



# 光电耦合器

## OPTOCOUPLER

产品规格书  
Product Data Sheet

# Si-816 系列

## Si-816 Series

Si DCC  
Release

贵州硅耐光电有限公司

GuiZhou Silicon Nice Optoelectronic Co., Ltd.

## 描述 Description

Si-816 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封装中。该产品的小尺寸封装可显著节省安装空间。

The Si-816 series has a infrared emitting diode, which is optically coupled to a silicon planar phototransistor detector, and is incorporated in 4-pin flat package. The small dimension of this product allows significant space saving.


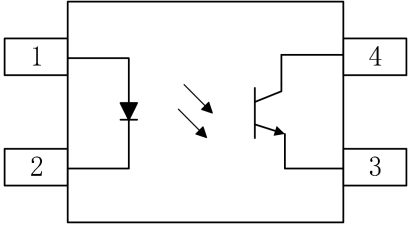
## 典型应用 Typical Applications

- 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: 80%~600% ( $I_F = 5\text{mA}$ ,  $V_{CE} = 5\text{V}$ )  
Current Transfer Ratio: 80% to 600% at  $I_F = 5\text{mA}$ ,  $V_{CE} = 5\text{V}$
- 集电极-发射极耐压  $V_{CEO} \geq 80\text{V}$   
Collector - emitter Voltage  $V_{CEO} \geq 80\text{V}$
- 输入-输出隔离电压最小 5000  $V_{RMS}$   
Input-output Isolation Voltage 5000  $V_{RMS}(\text{min})$

## 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
 <p>DIP-4      DIP4-M      SMD-4</p>		<p>1: Anode 2: Cathode 3: Emitter 4: Collector</p>



## 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 <sub>ISO</sub>	5000	V <sub>RMS</sub>
最大瞬态隔离电压 Maximum Transient Isolation Voltage	According to DIN EN 60747-5-5	V <sub>IOTM</sub>	1500	V <sub>peak</sub>
最大峰值重复隔离电压 Maximum Repetitive Peak Isolation Voltage	According to DIN EN 60747-5-5	V <sub>IORM</sub>	7000	V <sub>peak</sub>
爬电距离 Creepage Distance	/	L	>7.0	mm

## 极限参数 Absolute Maximum Ratings (T<sub>amb</sub>=25°C)

参数 Parameter		符号 Symbol	极限值 Rating	单位 Unit
输入端 Input	正向电流 Forward Current	I <sub>F</sub>	50	mA
	反向电压 Reverse Voltage	V <sub>R</sub>	6	V
	功耗 Power Dissipation	P	70	mW
	峰值电流 Peak forward current (1us, pulse)	I <sub>FP</sub>	1	A
	结温 Junction Temperature	T <sub>J</sub>	125	°C
输出端 Output	集电极-发射极电压 Collector - Emitter Voltage	V <sub>CEO</sub>	80	V
	发射极-集电极电压 Emitter - Collector Voltage	V <sub>ECO</sub>	7	V
	集电极电流 Collector Current	I <sub>C</sub>	50	mA
	集电极功耗 Collector Power Dissipation	P <sub>C</sub>	150	mW
	结温 Junction Temperature	T <sub>J</sub>	125	°C
总功耗 Total Power Dissipation		P <sub>tot</sub>	170	mW
工作温度 Operating Temperature		T <sub>amb</sub>	-55~110	°C
存储温度 Storage Temperature		T <sub>stg</sub>	-55~125	°C
焊接温度 Soldering Temperature		T <sub>sld</sub>	260	°C



### 特性参数 Electro-optical Characteristics ( $T_{amb}=25^{\circ}C$ )

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	$\mu A$
	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	$I_F=5mA, V_{CE}=5V$	CTR*	80	-	600	%
	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.	$R_{ISO}$	$5 \times 10^{10}$	$1 \times 10^{11}$	-	$\Omega$
	隔离电容 Isolation capacitance	$V=0, f=1MHz$	$C_{ISO}$	-	0.6	1	pF
	截止频率 Cut-off Frequency	$V_{CE}=5V, I_C=2mA,$ $R_L=100\Omega, -3dB$	$F_C$	-	80	-	kHz
	上升时间 Rise Time	$V_{CE}=2V, I_C=2mA,$	tr	-	4	-	$\mu s$
	下降时间 Fall Time	$R_L=100\Omega$	tf	-	3	-	$\mu s$

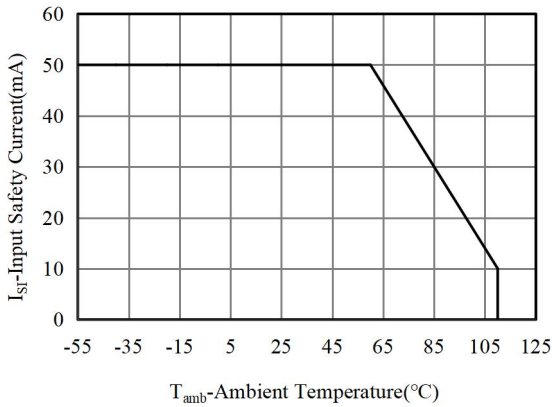
$*CTR = \frac{I_C}{I_F} \times 100\%$

### 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	$I_F = 5mA, V_{CE} = 5V$ $T_{amb} = 25^{\circ}C$	A	80	160	%
		B	130	260	%
		C	200	400	%
		D	300	600	%
		D1	300	450	%
		D2	380	600	%
		None	80	600	%

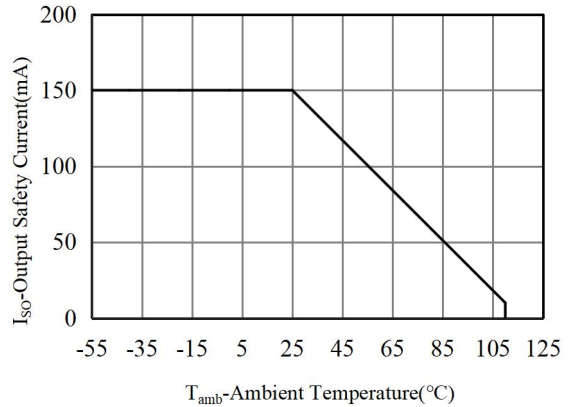


# 典型特性曲线 Typical Characteristics Curves



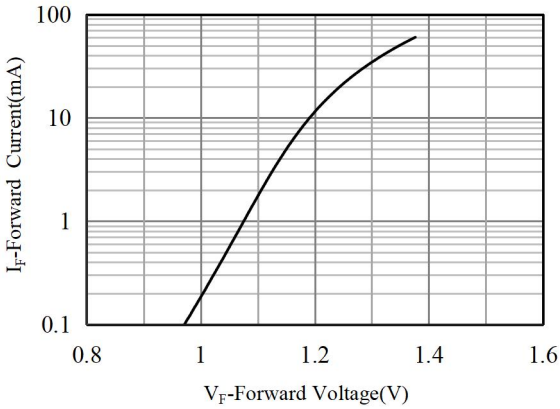
图例 1-输入安全电流与环境温度曲线图

Fig. 1 - Input Safety Current vs. Ambient Temperature



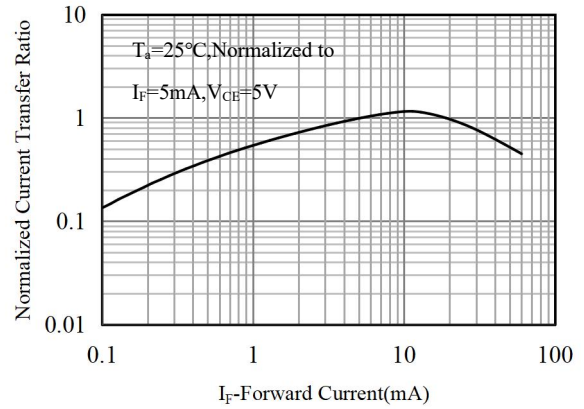
图例 2-输出安全电流与环境温度曲线图

Fig. 2 - Output Safety Power vs. Ambient Temperature



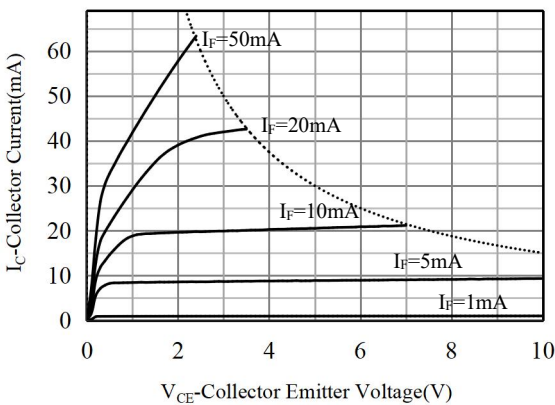
图例 3-正向电流与正向电压曲线图

Fig. 3 - Forward Current vs. Forward Voltage



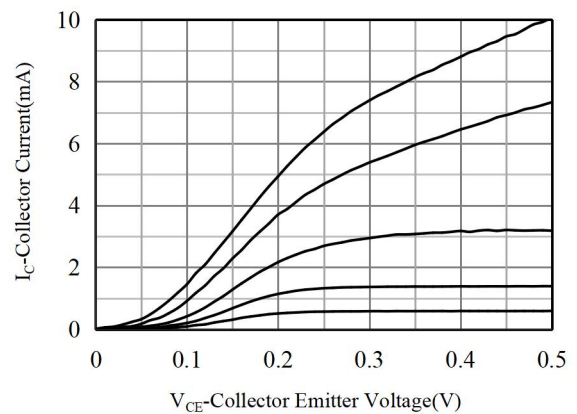
图例 4-归一化电流转换比与正向电流曲线图

Fig. 4 Normalized Current Transfer Ratio vs. Forward Current



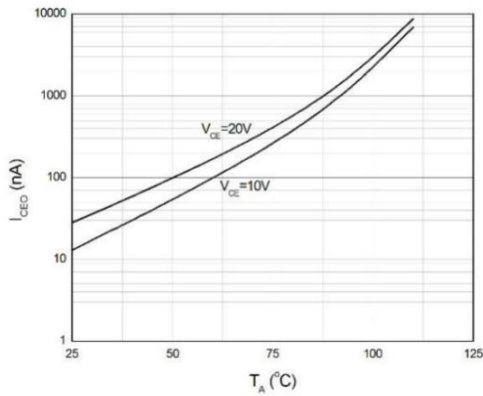
图例 5-集电极电流与集电极-发射极电压曲线图

Fig.5-Collector Current vs. Collector Emitter Voltage



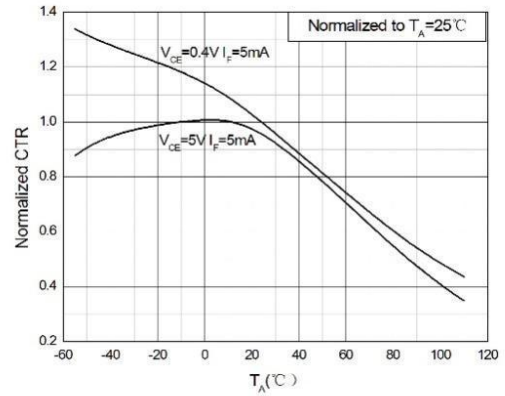
图例 6-集电极电流与集电极-发射极电压曲线图

Fig.-Collector Current vs. Collector Emitter Voltage



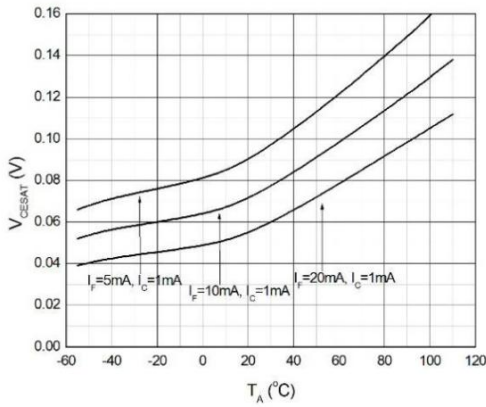
图例 7-集电极暗电流与环境温度曲线图

Fig. 4 Collector Dark Current vs. Ambient Temperature



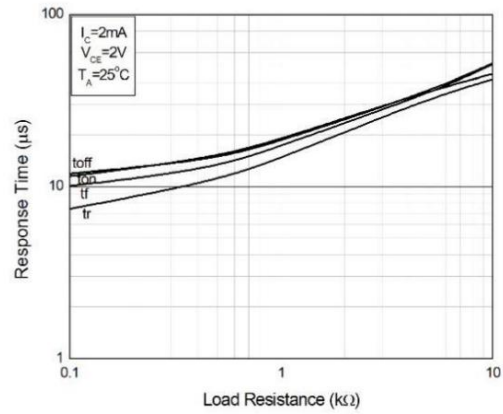
图例 8-归一化电流传输比与环境温度曲线图

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



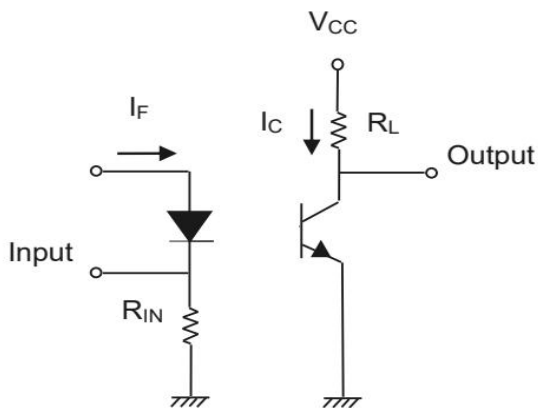
图例 9-集电极-发射极饱和电压与环境温度曲线图

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



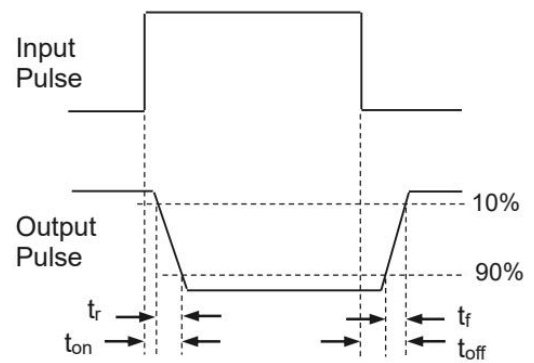
图例 10-响应时间与负载电阻曲线图

Fig. 10 - Response Time vs. Load Resistance



图例 11-开关时间测试电路图

Fig. 11 - Switching Time Test Circuit

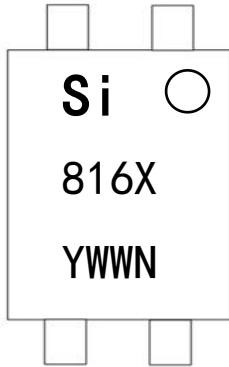


图例 12-开关时间波形图

Fig. 12 - Switching Time Test Waveforms



## 印字信息 Marking Information



- ◆ Si: 生产商代码 Manufacturer's Code Marking
- ◆ 816: 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

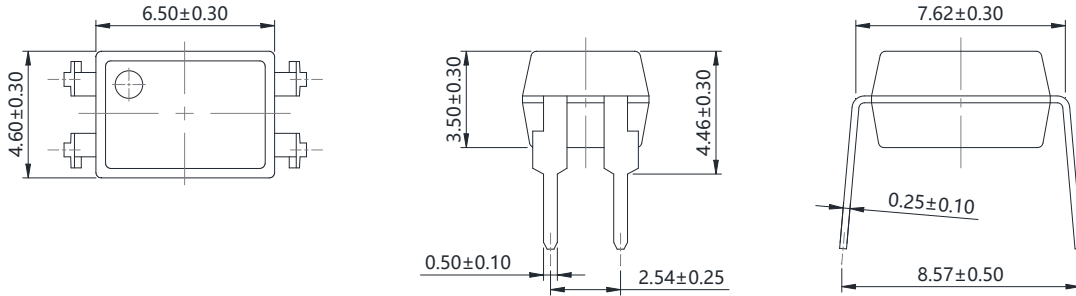
# Si-816X-WY-ZTT

- ◆ Si: 生产商代码 Manufacturer's Code Marking
- ◆ 816: 器件型号代码 Device Part Number
- ◆ X: 电流传输比代码 (C、D、D1、D2 或无) CTR Rank Code (C、D、D1、D2 OR None)
- ◆ W: 框架材质 (C=铜)
- ◆ Y: G/None (G=环保, None=非环保)
- ◆ Z: 封装 (Z=D: DIP、Z=S: SMD、Z=M: DIP-M)
- ◆ TT: 补充码 A~Z or 0~9 or None

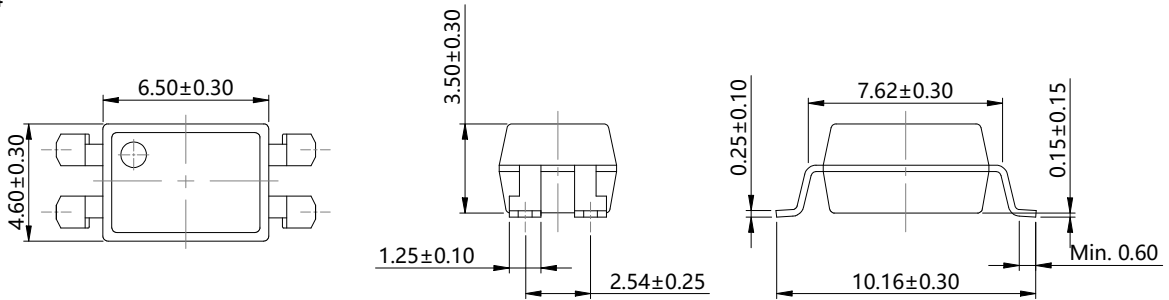


# 封装外形尺寸 Package Outline Dimensions

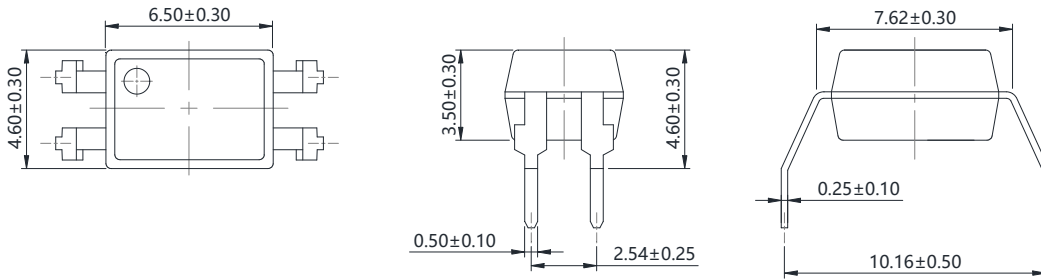
DIP-4



SMD-4

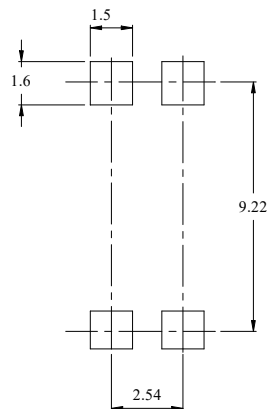


DIP4-M



单位: mm

# 推荐焊盘尺寸 Recommended Footprint Patterns



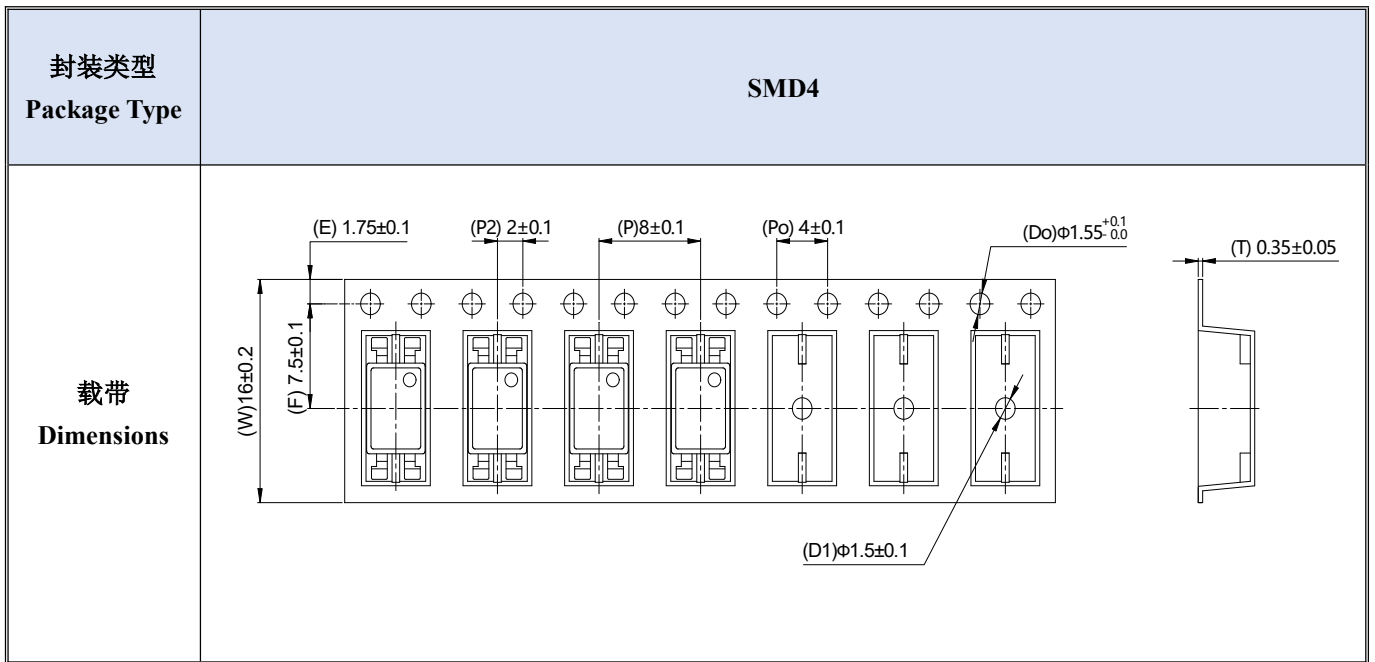
SMD-4



## 包装 Packing

封装 Package Type	包装方式 Packing Form	管/盘数 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	备注 Note
DIP4	管装 Tube (500*12*11 mm)	100 pcs /tube	50 tubes/box	10 boxes/ctn	525*130*57 mm	550*280*320 mm	管两端蓝白塞，方向一致 End plug (blue) and End plug (white) keep the direction
DIP4-M	管装 Tube (500*13*11 mm)	100 pcs /tube	45 tubes/box	8 boxes/ctn	525*130*57 mm	550*280*320 mm	
SMD4	卷盘 Reel ( $\phi$ 330mmBl ue)	2000 pcs/reel	2 reels/box	10 boxes/ctn	353*340*60 mm	650*375*365 mm	首端空 50 个空格，末端 空 100 个空格 Leave 50 Spaces at the beginning and 100 Spaces at the end

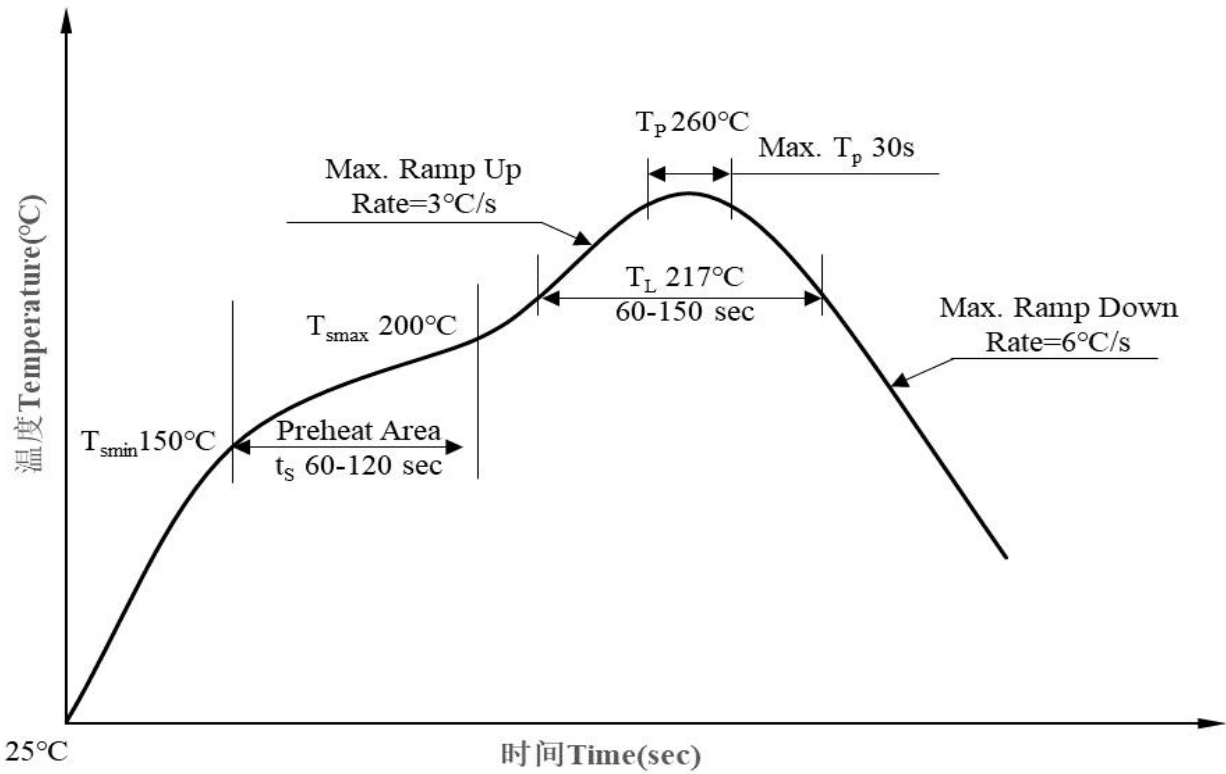
## 载带 Tape



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 <sub>smin</sub>	150	°C
	最高温度 Temperature Max.	T <sub>smax</sub>	200	°C
	时间 Time (min. to max.)	t <sub>s</sub>	60~120	sec
焊接区 Soldering Area	温度 Temperature	T <sub>L</sub>	217	°C
	时间 Time	t <sub>L</sub>	60~150	sec
峰值温度 Peak Temperature		T <sub>p</sub>	260	°C
峰值温度 T <sub>p</sub> 至 T <sub>p</sub> -5°C 之间的时间 Time within 5 °C of Peak Temperature: T <sub>p</sub> - 5°C		t <sub>p</sub>	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。

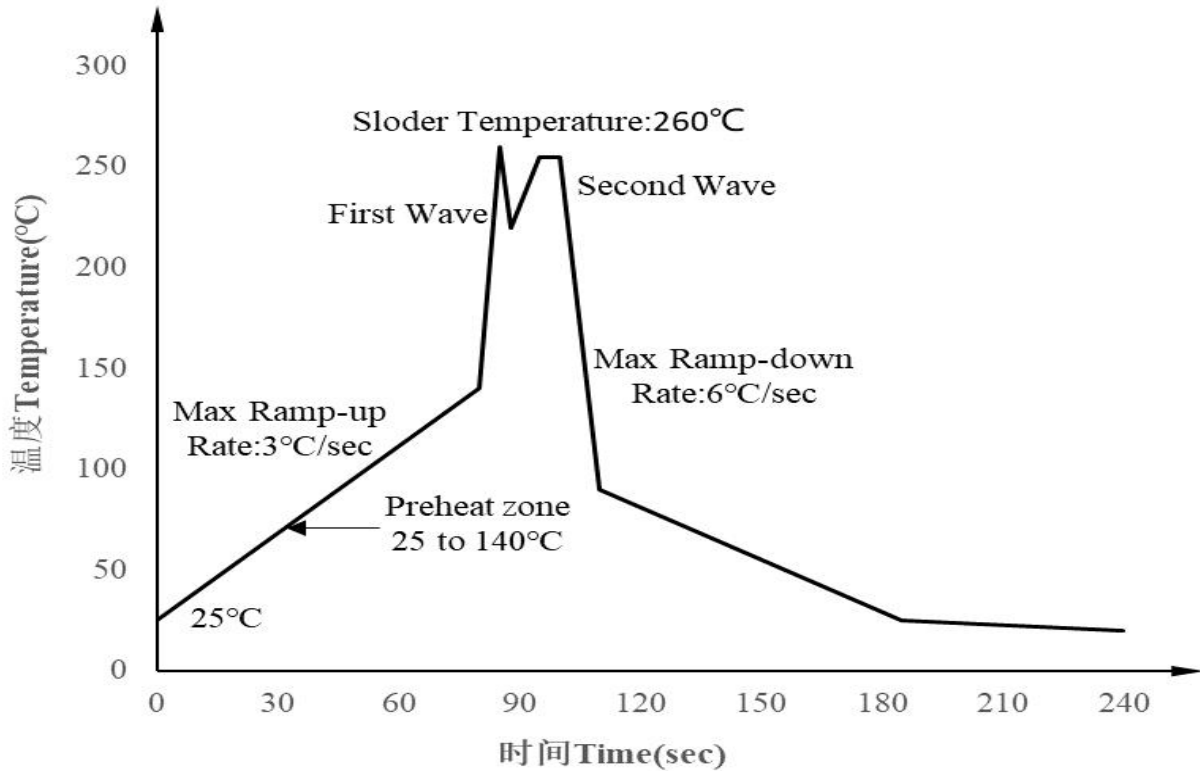
Note: Reference: IPC/JEDEC J-STD-020D.

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  $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , 时间  $\leq 3\text{s}$ 。  
Temperature:  $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , within 3s.

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