Kinglight®
晶台微电子

KL111X

PHOTOTRANSISTOR

LSOP5 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。
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1. 产品特点 Product features

- 电流转换率(Current transfer ratio)
  CTR: 50~600% at I_F =5mA, V_{CE} =5V
  CTR: 63~320% at I_F=10mA, V_{CE}=5V
- 输入与输出高隔离电压(Viso=5000 V rms)
  High isolation voltage between input and output (Viso=5000 V rms)
- 8mm长爬电距离 8mm long creepage distance
- 紧凑型5引脚LSOP,外形尺寸为2.0mm Compact 5 Pin LSOP with a 2.0mm profile
- 不含卤素(溴<900ppm, 氯<900ppm, 溴+氯<1500ppm)
  Halogen 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 compliant with RoHS standards
- 安全审批 Safety approval
  CQC认证已批准(编号:CQC23001407998) CQC approved (No.CQC23001407998)
  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)

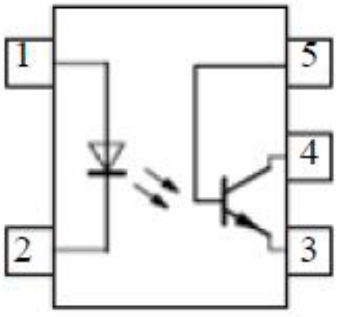
2. 产品描述 Product Description

- KL111X系列由一个红外发射二极管,光耦合到一个光电晶体管构成光电耦合器.
  Each KL111X device consists of an infrared emitting diode, optically coupled to a phototransistor detector.
- 它们5引脚LSOP封装模式 They are packaged in a 5-pin LSOP package

3. 产品应用 Product Applications

- 家用电器, 如电风扇加热器等 Home appliances, such as fan heaters, etc.
- 可编程控制器 Programmable controllers
- 电信设备 Telecommunication equipments
- 不同电位和阻抗电路间的信号传输
  Signal transmission between circuits of different potentials and impedances
- 系统设备、测量仪器 System appliances，measuring instruments

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. 基极 Base

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(1us脉冲) Peak forward current (1us pulse)	I_{FP}	1.5	A
	反向电压 Reverse voltage	V_R	6	V
	输入功耗 Input Power dissipation	P_D	100	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
	输出功耗 Output Power dissipation	Pc	150	mW
总消耗功率 Total Consume Power		P_{TOT}	250	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	℃

附注(Notes):

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, 引脚1&2短接在一起, 引脚3,4&5短接在一起
AC for 1 minute, 40~60%RH in this test, Pins 1,2 are shorted together, and pins 3,4&5 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 Input	正向电压 Forward voltage	V_F	-	-	1.5	V	I_F=50mA
	反向电流 Reverse current	I_R	-	-	10	μA	V_R=6V
	输入电容 Input capacitance	C_{in}	-	50	-	pF	V=0, f=1kHz
输出 Output	集电极与发射极间暗电流 Collector-Emitter dark current	I_{CEO}	-	-	100	nA	V_{CE}=20V 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	$V_{CE(sat)}$	-	-	0.4	V	I_F=10mA I_C=1mA
	隔离电阻 Isolation resistance	R_{ISO}	5×10^{10}	-	-	Ω	V_{IO}=500Vdc 40~60% R.H.
	浮动电容 Floating capacitance	C_f	-	-	1.0	pF	V_{IO}=0, f=1MHz
	上升时间 Rise time	t_r	-	2	18	μs	V_{CE}=5V, I_C=5mA, R_L=100Ω
	下降时间 Fall time	t_f	-	3	18	μs	
	开启时间 Turn on time	Ton	-	4	-	μs	V_{CE}=5V, I_C=5mA, R_L=100Ω
	关闭时间 Turn off time	Toff	-	3	-	μs	

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

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	KL1110	CTR	50	-	600	%	I_F=5mA V_{CE}=5V
	KL1116		100	-	300		
	KL1117		80	-	160		
	KL1118		130	-	260		
	KL1119		200	-	400		
	KL1112	CTR	63	-	125	%	I_F=10mA V_{CE}=5V
	KL1113		100	-	200		
	KL1114		160	-	320		
	KL1112	CTR	22	-	-	%	I_F=1mA V_{CE}=5V
	KL1113		34	-	-		
	KL1114		56				

7. 特性曲线 Characteristic Curves

图1. 正向电流与正向电压的关系
Figure1. Forward Current VS Forward Voltage

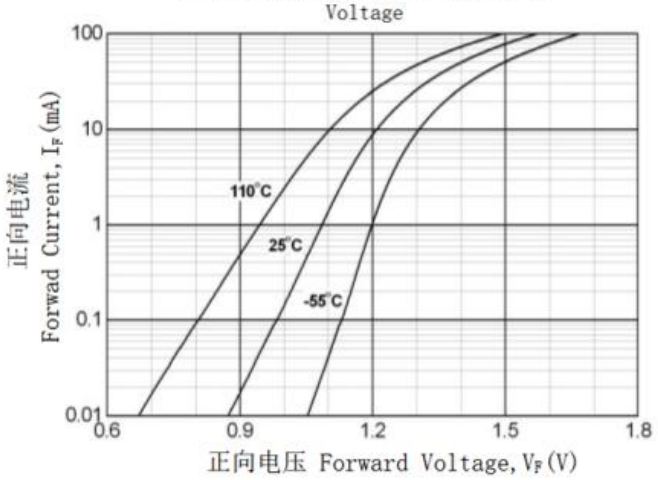


图2.集电极暗电流与环境温度的关系
Collector Dark Current vs Ambient Temperature

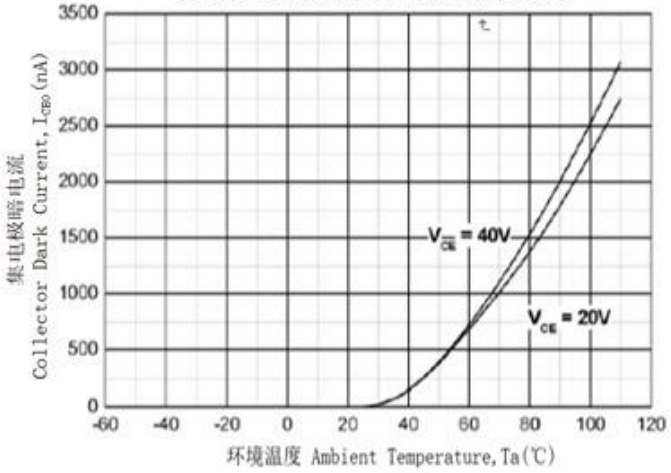


图3. 集电极电流与正向电流的关系
Collector Current VS Forward Current

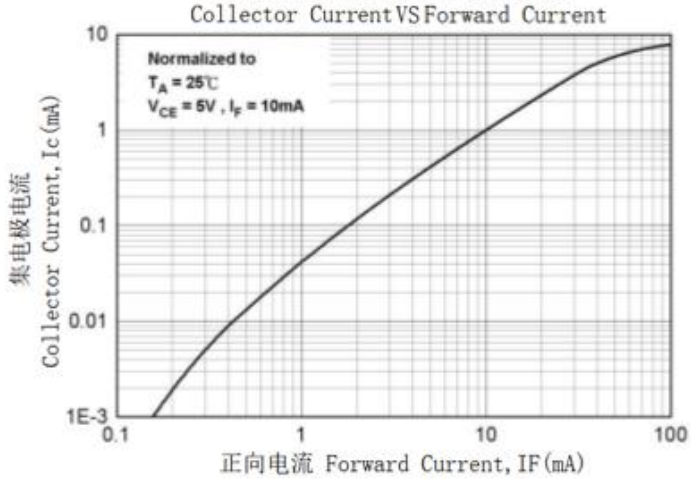


图4. 电流传输比与正向电流
Current Transfer Ration vs Forward Current

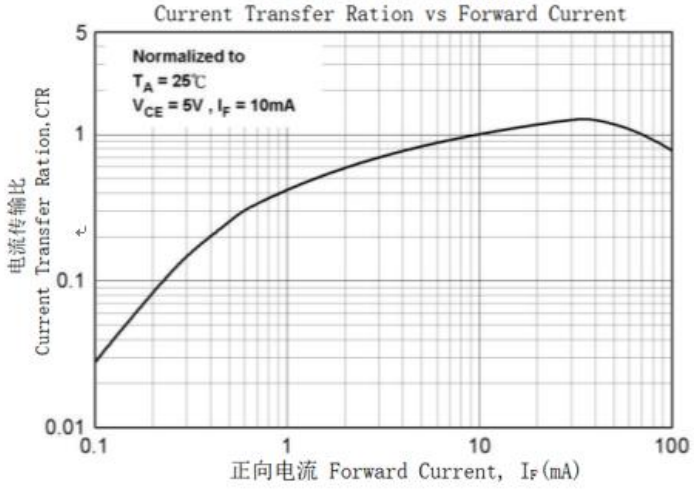


图5. 集电极电流与集电极-发射极电压
Collector Current vs Collector-Emitter Voltage

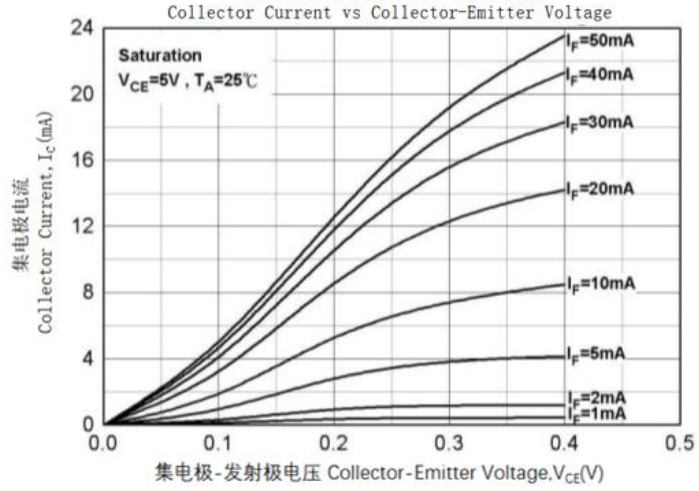


图6. 集电极电流与集电极-发射极电压
Collector Current vs Collector-Emitter Voltage

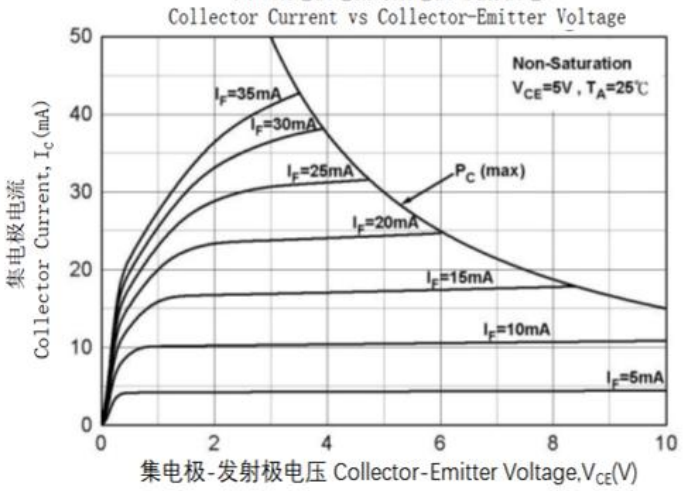


图7. 电流传输比与环境温度关系
Current Transfer Ratio vs Ambient Temperature

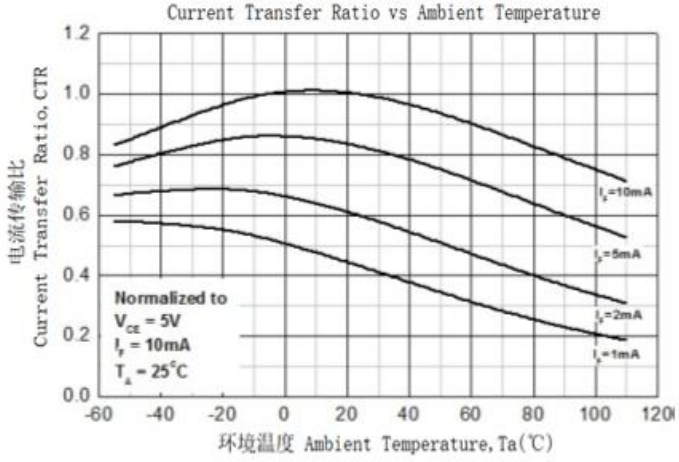


图8. 电流传输比与环境温度关系
Current Transfer Ratio vs Ambient Temperature

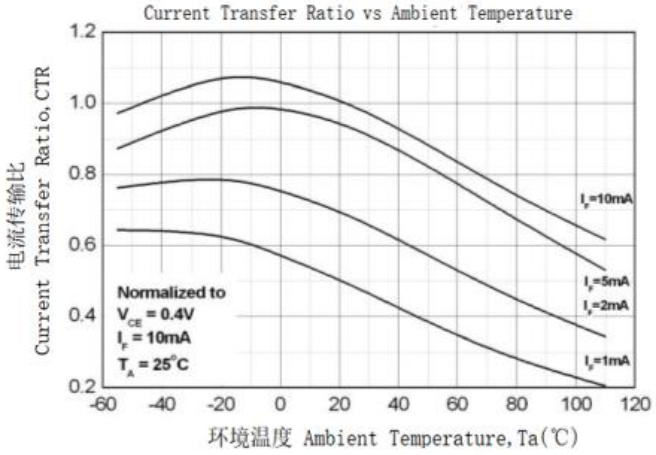


图9. 开启时间/关闭时间 vs 集电极电流
Ton/Toff Time vs Collector Current

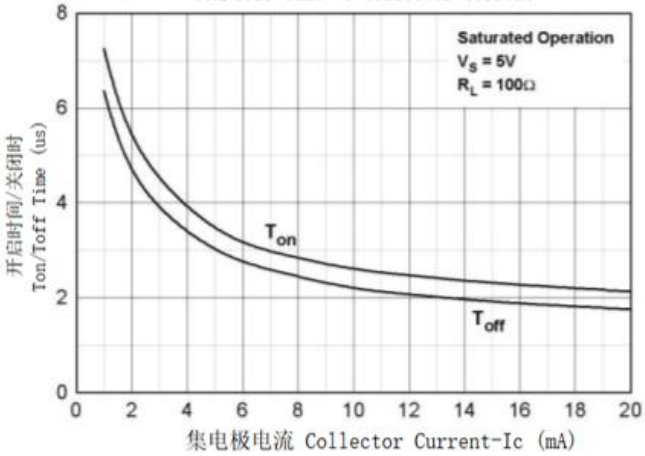


图10. 开启/关闭时间与正向电流的关系
Ton/Toff Time vs Forward Current

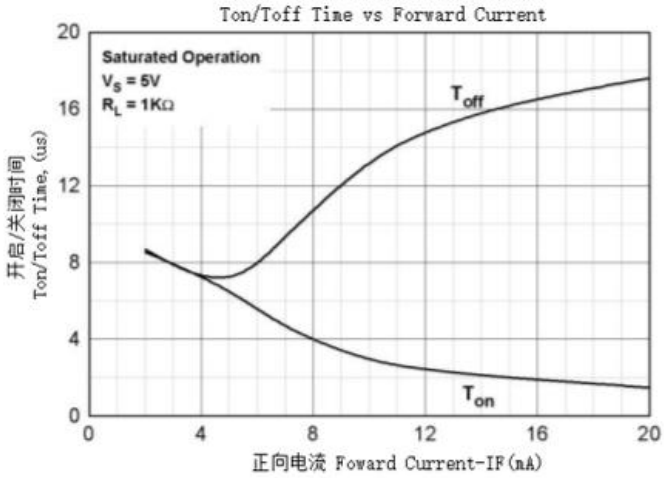
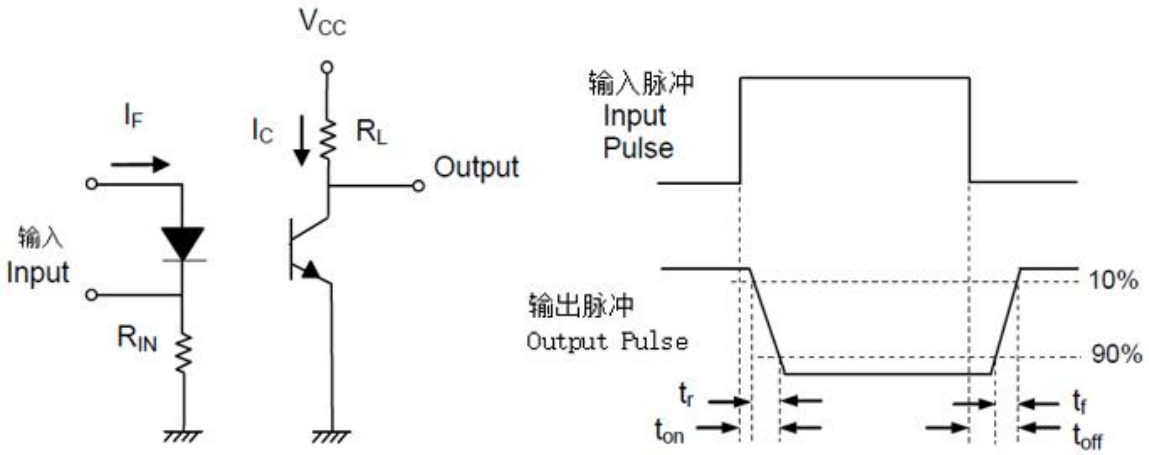


图11. 开关时间测试电路与波形
Switching Time Test Circuit vs Waveforms



8. 订单信息 Order Information

• 材料编号 Part Number

KL111X-Y-V

附注(Notes):

X = 表示CTR等级(0、2、3、4、6、7、8或9)
CTR Rank (0、2、3、4、6、7、8 or 9)

Y = 载带和卷轴包装方式(TA、TB或无)
Tape and reel option (TA,TB or none)

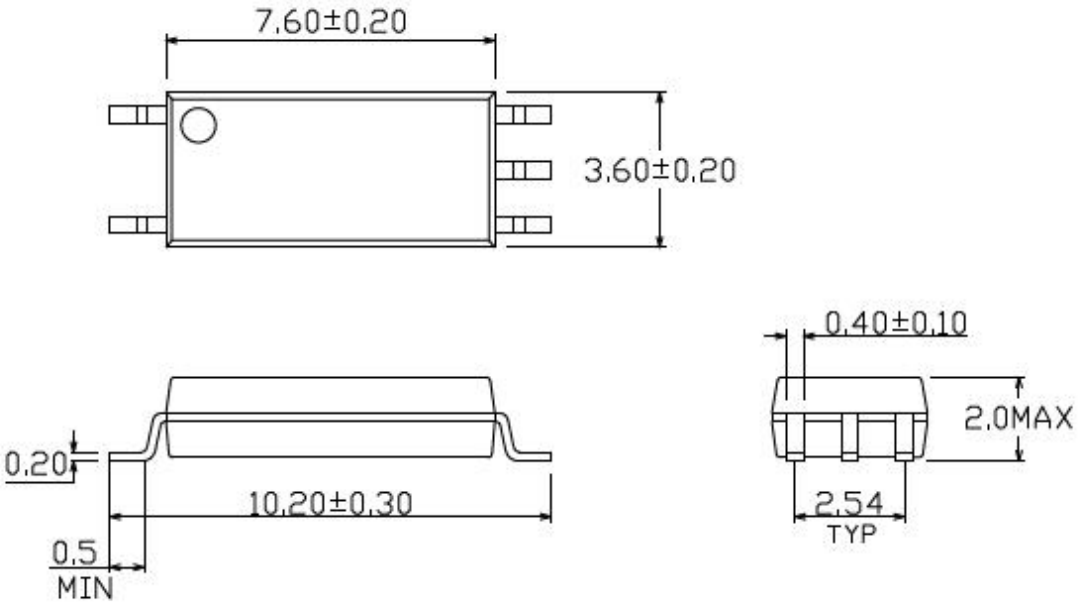
V = 表示VDE标识(客户指定镭射字符才加"V")
VDE (Only add "V" to laser characters specified by the customer)

选项 Option	描述 Description	包装数量 Packing quantity
(TA)	TA载带和卷轴选项 TA Tape & reel option	每卷3000pcs 3000 units per reel
(TB)	TB载带和卷轴选项 TB Tape & reel option	每卷3000pcs 3000 units per reel
(TA)-V	TA载带和卷轴选项 +VDE TA Tape & reel option + VDE	每卷3000pcs 3000 units per reel
(TB)-V	TB载带和卷轴选项 + VDE TB Tape & reel option + VDE	每卷3000pcs 3000 units per reel
/	内盒装: 每盒3盘 Inner box packaging: 3reels/box	每盒9000pcs 9000pcs per box
/	每箱装:10个内盒 Pack per Carton:10 inner boxes	每箱90000pcs 90000pcs per Carton

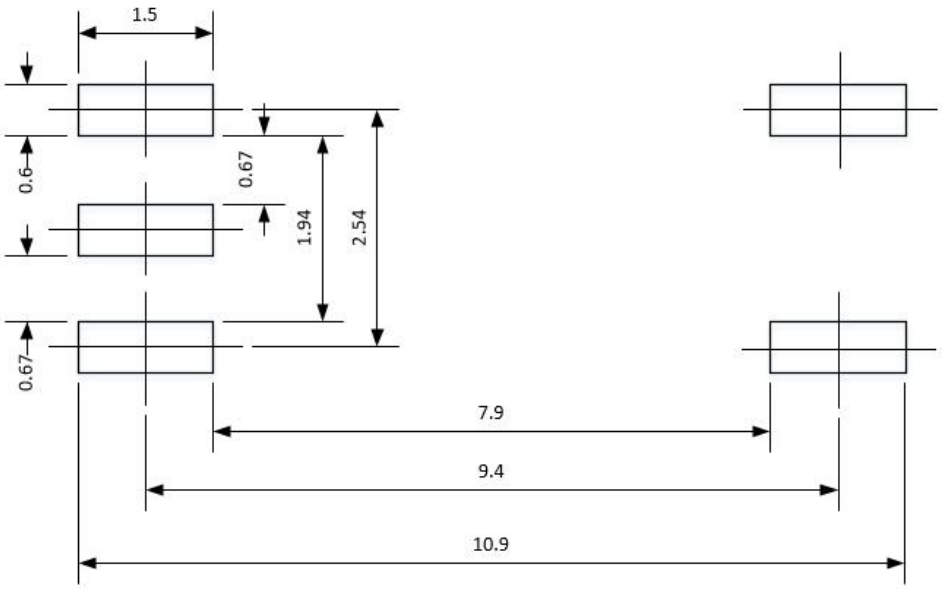
9. 封装尺寸(单位:毫米) Package Drawing(Unit:mm)

• 包装尺寸 (尺寸单位为mm)

Package Dimension (Dimensions in mm)



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



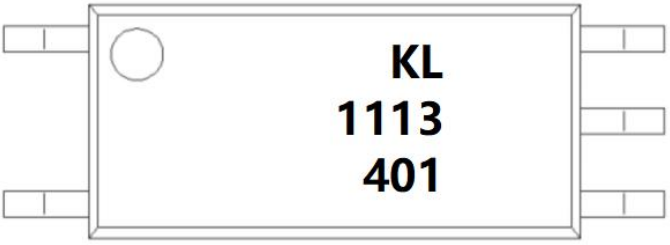
附注(Notes):

a. 推荐焊盘尺寸仅供参考 Suggested pad dimension is just for reference only

b. 请根据个人需求修改焊盘尺寸 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

111X =表示材料部件号 Denotes Device Part Number
X表示CTR等级(0、2、3、4、6、7、8或9) CTR Rank (0、2、3、4、6、7、8 or 9)

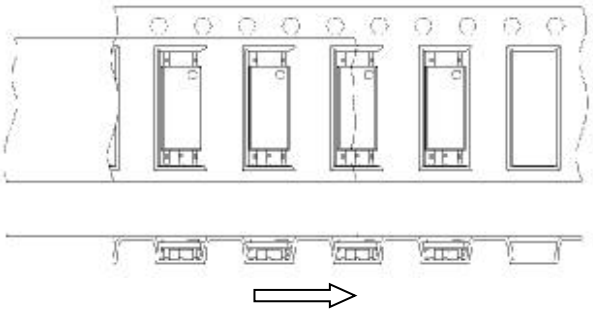
Y =表示1位年份代码 Denotes 1 digit Year code

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)

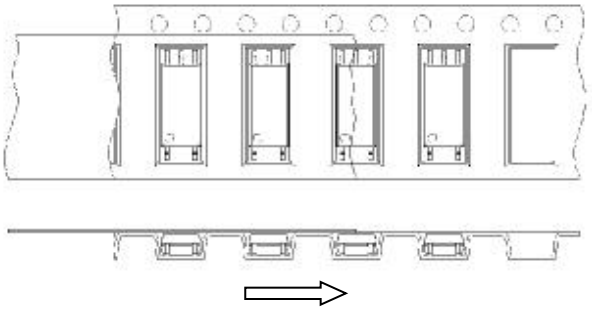
11. 料带和卷轴包装规格 Tape & Reel Packing Specifications

• 选择TA Option TA



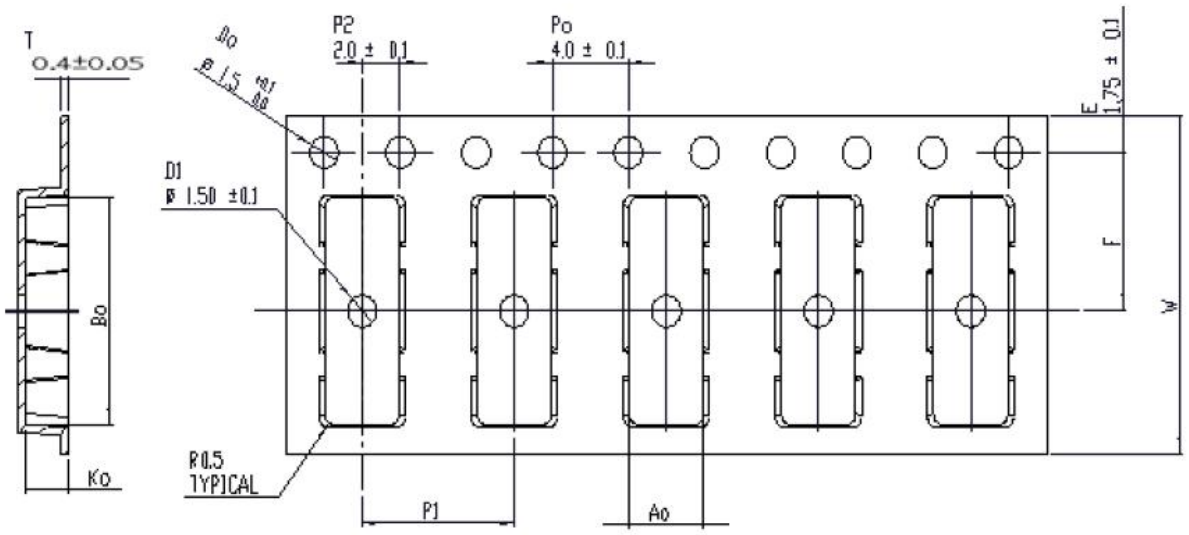
卷轴进给方向 Direction of feed from reel

• 选择TB Option TB



卷轴进给方向 Direction of feed from reel

料带尺寸Material belt size



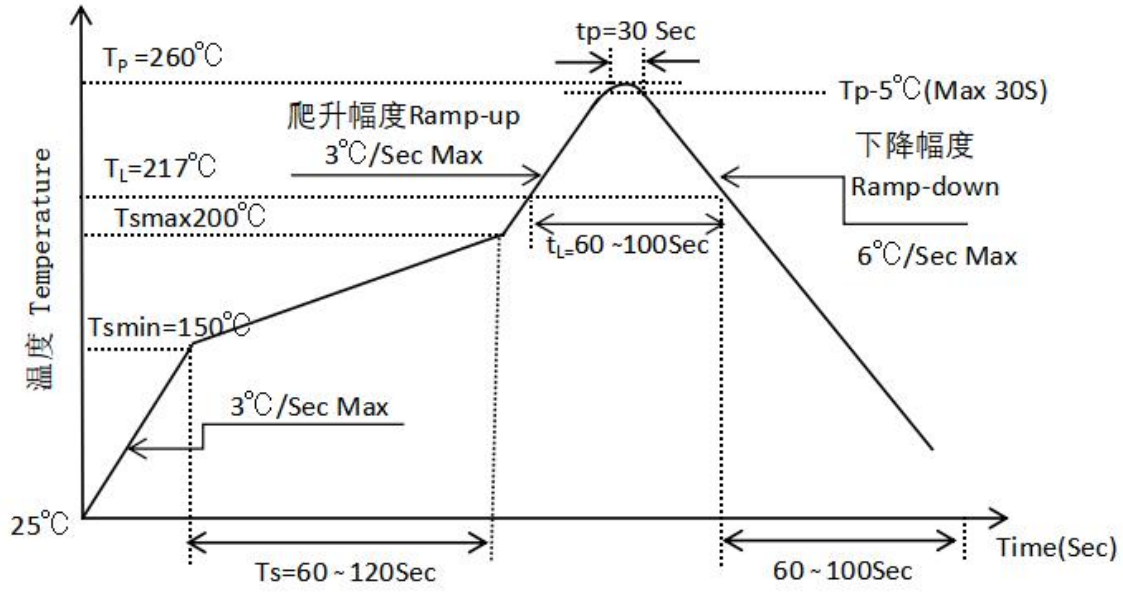
尺寸编号 Dimension No.	A0	B0	D0	D1	E	F
尺寸(mm) Dimension(mm)	3.9±0.1	10.75±0.1	1.5+0.1/-0	1.5±0.1	1.75±0.1	7.5±0.1
尺寸编号 Dimension No.	P0	P1	P2	T	W	K0
尺寸(mm) Dimension(mm)	4.0±0.1	8.0±0.1	2.0±0.1	0.4±0.05	16.0±0.3	2.25±0.1

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