$ $V_{DD}=5V, R_T=1.68K \Omega *$	10000			V/ μs
	输出端为低电平时的共模抑制能力 Common Mode Transient Immunity at Logic Low Level Output	$ CM_L $	$ V_{CM} =1000V_{P-P}$ $I_F=14mA, C_L=15pF$ $V_{DD}=5V, R_T=1.68K \Omega *$	10000			V/ μs
	输出端上升时间 Output Rise Time(10%~90%)	t_r	$C_L=15pF, I_F=10mA$ $R_T=1.68K \Omega *$		10		ns
输出端下降时间 Output Fall Time(90%~10%)	t_f			10			
隔离 Isolation	绝缘电压 Isolation voltage	V_{ISO}	$I_{off} \leq 0.30mA$, AC, 60s	3750			V
	常温绝缘电阻 Isolation Resistance between Input and Output	R_{I-O}	$V_{I-O}=500V DC$	10^{12}			Ω
	输入-输出电容 Capacitance (Input to Output)	$C_{I-O} *$	$f = 1MHz$		0.6		pF

* C_{I-O} 测试是将 PIN1,2,3,4 短接在一起, PIN5,6,7,8 短接在一起。

* Device considered a two-terminal device: Pins 1, 2, 3 and 4 shorted together, and Pins 5, 6, 7 and 8 shorted together.

* $R_T=R_1+R_2=1.68K \Omega$, 建议 $R_1=R_2=840 \Omega$ 。

*Recommendation input resistance conditions : $R_1 = R_2 = 840 \Omega$ 。

9 特性曲线图 Characteristic Curve

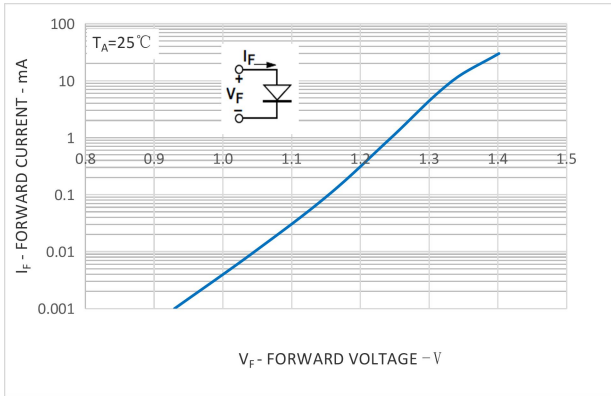


图 3 I_F - V_F 特性曲线

Figure 3-Typical input diode forward characteristic

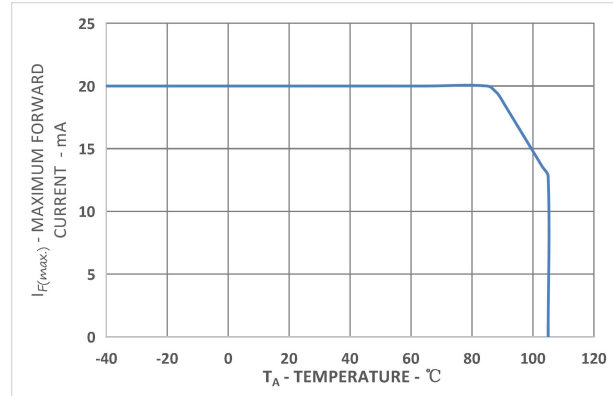


图 4 $I_{F(max)}$ - T_A 特性曲线

Figure 4- $I_{F(max)}$ vs. temperature

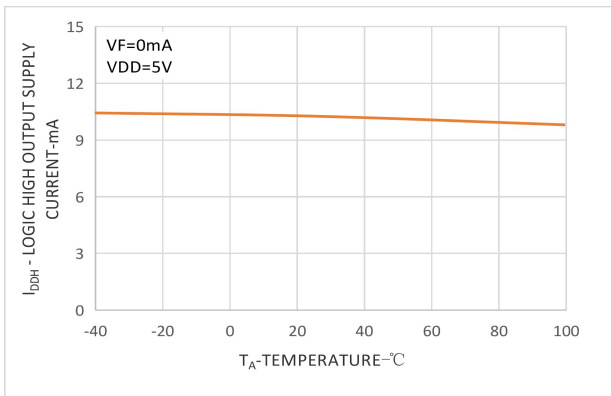


图 5 I_{DDH} - T_A 特性曲线

Figure 5-Typical logic high output supply current
 I_{DDH} Vs Temperature

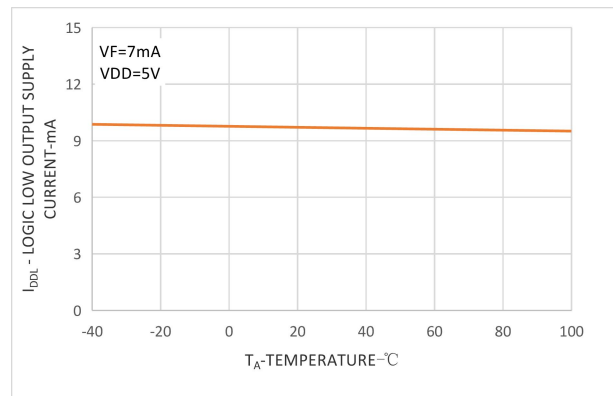


图 6 I_{DDL} - T_A 特性曲线

Figure 6-Typical logic low output supply current
 I_{DDL} Vs Temperature

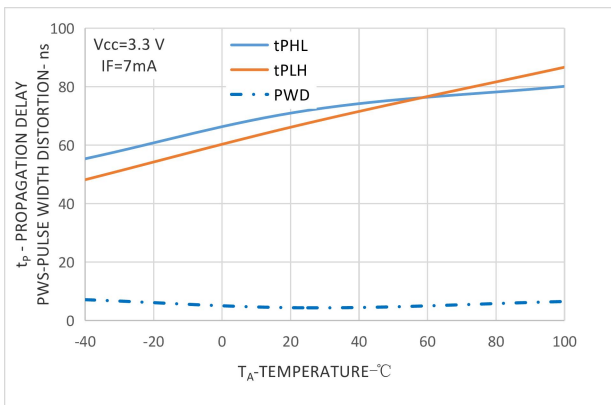


图 7 t_{PHL} - T_A 特性曲线

Figure 7-Typical propagation delay
 t_{PHL} Vs Temperature

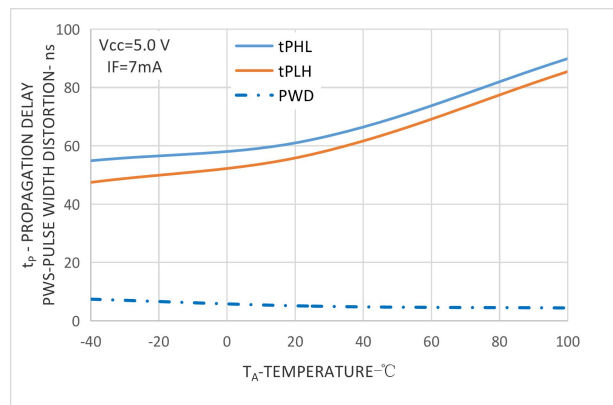


图 8 t_{PLH} - T_A 特性曲线

Figure 8-Typical propagation delay
 t_{PLH} Vs Temperature

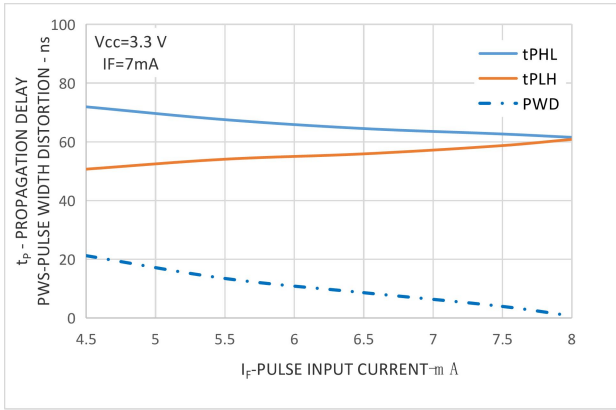


图 9 t_{PHL} - I_F 特性曲线

Figure 9-Typical switching speed versus pulse input current at 3.3V supply voltage

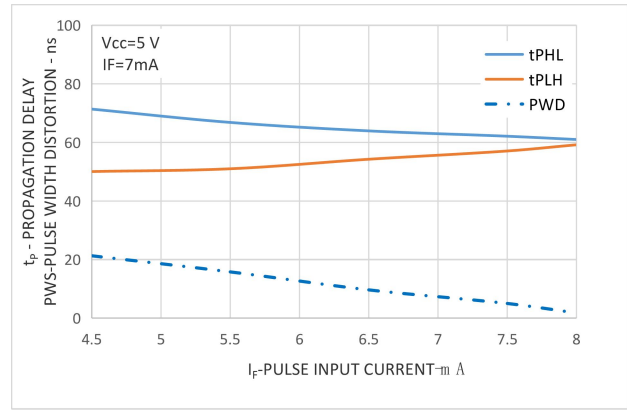


图 10 t_{PLH} - I_F 特性曲线

Figure 10-Typical switching speed versus pulse input current at 5V supply voltage

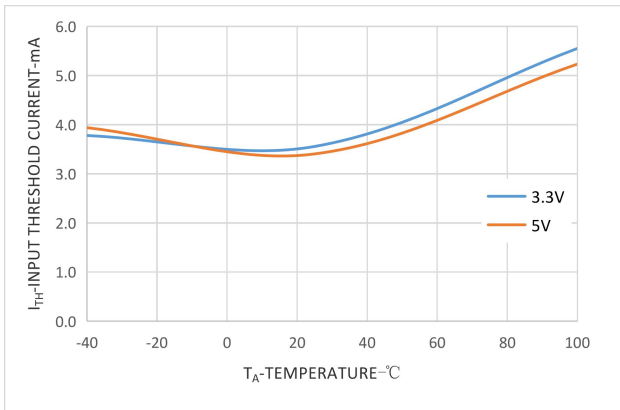


图 11 I_{TH} - T_a 特性曲线

Figure 11-Input threshold current vs. Temperature

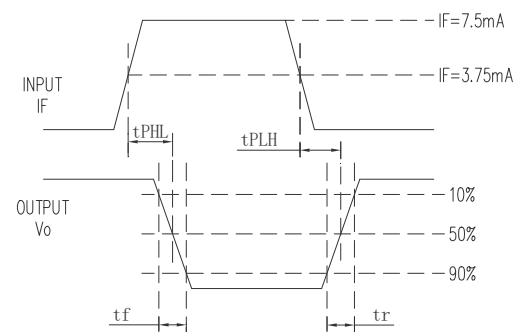
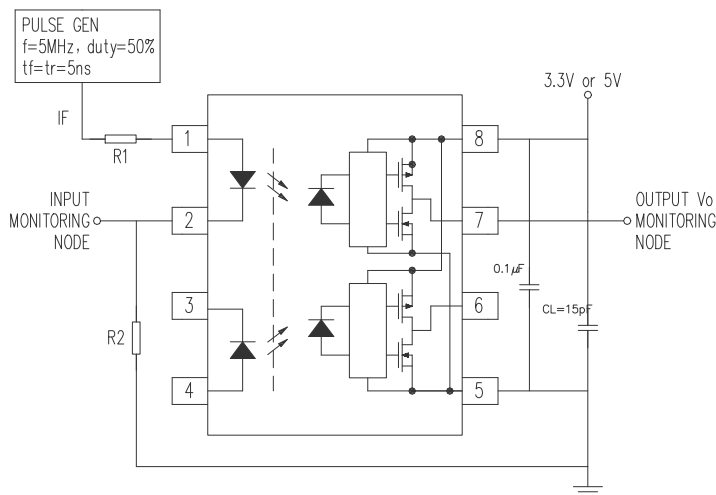


图 15 t_{PHL} 、 t_{PLH} 测试方法

Figure 15- The test method of t_{PHL} 、 t_{PLH}

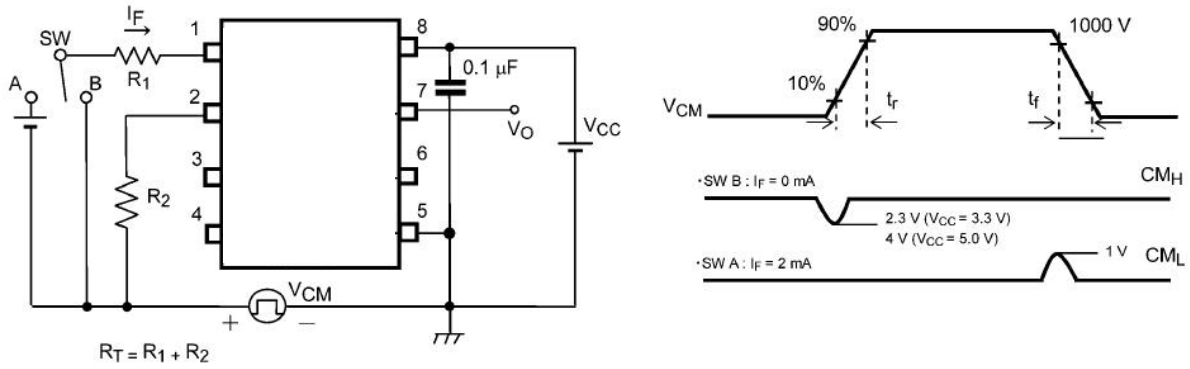


图 16 CMTI 测试电路与波形
Figure 16- CMTI Test Circuit and Waveform

10 外形尺寸 Dimensions

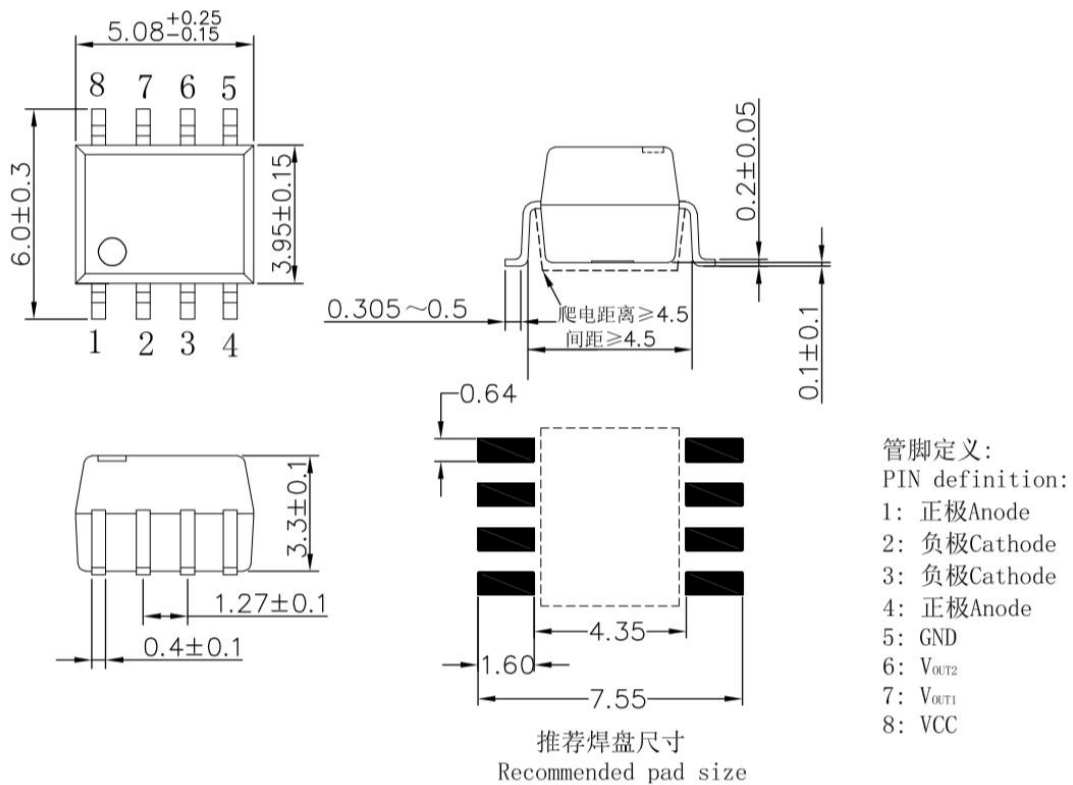
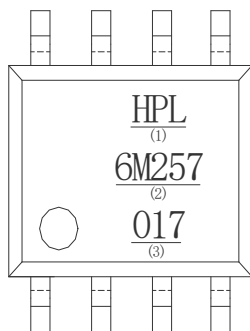


图 17 HPL6M257 外形尺寸
Figure 17- The dimensions of HPL6M257

11 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：**HPL6M257** 产品印章如图 18。

Print type characters ,trade mark and Lot.No.on the Photo Coupler.For example the marking of product **HPL6M257** is shown as Figure 18.



- (1) 高速逻辑门输出型光耦合器简称
High-Speed Logic Gate Opto-coupler
abbreviation
- (2) 型号 Model
- (3) 生产年周代码
Production year and week code

图 18 产品印章

Figure 18- Marking

12 包装方式 Packing

12.1 编带包装 (Tape and reel) : 适用于 For HPL6M257

12.1.1 每卷数量 (Qty/reel) : 2000 只 (pcs)。每箱数量 (Qty/ctn) : 40000 只 (pcs)。

12.1.2 内包装 (Inner packing) :

每卷盘 2000 只, 贴合格证 (型号、生产日期代号、检验员代号)。

2000pcs/reel, certificate on reel (model, code of product date, Inspector's code)

12.1.3 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.

12.1.4 示意图 (Schematic) :

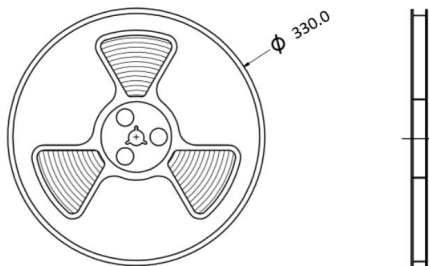
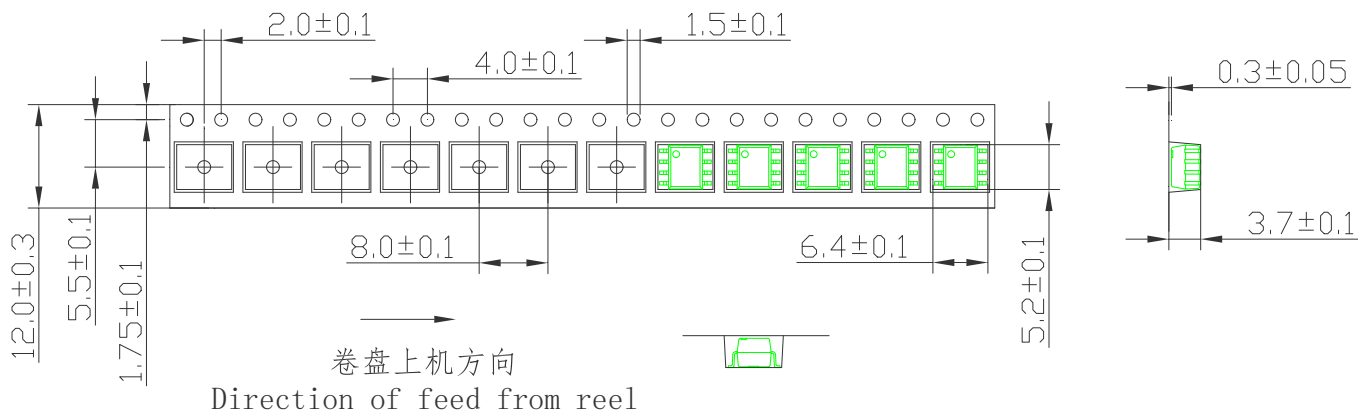


图 19 编带包装示意图

Figure 19- Taping Packing Schematic

13 使用注意事项 Note

13.1 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.

13.2 引脚镀锡厚度: 大于等于 3μm。

Thickness of Sn which plated on lead frame: ≥3μm.

13.3 推荐焊接条件 Recommended Soldering Conditions

13.3.1 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.

13.3.2 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.

13.3.3 回流焊 Reflow soldering

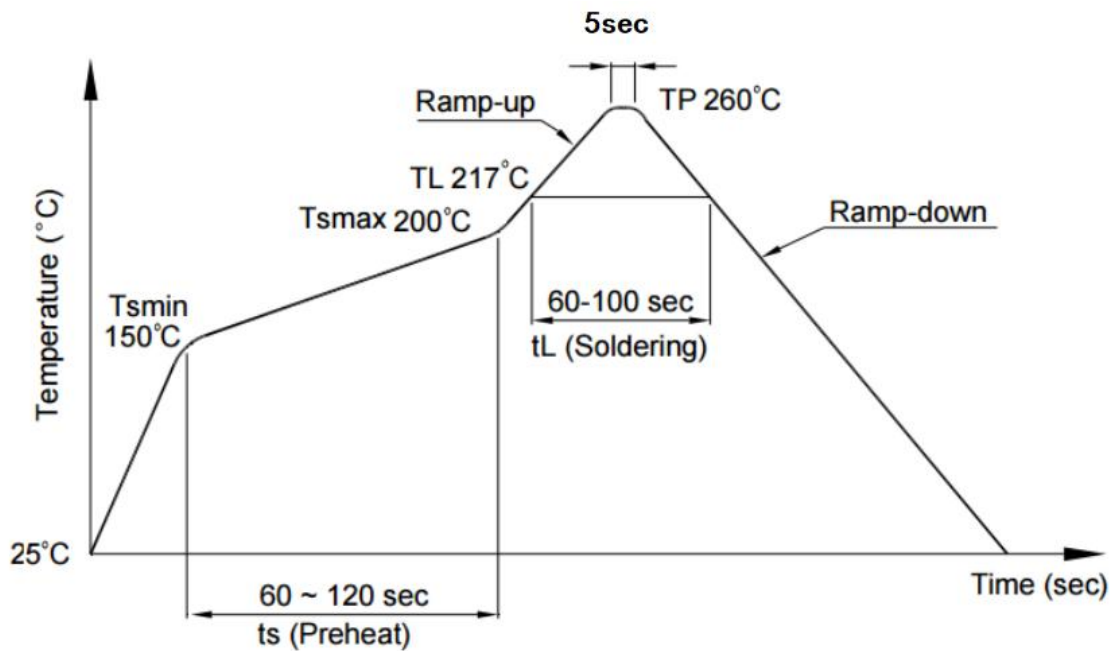
1) 推荐锡膏规格 Recommend tin glue specifications:

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 21 回流焊参数

Figure 21-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.

13.3.4 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 ≤ 2 次。Manual soldering requirements: temperature $\leq (360^{\circ}\text{C} \pm 5^{\circ}\text{C})$, time $\leq 3\text{s}$, repair times ≤ 2 times.

13.4 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.

14 产地 Production Place

14.1 产地 Production Place: 中国厦门 Xiamen China;

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

14.3 工厂地址 Production Add.: 厦门市翔安区舩阳南路 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	2020-12-25	新版发行 New edition	黄发宝	段果
1.1	2021-08-12	1.电源电压额定值由 7V 调整为 6.5V。	黄发宝	段果
1.2	2022-06-29	1.表 5 光电参数表部分参数更新； 2.更新图 5 IDDH-Ta、图 6 IDDL-Ta、图 7 ITH-Ta 的特性曲线图。	黄发宝	段果
1.3	2022-12-27	1. 工厂地址变更； 2. 删除邮编； 3. 工作温度由 105℃调整为 110℃； 4. 删除 12.2 标识 Label。	张强龙	黄发宝
1.4	2023-11-02	1、公司名称变更	姚彭彭	黄发宝
1.5	2023-12-26	1. 新增安规认证说明以及证书编号； 2. 更新图 21 回流焊参数。	张强龙	黄发宝