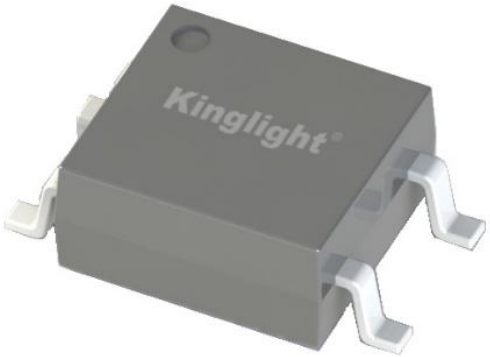
KLM406A, KLM440A, KLM460A

SOP4 MINI FLAT PACKAGE SSR

SOP4 MINI封装固态继电器



＊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.
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1. 产品特点 Product features

- 常开信号极单掷继电器 Normally open signal pole single throw relay
- 低工作电流、低电阻 Low operating current 、Low on resistance
- 60V、400V 、 600V 负载电压系列的小形4脚SOP 封装
  Small 4pin SOP package in the 60V, 400V, 600V load voltage series
- 低电平关闭状态漏电流 Low-level off state leakage current
- 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:CQC25001469219) CQC approved (No.CQC25001469219)
  UL认证已批准(编号:UL-US-2555216-0) UL approved (NO. UL-US-2555216-0)
  VDE认证已批准(编号:40061363) VDE approved (No.40061363)

2. 产品描述 Product Description

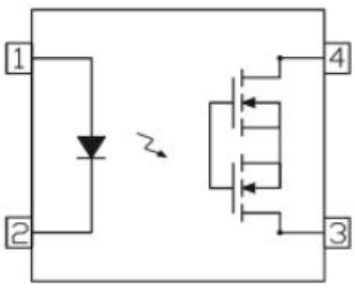
- KLM4XXA 是固态继电器，它们在发光侧（输入侧）装有一个 AlGaAs 红外LED，该 LED 与一个高压输出检测器电路光学耦合。这个检测器由一个光电二极管阵列和输出侧的 金属-氧化物半导体场效应晶体管组成。单通道配置相当于 1 个form A电磁继电器。
  The KLM4XXA is solid state relays containing an AlGaAs infrared LEDs on the light emitting side (input side) optically coupled to a high voltage output detector circuit. The detector consists of a photovoltaic diode array and MOSFETs on the output side. The single channel configuration is equivalent to 1 form A EMR.
- 这些器件采用 4 引脚小外形 SMD 封装。
  The devices in a 4-pin small outline SMD package.

3. 产品应用 Product Applications

- 交换设备、测量和测试设备 Exchange equipment、Measurement and testing equipment
- 工厂自动化/办公自动化设备、工业控制，安全 FA/OA equipment、Industrial controls, Security

4. 功能图 Functional Diagram

Schematic



引脚配置 Pin Configuration
1. LED阳极 LED Anode
2. LED阴极 LED Cathode
3, 4. 金属-氧化物半导体场效应晶体管 MOSFET

5. 光电特性 Electrical-Optical characteristics

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

参数 Parameter		符号 Symbol	额定值 Rated Value			单位 Unit
			KLM406A	KLM440A	KLM460A	
输入 Input	正向电流 Forward current	I_F	50			mA
	反向电压 Reverse voltage	V_R	5			V
	峰值正向电流 (1*) Peak Forward Current	I_{FP}	1			A
	功耗 Power dissipation	P_{IN}	75			mW
输出 Output	击穿电压 Break Down Voltage	V_L	60	400	600	V
	持续负载电流 Continuous Load Current	I_L	550	120	50	mA
	脉冲负载电流 (2*) Pulse Load Current	I_{Lpeak}	1.2	0.3	0.15	A
	功耗 Power Dissipation	P_{out}	500			mW
总功耗 Total Power Dissipation		P_T	550			mW
隔离电压 (3*) Isolation Voltage		V_{iso}	3750			V rms
工作温度 Operating temperature		T_{OPR}	-40 to +85			℃
储存温度 Storage temperature		T_{STG}	-40 to +125			℃
焊接温度 (4*) Soldering temperature		T_{SOL}	260			℃

附注 (Notes):

1* f =100Hz，占空比 = 0.1% f =100Hz, Duty Cycle = 0.1%

2* A 连通：100 ms（1 次），V_L = 直流 A connection: 100 ms (1 shot), V_L = DC

3* 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脚短接在一起, 3&4脚短接在一起 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, Pins 1 and 2 are shorted together, and pins 3 and 4 are shorted together.

4* 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	-	1.18	1.5	V	I_F=10mA
	反向电流 Reverse current		I_R	-	-	1	uA	V_R=5V
输出 Output	关闭状态泄漏电流 Off State leakage Current		I_{leak}	-	-	1	uA	I_F = 0mA, V_L = Max
	导通电阻 On Resistance	KLM406A	$R_{d(ON)}$	-	0.7	2.5	Ω	I_F = 10mA, I_L = Max. t = 1s
		KLM440A		-	20	30		
		KLM460A		-	40	70		
	输出电容 Output Capacitance	KLM406A	C_{out}	-	85		pF	V_L = 0V, f = 1MHz
		KLM440A		-	45	-		
		KLM460A		-	30	-		

• 传输特性

Transfer Characteristics

参数 Parameter		符号 Symbol	最小值 Min.	规格值 Typ.*	最大值 Max.	单位 Unit	条件 Condition
LED 打开电流 LED turn on Current	KLM406A	$I_{F(on)}$	-	1	5	mA	I_L = Max.
	KLM440A						
	KLM460A						
LED 关闭电流 LED turn off Current	KLM406A	$I_{F(off)}$	0.2	0.6	-	mA	I_L = 1uA
	KLM440A						
	KLM460A						
打开时间 Turn On Time	KLM406A	T_{on}	-	0.1	0.5	ms	I_F = 10 mA, I_L = Max. R_L = 200Ω ,
	KLM440A						
	KLM460A						
关闭时间 Turn Off Time	KLM406A	T_{off}		0.2		ms	
	KLM440A						
	KLM460A						
隔离电阻 Isolation Resistance		R_{I-O}	5×10^{10}	-	-	Ω	V_{I-O} = 500V DC
隔离电容 Isolation Capacitance		C_{I-O}	-	1.5	-	pF	V = 0V, f = 1MHz

7. 特性曲线 Characteristic Curves

图1. 负载电流 vs 环境温度的关系

Figure 1. Load Current vs Ambient Temperature

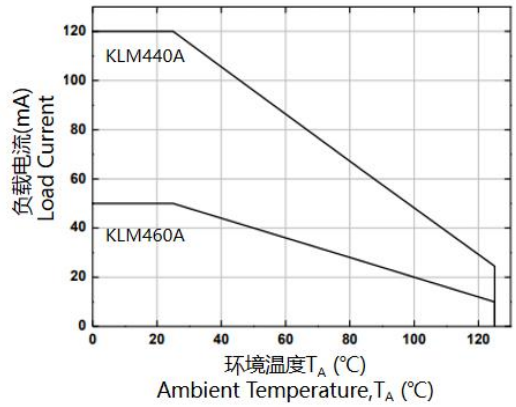


图2. 导通电阻 vs 环境温度的关系

Figure 2. On Resistance vs Ambient Temperature

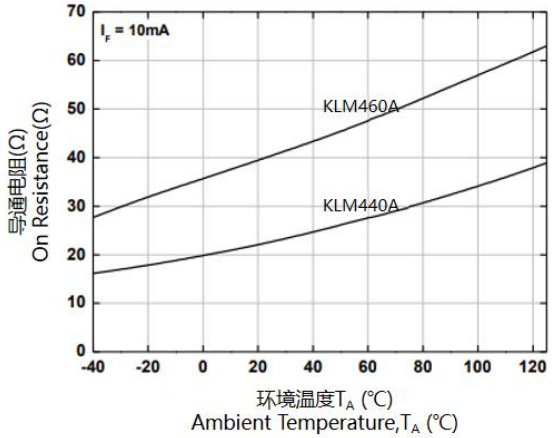


图3. 响应时间 vs 环境温度的关系

Figure 3. Switching Time vs Ambient Temperature

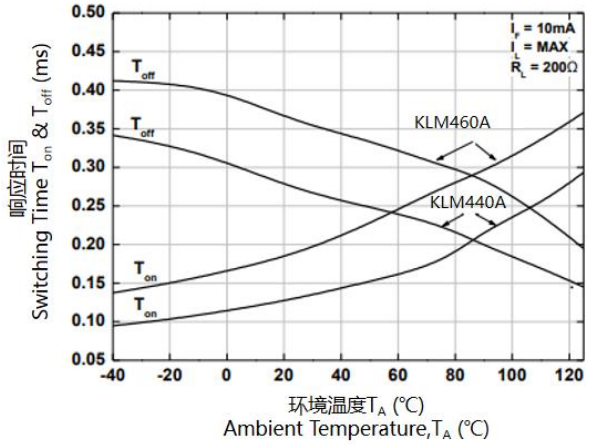


图4. 响应时间(开启) vs LED正向电流的关系

Figure 4. Switching Time vs LED Forward Current

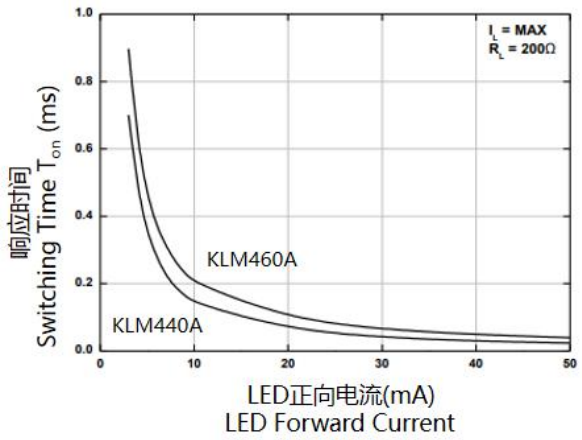


图5. 响应时间(关闭) vs LED正向电流的关系

Figure 5 Switching Time vs LED Forward Current

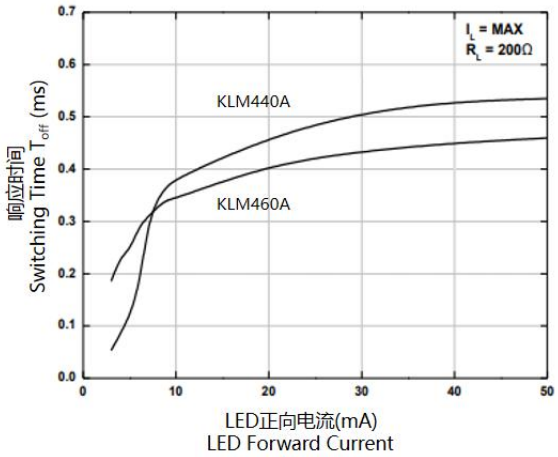


图6. LED工作电流 vs 环境温度的关系

Figure 6. LED operate on Current vs Ambient Temperature

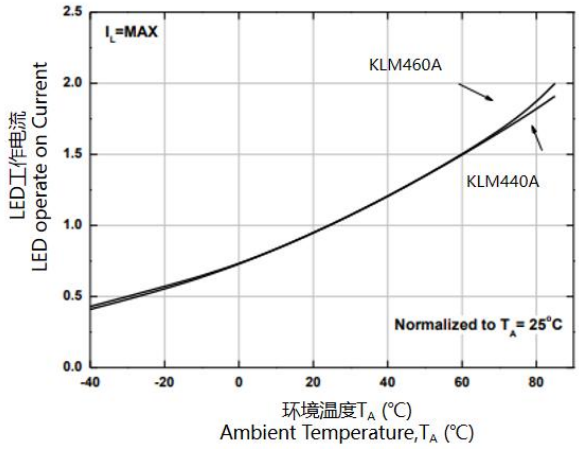


图7. LED关闭电流 vs 环境温度的关系

Figure 7 LED turn off Current vs Ambient Temperature

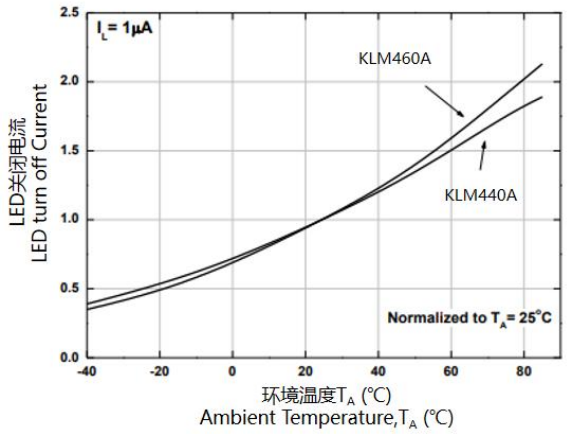


图8. LED下降电压 vs 环境温度的关系

Figure 8. LED Dropout Voltage vs Ambient Temperature

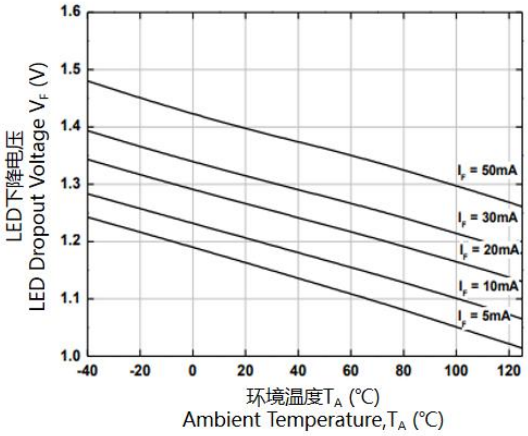


图9. 负载电流 vs 负载电压的关系

Figure 9 Load Current vs Load Voltage

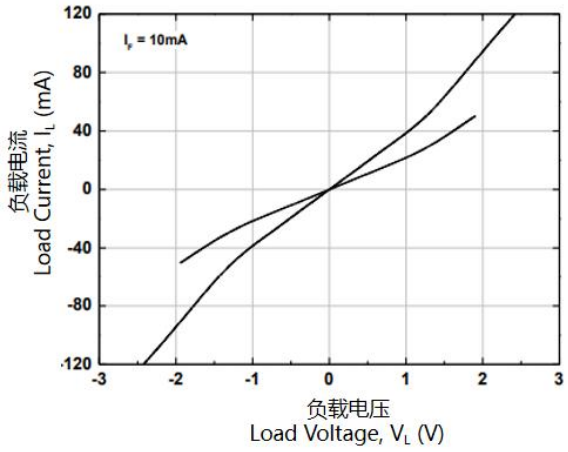


图10. 断态漏电流 vs 负载电压的关系

Figure 10 Off State Leakage Current vs Load Voltage

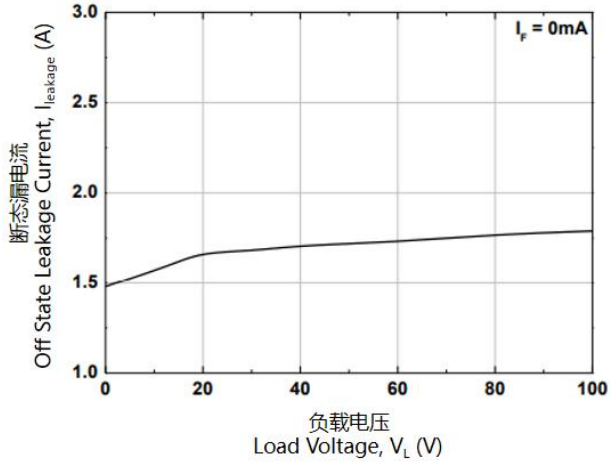
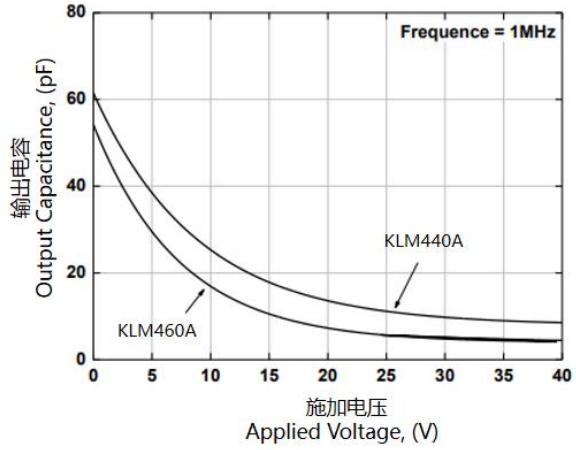
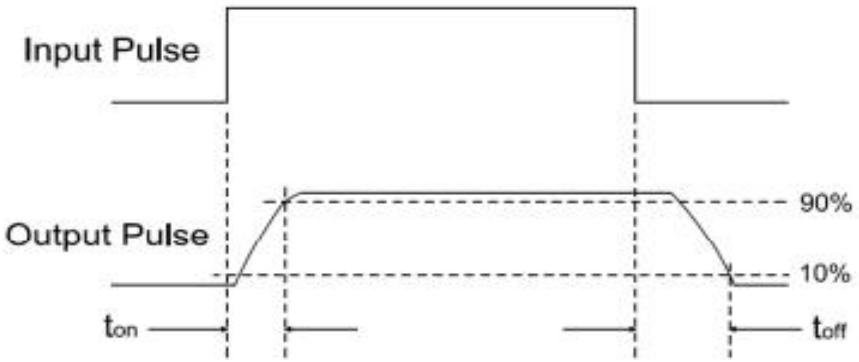


图11. 输出电容 vs 施加电压

Figure 11. Output Capacitance vs Applied Voltage



打开/关闭时间 Turn on/Turn off Time



8. 订单信息 Order Information

• 材料编号 Part Number

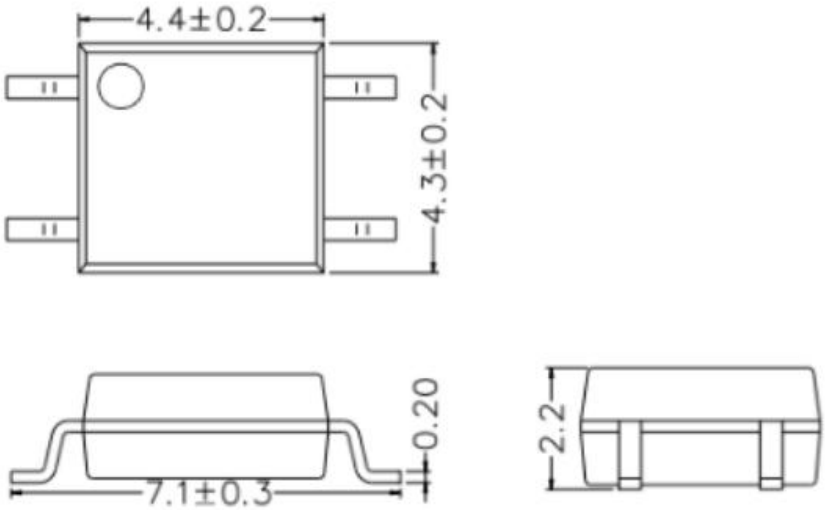
KLM4XXA-X-V

附注(Notes):

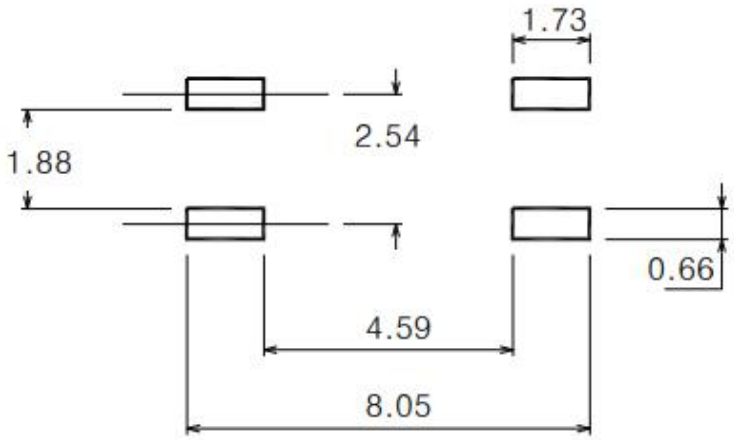
4XXA =零件编号(XX=06、40或60)
Part No. (XX=06, 40 or 60)
X = 料带和卷轴选项(TA或TB)
Tape and reel option (TA or TB)
V = 表示VDE标识(客户指定镭射字符才加"V")
VDE (Only add "V" to laser characters specified by the customer)

选项 Option	描述 Description	包装数量 Packing quantity
TA	TA载带和卷轴选项 TA Tape & reel option	每卷3500pcs 3500 units per reel
TB	TB载带和卷轴选项 TB Tape & reel option	每卷3500pcs 3500 units per reel
TA-V	TA载带和卷轴选项 +VDE TA Tape & reel option + VDE	每卷3500pcs 3500 units per reel
TB-V	TB载带和卷轴选项 + VDE TB Tape & reel option + VDE	每卷3500pcs 3500 units per reel
/	内盒装:每盒3盘 Inner box packaging:3 reels/box	每盒10500pcs 10500 pcs per box
/	每箱装:10个内盒 Pack per Carton:10 inner boxes	每箱105000pcs 105000 pcs per reel Carton

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



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



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 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

M4XXA = 表示材料部件号 Denotes Device Part Number
XX表示零件编号(06、40或60) Part No. (06, 40 or 60)

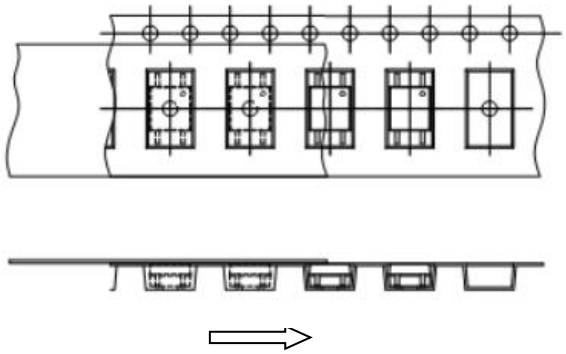
Y = 表示1位年份代码Denotes 1 digit Year code

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)

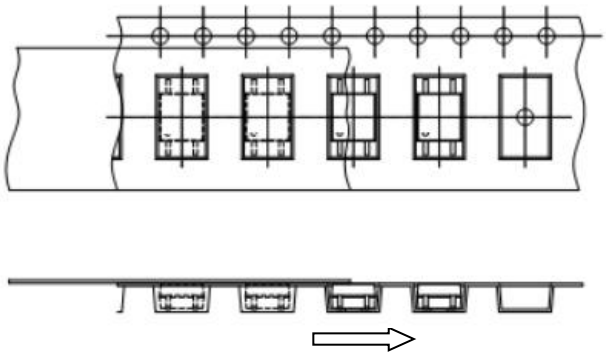
11.料带和卷轴包装规格 Tape & Reel Packing Specifications

• 选择TA Option TA



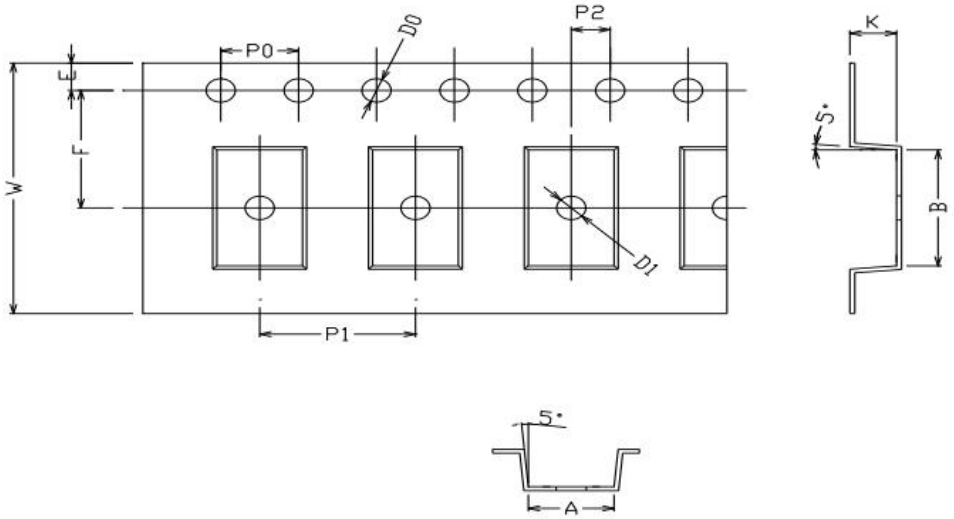
卷轴进给方向 Direction of feed from reel

• 选择TB Option TB



卷轴进给方向 Direction of feed from reel

料带尺寸Material belt size



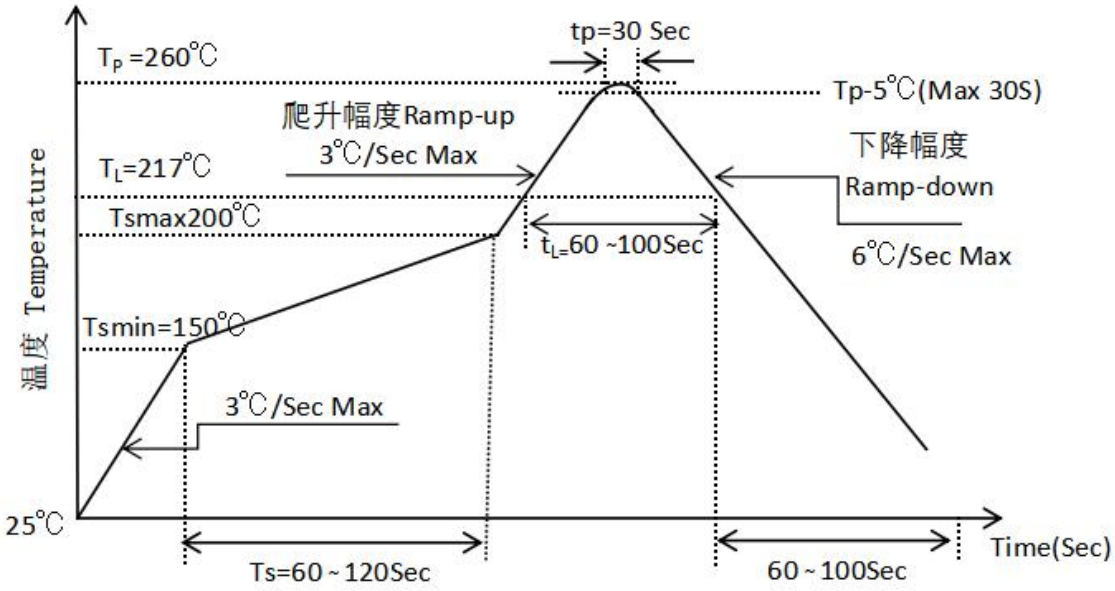
尺寸编号 Dimension No.	A	B	D0	D1	E	F
尺寸(mm) Dimension(mm) S1	4.4±0.1	7.4±0.1	1.5+0.1/-0	1.50±0.1	1.75±0.1	7.5±0.05
尺寸编号 Dimension No.	P0	P1	P2	t	W	K
尺寸(mm) Dimension(mm) S1	4.0±0.15	8.0±0.1	2.0±0.1	0.25±0.03	16.0±0.2	2.4±0.1

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