



厦 门 华 联 电 子 股 份 有 限 公 司

Xiamen Hualian Electronics Corp., Ltd.

产 品 规 格 书

SPECIFICATION

产品名称：IGBT 栅极驱动光耦合器

DESCRIPTION: IGBT Gate Drive Opto-coupler

产品型号：HGD341P

PART NO.: HGD341P

拟制 Prepared	审核 Verified	批准 Approved

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1 概述 General

光耦产品 HGD341P 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。

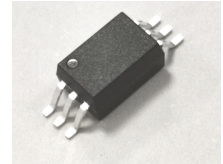


图 1 产品 Figure 1-Product

The HGD341P 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

- 3A 最大峰值输出电流。3 A maximum peak output current.
- 2.5A 最小峰值输出电流。2.5 A minimum peak output current.
- 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 200ns。Fast Switching Speed: 200ns max. Propagation Delay.
- 输入、输出间绝缘电压高。The isolation voltage between input and output is high: VISO $\geq$ 5000Vrms.
- 贴片式 6L 塑料封装。LSOP 6L 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.

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

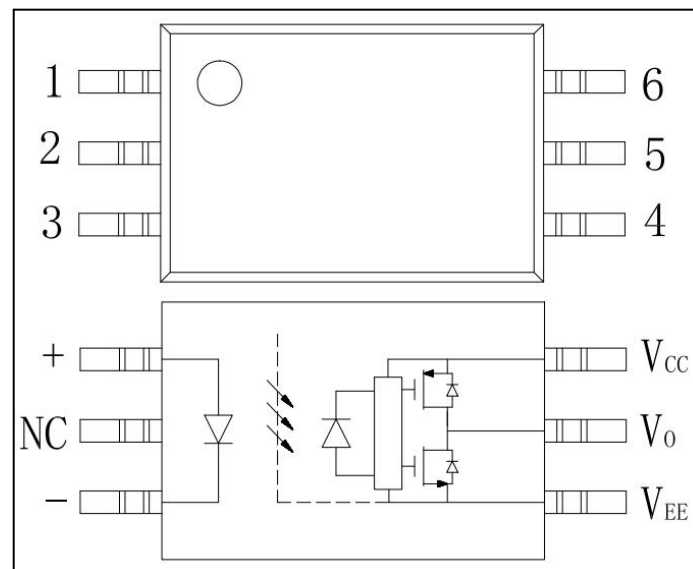


图 2 电原理图
Figure 2-Schematic

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 ≤ 150 Vrms		I – IV	
for rated mains voltage ≤ 300 Vrms		I – IV	
for rated mains voltage ≤ 300 Vrms		I – IV	
for rated mains voltage ≤ 600 Vrms		I – IV	
for rated mains voltage ≤ 1000 Vrms		I – III	
Climatic Classification		55/100/21	
Pollution Degree (DIN VDE 0110/39)		2	
Maximum Working Insulation Voltage	V_{IORM}	891	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}	1671	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}	1426	Vpeak
Highest Allowable Overvoltage (Transient Overvoltage $t_{ini} = 60$ sec)	V_{IOTM}	6000	Vpeak
Case Temperature	T_s	175	°C
Input Current	I_s , INPUT	150	mA
Output Power	P_s , OUTPUT	600	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
输入端 Input	正向电流 Forward Current	I _F	25	mA
	正向脉冲电流 Pulse Forward Current ($<1\mu\text{s}$ pulse width, 300 pps)	I _{FP}	1	A
	反向电压 Reverse Voltage	V _R	5	V
	输入端功率 Input Power Dissipation	P _I	45	mW
	节温 Junction Temperature	T _{J(IN)}	125	°C
	输入电流上升下降时间 Input Current (Rise/Fall Time)	t _{r(IN)} , t _{f(IN)}	500	ns
输出端 output	高电平输出峰值电流 High Level Peak Output Current	I _{OH}	3.0	A
	低电平输出峰值电流 Low Level Peak Output Current	I _{OL}	3.0	A
	输出端总电源电压 Total Output Supply Voltage	V _{CC} -V _{EE}	35	V
	输出电压 Output Voltage	V _{O(PEAK)}	V _{CC}	V
	输出端功耗 Output Power Dissipation	P _O	250	mW
	节温 Junction Temperature	T _{J(OUT)}	125	°C
工作温度 Operating temp.		T _{aop}	-40 ~ +105	°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 (10 Sec.)		260	
输入-输出间绝缘电压* Isolation voltage (RH≤60%,交流 1 分钟) (RH≤60%, AC 1min.)		V _{ISO}	5000	V _{rms}

*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	16	mA
输入端电压 Input Voltage (OFF)	V _{F(OFF)}	-3.6	0.8	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℃

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	1.1	1.35	1.6	V
	输入端反向击穿电压 Input Reverse Breakdown Voltage	BV _R	I _R =10μA	5			V
	反向电流 Reverse Current	I _R	V _R =6V			5	μA
	正向电压温度系数 Forward Voltage Temperature Coefficient	ΔV _F /ΔT	I _F =10mA		-1.2		mV/℃
	输入端子电容 Input Capacitance	C _{IN}	V=0V F=1MHz		30		pF
输出端 Output	高电平输出峰值电流 ^a High Level Peak Output Current	I _{OH}	V _O =V _{CC} -4V Pulse width≤50us	-1.0			A
			V _{CC} -V _O ≤15V Pulse width≤10us	-2.5			A
	低电平输出峰值电流 ^b Low Level Peak Output Current	I _{OL}	V _O =V _{EE} +2.5V Pulse width≤50us	1.0			A
			V _O -V _{EE} ≤15V Pulse width≤10us	2.5			A
耦合 Coupler	高电平电源电流 High Level Supply Current	I _{CCH}	I _F =10 mA V _{CC} =30V		1.5	3	mA
	低电平电源电流 Low Level Supply Current	I _{CCL}	V _F =0 V V _{CC} =30V		1.4	3	mA
	高电平输出电压 ^c High Level Output Voltage	V _{OH}	I _O =-100mA	V _{CC} -0.3	V _{CC} -0.2		V
			I _F =10mA I _O =0mA		V _{CC}		V
	低电平输出电压 ^d Low Level Output Voltage	V _{OL}	I _O =100mA		0.075	0.2	V
	低到高输入端电流 Threshold Input Current Low to High	I _{FLH}	V _O >5 V		2	4	mA
	高到低输入端电压 Threshold Input Voltage High to Low	V _{FHL}	V _O >5 V	0.8			V
	UVLO 阈值 UVLO Threshold	V _{UVLO+}	V _O >5 V, I _F =10 mA	11.0	12.7	13.5	V
		V _{UVLO-}	V _O >5 V, I _F =10 mA	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 ^e Propagation Delay Time to Hight Output Level	t _{PLH}				200	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}	$R_g=10\Omega$ $C_g=33nF$ $I_F=7\sim 16mA$ $V_{CC}=15\sim 30V$			200	ns
	脉冲宽度失真 Pulse Width Distortion	PWD			10	70	ns
	任何两个部分之间的传播延迟区别 Propagation Delay Difference Between Any Two Parts	PDD ($t_{PHL} - t_{PLH}$)		-100		100	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 $	$I_F=10mA$ $V_{CC}=30V$ $V_{CM}=1500V_{P-P}$	35			kV/ μs
	输出端为低电平时的共模抑制能力 Common Mode Transient Immunity at Low Level Output	$ CM_L $	$V_F=0V$ $V_{CC}=30V$ $V_{CM}=1500V_{P-P}$	35			kV/ μs
	输出端上升时间 °Output Rise Time(20%~80%)	t_r	$R_g=10\Omega, C_g=33nF$ $I_F=7.5mA$ $V_{CC}=30V$		35		ns
	输出端下降时间 °Output Fall Time(80%~20%)	t_f			35		
隔离 Isolation	绝缘电压 Isolation voltage	V_{ISO}	$I_{off}\leq 0.3mA$, AC, 60s	5000			V
	绝缘电阻 Isolation Resistance	R_{I-O}	$V_{I-O}=500V$, DC		10^{12}		Ω
	输入-输出电容 Capacitance (Input to Output)	C_{I-O}	$f = 1MHz$		0.9		pF

注: a. I_{OH} 测试电路见图 17; Figure 17. is the test circuit of I_{OH} ;
b. I_{OL} 测试电路见图 18; Figure 18. is the test circuit of I_{OL} ;
c. V_{OH} 测试电路见图 19; Figure 19. is the test circuit of V_{OH} ;
d. V_{OL} 测试电路见图 20; Figure 20. is the test circuit of V_{OL} ;
e. t_{PHL} , t_{PLH} , t_r , t_f 测试方法见图 21。 Figure 21. is the test circuit of t_{PHL} , t_{PLH} , t_r and t_f .

9 特性曲线图 Characteristic Curve

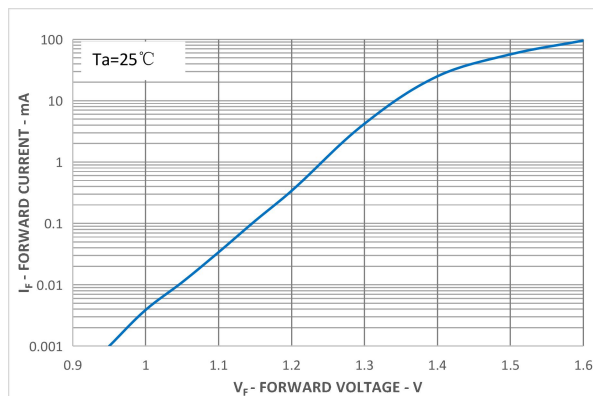


图 3 V_F - I_F 特性曲线

Figure 3-Typical input diode foward charcteristic

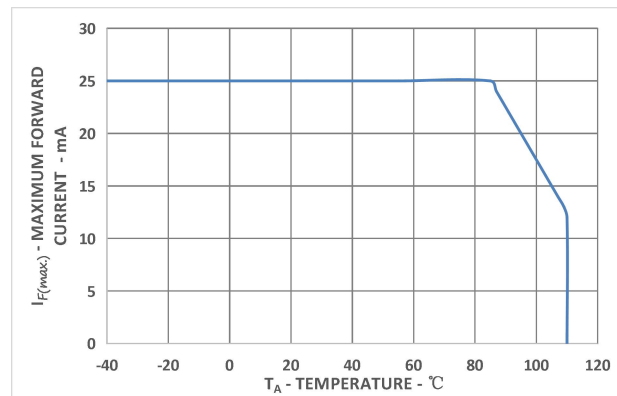


图 4 $I_{F(max.)}$ - T_A 特性曲线

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

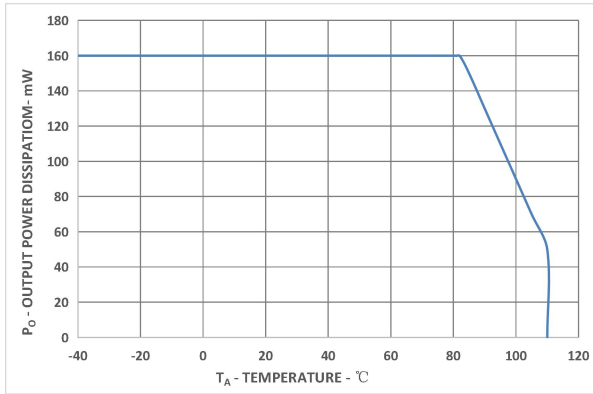


图 5 Po-T_A 特性曲线
Figure 5-Po vs. temperature

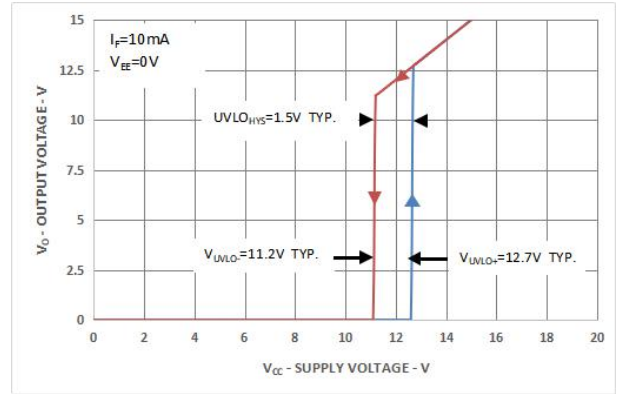


图 6 低压双锁特性曲线
Figure 6-Under voltage lockout

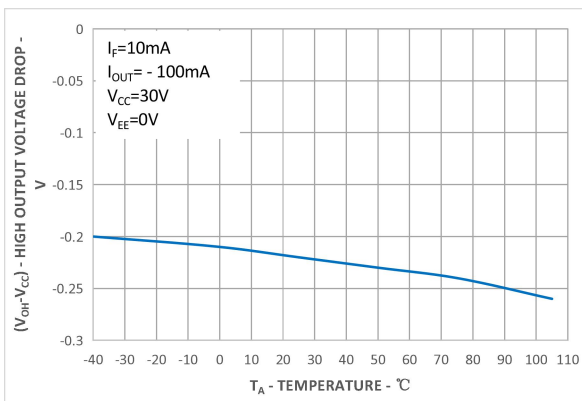


图 7 (V_{OH}-V_{CC})-T_A 特性曲线
Figure 7-(V_{OH}-V_{CC}) vs. temperature

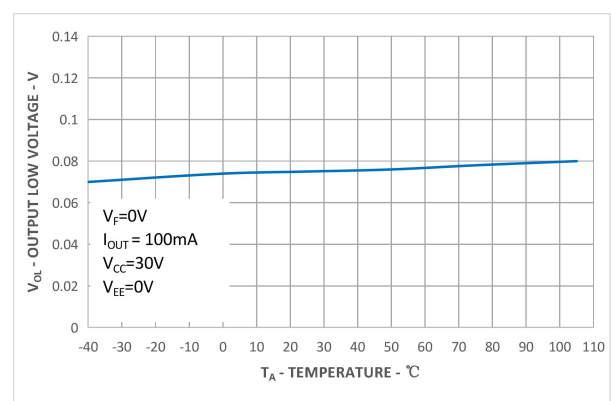


图 8 V_{OL}-T_A 特性曲线
Figure 8-V_{OL} vs. temperature

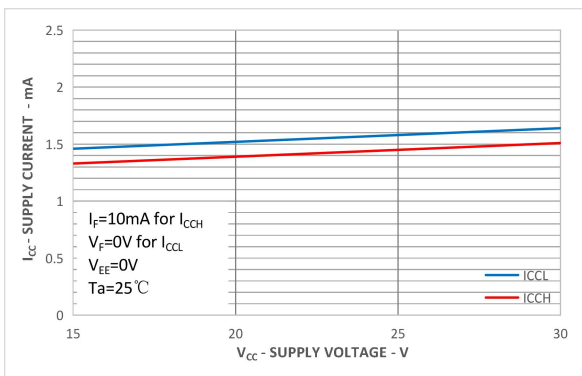


图 9 I_{CC}-V_{CC} 特性曲线
Figure 9-I_{CC} vs. V_{CC}

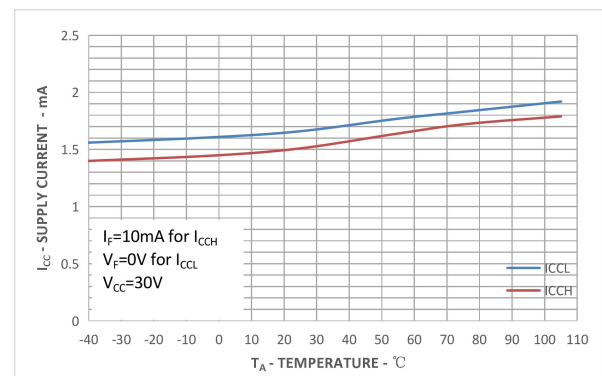


图 10 I_{CC}-T_A 特性曲线
Figure 10-I_{CC} vs. temperature

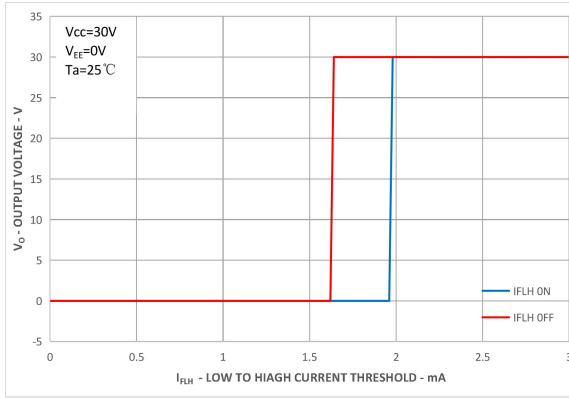


图 11 I_{FLH} 滞后特性曲线

Figure 11- I_{FLH} hysteresis

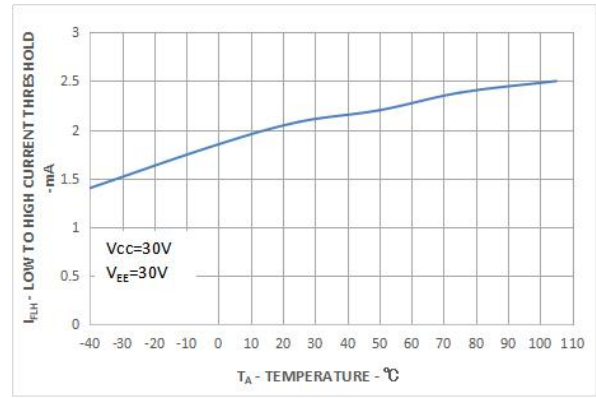


图 12 I_{FLH} - T_A 特性曲线

Figure 12- I_{FLH} vs. temperature

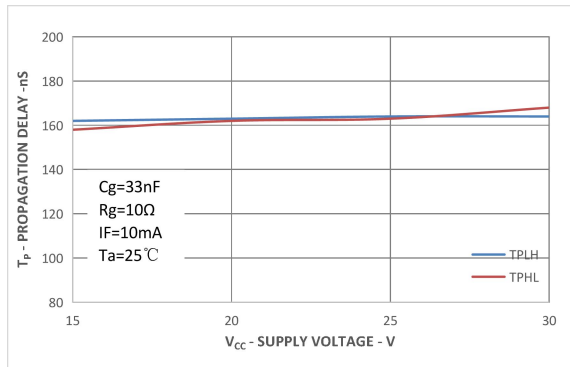


图 13 T_P - V_{CC} 特性曲线

Figure 13-Propagation delays vs. V_{CC}

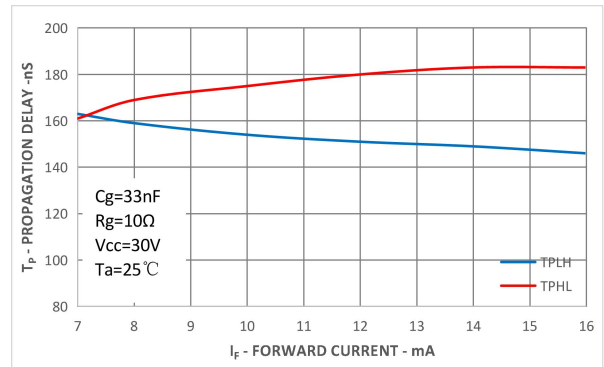


图 14 T_P - I_F 特性曲线

Figure 14-Propagation delays vs. I_F

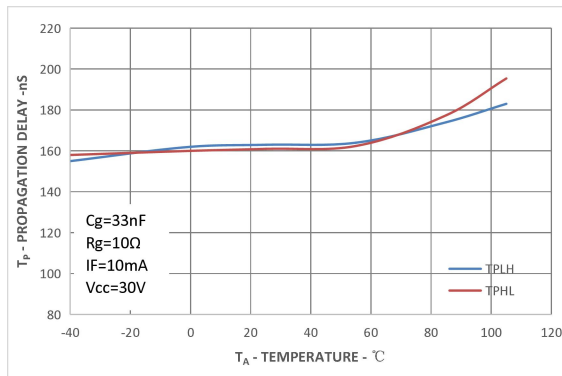


图 15 T_P - T_A 特性曲线

Figure 15-Propagation delays vs. temperature

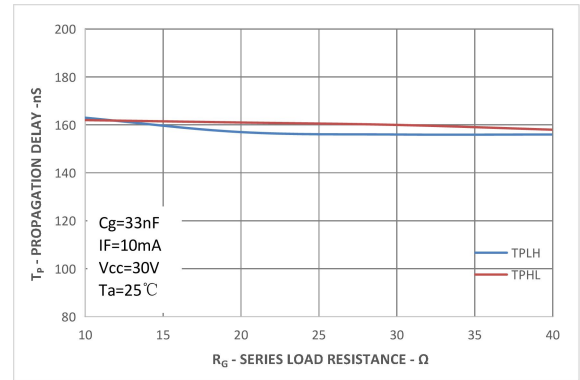


图 16 T_P - R_g 特性曲线

Figure 16-Propagation delays vs. R_g

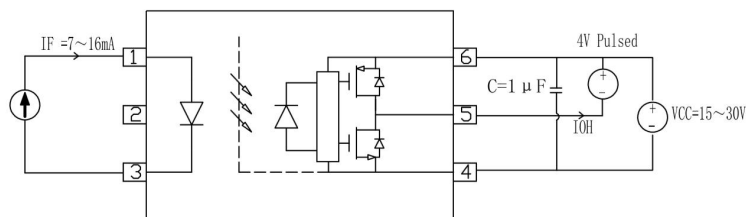


图 17 I_{OH} 测试电路

Figure 17- The test circuit of I_{OH}

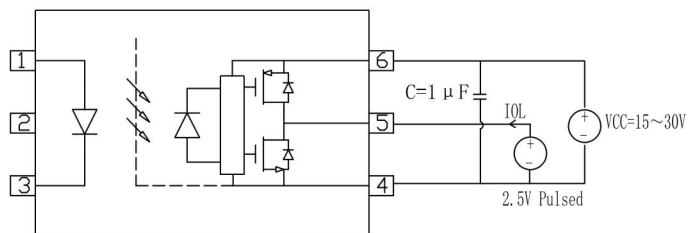


图 18 I_{OL} 测试电路

Figure 18- The test circuit of I_{OL}

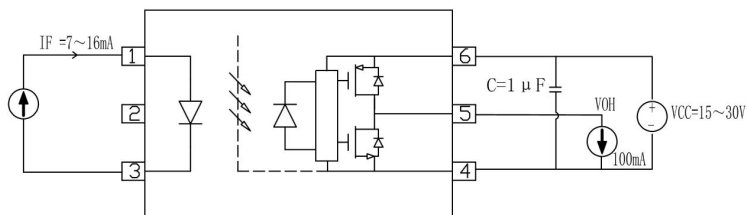


图 19 V_{OH} 测试电路

Figure 19- The test circuit of V_{OH}

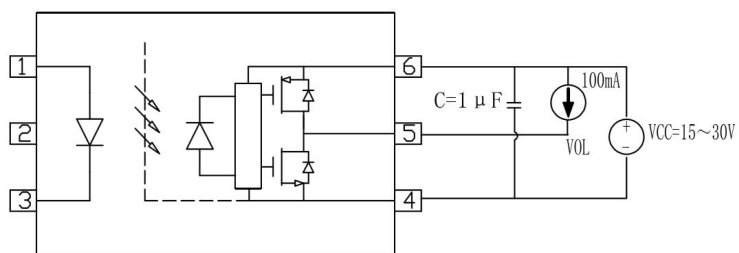


图 20 V_{OL} 测试电路

Figure 20- The test circuit of V_{OL}

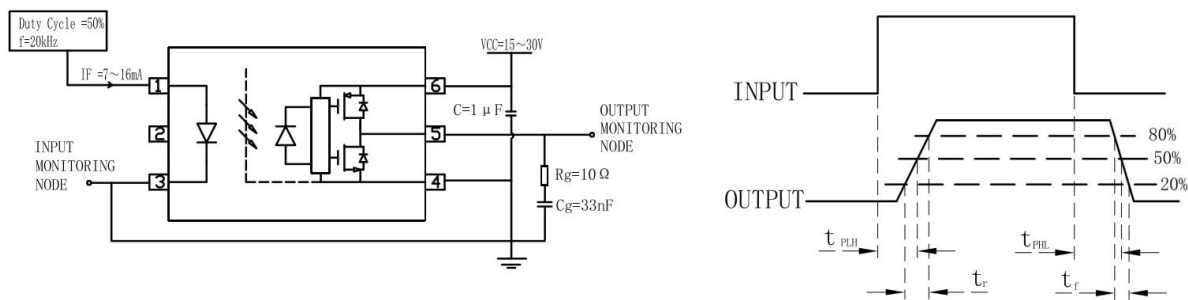


图 21 t_{PHL}, t_{PLH} 测试方法

Figure 21- The test method of t_{PHL}, t_{PLH}

10 外形尺寸 Dimensions

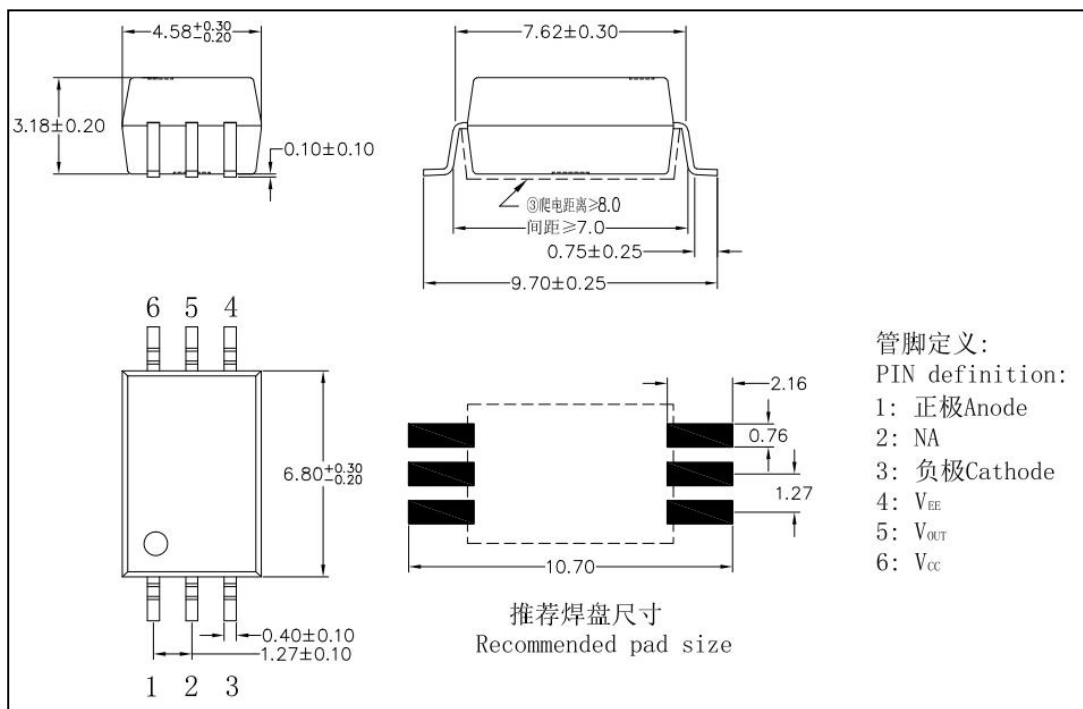
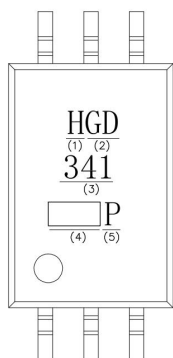


图 22 HGD341P 外形尺寸
Figure 22- The dimensions of HGD341P

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：**HGD341P** 产品印章如图 23。

Print type characters, trade mark and Lot.No. on the Photo Coupler. For example the marking of product **HGD341P** is shown as Figure 23.



- (1) 公司简称 Company Mark
- (2) IGBT 栅极驱动光耦合器缩写
IGBT Gate Drive Opto-coupler
- (3) 型号 Model
- (4) 生产年周信息代码 Production Date Code
- (5) 管脚外形 Pin Shape

图 23 产品印章
Figure 23- Marking

12 包装方式 Packing

12.1 编带包装 (Tape and reel) : 适用于 For HGD341P

12.1.1 每卷数量 (Qty/reel) : 1200 只 (pcs)。每箱数量 (Qty/ctn) : 24000 只 (pcs)。

12.1.2 内包装 (Inner packing) :

每卷盘 1200 只, 贴合格证 (型号、生产日期代号、检验员代号)。

1200pcs/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) (单位 Unit: mm) :

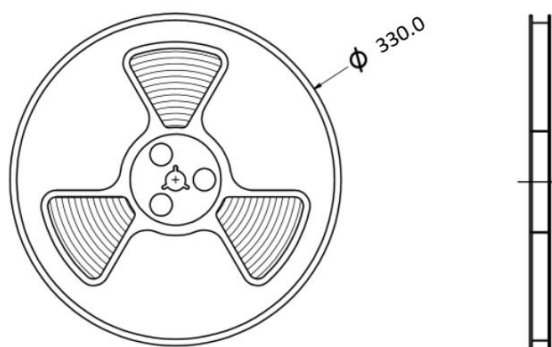
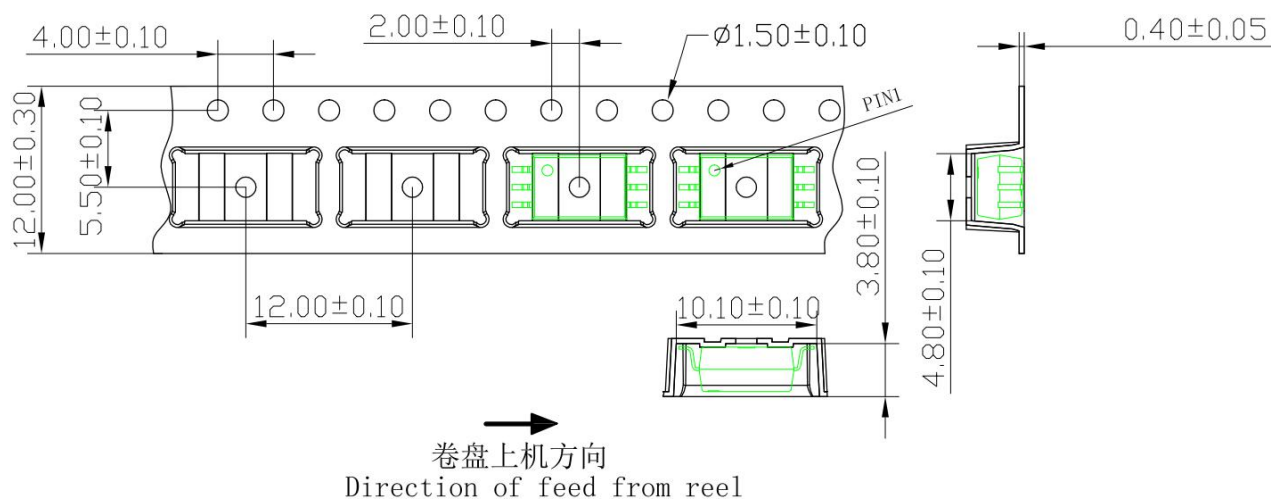


图 24 编带包装示意图
Figure 24- Taping Packing Schematic

12.2 标识 Label



图 25 标识 Figure 25-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%;

密封包装贮存有效期 1 年 Storage life of sealed packaging: 1 year.

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): Class 2.

13.3 引脚镀锡厚度: 大于等于 5μm。

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

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

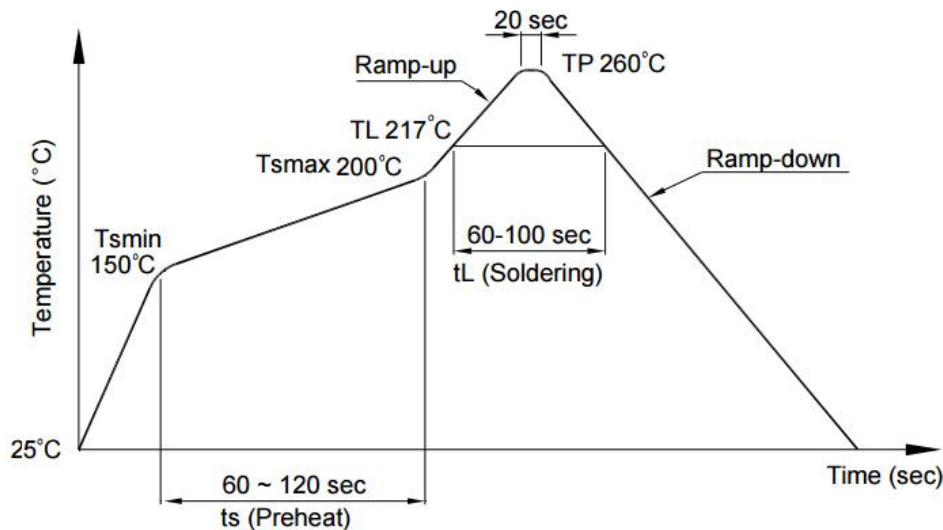
1) 推荐锡膏规格 Recommend tin glue specifications:

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)	$90\pm 30\text{ sec}$
焊接区 Soldering zone	Temperature (T_L)	217°C
	Time (t_L)	$60\sim 100\text{ sec}$
最高温度 Peak Temperature (T_P)		260°C
升温速率 Ramp-up rate		$3^{\circ}\text{C} / \text{sec max.}$
降温速率 Ramp-down rate		$3\sim 6^{\circ}\text{C} / \text{sec}$

图 26 回流焊参数

Figure 26-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 ≤ 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.

13.5 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.

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