硅耐光电
SILICON NICE OPTOELECTRONIC

光电耦合器
OPTOCOUPLER

产品规格书
Product Data Sheet

Si-356 系列
Si-356 Series

Si DCC
Release

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

描述 Description

Si-356 系列有一个发光二极管，通过红外光与硅基光电晶体管耦合并合封在四脚小型扁平封装中。该产品的小尺寸封装可显著节省安装空间。

The Si-356 series has a infrared emitting diode,which is optically coupled to a silicon planar phototransistor detector, and is incorporated in a 4-pin mini-flat package. The small dimension of this product allows significant space saving.

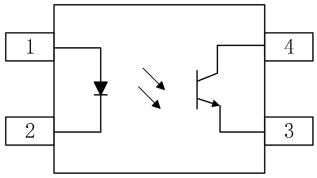
典型应用 Typical Applications

- 电源适配器
  AC Adapters
- I/O 接口隔离
  I/O Interface Boards
- 可编程控制器
  Programmable Logic Controllers (PLCs)
- 家用电器，比如空调、风扇、热水器等
  Household appliances: such as air conditioners, fans, water heaters, etc.

特性 Features

- 电流转换比(CTR)范围: 200%~600%(I_F = 5mA, V_{CE} = 5V)
  Current Transfer Ratio: 200% to 600% at I_F = 5mA, V_{CE} = 5V
- 集电极-发射极耐压 V_{CEO}≥80V
  Collector - emitter Voltage V_{CEO}≥80V
- 输入-输出隔离电压最小 3750 V_{RMS}
  Input-output Isolation Voltage 3750 V_{RMS}(min)

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
		1: Anode 2: Cathode 3: Emitter 4: Collector

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}	3750	V_{RMS}
最大瞬态隔离电压 Maximum Transient Isolation Voltage	According to DIN EN 60747-5-5	V_{IOTM}	600	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}	5000	V_{peak}
爬电距离 Creepage Distance	/	L	＞5.0	mm

极限参数 Absolute Maximum Ratings (T_{amb}=25℃)

参数 Parameter		符号 Symbol	极限值 Rating	单位 Unit
输入端 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	70	mW
	峰值电流 Peak forward current (1us, pulse)	I_{FP}	1	A
	结温 Junction Temperature	T_J	125	℃
输出端 Output	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}	7	V
	集电极电流 Collector Current	I_C	50	mA
	集电极功耗 Collector Power Dissipation	P_C	150	mW
	结温 Junction Temperature	T_J	125	℃
总功耗 Total Power Dissipation		P_{tot}	170	mW
工作温度 Operating Temperature		T_{amb}	-55~110	℃
存储温度 Storage Temperature		T_{stg}	-55~125	℃
焊接温度 Soldering Temperature		T_{sld}	260	℃

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

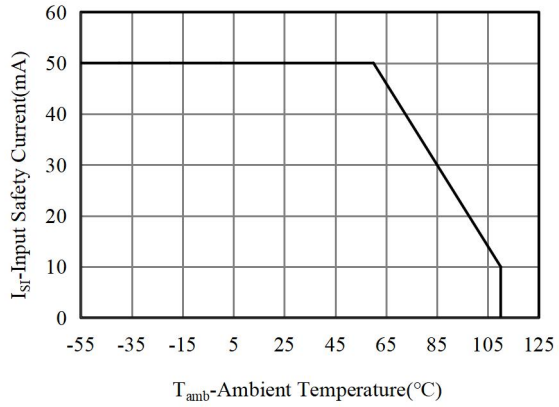
参数 Parameter		测试条件 Test Conditions	符号 Symbol	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Units
输入端 Input	正向电压 Forward Voltage	I_F=10mA	V_{F1}	-	1.2	1.4	V
		I_F=20mA	V_{F2}	-	1.25	1.45	V
	反向电流 Reverse current	V_R=5V	I_R	-	-	10	μA
	输入端电容 Input capacitance	V=0,f=1kHz	C_{IN}	-	30	250	pF
输入端 Output	集电极暗电流 Collector Dark Current	V_{CE}=50V	I_{CEO}	-	-	100	nA
	集电极-发射极击穿电压 Collector-Emitter Breakdown Voltage	I_C=0.1mA, I_F=0mA	BV_{CEO}	80	-	-	V
	发射极-集电极击穿电压 Emitter-Collector Breakdown Voltage	I_E=0.01mA, I_F=0mA	BV_{ECO}	7	-	-	V
传输特性 Transfer Characteristics	*电流传输比 *Current Transfer Ratio	I_F=2mA ,V_{CE}=5V	CTR*	100	-	600	%
		I_F=5mA ,V_{CE}=5V		200	-	600	%
	集电极-发射极饱和压降 Collector-Emitter Saturation Voltage	I_F=10mA,I_C=1mA	$V_{CE(sat)}$	0	-	0.2	V
	隔离电阻 Isolation Resistance	DC500V,40~60%R.H.	R_{ISO}	$5x10^{10}$	$1x10^{11}$	-	Ω
	隔离电容 Isolation capacitance	V=0,f=1MHz	C_{ISO}	-	0.6	1	pF
	截止频率 Cut-off Frequency	V_{CE}=5V, I_C=2mA, R_L=100Ω,-3dB	F_C	-	80	-	kHz
	上升时间 Rise Time	V_{CE}=2V, I_C=2mA, R_L=100Ω	tr	-	4	-	μs
	下降时间 Fall Time		tf	-	3	-	μs

*CTR=$\frac{I_C}{I_F}$ x 100%

电流传输比分档表 Rank Table of Current Transfer Ratio

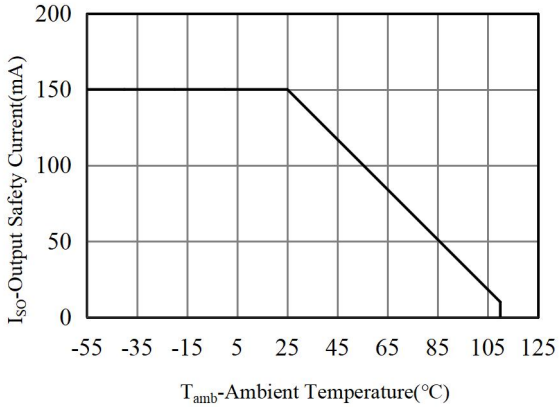
参数 Parameter	测试条件 Test Conditions	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
CTR Rank	I_F = 5mA, V_{CE} = 5V T_{amb} = 25°C	C	200	400	%
		D	300	600	%
		E	300	450	%
		F	380	600	%
	I_F = 2mA, V_{CE} = 5V T_{amb} = 25°C	C	100	-	%
		D	200	-	%
		E	200	-	%
		F	250	-	%

典型特性曲线 Typical Characteristics Curves



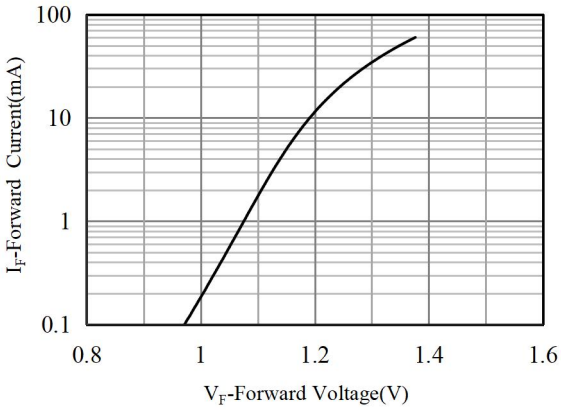
图例 1-输入安全电流与环境温度曲线图

Fig. 1 - Input Safety Current vs. Ambient Temperature



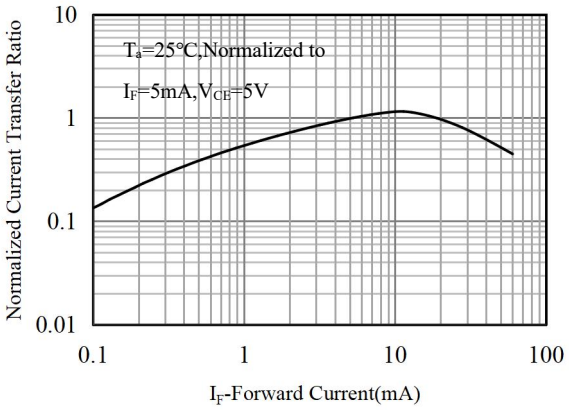
图例 2-输出安全电流与环境温度曲线图

Fig. 2 - Output Safety Power vs. Ambient Temperature



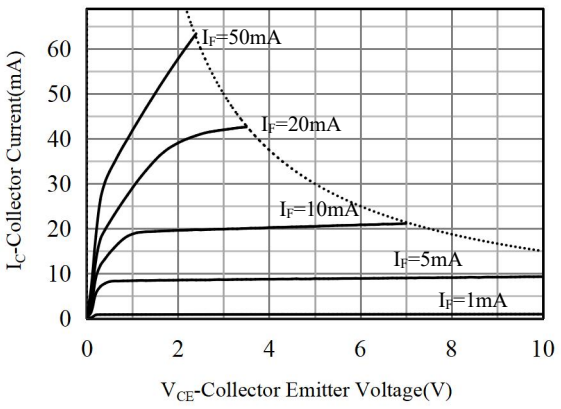
图例 3-正向电流与正向电压曲线图

Fig. 3 - Forward Current vs. Forward Voltage



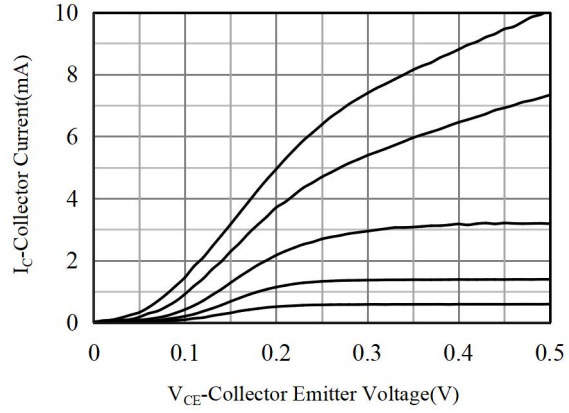
图例 4-归一化电流转换比与正向电流曲线图

Fig. 4 Normalized Current Transfer Ratio vs. Forward Current



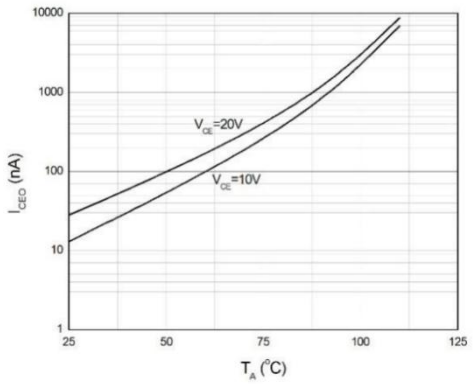
图例 5-集电极电流与集电极-发射极电压曲线图

Fig.5-Collector Current vs. Collector Emitter Voltage



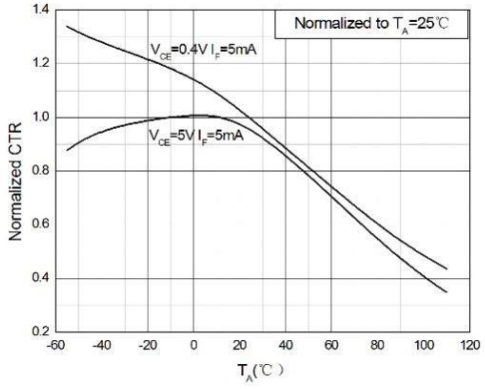
图例 6-集电极电流与集电极-发射极电压曲线图

Fig.-Collector Current vs. Collector Emitter Voltage



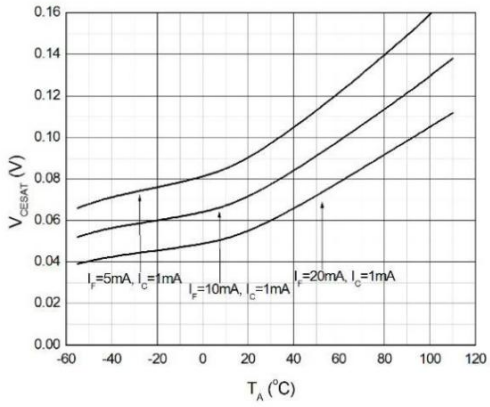
图例 7-集电极暗电流与环境温度曲线图

Fig. 4 Collector Dark Currentvs. Ambient Temperature



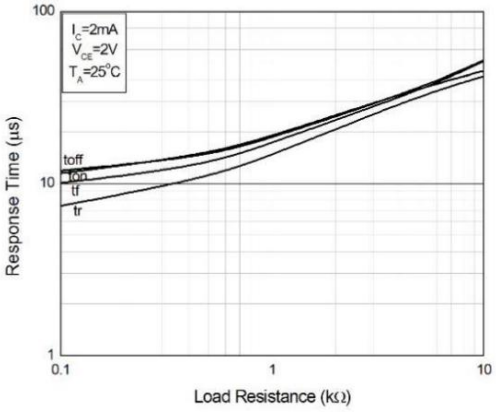
图例 8-归一化电流传输比与环境温度曲线图

Fig. 8 - Normalized Current Transfer Ratio vs. Ambient Temperature



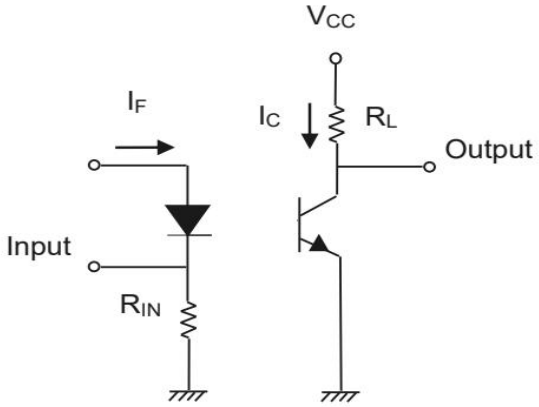
图例 9-集电极-发射极饱和压降与环境温度曲线图

Fig. 9 - Collector-emitter Saturation Voltage vs. Ambient Temperature



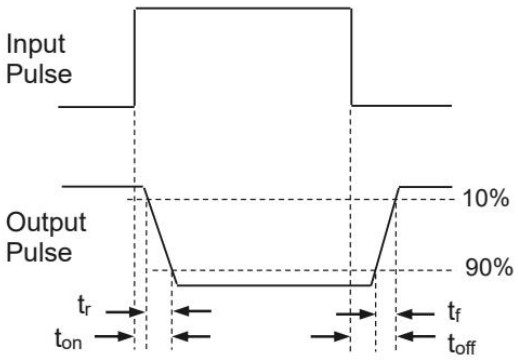
图例 10-响应时间与负载电阻曲线图

Fig. 10 -Responseg Time vs. Load Resistance



图例 11-开关时间测试电路图

Fig. 11 - Switching Time Test Circuit



图例 12-开关时间波形图

Fig. 12 - Switching Time Test Waveforms

印字信息 Marking Information

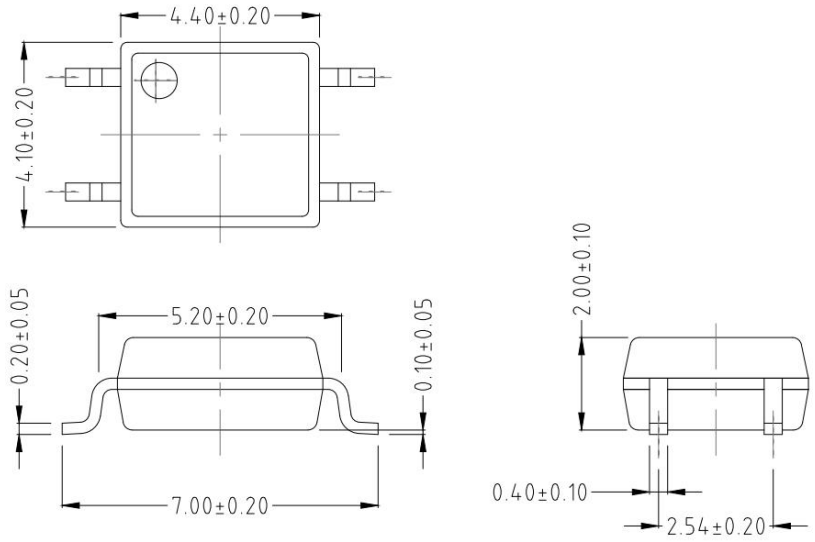
- Si:生产商代码 Manufacturer's Code Marking
- 356: 器件型号代码 Device Part Number
- X: 电流传输比代码 CTR Rank Code
- Y: 年份代码 Last Digit of Year (ex: 4=2024，5=2025)
- WW: 周号代码 Week Code (01 to 53)
- N:特殊代码或无 Special code or None

命名规则 Naming Rule

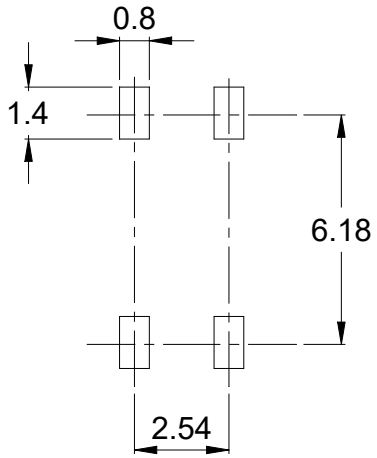
Si-356X-WY-ZTT

- Si: 生产商代码 Manufacturer's Code Marking
- 356: 器件型号代码 Device Part Number
- X: 电流传输比代码（C、D、E、F 或无）CTR Rank Code（C、D、E、F OR None）
- W:框架材质（C=铜）
- Y:G/None（G=环保 ， None =非环保）
- Z:SOP 封装（Z=S:SOP4）
- TT：补充码 A~Z or 0~9 or None

封装外形尺寸 Package Outline Dimensions



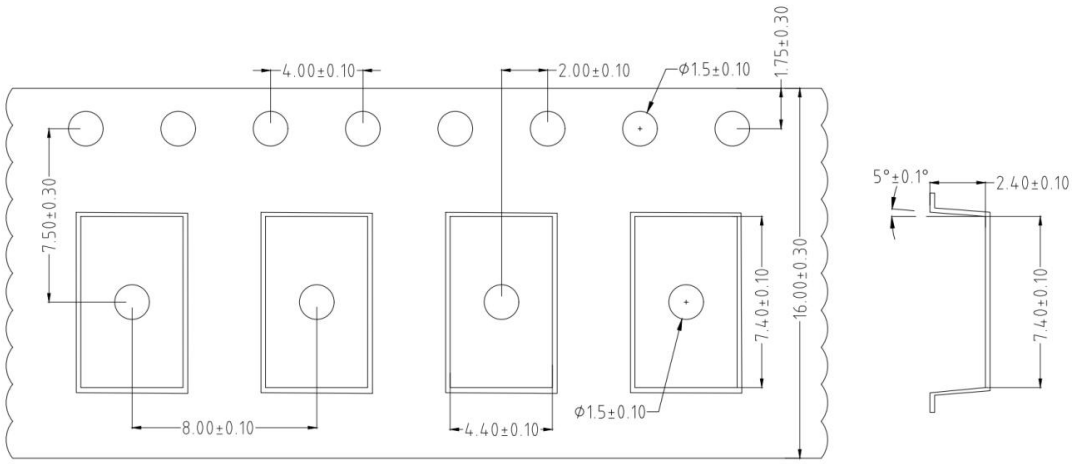
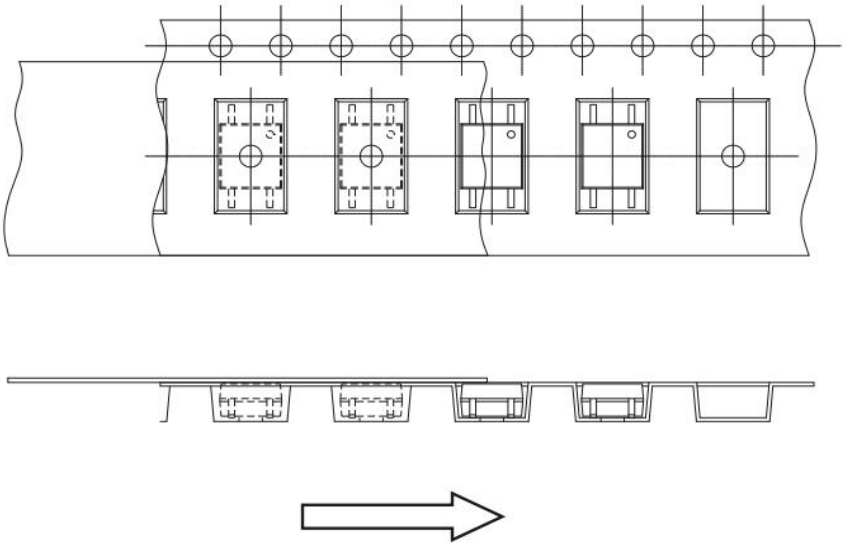
推荐焊盘尺寸 Recommended Footprint Patterns



包装 Packing

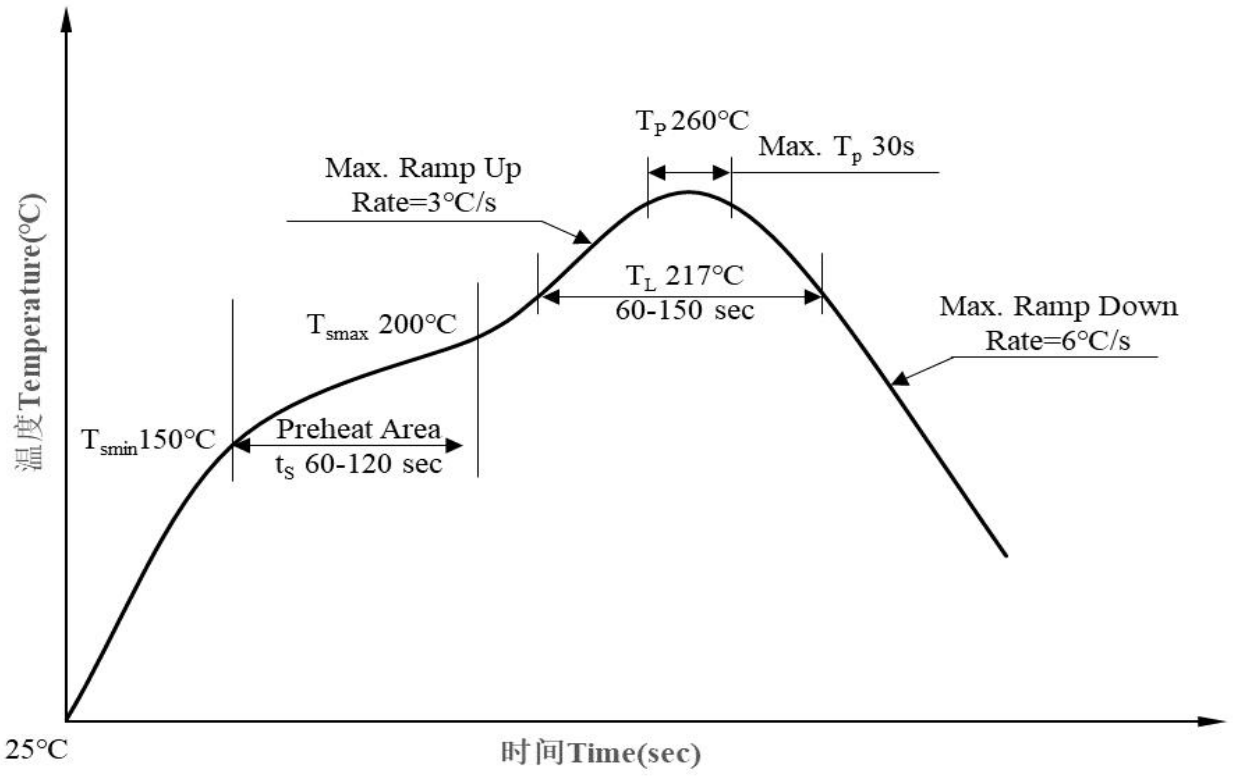
封装类型 Package Type	每盘数量 Quantity per Reel	内盒数量 Quantity per Inner Box	外箱数量 Quantity per Carton	内盒尺寸 Inner Box Dimensions	外箱尺寸 Carton Dimensions
SOP4	3000 pcs/reel	6000 pcs/inner box	60,000 pcs/carton	353*340*60mm	650*375*365mm

载带与卷盘 Tape and Reel

封装类型 Package Type	SOP4
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	°C
	最高温度 Temperature Max.	T_{smax}	200	°C
	时间 Time (min. to max.)	ts	60~120	sec
焊接区 Soldering Area	温度 Temperature	T_L	217	°C
	时间 Time	t_L	60~150	sec
峰值温度 Peak Temperature		T_P	260	°C
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.

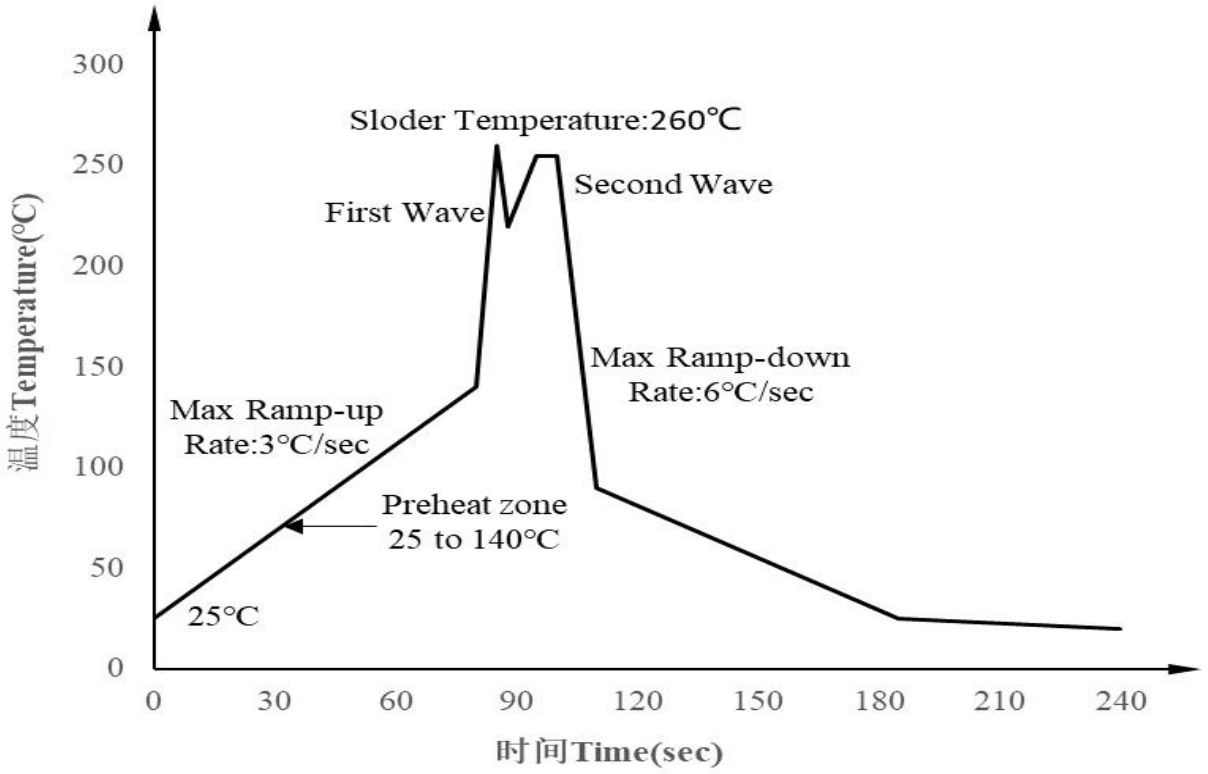
注：参考 IPC/JEDEC J-STD-020D 标准。

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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