硅耐光电
SILICON NICE OPTOELECTRONIC

光电耦合器
OPTOCOUPLER

产品规格书
Product Data Sheet

Si-M304X,Si-M306X,Si-M308X 系列

Si-M304X,Si-M306X,Si-M308X Series

Si DCC
Release

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

描述 Description

Si-M304X,Si-M306X,Si-M308X 系列器件是由一个 GaAs 红外发光二极管和一个单晶硅芯片的过零相位光电双向晶闸管组成的光电耦合器。

The Si-M304X,Si-M306X,Si-M308X series devices are optocouplers composed of a GaAs infrared light emitting diode and a zero-crossing silicon chip random phase photoelectric bidirectional thyristor.

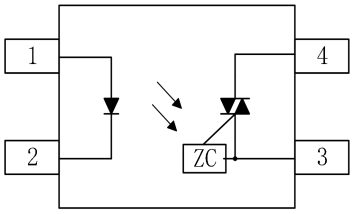
典型应用 Typical Applications

- 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.

特性 Features

- 高隔离电压（V_{ISO}=3750VRMS）
  High isolation 3750 VRMS
- 直流输入和过零触发输出
  DC input with zero-cross photo triac output
- 工作温度：-55℃~110℃
  Operating Temperature: -55℃~110℃

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
 SOP4		1: Anode 2: Cathode 3: Terminal 4: Terminal

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}	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	＞5.0	mm

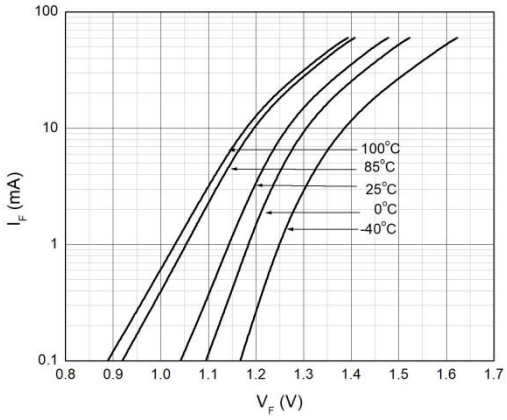
极限参数 Absolute Maximum Ratings (T_{amb}=25℃)

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	100	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	断态输出电压 Off-state Output Terminal Voltage	Si-M303X	250	V
		Si-M304X	400	
		Si-M306X	600	
		Si-M308X	800	
	峰值重复浪涌电流(pw=100μs,120pps) Peak repetitive surge current (pw=100μs,120pps)	I_{TSM}	1	A
	集电极功耗 Collector Power Dissipation	P_C	300	mW
	结温 Junction Temperature	T_J	125	℃
总功耗 Total Power Dissipation		P_{tot}	330	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℃)

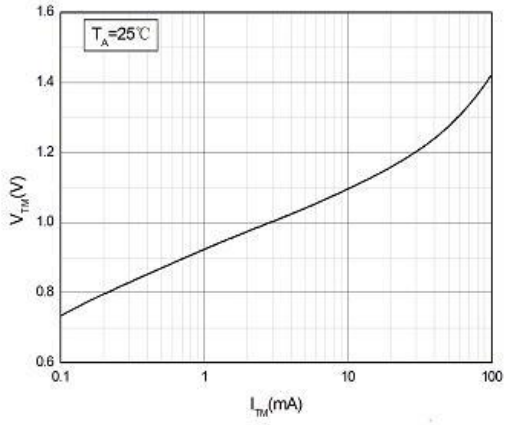
参数 Parameter			测试条件 Test Conditions	符号 Symbol	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Units
输入端 Input	正向电压 Forward Voltage		I_F=10mA	V_F	-	1.2	1.4	V
	反向电流 Reverse current		V_R=5V	I_R	-	-	10	μA
	输入端电容 Input capacitance		V=0,f=1kHz	C_{IN}	-	-	250	pF
输出端 Output	断态峰值电流 Peak Off-state Current,Either Direction		V_{DRM}=Rated V_{DRM} I_F=0mA	I_{DRM1}	-	-	500	nA
	通态峰值电压 Peak On-state Current,Either Direction		I_{TM}=100mA peak I_F= Rated I_{FT}	V_{TM}	-	-	2.5	V
	断态电压临界上升率 Critical Rate of Rise of Off-state Voltage		V_{PEAK} =Rated V_{DRM} I_F=0mA	dV/dt	1	-	-	KV/μs
	抑制电压 Inhibit Voltage		I_F= Rated I_{FT}	V_{INH}	-	-	20	V
	抑制状态的漏电流 Leakage in Inhibited State		V_{DRM}=Rated V_{DRM} I_F= Rated I_{FT}	I_{DRM2}	-	-	500	μA
传输特性 Transfer Characteristics	LED 触发电流 LED trigger current	Si-M3041	Terminal Voltage = 3V	I_{FT}	-	-	15	mA
		Si-M3061						
		Si-M3081						
		Si-M3042			-	-	10	
		Si-M3062						
		Si-M3082						
		Si-M3043			-	-	5	
		Si-M3063						
		Si-M3083						
	维持电流 Maintain current		-	I_H	-	250	-	μA
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



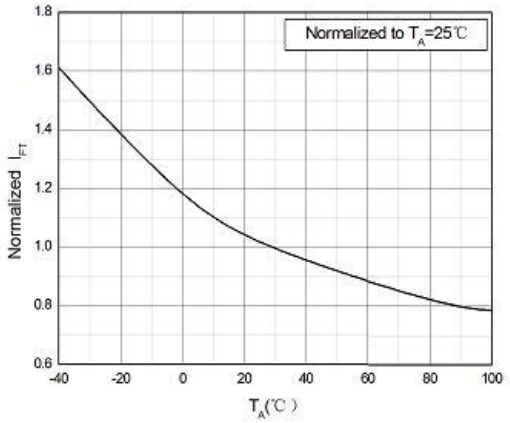
图例 1-正向电流与正向电压曲线图

Fig. 1 - Forward Current vs. Forward Voltage



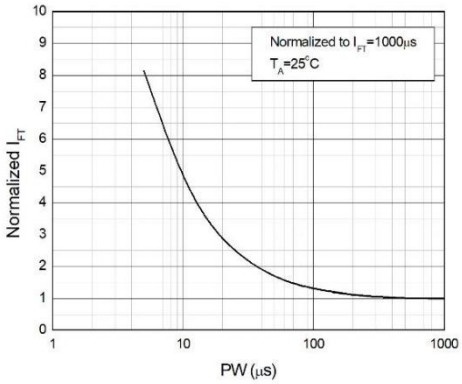
图例 2-通态特性图

Fig. 2 - On-state Terminal Voltage vs. On-state Terminal Current



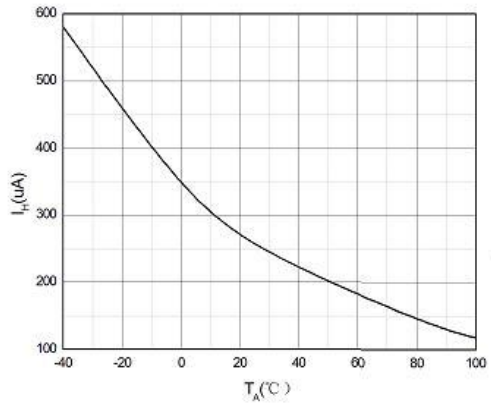
图例 3-触发电流与温度曲线图

Fig. 3 - Normalized Trigger Current vs. Temperature



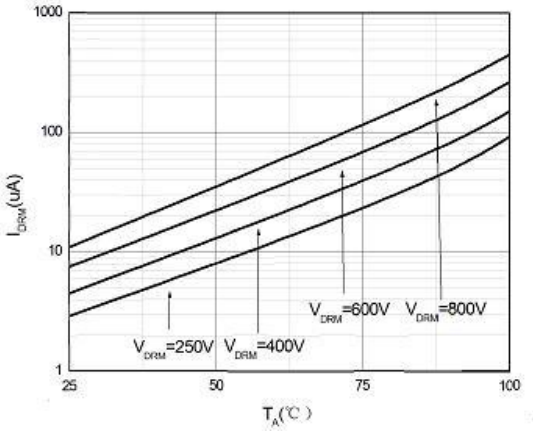
图例 4-触发电流 vs LED 脉冲宽度

Fig. 4 Normalized Trigger Current vs. LED Trigger Pulse Width



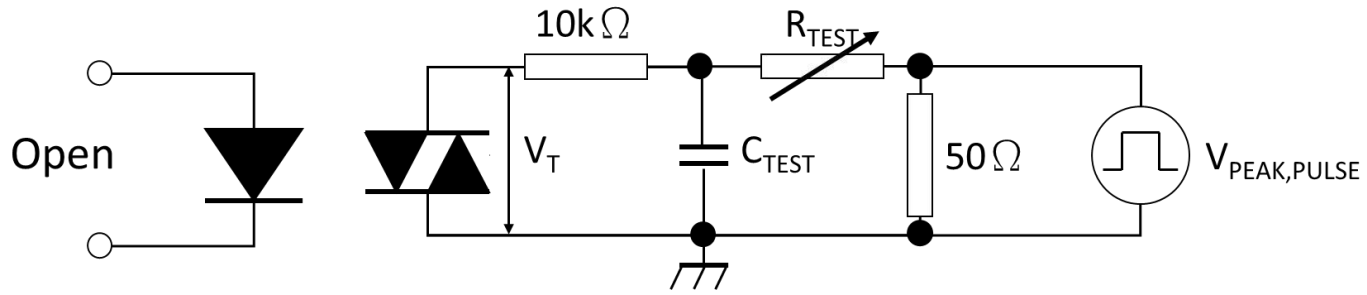
图例 5-维持电流与温度曲线图

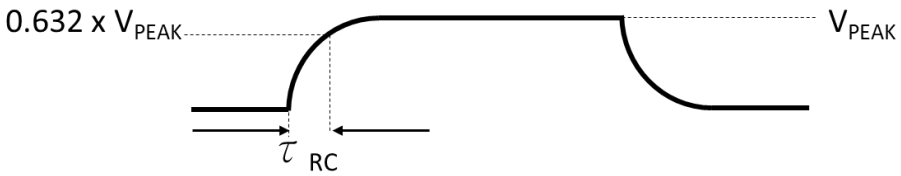
Fig.5-Holding Current vs. Temperature



图例 6-断态峰值电流与温度曲线图

Fig.-Off-state Terminal Current vs. Temperature





$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

通过 RC 电路施加于被测器件的输出端的高电压脉冲设置到所需的 V_{PEAK} 值上。LED 电流无需加上。波形 V_T 使用 X100 探头监测。通过调节 R_{TEST} 值，dv/dt（斜度）增加，直到被测器件观察到被触发（波形崩溃）。dv/dt 然后下降，直到被测器件停止被触发。此时，记录 τ_{RC} 值并可计算 dv/dt 了。

The high voltage pulse applied to the output end of the device under test through the RC circuit is set to the desired V_{PEAK} value. LED current does not need to be added. Waveform V_T is monitored with X100 probe. By adjusting the R_{TEST} value, dv/dt (slope) increases until the device under test is observed to be triggered (waveform collapse). Dv/dt then drops until the device under test stops being triggered. At this time, dv/dt can be calculated by recording the value of τRC.

$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

例如，QX305X 系列的电压峰值 = 400V。 dv/dt 值的计算方式如下：

For example, the voltage peak of QX305X series V_{PEAK}=400V. Then the dv/dt value can be calculated as follows:

$$dv/dt = \frac{0.632 \times 400}{\tau_{RC}} = \frac{252.8}{\tau_{RC}}$$

图例 7-dv/dt 测试电路

Fig.7-Test Circuits of dV/dt andWaveforms

印字信息 Marking Information

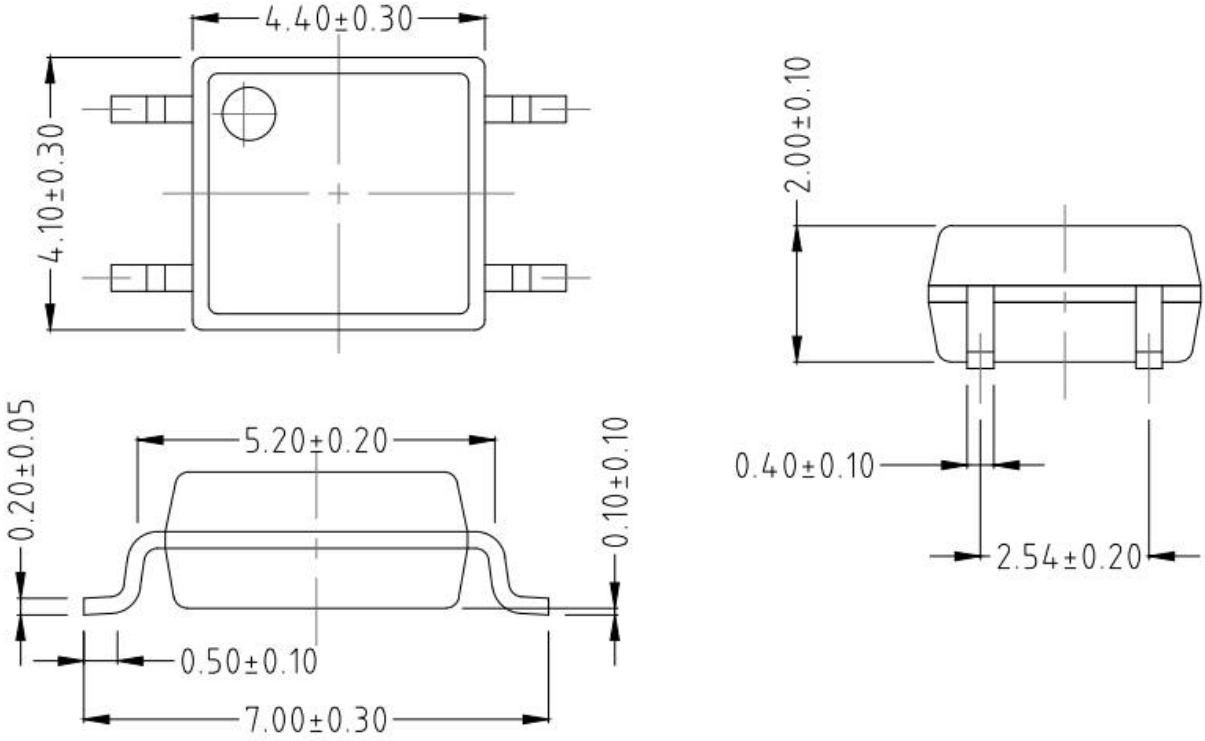
- Si:生产商代码 Manufacturer's Code Marking
- X：代表 V_{DRM} 分档 4,6,8
- V：代表 I_{FT} 分档 1,2,3
- Y: 年代码 Last Digit of Year (ex: 4=2024, 5=2025)
- WW: 周号代码 Week Code (01 to 53)
- N:特殊代码或无 Special code or None

命名规则 Naming Rule

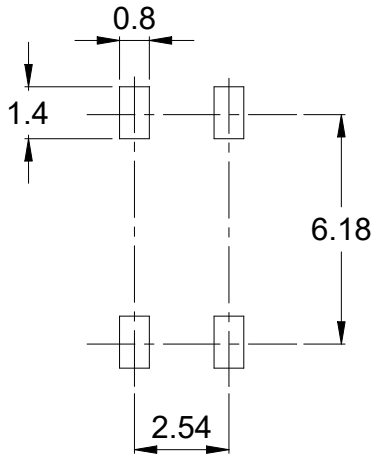
Si-M30XV-WY-ZTT

- Si: 生产商代码 Manufacturer's Code Marking
- M30XV: 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:SOP4）
- TT：补充码 A~Z or 0~9 or None

封装外形尺寸 Package Outline Dimensions



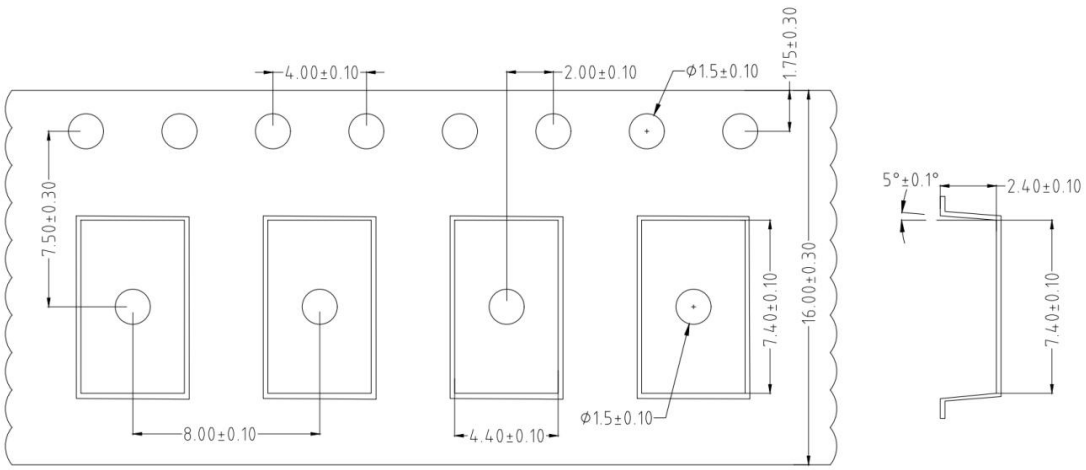
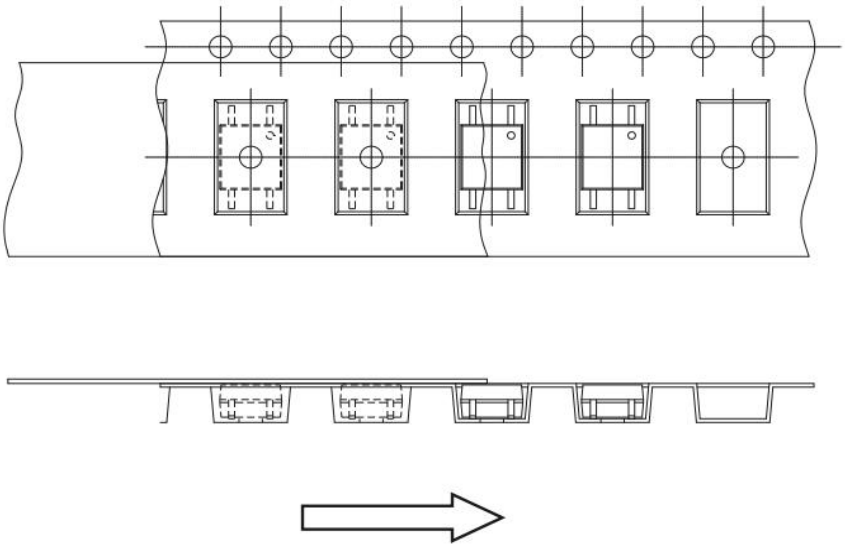
推荐焊盘尺寸 Recommended Footprint Patterns



包装 Packing

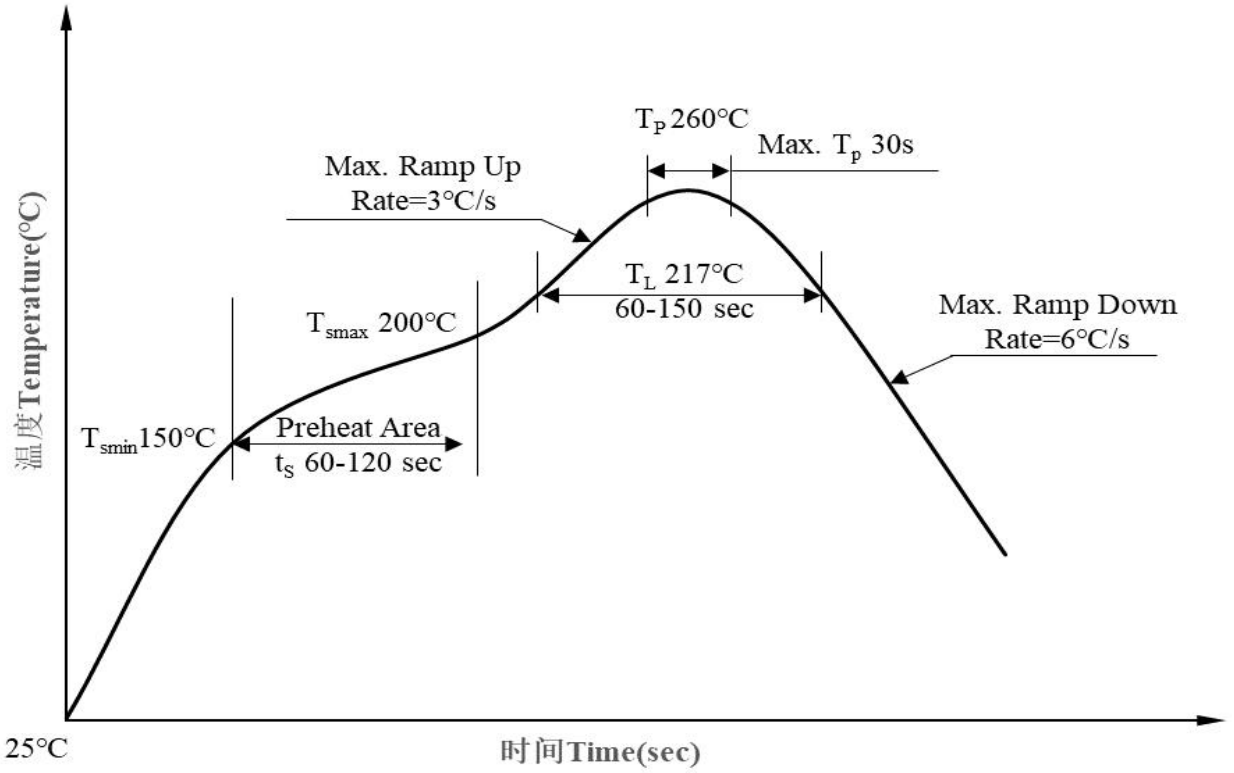
封装类型 Package Type	每盘数量 Quantity per Reel	内盒数量 Quantity per Inner Box	外箱数量 Quantity per Carton	内盒尺寸 Inner Box Dimensions	外箱尺寸 Carton Dimensions
SOP4	3000 pcs/reel	6000 pcs/inner box	60,000 pcs/carton	353*340*60mm	650*375*365mm

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.

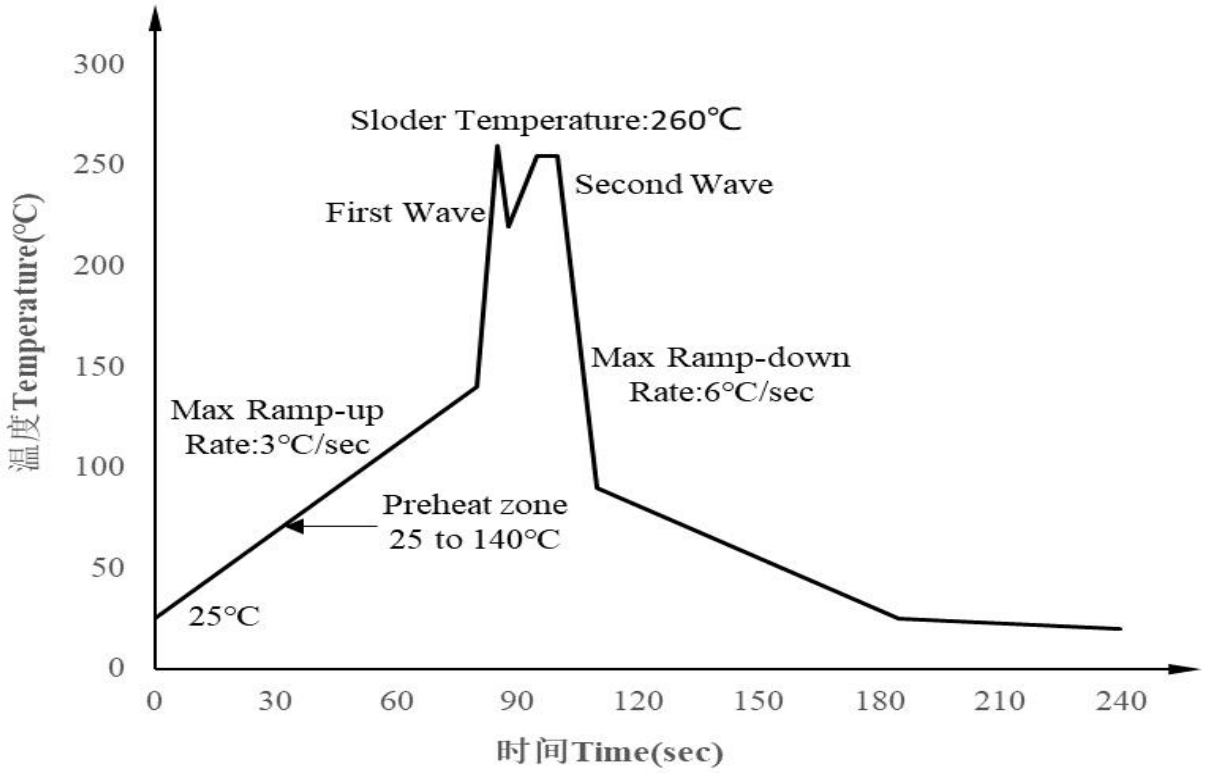
注：参考 IPC/JEDEC J-STD-020D 标准。

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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