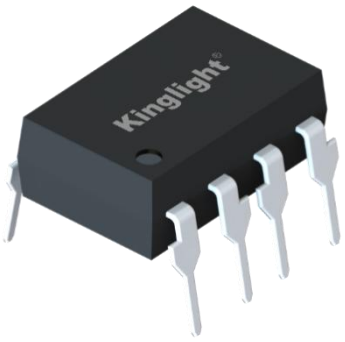
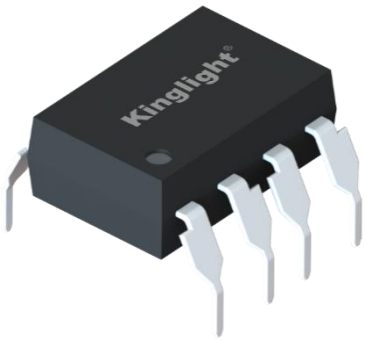
Kinglight® 晶台

KL2200,KL2201,KL2202 DIP8 HIGH SPEED LOW INPUT CURRENT LOGIC GATE PHOTOCOUPLER

DIP8 高速低输入电流逻辑门光耦





1. 产品特点 Product features

- 最小共模瞬态抗扰度 1kV/μs 1kV/μs min. common mode transient immunity
- 可保证在-40至85℃温度范围内运行 Guaranteed performance from -40 to 85℃
- 宽V_{CC}范围(4.5V至20V) Wide V_{CC} range (4.5V to 20V)
- 5Mbd 规格信号传输速率 5Mbd typical signal rate
- 低输入电流(1.6mA) Low input current (1.6mA)
- 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=5000 V rms)
  High isolation voltage between inputs and output (Viso=5000 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 Descripion

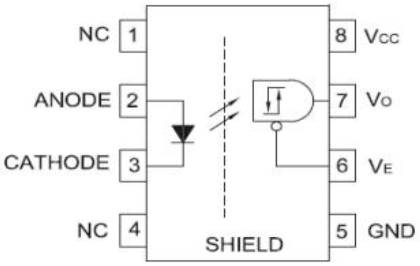
- KL2200、KL2201和KL2202 由一个红外发射二极管和一个高速集成光电检测器逻辑门组成。
  KL2200, KL2201 and KL2202 consist of an infrared emitting diode optically coupled to a high speed integrated photo detector logic gate.
- 它采用 8 引脚 DIP 封装，并提供 SMD 选项。KL2200 的检测器具有一个三态输出级，并具有一个带滞后的检测器阈值。三态输出无需上拉电阻，可直接驱动数据总线。滞后提供了差分模式抗噪能力，消除了输出信号抖动的可能性。
  It is packaged in an 8-pin DIP package and available in SMD options. The detector of KL2200 has a three state output stage and has a detector threshold with hysteresis. The three state output eliminates the need for a pull up resistor and allows for direct drive of data busses. The hysteresis provides differential mode noise immunity and eliminates the potential for output signal chatter.

3. 产品应用 Product Applications

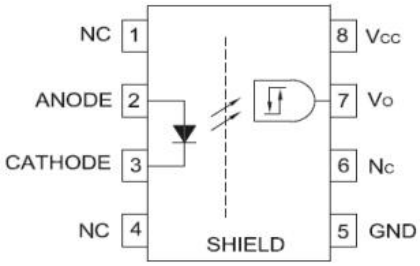
- 消除接地回路 Ground loop elimination
- LSTTL 至 TTL、LSTTL 或 CMOS LSTTL to TTL, LSTTL or CMOS
- 线路接收器、数据传输 Line receiver, data transmission
- 隔离总线驱动器 Isolated Buss Driver
- 微处理器系统接口 Microprocessor System Interface
- 脉冲变压器更换 Pulse transformer replacement
- 计算机外围接口 Computer peripheral interface
- 高速逻辑接地隔离 High speed logic ground isolation

4. 功能图 Functional Diagram

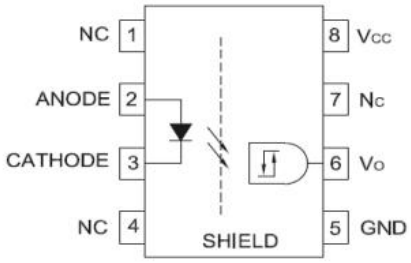
KL2200



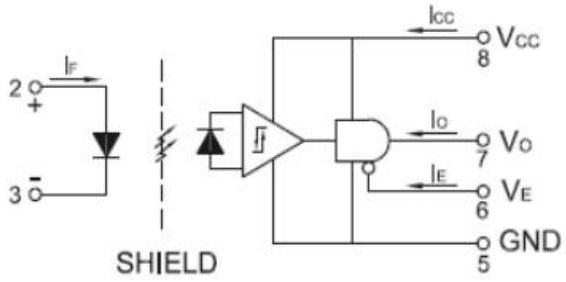
KL2201



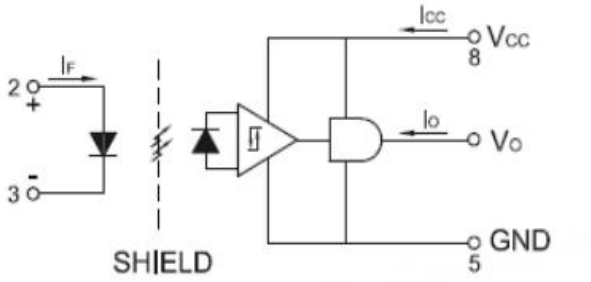
KL2202



Schematic



KL2200



KL2201/02

Truth Table

KL2200

Input	Enable	Output
H	H	Z
L	H	Z
H	L	H
L	L	L

KL2201/02

Input	Output
H	H
L	L

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 Parameter		符号 Symbol	额定值 Rated Value	单位 Unit
输入 Input	正向电流 Forward current	I_F	50	mA
	反向电压 Reverse voltage	V_R	5	V
	三态使能电压 Three State Enable Voltage	V_E	20	V
输出 Output	输出电压 Output Voltage	V_O	20	V
	输出电流 Output current	I_O	25	mA
	工作电压 Supply voltage	V_{CC}	20	V
总封装功率 (1*) Total Package Power dissipation		P_T	210	mW
隔离电压 (2*) Isolation Voltage		V_{iso}	5000	Vrms
工作温度 Operating temperature		T_{OPR}	-40 to +85	℃
储存温度 Storage temperature		T_{STG}	-55 to +125	℃
焊接温度 (3*) Soldering temperature		T_{SOL}	260	℃

6. 电气特性 Electrical Characteristics

• T_A = -40 to 85°C, V_{CC} = 4.5V to 20V, $I_{F(ON)}$ = 1.6mA to 5mA,V_{EH} = 2V to 20V, V_{EL} = 0V to 0.8V, $I_{F(OFF)}$ = 0mA unless otherwise specified 除非另有说明

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	-	1.4	1.8	V	I_F=10mA	
	反向电压 Reverse voltage	V_R	5.0	-	-	V	I_R=10μA	
	正向电压温度系数 Temperature coefficient of forward voltage	$\Delta V_F/\Delta T_A$	-	-1.8	-	mV/℃	I_F=10mA	
	输入电容 Input capacitance	C_{IN}	-	60	-	pF	V_F=0, f=1MHz	
输出 Output	高电平工作电流 High level supply current	I_{CCH}	-	2.3	4.5	mA	V_{CC}= 5.5V	I_F=5mA, I_O=Open V_E= Don’t care
			-	3	6		V_{CC}= 20V	
	低电平工作电流 Low level supply current	I_{CCL}	-	3.7	6	mA	V_{CC}= 5.5V	I_F=0mA, I_O=Open V_E= Don’t care
			-	4.5	7.5		V_{CC}= 20V	
	高电平使能电流 (仅 KL2200) High Level Enable Current(KL2200 only)	I_{EL}	-	-0.1	-0.32	mA	V_E=0.4V	
	低电平使能电流 (仅 KL2200) Low Level Enable Current(KL2200 only)	I_{EH}	-	-	20	uA	V_E=2.7V	
			-	-	100		V_E=5.5V	
			-	0.005	250		V_E=20V	
	高电平使能电压 (仅 KL2200) High Level Enable Voltage(KL2200 only)	V_{EH}	2.0	-	-	V	-	
	低电平使能电压 (仅 KL2200) Low Level Enable Voltage(KL2200 only)	V_{EL}	-	-	0.8	V	-	

• 传输特性 Transfer Characteristics (TA = -40 to 85°C, V_{CC} = 4.5V to 20V, $I_{F(ON)}$ = 1.6mA to 5mA, V_{EH} = 2V to 20V, V_{EL} = 0V to 0.8V, $I_{F(OFF)}$ = 0mA unless otherwise specified) (4*)

参数 Parameter	符号 Symbol	最小值 Min.	规格值 Typ.*	最大值 Max.	单位 Unit	条件 Condition	
输出漏电流 Output Leakage Current	I_{OHH}	-	1.5	100	μA	V_O=5.5V	V_{CC}=4.5V, I_F=5mA
		-	2	500		V_O=20V	
低电平输出电流 Low Level Output Current	V_{OL}	-	0.33	0.5	V	V_{CC} = 4.5V, I_F=0mA, V_E=0.4V, I_{OL}=6.4mA	
输入阈值电流 Input Threshold Current	I_{FT}	-	-	1.6	mA	V_{CC}= 4.5V, V_O=0.5V V_E=0.4V, I_{OL}=6.4mA	
逻辑高输出电压 Logic High Output Voltage	V_{OH}	2.4	V_{CC}-1.8	-	V	I_{OH} = -2.6mA	
高阻抗状态输出电流（仅KL2200） High Impedance State Output Current(KL2200 only)	I_{OZL}	-	-	-20	μA	V_O = 0.4V, I_F = 5mA, V_{EN} = 2V	
	I_{OZH}	-	-	20		V_O = 2.4V	I_F = 5mA, V_{EN} = 2V
		-	-	100		V_O = 5.5V	
		-	-	500		V_O = 20V	
逻辑低电平短路输出电流 Logic Low Short Circuit Output Current	I_{OSL}	25	-	-	mA	V_O = VCC = 5.5V	I_F = 0mA (5*)
		40	-	-		V_O = VCC = 20V	
逻辑高电平短路输出电流 Logic High Short Circuit Output Current	I_{OSH}	-10	-	-	mA	V_{CC} = 5.5V	I_F=5mA V_O = GND (5*)
		-25	-	-		V_{CC} = 20V	
输入电流滞后 Input Current Hysteresis	I_{HYS}	-	0.03	-	mA	V_{CC}= 4.5V	

• 开关特性 Switching Characteristics (T_A = -40 to 85°C, V_{CC} = 4.5V to 20V, $I_{F(ON)}$ = 1.6mA to 5mA, $I_{F(OFF)}$ = 0mA unless otherwise specified) (4*)

参数 Parameter	符号 Symbol	最小值 Min.	规格值 Typ.*	最大值 Max.	单位 Unit	条件 Condition	
到输出高电平的传播延迟时间 Propagation Delay Time to output high level	t_{PHL}	-	100	300	ns	(6*&8*) , Fig. 11	
到输出低电平的传播延迟时间 Propagation delay time to output low level	t_{PLH}	-	105	300	ns	(7*&8*), Fig. 11	
输出上升时间 Output rise time	t_r	-	45	-	ns	(9*) , Fig. 11	
输出下降时间 Output fall time	t_f	-	10	-	ns	(10*) , Fig. 11	
到输出高电平的使能传播延迟时间（仅限 KL2200）Enable Propagation Delay Time to Output High Level(KL2200 only)	t_{PZH}	-	20	-	ns	Fig. 12	
到输出低电平的使能传播延迟时间（仅限 KL2200）Enable Propagation Delay Time to Output Low Level(KL2200 only)	t_{PZL}	-	25	-	ns	Fig. 12	
到输出高电平的禁用传播延迟时间（仅限 KL2200）Disable Propagation Delay Time to Output High Level(KL2200 only)	t_{PHZ}	-	130	-	ns	Fig. 12	
到输出低电平的禁用传播延迟时间（仅限 KL2200）Disable Propagation Delay Time to Output Low Level(KL2200 only)	t_{PLZ}	-	35	-	ns	Fig. 12	
输出高电平时的共模瞬态抗扰度 Common Mode Transient Immunity at Output High	CM_H	1000	-	-	V/us	I_F = 5mA, V_{OH}(Min.) =2V (11*)	|V_{CM}| =50V T_A =25°C V_{CC}=5V (Fig. 13)
输出低电平时的共模瞬态抗扰度 Common Mode Transient Immunity at Output Low	CM_L	1000	-	-	V/us	I_F=0mA V_{OL}(Max.) =2V (12*)	

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

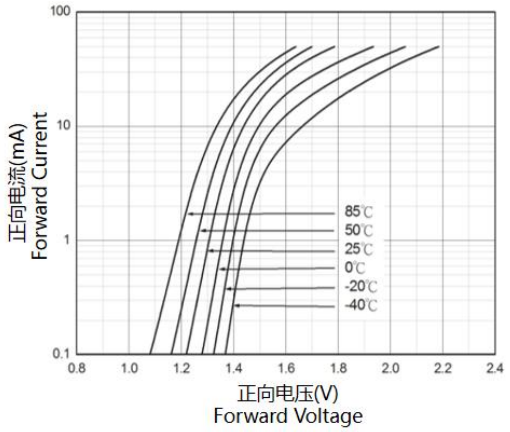


图2 输出电压 vs 输入正向电流的关系

Fig.2 Output Voltage vs Input Forward Current

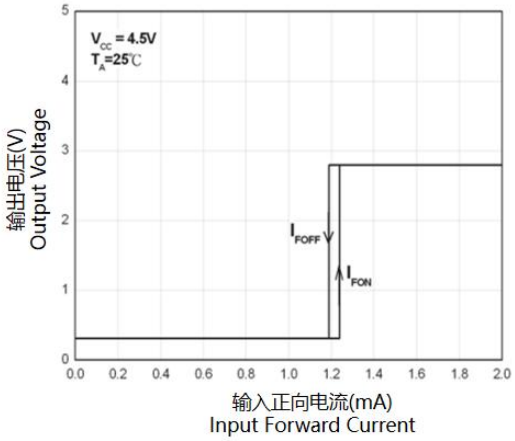


图3. 输入阈值电流 vs 环境温度的关系

Figure 3. Input threshold current vs Ambient Temperature

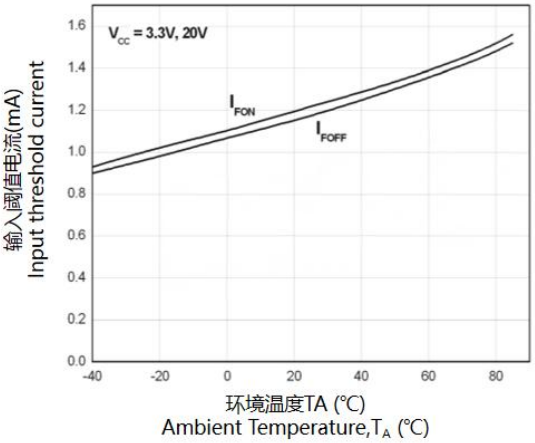


图4. 逻辑低输出电压 vs 环境温度的关系

Figure 4. Logic Low Output Voltage vs Ambient Temperature

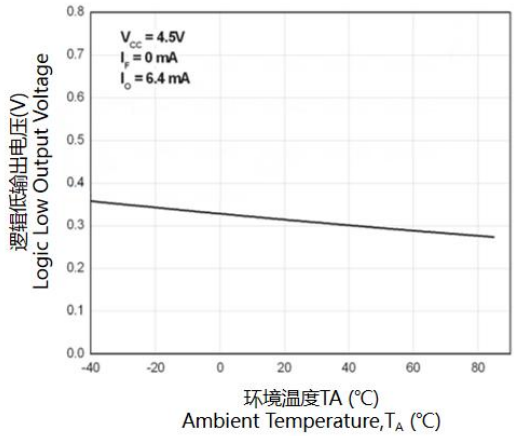


图5. 逻辑高输出电压 vs 工作电压的关系

Figure 5. Logic High Output Voltage vs Supply Voltage

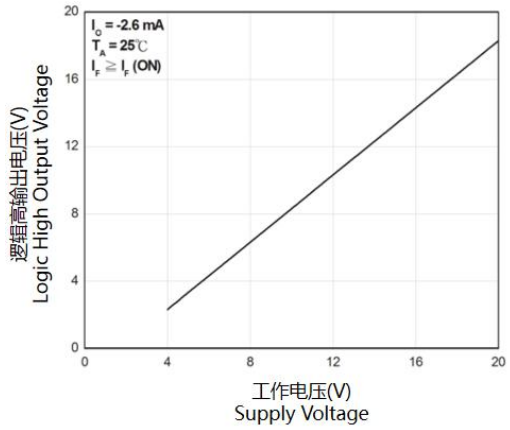


图6. 逻辑高输出电流 vs 环境温度的关系

Figure 6. Logic High Output current vs Ambient Temperature

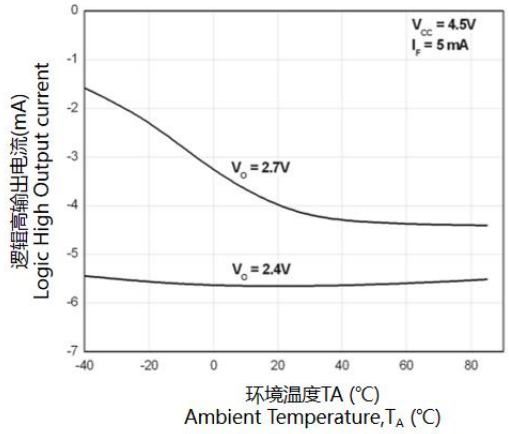


图7. 传播延迟 vs 温度的关系

Figure 7. Propagation Delay vs Temperature

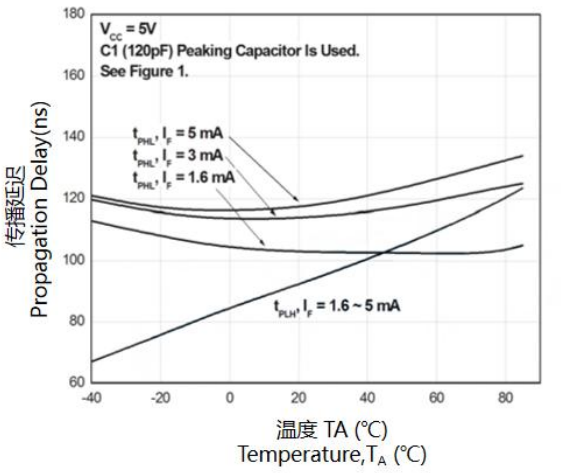


图8. 使能传播延迟 vs 温度的关系

Figure 8. Enable Propagation Delay vs Temperature

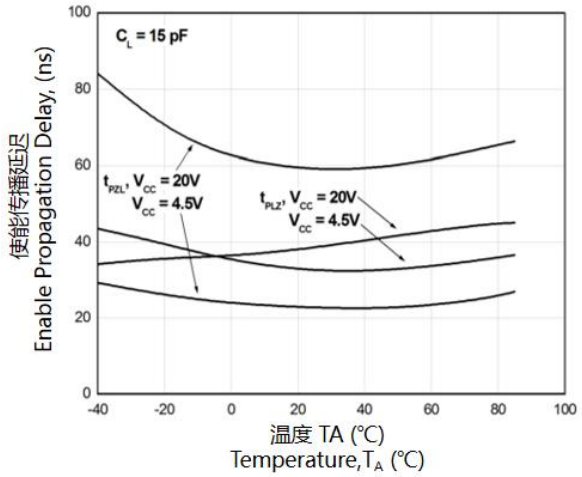


图9. 使能传播延迟 vs 环境温度的关系

Figure 9. Enable Propagation Delay vs Ambient Temperature

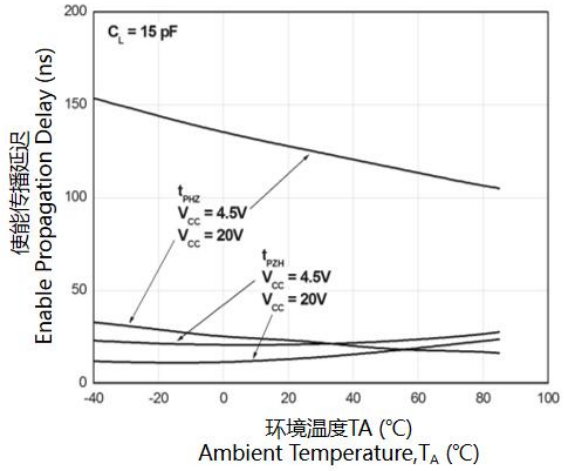


图10. 上升和下降时间 vs温度的关系

Figure 10. Rise and Fall Time vs Temperature

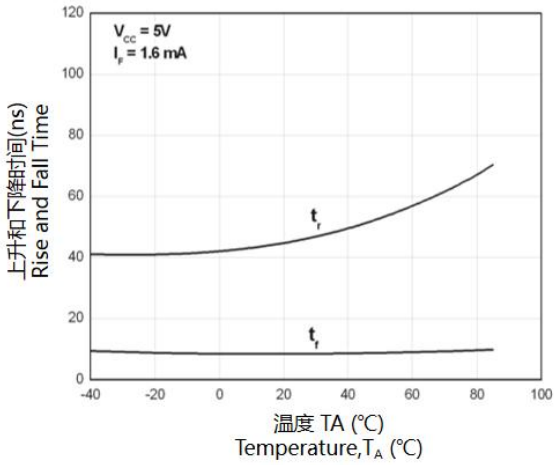
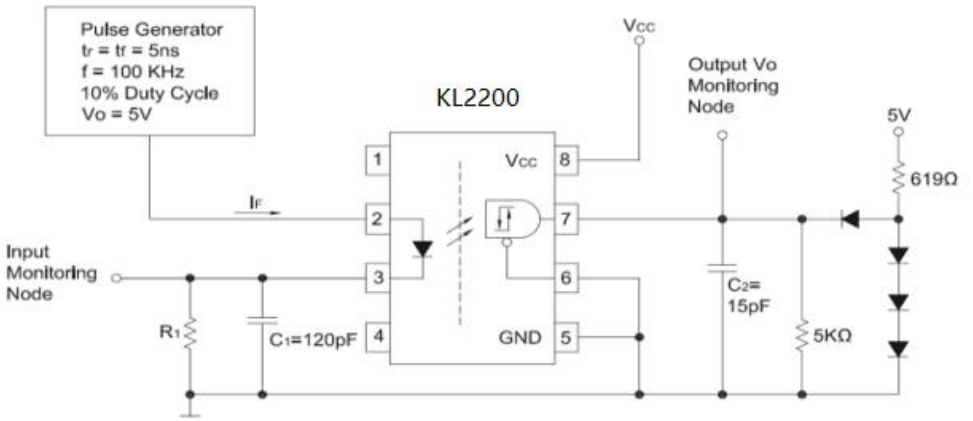


图11. t_{PLH}、t_{PHL}、tr 和 tf 的测试电路和波形 (13*)

Figure 11. Test Circuit and Waveforms for t_{PLH}, t_{PHL}, tr, and tf



C1 和 C2 中包含探头和夹具电容

所有二极管均为 1N916 和 1N3064

The Probe and Jig Capacitances are Included in C_1 and C_2
All Diodes are 1N916 and 1N3064.

R_1	2.25KΩ	1.2KΩ	720Ω
$I_{F(ON)}$	1mA	3mA	5mA

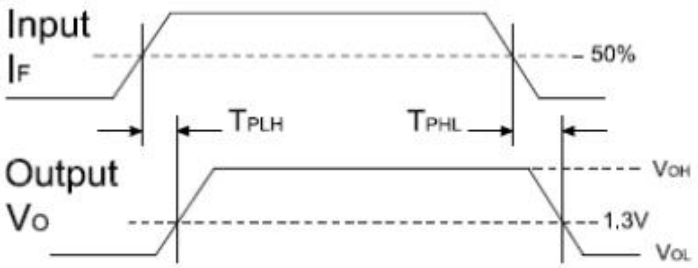


图 12. tPHZ 和 tPLZ、tPLZ 和 tPZL 的测试电路和波形

Figure. 12 Test Circuit and Waveform for t_{PHZ} and t_{PLZ}, t_{PLZ} and t_{PZL}

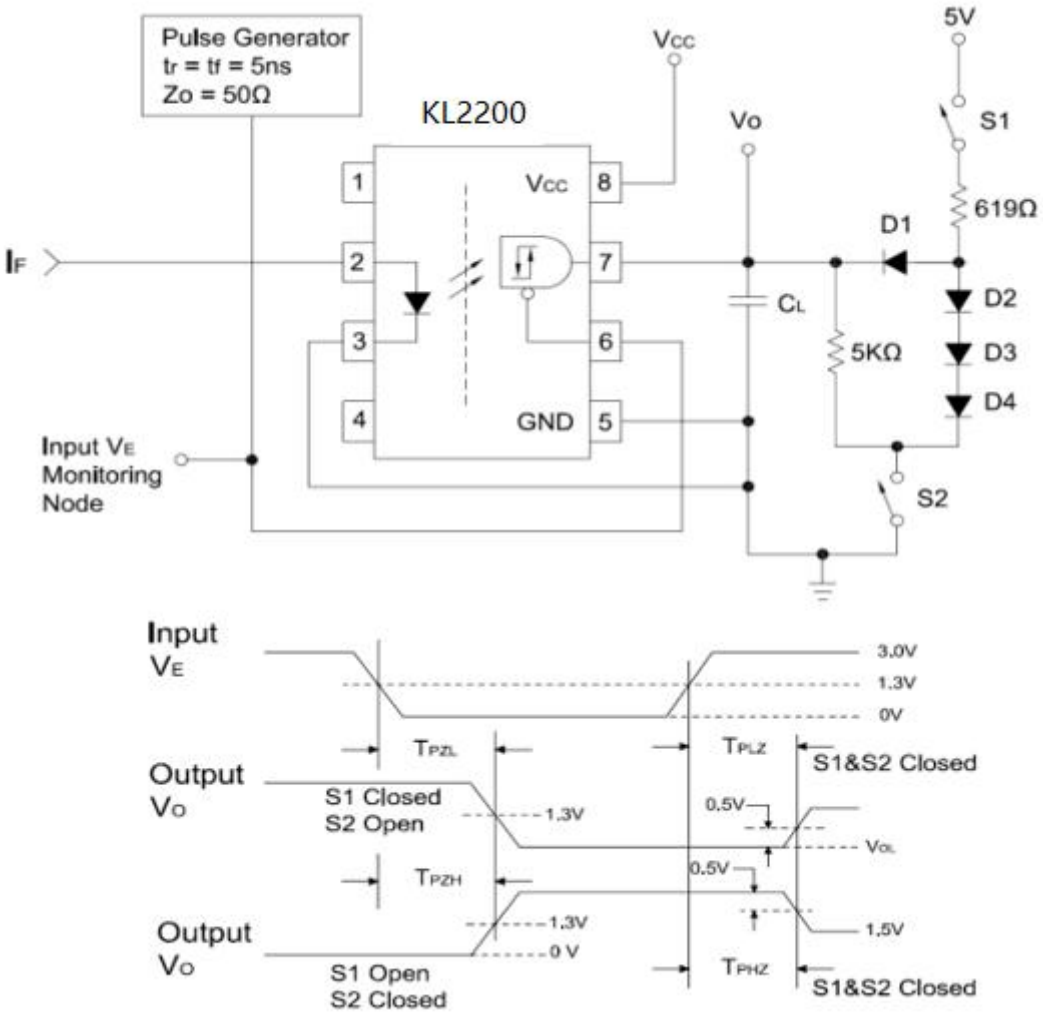


图 13. 测试电路共模瞬态抗扰度(13*)

Figure. 13 Test Circuit Common Mode Transient Immunity

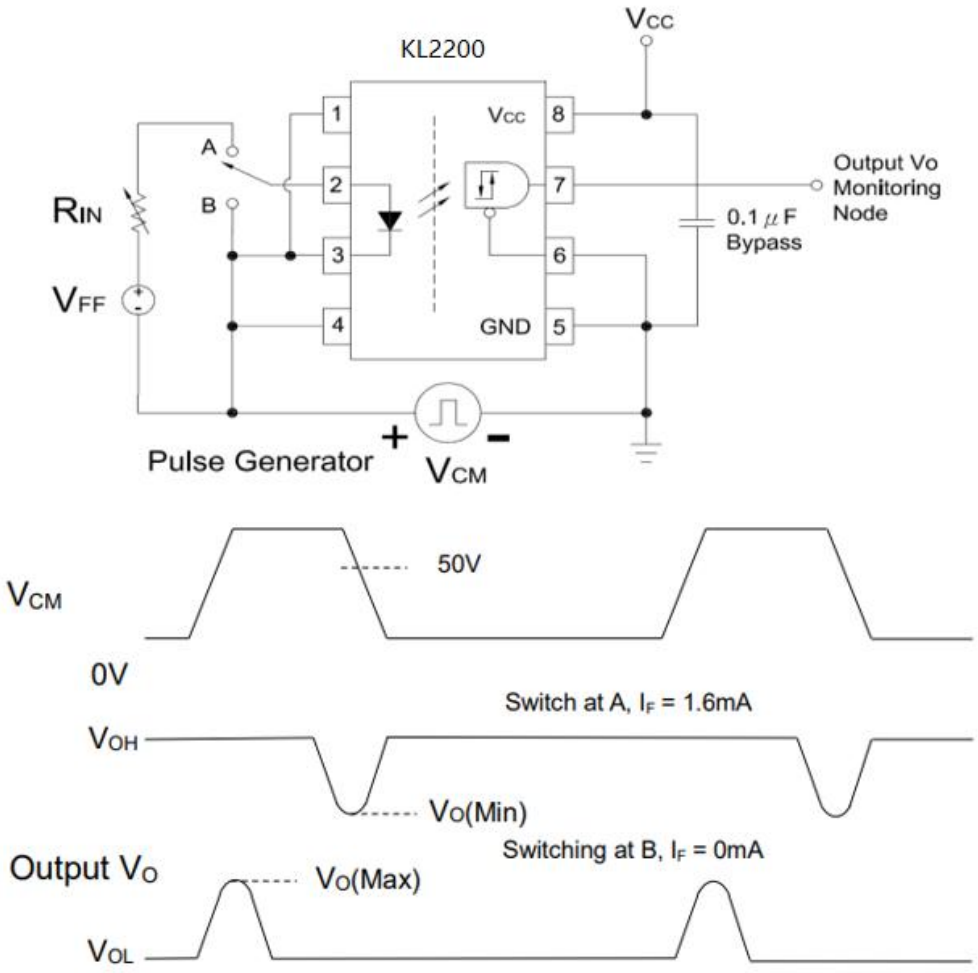


图 14. 推荐的 LSTTL 至 LSTTL 电路(13*)

Figure. 14 Recommended LSTTL to LSTTL Circuit

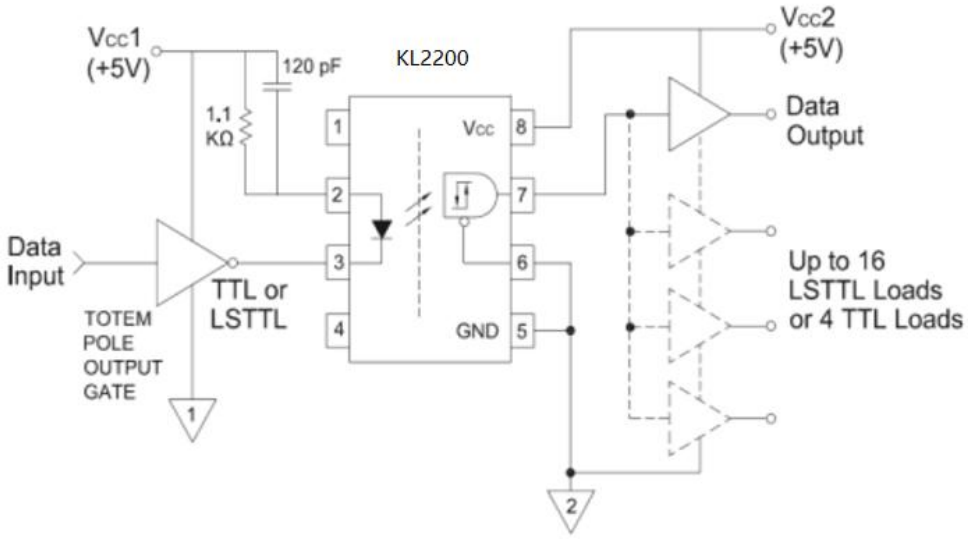


图 15. LSTTL 至 CMOS 接口电路(13*)

Figure. 15 LSTTL to CMOS Interface Circuit

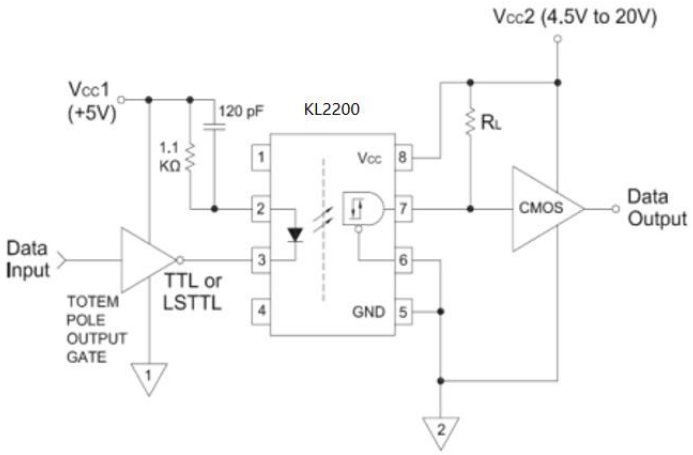


图 16. 推荐的 LED 驱动电路

Figure. 16 Recommended LED Drive Circuit

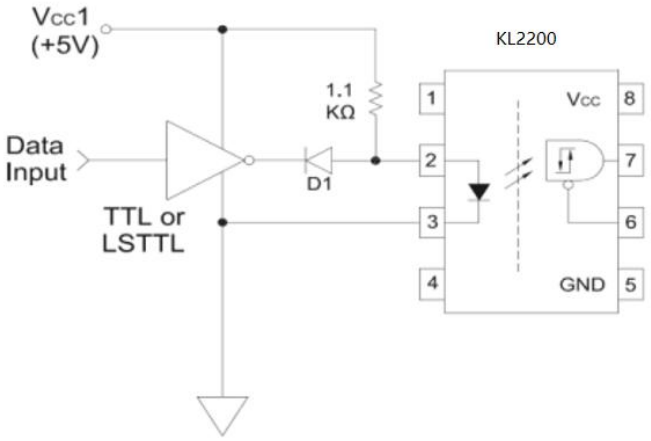
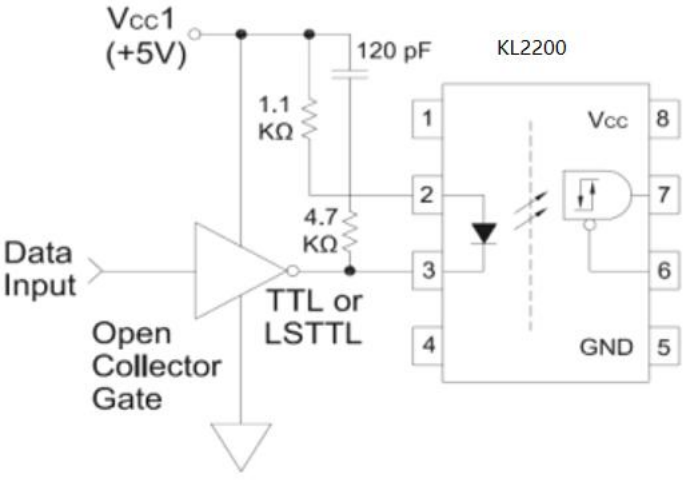


图 17. 带集电极开路栅极的串联 LED 驱动器（4.7KΩ 电阻器从 LED 分流 I_{OH}）

Figure. 17 Series LED Drive With Open Collector Gate.(4.7KΩ Resister Shunts I_{OH} from the LED)



1. 在 70°C 以上的自由空气温度下，以 4.5 mW/°C 的速率线性降低封装总功率耗散 PT。
Derate total package power dissipation, PT, linearly above 70°C free air temperature at a rate of 4.5 mW/°C.
2. AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2, 3 & 4 are shorted together, and pins 5, 6, 7 & 8 are shorted together.
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
3. 焊接时间为10秒 Soldering time is 10 seconds
4. VCC 电源必须由一个 0.1μF 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 VCC 和 GND 引脚。
The VCC supply must be bypassed by a 0.1μF 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 VCC and GND pins.
5. 输出短路时间不应超过 10 ms。
Duration of output short circuit time should not exceed 10 ms.
6.tPLH- 传播延迟是从输入电流脉冲低电平到高电平转换时的 50% 电平到输出电压脉冲低电平到高电平转换时的 1.3 V 电平之间测量的。
tPLH– Propagation delay is measured from the 50% level on the LOW to HIGH transition of the input current pulse to the 1.3 V level on the LOW to HIGH transition of the output voltage pulse.
7.tPHL- 传播延迟是从输入电流脉冲从高电平到低电平转换的 50% 电平到输出电压脉冲从高电平到低电平转换的 1.3 V 电平之间的时间。
tPHL– Propagation delay is measured from the 50% level on the HIGH to LOW transition of the input current pulse to the 1.3 V level on the HIGH to LOW transition of the output voltage pulse.
8.当省略峰值电容器时，传播延迟时间可能会增加 100 ns。
When the peaking capacitor is omitted, propagation delay times may increase by 100 ns.
9. tr- 上升时间是在输出脉冲的低电平到高电平转换时，从 10%到 90% 电平之间测量的时间。
tr– Rise time is measured from the 10% to the 90% levels on the LOW to HIGH transition of the output pulse.
10. tf- 下降时间是指输出脉冲从高电平转换为低电平时，从 90% 电平到 10% 电平之间的时间。
tf– Fall time is measured from the 90% to the 10% levels on the HIGH to LOW transition of the output pulse.
11. CMH - 为确保输出保持在高电平状态（即 VOUT > 2.0V），共模电压的最大容许上升率。
CMH – The maximum tolerable rate of rise of the common mode voltage to ensure the output will remain in the HIGH state (i.e., VOUT > 2.0V).
12. CML - 为确保输出保持在低电平输出状态（即 VOUT < 0.8V），共模电压的最大容许上升率。
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., VOUT < 0.8V).
13. 测试 KL2201/02 时，使能引脚必须浮动。
For testing KL2201/02 the enable pin must be floating.

8. 订单信息 Order Information

• 材料编号 Part Number

KL220XY-Z-V

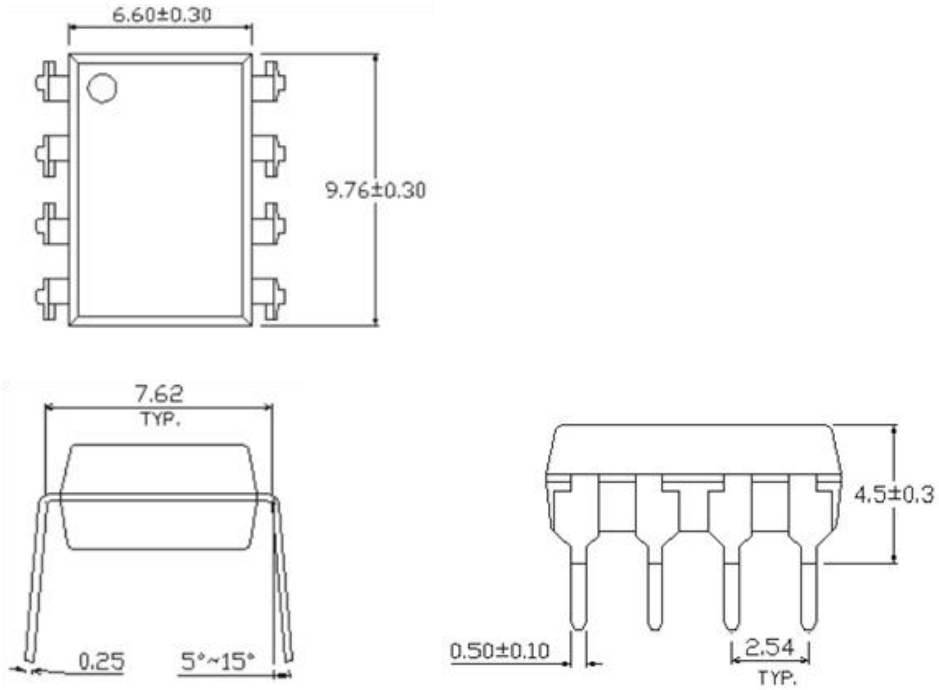
附注(Notes):

X =零件编号(0、1或2) Part No. (0,1 or 2)
Y =引脚形式选项(S、S1、M或无)
Lead form option (S, S1, M or none)
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)

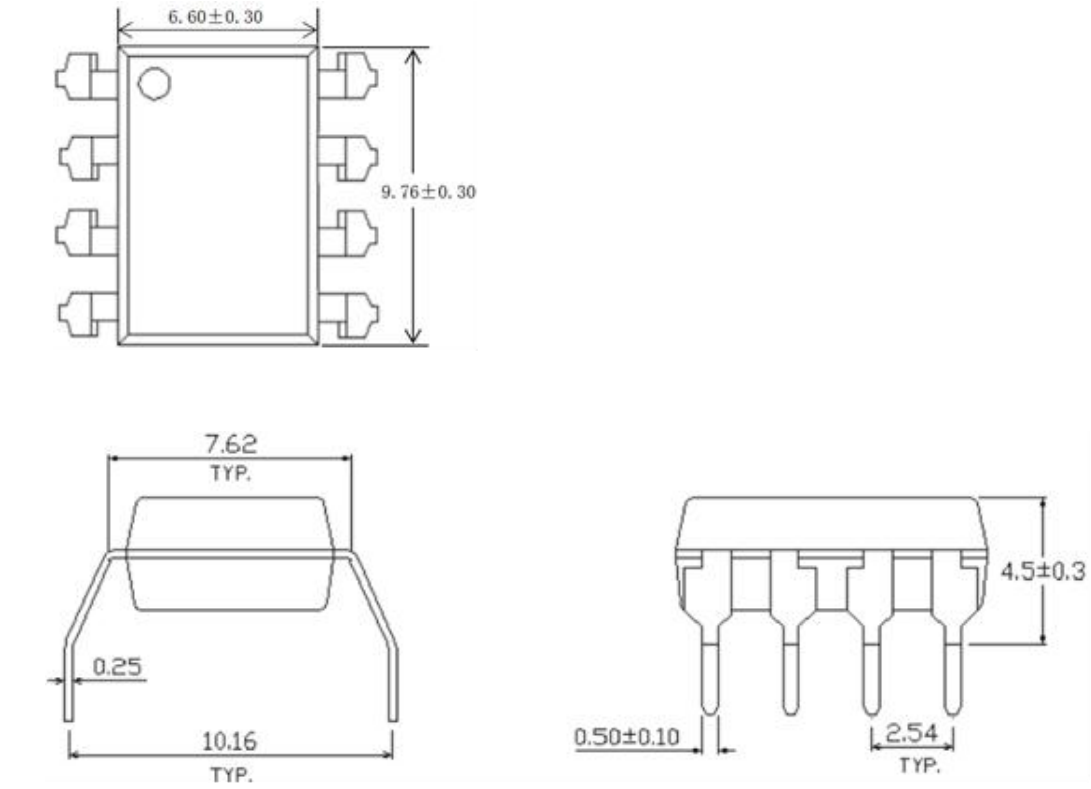
选项 Option	描述 Description	包装数量 Packing quantity
无 None	标准DIP-8 Standard DIP-8	每管45pcs 45 units per tube
M	宽引脚弯曲(0.4英寸间距) Wide lead bend (0.4 inch spacing)	每管45pcs 45 units per tube
S-TA	表面贴装引线形式+TA载带和卷轴选项 Surface mount lead form + TA tape & reel option	每卷1000pcs 1000 units per reel
S-TB	表面贴装引线形式+TB载带和卷轴选项 Surface mount lead form + TB tape & reel option	每卷1000pcs 1000 units per reel
S1-TA	表面贴装引线形式(低剖面)+TA载带和卷轴选项 Surface mount lead form (low profile) + TA tape & reel option	每卷1000pcs 1000 units per reel
S1-TB	表面贴装引线形式(低剖面)+TB载带和卷轴选项 Surface mount lead form (low profile) + TB tape & reel option	每卷1000pcs 1000 units per reel

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

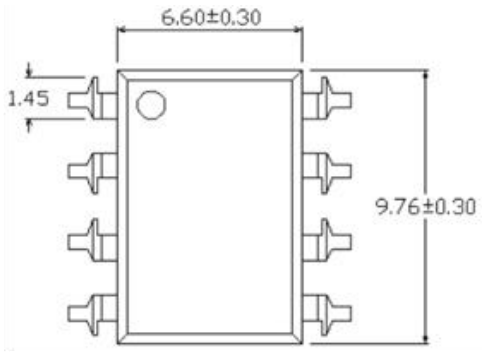
• 标准DIP型号 Standard DIP Type

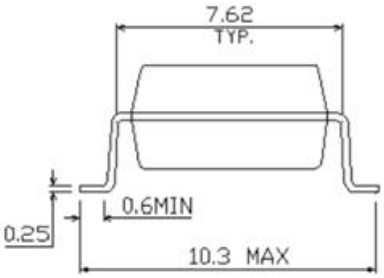


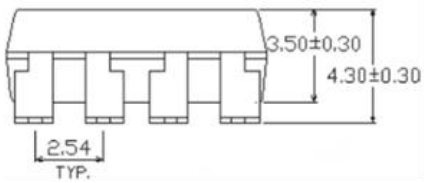
• 选择M型号 Option M Type



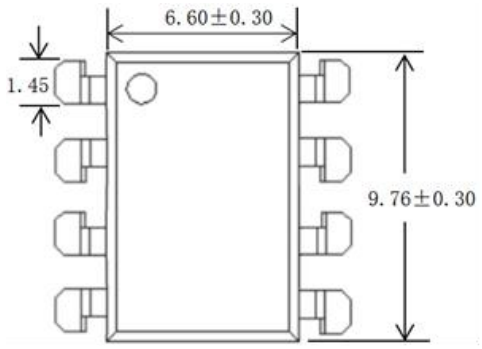
• 选择S型号 Option S Type

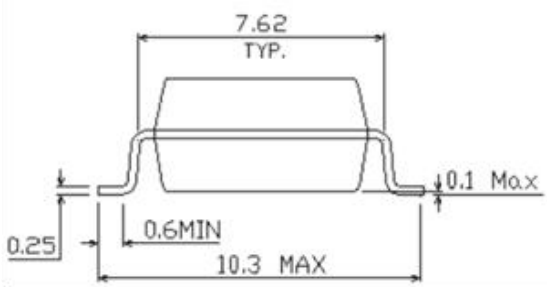


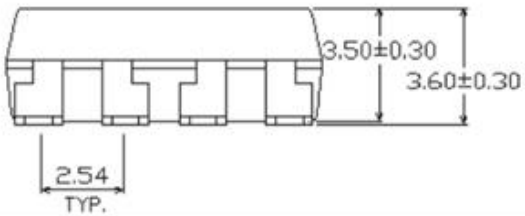




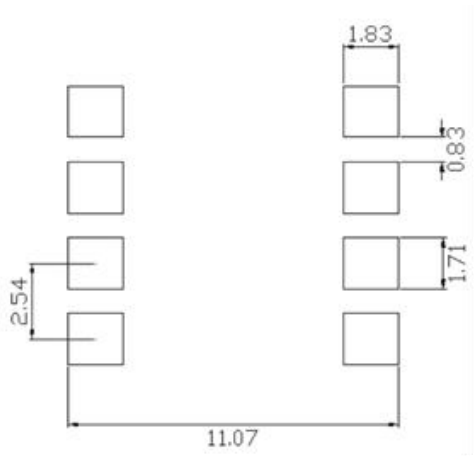
• 选择S1型号 Option S1 Type







• 表面贴装引线框架 推荐焊盘布局 Recommended pad layout for surface mount leadform

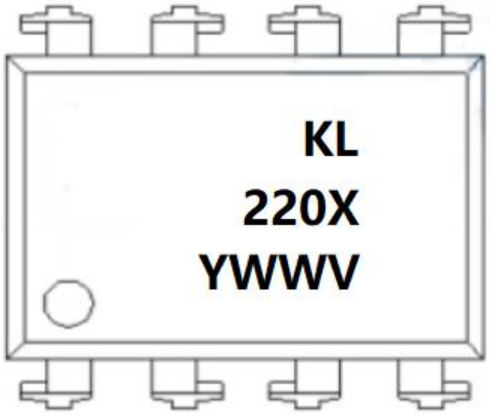


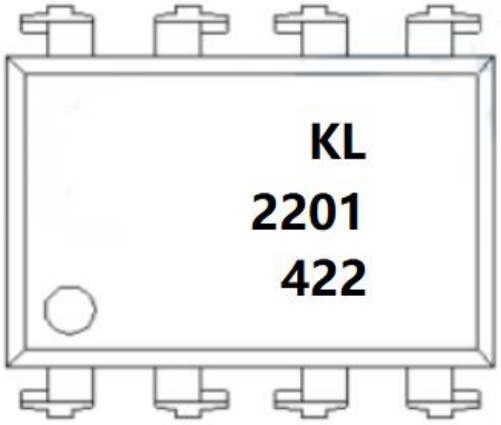
备注 Notes

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





(范本参考 Template reference)

附注(Notes):

KL = 表示晶台光电有限公司 Denotes KingLight

220X = 表示材料部件号 Denotes Device Part Number
X表示零件编号(0、1或2) Part No. (0,1 or 2)

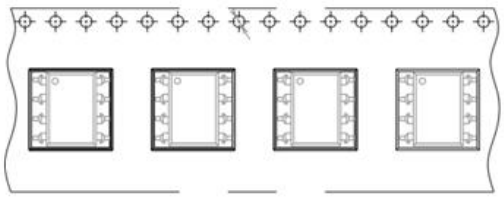
Y = 表示1位年份代码Denotes 1 digit Year code

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)

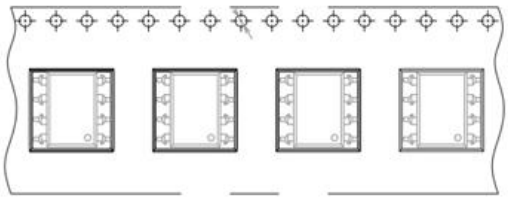
11.料带和卷轴包装规格 Tape & Reel Packing Specifications

• 选择TA Option TA



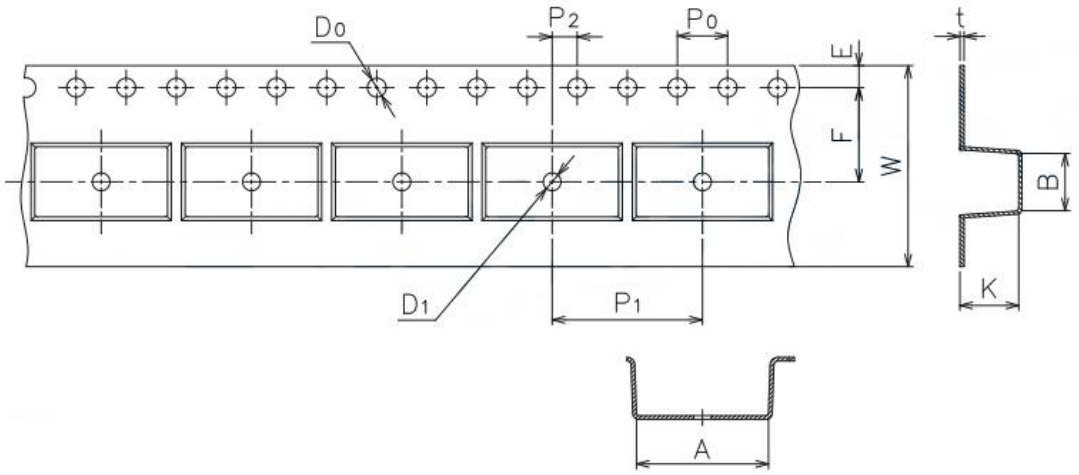
卷轴进给方向 Direction of feed from reel

• 选择TB Option TB



卷轴进给方向 Direction of feed from reel

料带尺寸Material belt size



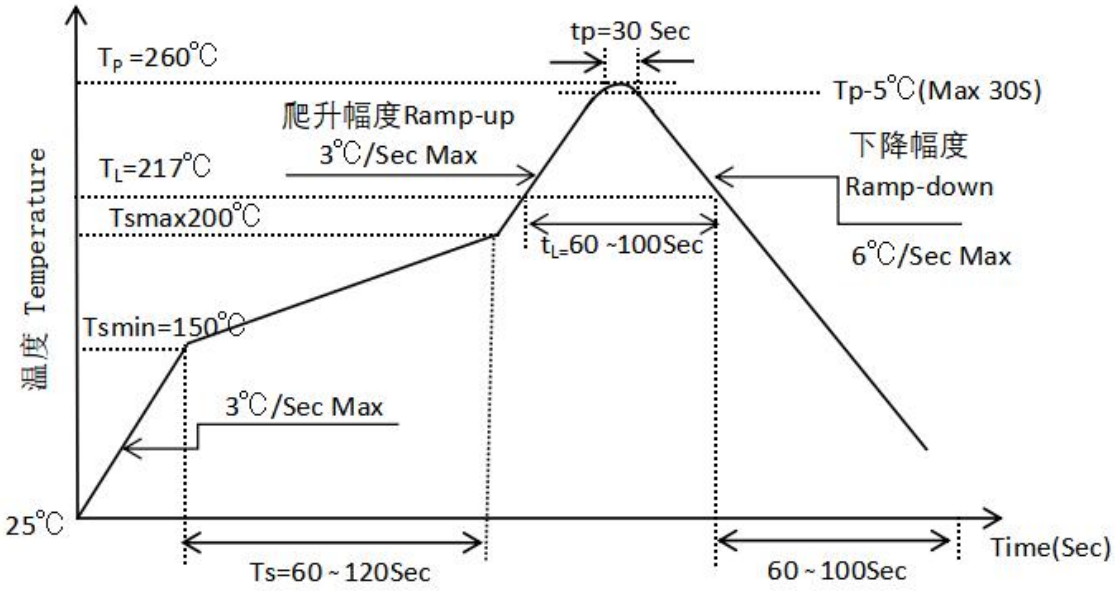
尺寸编号 Dimension No.	A	B	D0	D1	E	F
尺寸(mm) Dimension(mm)	10.4±0.1	10.0±0.1	1.5+0.1/-0	1.5±0.25	1.75±0.1	7.5±0.1
尺寸编号 Dimension No.	P0	P1	P2	t	W	K
尺寸(mm) Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.05	0.4±0.05	16.0±0.3	4.5±0.1

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.

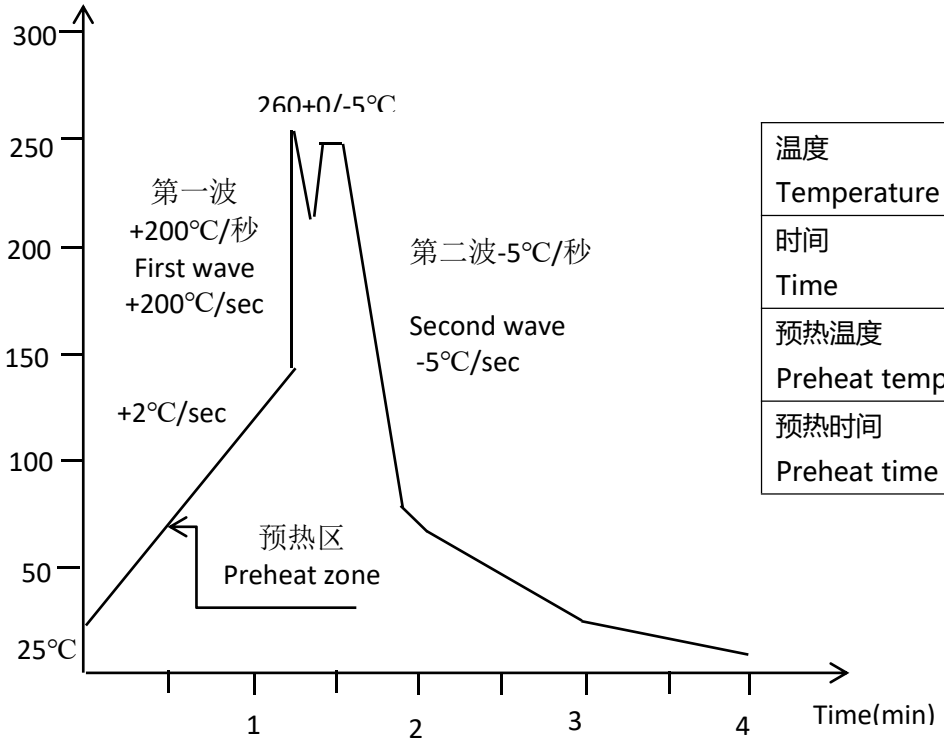


项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	T_s	150	200	℃
预热时间 Preheat Time	ts	60	120	s
升温速率 Ramp-Up Rate (T_L to T_P)	-	-	3	℃/s
液相线温度 Liquidus Temperature	T_L	217		℃
高于液相线温度(T_L)的时间 Time above Liquidus Temperature T_L	t_L	60	100	s
峰值温度 Peak Temperature	T_P	-	260	℃
T_c 在(T_P-5)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 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 Temperature	260℃+0/-5℃
时间 Time	10秒 10S
预热温度 Preheat temperature	25至140℃ 25 to 140℃
预热时间 Preheat time	30至80秒 30 to 80 S