硅耐光电
SILICON NICE OPTOELECTRONIC

光电耦合器
OPTOCOUPLER

产品规格书
Product Data Sheet

Si-M601 系列
Si-M601 Series

Si DCC
Release

贵州硅耐光电有限公司
GuiZhou Silicon Nice Optoelectronic Co., Ltd.

描述 Description

Si-M601 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。这些器件采用 5 引脚外形封装，符合标准封装外形。

The Si-M601 optocoupler consists of a 850 nm AlGaAS LED, optically coupled to a very high speed integrated photo-detector logic gate with a strobable output.The devices arepackaged in a 5-pin small outline package which conforms to the standard footprint.

典型应用 Typical Applications

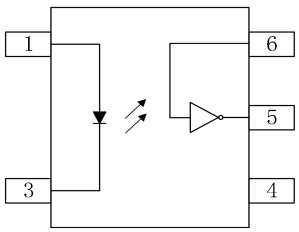
- 可编程逻辑控制器
  Programmable Logic Controllers (PLCs)
- 高速逻辑系统的隔离
  Isolation of high speed logic systems
- 计算机外围设备接口
  Computer-peripheral interface
- 电池管理系统
  Battery Management System (BMS)

特性 Features

- 高比特率：10MBit/s
  High Speed-10MBit/s
- 高隔离电压(Vios=3750VRMS)
  High isolation(Viso=3750VRMS)
- 高共模抑制比
  Very High Common Mode Rejection (CMR)
- 宽工作温度：-40~100℃
  Wide operating temperature range: -40℃ to 100℃

真值表 Truth Table	
发光二极管 LED	**V_{CC}-V_{EE} POSITIVE GOING**
OFF	HIGH
ON	LOW

封装与功能图 Package and Functional Diagram

封装 Package	内部连接图 Internal Connection Diagram	引脚分配 Pin Assignment
 SOP5		1: Anode　5: VCC 4: V_O 2: Cathode　3: GND

安规与绝缘参数 Safety and Insulation Ratings

参数 Parameter		符号 Symbol	数值 Value	单位 Unit
最大额定隔离电压 Maximum Rated Withstanding Isolation Voltage	According to UL1577, t = 1 min	V_{ISO}	3700	V_{RMS}
最大瞬态隔离电压 Maximum Transient Isolation Voltage	According to DIN EN 60747-5-5	V_{IOTM}	5000	V_{peak}
最大峰值重复隔离电压 Maximum Repetitive Peak Isolation Voltage	According to DIN EN 60747-5-5	V_{IORM}	600	V_{peak}
爬电距离 Creepage Distance	/	L	5	mm

极限参数 Absolute Maximum Ratings

参数 Parameter		符号 Symbol	最小值 Min.	极限值 Rating	单位 Unit
输入端 Input	平均输入电流 Average Input Current	$I_{F(AVG)}$	-	25	mA
	反向电压 Reverse Voltage	V_R	-	5	V
	功耗 Power Dissipation	P	-	100	mW
	瞬态峰值输入电流(<1 μs pulse width, 300 pps) Peak Transient Input Current (<1 μs pulse width, 300 pps)	$I_{F(TRAN)}$	-	1	A
	结温 Junction Temperature	T_J	-	125	°C
输出端 Output	电源电压 Supply Voltage	V_{CC}	-	7	V
	输出电压 Output Voltage	V_O	-	7	V
	输出电流 Output Current	I_O	-	50	mA
	峰值输出电流 Peak output current	$I_{O(PEAK)}$	-	16	mA
	输出功耗 Output power dissipation	P_O	-	200	mW
	结温 Junction Temperature	T_J	-	125	°C
工作温度 Operating Temperature		T_{amb}	-40	+100	°C
存储温度 Storage Temperature		T_{stg}	-55	+125	°C
焊接温度 Soldering Temperature		T_{sld}	-	260	°C

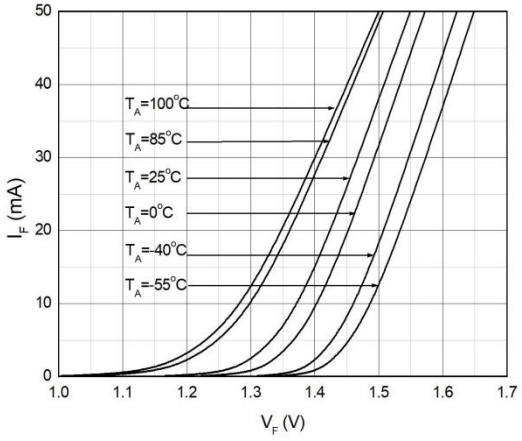
推荐的工作条件 Recommended Operating Conditions

参数 Parameter	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
电源电压 Supply Voltage	V_{CC}	2.7	5.5	V
低电平输出电流 Input current Low Level	I_{FL}	0	250	μA
高电平输出电流 Input current High Level	I_{FH}	5	15	mA
输出上拉电阻 Output Pull-up Resistor	R_L	330	4K	Ω
操作温度 Operating Temperature	TA	-40	100	°C

产品特性参数 Electro-optical Characteristics (T_{amb}=25℃)

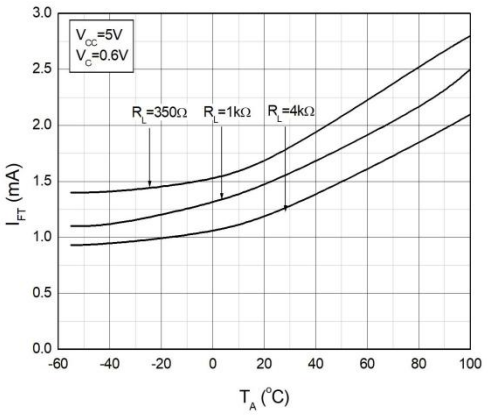
参数 Parameter		测试条件 Test Conditions	符号 Symbol	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Units
输入端 Input	输入端正向电压 Input Forward Voltage	I_F=16mA	V_F	-	1.38	1.8	V
	反向电 Input Reverse Breakdown Voltage	V_R=5V	I_R	-	-	10	μA
	输入端电容 Input capacitance	V_F=0,f=1MHz	C_{IN}	-	13	-	pF
输出端 Output	高电平电源电流 High Level Supply Current	I_F=0mA,V_{CC}=5V	I_{CCH}	-	6.3	10	mA
	高电平电源电流 Low Level Supply Current	I_F=10mA,V_{CC}=5V	I_{CCL}	-	8.3	13	mA
	高电平输出电流 High Level Output Current	I_F=250μA V_{CC}=V_O=5.5V	I_{OH}	-	2	30	μA
	低电平输出电压 Low Level Output Voltage	V_{CC}=5.5V,I_F=5mA I_{OL}=13mA	V_{OL}	-	0.3	0.6	V
	输入阈值电流 Input Threshold Current	V_{CC}=5.5V,V_O=0.6V I_{OL}=13mA	I_{TH}	-	2.5	5	mA
传输特性 Transfer Characteristics	输出高电平传输延迟 Propagation Delay Time to High Output Level	V_{CC} = 5V, I_F = 7.5mA, R_L = 350Ω, C_L = 15 pF	T_{PLH}	-	35	75	ns
	输出低电平传输延迟 Propagation Delay Time to Low Output Level		T_{PHL}	-	40	75	
	脉宽失真 ($\|T_{PHL} - T_{PLH}\|$) Pulse Width Distortion ($\|T_{PHL} - T_{PLH}\|$)		PWD	-	5	35	
	上升时间 Rise Time		t_r	-	27	-	
	下降时间 Fall Time		t_f	-	7	-	
	逻辑高电平共模瞬态抗扰度 Common Mode Transient Immunity (at Logic High)	V_{CC} = 5V, I_F = 0mA, $V_{O(MIN)}$ = 2V, R_L = 350Ω, V_{CM} = 1000V	$\|CM_H\|$	10	15	-	kv/μs
	逻辑低电平共模瞬态抗扰度 Common Mode Transient Immunity (at Logic Low)	I_F = 7.5mA,V_{CC} = 5V, $V_{O(Max)}$ = 0.8V, R_L = 350Ω, V_{CM} = 1000V	$\|CM_L\|$	10	15	-	kv/μs
隔离电阻 Isolation Resistance		V_{I-O}=500V	R_{ISO}	10^{12}	-	-	Ω
隔离电容 Isolation capacitance		f=1MHz	C_{ISO}	-	0.3	-	pF

典型特性曲线 Typical Characteristics Curves



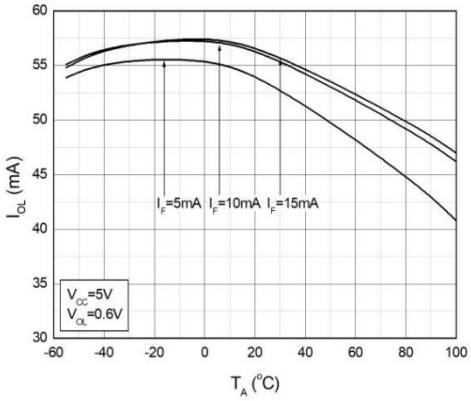
图例 1-正向电流与正向电压曲线图

Fig.1 Forward Current vs. Forward Votage



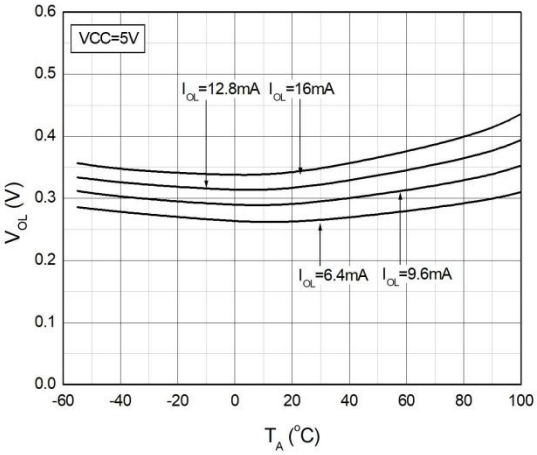
图例 2-输入阈值电流与温度曲线图

Fig. 2 Input Threshold Current vs. Temperature



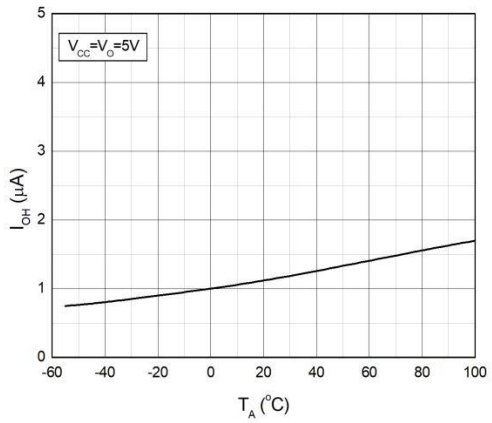
图例 3-低电平输出电流与温度曲线图

Fig. 3 Low Level Output Current vs.Temperature



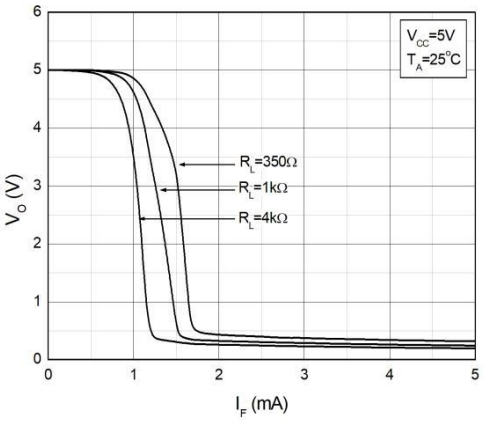
图例 4-低电平输出电压与温度曲线图

Fig. 4 Low Level Output Votage vs. Temperature



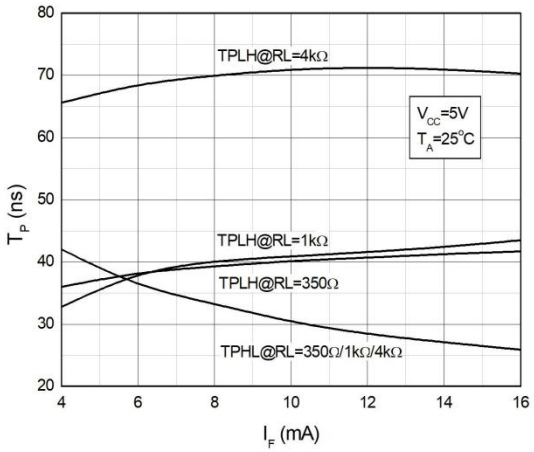
图例 5-高电平输出电流与温度曲线图

Fig. 5 High Level Output Current vs.Temperature



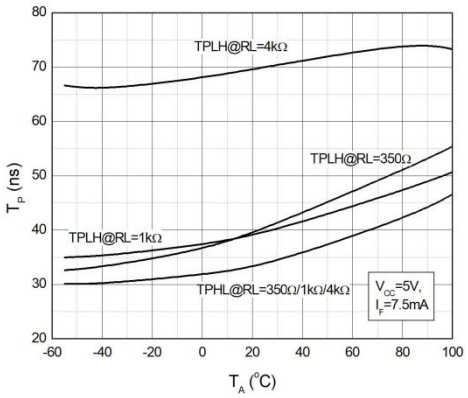
图例 6-输出电压与正向电流曲线图

Fig.6 Output Votage vs. Forward Current



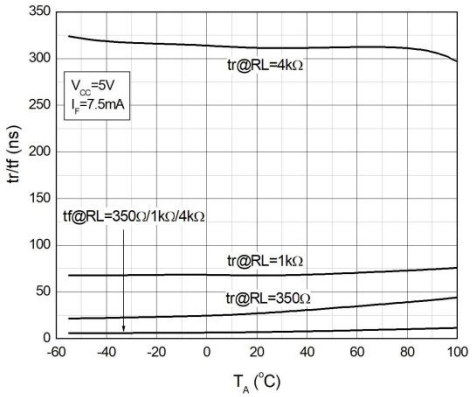
图例 7-传输延迟与正向电流曲线图

Fig.7 Propagation Delays vs. Forward Current



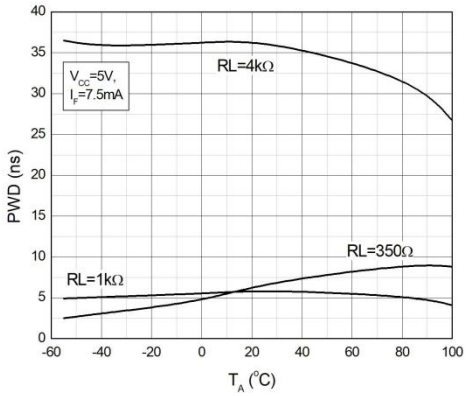
图例 8-传输延时与温度曲线图

Fig.8 Propagation Delays vs. Temperature



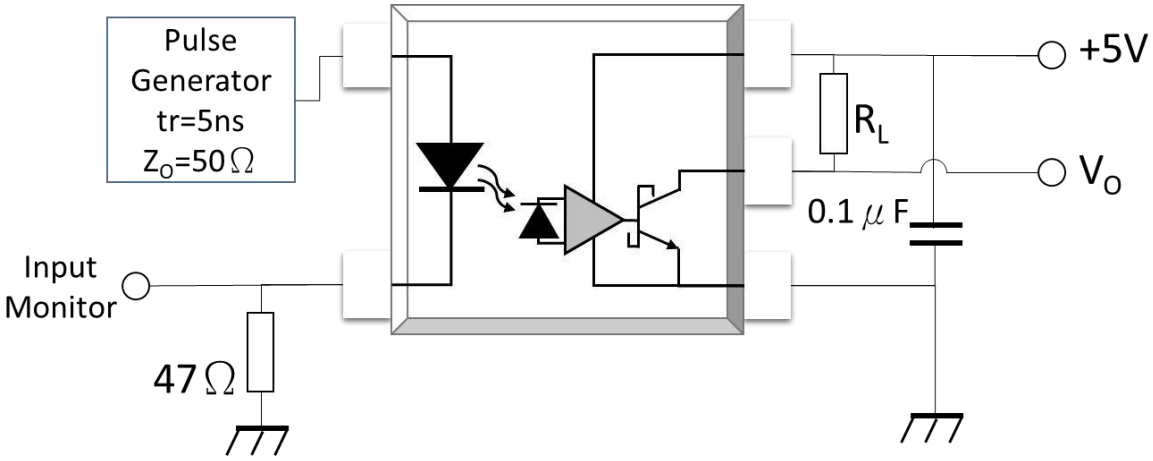
图例 9-上升＆下降时间与温度曲线图

Fig.9 Rise and Fall Time vs. Ambient Temperature



图例 10-脉宽失真与温度曲线图

Fig.10 Pulse Width Distortion vs. Ambient Temperature

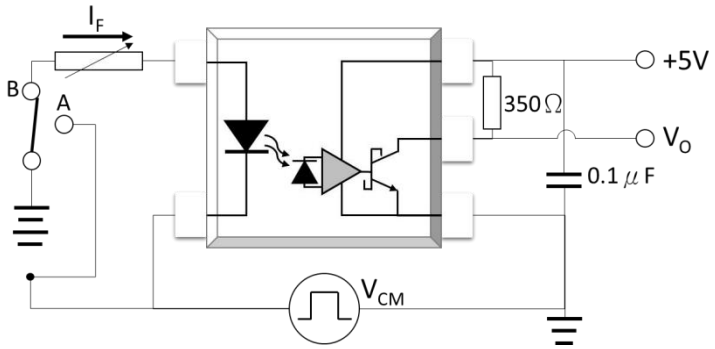


图例 11-T_{PHL},T_{PLH},t_r,t_f 测试电路

Fig.11 T_{PHL},T_{PLH} ,t_r,t_fTest Circuit

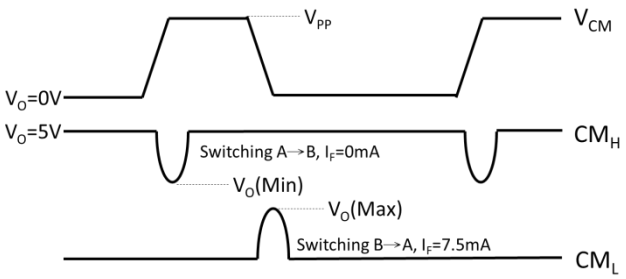
图例 12-T_{PHL},T_{PLH},t_r,t_f 波形

Fig.12 Waveforms of T_{PHL}, T_{PLH},t_r,t_f



图例 13-CMR 测试电路

Fig.16 Test Circuits for Common Mode Transient Immunity



图例 14-CMR 波形

Fig.17 Wave forms of Common Mode Transient Immunity

印字信息 Marking Information

- Si:生产商代码 Manufacturer’s Code Marking
- M601：器件型号代码 Device Part Number
- Y：年份代码 Last Digit of Year (ex: 4=2024,5=2025)
- WW：周号代码 Week Code (01 to 53)
- N：特殊代码或无 Special code or None

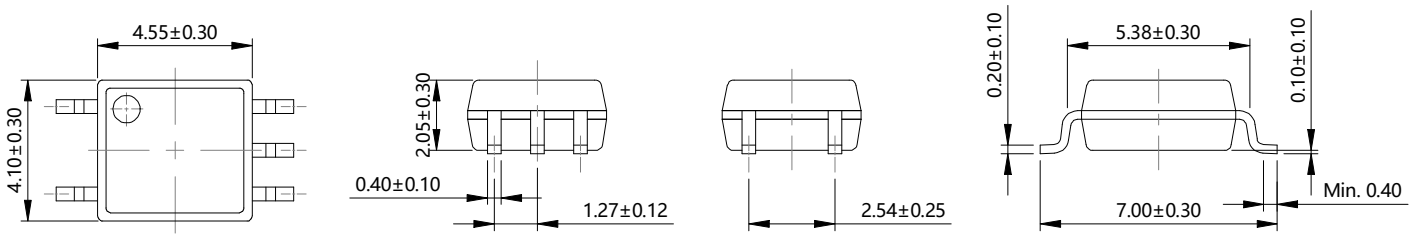
命名规则 Naming Rule

Si-M601-WY-ZTT

- Si：生产商代码 Manufacturer’s Code Marking
- M601：器件型号代码 Device Part Number
- W:框架材质（C=铜）
- Y:G/None（G=环保 ， None =非环保）
- Z 封装（Z=S:SOP5）
- TT：补充码 A~Z or 0~9 or None

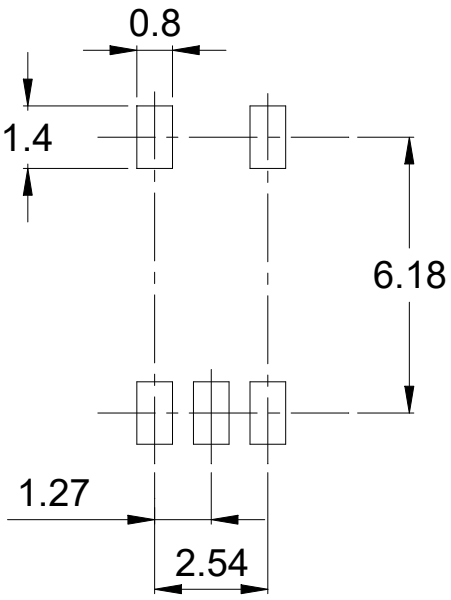
封装外形尺寸 Package Outline Dimensions

Si-M601



单位 Unit：mm

推荐焊盘尺寸 Recommended Footprint Patterns

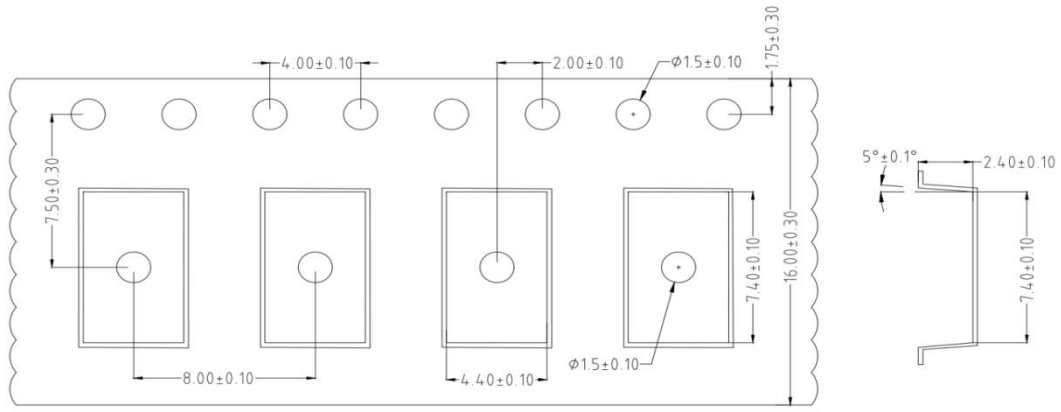
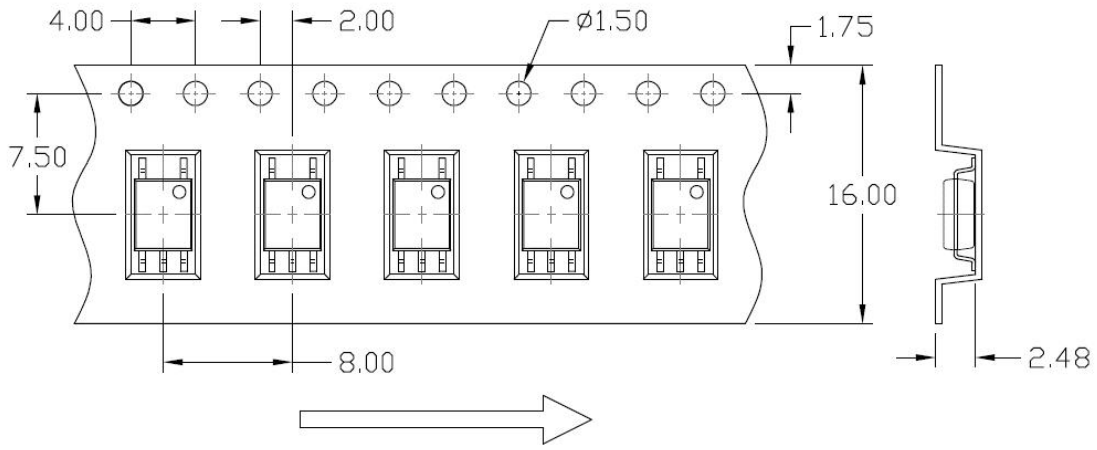


单位 Unit：mm

包装 Packing

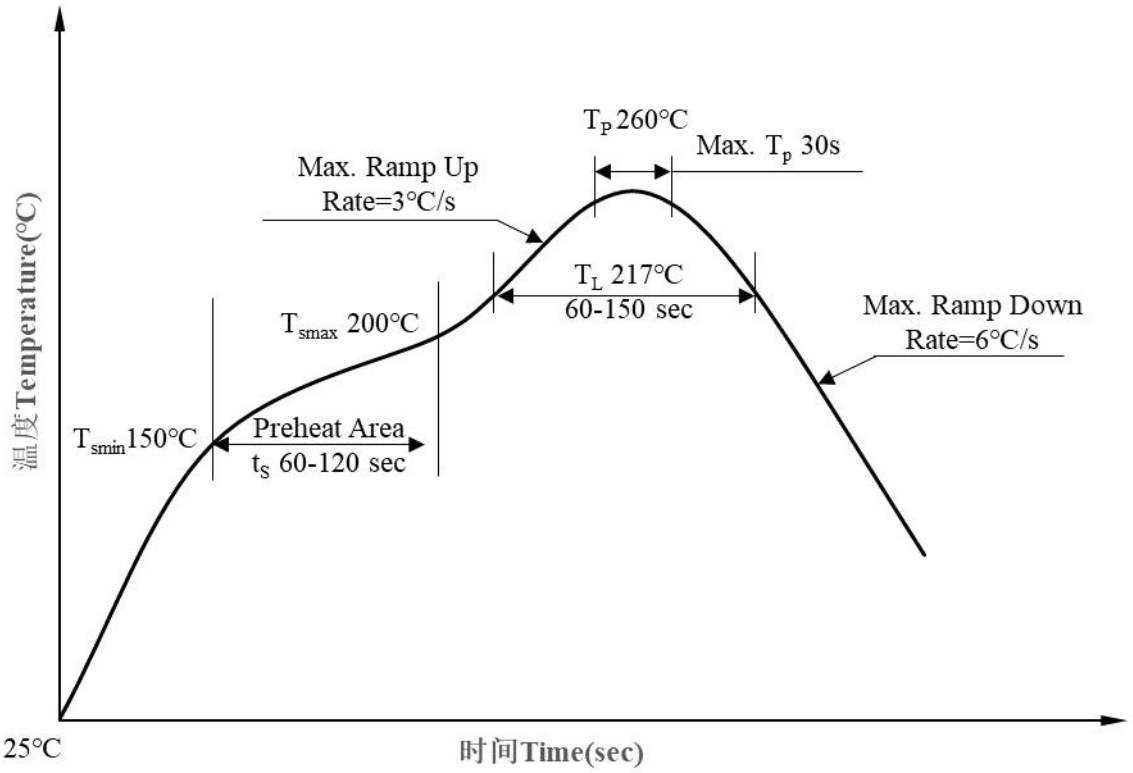
封装类型 Package Type	每盘数量 Quantity per Reel	内盒数量 Quantity per Inner Box	外箱数量 Quantity per Carton	内盒尺寸 Inner Box Dimensions	外箱尺寸 Carton Dimensions
SOP5	3000 pcs/reel	6000 pcs/inner box	60,000 pcs/carton	353*340*60mm	650*375*365mm

载带与卷盘 Tape and Reel

封装类型 Package Type	SOP5
载带 Dimensions	
包装方式 Packing Specifications	

单位：mm

回流焊温度曲线 Solder Reflow Temperature Profile



曲线项目 Profile Item		符号 Symbol	数值 Value	单位 Unit
预热区 Preheat Area	最低温度 Temperature Min.	T_{smin}	150	℃
	最高温度 Temperature Max.	T_{smax}	200	℃
	时间 Time (min. to max.)	ts	60~120	sec
焊接区 Soldering Area	温度 Temperature	T_L	217	℃
	时间 Time	t_L	60~150	sec
峰值温度 Peak Temperature		T_P	260	℃
峰值温度 T_P 至 T_P-5℃之间的时间 Time within 5 °C of Peak Temperature: T_P - 5°C		tp	30	sec max.
上升速率 Ramp-up rate			3	°C / sec max.
下降速率 Ramp-down rate			6	°C / sec max.

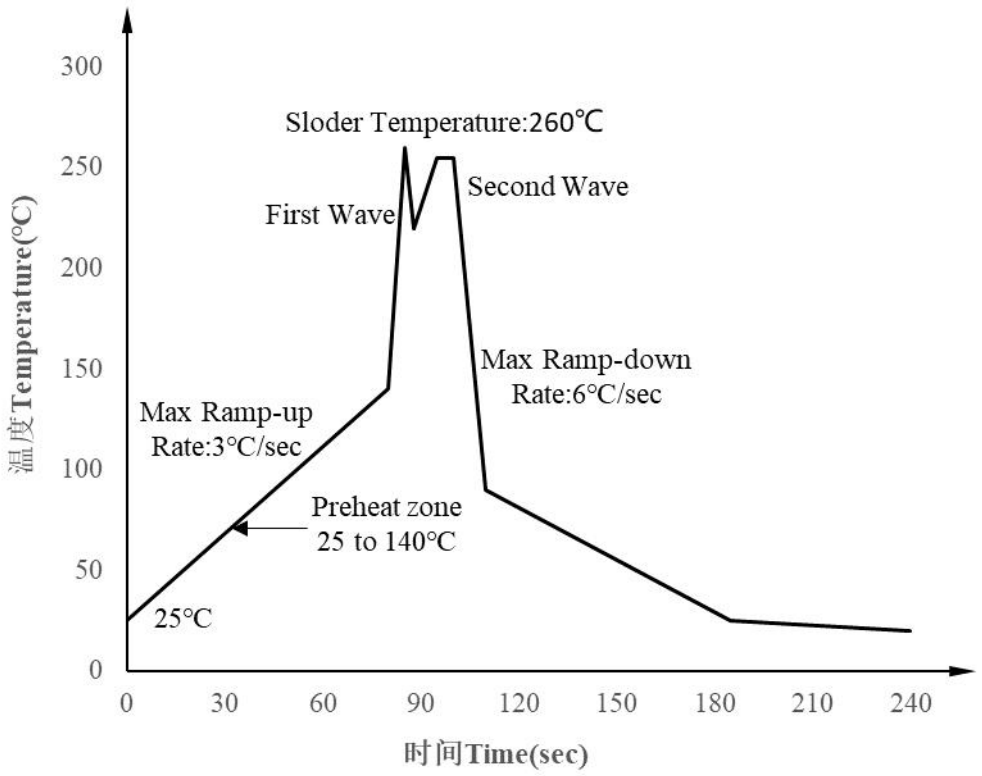
注：参考 IPC/JEDEC J-STD-020D 标准。

Note: Reference: IPC/JEDEC J-STD-020D.

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。

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

波峰焊温度曲线 Wave soldering Temperature Profile



详情请参考 JEDEC 标准 JESD22-A111
For more details,please refer to the JESD22-A111 of JEDEC standards.

手工烙铁焊接 Hand soldering by soldering iron

(1) 建议一次完成焊接。
One time soldering is recommended.
(2) 温度 360℃ ± 5℃，时间≤3s。
Temperature：360℃ ± 5℃, within 3s.

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