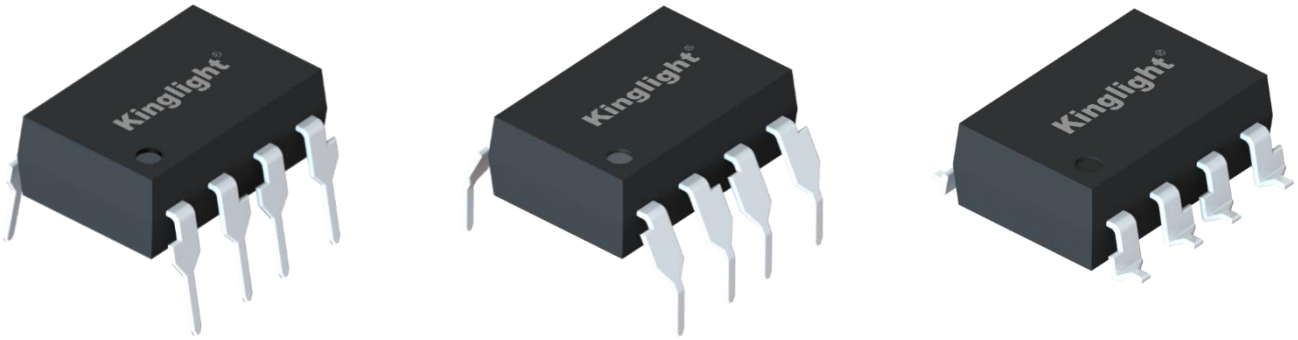
KL4502,KL4503

DIP8 HIGH SPEED 1MBit/s TRANSISTOR PHOTOCOUPLER

DIP8 高速1MBit/s 晶体管光耦



＊本文档中包含的信息反映了具有代表性的使用场景，仅供技术参考。
The information contained in this document reflects representative usage scenarios and is intended for technical reference only.
＊本文档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.
＊在使用本文档中引用的产品时，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，晶台微电子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 Microelectronics will not be responsible for any subsequent problems.
＊本文档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，请向晶台微电子咨询，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 Microelectronics for further assistance.
＊未经晶台微电子允许，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.klmicro.com。
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1. 产品特点 Product features

- 高速1MBit/s High speed 1Mbit/s
- 工作温度范围宽 -55°C 至 100°C
  Wide operating temperature range of -55°C to 100°C
- 可保证在 0 至 70℃ 温度范围内运行 Guaranteed performance from 0 to 70℃
- 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)
- 无卤素 (溴<900ppm, 氯<900ppm, 溴+氯<1500ppm)
  Halogens free (Br < 900ppm, Cl < 900ppm, Br+Cl < 1500ppm)
- 符合欧盟REACH法规 Compliance with EU REACH
- 无Pb且符合ROHS标准 Pb free and RoHS compliant
- 安全审批 Safety approval
  CQC认证已批准(编号:CQC23001408000) CQC approved (No.CQC23001408000)
  UL认证已批准(编号: UL-CA-2340753-0) UL approved (No: UL-CA-2340753-0)
  VDE认证已批准(编号:40059021) VDE approved (No.40059021)

2. 产品描述 Product Description

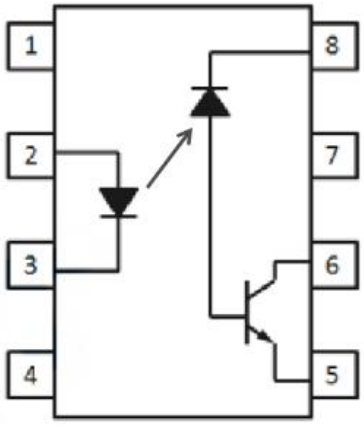
- KL4502和KL4503器件均由一个红外发射二极管与一个高速光电检测晶体管光学耦合组成。
  光敏二极管偏置和输出晶体管集电极的独立连接，通过减少输入晶体管的基极-集电极电容，使其速度比传统的光敏晶体管光耦提高了几个数量级。
  The KL4502 and KL4503 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photo diode bias and output-transistor collector increase the speed by several orders of magnitude over conventional phototransistor couplers by reducing the base-collector capacitance of the input transistor.
- 它们采用 8 引脚 DIP 封装，有宽引线间距和 SMD 两种选择
  They are packaged in an 8-pin DIP package and available in wide-lead spacing and SMD options

3. 产品应用 Product Applications

- 线路接收器 Line receivers
- 电信设备 Telecommunication equipment
- 电机驱动装置中的功率晶体管隔离 Power transistor isolation in motor drives
- 替代低速光电晶体管光耦 Replacement for low speed phototransistor photo couplers
- 开关模式电源的反馈回路 Feedback loop in switch-mode power supplies
- 家用电器 Home appliances
- 高速逻辑接地隔离 High speed logic ground isolation

4. 功能图 Functional Diagram

Schematic



引脚配置 Pin Configuration

1. 无连线No Connection
2. 阳极Anode
3. 阴极Cathode
4. 无连线No Connection
5. 接地 GND
6. 输出电压V_{out}
7. 基极电压V_B
8. 工作电压V_{CC}

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
	峰值正向电流（50% 占空比，1 ms P.W） Peak forward current(50% duty, 1ms P.W)	I_{FP}	50	mA
	峰值瞬态电流（≤1μs P.W,300pps） Peak transient current(≤1μs P.W,300pps)	I_{Ftrans}	1	A
	反向电压 Reverse voltage	V_R	5	V
	功耗 Power dissipation	P_{IN}	45	mW
输出 Output	功耗 Power dissipation (T_A = 25°C)	P_O	100	mW
	平均输出电流 Average Output current	$I_{O(AVG)}$	8	mA
	峰值输出电流 Peak Output current	$I_{O(PK)}$	16	mA
	输出电压 Output voltage	V_O	-0.5 to 20	V
	工作电压 Supply voltage	V_{CC}	-0.5 to 30	V
总功率 Total Power Dissipation		P_{TOT}	200	mW
隔离电压 (1*) Isolation Voltage		V_{iso}	5000	Vrms
工作温度 Operating temperature		T_{OPR}	-55 to +100	℃
储存温度 Storage temperature		T_{STG}	-55 to +125	℃
焊接温度 (2*) Soldering temperature		T_{SOL}	260	℃

附注 (Notes):

1* 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&4脚短接在一起, 5、6、7&8脚短接在一起

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.

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

6. 电气特性(Ta=0至70℃,除非另有规定)

Electrical Characteristics(Ta=0 to 70℃ 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	-	1.45	1.8	V	I_F=16mA
	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	$\Delta V_F/\Delta T_A$	-	-1.9	-	mV/°C	I_F =16mA
输出 Output	逻辑高电平工作电流 Logic High Supply Current	I_{CCH}	-	0.01	1	uA	I_F=0mA, V_O=Open V_{CC}=15V, T_A=25℃
			-	-	2		I_F=0mA, V_O=Open V_{CC}=15V
	逻辑低电平工作电流 Logic Low supply current	I_{CCL}	-	140	200	uA	I_F=16mA, V_O=Open, V_{CC}=15V
	逻辑高电平输出电流 Logic High Output Current	I_{OH}	-	0.001	0.5	uA	I_F=0mA, V_O=V_{CC}=5.5V, T_A=25℃
			-	0.01	1		I_F=0mA, V_O=V_{CC}=15V, T_A=25℃
			-	-	50		I_F=0mA, V_O=V_{CC}=15V

• 传输特性 (Ta=0至70℃,除非另有规定)

Transfer Characteristics (Ta=0 to 70℃ 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
电流传输比 Current Transfer Ratio	KL4502 KL4503	CTR	19	-	50	%	I_F=16mA, V_O=0.4V, V_{CC}=4.5V, T_A=25℃
	KL4502 KL4503		15	-	-		I_F=16mA, V_O=0.5V, V_{CC}=4.5V
逻辑低电平输出电压 Logic Low Output Voltage	KL4502 KL4503	V_{OL}	-	0.25	0.4	V	I_F=16mA, I_O=3mA, V_{CC}=4.5V, T_A=25℃
	KL4502 KL4503		-	-	0.5		I_F=16mA, I_O=2.4mA, V_{CC}=4.5V

开关特性(Ta=0至70℃, V_{CC}=5V, I_F=16mA, 除非另有说明)

Switching Characteristics (Ta=0 to 70°C, V_{CC}=5V, I_F=16mA 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
逻辑低电平的传播延迟时间 Propagation delay time to Logic Low (Fig.8)	KL4502 KL4503	T_{PHL}	-	0.35	0.8	us	R_L=1.9kΩ, T_A=25°C
			-	-	1.0		R_L=1.9kΩ
逻辑高电平的传播延迟时间 Propagation delay time to Logic High (Fig.8)	KL4502 KL4503	T_{PLH}	-	0.3	0.8	us	R_L=1.9kΩ, T_A=25°C
			-	-	1.0		R_L=1.9kΩ
逻辑高电平下的共模瞬态抗扰度(3*) Common Mode Transient Immunity at Logic High (Fig.9)	KL4502	CM_H	1000	-	-	V/us	I_F=0mA, V_{CM}=10Vp-p, R_L=1.9kΩ, T_A=25°C
	KL4503		15000	20000	-		I_F=0mA, V_{CM}=1500Vp-p, R_L=1.9kΩ, T_A=25°C
逻辑低电平下的共模瞬态抗扰度(3*) Common Mode Transient Immunity at Logic Low (Fig.9)	KL4502	CM_L	1000	-	-	V/us	I_F=16mA, V_{CM}=10Vp-p, R_L=1.9kΩ, T_A=25°C
	KL4503		15000	20000	-		I_F=16mA, V_{CM}=1500Vp-p, R_L=1.9kΩ, T_A=25°C

* Ta = 25°C 条件下的规格值

* Typical values at Ta = 25°C

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

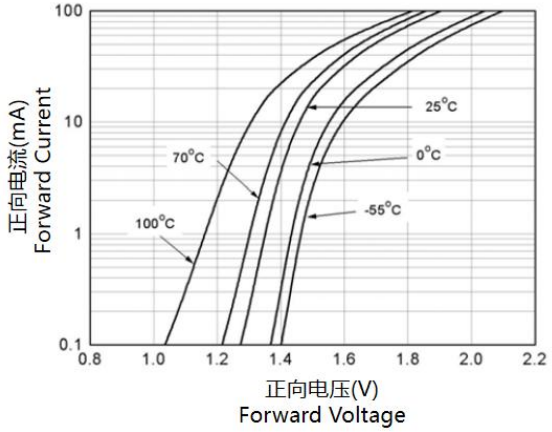


图2 电流转换比 vs 正向电流的关系

Fig.2 Current Transfer Ratio vs Forward Current

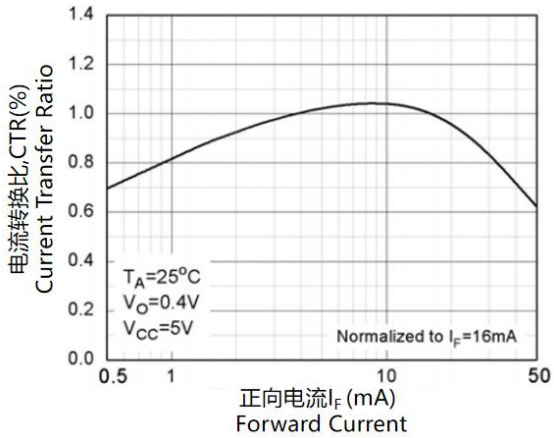


图3. 电流转换比 vs 环境温度的关系

Figure 3. Current Transfer Ratio vs Ambient Temperature

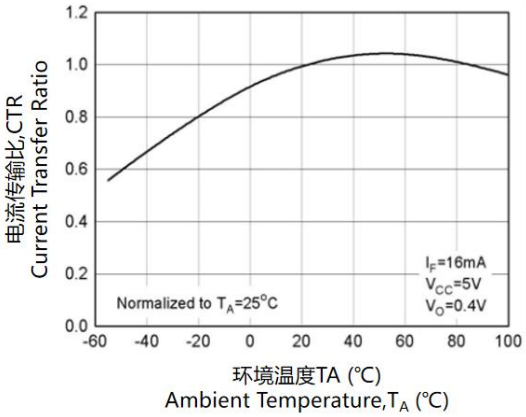


图4. 输出电流 vs 输出电压的关系

Figure 4. Output Current Vs Output Voltage

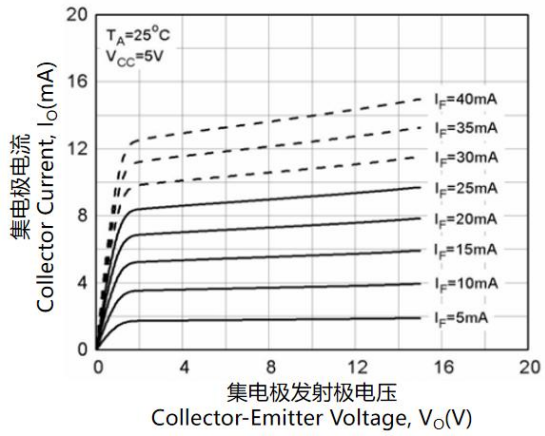


图5. 逻辑高电平输出电流 vs 环境温度的关系

Figure 5. Logic High Output Current vs Ambient Temperature

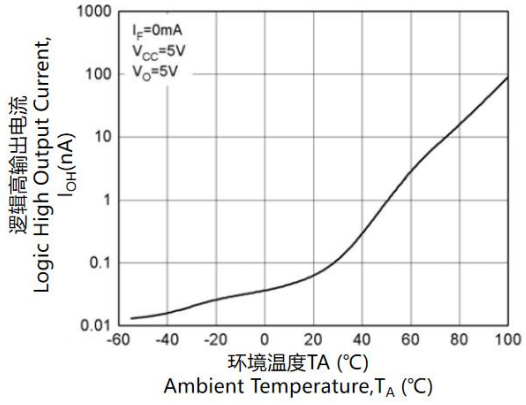


图6. 传播延迟 vs 负载电阻的关系

Figure 6. Propagation Delay vs Load Resistance

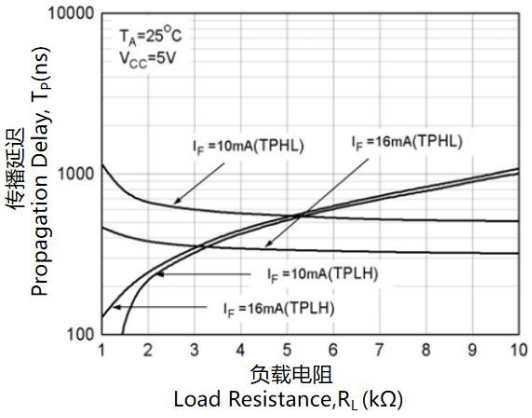


图7. 传播延迟 vs 温度的关系

Figure 7. Propagation Delay vs Temperature

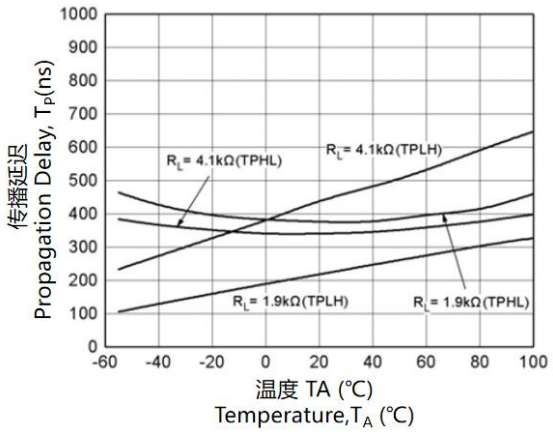


图8 开关时间测试电路及波形

Figure 8. Switching Time Test Circuit & Waveforms

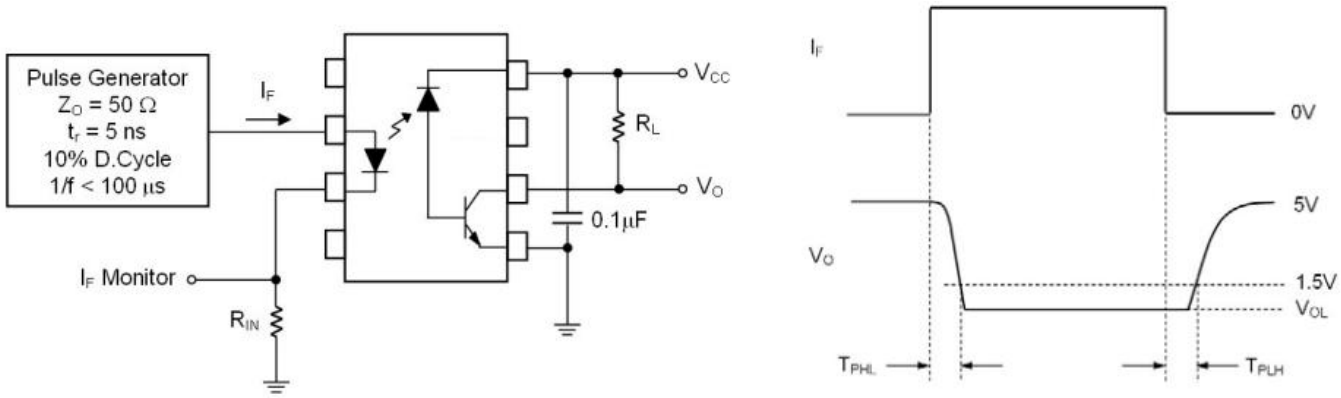
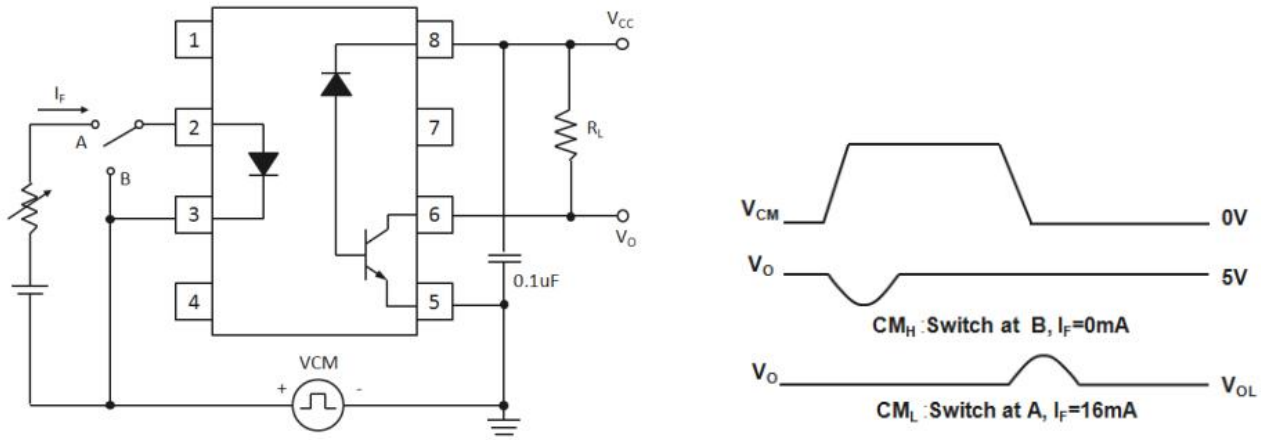


图9. 瞬态抗扰度测试电路及波形

Figure 9. Transient Immunity Test Circuit & Waveforms



*3逻辑高电平的共模瞬态抗扰度是共模脉冲信号 VCM 前沿的最大可容忍（正）dVcm/dt，以确保输出保持在逻辑高电平状态（即 VO >2.0V）。逻辑低电平的共模瞬态抗扰度是共模脉冲信号 VCM 后沿的最大可容忍（负）dVcm/dt，以确保输出保持在逻辑低电平状态（即 VO <0.8V）。

*3 Common mode transient immunity in logic high level is the maximum tolerable (positive) dVcm/dt on the leading edge of the common mode pulse signal VCM, to assure that the output will remain in a logic high state (i.e., VO >2.0V).Common mode transient immunity in logic low level is the maximum tolerable (negative) dVcm/dt on the trailing edge of the common mode pulse signal, VCM, to assure that the output will remain in a logic low state (i.e., VO <0.8V).

8. 订单信息 Order Information

• 材料编号 Part Number

KL450XY-Z-V

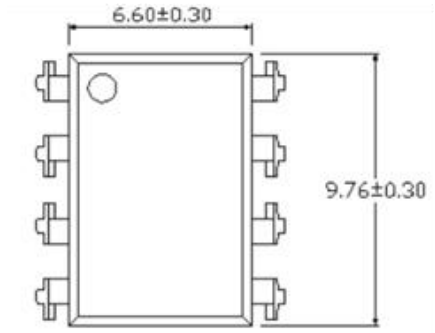
附注(Notes):

X = 零件编号(X=2或3)
Part No. (X = 2 or 3)
Y = 引脚形式选项(DIP、S、S1、M)
Lead form option (DIP, S, S1, M)
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)

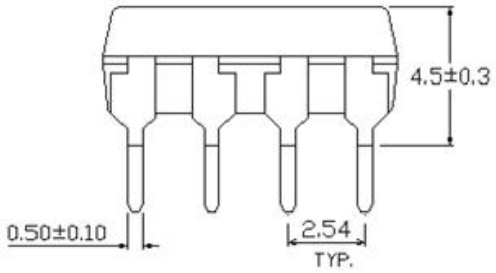
选项 Option	描述 Description	包装数量 Packing quantity
无 None	标准DIP-8 Standard DIP-8	每管45pcs 45 units per tube
M	宽引脚弯曲(0.4英寸间距) Wide lead bend (0.4 inch spacing)	每管45pcs 45 units per tube
S-TA	表面贴装引线形式+TA载带和卷轴选项 Surface mount lead form + TA tape & reel option	每卷1000pcs 1000 units per reel
S-TB	表面贴装引线形式+TB载带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

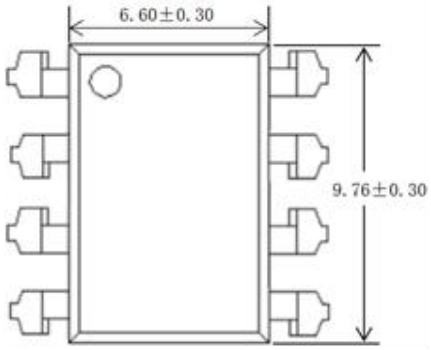
• 标准DIP型号 Standard DIP Type

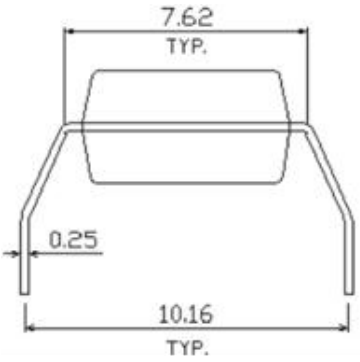


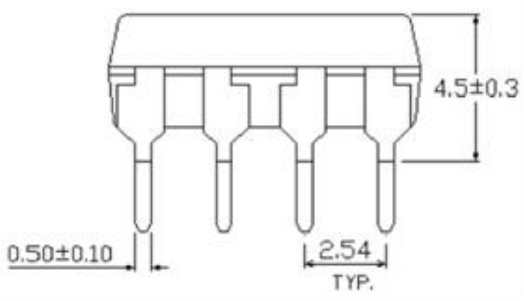




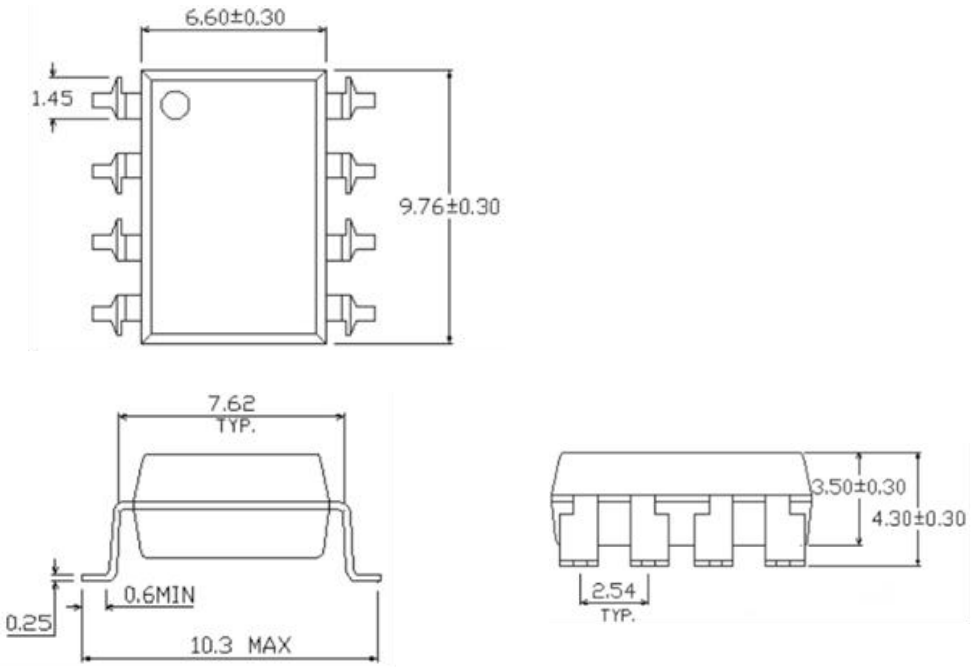
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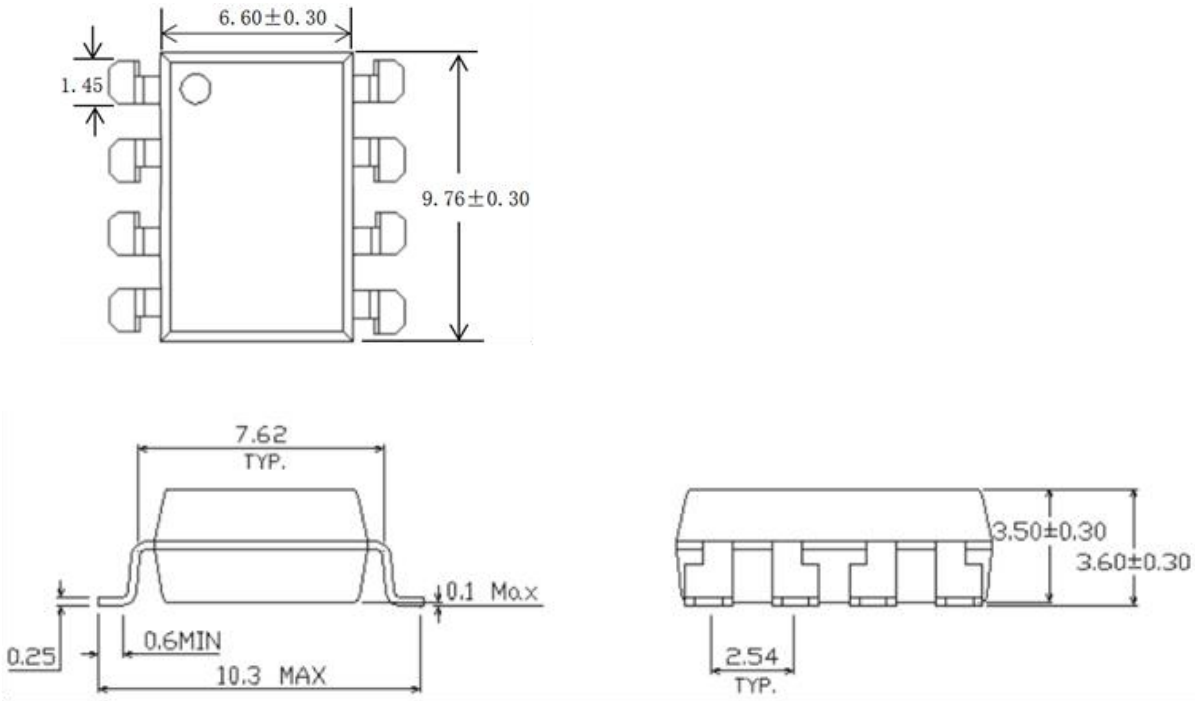




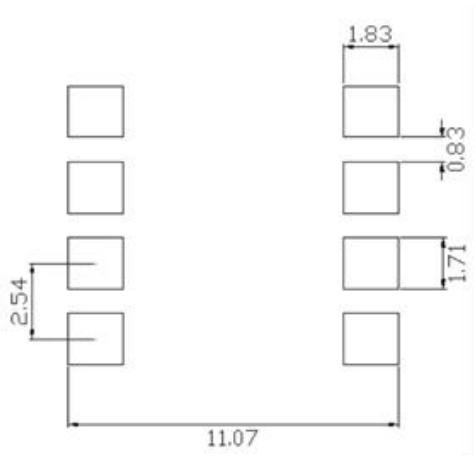
• 选择S型号 Option S Type



• 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 lead frame

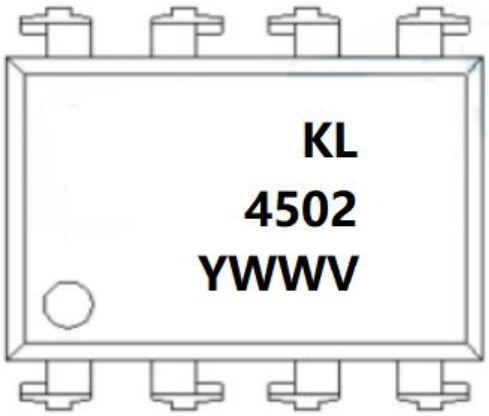


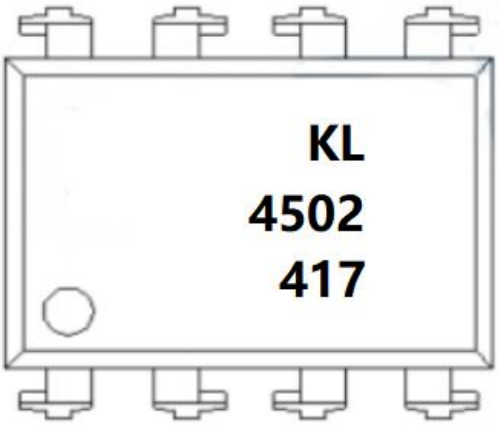
备注 Notes

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





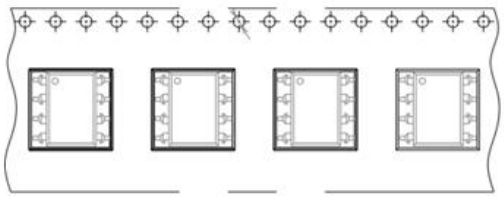
(范本参考 Template reference)

附注(Notes):

KL	= 表示晶台微电子有限公司 Denotes Kinglight Microelectronics
4502	= 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") VDE (Only add "V" to laser characters specified by the customer)

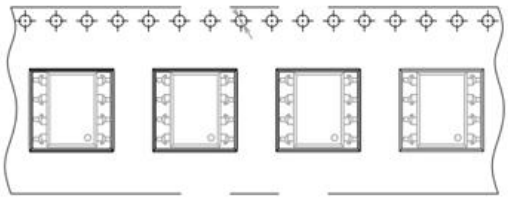
11. 料带和卷轴包装规格 Tape & Reel Packing Specifications

• 选择TA Option TA



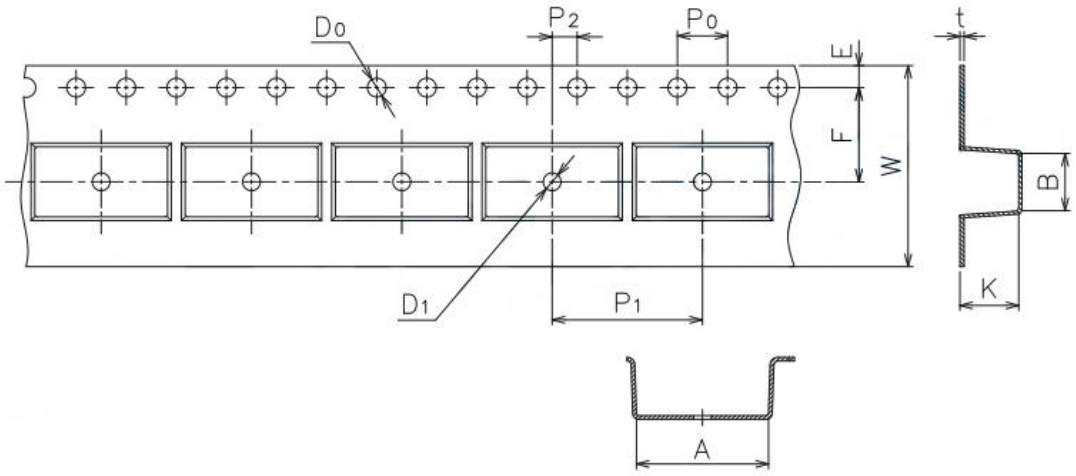
卷轴进给方向 Direction of feed from reel

• 选择TB Option TB



卷轴进给方向 Direction of feed from reel

料带尺寸Material belt size



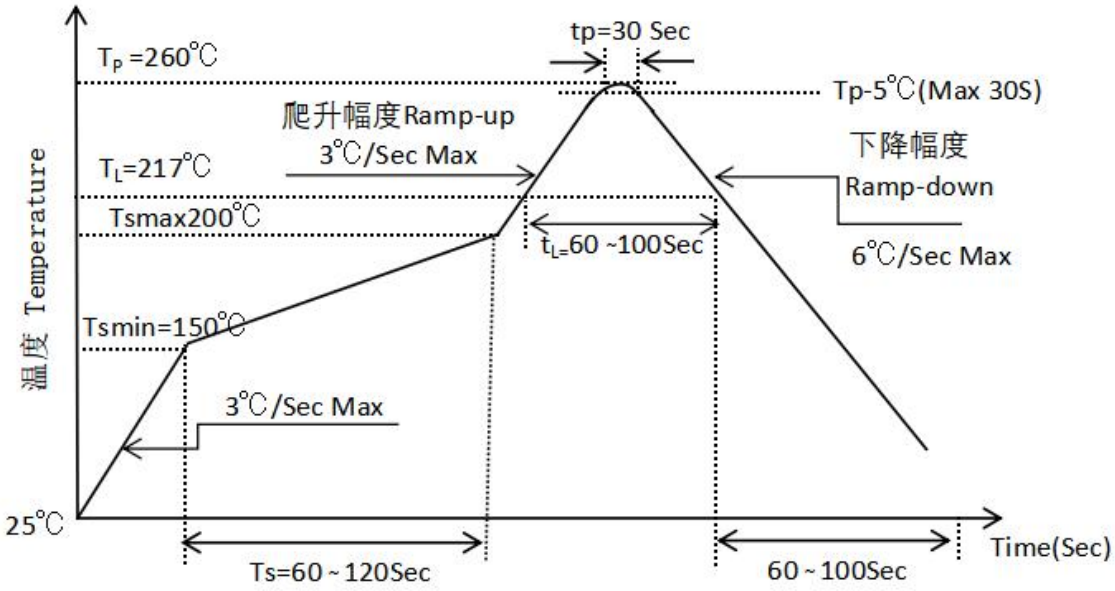
尺寸编号 Dimension No.	A	B	D0	D1	E	F
尺寸(mm) Dimension(mm)	10.4±0.1	10.0±0.1	1.5+0.1/-0	1.5±0.25	1.75±0.1	7.5±0.1
尺寸编号 Dimension No.	P0	P1	P2	t	W	K
尺寸(mm) Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.05	0.4±0.05	16.0±0.3	4.5±0.1

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.

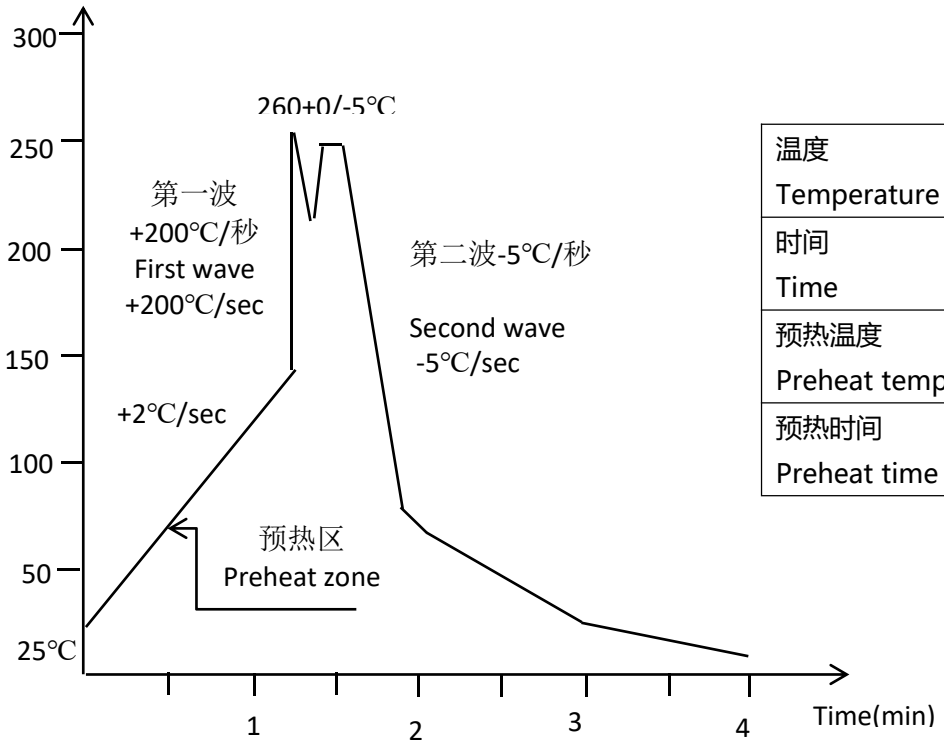


项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	T_s	150	200	℃
预热时间 Preheat Time	ts	60	120	s
升温速率 Ramp-Up Rate (T_L to T_P)	-	-	3	℃/s
液相线温度 Liquidus Temperature	T_L	217		℃
高于液相线温度(T_L)的时间 Time above Liquidus Temperature T_L	t_L	60	100	s
峰值温度 Peak Temperature	T_P	-	260	℃
T_c 在(T_P-5)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