KL816S1-EEM

PHOTO TRANSISTOR

晶体管光耦(电表)



＊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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＊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

- 电流转换率(Current transfer ratio)
  CTR：300~600% 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 input and output (Viso=5000 V rms)
- 响应时间(V_{CE}=10V,I_C=2mA,R_L=100Ω, tr Typ 2.9us, tf Typ 4.5us)
  Response time(tr Typ 2.9μs, tf Typ 4.5us at V_{CE} = 10V, I_C = 2mA, R_L = 100Ω)
- 工作温度可达+110℃ Operating temperature up to +110°C
- 爬电距离>7.62 mm Creepage distance >7.62 mm
- 符合RoHS法规要求，达到标准 In compliance with RoHS, REACH standards
- 静电放电：人体模式8000V、机器模式2000V
  ESD pass HBM 8000V/MM2000V
- 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)

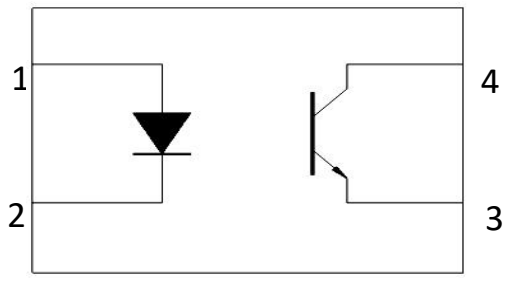
2. 产品描述 Product Description

KL816S1-EEM系列设备均由一个红外发光二极管和一个光电晶体管探测器组成。
KL816S1-EEM series of devices each consist of an infrared emitting diode, optically coupled to a phototransistor detector.

3. 产品应用 Product Applications

- 系统设备、测量仪器 System appliances, measuring instruments
- 电信设备 Telecommunication equipment
- 不同电位与阻抗电路间的信号传输
  Signal transmission between circuits of different potentials and impedances
- 电能表 Electric energy meter
- 可编程控制器 Programmable controllers
- 安培计 Ammeter

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=25ºC) 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
	输入功率 Input Power	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
	输出功率 Output Power	P_C	150	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	℃

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, 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, Pins 1 and 2 are shorted together, and pins 3 and 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 Input	正向电压 Forward voltage	V_F	1.0	1.2	1.3	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}	-	30	250	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}	-	-	20	nA	V_{CE}=5V I_F =0mA
			-	-	100	nA	V_{CE}=24V 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	0.2	V	I_F=20mA I_C=1mA
	电流传输比 Current transfer ratio(1*)	CTR	300	-	600	%	I_F=5mA V_{CE}=5V
	集电极电流 Collector Current	I_C	15	-	30	mA	I_F=5mA V_{CE}=5V
	隔离电阻 Isolation resistance	R_{ISO}	5×10^{10}	1×10^{12}	-	Ω	V_{IO}=500Vdc 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	-	2.9	10	μs	V_{CE}=10V, I_C=2mA, R_L=100Ω
	下降时间 Fall time	t_f	-	4.5	10	μs	

参数 Parameter		符号 Symbol	最小值 Min.	规格值 Typ.	最大值 Max.	单位 Unit	条件 Condition
传输特性 Transfer Characteristics	开启时间 Turn on time	Ton	-	6.5	10	μs	V_{CE}=10V, I_C=2mA, R_L=100Ω
	关断时间 Turn off time	Toff	-	7.2	10	μs	

1* 当前转换比率=I_C/I_F*100%, CTR公差:±3% Current Conversion Ratio = I_C / I_F × 100% , CTR Tolerance:±3%.

• 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	D	CTR	300	-	600	%	I_F=5mA V_{CE}=5V
	D1		300	-	470		
	D		200	-	500	%	I_F=2mA V_{CE}=5V
	D1		210	-	450		

7. 特性曲线 Characteristic Curves

图1. 正向电流与环境温度关系
Forward current vs Ambient temperature

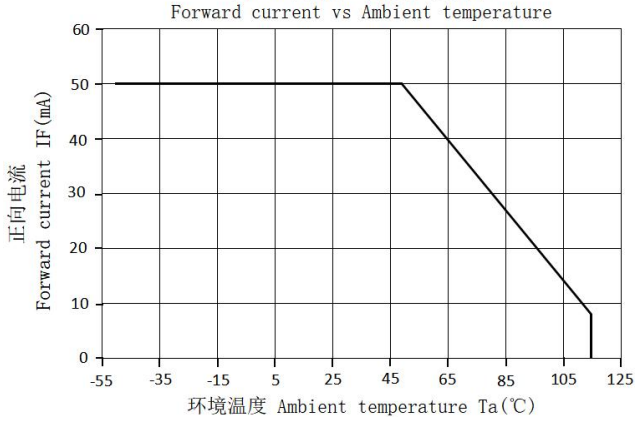


图2. 正向电流与正向电压的关系
Forward Current VS Forward Voltage

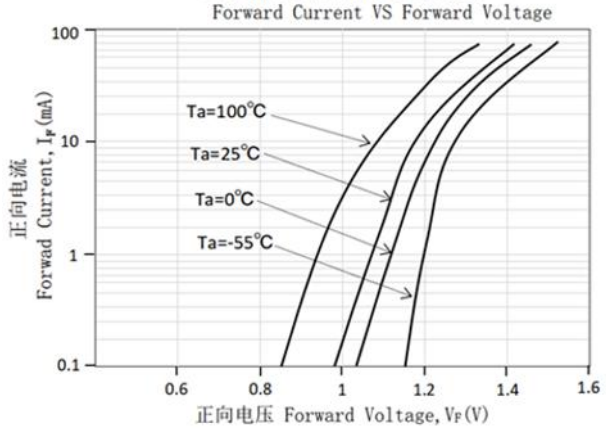


图3. 电流传输比与正向电流
Current Transfer Ration vs Forward Current

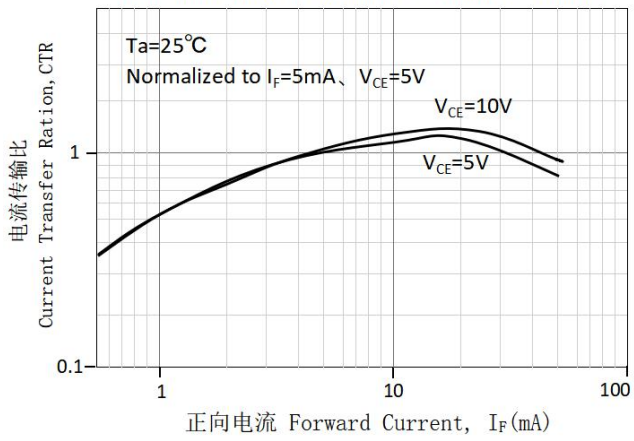


图4. 集电极电流与集电极-发射极电压
Collector Current vs Collector-Emitter Voltage

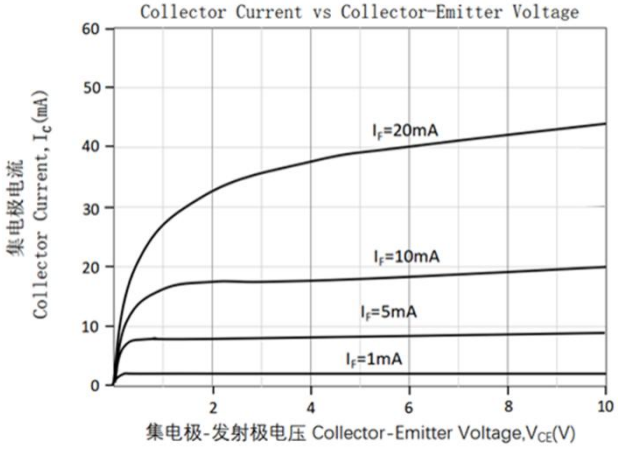


图5. 集电极电流与环境温度关系
Collector Current vs Ambient Temperature

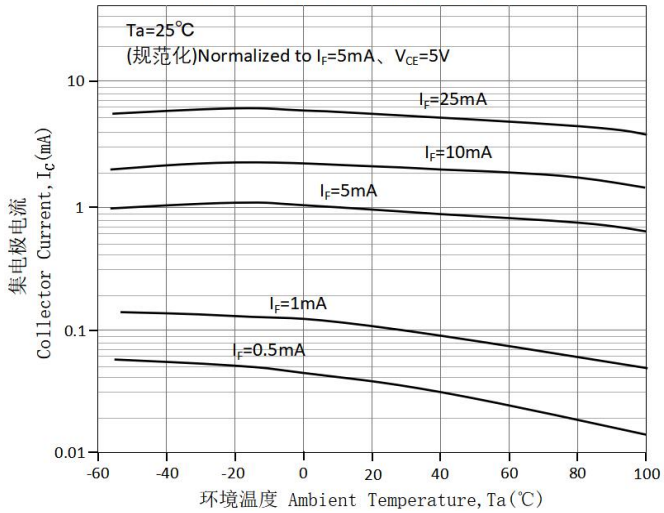


图6.集电极暗电流与环境温度的关系
Collector Dark Current vs Ambient Temperature

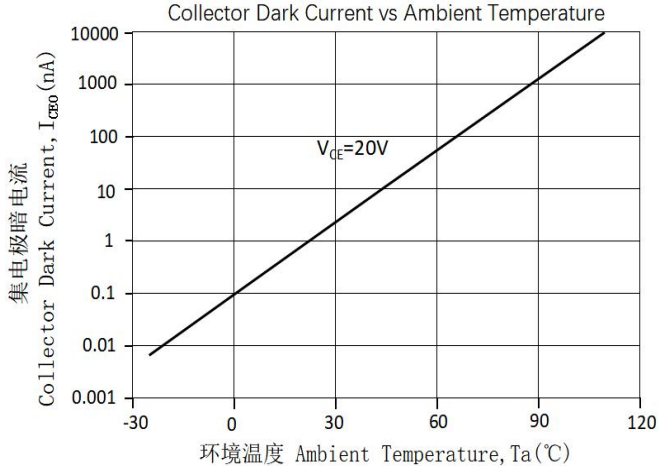


图7. 集电极-发射极饱和电压与环境温度关系
Collector-Emitter Saturation Voltage
vs Ambient Temperature

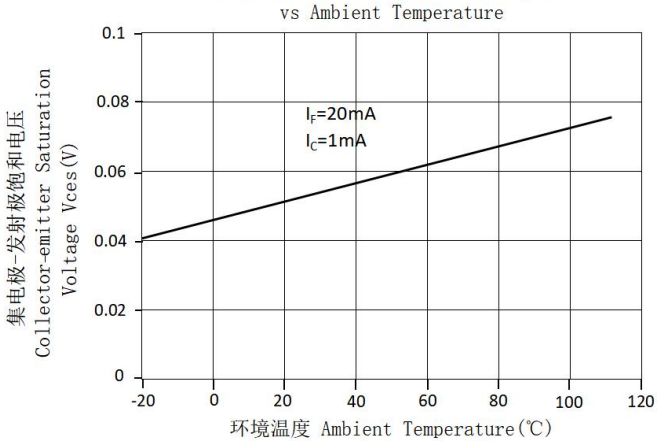


图8. 开关时间与负载电阻的关系
Switching Time vs Load Resistance

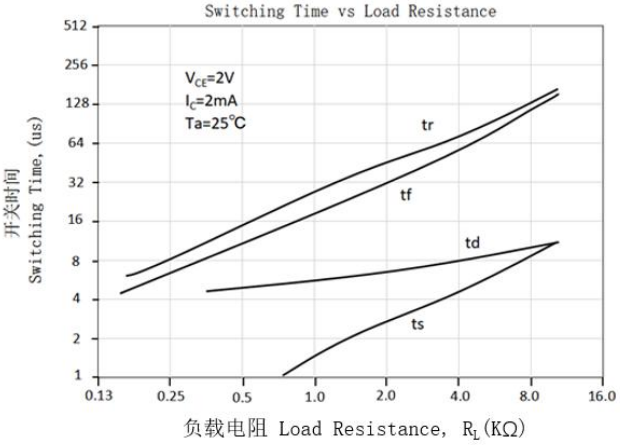
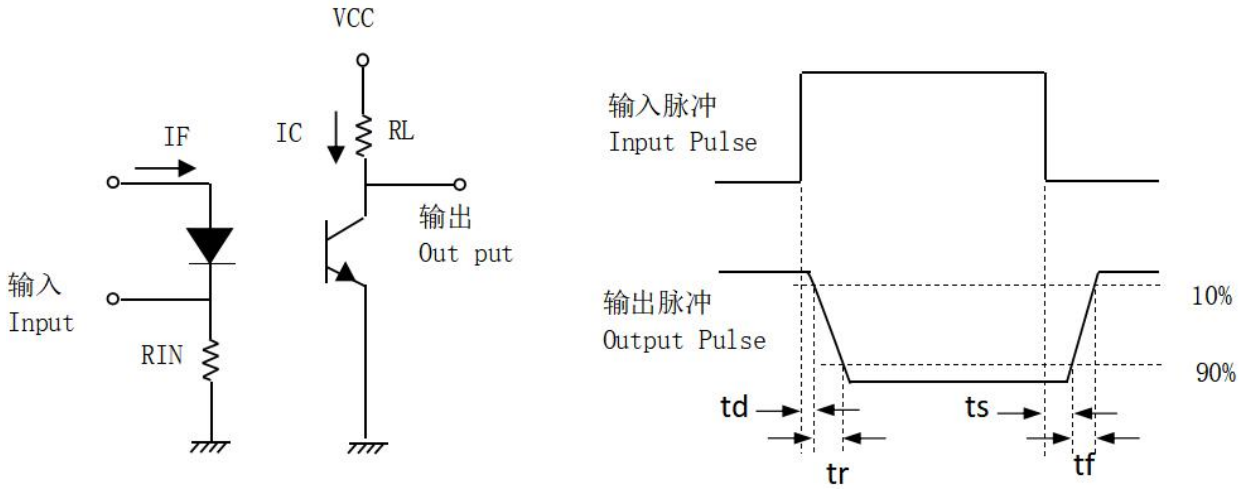


图9. 开关时间测试电路与波形
Switching Time Test Circuit vs Waveforms



8. 订单信息 Order Information

• 零件编号 Part Number

料号PN:KL816S1-Y-Z-V-T03-EEM

附注(Notes):

S1 = 表示引脚形式 Lead form option

Y = 表示CTR等级(D、D1) CTR Rank (D, D1)

Z = 表示料带和卷盘选项(TU、TD) Tape and reel option (TU, TD)

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)

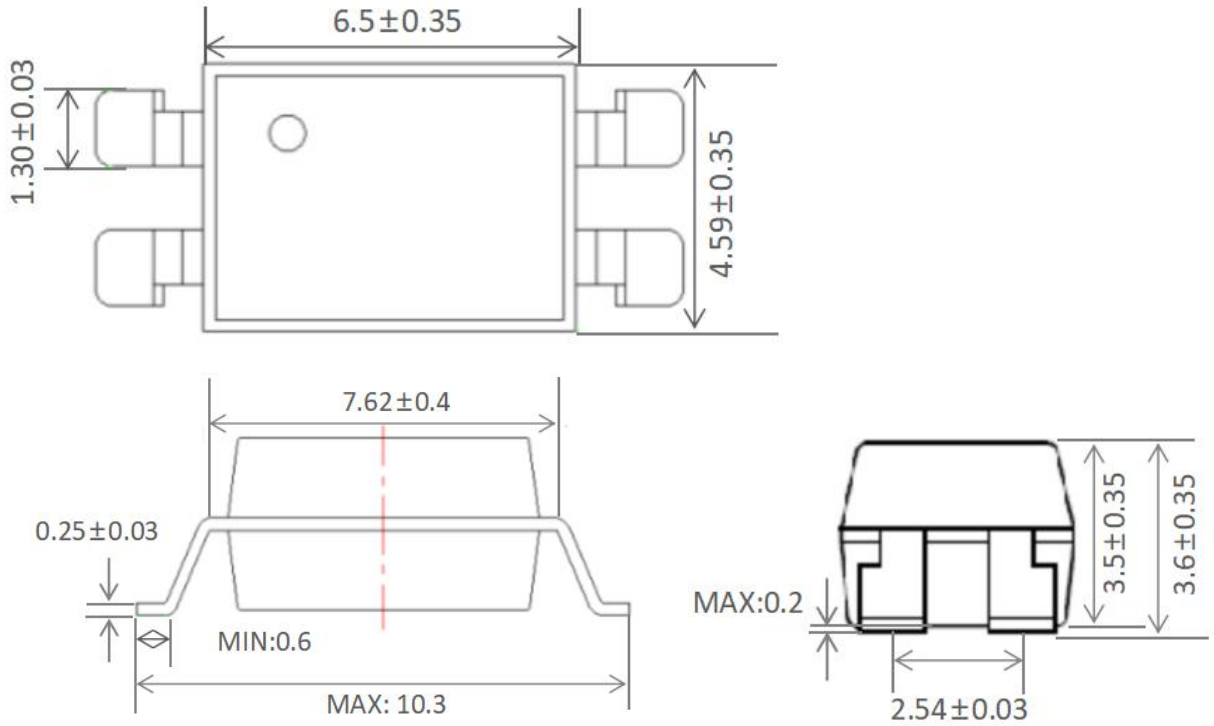
T03 = 表示2000pcs/卷 2000 units per reel

EEM = 表示电表系列 Electric energy meter series

选项 Option	描述 Description	包装数量 Packing quantity
S1-TU-T03	表面贴装脚型方式+ TU料带 & 卷轴选择 Surface mount lead form + TU tape & reel option	2000pcs/卷 2000 units per reel
S1-TD-T03	表面贴装脚型方式+ TD料带 & 卷轴选择 Surface mount lead form + TD tape & reel option	2000pcs/卷 2000 units per reel
盒数量 Quantity per Box	3盘/盒 3 reels/box	6000pcs/盒 6000 units per box
箱数量 Quantity per Carton	10盒/箱 10 boxes/ctn	60000pcs/箱 60000 units per ctn

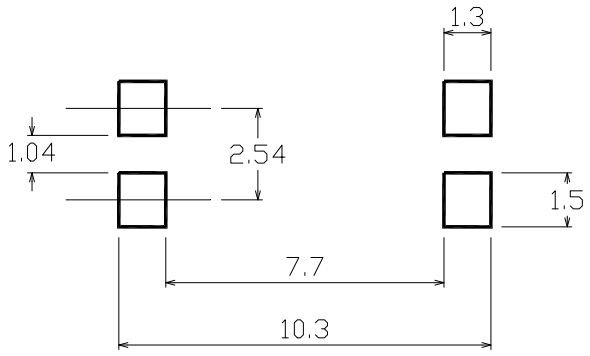
9. 封装尺寸(单位:毫米) Package Drawing(Unit:mm)

• 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

S1脚型选项 S1 foot-type



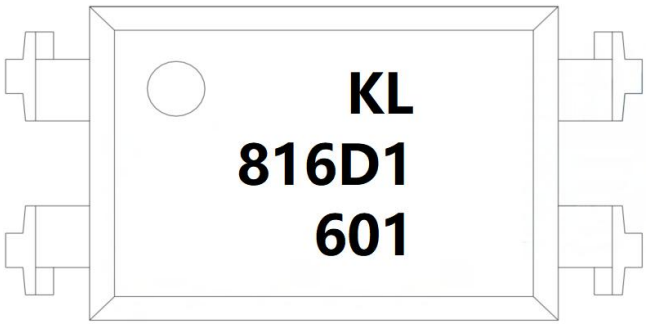
附注(Notes):

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





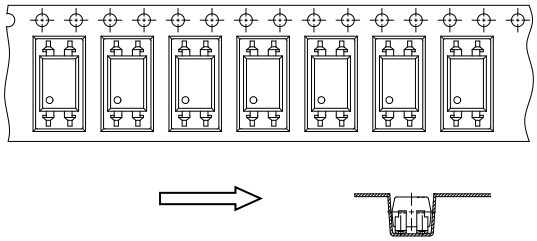
(范本参考 Template reference)

附注(Notes):

KL = 表示晶台微电子有限公司
denotes Kinglight Microelectronics
816 = 表示材料部件号
denotes Device Part Number
R = 表示CTR等级
denotes CTR Rank
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)

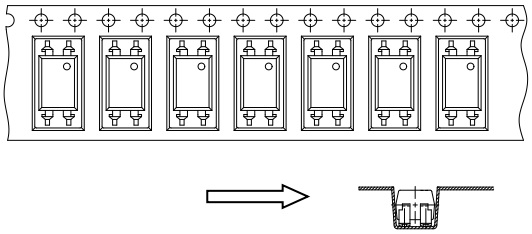
11. 料带和卷轴包装规格 Tape & Reel Packing Specifications

• 选择TD Option TD



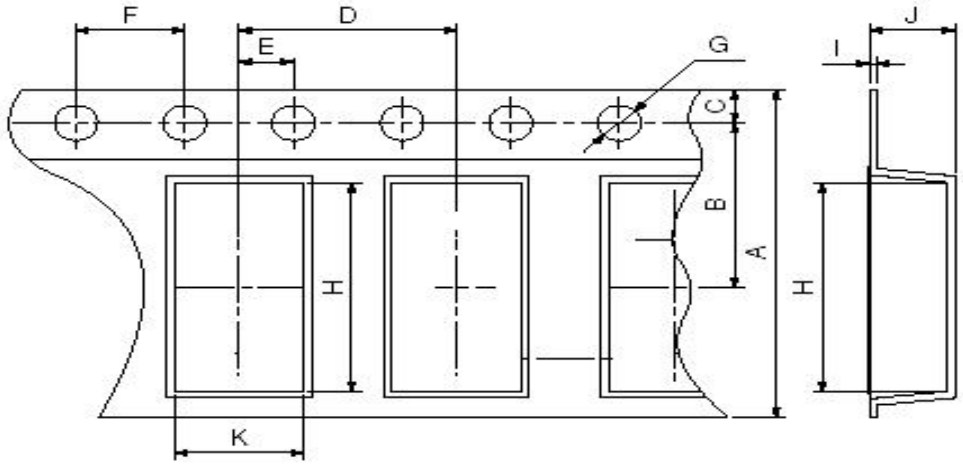
卷轴进给方向 Direction of feed from reel

• 选择TU Option TU



卷轴进给方向 Direction of feed from reel

料带尺寸Material belt size



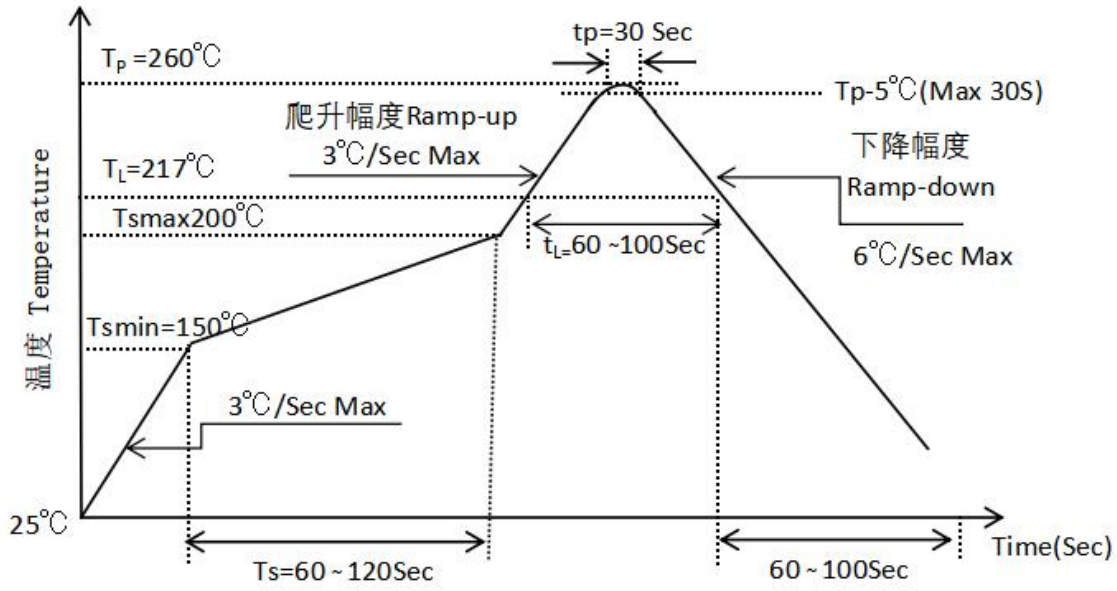
尺寸编号 Dimension No.	A	B	C	D1	E	F
尺寸(mm) Dimension(mm)	16±0.3	7.5±0.1	1.75±0.1	8.0±0.1	2.0±0.1	4.0±0.1
尺寸编号 Dimension No.	G	H	I	J	K	
尺寸(mm) Dimension(mm)	1.5+0.1/-0	10.4±0.1	0.4±0.05	4.6±0.1	5.1±0.1	

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