# KLS3150

# LSOP6 IGBT/MOSFET

# 1A Output Current GATE DRIVER PHOTOCOUPLER

## 1A峰值输出门极驱动光耦





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# 1. 产品特点 Product features

- 无卤素 (溴<900ppm, 氯<900ppm, 溴+氯<1500ppm)
  Halogens free (Br < 900ppm, Cl < 900ppm, Br+Cl < 1500ppm)
- 轨到轨输出电压 Rail-to-rail output voltage
- 可保证在-40至110℃温度范围内运行 Guaranteed performance from -40°C to 110°C
- 最大峰值输出电流1A Peak Output Current : $I_{OP}$ = 1A (max)
- 最大阈值输入电流5mA Threshold Input Current: $I_{FLH}$=5mA (max)
- 输入与输出间高隔离电压(Viso=5000 V rms)
  High isolation voltage between input and output (Viso=5000 V rms)
- 无Pb且符合ROHS标准 Pb free and RoHS compliant

# 2. 产品描述 Product Description

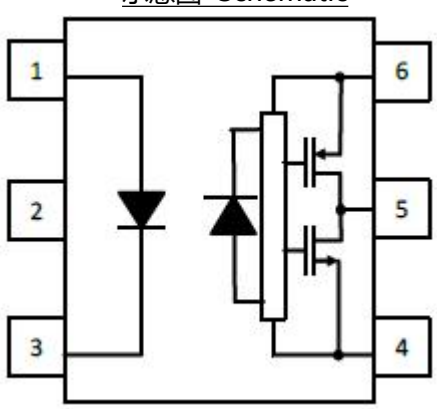
- KLS3150由一个红外发光二极管耦合到具有功率输出级的集成电路。
  The KLS3150 consists of an infrared light emitting diode coupled to an integrated circuit with a power output stage.
- 光电检测器有一个内部屏蔽，可确保共模瞬态抗扰度为±15 kV/μs。适用于IGBT或功率MOSFET的栅极驱动电路。
  The photo detector has an internal shield that provides guaranteed common-mode transient Immunity of ±15 kV/μs. It is suitable for direct gate driving circuit for IGBTs or power MOSFETs.

# 3. 产品应用 Product Applications

- 隔离式IGBT/Power MOSFET栅极驱动 Isolated IGBT/Power MOSFET Gate Drive
- 不间断供电系统 Uninterruptible power supply
- 逆变器 Inverters
- 家用电器，如暖风机等 Home appliances, such as fan heaters, etc.

# 4. 功能图 Functional Diagram

示意图 Schematic




引脚配置 Pin Configuration

1. 阳极 Anode
2. 无连接 No Connection
3. 阴极 Cathode
4. 电源电压 $V_{EE}$
5. 输出电压 $V_{OUT}$
6. 电源电压 $V_{CC}$

注意：引脚4和6之间必须连接一个 0.1μF 旁路电容器
Note： A 0.1μF bypass capacitor must be connected between pins 4 and 6

## 5. 光电特性 Electrical-Optical characteristics

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

| 参数 Parameter | | 符号 Symbol | 额定值 Rated Value | 单位 Unit |
|---|---|---|---|---|
| 输入 Input | 正向电流 Forward current | $I_F$ | 25 | mA |
| | 正向脉冲电流 Pulse Forward current( 1* ) | $I_{FP}$ | 1 | A |
| | 反向电压 Reverse voltage | $V_R$ | 5 | V |
| 输出 Output | “H” 峰值输出电流 “H” Peak Output current | $I_{OPH}$ | 1 | A |
| | “L” 峰值输出电流 “L” Peak Output current | $I_{OPL}$ | 1 | A |
| | 输出电压 Peak Output voltage | $V_O$ | 30 | V |
| | 工作电压 Supply voltage | $V_{CC}$-$V_{EE}$ | 15 to 30 | V |
| 工作频率 Operating Frequency | | f | 50 | kHz |
| 隔离电压 ( 2* ) Isolation Voltage | | $V_{ISO}$ | 5000 | Vrms |
| 总功耗 Total Power Dissipation | | $P_T$ | 300 | mW |
| 工作温度 Operating temperature | | $T_{OPR}$ | -40 to +110 | ℃ |
| 储存温度 Storage temperature | | $T_{STG}$ | -55 to +125 | ℃ |
| 焊接温度 ( 3* ) Soldering temperature | | $T_{SOL}$ | 260 | ℃ |

附注 (Notes):

1* 脉冲宽度 ≤ 1μs、300pps Pulse width ≤ 1μs, 300pps

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、2、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 to 3 are shorted together, and pins 4 to 6 are shorted together.

3* 焊接时间为10秒 Soldering time is 10 seconds

## 6. 电气特性(Ta=-40至110℃,除非另有规定)

## Electrical Characteristics(Ta=-40 to 110℃ unless specified otherwise)

| 参数 Parameter | | 符号 Symbol | 最小值 Min. | 规格值 Typ. | 最大值 Max. | 单位 Unit | 条件 Condition |
|---|---|---|---|---|---|---|---|
| 输入 Input | 正向电压 Forward voltage | $V_F$ | - | - | 1.8 | V | $I_F$=10mA |
| | 反向电压 Reverse voltage | $V_R$ | 5.0 | - | - | V | $I_R$=10μA |
| 输出 Output | 高电平电源电流 High level supply current | $I_{CCH}$ | - | 1.4 | 3.2 | mA | $I_F$=10mA, $V_{CC}$=30V $V_O$=Open |
| | 低电平电源电流 Low level supply current | $I_{CCL}$ | - | 1.5 | 3.2 | mA | $I_F$=0mA, $V_{CC}$=30V $V_O$=Open |

• 传输特性 Transfer 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 |
|---|---|---|---|---|---|---|
| 高电平输出电流( 4* )<br>HIGH Level Output Current | $I_{OH}$ | - | - | -0.2 | A | $V_{CC}$=30V, $I_F$=10mA<br>$V_O$= $V_{CC}$ -1V |
| | | - | - | -1 | | $V_{CC}$=30V, $I_F$=10mA<br>$V_O$= $V_{CC}$ -4V |
| 低电平输出电流( 4* )<br>LOW Level Output Current | $I_{OL}$ | 0.2 | - | - | A | $V_{CC}$=30V, $I_F$=0mA<br>$V_O$= $V_{EE}$ +1V |
| | | 1 | - | - | | $V_{CC}$=30V, $I_F$=0mA<br>$V_O$= $V_{EE}$ +4V |
| 高电平输出电压<br>HIGH Level Output Voltage | $V_{OH}$ | $V_{CC}$-4 | - | - | V | $V_{CC}$= 30V, $I_F$=10mA<br>$I_O$=-1A |
| | | $V_{CC}$-0.5 | - | - | | $V_{CC}$= 30V, $I_F$=10mA<br>$I_O$=-100mA |
| 低电平输出电压<br>LOW Level Output Voltage | $V_{OL}$ | - | - | $V_{EE}$+4 | V | $V_{CC}$= 30V, $I_F$=10mA<br>$I_O$=1A |
| | | - | - | $V_{EE}$+0.5 | | $V_{CC}$= 30V, $I_F$=10mA<br>$I_O$=100mA |
| 输入阈值电流<br>Input Threshold Current | $I_{FLH}$ | - | - | 5 | mA | $V_{CC}$=10 or 30V, $V_O$ >5V |
| 输入阈值电压<br>Input Threshold Voltage | $V_{FLH}$ | 0.8 | - | - | V | $V_{CC}$=10 or 30V, $V_O$ <5V |
| 低电压锁定阈值<br>Under Voltage Lockout Threshold | $V_{UVLO+}$ | 6.5 | 7.8 | 9 | V | $I_F$=10mA<br>$V_O$ >5V |
| 低电压锁定阈值<br>Under Voltage Lockout Threshold | $V_{UVLO-}$ | 5.5 | 6.8 | 8 | V | $I_F$=10mA<br>$V_O$ <5V |

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 |
|---|---|---|---|---|---|---|
| 低电平传输延迟<br>Propagation Delay Time to output Low level | $T_{PHL}$ | 60 | 200 | 400 | ns | $I_F$=7 to 16mA<br>$V_{CC}$=10 to 30V<br>$R_G$=10Ω，$C_G$=10nF<br>f=10kHz, $T_A$=25°C<br>Duty Cycle=50% |
| 高电平传输延迟<br>Propagation Delay Time to output High level | $T_{PLH}$ | 60 | 200 | 400 | ns | |
| 脉冲宽度失真<br>Pulse width distortion | $\|T_{PHL}-T_{PLH}\|$ | - | - | 150 | ns | |
| 传播延迟偏差( 5* )<br>Propagation Delay Skew | $t_{PSK}$ | - | - | 150 | ns | |
| 输出上升时间<br>Output rise time | $t_r$ | - | 80 | - | ns | |
| 输出下降时间<br>Output fall time | $t_f$ | - | 80 | - | ns | |
| 输出高电平共模抑制( 6* )<br>Common Mode Transient Immunity at Logic High | $CM_H$ | 15 | - | - | kV/us | $I_F$=10mA,$V_{CC}$=30V,<br>$V_{CM}$=1500V,<br>$T_A$=25°C |
| 输出低电平共模抑制( 7* )<br>Common Mode Transient Immunity at Logic Low | $CM_L$ | 15 | - | - | kV/us | $I_F$=0mA,$V_{CC}$=30V,<br>$V_{CM}$=1500V,<br>$T_A$=25°C |

附注 (Notes):

4* 最大脉冲宽度10μs，最大占空比1% Max pulse width=10μs, max duty cycle =1%

5* 传输延迟偏差的定义是最大和最小传输延迟时间的差值(即 $T_{PHL}$或 $T_{PLH}$之差)，在相同的测试条件(电源电压、输入电流、温度等)下对产品进行评估。
Propagation delay skew is defined as the difference between the largest and smallest propagation delay times (i.e. $T_{PHL}$ or $T_{PLH}$) of multiple samples. Evaluations of these samples are conducted under identical test conditions (supply voltage, input current, temperature, etc).

6* 输出高电平共模抑制是共模脉冲信号 $V_{CM}$ 后沿的最大可容电压上升率 dv/dt，使输出保持高电平(即 $V_O$>10.0V)
Common mode transient immunity at output high is the maximum tolerable negative dv/dt on the trailing edge of the common mode impulse signal, $V_{CM}$, to assure that the output will remain high (i.e. $V_O$ >10.0V)

7* 输出低电平共模抑制是共模脉冲信号 $V_{CM}$ 前沿的最大可容电压上升率 dv/dt，使输出保持低电平(即 $V_O$ <1.0V)
Common mode transient immunity at output low is the maximum tolerable positive dv/dt on the leading edge of the common mode pulse signal, $V_{CM}$, to assure that the output will remain low (i.e. $V_O$ <1.0V)

# 7. 特性曲线 Characteristic Curves

图1. 正向电压和环境温度的关系

Fig 1. Forward Voltage vs Ambient Temperature

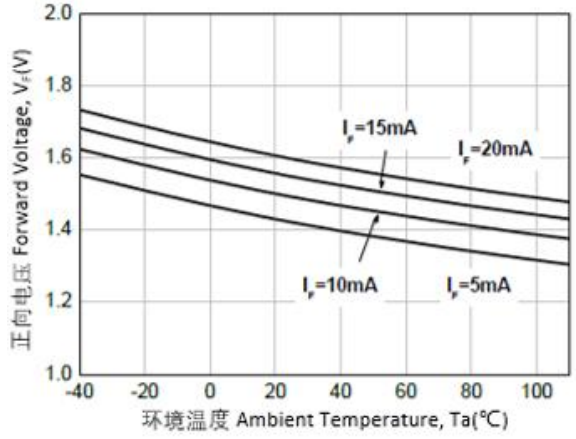



图2. 输出高电压和输出高电流的关系

Fig.2 Output High Voltage vs Output High Current

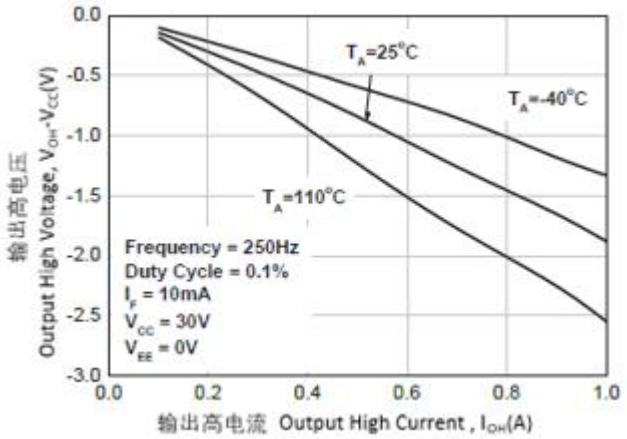



图3. 输出高压降和环境温度的关系

Fig 3. Output High Voltage Drop vs Ambient Temperature

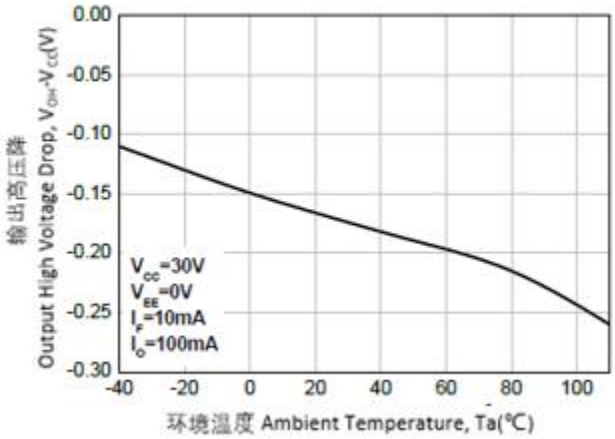



图4. 输出低电压和输出低电流的关系

Fig 4. Output Low Voltage Vs Output Low Current

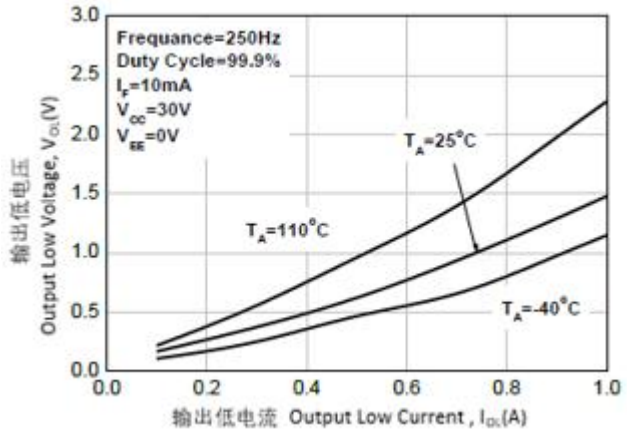



图5. 低电压输出和环境温度的关系

Fig 5. Output Low Voltage vs Ambient Temperature

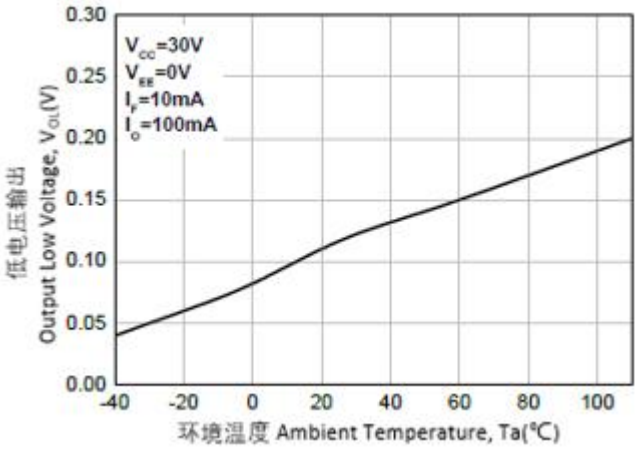



图6. 供电电流和环境温度的关系

Fig 6. Supply Current vs Ambient Temperature

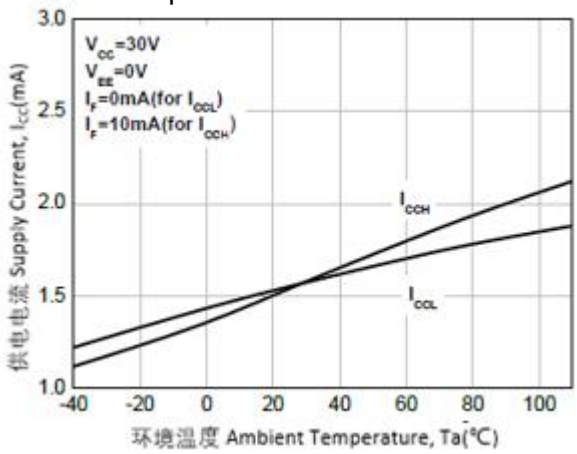


图7. 供电电流和电源电压的关系

Fig 7. Supply Current vs Supply voltage

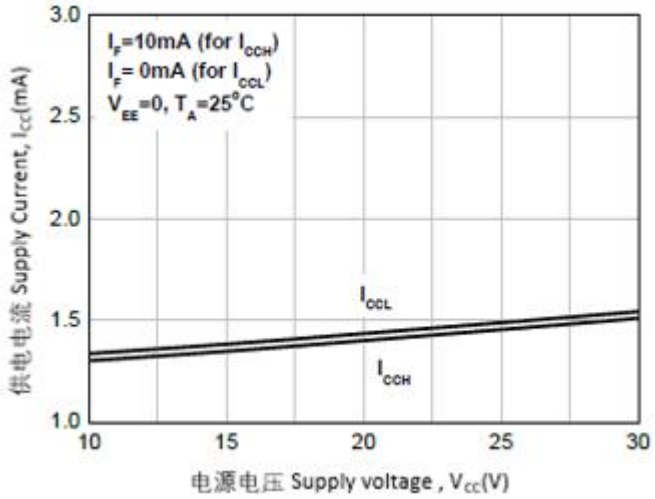



图8. 阈值输入电流环境温度的关系

Fig 8. Threshold Input Current vs Ambient Temperature

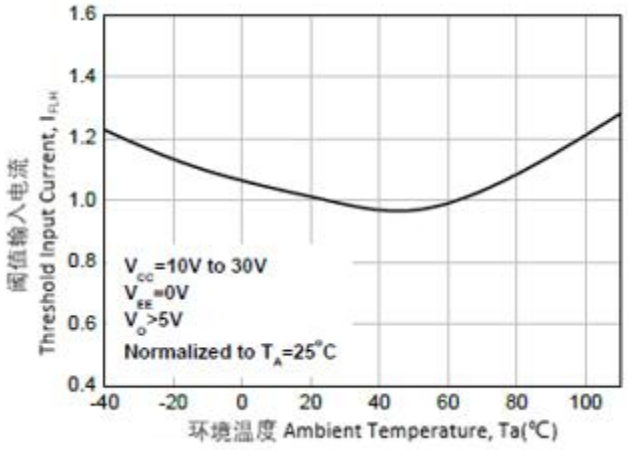



图9. 欠压闭锁

Fig 9. Under Voltage Lockout

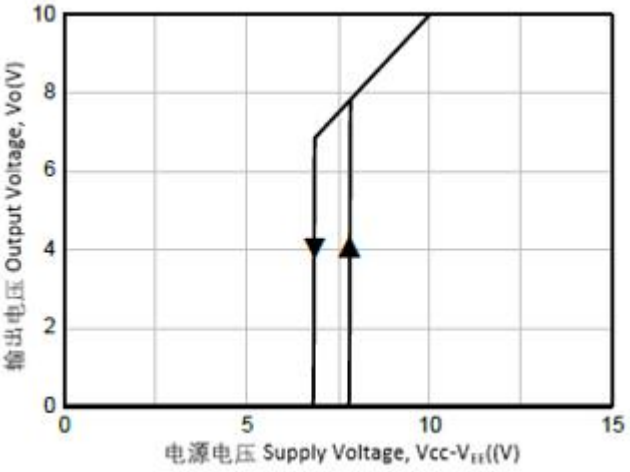



图10. 传播延迟和电源电压的关系

Fig 10. Propagation Delay vs Supply Voltage

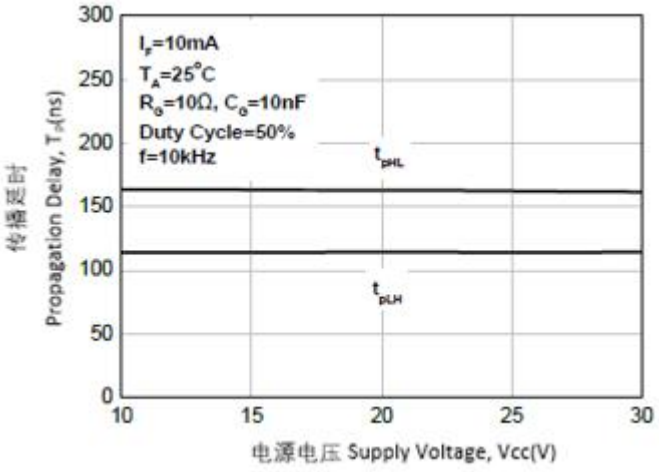



图11. 传播延迟和正向电流的关系

Fig 11. Propagation Delay vs LED Forward Current

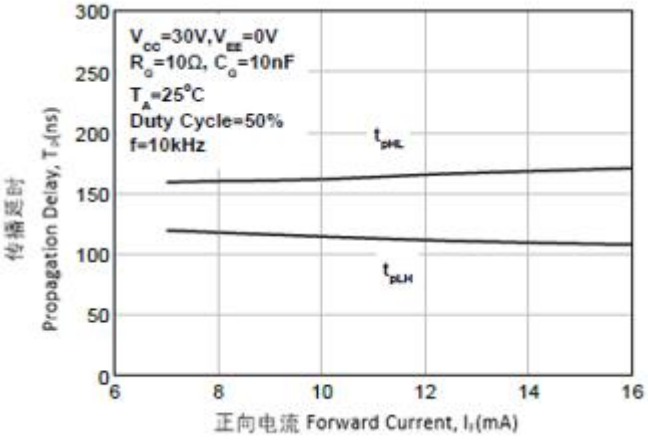



图12. 传播延迟和环境温度的关系

Fig 12. Propagation Delay vs Ambient Temperature

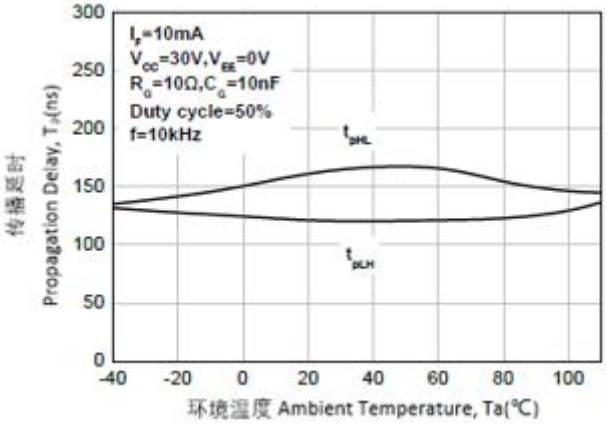


图13. 传播延时和负载电阻的关系

Fig 13. Propagation Delay vs Series Load Resistance

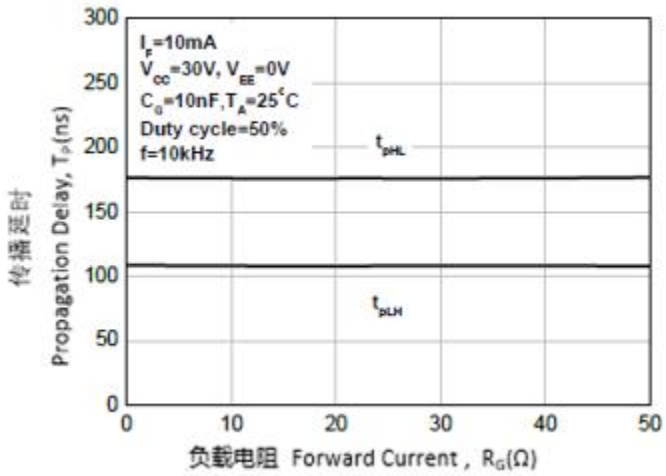



图14. 传播延时和负载电容的关系

Fig 14. Propagation Delay vs Load Capacitance

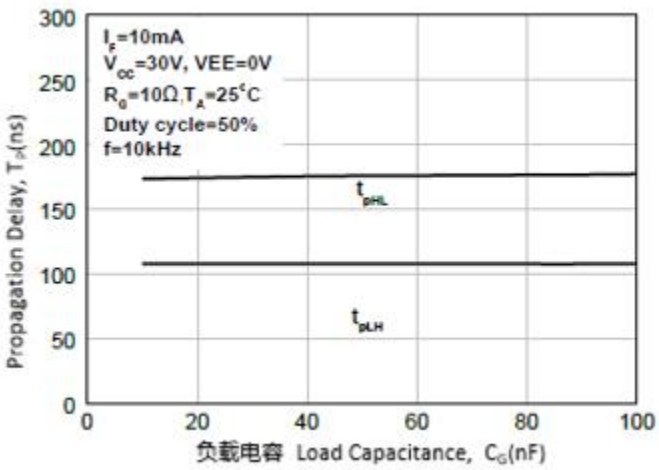



图15.$I_{OH}$测试电路

Fig 15. $I_{OH}$ Test circuit

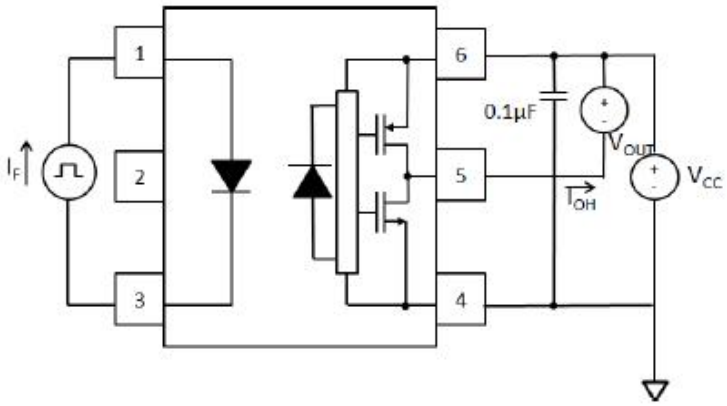



图16. $I_{OL}$测试电路

Fig 16. $I_{OL}$ Test circuit

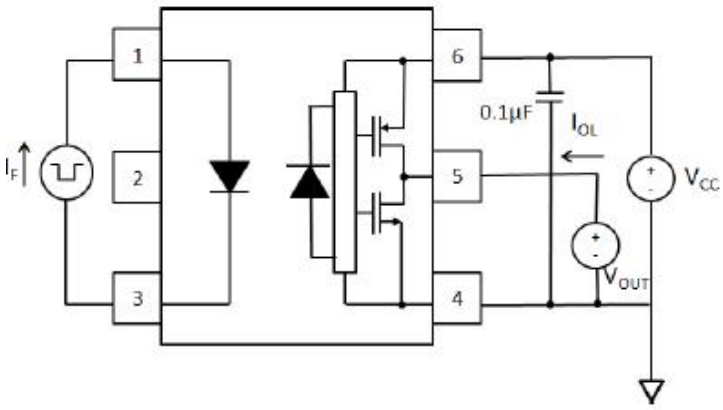



图17.$V_{OH}$测试电路

Fig 17. $V_{OH}$ Test circuit

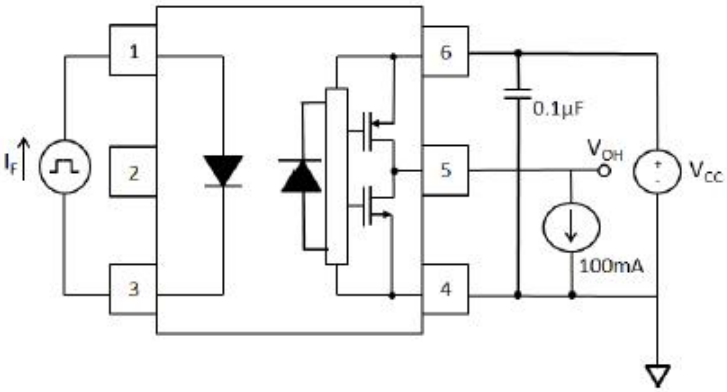



图18. $V_{OL}$测试电路

Fig 18. $V_{OL}$ Test circuit

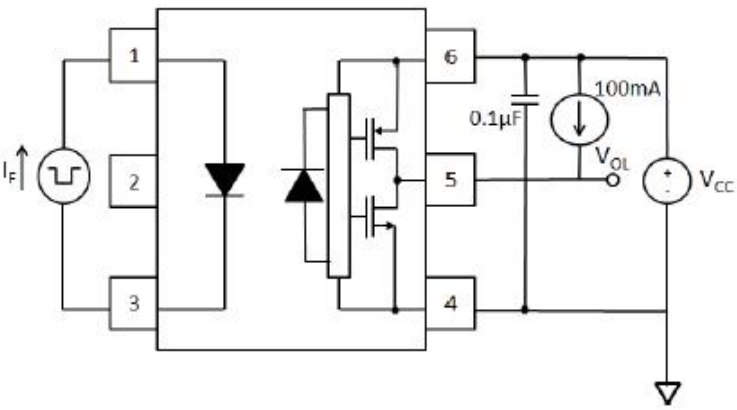


图19.$I_{FHL}$测试电路

Fig 19. $I_{FHL}$e Test circuit

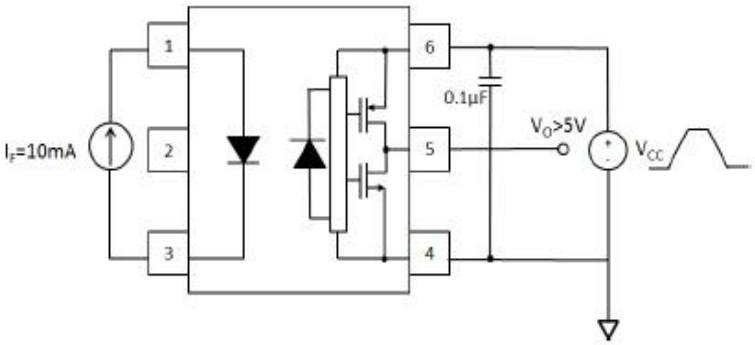



图20. UVLO测试电路

Fig 20. UVLO Test circuit

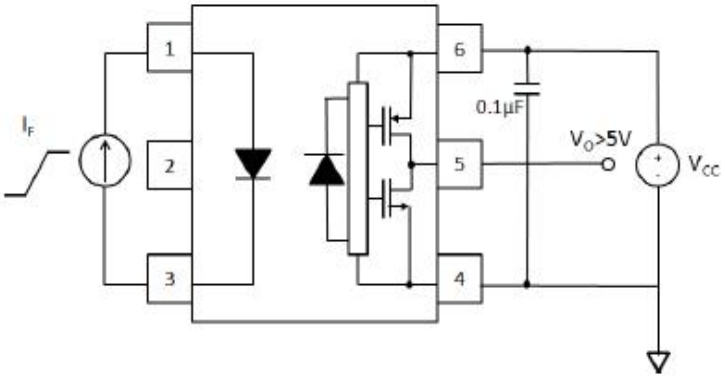
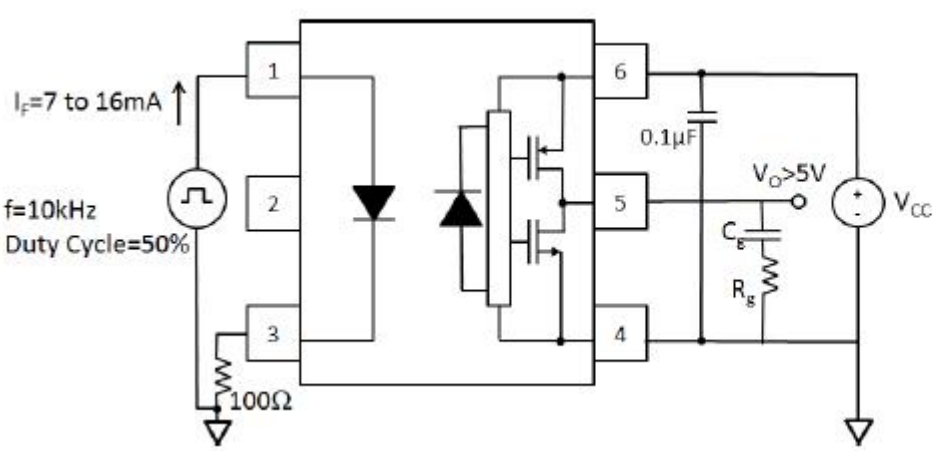



图21.开关时间测试电路

Fig 21. Switching Time Test circuit



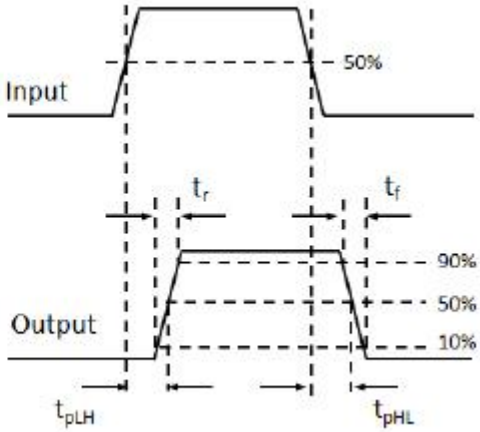
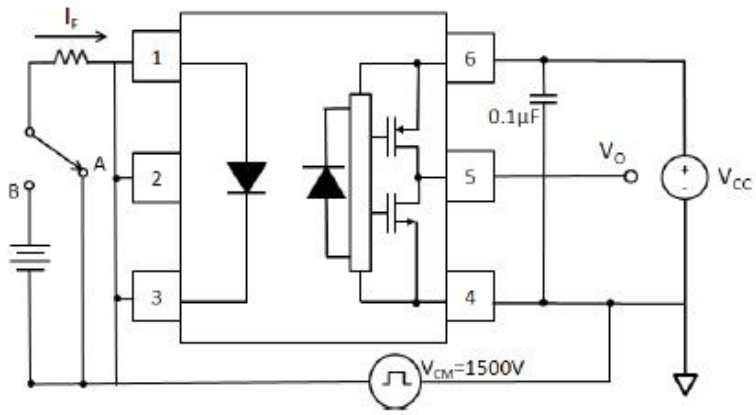
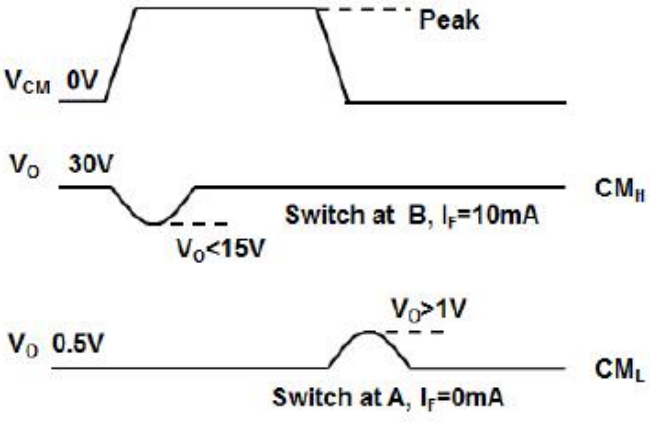




图22.CMR 测试电路

Fig 22. CMR Test circuit



## 8. 订单信息 Order Information

• 材料编号 Part Number

# KLS3150Y-Z-V

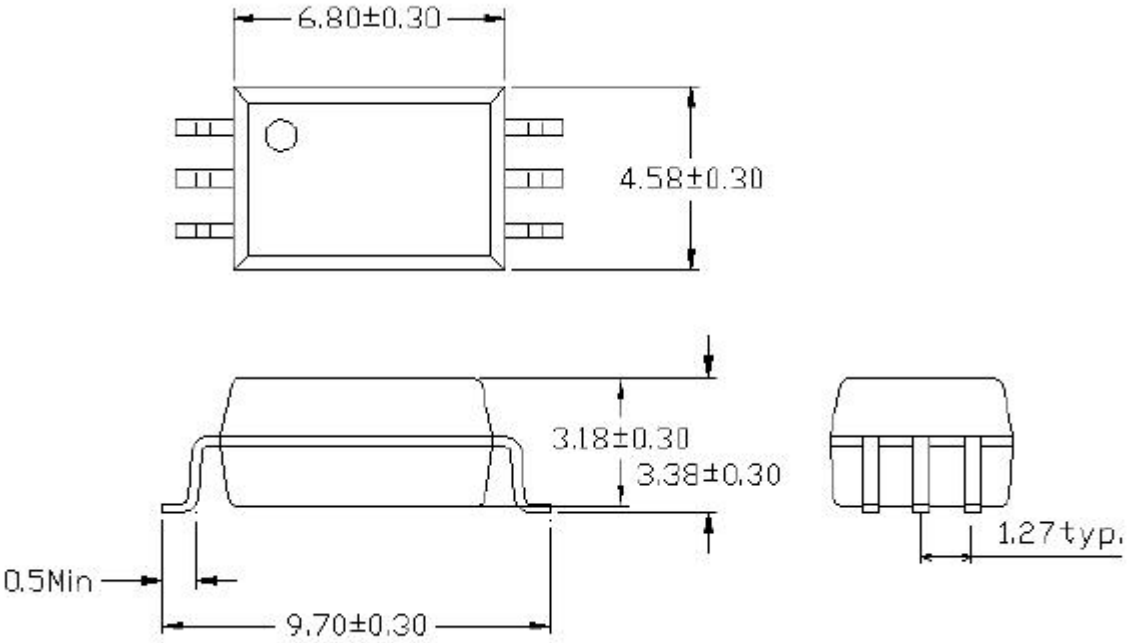
**附注(Notes):**

Y =引脚形式选项(P)
Lead form option (P)
Z = 料带和卷轴选项(TA, TB)
Tape and reel option (TA、TB)
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)

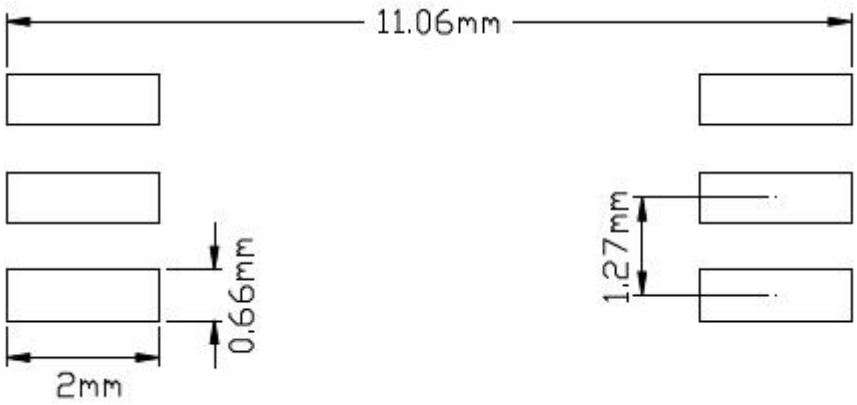
| 选项<br>Option | 描述<br>Description | 包装数量<br>Packing quantity |
|---|---|---|
| TA | 表面贴装引线形式+TA载带和卷轴选项<br>Surface mount lead form + TA tape & reel option | 每卷1000pcs<br>1000 units per reel |
| TB | 表面贴装引线形式+TB载带和卷轴选项<br>Surface mount lead form + TB tape & reel option | 每卷1000pcs<br>1000 units per reel |

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

• P型号　P Type




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

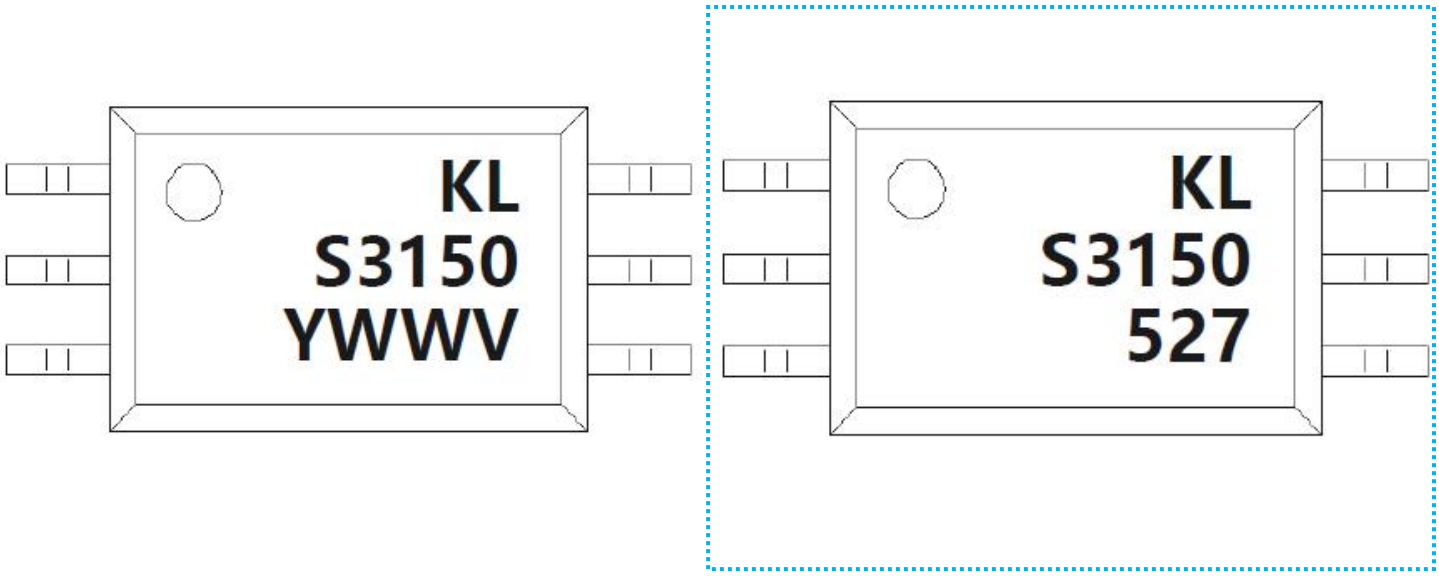



备注 Notes

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 needs

## 10.设备标记 Device marking



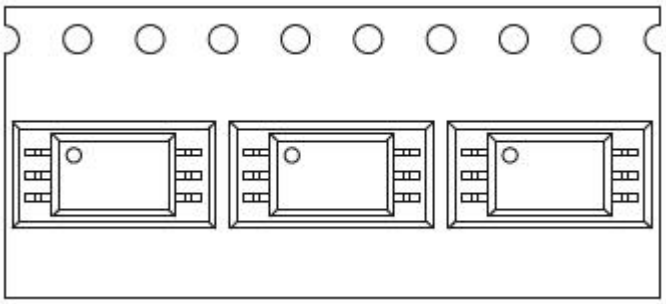

(范本参考 Template reference)

**附注(Notes):**

| | |
|---|---|
| KL | = 表示晶台微电子有限公司 Denotes Kinglight Microelectronics |
| S3150 | = 表示材料部件号 Denotes Device Part Number |
| 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")<br>VDE (Only add "V" to laser characters specified by the customer) |

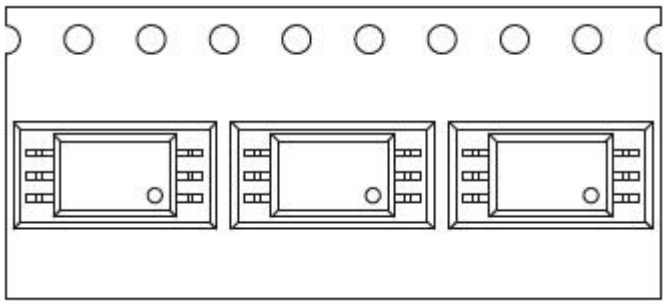
# 11.料带和卷轴包装规格 Tape & Reel Packing Specifications

• 选择TA Option TA



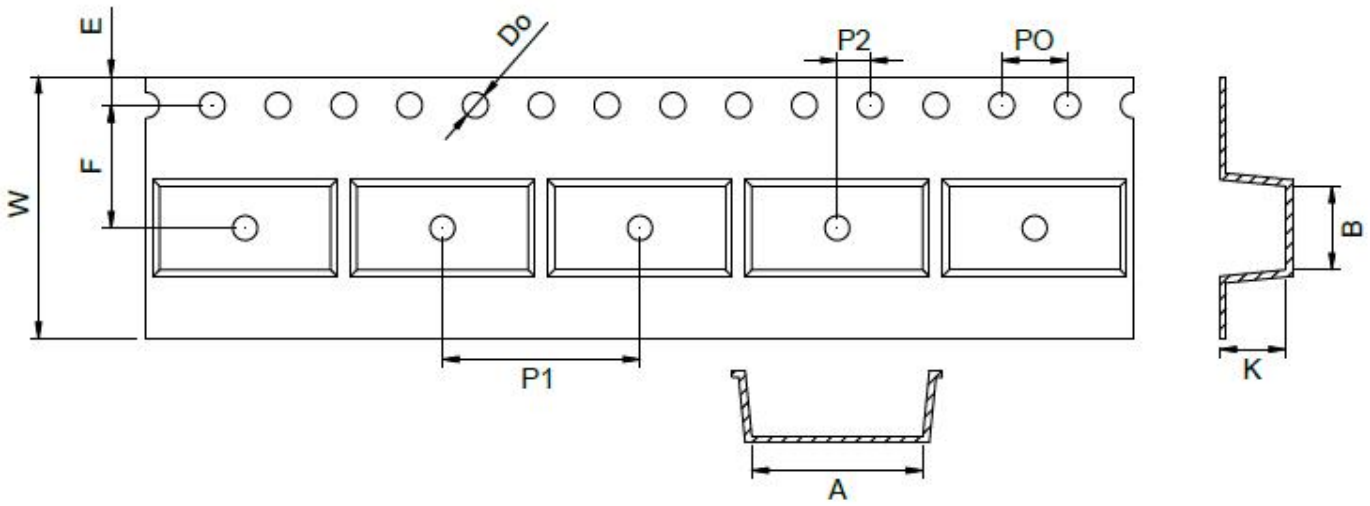
卷轴进给方向 Direction of feed from reel

• 选择TB Option TB



卷轴进给方向 Direction of feed from reel

## 料带尺寸Material belt size



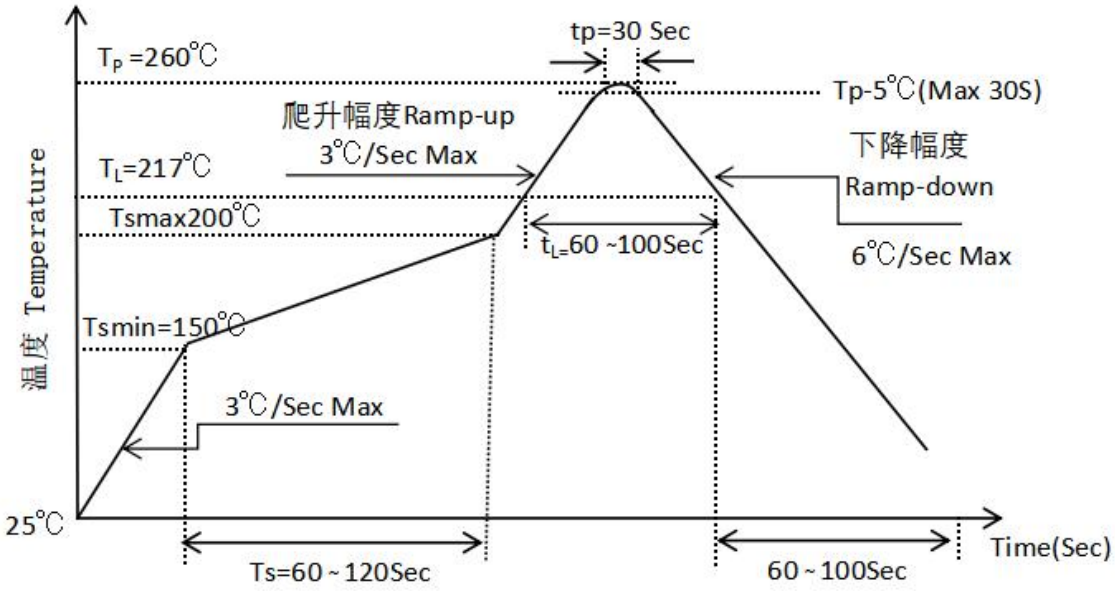

| 尺寸编号 Dimension No. | A | B | D0 | E | F | t |
|---|---|---|---|---|---|---|
| 尺寸(mm) Dimension(mm) | 10.4±0.1 | 5.1±0.1 | 1.55±0.1 | 1.75±0.1 | 7.5±0.1 | 0.4±0.1 |
| 尺寸编号 Dimension No. | $P_0$ | P1 | P2 | W | K | |
| 尺寸(mm) Dimension(mm) | 4.0±0.1 | 12.0±0.1 | 2.0±0.1 | 16.0±0.3 | 4.0±0.1 | |

# 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.

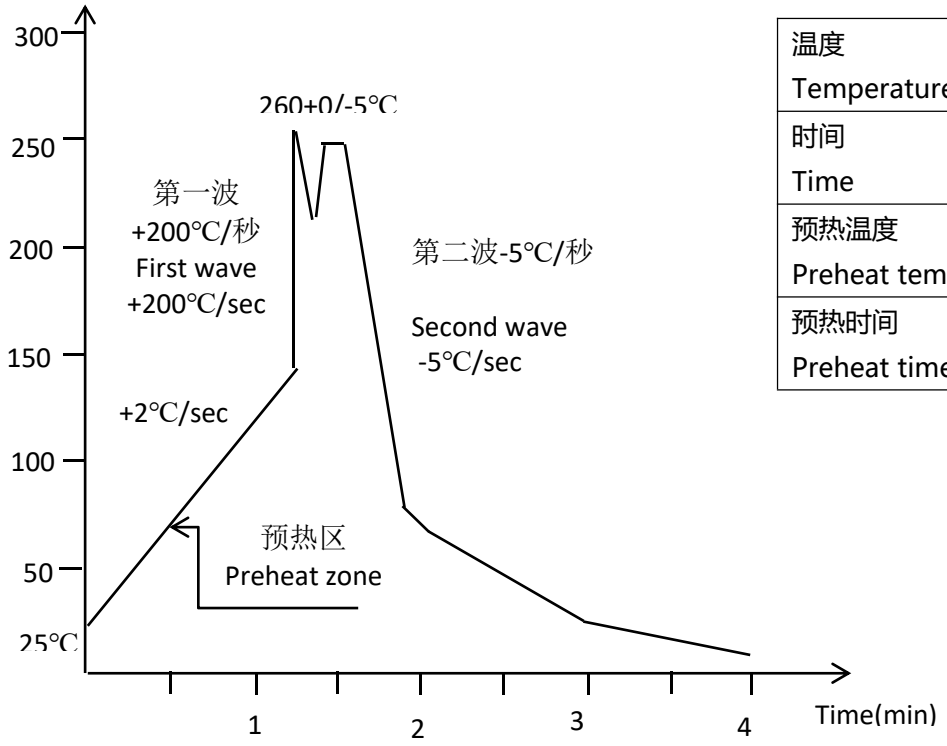



| 项目<br>Item | 符号<br>Symbol | 最小值<br>Min. | 最大值<br>Max. | 单位<br>Unit |
|---|---|---|---|---|
| 预热温度<br>Preheat Temperature | $T_s$ | 150 | 200 | ℃ |
| 预热时间<br>Preheat Time | ts | 60 | 120 | s |
| 升温速率<br>Ramp-Up Rate ($T_L$ to $T_P$) | - | - | 3 | ℃/s |
| 液相线温度<br>Liquidus Temperature | $T_L$ | 217 | | ℃ |
| 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 | ℃ |
| $T_c$ 在($T_P$-5)和 $T_P$之间的时间 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 | ℃/s |

## • 波峰焊温度曲线 Wave Soldering

温度条件下, 建议一次焊接

One time soldering is recommended within the condition of temperature




| | |
|---|---|
| 温度<br>Temperature | 260℃+0/-5℃ |
| 时间<br>Time | 10秒<br>10S |
| 预热温度<br>Preheat temperature | 25至140℃<br>25 to 140℃ |
| 预热时间<br>Preheat time | 30至80秒<br>30 to 80 S |