Kinglight®
晶台微电子

KL2501

PHOTO TRANSISTOR

DIP4 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.
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  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.
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  The information in this document applies to typical use in electronic component applications. For special applications, please contact Kinglight Microelectronics for further assistance.
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1. 产品特点 Product features

- 电流转换率(Current transfer ratio)
  CTR: 80~600% at I_F =5mA, V_{CE} =5V
- 输入与输出高隔离电压(Viso=5000 V rms)
  High isolation voltage between inputs and output (Viso=5000 V rms)
- 爬电距离>7.62mm
  Creepage distance>7.62mm
- 工作温度可达+110℃
  Operating temperature up to +110°C
- 4PIN引脚封装模式
  4PIN DIP encapsulation mode
- 无铅且符合ROHS标准
  Pb free and ROHS compliant
- 安全审批 Safety approval
  CQC认证已批准(编号:CQC23001407997) CQC approved (No.CQC23001407997)
  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)

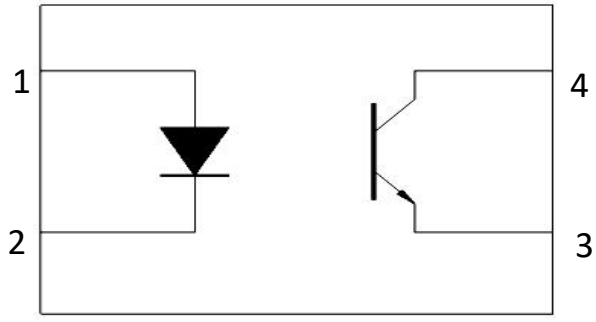
2. 产品描述 Product Description

- KL2501光耦合器由一块砷化镓发射器和一块NPN晶体管组成
  KL2501 photo coupler consist of one piece of GaAs emitter and one piece of NPN transistor
- 它们采用4引脚DIP封装, 并提供宽引线间距和SMD选项
  Packaged in a 4-pin DIP package and available in wide-lead spacing and SMD option

3. 产品应用 Product Applications

- 可编程式控制器 Programmable controllers
- 仪器应用、测量仪器 Instrumental application、measuring instruments
- 家用电器, 如风扇加热器等 Home appliances, such as fan heaters, etc.
- 电信设备 Telecommunication equipment
- 不同电位,不同阻抗的电路之间的信号传输
  Signal transmission between circuits of different potentials and impedance

4. 功能图 Functional Diagram



引脚配置 Pin Configuration
1. 阳极Anode
2. 阴极Cathode
3. 发射极Emitter
4. 集电极Collector

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	60	mA
	峰值正向电流(100us脉冲,100Hz频率) Peak forward current (100us pulse,100Hz frequency)	I_{FP}	1	A
	反向电压 Reverse voltage	V_R	6	V
	功率 Power dissipation	P_D	100	mW
	减额系数(Ta=100℃) Derating factor (above Ta=100℃)		5.8	mW/℃
输出 Output	集电极电流 Collector current	I_C	50	mA
	集电极与发射极间电压 Collector and emitter Voltage	V_{CEO}	80	V
	发射极与集电极间电压 Emitter and Collector Voltage	V_{ECO}	7	V
	功率 Power dissipation	P_C	150	mW
	减额系数(Ta=100℃) Derating factor (above Ta=100℃)		5.8	mW/℃
总消耗功率 Total Consume Power		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 +110	℃
储存温度 Storage temperature		T_{STG}	-55 to +125	℃
焊接温度 (2*) Soldering temperature		T_{SOL}	260	℃

1* 交流电源1分钟内, 相对湿度40~60%环境下, 隔离电压测试方法, 1&2脚短接在一起, 3&4脚短接在一起
AC for 1 minute, 40~60%RH in this test, Pin 1,2 are shorted together, and 3,4 are shorted together

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

6. 电气特性(Ta=25℃,除非另有规定)

Electrical Characteristics(Ta=25℃ 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 In put	正向电压 Forward voltage	V_F	-	1.2	1.4	V	I_F=10mA
	反向电流 Reverse current	I_R	-	-	10	μA	V_R=5V
	输入电容 Input capacitance	C_{in}	-	50	250	pF	V=0, f=1kHz
输出 Out put	集电极与发射极间暗电流 Collector-Emitter dark current	I_{CEO}	-	-	100	nA	V_{CE}=80V I_F =0mA
	集电极与发射极间击穿电压 Collector-Emitter breakdown voltage	V_{CEO}	80	-	-	V	I_C=0.1mA I_F=0mA
	发射极与集电极间击穿电压 Emitter-Collector breakdown voltage	V_{ECO}	7	-	-	V	I_E=0.1mA I_F=0mA
传输特性 Transfer Characteristics	集电极与发射极间饱和电压 Collector-Emitter saturation voltage	$V_{CE(sat)}$	-	0.1	0.3	V	I_F=10mA I_C=2mA
	电流传输比 Current transfer ratio(1*)	CTR	80	-	600	%	I_F=5mA V_{CE}=5V
	隔离电阻 Isolation resistance	R_{ISO}	1×10^{11}	-	-	Ω	V_{IO}=1KVdc 40~60% R.H.
	浮动电容 Floating capacitance	C_f	-	0.6	1.0	pF	V_{IO}=0, f=1MHz
	截止频率 Cut-off frequency	fc	-	80	-	kHz	V_{CE}=5V, I_C=2mA R_L=100Ω, -3dB
	上升时间 Rise time	t_r	-	3	18	μs	V_{CE}=10V, I_C=2mA, R_L=100Ω
	下降时间 Fail time	t_f	-	5	18	μs	

• 温度Ta=25℃下规格值 Typical values at Ta = 25°C

• 传输特性等级表(Ta=25℃, 除非另有规定)

Transfer Characteristics level table (Ta=25℃ 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	KL2501N	CTR	80	-	600	%	I_F=5mA V_{CE}=5V
	KL2501H		80	-	160		
	KL2501W		130	-	260		
	KL2501L		200	-	400		
	KL2501K		300	-	600		
	KL2501Q		100	-	200		
	KL2501D		150	-	300		

7. 特性曲线 Characteristic Curves

图1 正向电流与正向电压的关系

Fig.1 Forward Current vs Forward Voltage

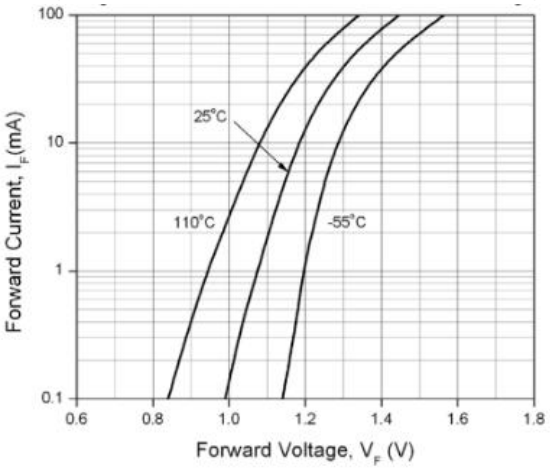


图2 电流传输比与正向电流的关系

Fig.2 Current Transfer Ratio vs Forward Current

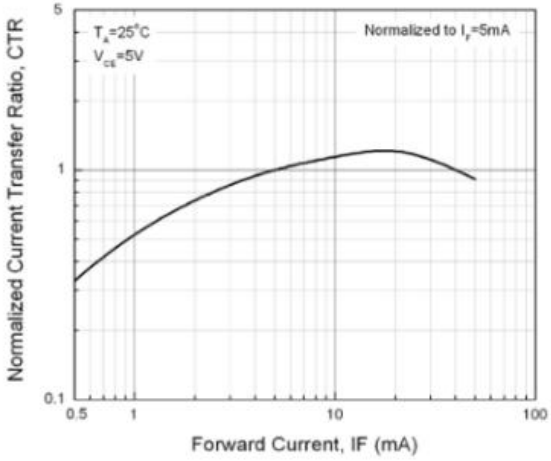


图3 电流传输比与环境温度的关系

Fig.3 Current Transfer Ratio vs Ambient Temperature

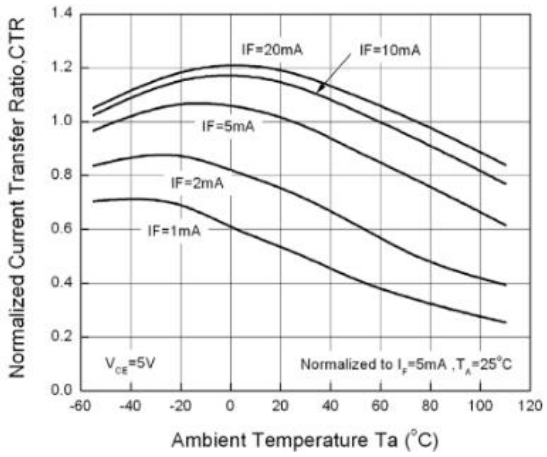


图4 暗电流与环境温度的关系

Fig.4 Dark Current vs Ambient Temperature

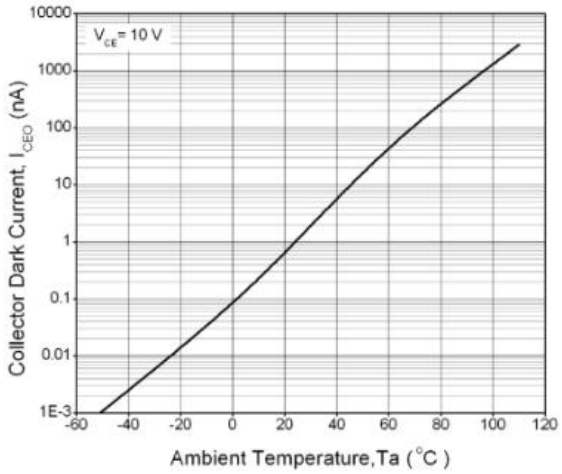


图5 集电极-发射极饱和电压与集电极电流的关系

Fig.5 Collector-Emitter Saturation Voltage vs Collector Current

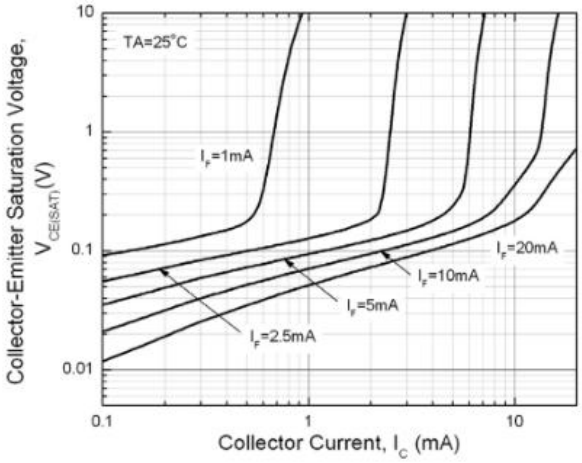


图6 开关时间与负载电阻的关系

Fig.6 Switching Time vs Load Resistance

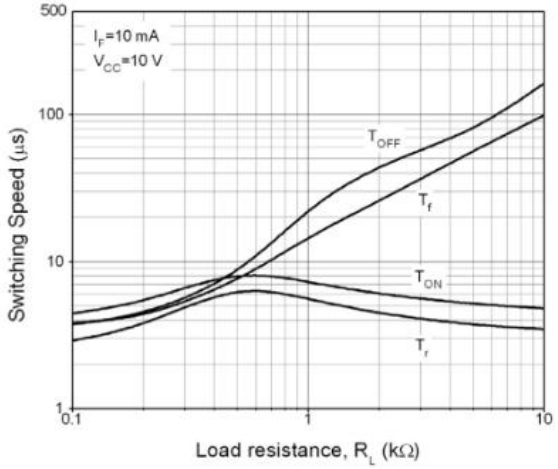
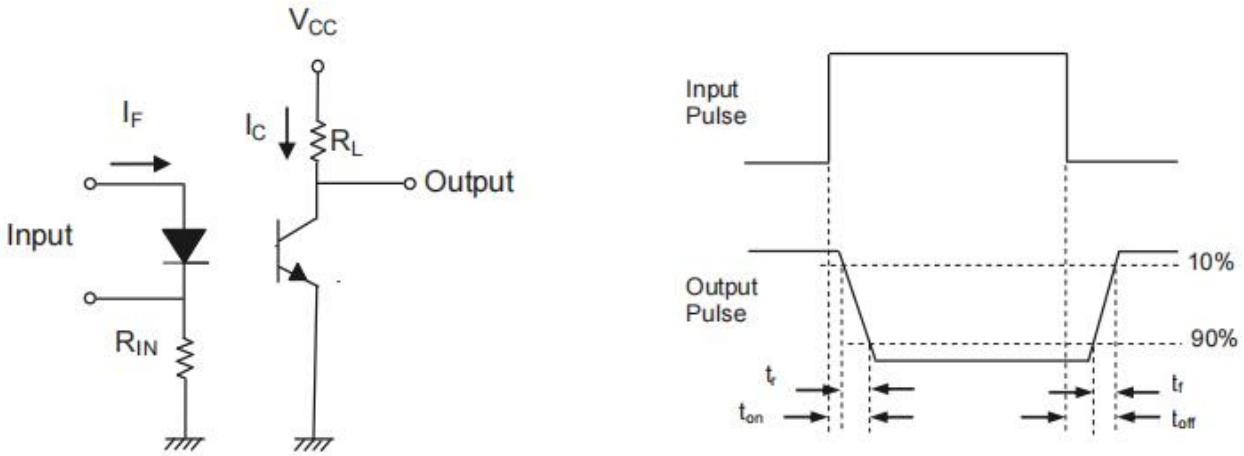


图7 开关时间测试电路及波形
Figure 7. Switching Time Test Circuit & Waveform



8. 订单信息 Order Information

• 零件编号 Part Number

KL2501X-Y-Z-V

附注(Notes):

X = 表示引脚形式选项(S、S1、S2、M 或 无) Lead form option (S, S1, S2, M or none)

Y = 表示CTR等级(N、H、K、L、W、Q 、D) CTR Rank(N, H, K, L, W, Q, D)

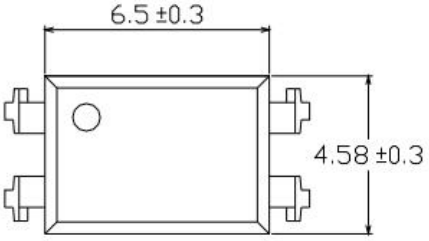
Z = 表示料带和卷盘选项(TA、TB、TU、TD 或 无) Tape and reel option (TA, TB, TU, TD or none)

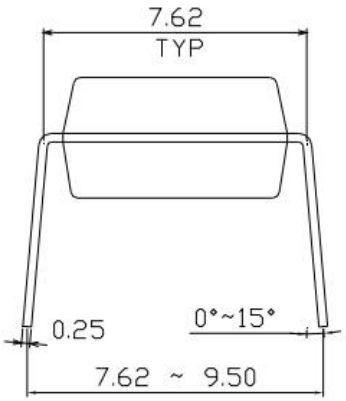
V = 表示VDE标识(客户指定镭射字符才加"V")
VDE (Only add "V" to laser characters specified by the customer)

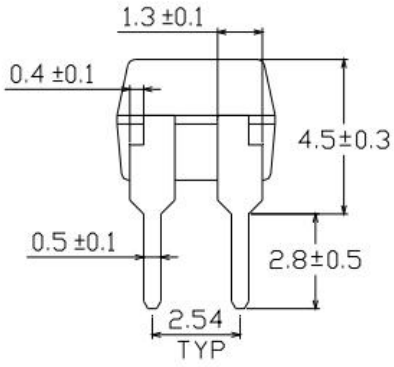
选项 Option	描述 Description	包装数量 Packing quantity
直脚None	标准DIP-4 Standard DIP-4	每管100pcs 100 units per tube
M脚	折弯脚(0.4英寸间距) Wide lead bend (0.4 inch spacing)	每管100pcs 100 units per tube
S-TA	表面贴装脚型方式+ TA料带 & 卷轴选择 Surface mount lead form + TA tape & reel option	每卷1000pcs 1000 units per reel
S-TB	表面贴装脚型方式+ TB料带 & 卷轴选择 Surface mount lead form + TB tape & reel option	每卷1000pcs 1000 units per reel
S1-TA	表面贴装脚型方式(低轮廓)+ TA料带 & 卷轴选择 Surface mount lead form (low profile) + TA tape & reel option	每卷1000pcs 1000 units per reel
S1-TB	表面贴装脚型方式(低轮廓)+ TB料带 & 卷轴选择 Surface mount lead form (low profile) + TB tape & reel option	每卷1000pcs 1000 units per reel
S2-TA	表面贴装脚型方式(翅形)+ TA料带 & 卷轴选择 Surface mount lead form (Gull-wing) + TA tape & reel option	每卷1000pcs 1000 units per reel
S2-TB	表面贴装脚型方式(翅形)+ TB料带 & 卷轴选择 Surface mount lead form (Gull-wing) + TB tape & reel option	每卷1000pcs 1000 units per reel
S-TU	表面贴装脚型方式+ TU料带 & 卷轴选择 Surface mount lead form + TU tape & reel option	每卷1500pcs 1500 units per reel
S-TD	表面贴装脚型方式+ TD料带 & 卷轴选择 Surface mount lead form + TD tape & reel option	每卷1500pcs 1500 units per reel
S1-TU	表面贴装脚型方式(低轮廓)+ TU料带 & 卷轴选择 Surface mount lead form (low profile) + TU tape & reel option	每卷1500pcs 1500 units per reel
S1-TD	表面贴装脚型方式(低轮廓)+ TD料带 & 卷轴选择 Surface mount lead form (low profile) + TD tape & reel option	每卷1500pcs 1500 units per reel

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

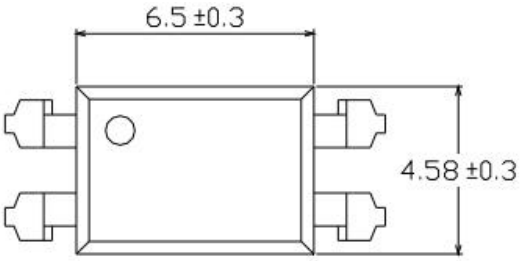
• 标准DIP型号 Standard DIP Type

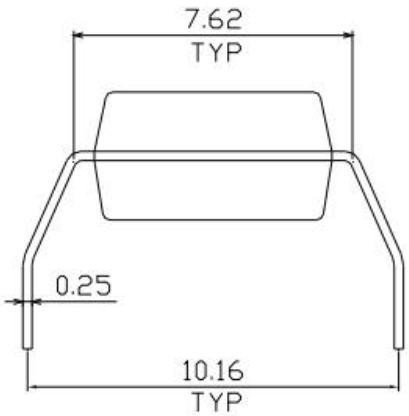


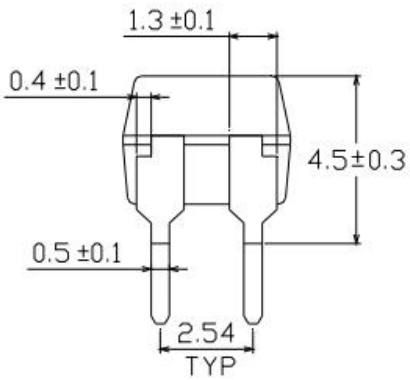




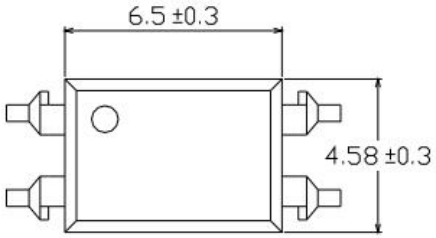
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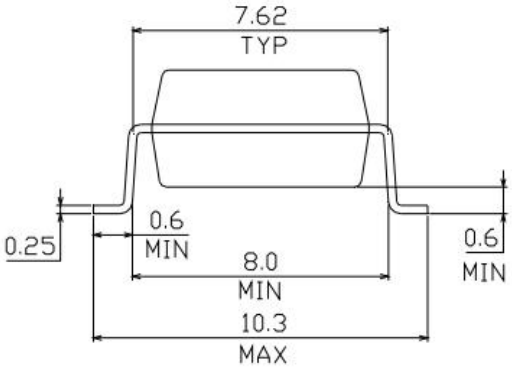


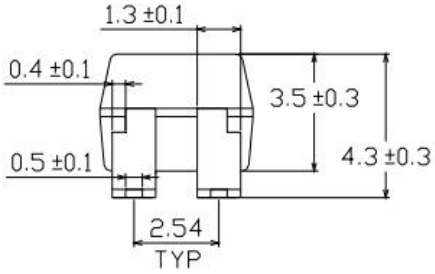




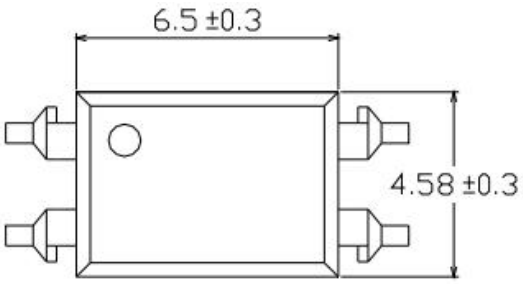
• 选择S型号 Option S Type

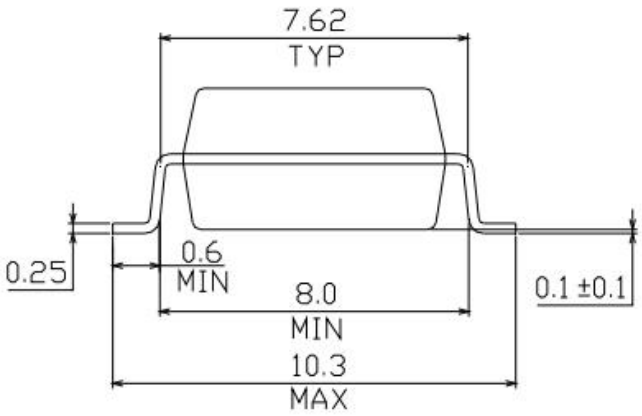


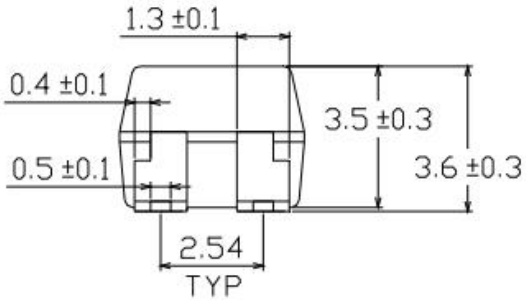




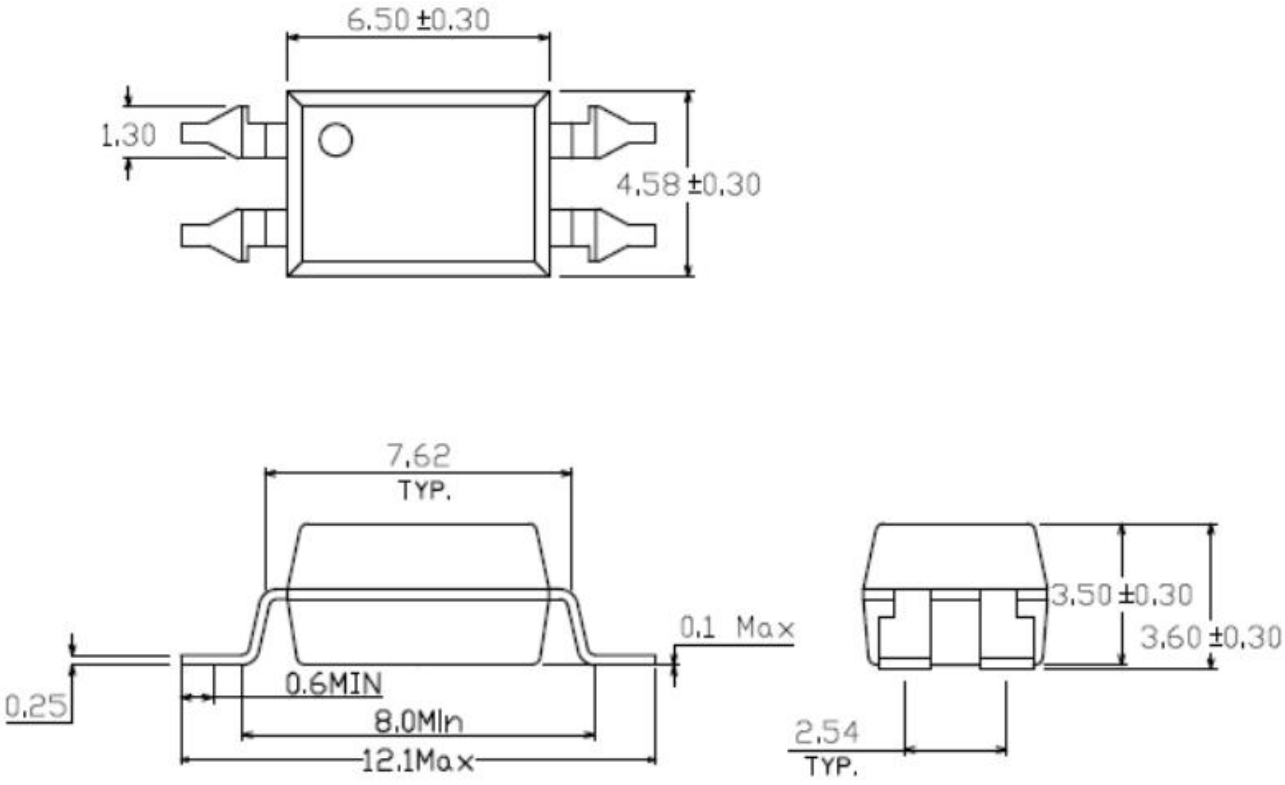
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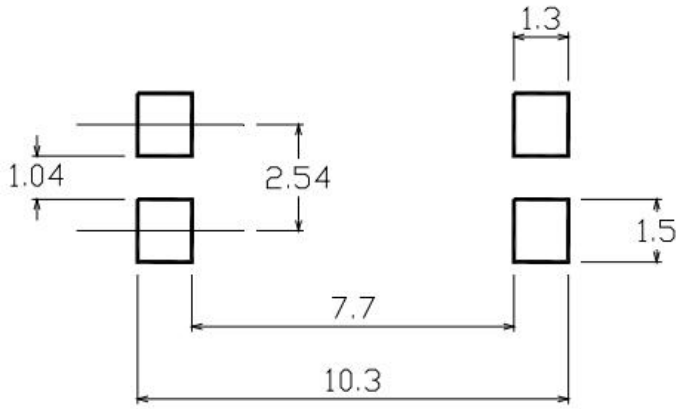


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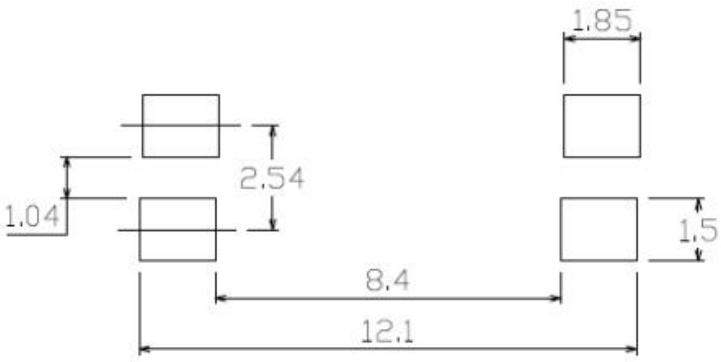


• 表面贴装引线框架 推荐焊盘布局 Recommended pad layout for surface mount lead frame

S和S1脚型焊盘 S and S1 Options



S2脚型焊盘 S2 Options



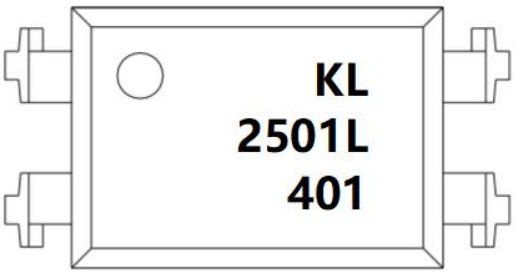
附注(Notes):

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 = 表示晶台微电子有限公司 Denotes Kinglight Microelectronics

2501 = 表示材料部件号 Denotes Device Part Number

R = 表示CTR等级(N、H、K、L、W、Q 、D) Denotes CTR Rank(N, H, K, L, W, Q, D)

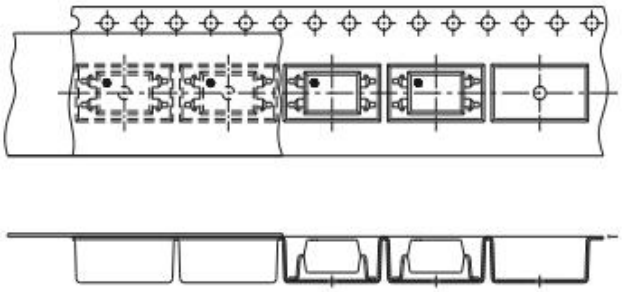
Y = 表示1位年份代码 Denotes 1 digit Year code

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)

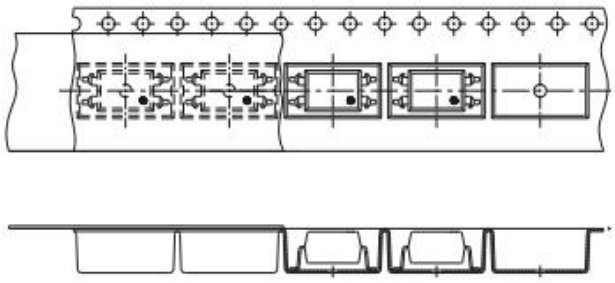
11. 料带和卷轴包装规格 Tape & Reel Packing Specifications

• 选择TA Option TA



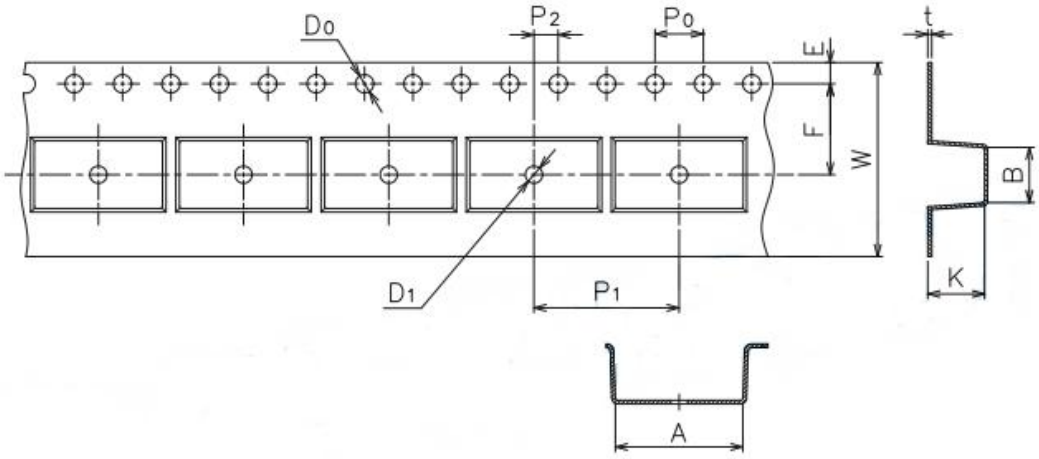
卷轴进给方向 Direction of feed from reel

• 选择TB Option TB



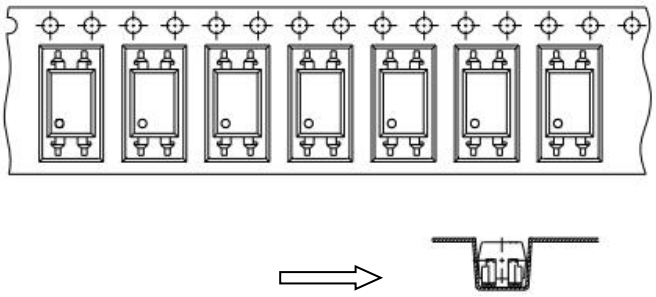
卷轴进给方向 Direction of feed from reel

料带尺寸Material belt size



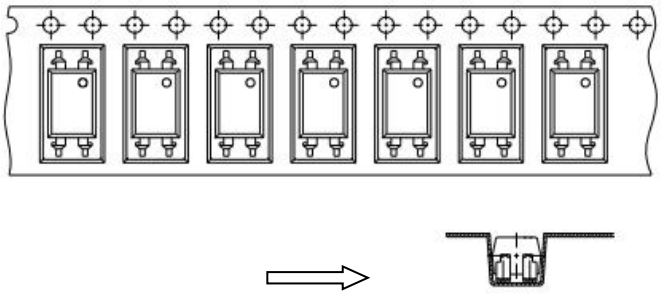
尺寸编号 Dimension No.	A	B	D0	D1	E	F
S2尺寸(mm) S2 Dimension(mm)	12.15±0.1	4.65±0.1	1.55±0.1	1.5±0.05	1.75±0.1	7.5±0.1
尺寸(mm) Dimension(mm)	10.4±0.1	4.55±0.1	1.5±0.1	1.5±0.05	1.75±0.1	7.5±0.1
尺寸编号 Dimension No.	P0	P1	P2	t	W	K
S2尺寸(mm) S2 Dimension(mm)	4.0±0.1	16.0±0.1	2.0±0.1	0.35±0.1	16.0+0.3/-0.1	4.55±0.1
尺寸(mm) Dimension(mm)	4.0±0.1	12.0±0.1	2.0±0.1	0.35±0.1	16.0+0.3/-0.1	4.55±0.1

• 选择TD Option TD



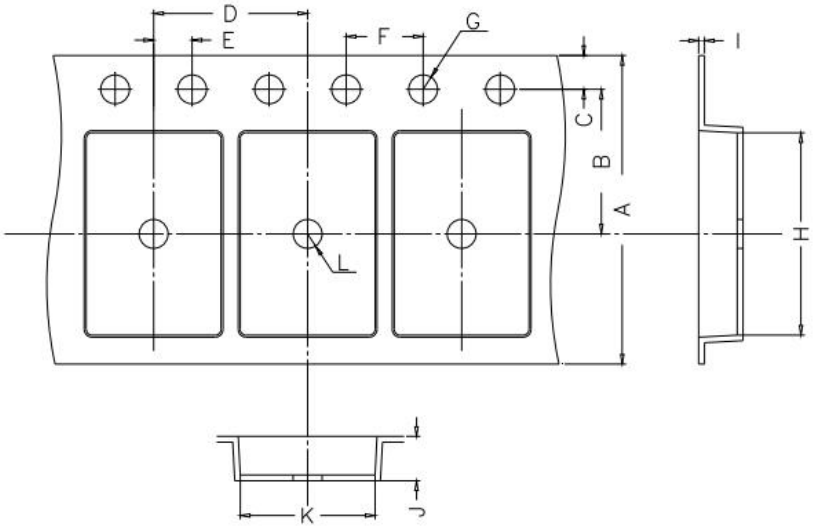
卷轴进给方向 Direction of feed from reel

• 选择TU Option TU



卷轴进给方向 Direction of feed from reel

料带尺寸Material belt size



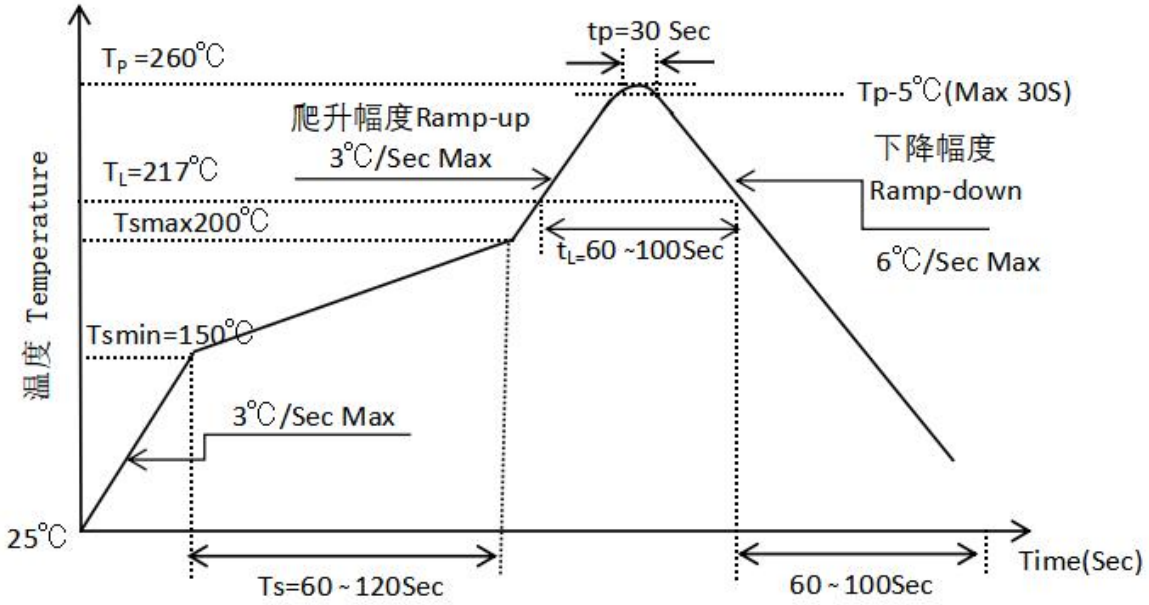
尺寸编号 Dimension No.	A	B	C	D	E	F
尺寸(mm) Dimension(mm)	16.0±0.3	7.5±0.1	1.75±0.1	8.0±0.1	2.0±0.1	4.0±0.1
尺寸编号 Dimension No.	G	H	I	J	K	L
尺寸(mm) Dimension(mm)	1.5+0.1/-0	10.4±0.1	0.4±0.05	4.55±0.1	5.1±0.1	1.5±0.05

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.

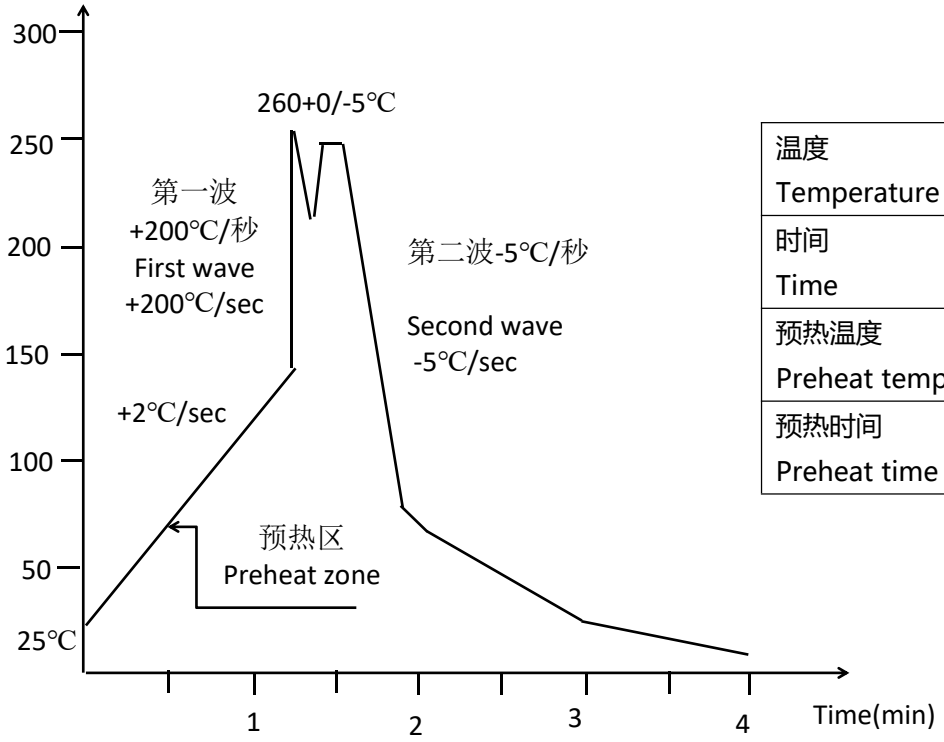


项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	T_s	150	200	℃
预热时间 Preheat Time	ts	60	120	s
升温速率 Ramp-Up Rate (T_L to T_P)	-	-	3	℃/s
液相线温度 Liquidus Temperature	T_L	217		℃
高于液相线温度(T_L)的时间 Time above Liquidus Temperature T_L	t_L	60	100	s
峰值温度 Peak Temperature	T_P	-	260	℃
T_c 在(T_P-5)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