

## KLM80L, KLM81L

# SOP5 3.3V HIGH SPEED 15MBit/s

# LOGIC GATE PHOTOCOUPLER

SOP5 3.3V高速15MBit/s逻辑门光耦



\* 本文件中包含的信息反映了具有代表性的使用场景，仅供参考。

The information contained in this document reflects representative usage scenarios and is intended for technical reference only.

\* 本文件中提到的产品型号和规格如有更改或改进，恕不另行通知。在生产使用之前，客户应参考产品规格书的最新数据表。

Product models and specifications mentioned in this document are subject to change or improvement without notice. Customers should refer to the latest data sheets in the product specifications prior to production use.

\* 在使用本文件中引用的产品时，请确保产品在数据手册中规定的环境和电气限制范围内运行。如果客户使用超过指定的限制，晶台将不会对任何后续问题负责。

When using the products referenced in this document, ensure that the products are operated within the environmental and electrical limits specified in the data sheet. If the customer uses the product beyond the specified limits, Kinglight will not be responsible for any subsequent problems.

\* 本文件中的信息适用于电子元器件应用中的典型用法。如有任何特殊用途，请向晶台咨询，以获得进一步的帮助。

The information in this document applies to typical use in electronic component applications. For special applications, please contact Kinglight for further assistance.

\* 未经晶台允许，不得复制或转载本文件的内容和信息。对于最新的信息，请参考官方网站 [Http:// www.kinglight-semi.com](http://www.kinglight-semi.com)。

The contents and information in this document may not be copied or reproduced without the permission of Kinglight. For the latest information, please visit the official website [Http:// www.kinglight-semi.com](http://www.kinglight-semi.com).

## 1. 产品特点 Product features

- 高速10MBit/s High speed 10MBit/s
- 可保证在-40至85°C温度范围内运行 Guaranteed performance from -40 to 85°C
- 兼容 3.3和5V CMOS, 逻辑门输出 3.3 and 5 V CMOS compatibility, Logic gate output
- 无卤素 (溴<900ppm, 氯<900ppm, 溴+氯<1500ppm)  
Halogens free (Br < 900ppm, Cl < 900ppm, Br+Cl < 1500ppm)
- 输入与输出间高隔离电压(Viso=3750 V rms)  
High isolation voltage between inputs and output (Viso=3750 V rms)
- 符合欧盟REACH法规 Compliance with EU REACH
- 无Pb且符合ROHS标准 Pb free and RoHS compliant

## 2. 产品描述 Product Description

- KLM80L和KLM81L 由一个红外发射二极管和一个 CMOS 检测器集成电路组成。  
The KLM80L and KLM81L consist of an infrared emitting diode optically coupled to a CMOS detector ICs.
- 这些器件采用 5 脚SOP封装, 适用于表面贴装技术。  
The devices are packaged in 5-pin SOP package and is suitable for surface mounting technology.

## 3. 产品应用 Product Applications

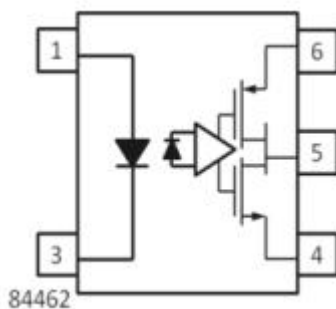
- 线路接收器, 数据传输 Line receiver, data transmission
- 高速逻辑接地隔离 High speed logic ground isolation
- 数据多路复用 Data multiplexing
- 开关电源 Switching power supplies
- 脉冲变压器更换 Pulse transformer replacement
- 计算机外围接口 Computer peripheral interface

Truth Table(Positive Logic)

| Input | Output |
|-------|--------|
| H     | L      |
| L     | H      |

## 4. 功能图 Functional Diagram

Schematic



引脚配置 Pin Configuration

1. 阳极 Anode
3. 阴极 Cathode
4. 接地 GND
5. 输出电压  $V_{out}$
6. 电源电压  $V_{CC}$

## 5. 光电特性 Electrical-Optical characteristics

• 最大限度额定值(温度=25°C) Absolute Maximum Ratings(Ta=25°C)

| 参数<br>Parameter                    |   | 符号<br>Symbol | 额定值<br>Rated Value | 单位<br>Unit |
|------------------------------------|---|--------------|--------------------|------------|
| 输入<br>Input                        | 正向电流 Forward current                              | $I_F$        | 15                 | mA         |
|                                    | 反向电压 Reverse voltage                              | $V_R$        | 5                  | V          |
|                                    | 功耗 Power dissipation ( $T_A = 25^\circ\text{C}$ ) | $P_D$        | 35                 | mW         |
| 输出<br>Output                       | 功耗 Power dissipation ( $T_A = 25^\circ\text{C}$ ) | $P_O$        | 85                 | mW         |
|                                    | 输出电流 Output current                               | $I_O$        | 20                 | mA         |
|                                    | 工作电压 (1*) Supply voltage                          | $V_{CC}$     | 5.5                | V          |
| 总功率<br>Total Power Dissipation     |   | $P_T$        | 100                | mW         |
| 隔离电压 (2*) Isolation Voltage        |   | $V_{iso}$    | 3750               | Vrms       |
| 工作温度 Operating temperature         |   | $T_{OPR}$    | -40 to +85         | °C         |
| 储存温度 Storage temperature           |   | $T_{STG}$    | -55 to +125        | °C         |
| 焊接温度 (3*)<br>Soldering temperature |   | $T_{SOL}$    | 260                | °C         |

附注 (Notes):

- 1\* The  $V_{CC}$  supply must be bypassed by a 0.1 $\mu\text{F}$  capacitor or larger. This can be either a ceramic or solid tantalum capacitor with good high frequency characteristic and should be connected as close as possible to the package  $V_{CC}$  and GND pins  
 $V_{CC}$  电源必须由一个 0.1 $\mu\text{F}$  或更大的电容器旁路。该电容可以是陶瓷电容，也可以是具有良好高频特性的固体钽电容，并应尽可能靠近封装的  $V_{CC}$  和 GND 引脚连接。
- 2\* 交流电源1分钟内, 相对湿度在40~60%RH环境下, 隔离电压测试时, 1&3脚短接在一起, 4、5&6脚短接在一起  
 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1&3 are shorted together, and pins 4, 5&6 are shorted together.
- 3\* 焊接时间为10秒 Soldering time is 10 seconds

## 6. 电气特性

## Electrical Characteristics

| 参数<br>Parameter |   | 符号<br>Symbol            | 最小值<br>Min. | 规格值<br>Typ.  | 最大值<br>Max. | 单位<br>Unit | 条件<br>Condition                           |
|-----------------|---|-------------------------|-------------|--------------|-------------|------------|---|
| 输入<br>In put    | 正向电压<br>Forward voltage                                   | $V_F$                   | -           | 1.4          | 1.8         | V          | $I_F=8mA$                                 |
|                 | 反向电压<br>Reverse voltage                                   | $V_R$                   | 5.0         | -            | -           | V          | $I_R=10\mu A$                             |
|                 | 正向电压温度系数<br>Temperature coefficient<br>of forward voltage | $\Delta V_F/\Delta T_A$ | -           | -1.7         | -           | mV/°C      | $I_F=8mA$                                 |
|                 | 输入电容<br>Input capacitance                                 | $C_{IN}$                | -           | 60           | -           | pF         | $V_F=0,$<br>$f=1MHz$                      |
| 输出<br>Out put   | 高电平工作电流<br>High level supply current                      | $I_{CCH}$               | -           | 1.3          | 6           | mA         | $I_F=0mA$                                 |
|                 | 低电平工作电流<br>Low level supply current                       | $I_{CCL}$               | -           | 1.3          | 6           | mA         | $I_F=8mA$                                 |
|                 | 高电平输出电压<br>High level output voltage                      | $V_{OH}$                | $V_{CC}-1$  | $V_{CC}-0.3$ | -           | V          | $I_F=0mA,$<br>$I_O=-4mA$<br>$V_{CC}=3.3V$ |
|                 |   |                         | $V_{CC}-1$  | $V_{CC}-0.2$ | -           | V          | $I_F=0mA,$<br>$I_O=-4mA$<br>$V_{CC}=5V$   |
|                 | 低电平输出电压<br>Low level output voltage                       | $V_{OL}$                | -           | 0.21         | 0.6         | V          | $I_F=8mA,$<br>$I_O=4mA$<br>$V_{CC}=3.3V$  |
|                 |   |                         | -           | 0.17         | 0.6         | V          | $I_F=8mA,$<br>$I_O=4mA$<br>$V_{CC}=5V$    |
|                 | 输入阈值电流<br>Input threshold current                         | $I_{FT}$                | -           | 2            | 5           | mA         | $I_{OL}=20\mu A$<br>$V_{CC}=3.3V$         |

## 开关特性 Switching Characteristics

| 参数<br>Parameter  | 符号<br>Symbol        | 最小值<br>Min. | 规格值<br>Typ.* | 最大值<br>Max. | 单位<br>Unit | 条件<br>Condition        |  |
|--|---------------------|-------------|--------------|-------------|------------|------------------------|--|
| 到输出高电平的传播延迟时间<br>Propagation Delay Time to output high level       | $t_{PHL}$           | -           | 30           | 65          | ns         | $I_F=8mA, V_{CC}=3.3V$ |  |
|  |                     | -           | 33           | -           | ns         | $I_F=8mA, V_{CC}=5V$   |  |
| 到输出低电平的传播延迟时间<br>Propagation delay time to output low level        | $t_{PLH}$           | -           | 48           | 65          | ns         | $I_F=8mA, V_{CC}=3.3V$ |  |
|  |                     | -           | 52           | -           | ns         | $I_F=8mA, V_{CC}=5V$   |  |
| 脉冲宽度失真<br>Pulse width distortion                                   | $ t_{PHL}-t_{PLH} $ | -           | 20           | 50          | ns         | $I_F=8mA, V_{CC}=3.3V$ |  |
|  |                     | -           | 22           | -           | ns         | $I_F=8mA, V_{CC}=5V$   |  |
| 输出上升时间<br>Output rise time   | $t_r$               | -           | 7            | -           | ns         | $I_F=8mA, V_{CC}=3.3V$ |  |
| 输出下降时间<br>Output fall time   | $t_f$               | -           | 7            | -           | ns         |                        |  |
| 逻辑高电平时的共模瞬态抗扰度(4*)<br>Common Mode Transient Immunity at Logic High | KLM80L              | $ CM_H $    | 5000         | -           | -          | V/us                   | $I_F = 0mA, T_A = 25^\circ C$<br>$V_{CM}=1000Vp-p$ |
|  | KLM81L              |             | 10000        | -           | -          |                        |  |
| 逻辑低电平时的共模瞬态抗扰度(5*)<br>Common Mode Transient Immunity at Logic Low  | KLM80L              | $ CM_L $    | 5000         | -           | -          | V/us                   | $I_F = 8mA, T_A = 25^\circ C$<br>$V_{CM}=1000Vp-p$ |
|  | KLM81L              |             | 10000        | -           | -          |                        |  |

## 7. 特性曲线 Characteristic Curves

图1. 正向电流 vs 正向电压的关系

Figure 1. Forward Current vs Forward Voltage

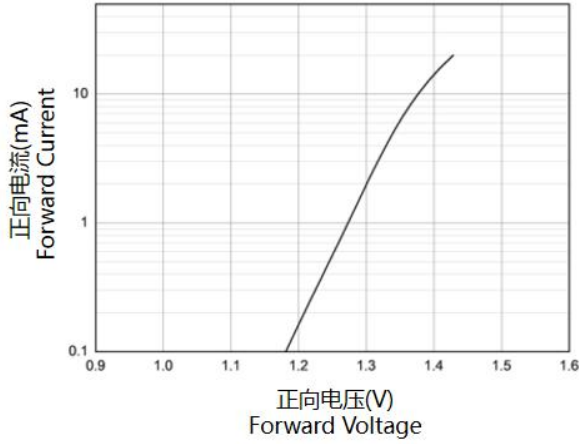


图3. 高电平工作电流 vs 环境温度的关系  
Figure 3. High level supply current vs Ambient Temperature

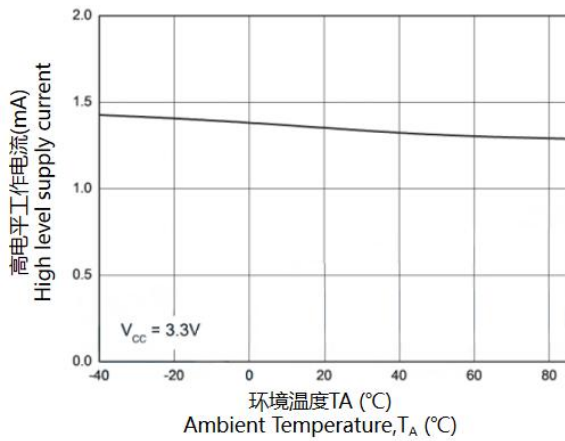


图5. 开关时间 vs 正向电流的关系  
Figure 5. Switching time vs Forward current

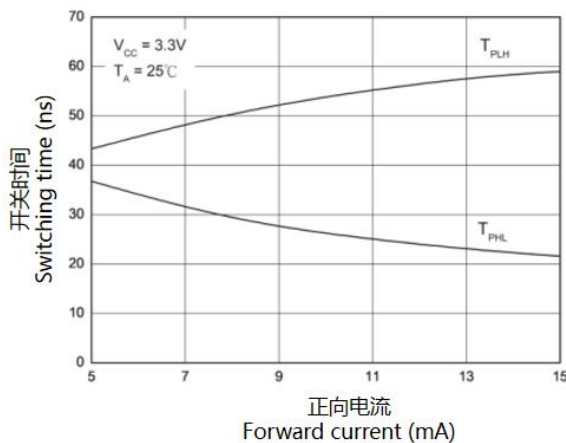


图2 输入阈值电流 vs 环境温度的关系

Fig.2 Input threshold current vs ambient temperature

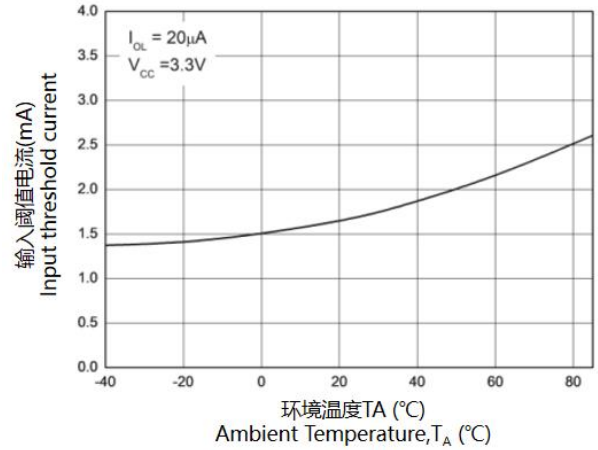


图4. 低电平工作电流 vs 环境温度的关系  
Figure 4. Low level supply current vs Ambient Temperature

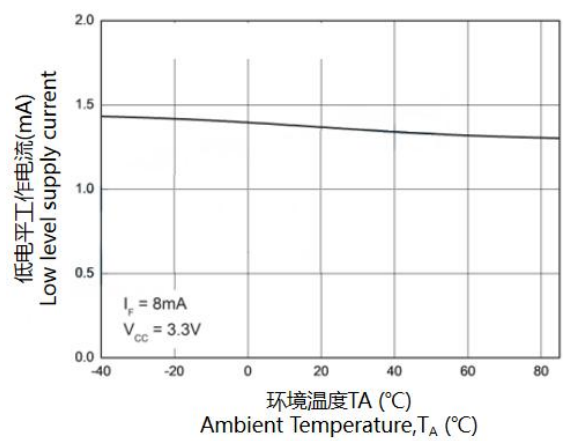


图6. 开关时间 vs 正向电流的关系  
Figure 6. Switching time vs Forward current

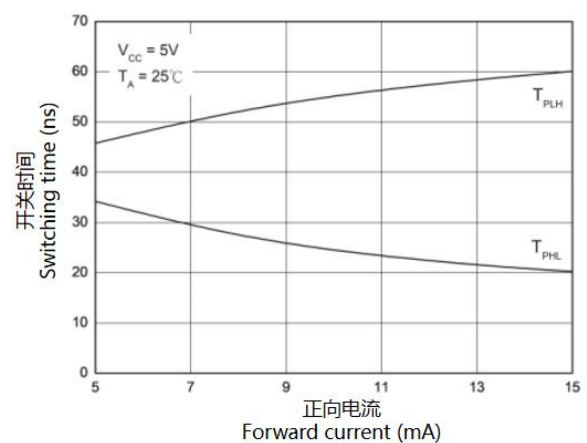


Figure 7. tPHL, tPLH, tr 和 tf 的测试电路和波形 Test circuit and waveforms for tPHL, tPLH, tr and tf

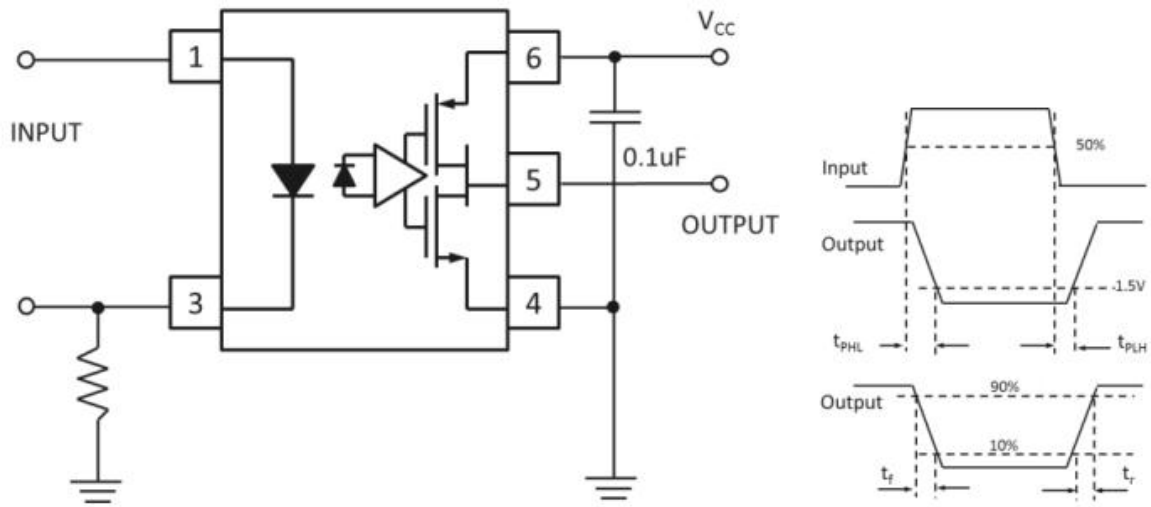
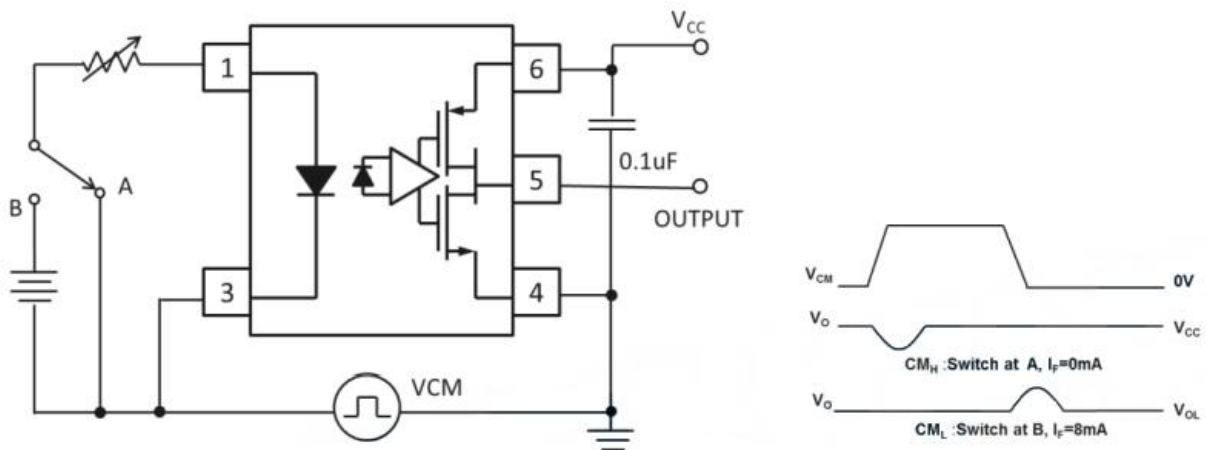


图8.测试电路共模瞬态抗扰度 Test circuit Common mode Transient Immunity



\*4.CMH-为确保输出保持在高电平状态 (即  $V_{OUT} > 2.0V$ ) , 共模电压的最大可容许上升率

CMH-The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the HIGH state (i.e.,  $V_{OUT} > 2.0V$ )

\*5.CML-为确保输出保持在低电平输出状态 (即  $V_{OUT} < 0.8V$ ) , 共模电压的最大可容许上升率

CML-The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the LOW output state (i.e.,  $V_{OUT} < 0.8V$ )

## 8. 订单信息 Order Information

- 材料编号 Part Number

### KLM8XL-Z-V

#### 附注(Notes):

X =零件编号(0或1) Part No. (0 or 1)

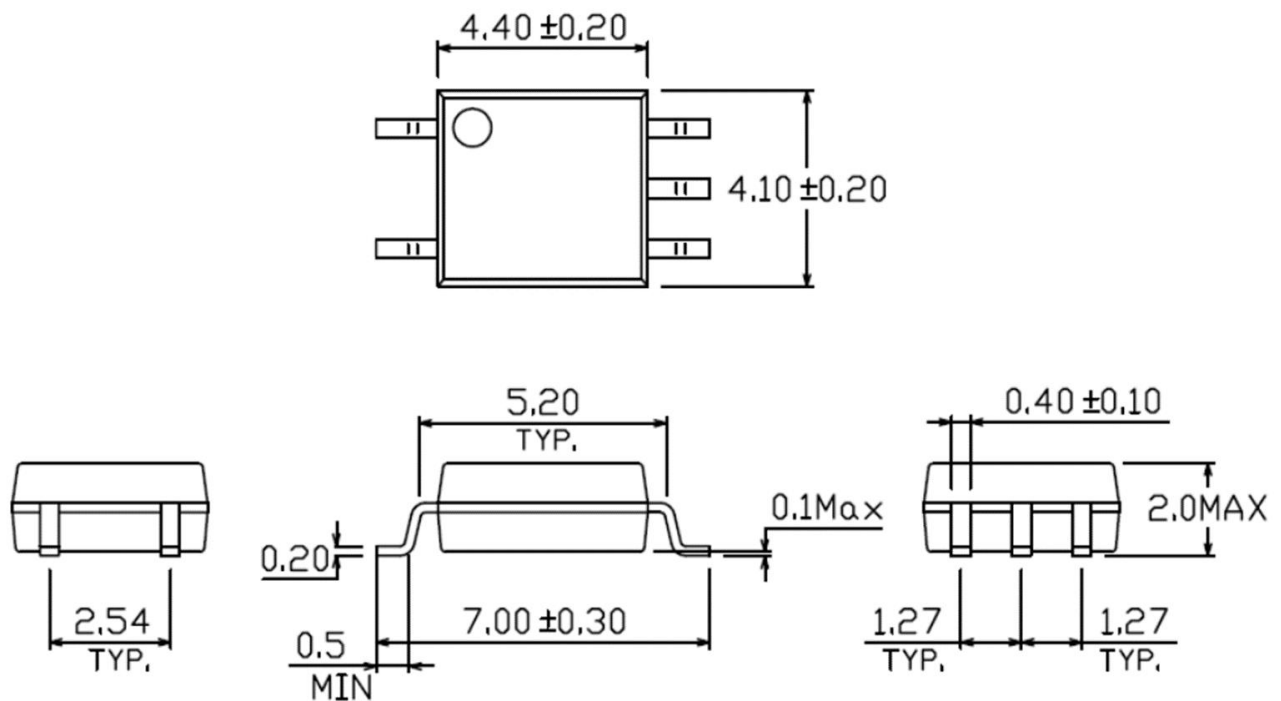
Z = 料带和卷轴选项 (TA, TB或无)  
Tape and reel option (TA、TB or none)

V = 表示VDE标识(客户指定镭射字符才加"V")  
VDE (Only add "V" to laser characters specified by the customer)

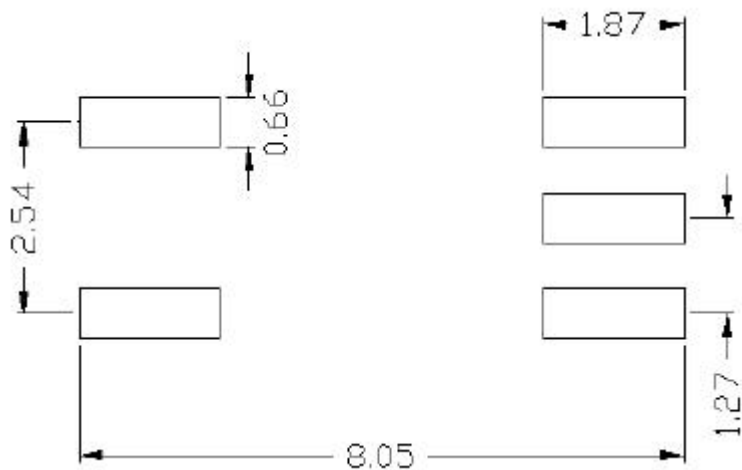
| 选项<br>Option | 描述<br>Description   | 包装数量<br>Packing quantity          |
|--------------|---|-----------------------------------|
| 无<br>None    | 标准SMD选项<br>Standard SMD option  | 每管100pcs<br>100 units per tube    |
| TA           | 表面贴装引线形式+TA载带和卷轴选项<br>Surface mount lead form + TA tape & reel option | 每卷3000pcs<br>3000 units per reel  |
| TB           | 表面贴装引线形式+TB载带和卷轴选项<br>Surface mount lead form + TB tape & reel option | 每卷3000pcs<br>3000 units per reel  |
| /            | 内盒装: 每盒3盘<br>Inner box packaging: 3reels/box                          | 每盒9000pcs<br>9000pcs per box      |
| /            | 每箱装: 10个内盒<br>Pack per Carton: 10inner boxes                          | 每箱90000pcs<br>90000pcs per Carton |



9. 封装尺寸(单位:毫米) Package Drawing(Unit:mm)



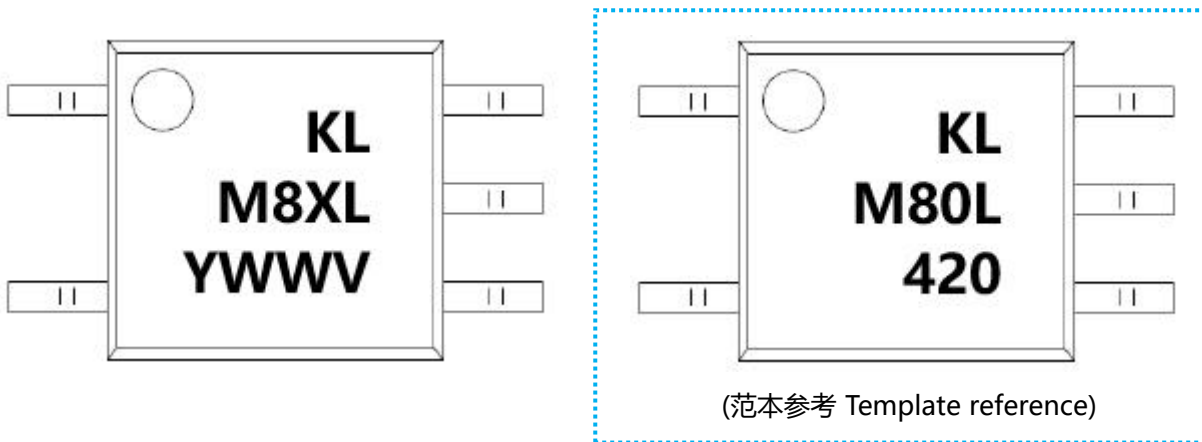
• 表面贴片类型PIN脚焊盘布局 Surface patch type PIN foot pad layout



备注 Notes

- a. 建议焊盘尺寸仅供参考 Suggested pad dimension is just for reference only
- b. 请根据个人需要修改焊盘尺寸 Please modify the pad dimension based on individual need

## 10.设备标记 Device marking

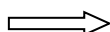
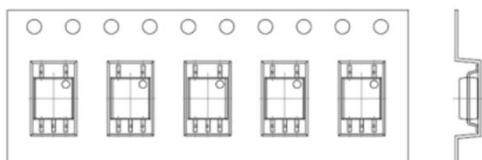


### 附注(Notes):

- KL = 表示晶台光电有限公司 Denotes KingLight
- M8XL = 表示材料部件号 Denotes Device Part Number  
X表示零件编号(0或1) Part No. (0 or 1)
- Y = 表示1位年份代码Denotes 1 digit Year code
- WW = 表示2位周别代码Denotes 2 digit Week code
- V = 表示VDE标识(客户指定镭射字符才加"V")  
VDE (Only add "V" to laser characters specified by the customer)

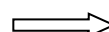
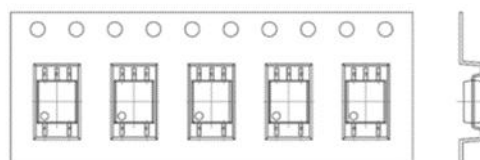
### 11.料带和卷轴包装规格 Tape & Reel Packing Specifications

• 选择TA Option TA



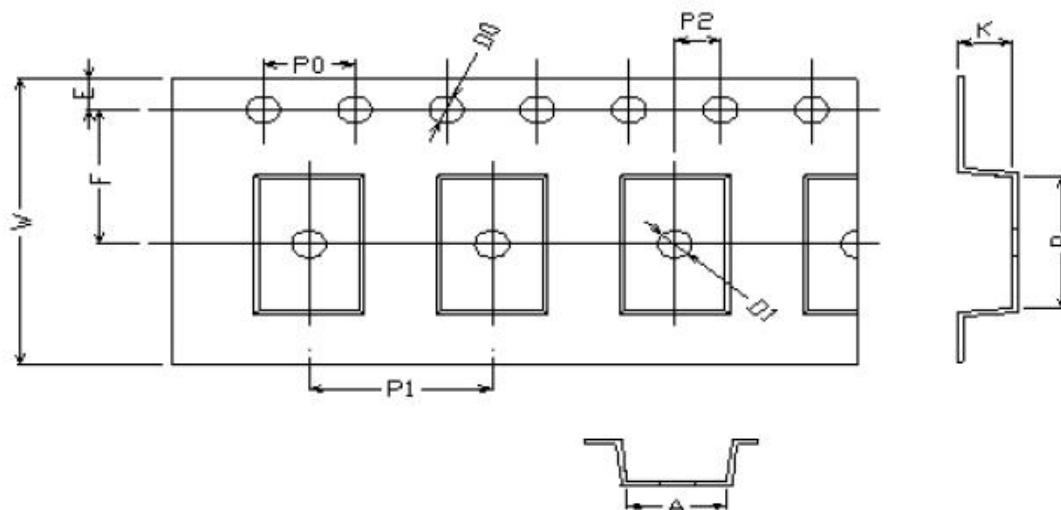
卷轴进给方向 Direction of feed from reel

• 选择TB Option TB



卷轴进给方向 Direction of feed from reel

#### 料带尺寸Material belt size



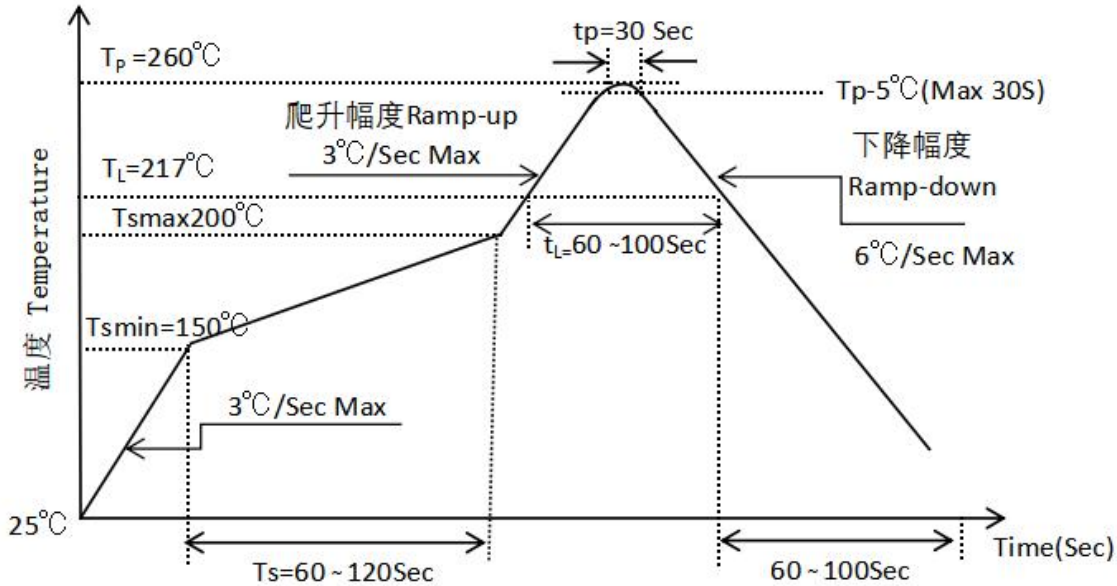
|                         |          |         |         |         |          |         |
|-------------------------|----------|---------|---------|---------|----------|---------|
| 尺寸编号<br>Dimension No.   | A        | B       | D0      | D1      | E        | F       |
| 尺寸(mm)<br>Dimension(mm) | 4.4±0.1  | 7.6±0.1 | 1.5±0.1 | 1.5±0.1 | 1.75±0.1 | 7.5±0.1 |
| 尺寸编号<br>Dimension No.   | P0       | P1      | P2      | t       | W        | K       |
| 尺寸(mm)<br>Dimension(mm) | 4.0±0.15 | 8.0±0.1 | 2.0±0.1 | 0.3±0.1 | 16.0±0.2 | 2.4±0.1 |

## 12. 焊接温度曲线 Temperature Profile Of Soldering

### • 回流焊温度曲线 Reflow soldering

建议在下面所示的温度和时间分布条件下, 进行一次回流焊作业, 不得超过三次

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



| 项目<br>Item  | 符号<br>Symbol | 最小值<br>Min. | 最大值<br>Max. | 单位<br>Unit |
|---|--------------|-------------|-------------|------------|
| 预热温度<br>Preheat Temperature   | $T_s$        | 150         | 200         | °C         |
| 预热时间<br>Preheat Time  | $t_s$        | 60          | 120         | s          |
| 升温速率<br>Ramp-Up Rate ( $T_L$ to $T_p$ )   | -            | -           | 3           | °C/s       |
| 液相线温度<br>Liquidus Temperature   | $T_L$        | 217         |             | °C         |
| 高于液相线温度( $T_L$ )的时间<br>Time above Liquidus Temperature $T_L$                                | $t_L$        | 60          | 100         | s          |
| 峰值温度<br>Peak Temperature  | $T_p$        | -           | 260         | °C         |
| $T_c$ 在( $T_p-5$ )和 $T_p$ 之间的时间<br>Time During Which $T_c$ Is Between ( $T_p-5$ ) and $T_p$ | $t_p$        | -           | 30          | s          |
| 降温速率<br>Ramp-down Rate( $T_p$ to $T_L$ )  | -            | -           | 6           | °C/s       |