



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: IGBT 栅极驱动光耦合器  
DESCRIPTION: IGBT Gate Drive Opto-coupler  
产品型号: HGD313H  
PART NO.: HGD313H

拟制 Prepared	审核 Verified	批准 Approved

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## 1 概述 General

光耦产品 HGD313H 由砷化铝镓红外发光二极管耦合到一个集成电路的功率输出端。此光耦合器适合驱动功率 IGBT 和场效应管用于电机控制逆变器应用程序。输出端高电压工作范围能提供所需的驱动门电压控制装置。



图 1 产品 Figure 1-Product

The HGD313H consists of a AlGaAs LED, optically coupled to an integrated circuit with a power output stage. This optocoupler is ideally suited for driving power IGBTs and MOSFETs used in motor control inverter applications. The high operating voltage range of the output stage provides the drive voltages required by gate controlled devices.

## 2 特点 Features

- 2.5A 最大峰值输出电流。2.5A maximum peak output current.
- 2.0A 最小峰值输出电流。2.0 A minimum peak output current.
- 轨至轨输出 Rail to rail output
- 电源电压工作范围宽。Wide operating VCC Range: 15V to 30V.
- 开关速度快，延迟时间最大值为 500ns。Fast Switching Speed: 500ns max. Propagation Delay.
- 输入、输出间绝缘电压高。The isolation voltage between input and output is high: VISO  $\geq$  7500Vrms.
- 双列贴片宽体式 8L 塑料封装。WSOP8 plastic package.
- UL 安全认证 Safety certification of UL
- VDE 安全认证 Safety certification of VDE
- 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

- IGBT/MOSFET 驱动 IGBT/MOSFET gate drive
- 开关电源 Switching power supplies
- 工业逆变器 Industrial inverters
- 感应加热器 Industrial inverters

## 4 电原理图 Schematic

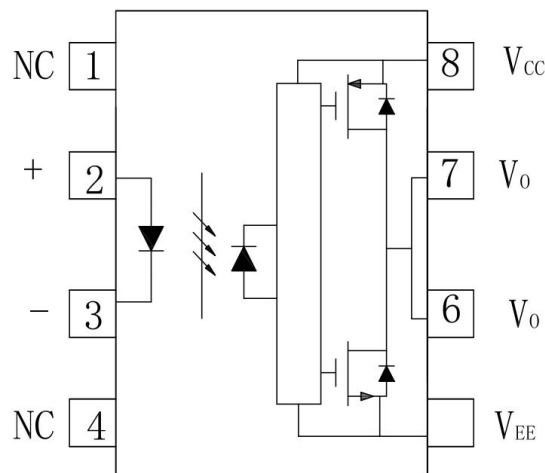


图 2 电原理图  
Figure 2-Schematic

表 1 真值表

Table 1-Truth Table

LED	$V_{CC}-V_{EE}$ “正向 POSITIVE GOING” (导通 TURN-ON)	$V_{CC}-V_{EE}$ “反向 NEGATIVE GOING” (关断 TURN-ON)	OUTPUT
OFF	0~30.0V	0~30.0V	LOW
ON	0~11.0V	0~9.5V	LOW
ON	11.0~13.5V	9.5~12.0V	TRANSITION
ON	13.5~30.0V	12.0~30.0V	HIGHT

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 $\leq 150$ Vrms		I – IV	
for rated mains voltage $\leq 300$ Vrms		I – IV	
for rated mains voltage $\leq 300$ Vrms		I – IV	
for rated mains voltage $\leq 600$ Vrms		I – IV	
for rated mains voltage $\leq 1000$ Vrms		I – III	
Climatic Classification		40/105/21	
Pollution Degree (DIN VDE 0110/39)		2	
Maximum Working Insulation Voltage	$V_{IORM}$	2262	Vpeak
Input to Output Test Voltage, Method b* $V_{IORM} \times 1.875 = V_{PR}$ , 100% Production Test with time=1 sec, Partial discharge < 5 pC	$V_{PR}$	4242	Vpeak
Input to Output Test Voltage, Method a* $V_{IORM} \times 1.6 = V_{PR}$ , Type and Sample Test, time=10 sec, Partial discharge < 5 pC	$V_{PR}$	3619	Vpeak
Highest Allowable Overvoltage (Transient Overvoltage time = 60 sec)	$V_{IOTM}$	12000	Vpeak
Case Temperature	$T_S$	175	°C
Input Current	$I_S$ , INPUT	230	mA
Output Power	$P_S$ , OUTPUT	1000	mW
Insulation Resistance at $T_S$ , $V_{IO} = 500$ V	$R_S$	$\geq 10^9$	$\Omega$
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
输入端 Input	正向电流 Forward Current	I <sub>F</sub>	25	mA
	正向脉冲电流 Pulse Forward Current (<1μs pulse width, 300 pps)	I <sub>FP</sub>	1	A
	反向电压 Reverse Voltage	V <sub>R</sub>	5	V
	输入端功率 Input Power Dissipation	P <sub>I</sub>	50	mW
	节温 Junction Temperature	T <sub>J(IN)</sub>	125	°C
输出端 output	高电平输出峰值电流 High Level Peak Output Current	I <sub>OH</sub>	2.5	A
	低电平输出峰值电流 High Level Peak Output Current	I <sub>OL</sub>	2.5	A
	输出端总电源电压 Total Output Supply Voltage	V <sub>CC</sub> -V <sub>EE</sub>	35	V
	输出电压 Output Voltage	V <sub>O(PEAK)</sub>	V <sub>CC</sub>	V
	输出端功耗 Output Power Dissipation	P <sub>O</sub>	250	mW
	节温 Junction Temperature	T <sub>J(OUT)</sub>	125	°C
工作温度 Operating temp.		T <sub>aop</sub>	-40 ~ +105	°C
贮存温度 Storage temp.		T <sub>stg</sub>	-55 ~ +125	°C
焊接温度 Soldering Temperature	手工焊 Hand Soldering (3 Sec.)	T <sub>sld</sub>	360	°C
	回流焊 Reflow Soldering (10 Sec.)		250	
输入-输出间绝缘电压* Isolation voltage (RH≤60%,交流 1 分钟) (RH≤60%, AC 1min.)		V <sub>ISO</sub>	7500	V <sub>rms</sub>

\*交流 60 秒, R.H. = 40 ~ 60% 隔离电压应采用以下方法测量。(1)初级侧的阳极和阴极之间以及次级侧的集电极和发射极之间的距离短。(2)带过零电路应使用的隔离电压测试仪。(3)外加电压的波形应为正弦波。

\*AC For 60 Seconds, R.H. = 40 ~ 60% Isolation voltage shall be measured using the following method. (1) Short between anode and cathode on the primary side and between collector and emitter on the secondary side. (2) The isolation voltage tester with zero-cross circuit shall be used. (3) The waveform of applied voltage shall be a sine wave.

## 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.
输入端电流 Input Current (ON)	$I_{F(ON)}$	7	12	mA
输入端电压 Input Voltage (OFF)	$V_{F(OFF)}$	-3.6	0.5	V
输出端电源电压 Output Supply Voltage	$V_{CC}-V_{EE}$	15	30	V
工作温度 Operating temp.	$T_{aop}$	-40	+105	°C

## 8 光电参数 Opto-Electrical Characteristics

表 5 光电参数

Table 5-Opto-Electrical Characteristics

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

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	$V_F$	$I_F=10\text{mA}$	1.1	1.35	1.6	V	
	输入端反向击穿电压 Input Reverse Breakdown Voltage	$BV_R$	$I_R=10\mu\text{A}$	5.0			V	
	反向电流 Reverse Current	$I_R$	$V_R=6\text{V}$			5.0	$\mu\text{A}$	
	正向电压温度系数 Forward Voltage Temperature Coefficient	$\Delta V_F/\Delta T$	$I_F=10\text{mA}$		-1.2		$\text{mV}/^{\circ}\text{C}$	
	输入端子电容 Input Capacitance	$C_{IN}$	$V=0\text{V}$ $F=1\text{MHz}$		23		pF	
输出端 Output	高电平输出峰值电流 <sup>a</sup> High Level Peak Output Current	$I_{OH}$	$V_O=V_{CC}-4\text{V}$ Pulse width $\leq 50\mu\text{s}$	-0.5			A	
			$V_O=V_{CC}-15\text{V}$ Pulse width $\leq 10\mu\text{s}$	-2.0			A	
	低电平输出峰值电流 <sup>b</sup> High Level Peak Output Current	$I_{OL}$	$I_{OL}$	$V_O=V_{EE}+2.5\text{V}$ Pulse width $\leq 50\mu\text{s}$	0.5			A
				$V_O=V_{EE}+15\text{V}$ Pulse width $\leq 10\mu\text{s}$	2.0			A
耦合 Coupler	高电平电源电流 High Level Supply Current	$I_{CCH}$	$I_F=10\text{mA}$ $V_{CC}=30\text{V}$			5.0	mA	
	低电平电源电流 Low Level Supply Current	$I_{CCL}$	$V_F=0\text{V}$ $V_{CC}=30\text{V}$			5.0	mA	
	高电平输出电压 <sup>c</sup> Low Level Output Voltage	$V_{OH}$	$I_O=-100\text{mA}$	$V_{CC}-4.0$			V	
	低电平输出电压 <sup>d</sup> Low Level Output Voltage	$V_{OL}$	$I_O=100\text{mA}$		0.1	0.5	V	
	低到高输入端电流 Threshold Input Current Low to High	$I_{FLH}$	$V_O > 5\text{V}$			5.0	mA	

	高到低输入端电压 Threshold Input Voltage High to Low	$V_{FHL}$	$V_O > 5V$	0.5			V
	UVLO 阈值 UVLO Threshold	$V_{UVLO+}$	$V_O > 5V,$ $I_F=10mA$	11.0	12.7	13.5	V
		$V_{UVLO-}$	$V_O > 5V,$ $I_F=10mA$	9.5	11.2	12.0	V
	UVLO 迟滞	$UVLO_{HYS}$			1.5		V
开关 Switching	输出端由低电平到高电平的 传输延迟时间 °Propagation Delay Time to High Output Level	$t_{PLH}$	$R_g=10\Omega$ $C_g=10nF$ $I_F=7\sim 12mA$ $V_{CC}=15\sim 30V$	100		500	ns
	输出端由高电平到低电平的 传输延迟时间 °Propagation Delay Time to Low Output Level	$t_{PHL}$		100		500	ns
	脉冲宽度失真 Pulse Width Distortion	PWD				300	ns
	任何两个部分之间的传播延 迟区别 Propagation Delay Difference Between Any Two Parts	PDD ( $t_{PHL} - t_{PLH}$ )		-350		350	ns
	输出端为高电平时的共模抑 制能力 Common Mode Transient Immunity at High Level Output	$ CM_H $	$I_F=10mA$ $V_{CC}=30V$ $V_{CM}=1500V_{P-P}$	40			kV/ $\mu s$
	输出端为低电平时的共模抑 制能力 Common Mode Transient Immunity at High Level Output	$ CM_L $	$V_O=0V$ $V_{CC}=30V$ $V_{CM}=1500V_{P-P}$	40			kV/ $\mu s$
	输出端上升时间 °Output Rise Time(20%~80%)	$t_r$	$R_g=10\Omega, C_g=10nF$ $I_F=7\sim 12mA$ $V_{CC}=15\sim 30V$		100		ns
	输出端下降时间 °Output Fall Time(80%~20%)	$t_f$			100		
隔离 Isolation	绝缘电压 Isolation voltage	$V_{ISO}$	$I_{off}\leq 0.3mA,$ AC, 60s	7500			V
	绝缘电阻 Isolation Resistance	$R_{I-O}$	$V_{I-O}=500V, DC$		$10^{12}$		$\Omega$
	输入-输出电容 Capacitance (Input to Output)	$C_{I-O}$	$f = 1MHz$		0.5		pF

注: a.  $I_{OH}$  测试电路见图 9; Figure 9. is the test circuit of  $I_{OH}$ ;  
b.  $I_{OL}$  测试电路见图 10; Figure 10. is the test circuit of  $I_{OL}$ ;  
c.  $V_{OH}$  测试电路见图 11; Figure 11. is the test circuit of  $V_{OH}$ ;  
d.  $V_{OL}$  测试电路见图 12; Figure 12. is the test circuit of  $V_{OL}$ ;  
e.  $t_{PHL}, t_{PLH}, t_r, t_f$  测试方法见图 13。 Figure 13. is the test circuit of  $t_{PHL}, t_{PLH}, t_r$  and  $t_f$ .

9 特性曲线图 Characteristic Curve

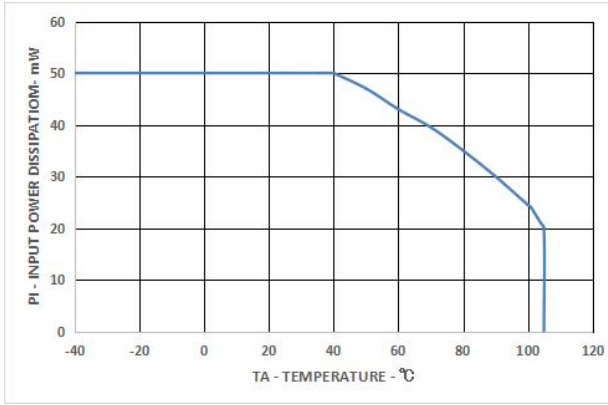


图 3  $P_1$ - $T_A$  特性曲线  
Figure 3- $P_1$  vs. temperature

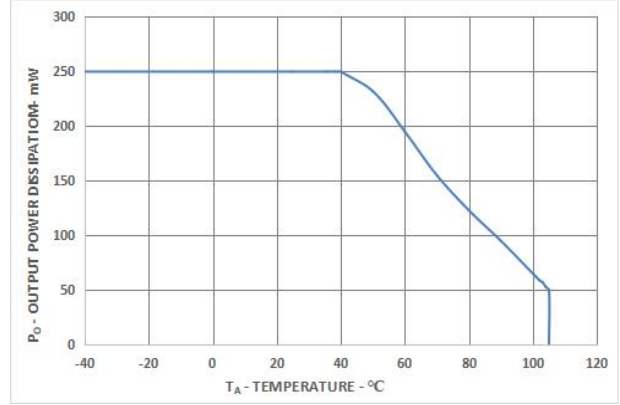


图 4  $P_o$ - $T_A$  特性曲线  
Figure 4- $P_o$  vs. temperature

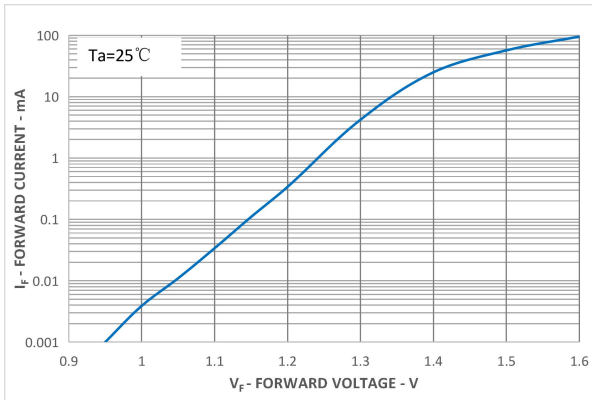


图 5  $V_F$ - $I_F$  特性曲线  
Figure 5-Typical input diode forward characteristic

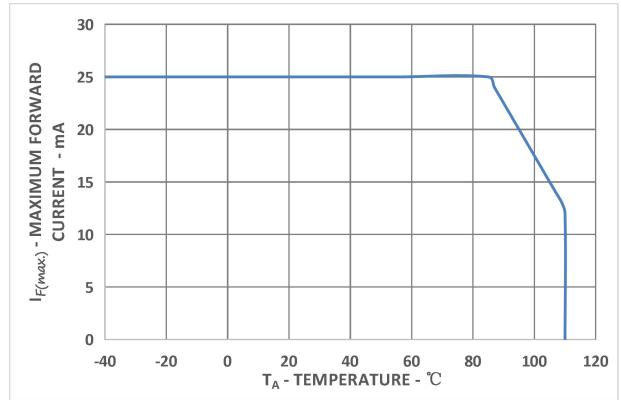


图 6  $I_{F(max)}$ - $T_A$  特性曲线  
Figure 6- $I_{F(max)}$  vs. temperature

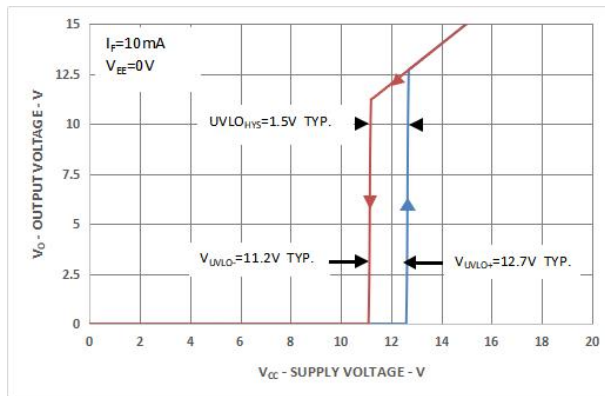


图 7 低压双锁特性曲线  
Figure 7-Under voltage lockout

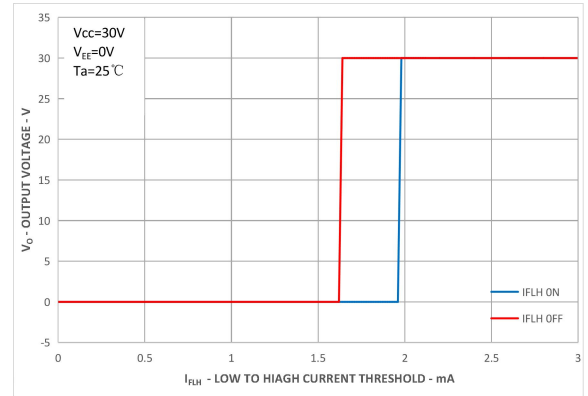


图 8  $I_{FLH}$  滞后特性曲线  
Figure 8- $I_{FLH}$  hysteresis

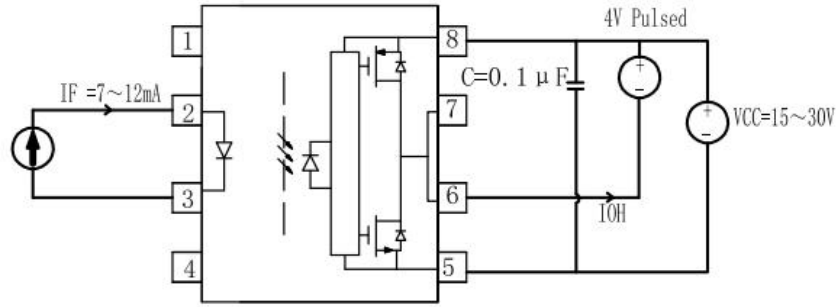


图 9 IOH 测试电路

Figure 9- The test circuit of IOH

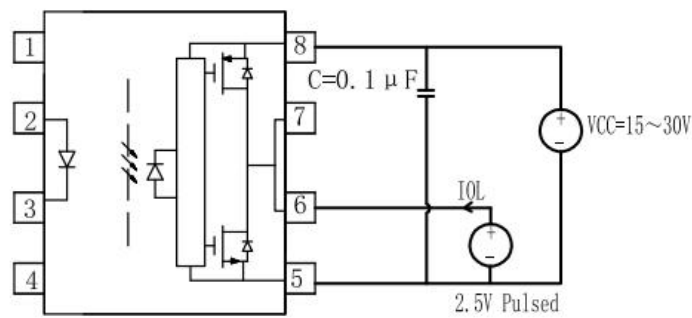


图 10 IOL 测试电路

Figure 10- The test circuit of IOL

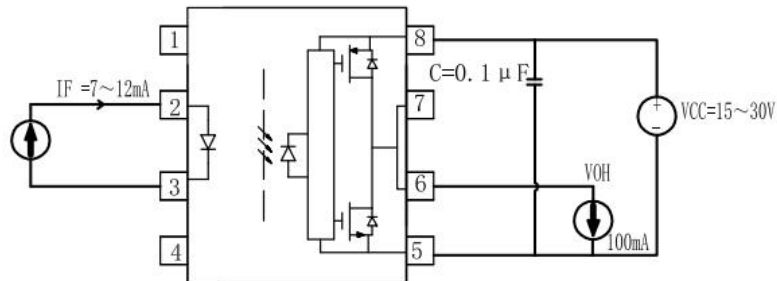


图 11 VOH 测试电路

Figure 11- The test circuit of VOH

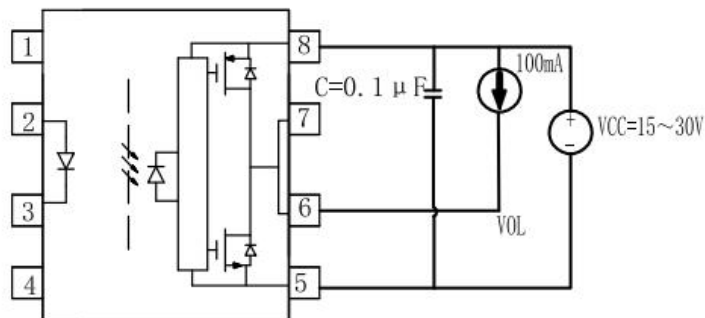


图 12 VOL 测试电路

Figure 12- The test circuit of VOL



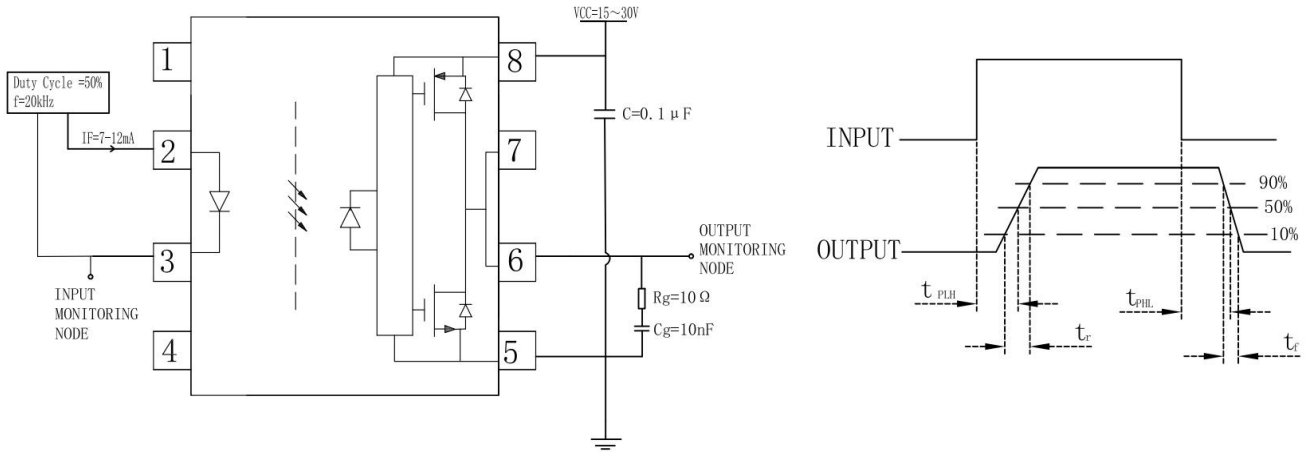


图 13  $t_{PHL}$ ,  $t_{PLH}$  测试方法  
Figure 13- The test method of  $t_{PHL}$ ,  $t_{PLH}$

## 10 外形尺寸 Dimensions

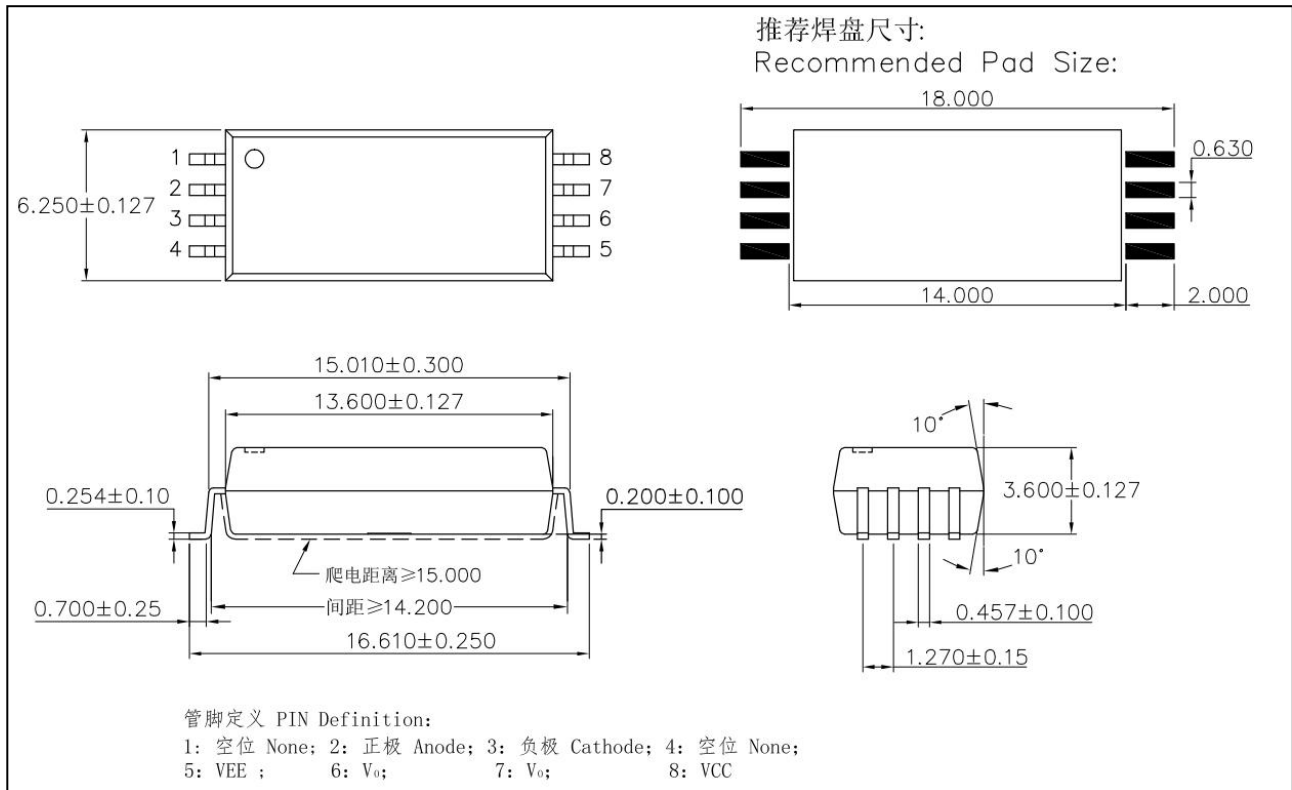


图 14 HGD313H 外形尺寸  
Figure 14- The dimensions of HGD313H

## 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：**HGD313H** 产品印章如图 15。

Print type characters, trade mark and Lot.No. on the Photo Coupler. For example the marking of product **HGD313H** is shown as Figure 15.

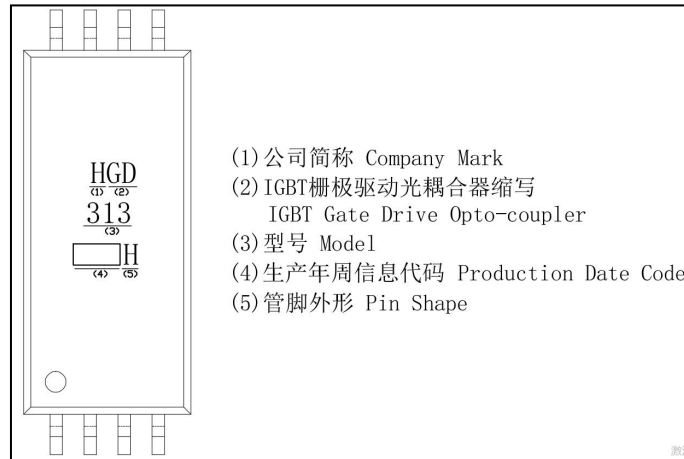


图 15 产品印章

Figure 15- Marking

## 12 包装方式 Packing

### 12.1 编带包装 (Tape and reel) : 适用于 For HGD313H

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

#### 12.1.2 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)

#### 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) :

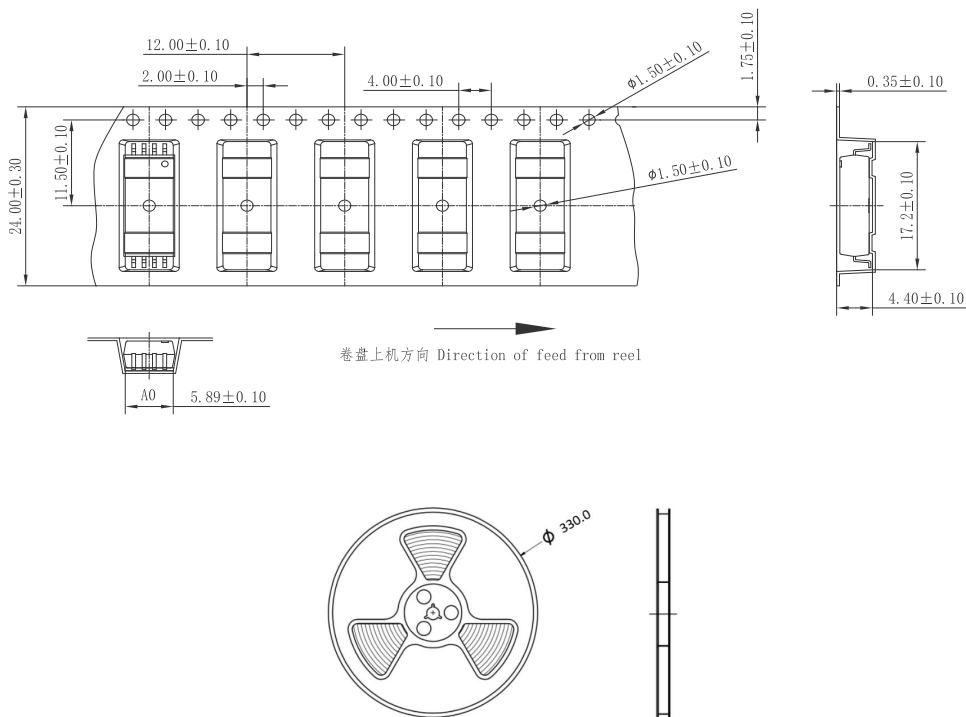


图 16 编带包装示意图

Figure 16- Taping Packing Schematic

## 12.2 标识 Label



图 17 标识 Figure 17-Label

## 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 静电防护等级（人体模式） ESD(HBM):  $\geq 2000V$ .

13.3 引脚镀锡厚度：大于等于  $5\mu m$ 。

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

13.4 推荐焊接条件 Recommended Soldering Conditions

13.4.1 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.

13.4.2 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.

13.4.3 回流焊 Reflow soldering

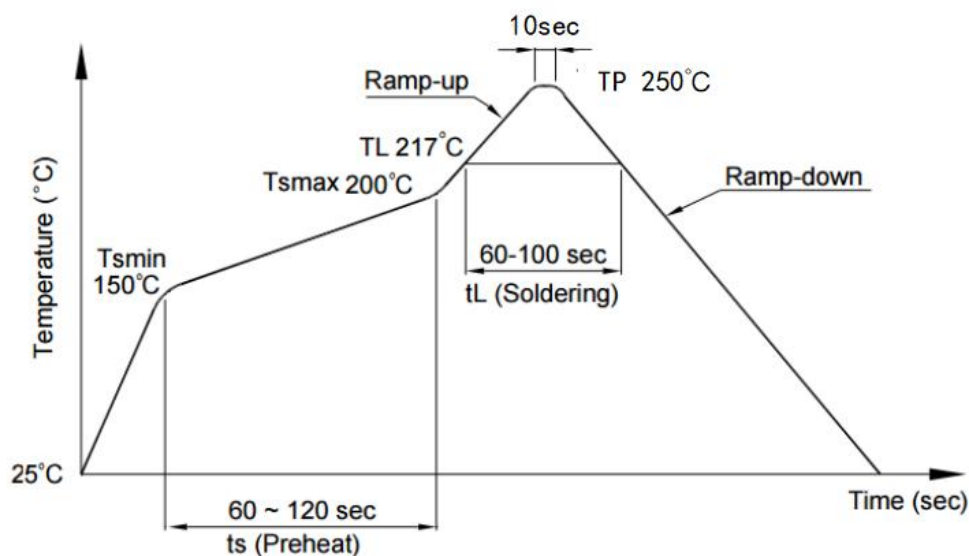
1) 推荐锡膏规格 Recommend tin glue specifications:

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		3~6°C / sec

图 18 回流焊参数

Figure 18-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.

#### 13.4.4 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.

13.5 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.

## 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.: 中国厦门市翔安区舫阳南路 189 号 No.189, Fangyang South Road, Xiangan District, Xiamen China.

