NQUNXIN
群芯微电子

中国芯 光电梦

栅极驱动光耦

Gate Drive Optocoupler

QXM341

宁波群芯微电子股份有限公司

NINGBO QUNXIN MICROELECTRONICS CO., LTD.

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概述 Description

QXM341 是一种 3A 输出电流栅极驱动光电耦合器，其非常适用于驱动电机控制领域的功率 IGBT 和 MOSFETs。其包含一个铝镓砷化合物（AlGaAs）LED，它通过光学耦合到一个具有功率输出级的集成电路上。

QXM341 is 3.0 Amp Output Current IGBT Gate Drive Optocoupler, this optocoupler is ideally suited for driving power IGBTs and MOSFETs used in motor control inverter applications. The QXM341 contains an AlGaAs LED, which is optically coupled to an integrated circuit with a power output stage.

特性 Features

- 35kV/us 最小共模抑制(V_{CM}=1500V)
  35kV/us minimum common mode rejection(CMR) at V_{CM}= 1500V
- 最大峰值输出电流 3A
  3A maximum peak output current
- 最小峰值输出电流 2.5A
  2.5A minimum peak output current
- 电源电压额定值宽至 15 至 30V
  Wide supply voltage range: 15V to 30V
- 200ns 的最大延迟时间
  200ns maximum delay time
- 100ns 的最大传播延迟差
  100ns maximum propagation delay difference
- 工作温度范围：-40℃ to +110℃
  Operating temperature range: -40℃ to +110℃
- 符合加强绝缘标准
  Meet reinforced insulation standards
- 符合安规标准：UL 1577，VDE DIN EN60747-5-5（VDE 0884-5），CQC11-471543-2022
  Meet safety standard approval: UL 1577, VDE DIN EN60747-5-5 (VDE 0884-5), CQC11-471543-2022

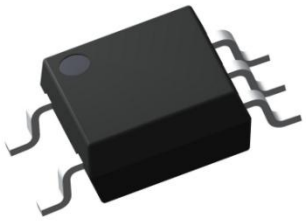
应用 Applications

- 开关电源
  Switching power supplies
- LGBT/MOSFET 栅极驱动
  LGBT / MOSFET gate drive
- 交流和无刷直流电机驱动
  AC and Brushless DC motor drives
- 可再生能源逆变器
  Renewable energy inverters
- 工业逆变器
  Industrial inverters

真值表 Truth table

LED	V_{CC}-V_{EE} " Positive Going" (Turn-on)		V_{CC}-V_{EE} "Negative Going" (Turn-off)	
LED	V_{CC}-V_{EE}	V_O	V_{CC}-V_{EE}	V_O
OFF	0V to 30V	Low	30V to 0V	Low
ON	0V to 11V	Low	30V to 12V	High
ON	11V to 13.5V	Transition	12V to 9.5V	Transition
ON	13.5V to 30V	High	9.5V to 0V	Low

封装和原理图 Package and Schematic Diagram



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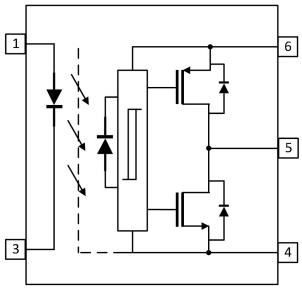


Pin Configuration

1. Anode
3. Cathode
4. VSS
5. VO
6. VDD

注：4，6 脚之间必须连接 1uF 的旁路电容。

Note: 1μF bypass capacitor must be connected between Pin 4 and 6.

产品型号命名规则 Order Code

QX M341- UN Y - W V

① ② ③ ④ ⑤ ⑥

① 公司代码 Company Code（QX: 群芯 Qunxin）

② 产品系列 Product Series（M341）

③ 框架类型 Lead Frame（Cu: 铜框架 Copper）

④ 树脂类型 Epoxy（H: 无卤 Halogen-free）

⑤ 封装形式 Package(S: SOP)

⑥ 产品版本 Product Versions: E

印字信息 Marking Information

- 印字中"Q"为群芯品牌 LOGO
  "Q"denotes LOGO
- 印字中"Y"代表年份；A(2018),B(2019),C(2020).....
  "Y"denotes YEAR：A(2018), B(2019), C(2020).....
- 印字中"WW"代表周号
  "WW"denotes Week's number
- 印字中"N"代表星期几
  "N"denotes the day of the week
- 印字中的"H"代表无卤
  "H"denotes Halogen-free

绝缘和安规信息 Insulation and Safety related specifications

项目 Item	符号 Symbol	数值 Value	单位 Unit	备注 Note
爬电距离 Creepage Distance	L	≥5	mm	从输入端到输出端，沿本体最短距离路径 Measured from input terminals to output terminals, shortest distance path along body.
电气间隙 Clearance Distance	L	≥7	mm	从输入端到输出端，通过空气的最短距离 Measured from input terminals to output terminals, shortest distance through air.
绝缘距离 Insulation Thickness	DTI	≥0.3	mm	发射器和探测器之间的绝缘厚度 Insulation thickness between emitter and detector.
峰值隔离电压 Peak Isolation Voltage	V_{IORM}	600	V_{peak}	DIN/EN/IEC EN60747-5-5.
瞬态隔离电压 Transient Isolation Voltage	V_{IOTM}	5000	V_{peak}	DIN/EN/IEC EN60747-5-5.
隔离电压 Isolation Voltage	V_{ISO}	3750	V_{rms}	For 1 min

极限参数 Absolute Maximum Ratings (T_A=25℃)

参数 Parameter		符号 Symbol	额定值 Rating	单位 Unit
发射端 Input	平均输入电流 Average Input Current	$I_{F(AVG)}$	25	mA
	峰值瞬态输入电流（<1μs 脉冲宽度，300pps） Peak Transient Input Current (<1μs pulse width, 300pps)	$I_{F(TRAN)}$	1.0	A
	反向输入电压 Reverse Input Voltage	V_R	5	V
	输入功耗 Power Dissipation	P_I	45	mW
接收端 Output	高峰值输出电流 High Peak Output Current	$I_{OH(PEAK)}$	-3	A
	低峰值输出电流 Low Peak Output Current	$I_{OL(PEAK)}$	3	A
	电源电压 Supply Voltage	V_{CC}-V_{EE}	0~35	V
	峰值输出电流 Peak Output Current	$V_{O(PECK)}$	-0~V_{CC}	V
	输出功率 Output Power Dissipation	P_O	700	mW
总功耗 Total Power Dissipation		P_{tot}	745	mW
隔离电压 Isolation Voltage		V_{ISO}	3750	V_{rms}
工作温度 Operating Temperature		T_{opr}	-40~+110	°C

参数 Parameter	符号 Symbol	额定值 Rating	单位 Unit
储存温度 Storage Temperature	T_{STG}	-55~+125	℃
焊接温度 Soldering Temperature	T_{sol}	260	℃

产品特性参数 Electro-optical Characteristics (T_A=25℃)

除非另有规定，适用于所有的推荐条件，典型值在 T_A =25℃，V_{DD} =30V，V_{SS} =GND 条件下测得。

All minimum and maximum specifications are at recommended operating conditions unless otherwise noted.

All typical values are at T_A =25℃, V_{DD} =30V, V_{SS} =GND.

参数 Parameter		符号 Symbol	条件 Condition	最小 Min	典型 Typ	最大 Min	单位 Unit
输入 Input	正向电压 Forward Voltage	V_F	I_F=10mA	1.0	1.39	1.6	V
	反向击穿电压 Reverse Voltage	I_R	V_R=5V	-	-	10	uA
	开启电流 Threshold Input Current Low to High	I_{FLH}	Rg = 10Ω, Cg = 25 nF, V_O > 5V	-	1.21	5	mA
	关断电压 Threshold Input Voltage High to Low	V_{FHL}	Rg = 10Ω, Cg = 25nF, V_O < 5V	0.8	1.12	-	V
	低电压锁定阈值 UVLO Threshold	V_{UVLO+}	I_F=10mA,V_O >5V	11.0	12.8	13.5	V
		V_{UVLO-}	I_F=10mA,V_O <5V	9.5	11.3	12	
	低电压锁定阈值迟滞 UVLO Hysteresis	U_{VLOHS}	-	-	1.6	-	V
	输入正向电压的温度系数 Temperature Coefficient of Input Forward Voltage	$\Delta V_F/\Delta T_A$	I_F = 10mA	-	-1.8	-	mV/°C
	输入电容 Terminal Capacitance	C_T	V=0, f=1kHz	-	70	-	pF
输出 Output	高电平输出电流 High Level Peak Output Current	I_{OH}	V_O=V_{CC}-1.5V	-	-	-1.0	A
			V_O=V_{CC}-4V	-	-	-3.0	
	低电平输出电流 Low Level Peak Output Current	I_{OL}	V_O = V_{EE}+1.5V	1.0	-	-	A
			V_O = V_{EE}+4V	3	-	-	
	高输出晶体管电阻 High Output Transistor	$R_{DS,OH}$	I_{OH} = -2.5A	-	1.7	3.0	Ω
	低输出晶体管电阻 Low Output Transistor	$R_{DS,OL}$	I_{OL} = 2.5A	-	0.8	1.8	

	高电平输出电压 High Level Output Voltage	V_{OH}	I_F=10mA, Io= -100mA	V_{CC}- 0.3V	V_{CC}- 0.15V	-	V
			I_F=10mA,Io=-3A	V_{CC}- 5V	V_{CC}-3V	-	
	低电平输出电压 Low Level Output Voltage	V_{OL}	Io=100mA	-	0.08	0.25	
			I_O=3A	-	3	5	
	高电平电源电流 High Level Supply Current	I_{CCH}	Rg = 10Ω, Cg=25nF I_F=10mA	-	1.6	3.0	mA
	低电平电源电流 Low Level Supply Current	I_{CCL}	Rg = 10Ω, Cg=25nF, V_F=0V	-	1.9	3.0	
传输特性 Transfer Characteristics	逻辑低电平传输延迟 Propagation Delay Time to Low Output Level	T_{PHL}	V_{CC}=15V to 30V I_F=7mA to 16mA, Rg=10Ω Cg=25nF f=20kHz Duty Cycle=50%	10	149	200	ns
	逻辑高电平传输延迟 Propagation Delay Time to High Output Level	T_{PLH}		10	100	200	ns
	脉宽失真 $\|t_{PHL}-t_{PLH}\|$ Pulse Width Distortion	PWD		-	22	60	ns
	传输延迟差($t_{PHL}-t_{PLH}$) Propagation Delay Difference Between Any Two Parts	PDD		-100	-	100	ns
	输出上升时间(10%~90%) Rise Time(10%~90%)	t_R		-	99	-	ns
	输出下降时间(90%~10%) Fall Time(90%~10%)	t_F		-	90	-	ns
	输出高电平共模抑制 Output High Level Common Mode Transient Immunity	$\|CM_H\|$	T_A =25℃ V_{CM}=1500V	35	50	-	kV/μs
	输出低电平共模抑制 Output Low Level Common Mode Transient Immunity	$\|CM_L\|$		35	50	-	kV/μs
	隔离电阻 Isolation Resistance	R_{ISO}	V_{I-O}≤500V	5×10^{12}	-	-	Ω
	隔离电容 Isolation Capacitance	C_{ISO}	V_{I-O}=0V, Freq=1.0MHz	-	0.6	-	pF

典型光电特性曲线 Typical Electro-Optical Characteristics Curves

Fig.1 High Output Rail Voltage vs. Ambient Temperature

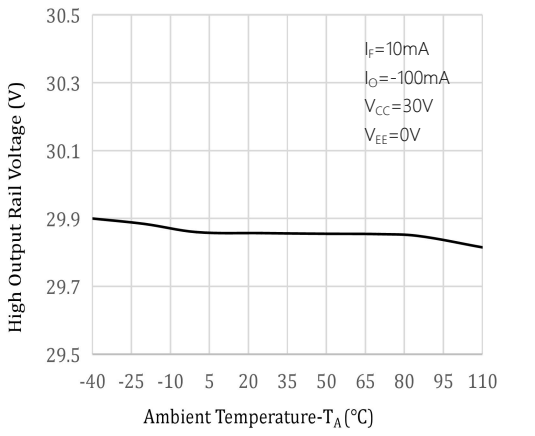


Fig.2 High Output Voltage vs. Ambient Temperature

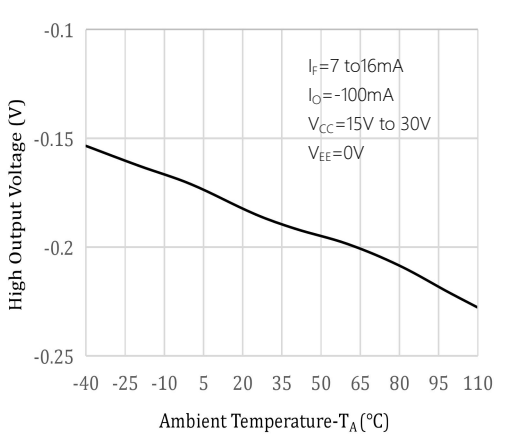


Fig.3 Output Low Voltage vs. Ambient Temperature

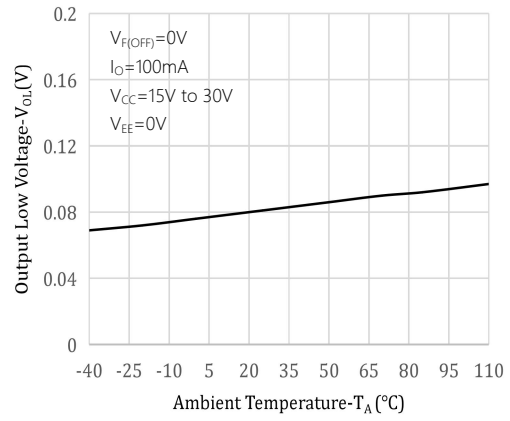


Fig.4 Supply Current vs. Ambient Temperature

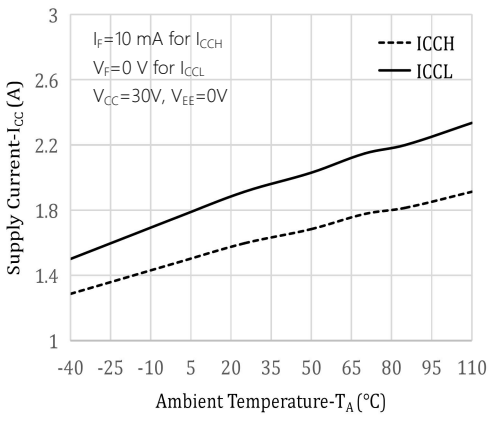


Fig.5 Supply Current vs. Supply Voltage

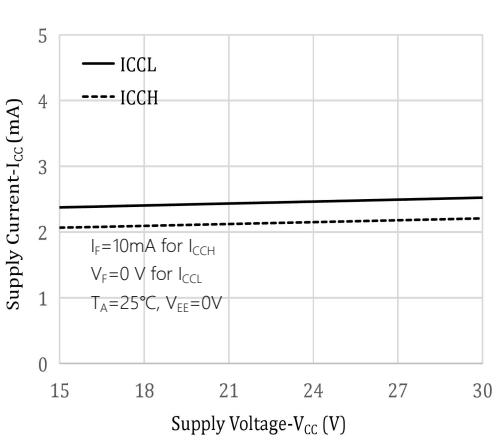


Fig.6 Output Voltage vs. Low To High Current Threshold

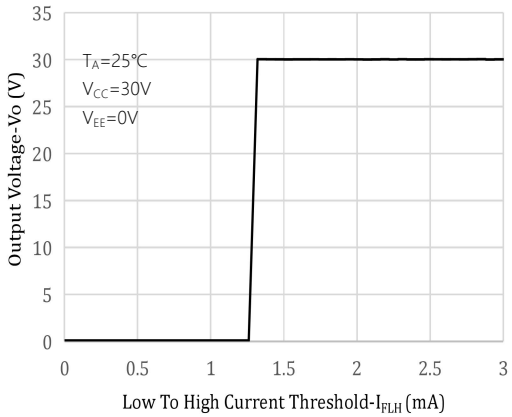


Fig.7 Low To High Current Threshold vs. Ambient Temperature

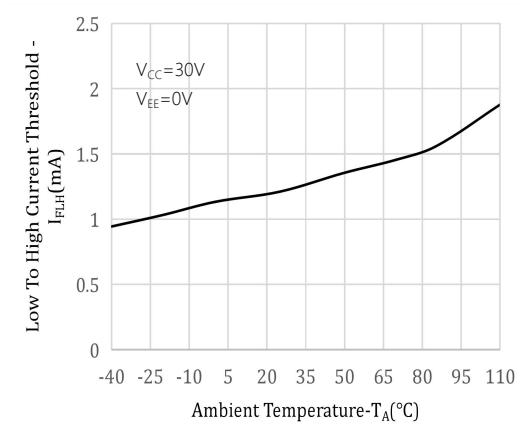


Fig.8 Propagation Delay vs. Supply Voltage

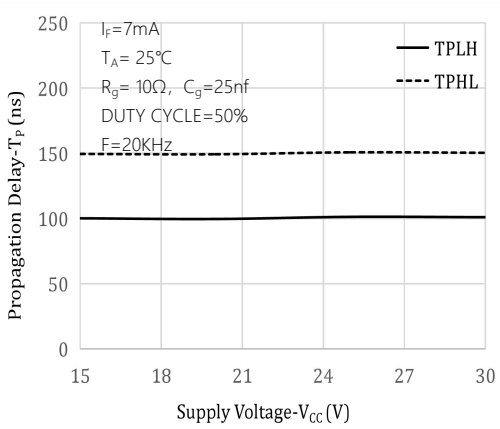


Fig.9 Propagation Delay vs. Input Forward Current

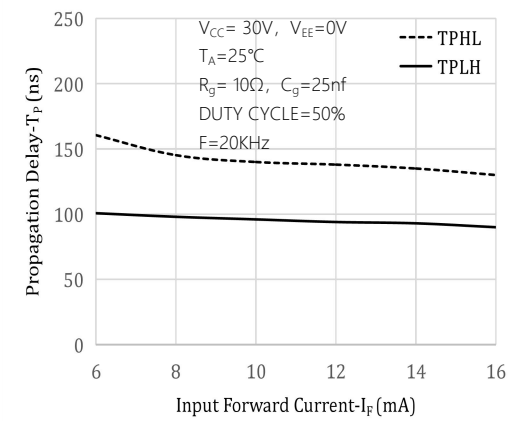


Fig.10 Propagation Delay vs. Ambient Temperature

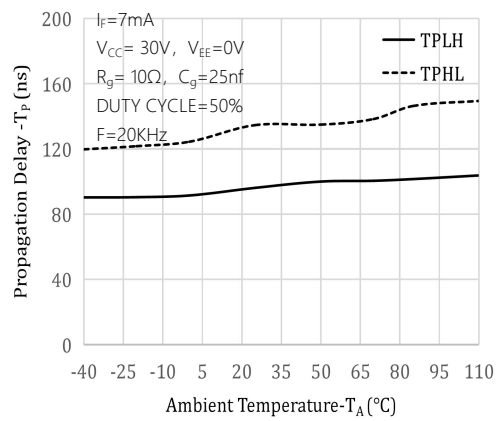
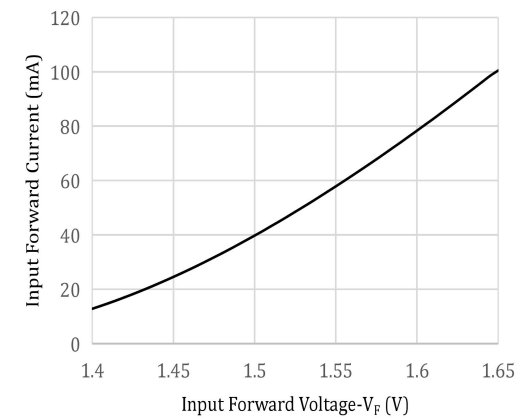


Fig.11 Input Forward Current vs. Input Forward Voltage



实验测试电路 Test Circuit

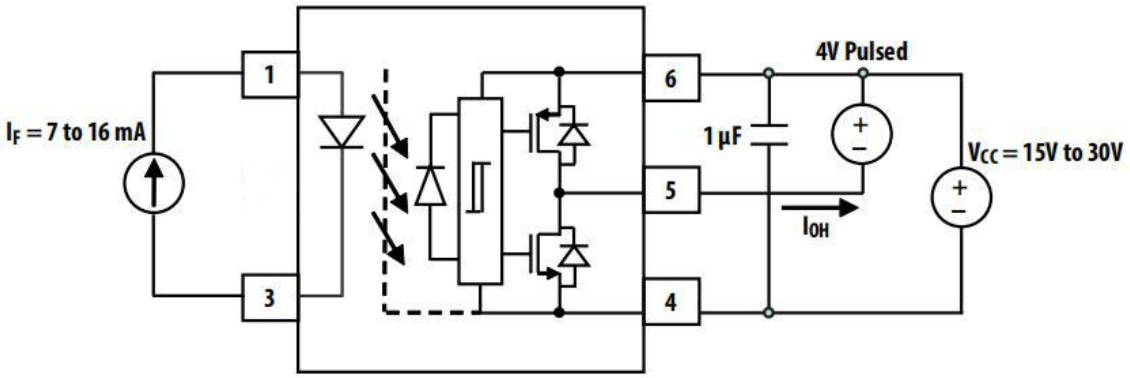


Fig.12 I_{OH} Test Circuit

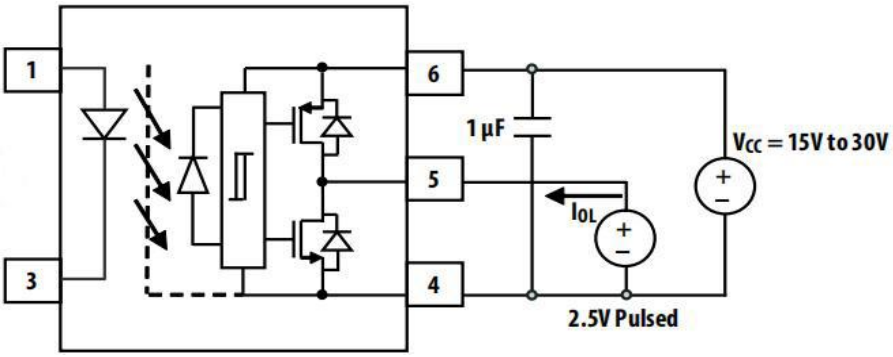


Fig.13 I_{OL} Test Circuit

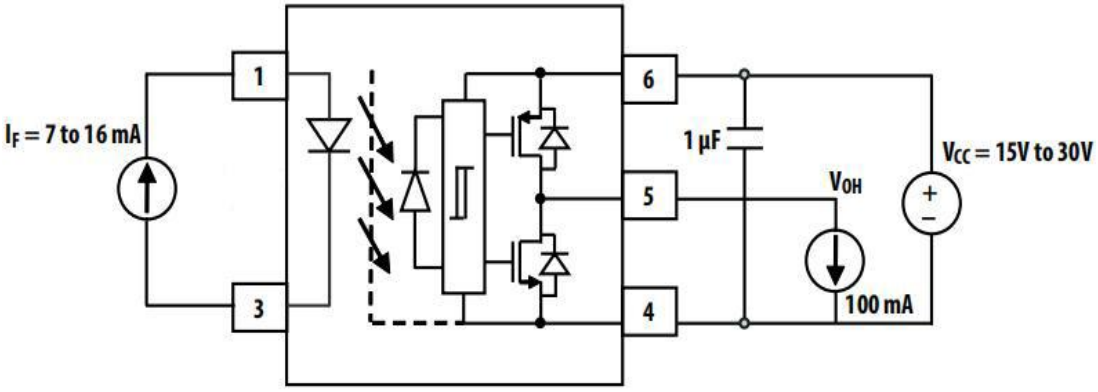


Fig.14 V_{OH} Test Circuit

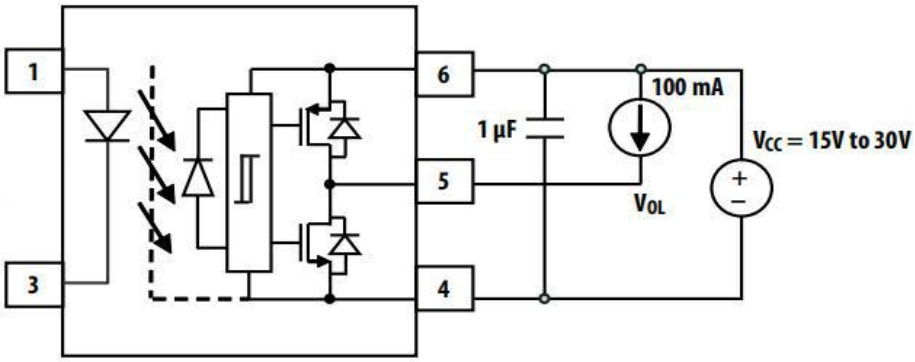


Fig.15 V_{OL} Test Circuit

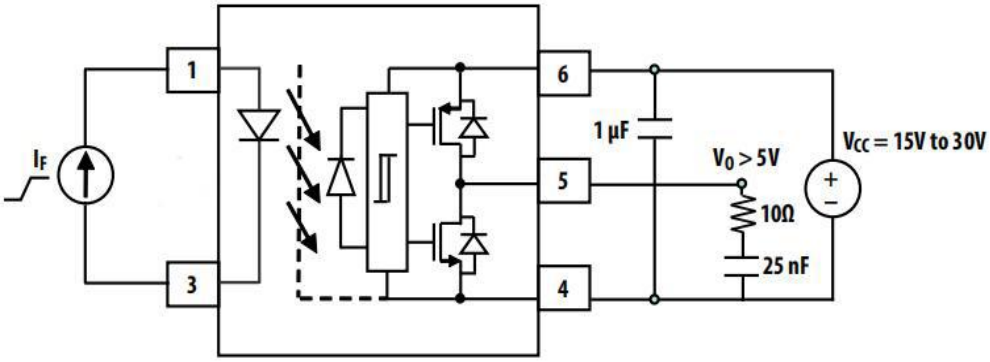


Fig.16 I_{FLH} Test Circuit

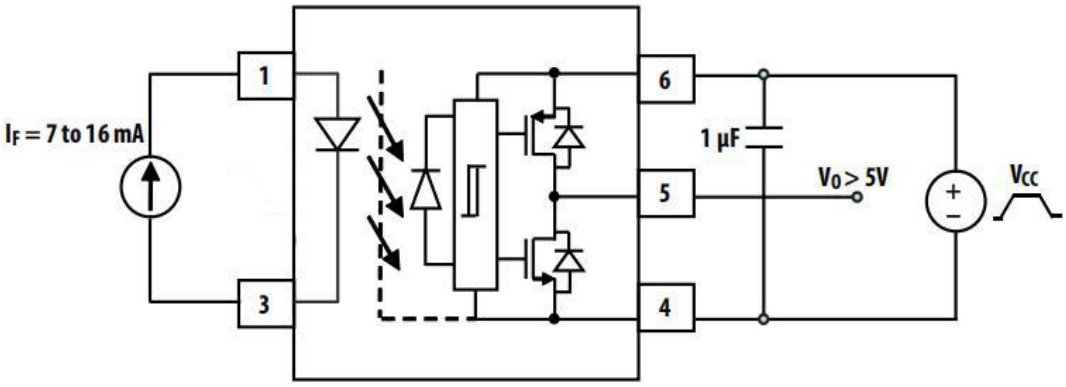


Fig.17 UVLO Test Circuit

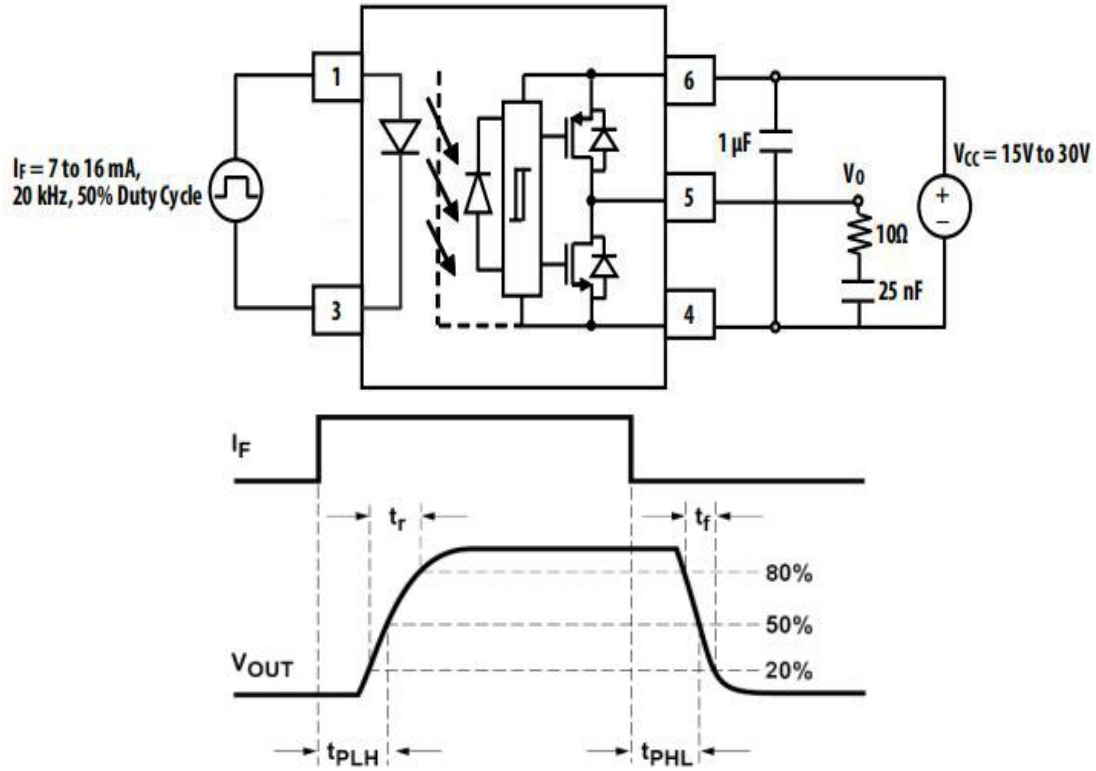


Fig.18 T_{PHL}、T_{PLH}、T_R、T_F Test Circuit

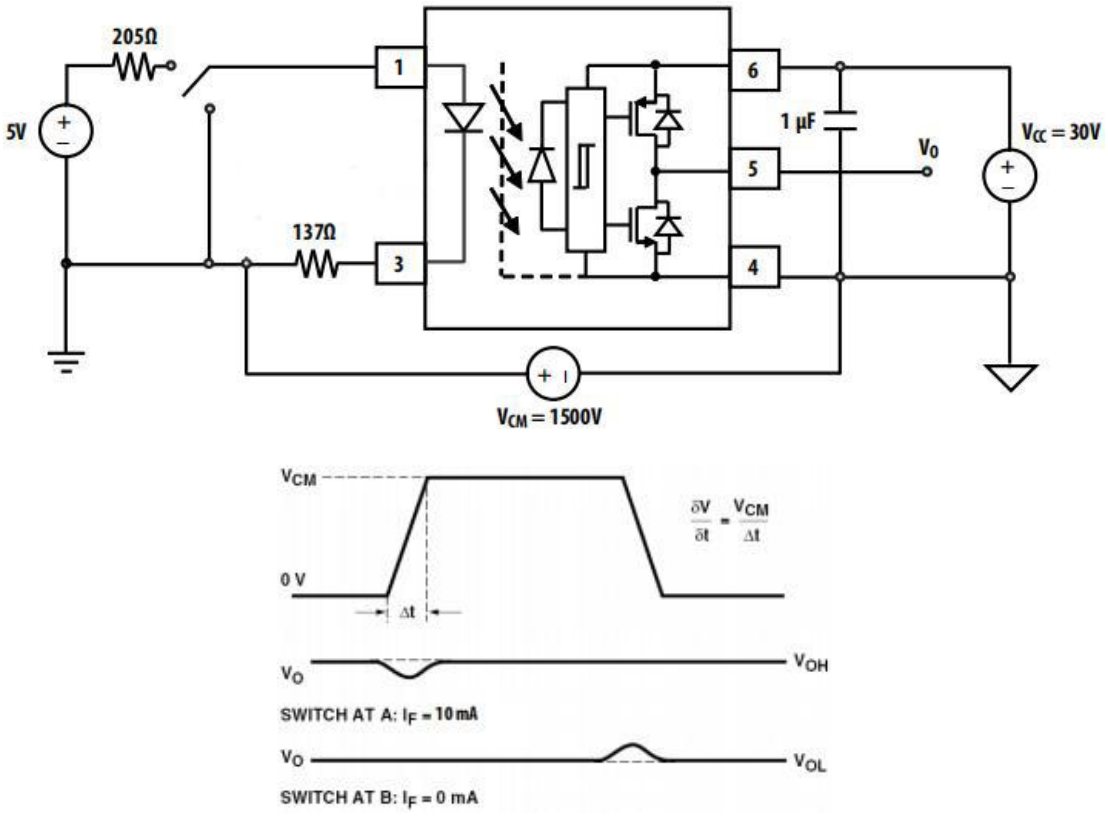
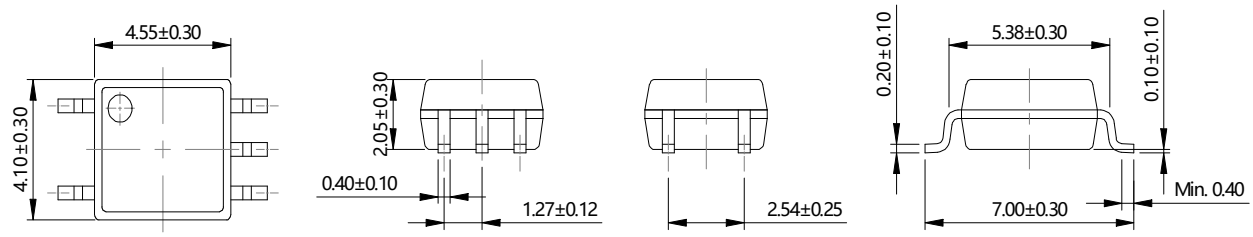


Fig.19 CMR Test Circuit

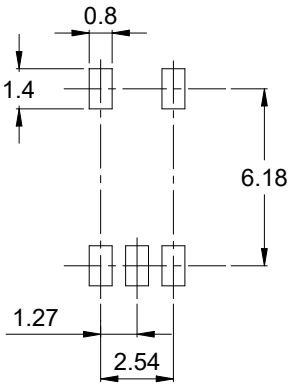
外形尺寸 Package Dimensions

SOP5



单位 Unit: mm

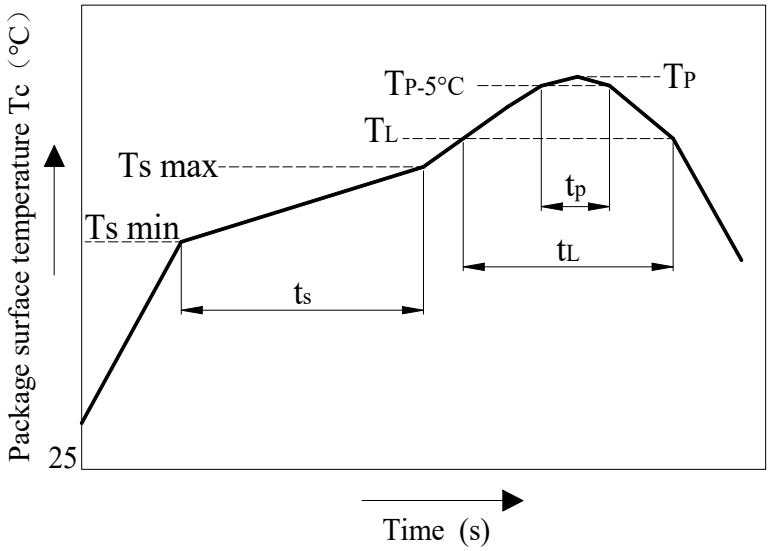
建议焊盘布局 Land Pattern Dimensions



单位 Unit: mm

注：上图为产品正视图。
Note：The picture above is the front view of the product.

回流焊温度曲线图 Solder Reflow Profile

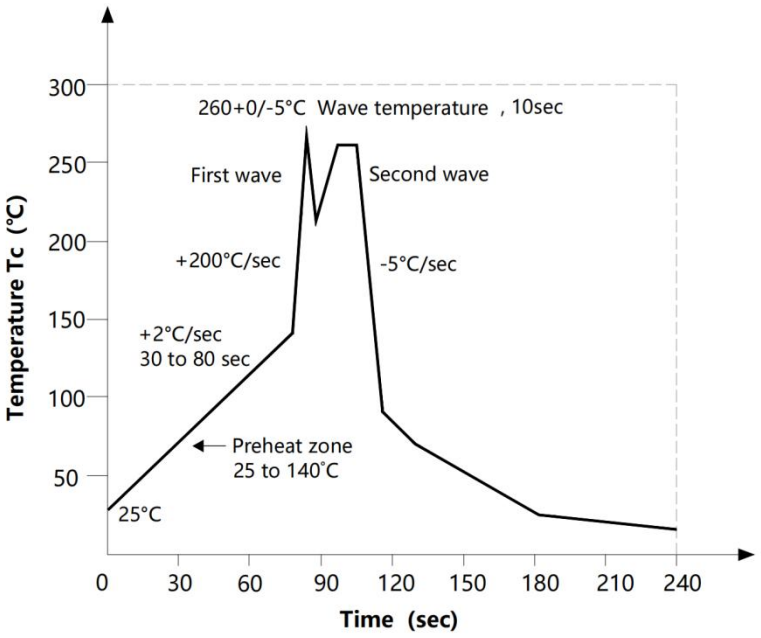


项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	Ts	150	200	℃
预热时间 Preheat Time	ts	60	120	s
升温速率 Ramp-Up Rate (T_L to T_P)	-	-	3	℃/s
液相线温度 Liquidus Temperature	T_L	217		℃
时间高于 T_L Time Above T_L	t_L	60	150	s
峰值温度 Peak Temperature	T_P	-	260	℃
Tc 在(T_P-5)和 T_P 之间的时间 Time During Which Tc is Between (T_P-5) and T_P	t_p	-	30	s
降温速率 Ramp-down Rate(T_P to T_L)	-	-	6	℃/s

注：建议在所示的温度和时间条件下进行回流焊，最多不能超过三次。

Note: Reflow soldering is recommended at the temperatures and times shown, no more than three times.

波峰焊温度曲线图 Wave Soldering Profile



手工烙铁焊接 Soldering with hand soldering iron

A. 手工烙铁焊仅用于产品返修或样品测试；

Hand soldering iron is only used for product rework or sample testing;

B. 手工烙铁焊要求：温度 360℃ ± 5℃，时间≤3s。

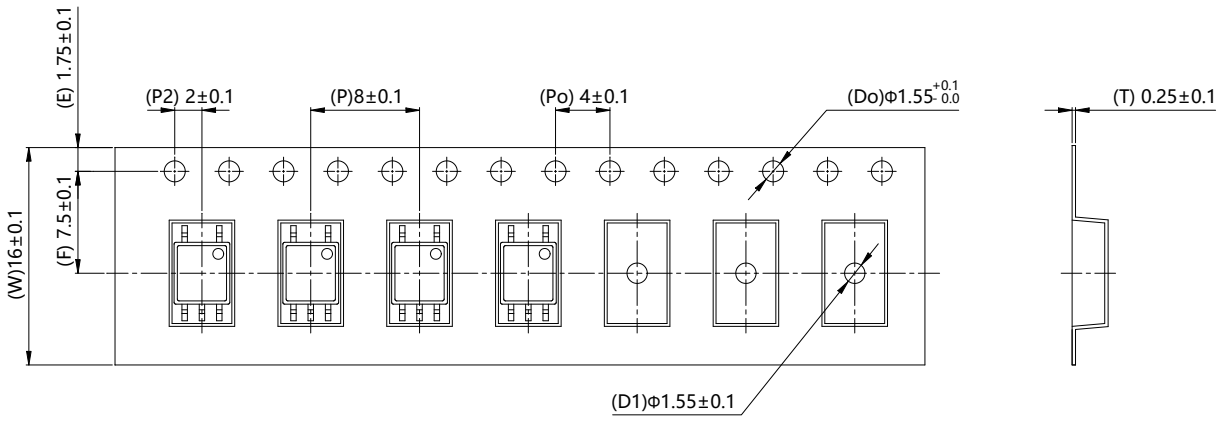
Manual soldering method Temperature: 360℃ ± 5℃, within 3s.

包装 Packing

封装形式	包装方式	盘数量	盒数量	箱数量	静电袋规格	盒规格	箱(双瓦楞)规格	备注
SOP5	卷盘 (ϕ330mm 蓝盘)	3000 只/盘	2 盘/盒	10 盒/箱	450*390*0.1mm	353*340*60 mm	650*375*365mm	首端空 50 个空格， 末端空 100 个空格
Package Type	Packing Form	Quantity per Reel	Quantity per Box	Quantity per Carton	Antistatic Bag Specification	Box Specification	Carton Specification	Note
SOP5	Reel (ϕ330mm Blue)	3000 pcs/reel	2 reels/box	10 boxes/ctn	450*390*0.1mm	353*340*60 mm	650*375*365mm	Leave 50 Spaces at the beginning and 100 Spaces at the end

■ 编带包装 Tape & Reel

1) 每盘数量：3000 只。
   Qty/reel：3000pcs.
2) 每箱数量：60000 只。
   Qty/ctn：60000pcs.
3) 内包装：每盒 2 盘。
   Inner packing：2 reels/box.
4) 示意图 Schematic：



单位 Unit：mm

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