



高速光耦

High Speed Photo Coupler

**QX0631(H)**

宁波群芯微电子股份有限公司

NINGBO QUNXIN MICROELECTRONICS CO., LTD.

中国 浙江省宁波杭州湾新区玉海东路 68 号

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

## 概述 Description

QX0631(H) 是一款双通道的高速光耦，其内部每个通道由一个 850nm 的 AlGaAs 发光二极管和一个集成检测器组成。

The QX0631(H) are dual-channel high-speed optocoupler that combine a 850 nm AlGaAS LED and an integrated detector.

## 特性 Features

- 高速 10 Mbit/s  
High speed – 10 Mbit/s
- 输入输出之间的高隔离电压 (Viso=3750Vrms)  
High isolation voltage between input and output (Viso=3750 Vrms )
- 低启动电流: 5mA  
Low turn-on current: 5mA
- 工作温度: -40°C ~ +125°C  
Operating Temperature: -40°C to +125°C
- 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

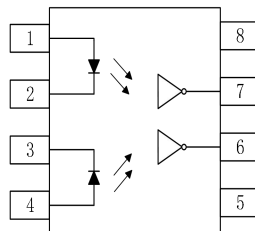
## 应用 Applications

- 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
- 数模, 模数转化中的数字隔离  
Digital Isolation in D/A and A/D Conversion
- 高速逻辑系统隔离  
High-speed logic system isolation

## 真值表 Truth table

LED	VO
OFF	H
ON	L

## 封装和原理图 Package and Schematic Diagram



### Pin Configuration

- |              |        |
|--------------|--------|
| 1. Anode 1   | 8.VCC  |
| 2. Cathode 1 | 7.VO 1 |
| 3. Cathode 2 | 6.VO 2 |
| 4. Anode 2   | 5.GND  |

注: 在引脚 5 和 8 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 5 and 8.



产品型号命名规则 Order Code

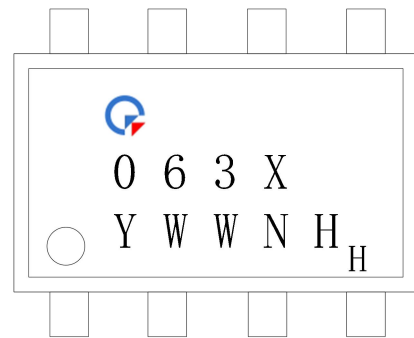
**QX 063X - UN Y - W (V) (ZZ)**

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 (X: 1)
- 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 器件工作温度范围 Device Operating Temperature Range (H: ~+125°C)
- 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“”为群芯品牌 LOGO  
“”denotes LOGO
- 印字中的“XX”代表产品分档: 0、1  
“XX”denotes the classification: 0、1
- 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



### 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	> 4.6	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	> 4.6	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	$V_{IORM}$	600	$V_{peak}$	DIN/EN/DIN EN60747-5-5
瞬态隔离电压 Transient isolation voltage	$V_{IOTM}$	5000	$V_{peak}$	DIN/EN/DIN EN60747-5-5
隔离电压 Isolation Voltage	$V_{iso}$	> 3750	$V_{rms}$	For 1 min

### 极限参数 Absolute Maximum Ratings ( $T_A=25^{\circ}C$ )

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	$P_I$	27	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	$P_O$	60	mW
工作温度 Operating Temperature		$T_{opr}$	-40 to +125	$^{\circ}C$
存储温度 Storage Temperature		$T_{stg}$	-55 to +125	$^{\circ}C$
焊接温度 Soldering Temperature		$T_{sol}$	260	$^{\circ}C$

**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 *	$I_{FH}$	5	15	mA
电源电压 Supply Voltage	$V_{CC}$	3	5.5	V
工作温度 Output Pull-up resistor	$T_A$	-40	+125	°C
输出上拉电阻 Operating Temperature	$R_L$	330	4K	$\Omega$

注 \*：初始切换阈值为 5mA 或以下。建议使用 6.3mA 至 10mA 以达到最佳性能

Note \*: The initial switching threshold is 5 mA or less. From 6.3 mA to 10 mA is recommended to achieve optimal performance

### 产品特性参数 Electro-optical Characteristics ( $T_A=25^\circ\text{C}$ )

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	$V_F$	$I_F=10\text{mA}$	1.2	1.39	1.8	V
	反向击穿电压 Reverse Breakdown Voltage	$B_{VR}$	$I_R=10\mu\text{A}$	5	50	-	V
	输入电容 Input Capacitance	$C_{IN}$	$V=0, f=1\text{MHz}$	-	60	-	pF
接收端 Output	高电平电源电流 High Level Supply Current	$I_{CCH}$	$I_F=0\text{mA}, V_{CC}=5.5\text{V}$	-	13	15	mA
	低电平电源电流 Low Level Supply Current	$I_{CCL}$	$I_F=10\text{mA}, V_{CC}=5.5\text{V}$	-	15	21	mA
传输特性 Transfer Characteristics	高电平输出电流 High Level Output Current	$I_{OH}$	$I_F=250\mu\text{A}$ $V_{CC}=V_O=5.5\text{V}$	-	5.5	100	$\mu\text{A}$
	低电平输出电压 Low Level Output Voltage	$V_{OL}$	$I_F=5\text{mA}, V_{CC}=5.5\text{V}$ $I_{OL}=13\text{mA}$	-	0.28	0.6	V
	输入阈值电流 Input Threshold Current	$I_{FT}$	$V_{CC}=5.5\text{V}, I_{OL}=13\text{mA}$ $V_O<0.6\text{V}$	-	1.8	5	mA
隔离电压 Isolation Voltage		$V_{ISO}$	$R_H<50\%$ $I_{I-O}\leq 50\mu\text{A}$	3750	-	-	$V_{RMS}$
隔离电阻 <sup>①</sup> Isolation Resistance		$R_{I-O}$	$V_{I-I}=500\text{V}$ , 40~60%R.H.	-	$10^{12}$	-	$\Omega$
隔离电容 <sup>①</sup> Isolation Capacitance		$C_{I-O}$	$V=0, f=1\text{MHz}$	-	0.6	-	pF
输入隔离电阻 <sup>②</sup> Input Isolation Resistance		$R_{I-I}$	$V_{I-I}=500\text{V}$ , 40~60%R.H.	-	$10^{11}$	-	$\Omega$
输入隔离电容 <sup>②</sup> Input Isolation Capacitance		$C_{I-I}$	$V=0, f=1\text{MHz}$	-	0.25	-	pF

注: Note:

1. 测量时将 PIN1,2,3,4 短接, PIN5,6,7,8 短接。  
When measuring, short-circuit PIN1, 2, 3, and 4, and short-circuit PIN5, 6, 7, and 8.
2. 测量时将 PIN1,2 短接, PIN3,4 短接。  
When measuring, short-circuit PIN1, 2, and short-circuit PIN3, 4.

### 开关特性 Switching Specification ( $T_A=25^\circ\text{C}$ )

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	$T_{PLH}$	$I_F=7.5\text{mA}$ $V_{CC}=5.0\text{V}$ $C_L=15\text{pF}$ $R_L=350\Omega$	20	40	75	ns
输出低电平传播延迟 Propagation Delay Time to Output Low Level	$T_{PHL}$		20	35	75	ns
脉宽失真 ( $ T_{PHL}-T_{PLH} $ ) Pulse Width Distortion ( $ T_{PHL}-T_{PLH} $ )	PWD		-	3.5	35	ns
输出上升时间(10% - 90%) Output Rise Time (10 to 90%)	$t_r$		-	30	-	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	$ CM_H $	$I_F=0\text{mA}$ $V_{CC}=5.0\text{V}$ $ V_{CM} =1000\text{V(Peak)}$ $V_{O(MIN)}=2\text{V}$ $R_L=350\Omega$	10	-	-	kV/ $\mu\text{s}$
输出低电平共模瞬态抑制 Common Mode Transient Immunity at Output Low Level	$ CM_L $	$I_F=7.5\text{mA}$ $V_{CC}=5.0\text{V}$ $ V_{CM} =1000\text{V(Peak)}$ $V_{O(MAX)}=0.8\text{V}$ $R_L=350\Omega$	10	-	-	kV/ $\mu\text{s}$

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

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

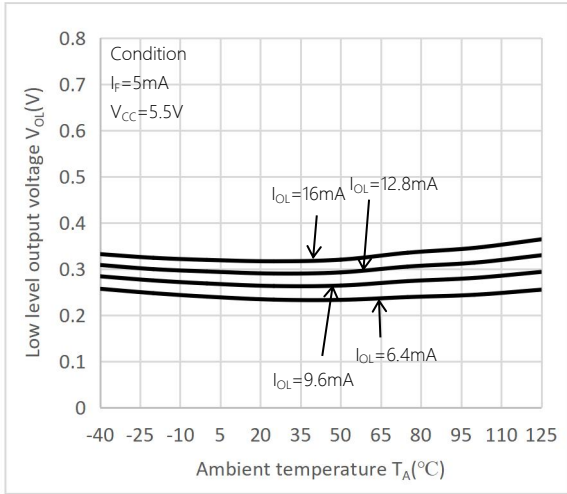


Fig.2 Forward current vs. Forward voltage

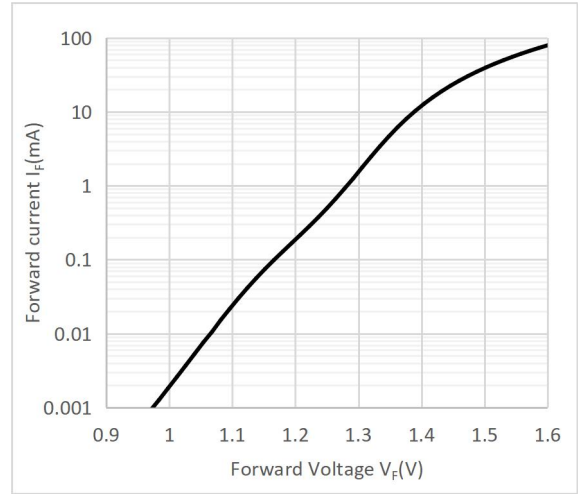


Fig.3 Propagation delay time vs. Forward current

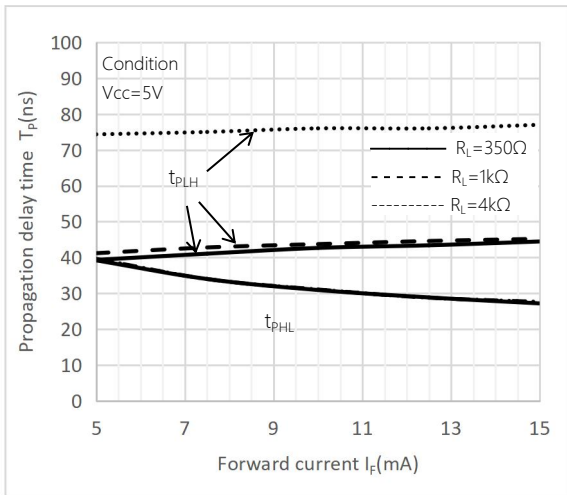


Fig.4 Low-level output current vs. Ambient temperature

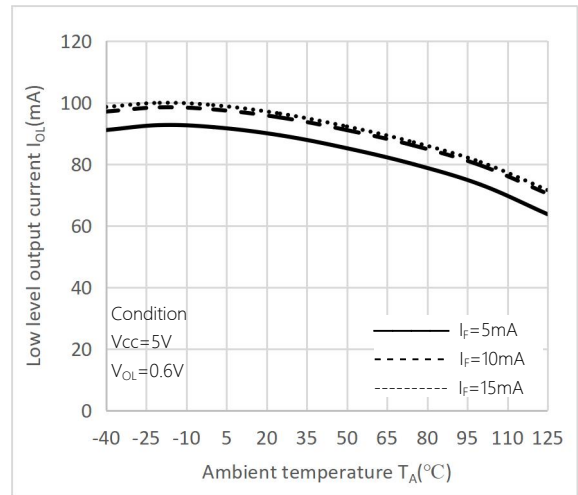


Fig.5 Input threshold current vs. Ambient temperature

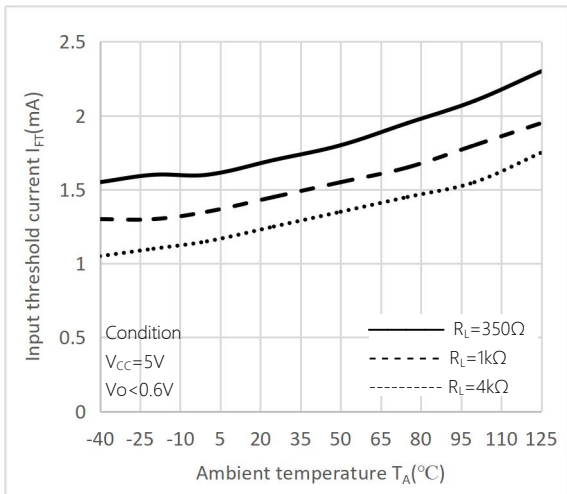


Fig.6 Output voltage vs. Forward current

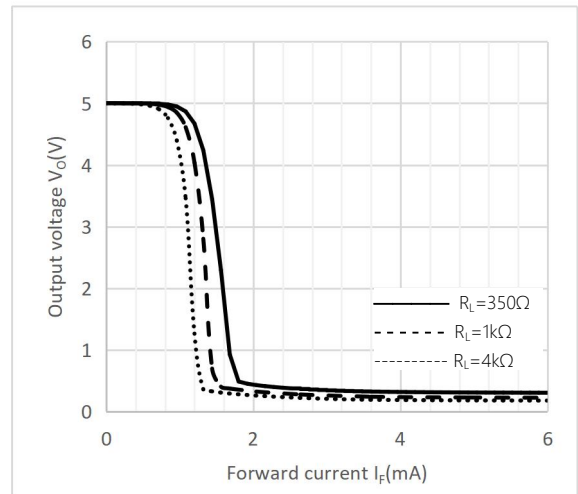




Fig.7 Pulse-width distortion vs. Ambient temperature

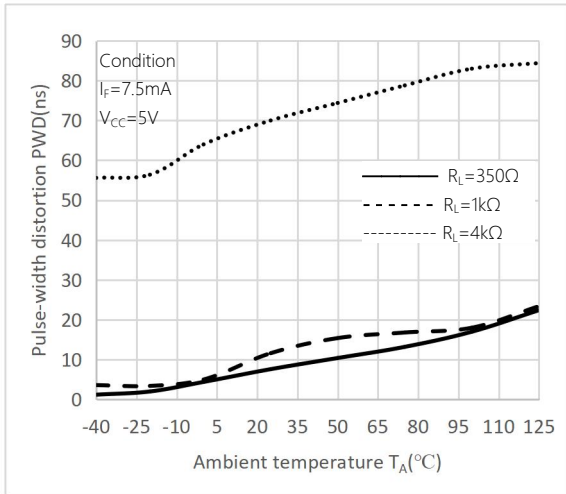


Fig.8 Switching time vs. Ambient temperature

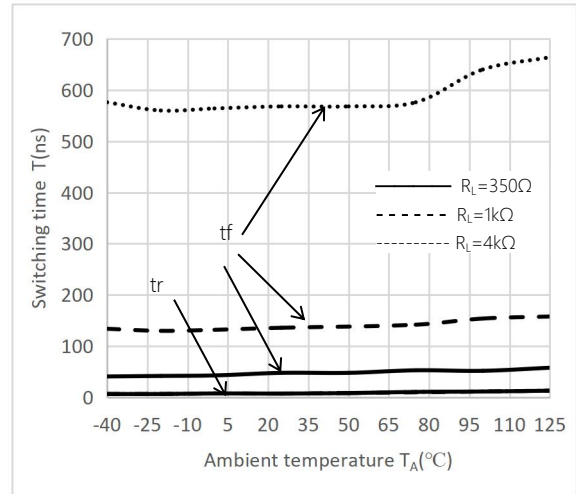


Fig.9 Propagation delay time vs. Ambient temperature

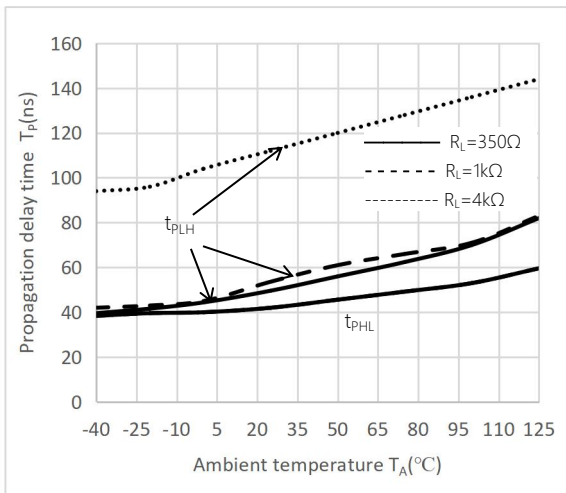
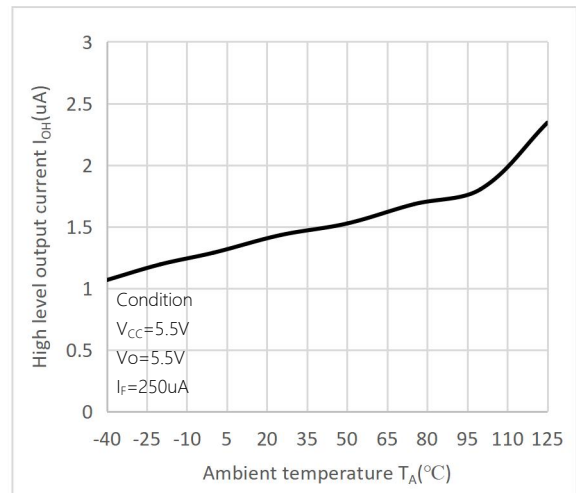
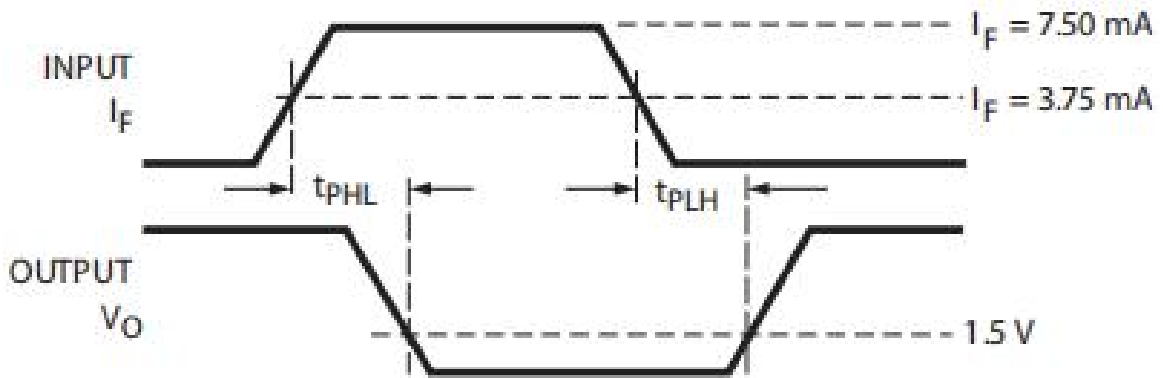
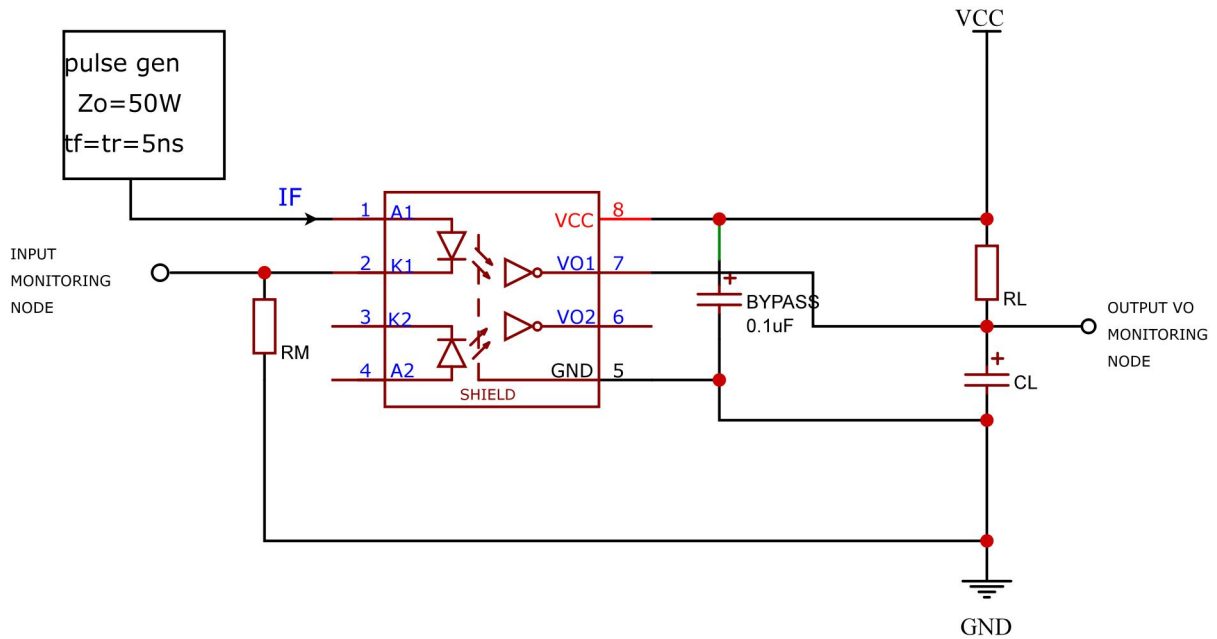


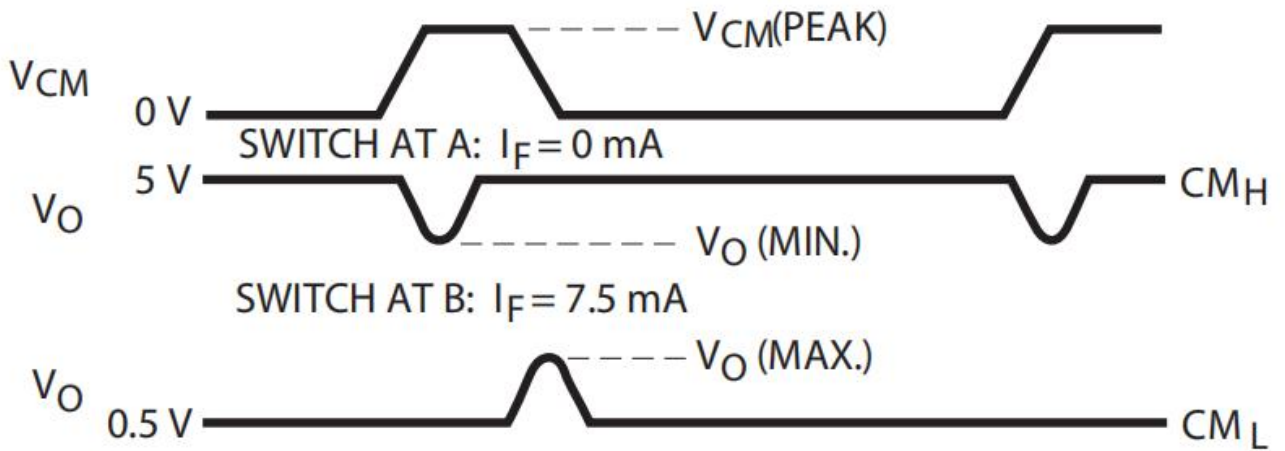
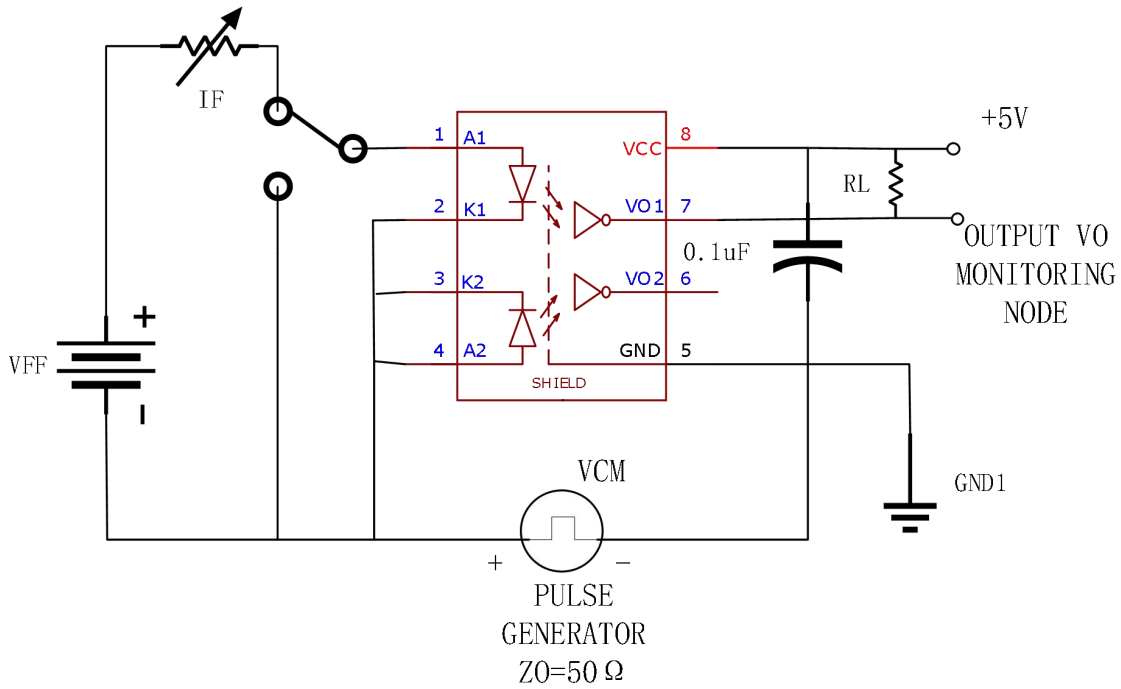
Fig.10 High-level output current vs. Ambient temperature



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

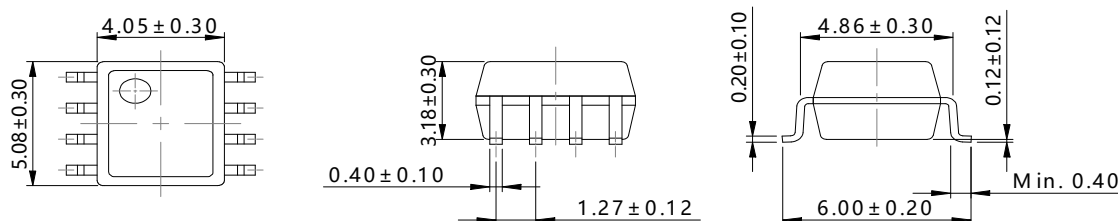


CMR 测试电路 Test Circuit for Common Mode Transient Immunity



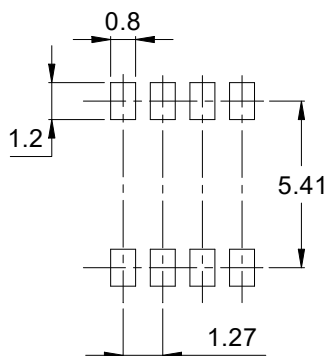
**外形尺寸 Outline Dimensions**

SOP8



单位 Unit: mm

**建议焊盘布局 Recommended Pad Layout**

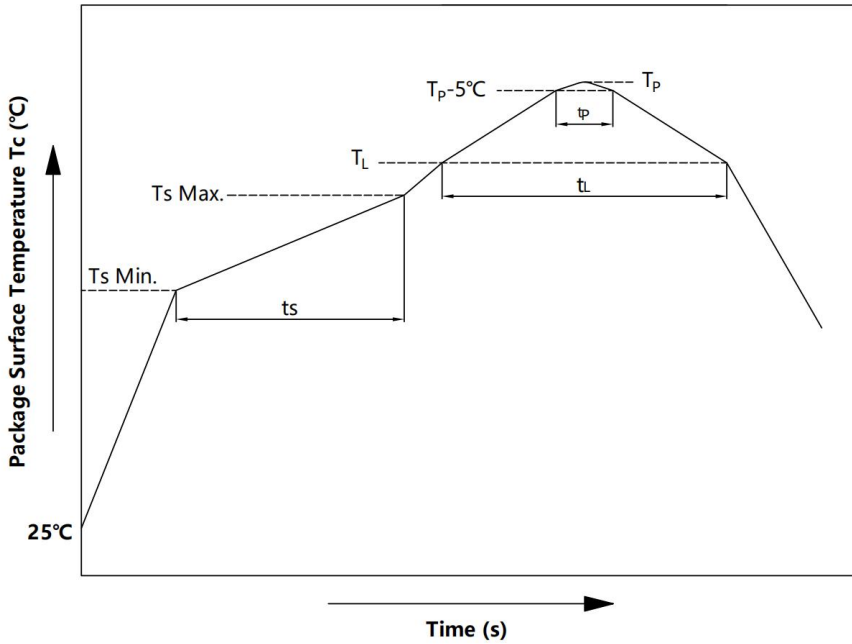


单位 Unit: mm

注：上图为产品正视图。

Note: The picture above is the front view of the product.

回流焊温度曲线图 Solder Reflow Profile



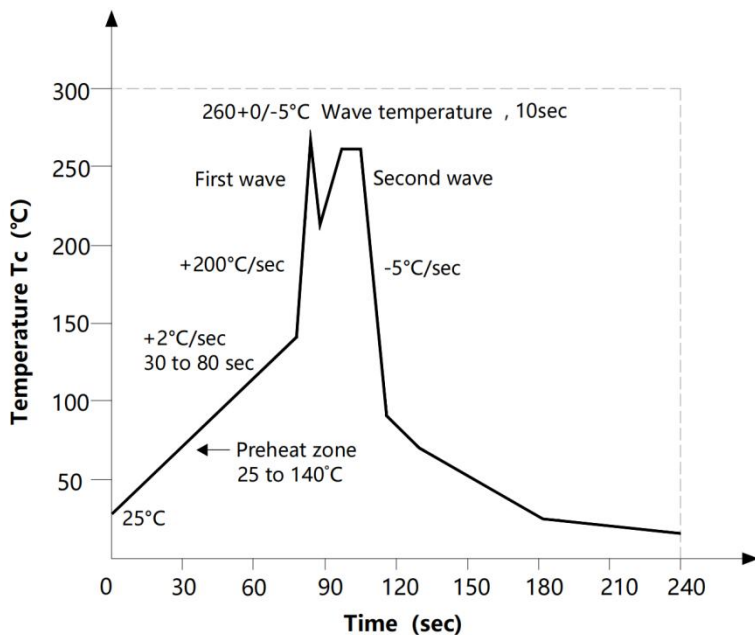
项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	$T_s$	150	200	$^\circ\text{C}$
预热时间 Preheat Time	$t_s$	60	120	s
升温速率 Ramp-Up Rate ( $T_L$ to $T_P$ )	-	-	3	$^\circ\text{C}/\text{s}$
液相线温度 Liquidus Temperature	$T_L$	217		$^\circ\text{C}$
时间高于 $T_L$ Time Above $T_L$	$t_L$	60	150	s
峰值温度 Peak Temperature	$T_P$	-	260	$^\circ\text{C}$
$T_c$ 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	$^\circ\text{C}/\text{s}$

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;

**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  $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , 时间  $\leq 3\text{s}$ .  
Hand soldering iron requirements: Temperature:  $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , within 3s.

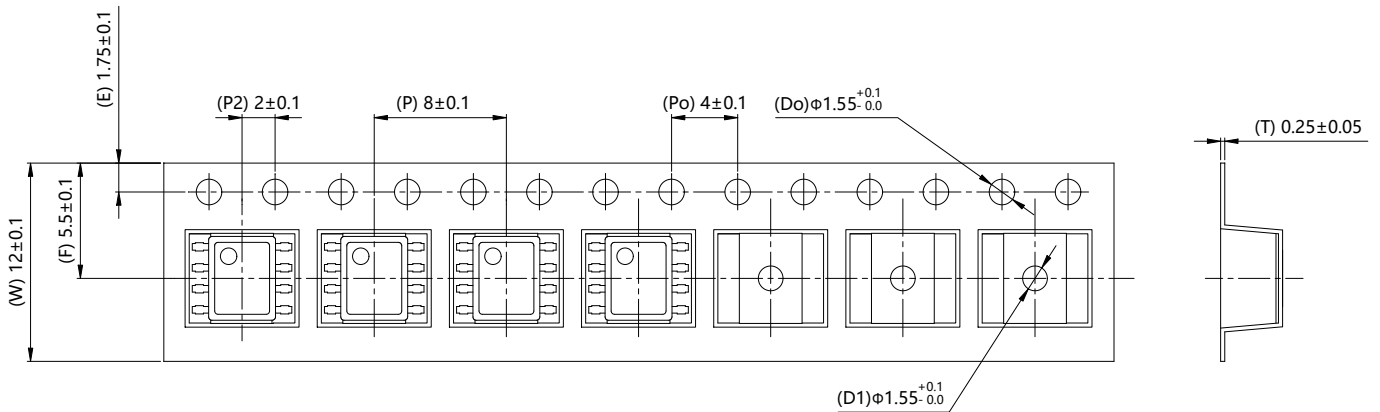
**包装 Packing**

■ 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
SOP8	编带 (φ330mm 蓝盘)	2k /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
SOP8	Reel (φ330mm Blue)	2k pcs/reel	2 reels /box	10 boxes /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: 2000 只。  
Qty/reel: 2000 pcs.
- 2) 每箱数量: 40000 只。  
Qty/ctn: 40000 pcs.
- 3) 内包装: 每盒 2 盘。  
Inner packing: 2reels/box
- 4) 示意图 Schematic:



单位 Unit: mm

### **注意 Attention**

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