硅耐光电
SILICON NICE OPTOELECTRONIC

光电耦合器
OPTOCOUPLER

产品规格书
Product Data Sheet

Si-214 系列
Si-214 Series

Si DCC
Release

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

描述 Description

Si-214 系列有两个发光二极管，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-214 series has two 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.

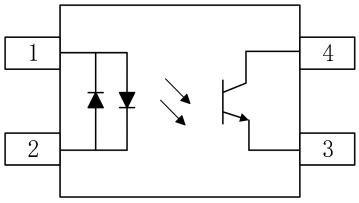
典型应用 Typical Applications

- 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: 50%~300%(I_F = ±1mA, V_{CE} = 5V)
  Current Transfer Ratio: 50% to 300% at I_F = ±1mA, 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/Cathode 2: Cathode/Anode 3: Emitter 4: Collector

安规与绝缘参数 Safety and Insulation Ratings

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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	℃

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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_F	-	1.2	1.4	V
	反向电流 Reverse current	V_R=4V	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}=20V	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=±1mA ,V_{CE}=5V	CTR*	50	-	300	%
	集电极-发射极饱和压降 Collector-Emitter Saturation Voltage	I_F=±20mA,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 = ±1mA V_{CE} = 5V T_{amb} = 25°C	A	50	150	%
		B	100	300	%
		None	50	300	%

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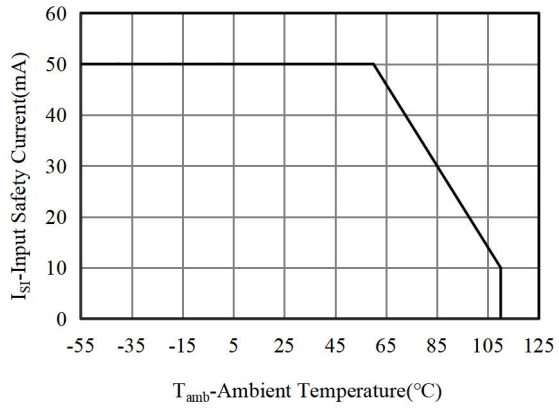
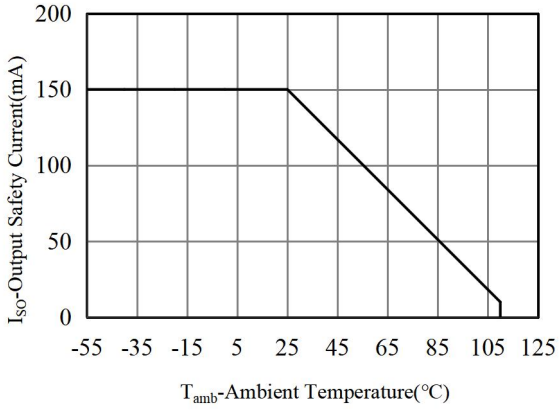
典型特性曲线 Typical Characteristics Curves



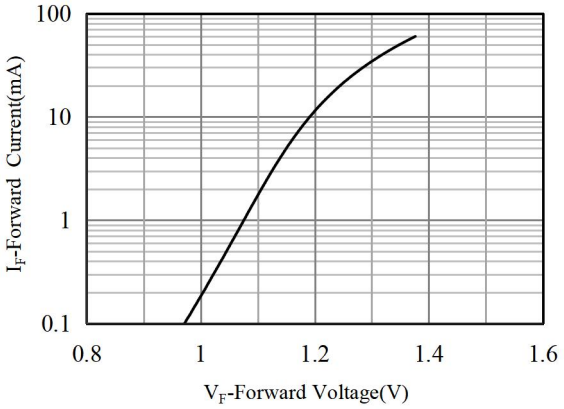
图例 1-输入安全电流与环境温度曲线图

Fig. 1 - Input Safety Current vs. Ambient Temperature



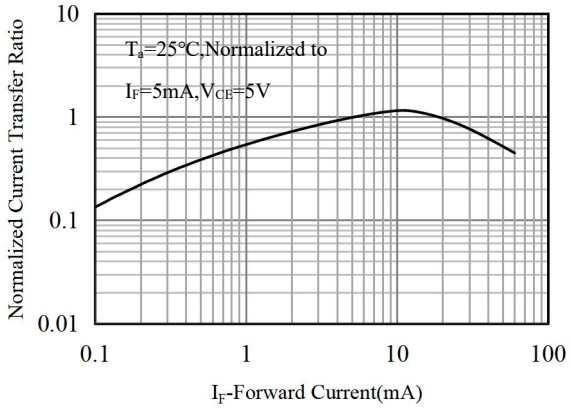
图例 2-输出安全电流与环境温度曲线图

Fig. 2 - Output Safety Power vs. Ambient Temperature



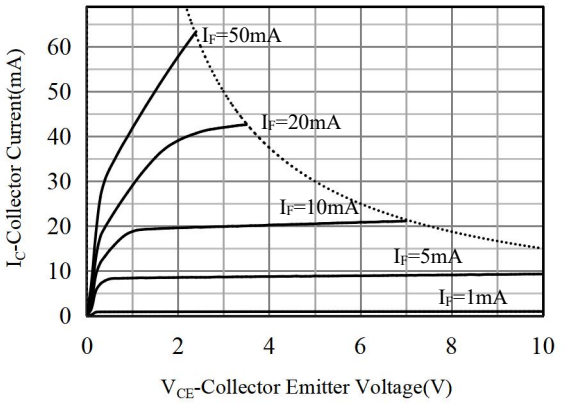
图例 3-正向电流与正向电压曲线图

Fig. 3 - Forward Current vs. Forward Voltage



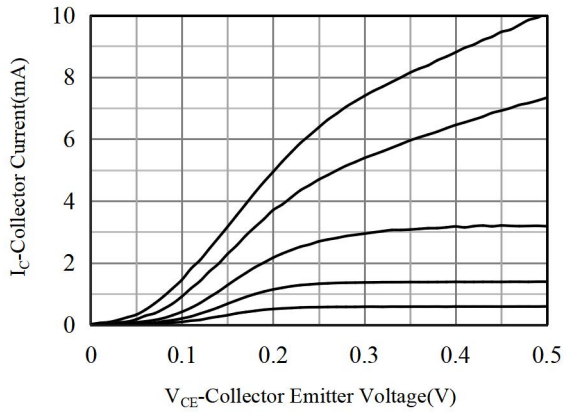
图例 4-归一化电流转换比与正向电流曲线图

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

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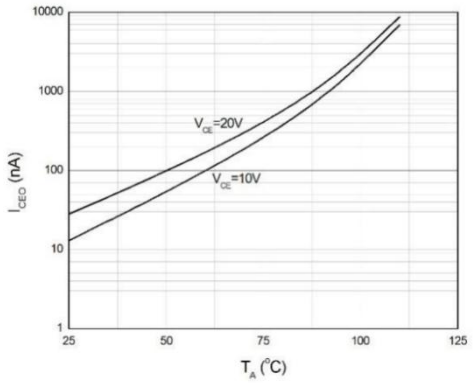
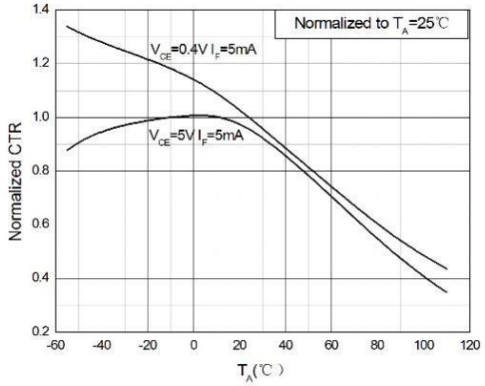


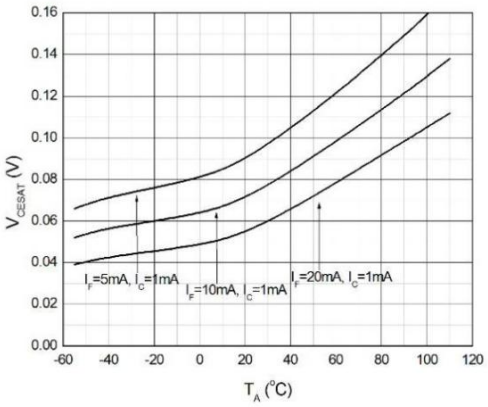
图例 7-集电极暗电流与环境温度曲线图

Fig. 4 Collector Dark Currentvs. Ambient Temperature



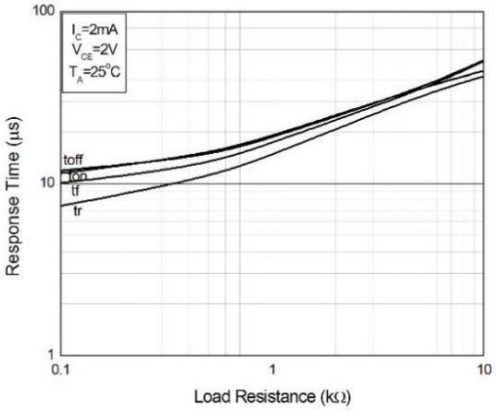
图例 8-归一化电流传输比与环境温度曲线图

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



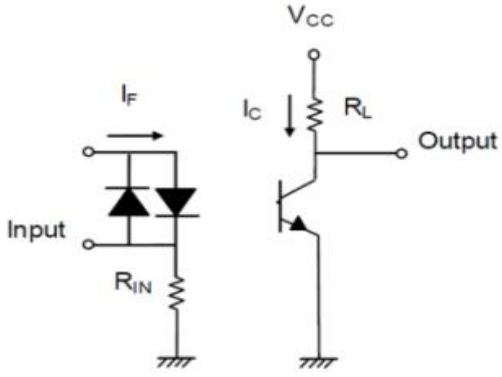
图例 3-正向电流与正向电压曲线图

Fig. 3 - Forward Current vs. Forward Voltage



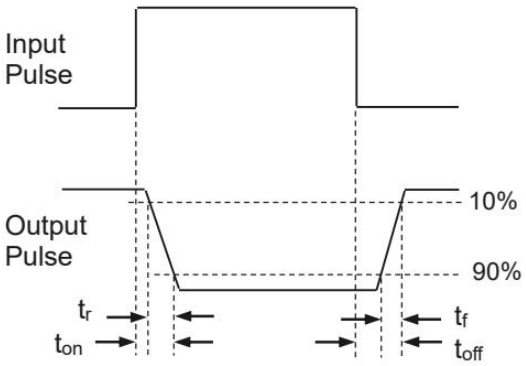
图例 4-归一化电流转换比与正向电流曲线图

Fig. 4 Normalized Current Transfer Ratio vs. Forward Current



图例 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

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印字信息 Marking Information

- Si:生产商代码 Manufacturer’s Code Marking
- 214: 器件型号代码 Device Part Number
- X: 电流传输比代码 CTR Rank Code
- Y: 年代码 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-214X-WY-ZTT

- Si: 生产商代码 Manufacturer’s Code Marking
- 214: 器件型号代码 Device Part Number
- X: 电流传输比代码（A、B 或无）CTR Rank Code（A、B OR None）
- W:框架材质（C=铜）
- Y:G/None（G=环保 ， None =非环保）
- Z:SSOP 封装（Z=S:SSOP4）
- TT：补充码 A~Z or 0~9 or None

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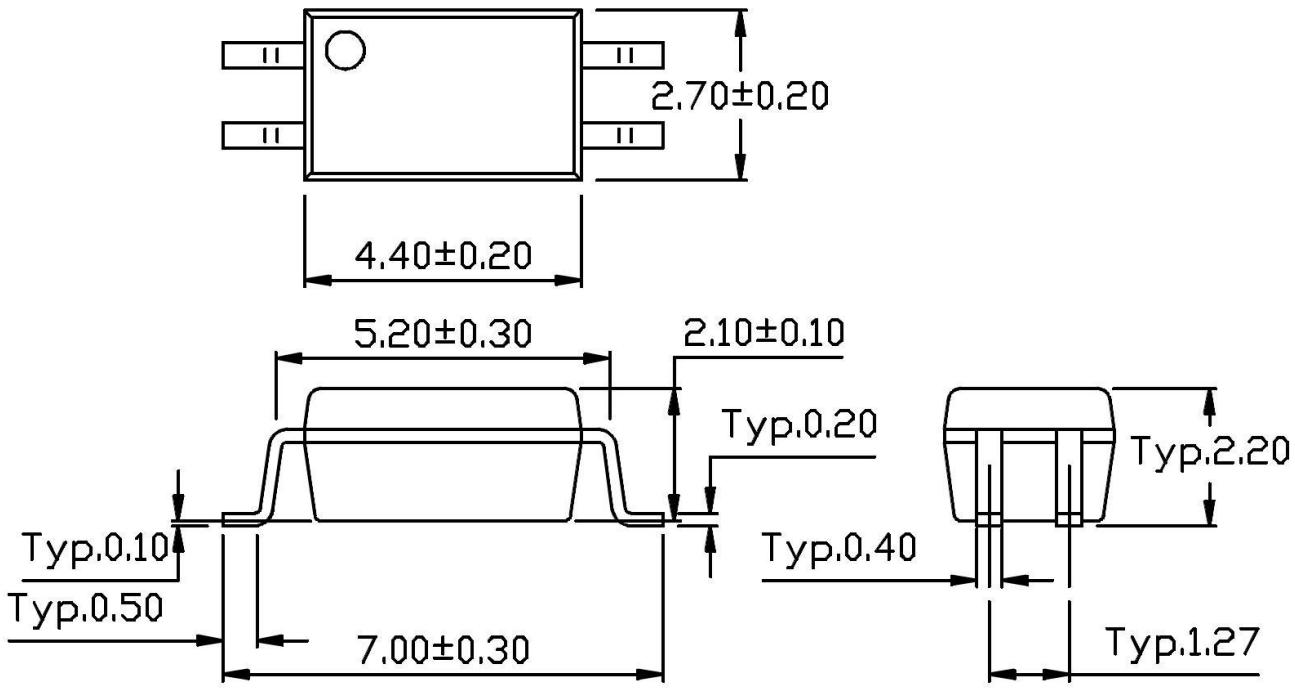
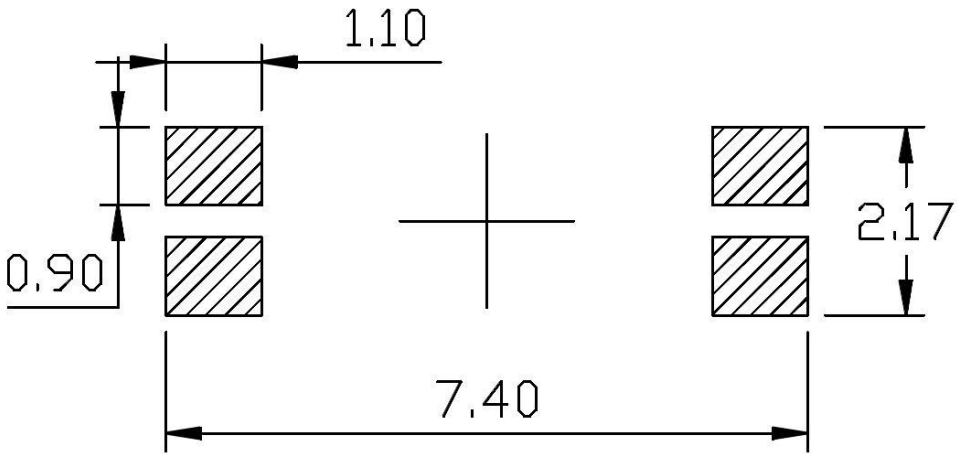
封装外形尺寸 Package Outline Dimensions



推荐焊盘尺寸 Recommended Footprint Patterns



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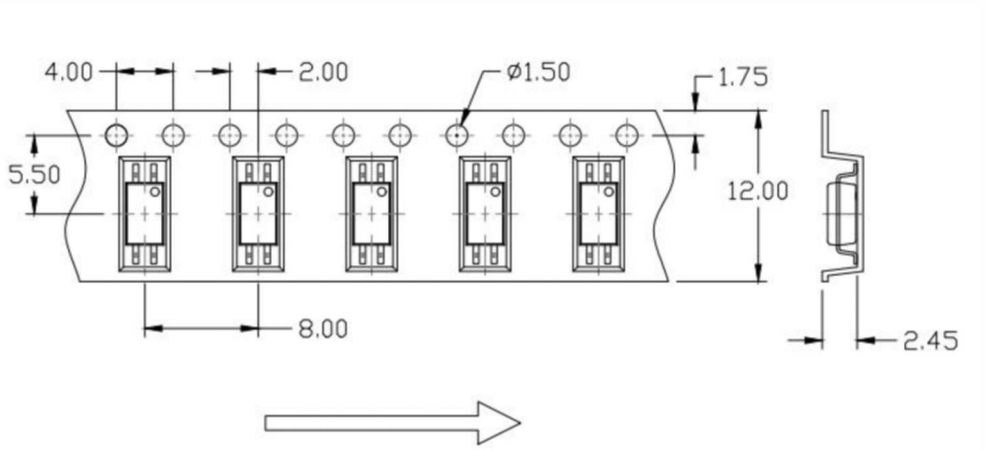
包装 Packing

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
SSOP4	3000 pcs/reel	9000 pcs/inner box	45,000 pcs/carton	360*360*69mm	450*380*380mm

载带与卷盘 Tape and Reel

封装类型 Package Type	SSOP4
载带 Dimensions	

单位：mm

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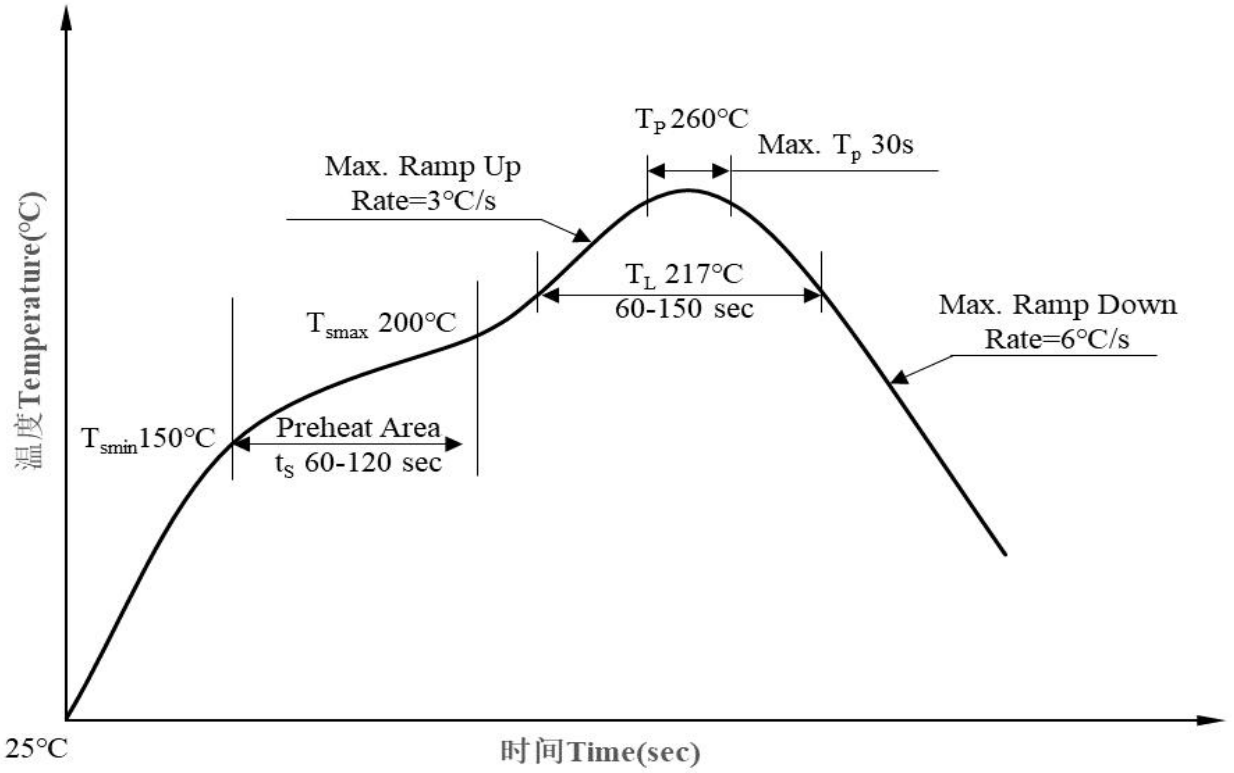
回流焊温度曲线 Solder Reflow Temperature Profile



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.

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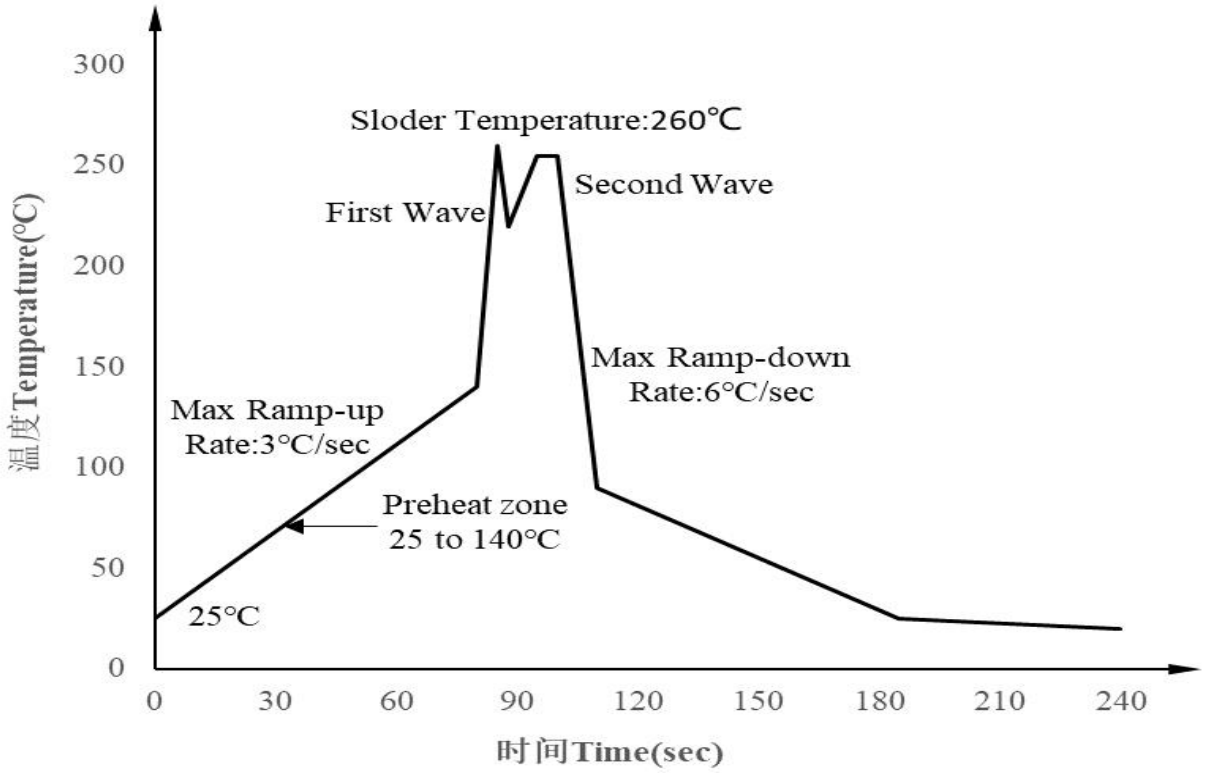
波峰焊温度曲线 Wave soldering Temperature Profile



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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