NQUNXIN
群芯微电子

中国芯 光电梦



高速光耦

High Speed Photo Coupler

QXW6XX

宁波群芯微电子股份有限公司
NINGBO QUNXIN MICROELECTRONICS CO., LTD.

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68 Yuhaidong Road, Hangzhou Bay New District, Ningbo, Zhejiang, China

QXW600 QXW601 QXW611

High Speed 10Mbit/s Logic Gate

概述 Description

QXW600、QXW601、QXW611 内部有一个 850nm 的 AlGaAS LED，其光学耦合到具有选通输出的超高速集成光电检测器。

The QXW600 QXW601 QXW611 optocoupler consists of a 850 nm AlGaAS LED, optically coupled to a very high speed integrated photo-detector logic gate with a strobable output.

特性 Features

- 高速 10 Mbit/s
  High speed – 10 Mbit/s
- 输入-输出高隔离电压 (V_{ISO}=5000 Vrms)
  High isolation voltage between input and output(V_{ISO}=5000 Vrms)
- 工作温度：-40℃~110℃
  Operating Temperature: -40℃~110℃
- 逻辑门输出
  Logic gate output
- 符合安规标准：UL 1577，VDE DIN EN60747-5-5 (VDE 0884-5)，CQC11-471543-2022
  Meet Safety standard : UL 1577, VDE DIN EN60747-5-5 (VDE 0884-5)，CQC11-471543-2022

应用 Applications

- 接地回路消除
  Ground loop elimination
- 开关电源
  Switching power supplies
- 计算机外围接口
  Computer-peripheral interface
- LSTTL 转 TTL, LSTTL 或 5V CMOS
  LSTTL to TTL, LSTTL or 5-volt CMOS
- 线路接收器，数据传输
  Line receiver, data transmission

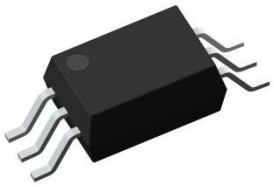
真值表 Truth table

LED	VO
OFF	H
ON	L

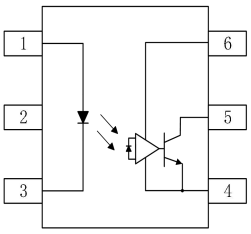
封装和原理图 Package and Schematic Diagram



SOP6-P



SOP6-W



Pin Configuration
1. Anode
2. NC
3. Cathode
4. GND
5. VO
6.VCC

注：在引脚 4 和 6 之间必须连接一个 0.1uF 的旁路电容器。

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

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产品型号命名规则 Order Code

QX W6XX - UN Y - W (V) (ZZ)

① ② ③ ④ ⑤ ⑥ ⑦

① 公司代码 Company Code（QX: 群芯 Qunxin）
② 产品系列 Product Series（XX: 00, 01, 11）
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（P: SOP6-P ; W: SOP6-W）
⑥ 器件工作温度范围 Device Operating Temperature Range（特殊范围需填或者空白 Special Range need to be filled in or left blank）
⑦ 内部补充代码 Internal Supplementary Code（数字或者空白 Number or None

印字信息 Marking Information

- 印字中"G"为群芯品牌 LOGO
  "G"denotes LOGO
- 印字中的"XX"代表产品分档：00、01、11
  "XX"denotes the classification：00、01、11
- 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 day of the week.
- 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 Remark
爬电距离 Creepage Distance	L	> 8.0	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	> 8.0	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	> 0.4	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}	1500	V_{peak}	DIN/EN/IEC EN60747-5-5
瞬态隔离电压 Transient isolation voltage	V_{IOTM}	7000	V_{peak}	DIN/EN/IEC EN60747-5-5
隔离电压 Isolation Voltage	Viso	> 5000	Vrms	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	正向电流 Forward Current	I_F	50	mA
	反向电压 Reverse Voltage	V_R	5	V
	输入功耗 Input Power Dissipation	P_I	100	mW
接收端 Output	电源电压 Supply Voltage	V_{CC}	7	V
	输出电流 Output Current	I_O	50	mA
	输出电压 Output Voltage	V_O	7	V
	输出集电极功耗 Output Collector Power Dissipation	P_O	85	mW
工作温度 Operating Temperature		T_{opr}	-40 to +110	℃
存储温度 Storage Temperature		T_{stg}	-55 to +125	℃
焊接温度 Soldering Temperature		T_{sol}	260	℃

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推荐工作条件 Recommended Operating Conditions

参数 Parameter	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
低电平输入电流 Input Current , Low level	I_{FL}	0	250	uA
高电平输入电流 Input Current , High level	I_{FH}	6	15	mA
电源电压 Supply Voltages	V_{CC}	2.7	5.5	V
输出上拉电阻 Output Pull-up Resistor	R_L	330	4k	Ω
操作温度 Operating Temperature	T_A	-40	+110	℃

产品特性参数 Electro-optical Characteristics (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	-	1.33	1.8	V
	反向击穿电压 Reverse Breakdown Voltage	BV_R	I_R=10μA	5	20	45	V
	输入电容 Input Capacitance	C_{IN}	V=0, f=1MHz	-	70	-	pF
	正向电压的温度系数 Diode Temperature Coefficient	$\Delta V_F/\Delta T_A$	I_F=10mA	-	-1.9	-	mV/°C
接收端 Output	高电平电源电流 High Level Supply Current	I_{CCH}	I_F=0mA, V_{CC}=5.5V V_O=Open	-	6.0	9	mA
	低电平电源电流 Low Level Supply Current	I_{CCL}	I_F=10mA, V_{CC}=5.5V V_O=Open	-	7.5	10	mA
传输特性 Transfer Characteristics	高电平输出电流 High Level Output Current	I_{OH}	I_F=250uA V_{CC}=V_O=5.5V	-	2.1	30	μA
	低电平输出电压 Low Level Output Voltage	V_{OL}	I_F=5mA, V_{CC}=5.5V I_{OL}=13mA	-	0.4	0.6	V
	输入阈值电流 Input Threshold Current	I_{FT}	V_{CC}=5.5V, I_{OL}=13mA V_O<0.6V	-	2.4	5	mA
隔离电压 Isolation Voltage		V_{ISO}	R_H<50% I_{I-O}≤50μA	5000	-	-	V_{RMS}
隔离电阻 Isolation Resistance		R_{I-O}	V_{I-O}=500V	-	10^{12}	-	Ω
隔离电容 Isolation Capacitance		C_{I-O}	V=0, f=1MHz	-	0.6	-	pF

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开关特性 Switching Specification (T_A=25℃)

参数 Parameter		符号 Symbol	条件 Condition	最小 Min.	典型 Typ.	最大 Max.	单位 Unit
输出高电平传播延迟 Propagation Delay Time to Output High Level		T_{PLH}	I_F=7.5mA V_{CC}=5.0V C_L=15pF R_L=350Ω	-	41	100	ns
输出低电平传播延迟 Propagation Delay Time to Output Low Level		T_{PHL}		-	50	100	ns
脉宽失真 ($\|T_{PHL}-T_{PLH}\|$) Pulse Width Distortion ($\|T_{PHL}-T_{PLH}\|$)		PWD		-	9	35	ns
输出上升时间(10% – 90%) Output Rise Time (10 to 90%)		t_r		-	40	-	ns
输出下降时间(90% - 10%) Output Fall Time (90 to 10%)		t_f		-	10	-	ns
传播延迟偏斜 Propagation Delay Skew		t_{psk}		-	-	40	ns
输出高电平共模瞬态抑制 Common Mode Transient Immunity at Output High Level	W600	$\|CM_H\|$	I_F=0mA, V_{CC}=5.0V $\|V_{CM}\|$=10V(Peak) $V_{O(MIN)}$=2.0V, R_L=350Ω	-	-	-	kV/μs
	W601		I_F=0mA, V_{CC}=5.0V $\|V_{CM}\|$=50V(Peak) $V_{O(MIN)}$=2.0V, R_L=350Ω	5	-	-	
	W611		I_F=0mA, V_{CC}=5.0V $\|V_{CM}\|$=1000V(Peak) $V_{O(MIN)}$=2.0V, R_L=350Ω	20	-	-	
输出低电平共模瞬态抑制 Common Mode Transient Immunity at Output Low Level	W600	$\|CM_L\|$	I_F=7.5mA, V_{CC}=5.0V $\|V_{CM}\|$=10V(Peak) $V_{O(MAX)}$=0.8V, R_L=350Ω	-	-	-	kV/μs
	W601		I_F=7.5m , V_{CC}=5.0V $\|V_{CM}\|$=50V(Peak) $V_{O(MAX)}$=0.8V, R_L=350Ω	5	-	-	
	W611		I_F=7.5mA, V_{CC}=5.0V $\|V_{CM}\|$=1000V(Peak) $V_{O(MAX)}$=0.8V, R_L=350Ω	20	-	-	

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

Fig.1 Low-level output voltage vs. Ambient temperature

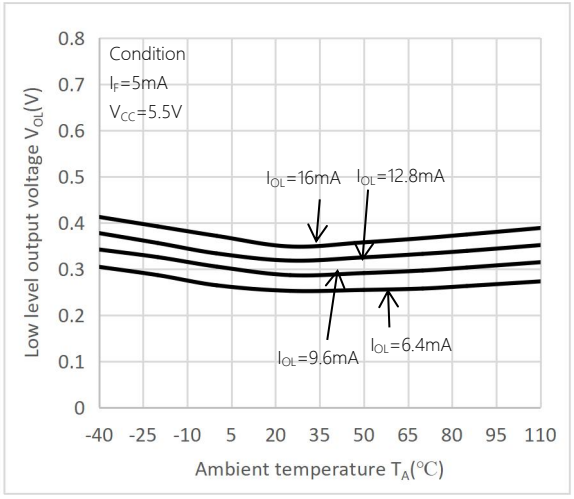


Fig.2 Forward current vs. Forward voltage

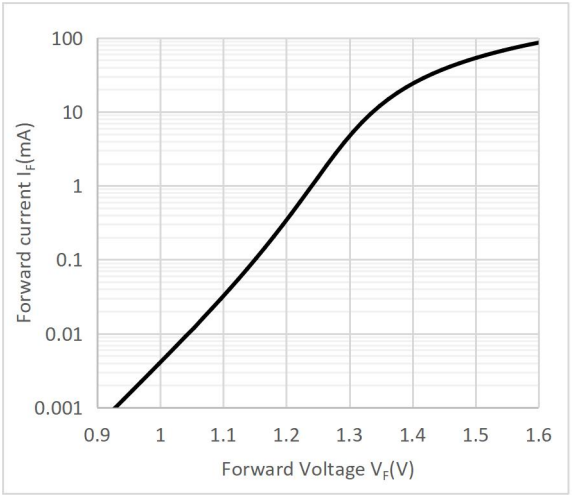


Fig.3 Propagation delay time vs. Forward current

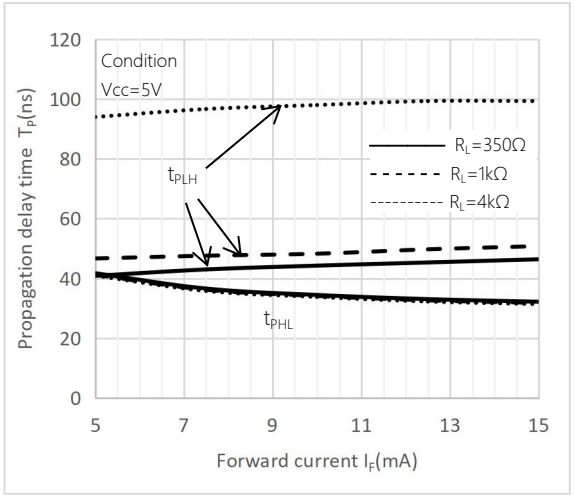


Fig.4 Low-level output current vs. Ambient temperature

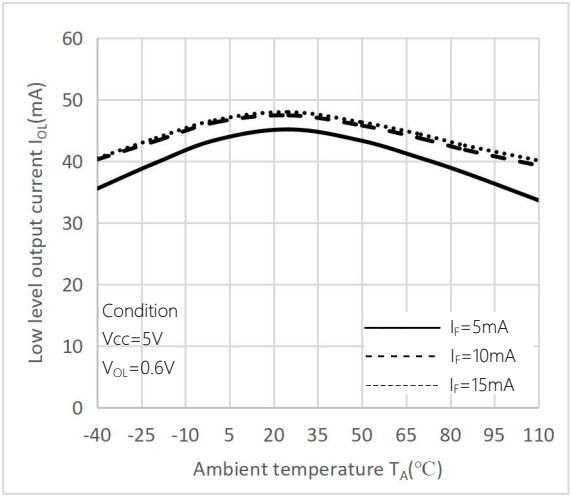


Fig.5 Input threshold current vs. Ambient temperature

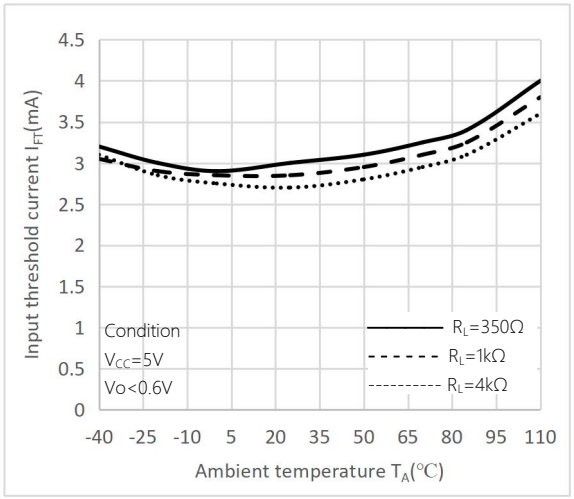
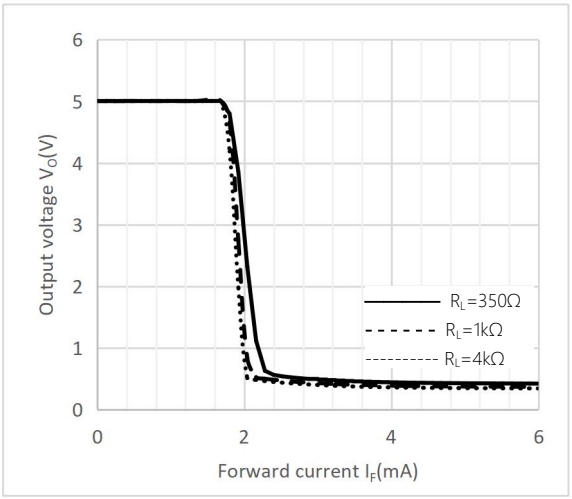


Fig.6 Output voltage vs. Forward current



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Fig.7 Pulse-width distortion vs. Ambient temperature

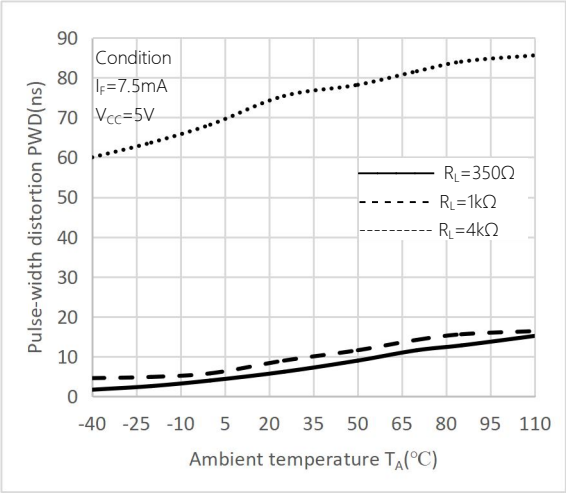


Fig.8 Switching time vs. Ambient temperature

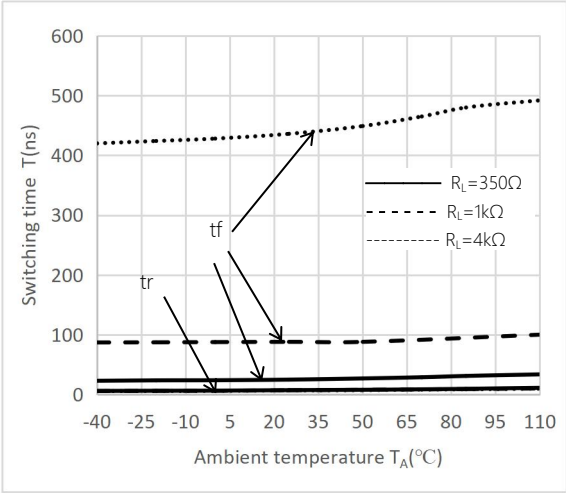


Fig.9 Propagation delay time vs. Ambient temperature

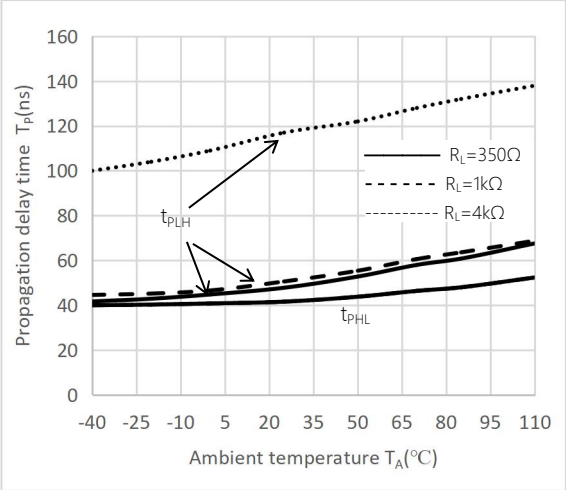
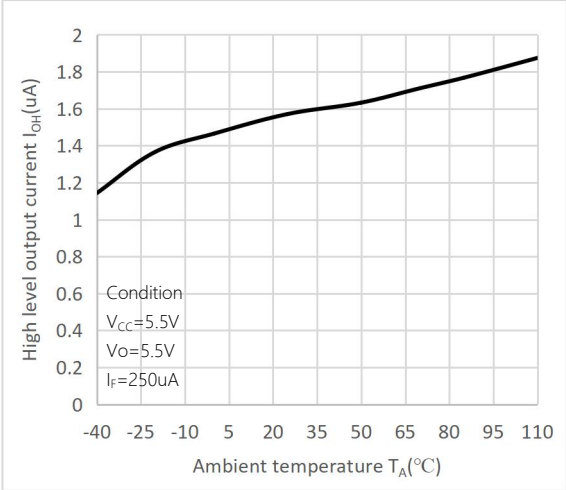
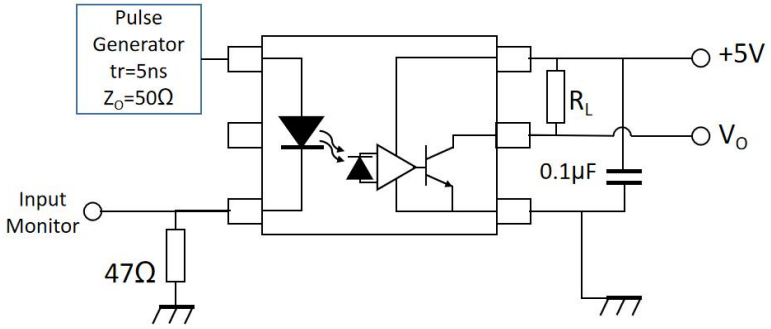


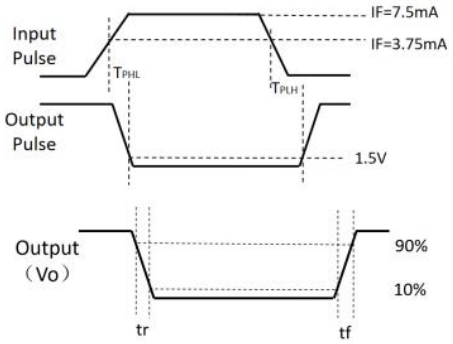
Fig.10 High-level output current vs. Ambient temperature



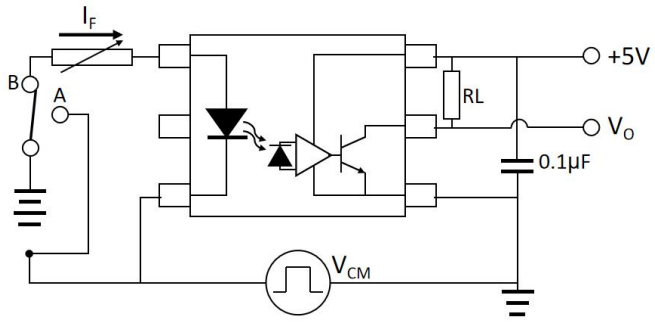
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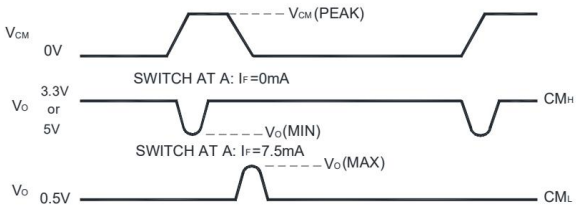
传输延迟时间测试电路 Test Circuit for Propagation Delay Time





CMR 测试电路 Test Circuit for Common Mode Transient Immunity

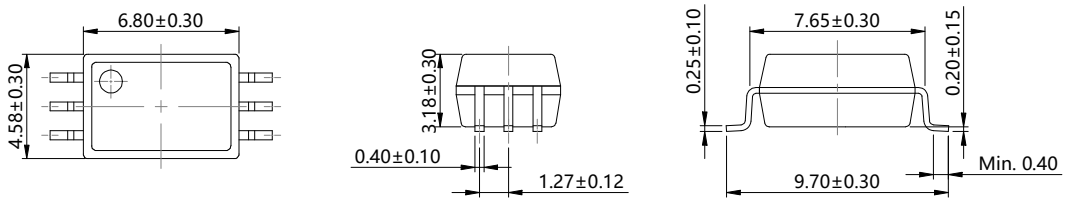




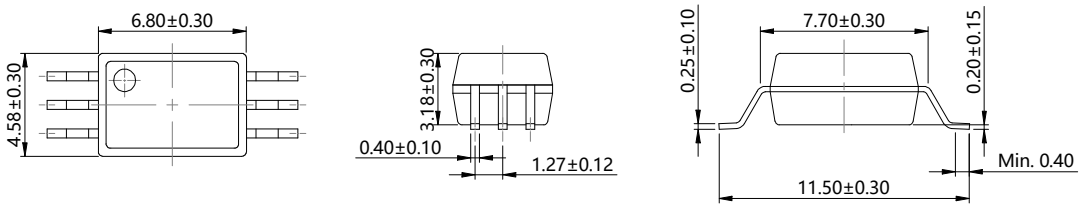
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外形尺寸 Outline Dimensions

SOP6-P

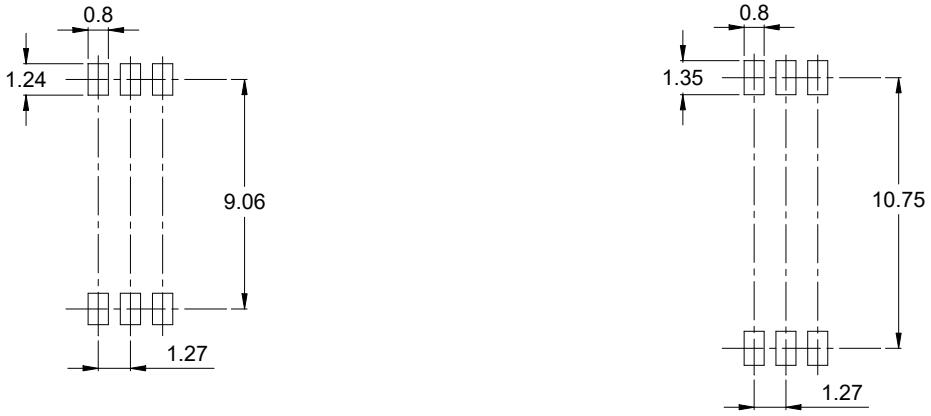


SOP6-W



单位 Unit: mm

建议焊盘布局 Recommended Pad Layout



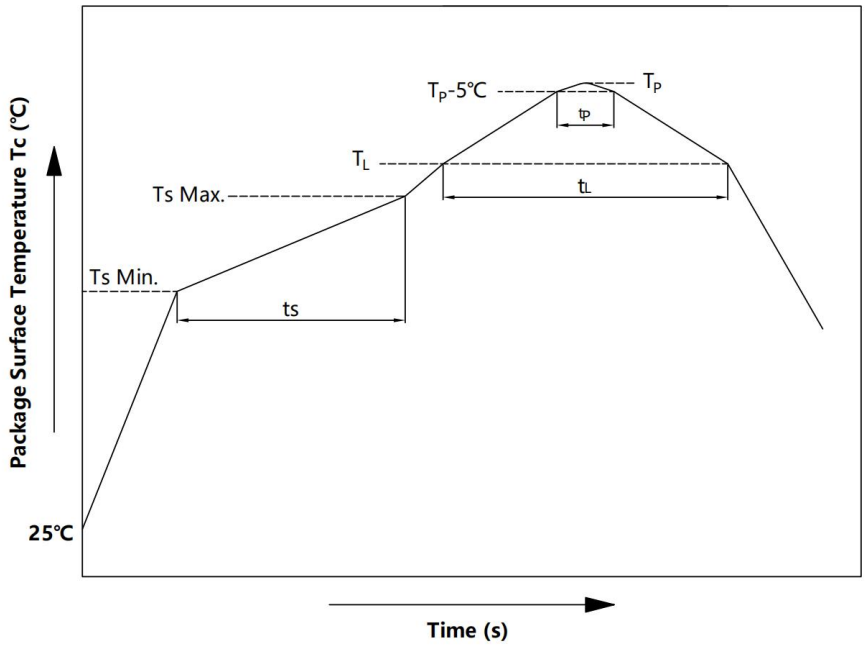
SOP6-P　　SOP6-W

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	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

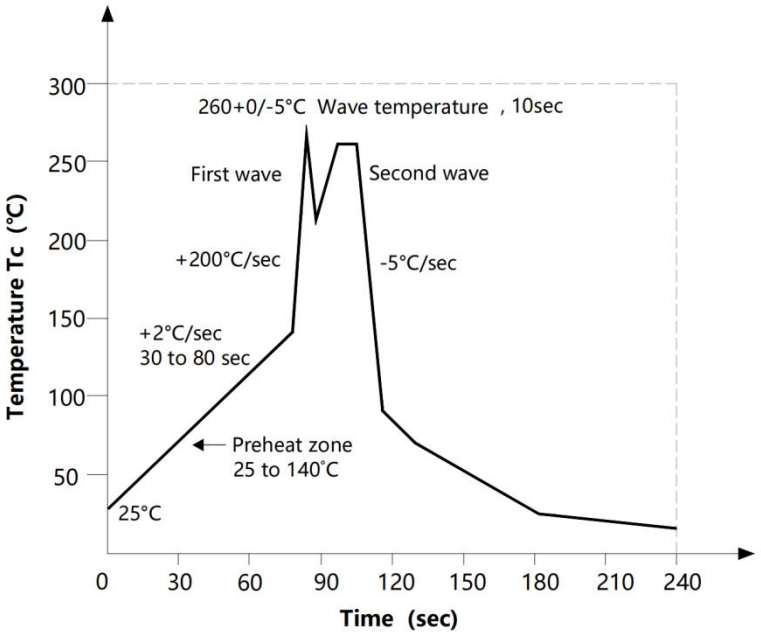
注 Note:

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;

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。
Hand soldering iron requirements：Temperature：360℃ ± 5℃, within 3s.

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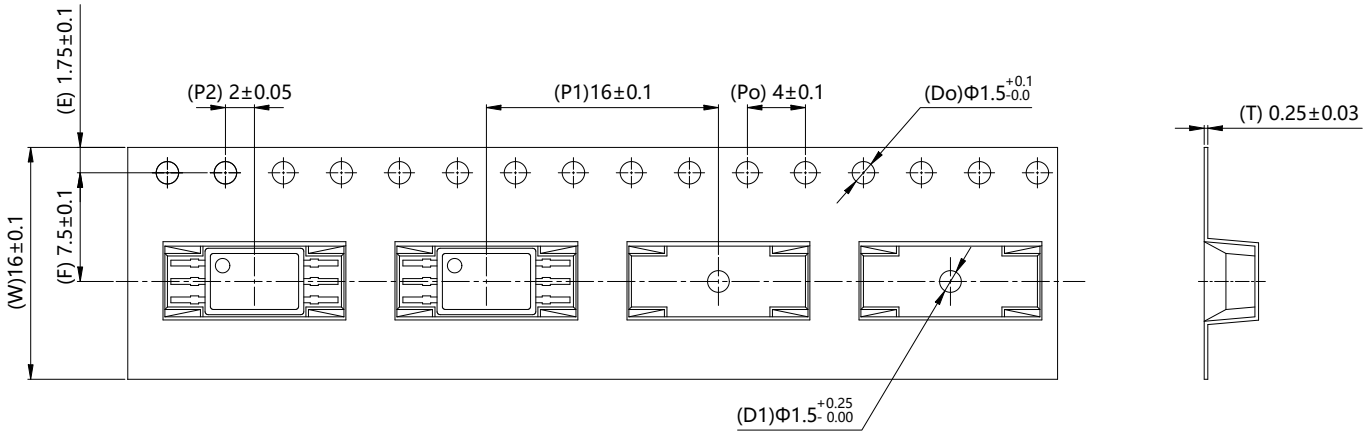
包装 Packing

■ 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
SOP6	卷盘 (ϕ330mm 蓝盘)	1 千只/盘	2 盘/盒	10 盒/箱	450*390*0.1mm	353*340*60mm	650*375*365mm	首端各空 50 个空格，末端空 100
Package Type	Packing Form	Quantity per Reel	Quantity per Box	Quantity per Carton	Antistatic Bag Specification	Box Specification	Carton Specification	Note
SOP6	Reel(ϕ330mm Blue)	1k pcs/reel	2Reel/box	10box/ctn	450*390*0.1mm	353*340*60mm	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：1000 只。
   Qty/reel：1000 pcs.
2) 每箱数量：20000 只。
   Qty/ctn：20000 pcs.
3) 内包装：每卷盘 1000 只。
   Inner packing：1000pcs/reel.
4) 示意图 Schematic：



单位 Unit：mm

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