NQUNXIN
群芯微电子

中国芯 光电梦



栅极驱动光耦

Gate Drive Optocoupler

QXM314

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

QXM314 是一种输出电流为 0.6A 的栅极驱动光电耦合器，具有一个镓砷磷化合物（GaAsP）的发光二极管，通过红外光耦合到光敏集成电路。这种光电耦合器可驱动大多数的小功率 IGBTs 和MOSFETs。在电机控制逆变器以及高性能电力系统应用中，其非常适用于快速切换驱动功率 IGBTs 和MOSFETs。

The QXM314 is a gate driven optocoupler with an output current of 0.6 A, with an GaAsP LED, which is coupled to a photosensitive integrated circuit through infrared light. This optocoupler can drive most low-power IGBTs and MOSFETs. In the motor control inverter and high-performance power system applications, it is very suitable for fast switching drive power IGBTs and MOSFETs.

特性 Features

- 工作温度范围：-40℃ to +105℃；
  Operating temperature range: -40℃ ~ +105℃;
- 最大传播延迟：200ns
  200ns maximum propagation delay
- 共模瞬态抗扰度：±20kV/us；
  Common-mode transient immunity:±20kV/us
- 传播延迟差：±85ns；
  Propagation delay difference between any two Parts: ±85ns
- 隔离电压：3750 V_{rms} (最小值)
  Isolation voltage: 3750 V_{rms} (min)
- 最小峰值输出电流：0.4A
  0.4A Minimum peak output current
- 最大峰值输出电流：0.6A
  0.6A Maximum peak output current
- 符合加强绝缘标准
  Meet reinforced insulation standards.

应用 Applications

- 等离子显示面板(PDPs)
  Plasma Display Panels (PDPs)
- 晶体管逆变器
  Transistor Inverters
- MOSFET 栅极驱动器
  MOSFET Gate Drivers
- IGBT 栅极驱动器
  IGBT Gate Drivers

真值表 Truth table

LED	V_{CC}-V_{SS} " POSITIVE GOING" (TURN-ON)	V_{CC}-V_{SS} "NEGATIVE GOING" (TURN-OFF)	VO
OFF	0~30V	0~30V	LOW
ON	0~6.9V	0~5.9V	LOW
ON	6.9~8.7V	5.9~7.5V	TRANSITION
ON	8.7~30V	7.5~30V	HIGH

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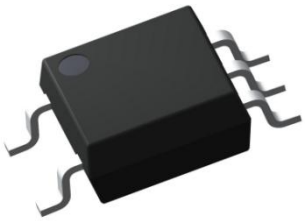
封装和原理图 Package and Schematic Diagram



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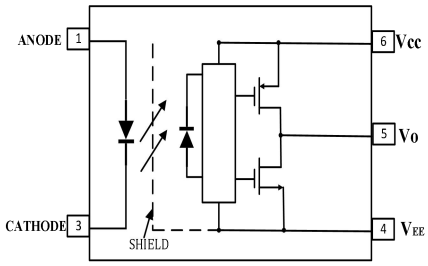

Pin Configuration
1. Anode
3. Cathode
4. VEE
5. VO
6. VCC

注：引脚 4 和 6 之间必须连接一个 0.1uF 的旁路电容。

Note: A 0.1uF bypass capacitor must be connected between pins 4 and 6.

产品型号命名规则 Order Code

QX M314 - 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（M314）
③ 框架类型 Lead Frame（Cu: 铜框架 Copper）
④ 树脂类型 Epoxy Type（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"◔"为群芯品牌 LOGO
  "◔"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
- 印字中的"E"代表经济型产品
  "E"denotes the economical product.
- 印字中的"H"代表无卤
  "H"denotes Halogen-free



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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	≥5	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}	T_A = 25°C, RH < 50% for 1 min.

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

参数 Parameter		符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
输入 Input	平均输入电流 Average Current Input	$I_{F(AVG)}$	-	20	mA
	峰值瞬态输入电流（<1 us pulse, 300pps） Peak Transient Input Current（<1 us Pulse, 300pps）	$I_{F(TRAN)}$	-	1	A
	反向电压 Reverse Voltage	V_R	5	-	V
输出 Output	高峰值输出电流 High Peak Output Current	$I_{OH(PEAK)}$	-	-0.6	A
	低峰值输出电流 Low Peak Output Current	$I_{OL(PEAK)}$	-	0.6	A
	电源电压 Supply Voltage	V_{CC}	-	35	V
	峰值输出电压 Peak Output Voltage	V_O	-	35	V
隔离电压 Isolation Voltage		V_{ISO}	3750	-	V_{rms}
工作温度 Operating Temperature		T_{opr}	-40	+105	°C
储存温度 Storage Temperature		T_{STG}	-55	+125	°C
焊接温度 Soldering Temperature		T_{sol}	-	260	°C

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推荐操作条件 Recommended Operating Conditions

参数 Parameter	符号 Symbol	最小值 Min	最大值 Max.	单位 Unit
电源电压 Power Supply Voltage	V_{CC}	10	30	V
开启电流 Input Current (ON)	I_{FLH}	10	15	mA
关断电压 Input Voltage (OFF)	V_{FHL}	0	0.8	V
高电平峰值输出电流 Peak high-level output current	I_{OH}	-	-0.2	A
低电平峰值输出电流 Peak low-level output current	I_{OL}	-	0.2	A
工作温度 Operating temperature	T_{opr}	-40	+105	℃
工作频率 Operating frequency	F	-	250	kHz

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 V_{CC}=30V, V_{SS}=Ground, T_A=25℃ 下测量

Unless otherwise specified, as appropriate for all recommended conditions, typical values are measured at V_{CC}=30V, V_{SS}=Ground, T_A=25℃.

参数 Parameter		符号 Symbol	条件 Condition	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
发射端 Input	正向电压 Forward Voltage	V_F	I_F=10mA	1.2	1.4	1.8	V
	反向电压 Reverse Voltage	B_{VR}	I_R=10uA	5	-	-	V
	阈值电流从低到高 Threshold Input Current Low to High	I_{FLH}	Io=0mA，V_O >5V	-	0.6	7.5	mA
	阈值电压从高到低 Threshold Input Voltage High to Low	V_{FHL}	Io=0mA，V_O <5V	0.8	-	-	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 Input Capacitance	C_{IN}	V=0, F=1kHz	-	85	-	pF
接收端 Output	高电平输出电流 High Level Output Current	I_{OH}	V_O=V_{CC}-4V	-	-0.5	-0.2	A
			V_O=V_{CC}-10V	-	-	-0.4	
	低电平输出电流 Low Level Output Current	I_{OL}	V_O=V_{SS}+2V	0.2	0.5	-	
			V_O=V_{SS}+10V	0.4	-	-	

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参数 Parameter		符号 Symbol	条件 Condition	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
	高电平输出电压 High Level Output Voltage	V_{OH}	I_F = 10mA, Io= -100mA	V_{CC}-0.6V	V_{CC}-0.35V	-	V
	低电平输出电压 Low Level Output Voltage	V_{OL}	I_F = 0mA, Io= 100mA	-	V_{SS}+0.25V	V_{SS}+0.4V	V
	高电平电源电流 High Level Power Supply Current	I_{CCH}	I_F=10mA, V_{CC}=10 to 30V	-	1.6	3	mA
	低电平电源电流 Low Level Power Supply Current	I_{CCL}	I_F=0mA, V_{CC}=10 to 30V	-	1.5	3	
传输特性 Transfer Characteristics	低电压锁定阈值 UVLO Threshold	V_{UVLO+}	I_F=10mA, V_O>5V	6.9	7.8	8.7	V
		V_{UVLO-}	I_F=10mA, V_O<5V	5.9	6.7	7.5	V
	低电压锁定阈值迟滞 UVLO Hysteresis	U_{VLOHYS}	-	-	1.1	-	V
	低电平传输延迟 Propagation Delay Time to Low Output Level	T_{PHL}	V_{CC}=30V I_F=8mA Rg=47Ω Cg=3nF f =10 kHz Duty Cycle=50%	50	170	250	ns
	高电平传输延迟 Propagation Delay Time to High Output Level	T_{PLH}		50	120	250	ns
	传输延迟差 Propagation Delay Difference Between Any Two Parts	PDD		-85	-	85	ns
	上升时间(10%~90%) Rise Time	T_R		-	61	-	ns
	下降时间(90%~10%) Fall Time	T_F		-	60	-	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	20	-	-	kV/μs
	输出低电平共模抑制 Output Low Level Common Mode Transient Immunity	$\|CM_L\|$		20	-	-	kV/μs
	隔离电阻 Isolation Resistance	R_{ISO}	V_{I-O}≤500V	10^{12}	-	-	Ω
	隔离电容 Isolation Capacitance	C_{ISO}	V_{I-O} =0V f=1.0MHz	-	0.9	-	pF

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

Fig.1 High Level Output Voltage vs. Ambient Temperature

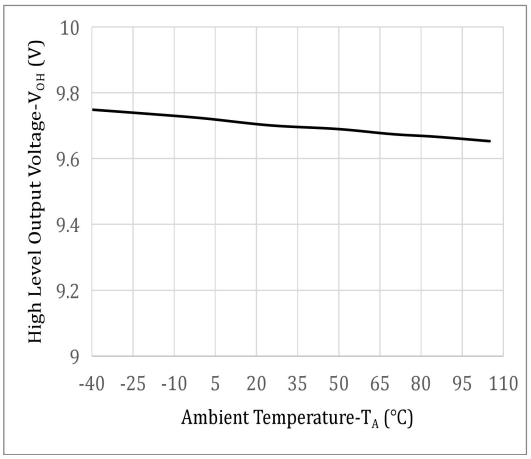

Fig.2 High Level Output Current vs Ambient Temperature

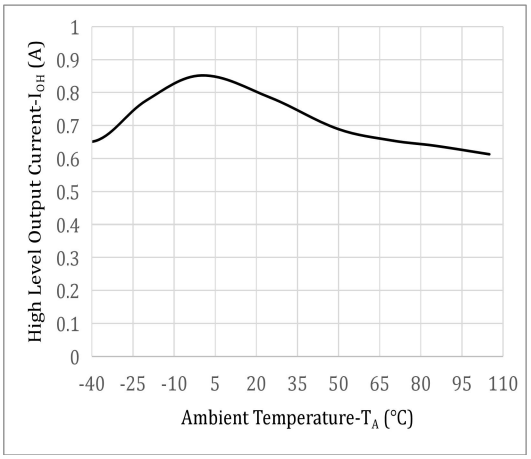

Fig.3 High Level Output Voltage vs High Level Output Current

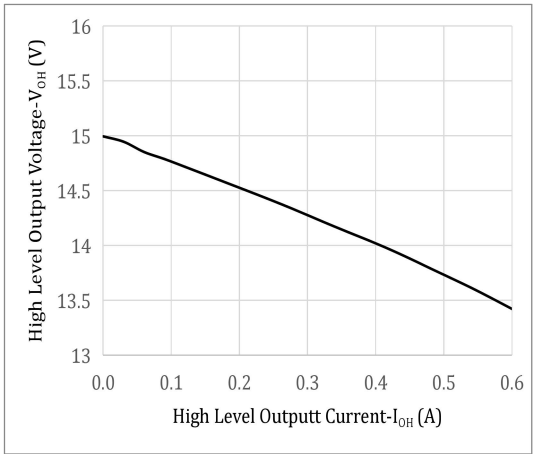

Fig.4 Low Level Output Voltage vs Ambient Temperature

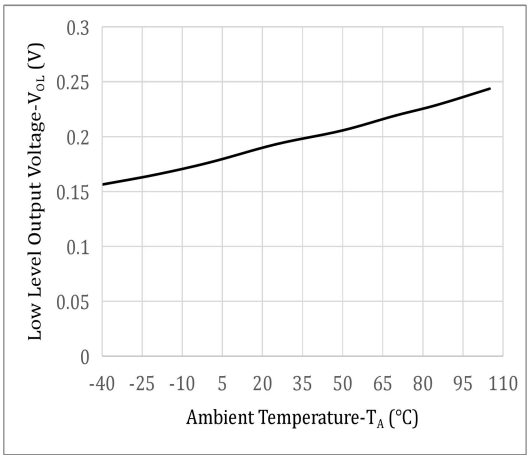

Fig.5 Low Level Output Current vs Ambient Temperature

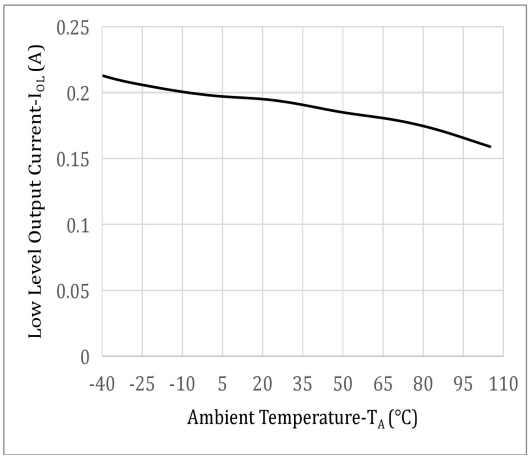

Fig.6 Low Level Output Voltage vs Low Level Output Current

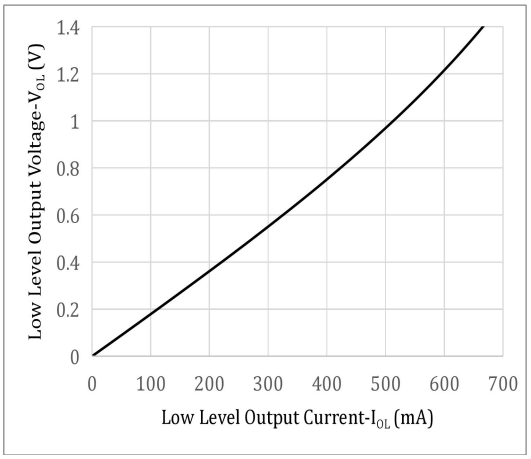

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Fig.7 Supply Current vs Ambient Temperature

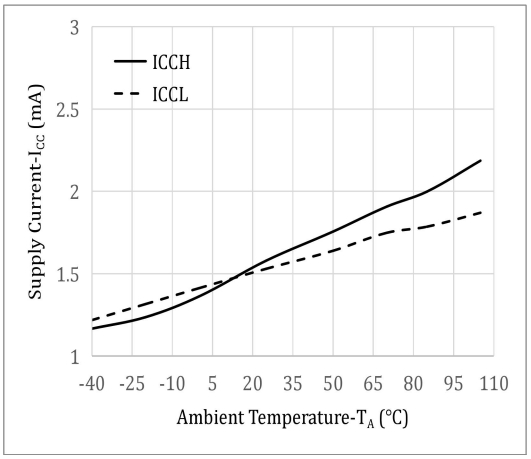

Fig.8 Supply Current vs Supply Voltage

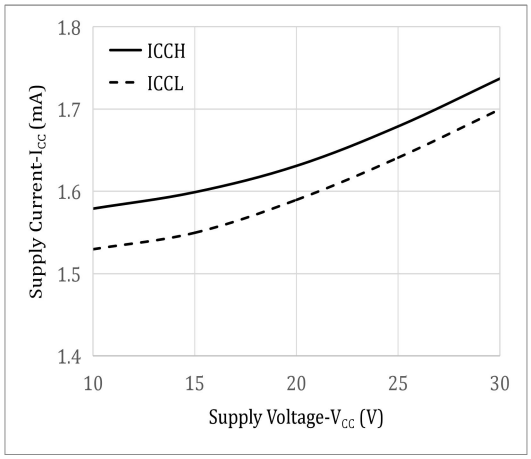

Fig.9 Threshold Input Current Low to High vs Ambient Temperature

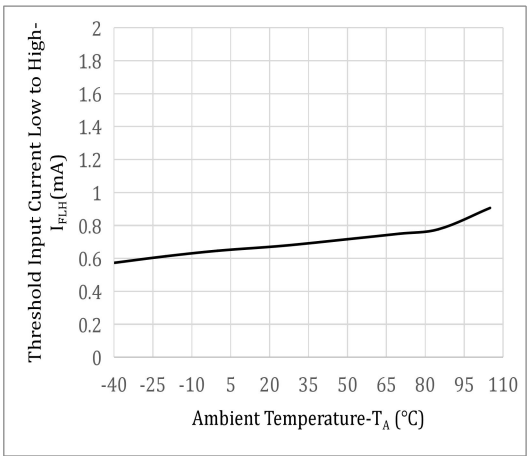

Fig.10 Propagation Delay vs. Supply Voltage

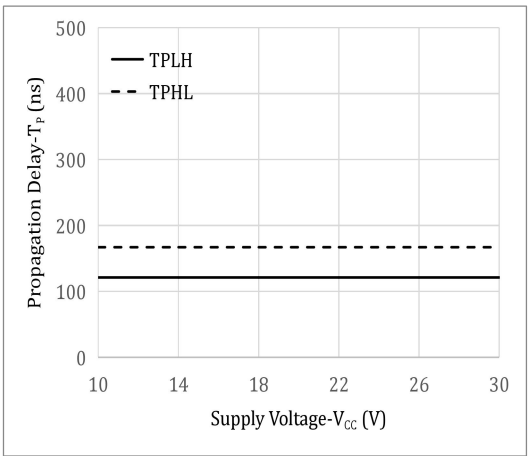

Fig.11 Propagation Delay vs Input Forward Current

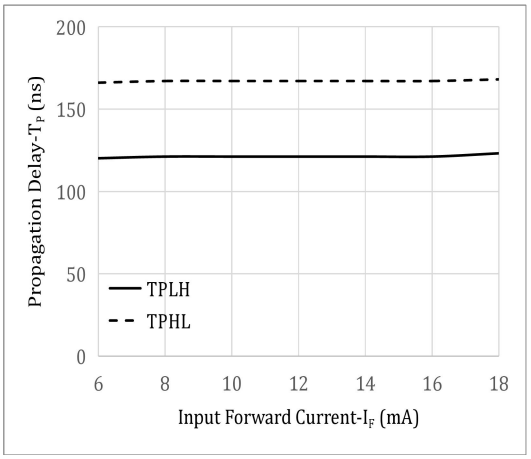

Fig.12 Propagation Delay vs Ambient Temperature

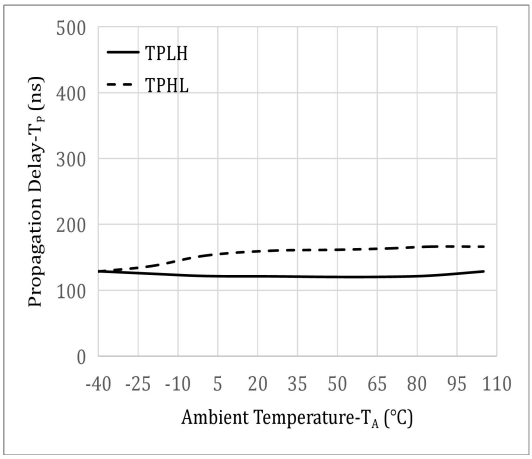

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Fig.13 Propagation Delay vs. Load Resistance

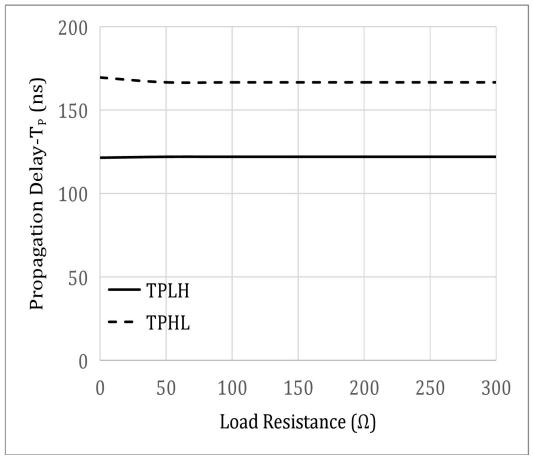


Fig.14 Propagation Delay vs. Load Capacitance

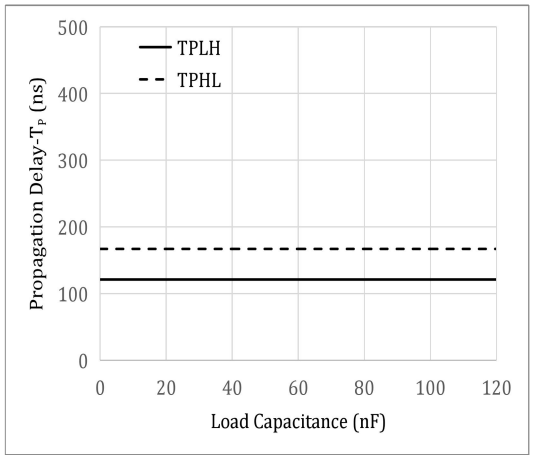


Fig.15 Output Voltage vs Forward Current

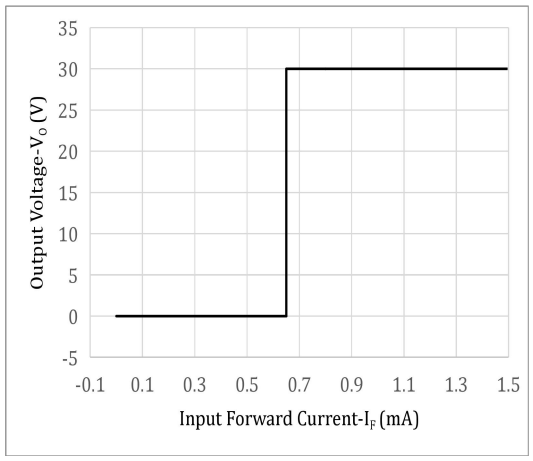
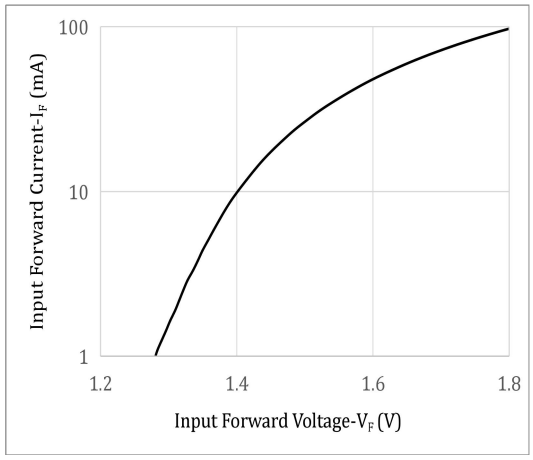


Fig.16 Input Forward Current vs Forward Voltage



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测试电路 Test Circuits

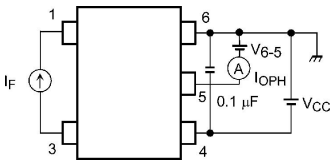


Fig.17 I_{OH} Test Circuit

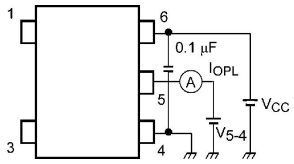
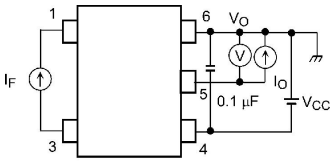


Fig.18 I_{OL} Test Circuit



*$V_{OH} = V_{CC}-V_O$

Fig.19 V_{OH} Test Circuit

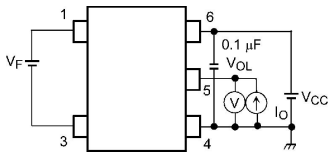


Fig.20 V_{OL} Test Circuit

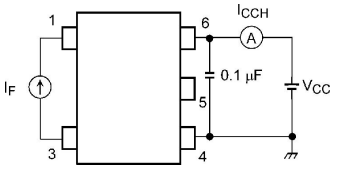


Fig.21 I_{CCH} Test Circuit

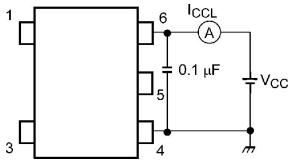


Fig.22 I_{CCL} Test Circuit

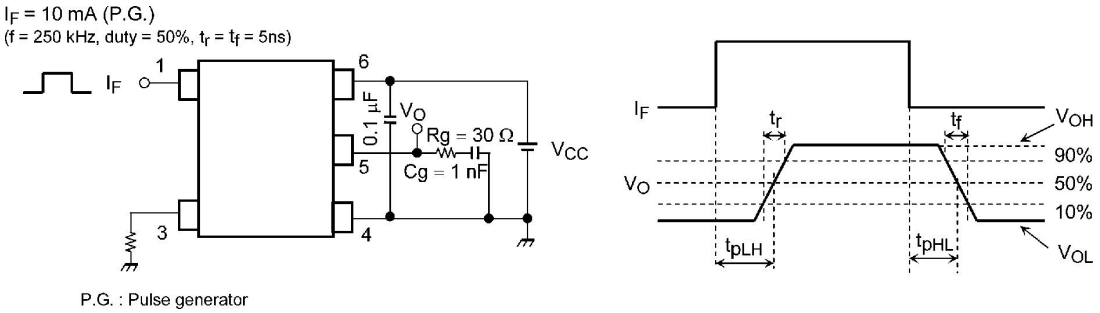
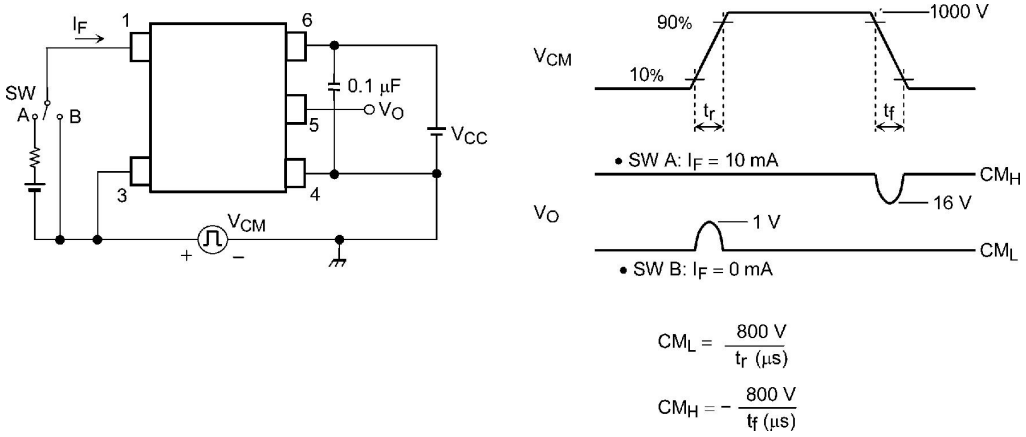


Fig.23 Switching Time Test Circuit and Waveform



$$CM_L = \frac{800\ V}{t_r\ (\mu s)}$$

$$CM_H = -\frac{800\ V}{t_f\ (\mu s)}$$

Fig.24 Common-Mode Transient Immunity Test Circuit and Waveform

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外形尺寸 Outline Dimensions

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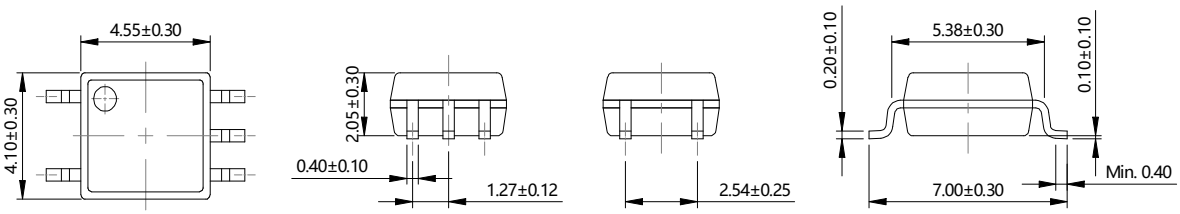
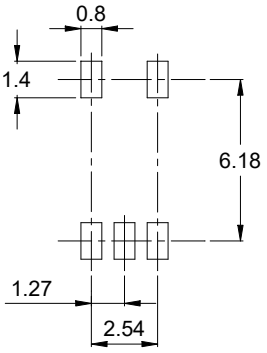


单位 Unit: mm

建议焊盘布局 Recommended Pad Layout



单位 Unit: mm

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

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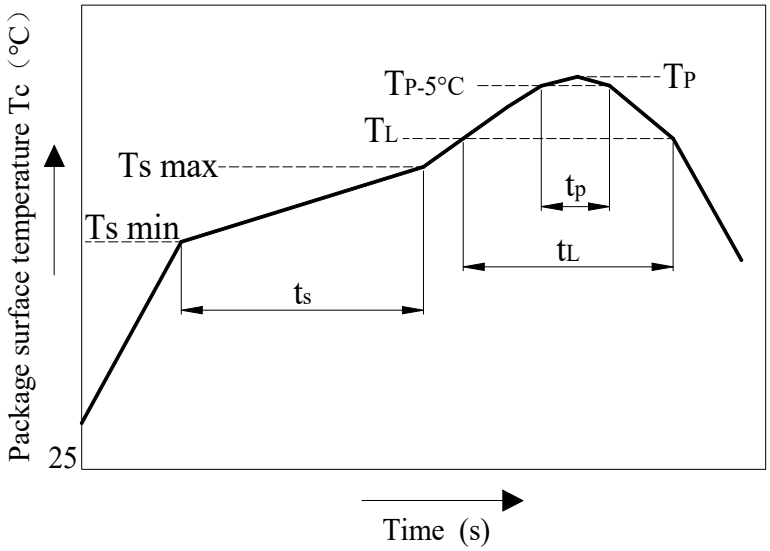
回流焊温度曲线图 Solder Reflow Profile



项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	T_s	150	200	℃
预热时间 Preheat Time	t_s	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	℃
T_C 在(T_P-5)和 T_P 之间的时间 Time During Which T_C 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

注意：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.

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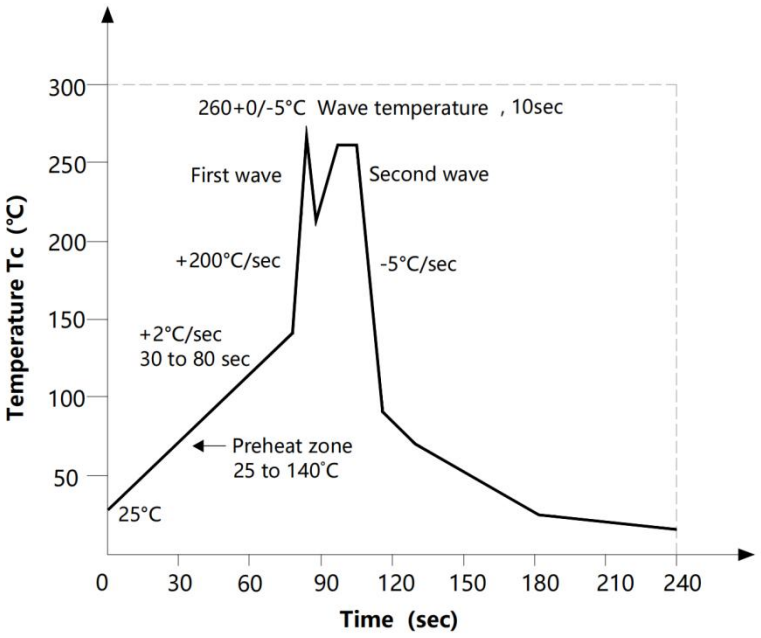
波峰焊温度曲线图 Wave Soldering Profile



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.

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包装 Packing

■ 汇总表 Summary table

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*0.1 mm	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*0.1 mm	353*340*60 mm	650*375*365mm	Leave 50 Spaces at the beginning and 100 Spaces at the end

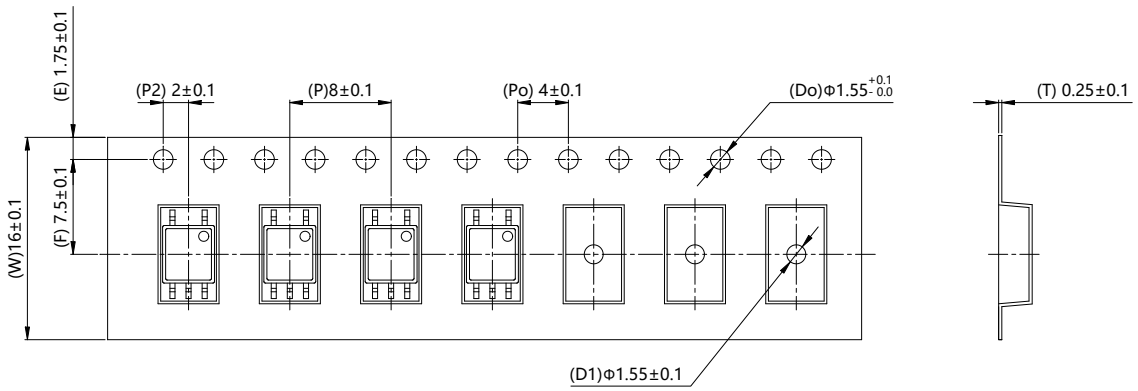
■ 编带包装 Tape & Reel

1) 每卷数量：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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