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：IGBT 栅极驱动光耦合器
DESCRIPTION: IGBT Gate Drive Opto-coupler
产品型号：HGD341W
PART NO.：HGD341W

拟制 Prepared	审核 Verified	批准 Approved

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1 概述 General

光耦产品 HGD341W 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。

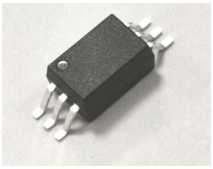


图 1 产品 Figure 1-Product

The HGD341W 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≥5000Vrms.
- 贴片式 6L 塑料封装。LSOP 6L 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

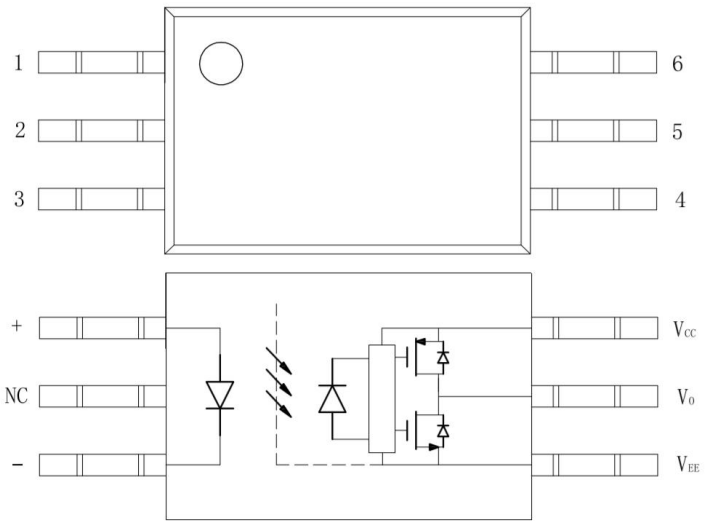


图 2 电原理图

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 ≤ 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}	1140	Vpeak
Input to Output Test Voltage, Method b* V_{IORM} x 1.875 = V_{PR}, 100% Production Test with tm=1 sec, Partial discharge < 5 pC	V_{PR}	2137	Vpeak
Input to Output Test Voltage, Method a* V_{IORM} x 1.6 = V_{PR}, Type and Sample Test, tm=10 sec, Partial discharge < 5 pC	V_{PR}	1824	Vpeak
Highest Allowable Overvoltage (Transient Overvoltage tini = 60 sec)	VIOTM	8000	Vpeak
Case Temperature	T_S	175	℃
Input Current	I_S, INPUT	150	mA
Output Power	P_S, OUTPUT	600	mW
Insulation Resistance at TS, VIO = 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℃, 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 (<1μs 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
	结温 Junction Temperature	$T_{J(IN)}$	125	℃
	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
	结温 Junction Temperature	$T_{J(OUT)}$	125	℃
工作温度 Operating temp.		T_{aop}	-40 ~ +105	℃
贮存温度 Storage temp.		T_{stg}	-55 ~ +125	℃
焊接温度 Soldering Temperature	手工焊 Hand Soldering (3 Sec.)	T_{sld}	360	℃
	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	℃

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	$\Delta V_F/\Delta T$	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 Swithing	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}	Rg=10Ω C_g=33nF I_F=7～16mA VCC=15～30V			200	ns

	输出端由高电平到低电平的传输延迟时间 [e] Propagation Delay Time to Low Output Level	t_{PHL}				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 Diff erence 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 VCC=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 [e] Output Rise Time(20%~80%)	t_r	Rg=10Ω,C_g=33nF I_F=7.5mA V_{CC}=30V		35		ns
	输出端下降时间 [e] Output Fall Time(80%~20%)	t_f			35		
隔离 Isolation	绝缘电压 Isolation voltage	V_{ISO}	I_{off}≤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

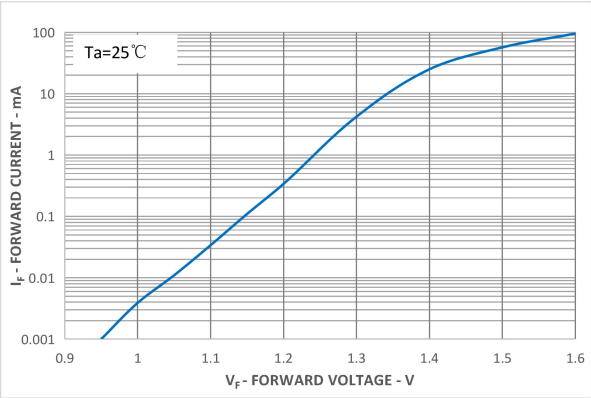


图 3 V_F-I_F 特性曲线

Figure 3-Typical input diode forward characteristic

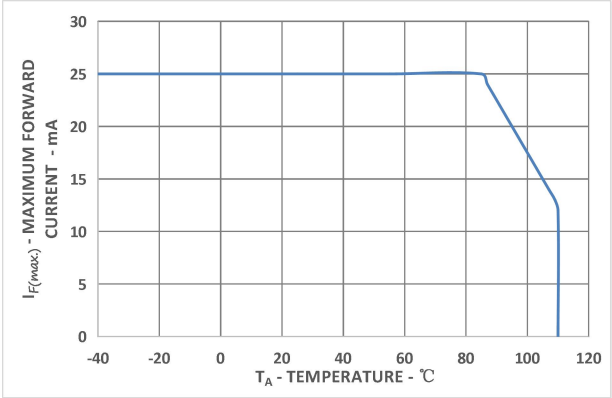


图 4 $I_{F(max.)}$-T_A 特性曲线

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

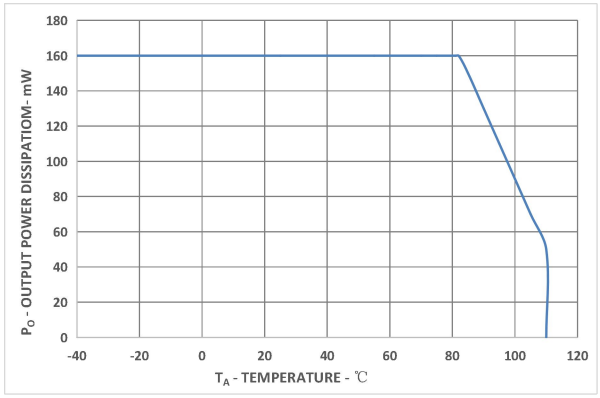


图 5 Po-T_A 特性曲线

Figure 5-Po vs. temperature

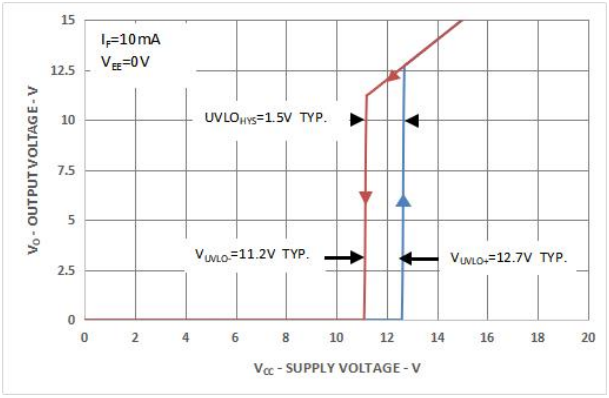


图 6 低压双锁特性曲线

Figure 6-Under voltage lockout

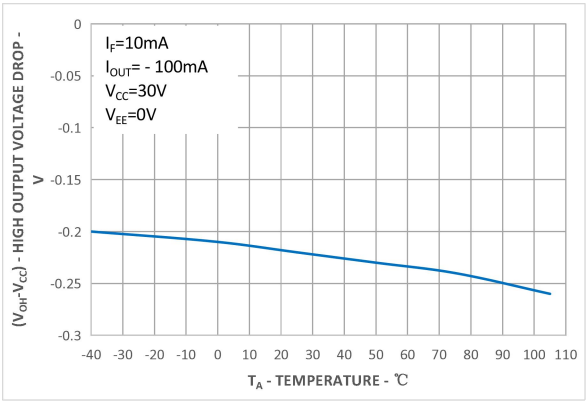


图 7 (V_{OH}-V_{CC})-T_A 特性曲线

Figure 7-(V_{OH}-V_{CC}) vs. temperature

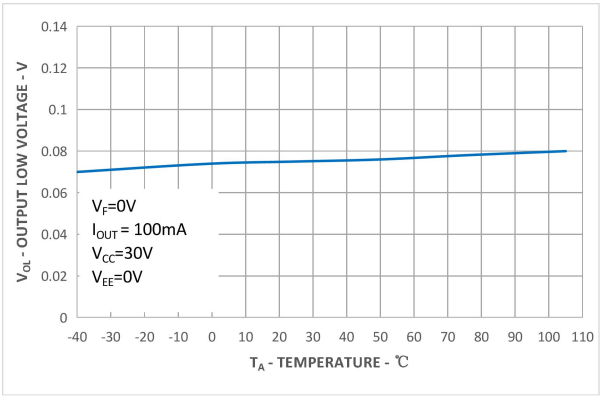


图 8 V_{OL}-T_A 特性曲线

Figure 8-V_{OL} vs. temperature

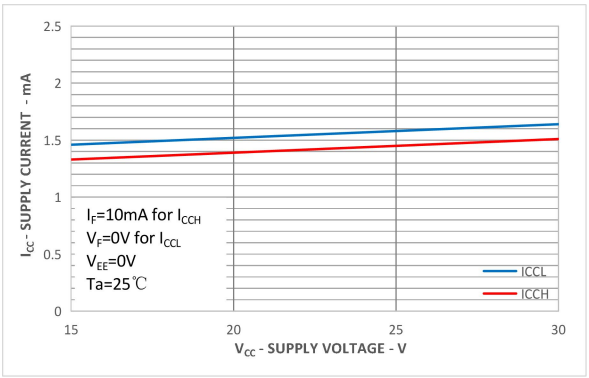


图 9 I_{CC}-V_{CC} 特性曲线

Figure 9-I_{CC} vs.V_{CC}

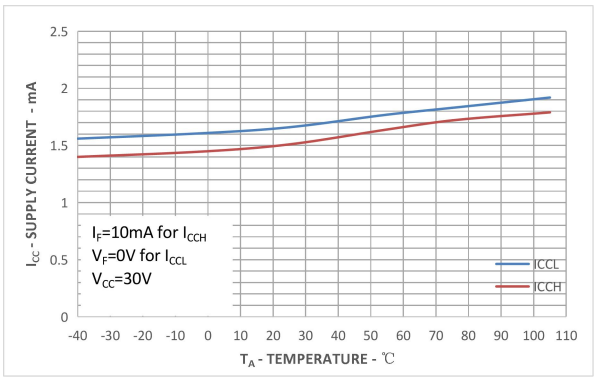


图 10 I_{CC}-T_A 特性曲线

Figure 10-I_{CC} vs. temperature

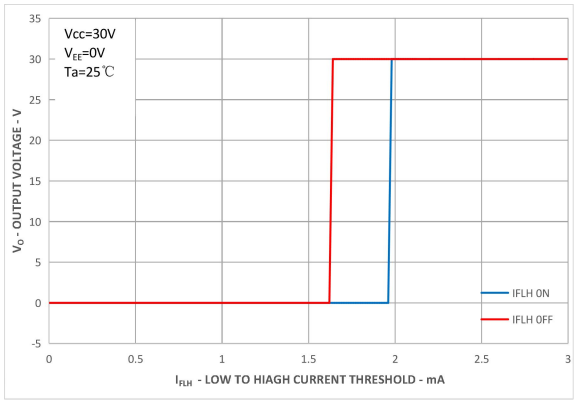


图 11 I_{FLH} 滞后特性曲线

Figure 11-I_{FLH} hysteresis

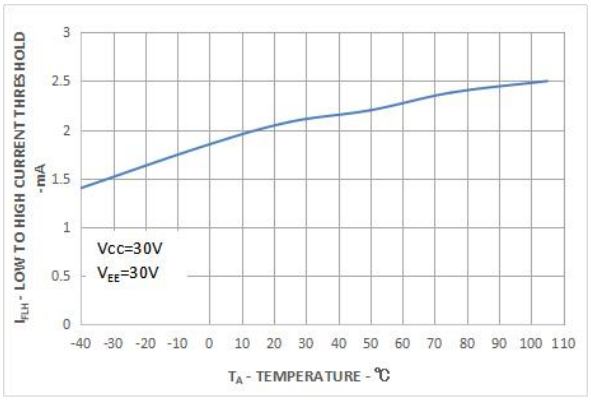


图 12 I_{FLH}-T_A 特性曲线

Figure 12-I_{FLH} vs. temperature

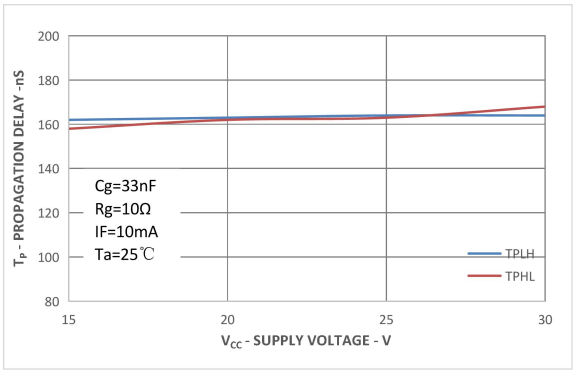


图 13 T_p-V_{CC} 特性曲线

Figure 13-Propagation delays vs. V_{CC}

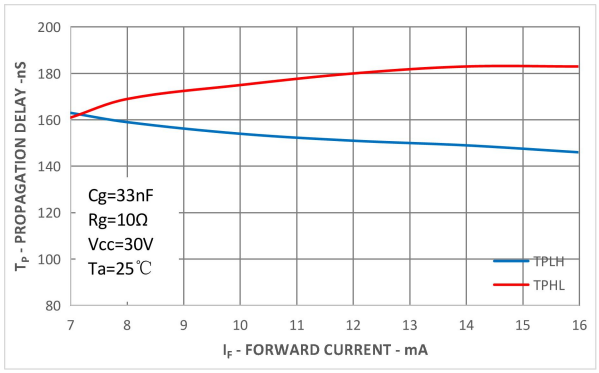


图 14 T_p-I_F 特性曲线

Figure 14-Propagation delays vs. I_F

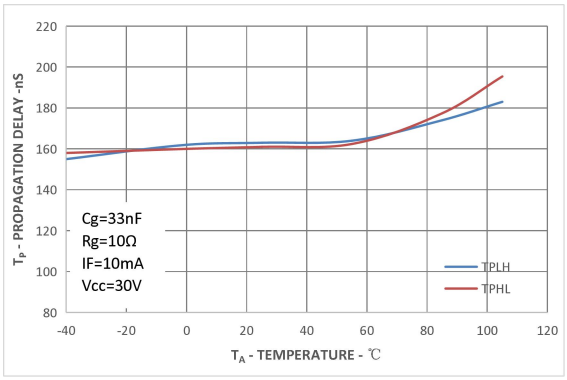


图 15 T_p-T_A 特性曲线

Figure 15-Propagation delays vs. temperature

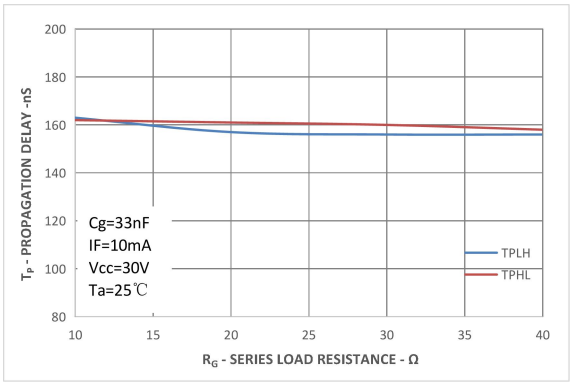


图 16 T_p-Rg 特性曲线

Figure 16-Propagation delays vs. Rg

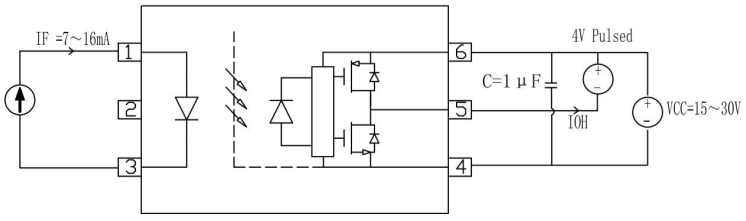


图 17　I_{OH} 测试电路

Figure 17- The test circuit of I_{OH}

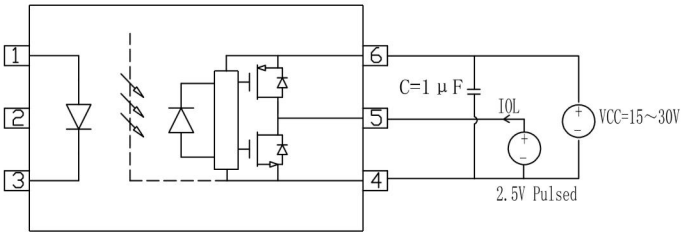


图 18　I_{OL} 测试电路

Figure 18- The test circuit of I_{OL}

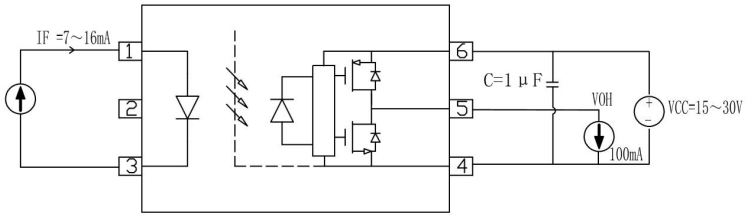


图 19　V_{OH} 测试电路

Figure 19- The test circuit of V_{OH}

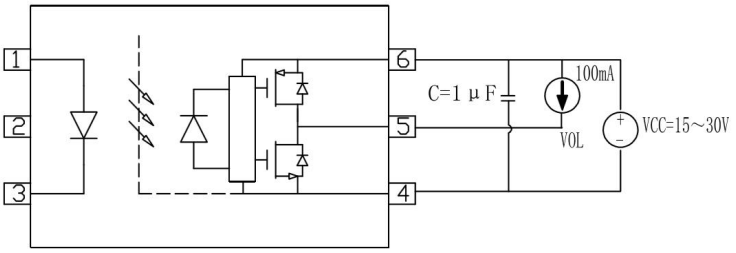


图 20　V_{OL} 测试电路

Figure 20- The test circuit of V_{OL}

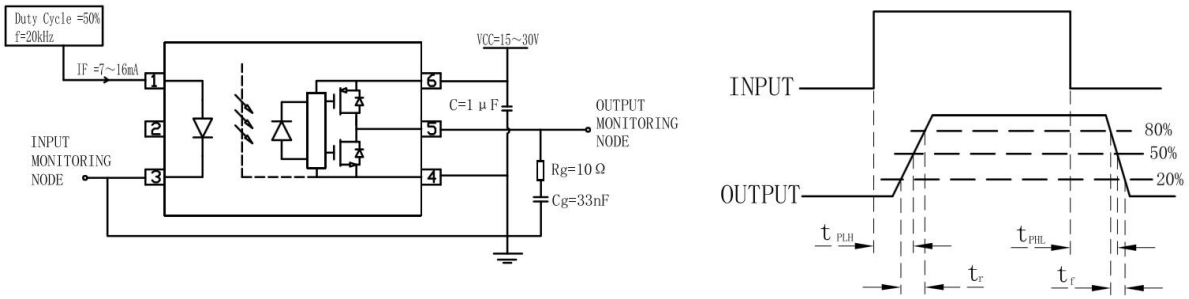


图 21 t_{PHL} ,t_{PLH} 测试方法

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

10 外形尺寸 Dimensions

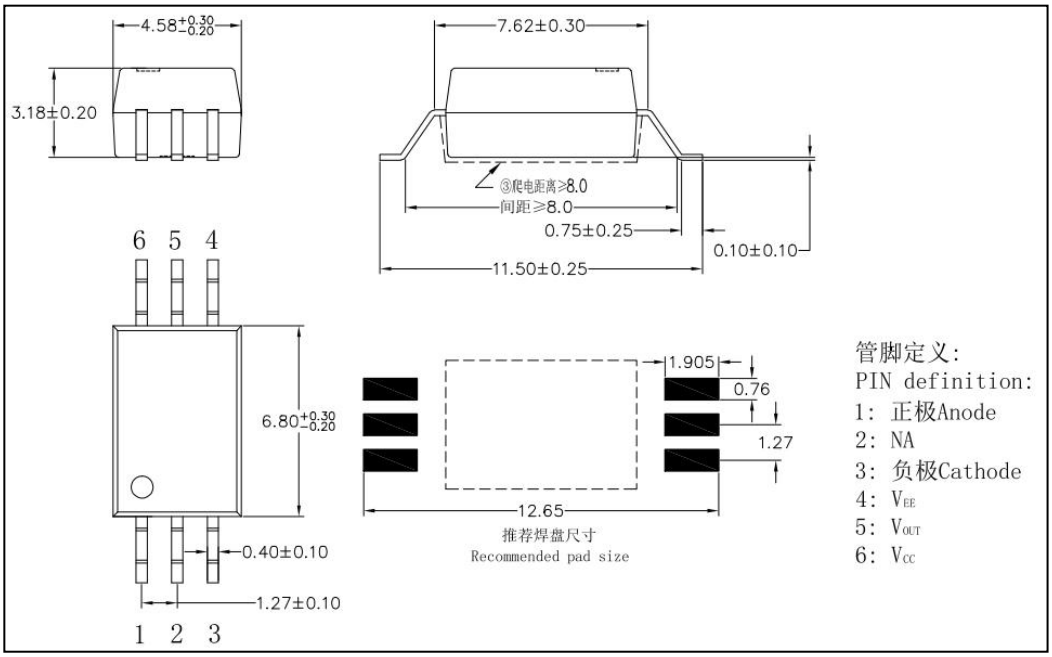


图 22 HGD341W 外形尺寸

Figure 22- The dimensions of HGD341W

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：**HGD341W** 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 **HGD341W** is shown as Figure 23.

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 HGD341W

12.1.1 每卷数量（Qty/reel）：1000 只（pcs）。每箱数量（Qty/ctn）：20000 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）。

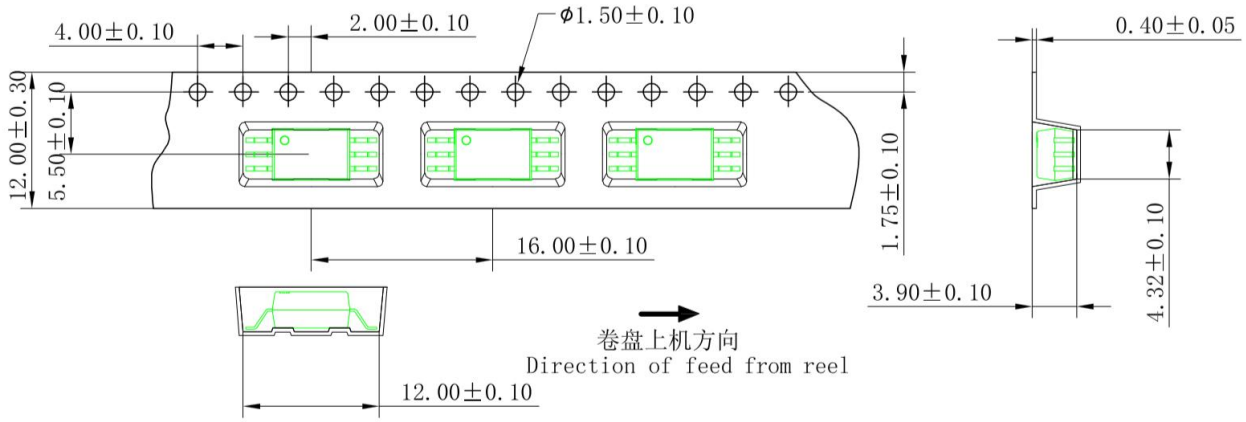
1000pcs/reel，certificate on reel（model，code of product date，Inspector’s code）

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）（单位 Unit：mm）：



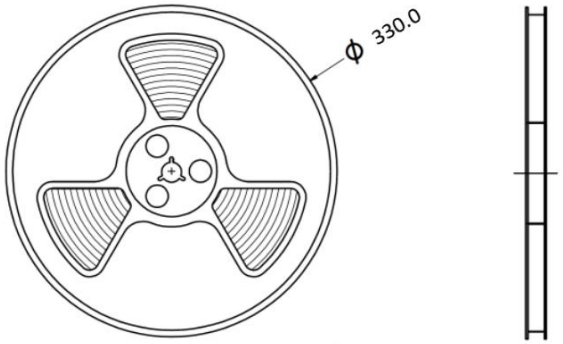


图 24 编带包装示意图

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%;

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: ≥5μm.

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

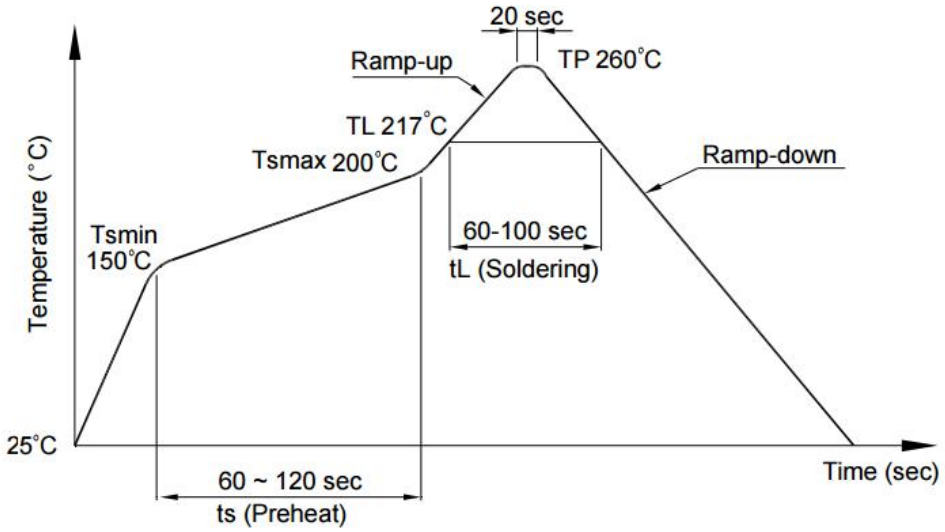
1) 推荐锡膏规格 Recommend tin glue specifications:

a) 熔点 Melting temperature:217℃

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 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，最多不能不超过三次。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℃±5℃，时间≤3s，返修次数≤2次。Manual soldering requirements: temperature ≤(360℃±5℃), time ≤3s, 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 automationequipment, 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.：中国厦门市翔安区航阳南路 189 号 No.189, Fangyang South Road, Xiangan 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	2020-06-01	新版发行 New edition	王梓建	段果
1.1	2020-10-09	1. 表 3 推荐工作条件中，“导通输入电流”与“关断输入电压” 更改为“输入端电流”与“输入端电压”； 2. 表 4 电参数表增加“UVLO 阈值”、“脉冲宽度失真”、“绝缘电阻”。 3. 图 8 I_{FLH}-T_A 特性曲线更新。	王梓建	段果
1.2	2020-12-15	1、增加绝缘特性表格。 2、补充完善极限参数表和光电参数表。 3、补充完善特性曲线。 4、外形图增加爬电距离和电气间隙，端子尺寸公差，增加推荐的焊盘尺寸； 5、增加印章说明； 6、增加编带示意图拉出方向； 7、修订标签图示； 8、更新推荐的回流焊曲线，增加返修手工焊接要求； 9、修订部分使用注意事项。	王梓建	段果
1.3	2021-08-04	1.第 11.3 项中，引脚镀锡厚度下限值由 3μm 变更为 5um。	王梓建	段果
1.4	2023-02-10	1.规格书封面及第 14 项中更新新厂址地址	张子扬	段果
1.5	2023-06-01	1.公司名称变更	连晓彬	王梓建