NQUNXIN
群芯微电子

中国芯 光电梦

晶体管光耦

Photo Transistor

QX357X

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

QX357X是一款由发光二极管和光电晶体管组成的光电耦合器。四引脚封装（SOP）。
The QX357X is a photoelectric coupler composed of light-emitting diode and phototransistor. It is packaged in a 4-pin small outline SOP package.

特性 Features

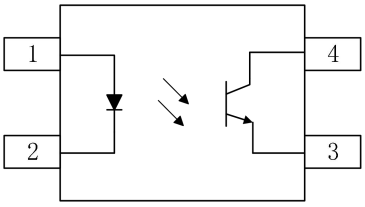
- 电流转换比(CTR)范围: 80%~600% (I_F=5mA, V_{CE}=5V, Ta=25℃)
  Current transfer ratio: 80%~600% (I_F=5mA, V_{CE}=5V, Ta=25℃)
- 输入-输出隔离电压 (V_{ISO}=3750 Vrms)
  High isolation voltage between input and output(V_{ISO}=3750 Vrms)
- 集电极-发射极击穿电压 BV_{CEO}≥80V
  Collector - emitter breakdown voltage BV_{CEO}≥80V
- 工作温度：-55℃~+110℃
  Operating Temperature: -55℃~+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，智能电表
  Switching power supply, intelligent meter
- 工业控制，测量仪器
  Industrial control, measuring instruments
- 办公设备，比如复印机
  Office equipment such as copiers
- 家用电器，比如空调、风扇、热水器等
  Household appliances: such as air conditioners, fans, water heaters, etc.

封装和原理图 Package and Schematic Diagram

SOP4



Pin Configuration
1. Anode
2. Cathode
3. Emitter
4. Collector

产品型号命名规则 Order Code

QX 357 X - UN Y - W (V) (ZZ)

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① 公司代码 Company Code（QX: 群芯 Qunxin）

② 产品系列 Product Series（357）

③ CTR 档位 Classification A、B、C、D、E、F 或无（代码 Code: A、B、C、D、E、F or None）

④ 框架类型 Lead Frame（Cu: 铜框架 Copper）

⑤ 树脂类型 Epoxy Type（H: 无卤 Halogen-free）

⑥ 封装形式 Package（S: SOP）

⑦ 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）

⑧ 内部补充代码 Internal Supplementary Code（数字或者空白 Number or Non）

印字信息 Marking Information

- 印字中"Q"为群芯品牌 LOGO
  "Q"denotes LOGO
- 印字中的"X"代表产品分档：A、B、C、D、E、F 或无
  "X"denotes the classification：A、B、C、D、E、F or None
- 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	>5.0	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	>5.0	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}	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	Viso	> 3750	Vrms	For 1 min

极限参数 Absolute Maximum Ratings (Ta=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	6	V
	功耗 Power Dissipation	P_D	70	mW
	额定值降低因子(在 Ta = 90°C 以上) Power dissipation Derating factor (above Ta = 90°C)	P_{DD}	2.9	mW/°C
接收端 output	集电极功耗 Collector Power Dissipation	P_C	150	mW
	集电极电流 Collector Current	I_C	50	mA
	集电极-发射极电压 Collector-Emitter Voltage	V_{CEO}	80	V
	发射极-集电极电压 Emitter-Collector Voltage	V_{ECO}	6	V
隔离电压 Isolation Voltage		Viso	3750	Vrms
工作温度 Operating Temperature		T_{opr}	-55~+110	℃
存储温度 Storage Temperature		T_{stg}	-55~+125	℃
焊接温度 Soldering Temperature		T_{sol}	260	℃

产品特性参数 Electro-optical Characteristics (Ta=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=20mA	-	1.2	1.4	V
	反向电流 Reverse Current	I_R	V_R=4V	-	-	10	μA
	输入电容 Terminal Capacitance	C_t	V=0,f=1KHz	-	30	250	pF
接收端 Output	集电极暗电流 Collector Dark Current	I_{CEO}	V_{CE}=20V	-	-	100	nA
	集电极-发射极击穿电压 Collector-Emitter Breakdown Voltage	BV_{CEO}	I_C=0.1mA, I_F=0mA	80	-	-	V
	发射极-集电极击穿电压 Emitter-Collector Breakdown Voltage	BV_{ECO}	I_E=10μA, I_F=0	6	-	-	V
传输特性 Transfer Characteristics	电流传输比 Current Transfer Ratio	CTR*	I_F=5mA ,V_{CE}=5V	80	-	600	%
	集电极-发射极饱和压降 Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_F=20mA,I_C=1mA	-	0.1	0.2	V
	隔离电阻 Isolation Resistance	R_{ISO}	DC500V,40~60%R.H.	$5x10^{10}$	$1x10^{11}$	-	Ω
	隔离电容 Isolation capacitance	C_{ISO}	V=0,f=1MHz	-	0.6	1.0	pF
	截止频率 Cut-off Frequency	Fc	V_{CE}=5V, I_C=2mA, R_L=100Ω,-3dB	-	80	-	kHz
	上升时间 Rise Time	T_r	V_{CE}=2V, I_C=2mA, R_L=100Ω	-	4	18	μs
	下降时间 Fall Time	T_f	V_{CE}=2V, I_C=2mA, R_L=100Ω	-	3	18	μs

注*：电流传输比=I_C/I_F x 100%。

Note*：CTR=I_C/I_F x 100%.

电流传输比分档表 CTR Classification Table (I_F=5mA, V_{CE}=5V, Ta=25℃)

代码 Code	最小值 Min.	最大值 Max.
A	80	160
B	130	260
C	200	400
D	300	600
E	100	200
F	150	300
None	80	600

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

Fig.1 Allowable Forward Current VS Ambient Temperature

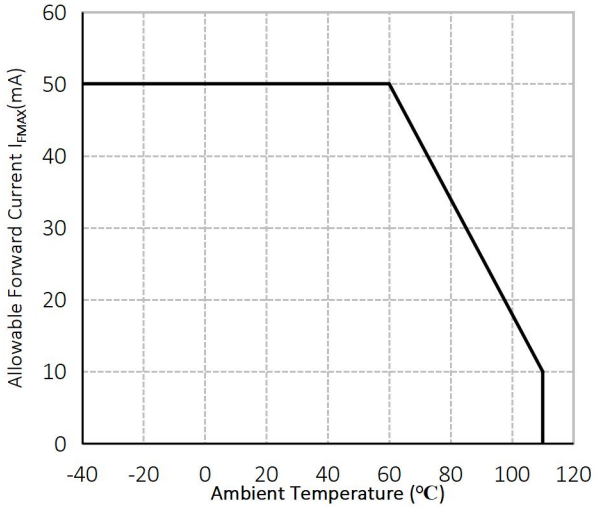


Fig.2 Allowable collector power disspation VSAmbient Temperature(℃)

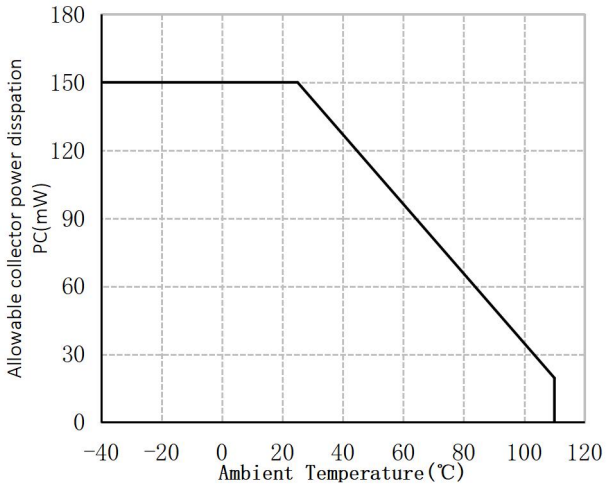


Fig.3 Current Transfer Ratio vs Forward Current

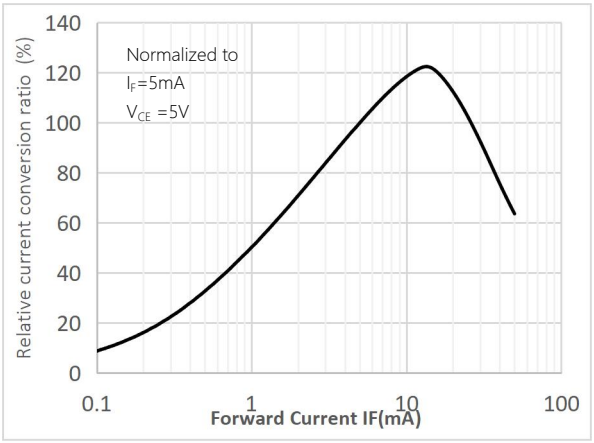


Fig.4 Forward Current vs. Forward Voltage

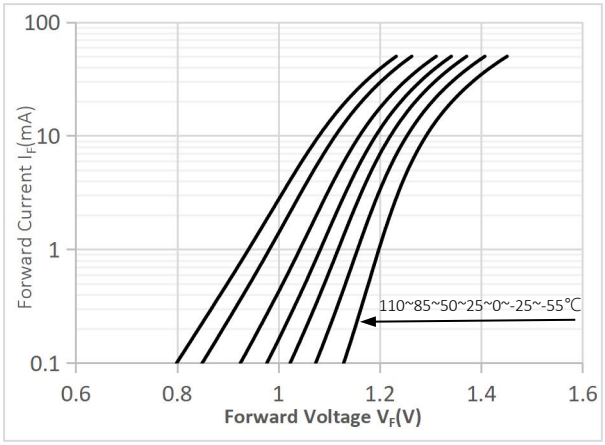


Fig.5 Collector Current vs. Collector-emitter Voltage

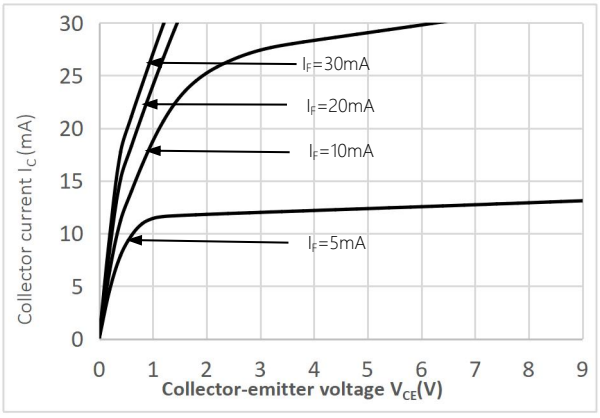


Fig.6 Relative Current Transfer Ratio vs.Ambient Temperature

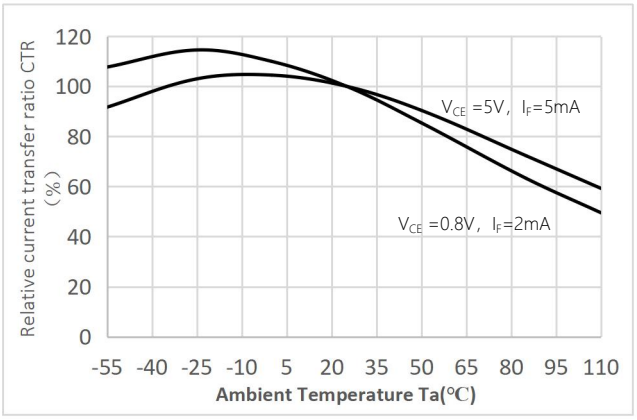


Fig.7 Collector-emitter Saturation Voltage vs. Ambient Temperature

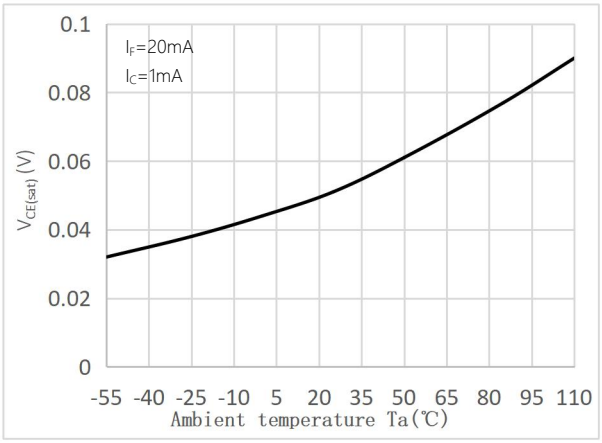


Fig.8 Collector Dark Current vs Ambient Temperature

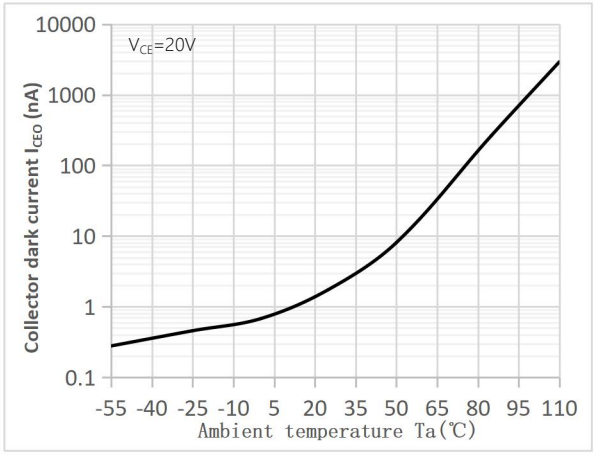


Fig.9 Response Time vs. Load Resistance

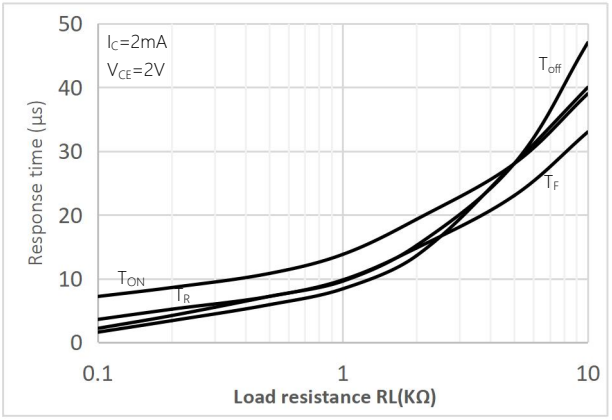


Fig.10 Frequency Response

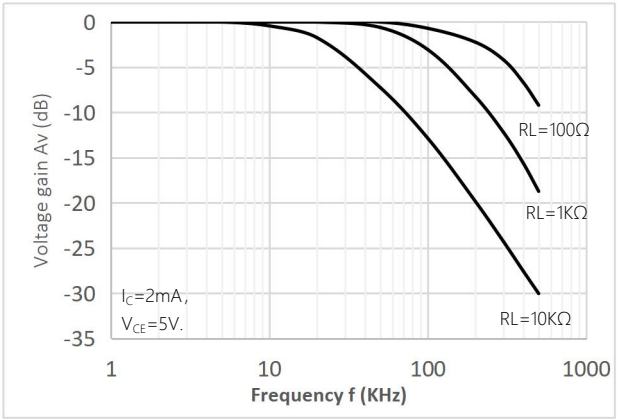


Fig.11 Collector-emitter Saturation Voltage vs Forward Current

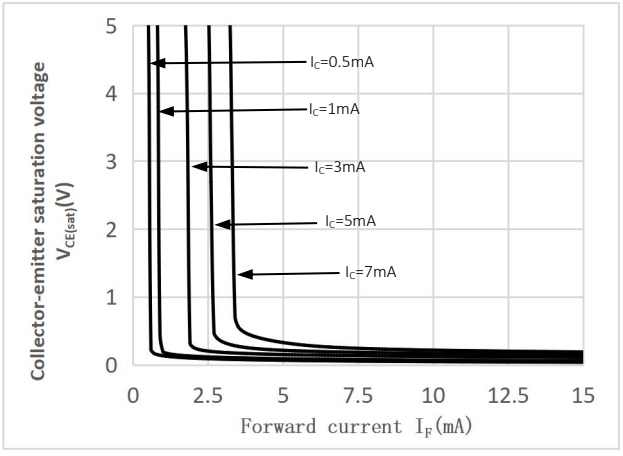
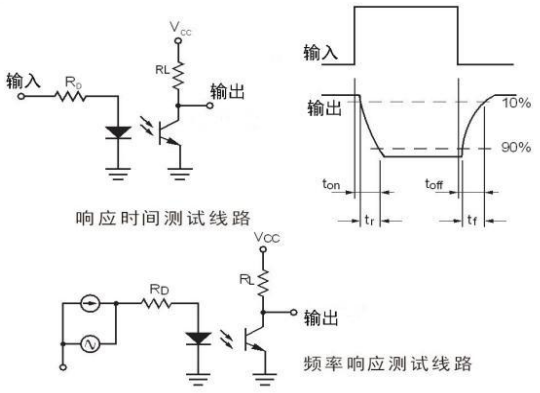
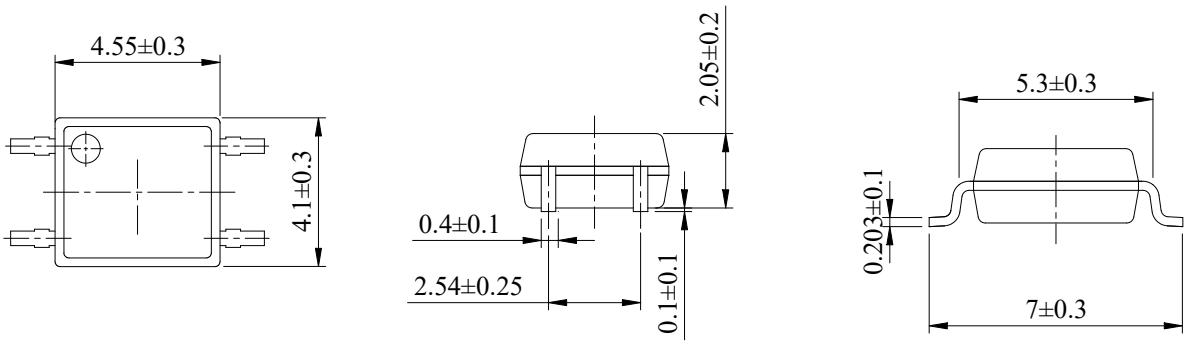


Fig.12 Switching Time Test Circuit & Waveforms



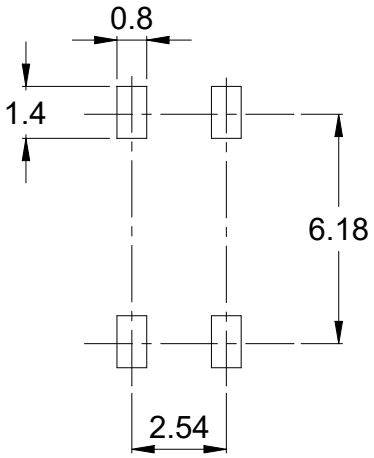
外形尺寸 Outline Dimensions

SOP4



单位 Unit: mm

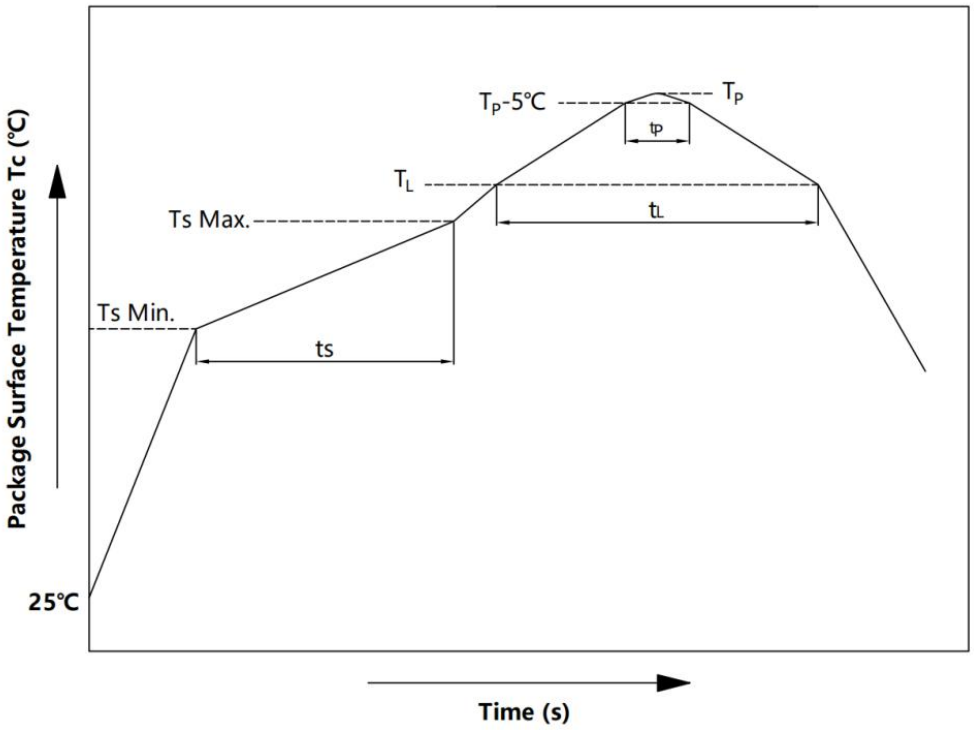
建议焊盘布局 Recommended Pad Layout



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	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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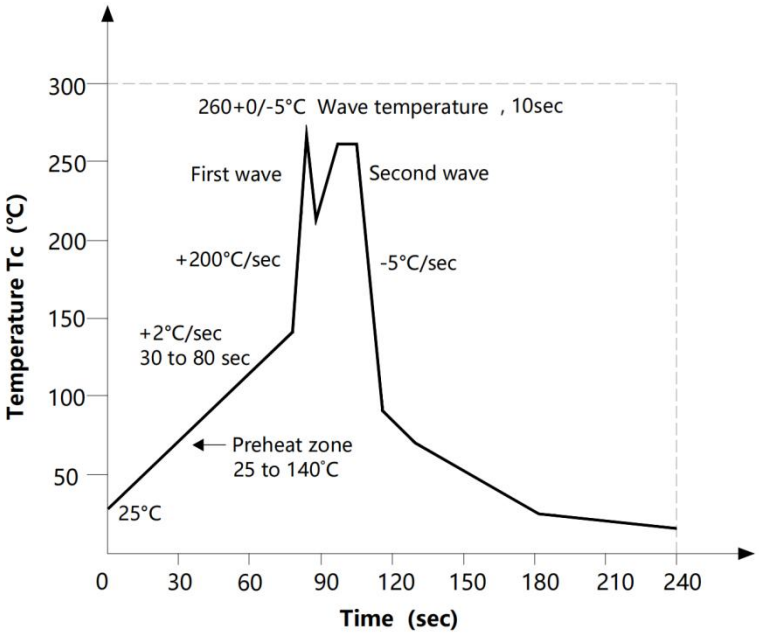
波峰焊温度曲线图 Wave Soldering Profile



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.

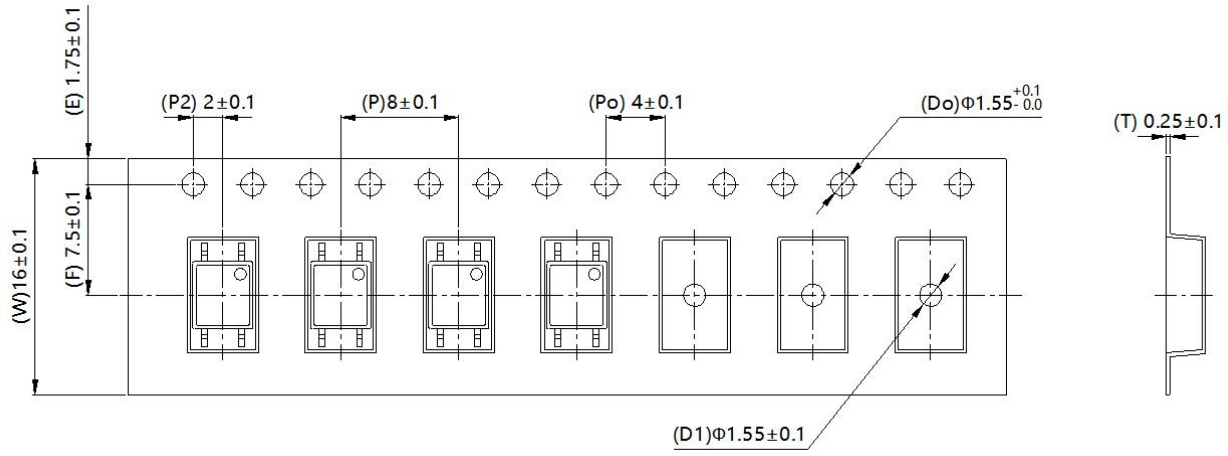
包装 Packing

■ 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
SOP4	卷盘 (ϕ330mm 蓝盘)	3000 只/盘	2 盘/盒	10 盒/箱	450*390*0.1mm	340*60*340mm	620*360*365mm	首尾端空至少 200mm
Package Type	Packing Form	Quantity per Reel	Quantity per Box	Quantity per Carton	Antistatic Bag Specification	Box Specification	Carton Specification	Note
SOP4	Reel (ϕ330mm Blue)	3000 pcs /reel	2 reels /box	10 boxes /ctn	450*390*0.1mm	340*60*340mm	620*360*365mm	Guard band 200mm min.

■ 编带包装 Tape & Reel

1) 每卷数量：3000 只。
   Qty/reel：3000 pcs.
2) 每箱数量：60000 只。
   Qty/ctn：60000 pcs.
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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