KL155E

SOP5 IGBT/MOSFET

1A Output Current GATE DRIVER PHOTOCOUPLER

1A峰值输出门极驱动光耦



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1. 产品特点 Product features

- 轨到轨输出电压 Rail-to-rail output voltage
- 可保证在-40至110℃温度范围内运行 Guaranteed performance from -40°C to 110°C
- 最大峰值输出电流1A 1.0 A maximum peak output current
- 最小峰值输出电流0.8A 0.8 A minimum peak output current
- 输入与输出间高隔离电压(Viso=3750 V rms)
  High isolation voltage between input and output (Viso=3750 V rms)
- 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:CQC26001516433) CQC approved (No.CQC26001516433)

2. 产品描述 Product Description

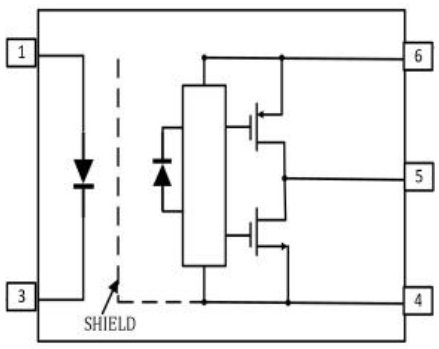
- KL155E由一个红外发光二极管和集成的高增益高速光电探测器组成,该器件采用 5引脚 SOP 封装。
  The KL155E consists of an infrared light emitting diode and integrated high gain, high-speed Photo detectors. The device is housed in a 5 pin SOP package.
- 光电检测器有一个内部屏蔽，可确保共模瞬态抗扰度为±20 kV/μs。适用于IGBT或功率MOSFET的栅极驱动电路。
  The photo detector has an internal shield that provides guaranteed common-mode transient Immunity of ±20 kV/μs. It is suitable for direct gate driving circuit for IGBTs or power MOSFETs.

3. 产品应用 Product Applications

- 隔离式IGBT/Power MOSFET栅极驱动 Isolated IGBT/Power MOSFET Gate Drive
- 等离子显示面板(PDPs) Plasma Display Panels (PDPs)
- 逆变器 Inverters
- 不间断供电系统(UPS) Uninterruptible power supply (UPS)
- 电磁炉加热 Induction heating

4. 功能图 Functional Diagram

示意图 Schematic



引脚配置 Pin Configuration

1. 阳极 Anode
3. 阴极 Cathode
4. 接地 GND
5. 输出电压 V_O
6. 电源电压 V_{CC}

Truth Table			
LED	High side	Low side	VO
OFF	OFF	ON	Low
ON	ON	OFF	High

注意：引脚4和6之间必须连接一个 0.1μF 旁路电容器

Note： A 0.1μF bypass capacitor must be connected between pins 4 and 6

5. 光电特性 Electrical-Optical characteristics

• 最大限度额定值(温度=25°C) Absolute Maximum Ratings(Ta=25°C)

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
	正向脉冲电流 Pulse Forward current(1*)	I_{FP}	1	A
	反向电压 Reverse voltage	V_R	5	V
	输入功率损耗 Input power dissipation	P_D	40	mW
输出 Output	“H” 峰值输出电流 “H” Peak Output current	I_{OPH}	1.0	A
	“L” 峰值输出电流 “L” Peak Output current	I_{OPL}	1.0	A
	输出电压 Peak Output voltage	V_O	30	V
	电源电压 Supply voltage	V_{CC}	35	V
	输出集电极功率耗散 Output Collector Power Dissipation	P_O	250	mW
输入电流（上升/下降时间） Input Current (Rise/Fall Time)		$tr_{(IN)}$ /$tf_{(IN)}$	500	ns
隔离电压 (2*) Isolation Voltage		V_{ISO}	3750	Vrms
总功耗 Total Power Dissipation		P_T	300	mW
工作温度 Operating temperature		T_{OPR}	-40 to +110	℃
储存温度 Storage temperature		T_{STG}	-55 to +125	℃
焊接温度 (3*) Soldering temperature		T_{SOL}	260	℃

附注 (Notes):

1* 脉冲宽度 ≤ 1μs、300pps Pulse width ≤ 1μs, 300pps

2* 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和3脚短接在一起,, 4、5和6脚短接在一起

AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1 and 3 are shorted together, and pins 4 to 6 are shorted together.

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

6. 电气特性(Ta=-40至110℃,除非另有规定)

Electrical Characteristics(Ta=-40 to 110℃ 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	1.2	1.37	1.8	V	I_F=10mA
	输入正向电压温度系数 Input Forward Voltage Temperature Coefficient	ΔVF/ ΔT	-	-1.237	-	mV/°C	I_F=10mA
	反向电压 Input Reverse Voltage	V_R	5	-	-	V	I_R = 10μA
	输入电容 Input Capacitance	C_{IN}	-	33	-	pF	f = 1 MHz VF = 0 V
输出 Output	高电平输出电流 High level supply current	I_{CCH}	-	1.9	3.0	mA	Output Open I_F =7to16mA
	低电平输出电流 Low level supply current	I_{CCL}	-	2.1	3.0	mA	Output Open V_F=-3to+0.8V

• 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
高电平输出电流(4*) HIGH Level Output Current	I_{OH}	-	-	-0.3	A	V_O= V_{CC} -1.5V
		-	-	-0.8		V_O= V_{CC} -3V
低电平输出电流(4*) LOW Level Output Current	I_{OL}	0.3	-	-	A	V_O= V_{EE} +1.5V
		0.8	-	-		V_O= V_{EE} +3V
高电平输出电压 HIGH Level Output Voltage	V_{OH}	V_{CC}-0.6	V_{CC}-0.35	-	V	I_F=10mA I_O=-100mA
低电平输出电压 LOW Level Output Voltage	V_{OL}	-	V_{EE}+0.25	V_{EE}+0.4	V	I_F=10mA I_O=100mA
输入阈值电流 Input Threshold Current	I_{FLH}	-	1.9	5	mA	I_O=0mA, V_O >5V
输入阈值电压 Input Threshold Voltage	V_{FLH}	0.8	-	-	V	I_O=0mA, V_O <5V
低电压锁定阈值 Under Voltage Lockout Threshold	V_{UVLO+}	-	7.8	-	V	I_F=10mA V_O >5V
低电压锁定阈值 Under Voltage Lockout Threshold	V_{UVLO-}	-	6.7	-	V	I_F=10mA V_O <5V

开关特性 Switching 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
低电平传输延迟 Propagation Delay Time to output Low level	T_{PHL}	50	120	200	ns	I_F=7 to 16mA V_{CC}=15 or 30V R_G=47Ω，C_G=3nF f=10kHz, T_A=25°C Duty Cycle=50% V_{EE}=ground
高电平传输延迟 Propagation Delay Time to output High level	T_{PLH}	50	110	200	ns	
脉冲宽度失真 Pulse width distortion	PWD	-	10	70	ns	
传播延迟差(5*) Propagation Delay Skew	PDD	100	-	100	ns	
输出上升时间 Output rise time	tr	-	35	-	ns	
输出下降时间 Output fall time	tf	-	35	-	ns	
输出高电平共模抑制(6*) Common Mode Transient Immunity at Logic High	CM_H	35	50	-	kV/us	I_F=10 to16mA, V_{CC}=30V,T_A=25°C V_{CM}=1500V
输出低电平共模抑制(7*) Common Mode Transient Immunity at Logic Low	CM_L	35	50	-	kV/us	V_{CC}=30V,V_F=0V, V_{CM}=1500V, T_A=25°C

附注 (Notes):

4* 最大脉冲宽度10μs，最大占空比1% Max pulse width=10μs, max duty cycle =1%

5* 传输延迟偏差的定义是最大和最小传输延迟时间的差值(即 T_{PHL}或 T_{PLH}之差)，在相同的测试条件(电源电压、输入电流、温度等)下对产品进行评估。

Propagation delay skew is defined as the difference between the largest and smallest propagation delay times (i.e. T_{PHL} or T_{PLH}) of multiple samples. Evaluations of these samples are conducted under identical test conditions (supply voltage, input current, temperature, etc).

6* 输出高电平共模抑制是共模脉冲信号 V_{CM} 后沿的最大可容电压上升率 dv/dt，使输出保持高电平(即 V_O>15.0V)

Common mode transient immunity at output high is the maximum tolerable negative dv/dt on the trailing edge of the common mode impulse signal, V_{CM}, to assure that the output will remain high (i.e. V_O >15.0V)

7* 输出低电平共模抑制是共模脉冲信号 V_{CM} 前沿的最大可容电压上升率 dv/dt，使输出保持低电平(即 V_O <1.0V)

Common mode transient immunity at output low is the maximum tolerable positive dv/dt on the leading edge of the common mode pulse signal, VCM, to assure that the output will remain low (i.e. V_O <1.0V)

7. 特性曲线 Characteristic Curves

图1. 高输出轨电压和环境温度的关系

Fig 1. High output rail voltage vs Ambient Temperature

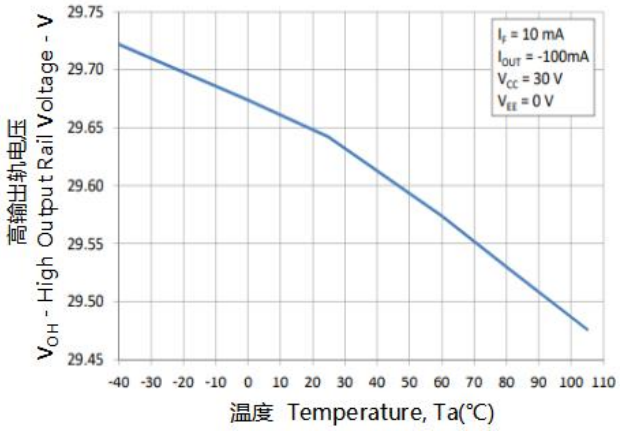


图2. 高电平输出电压和环境温度的关系

Fig.2 V_{OH} vs Ambient Temperature

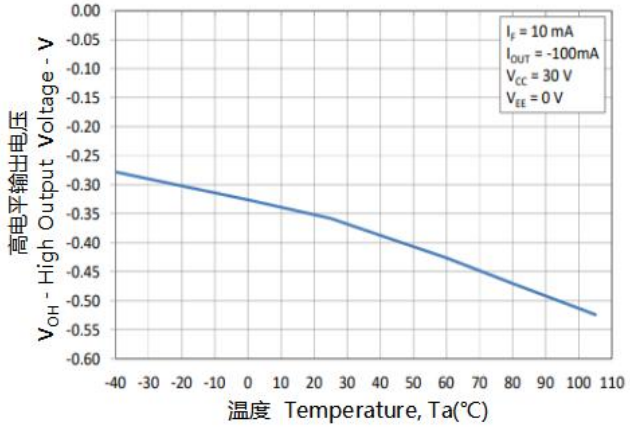


图3. 低电平输出电压和环境温度的关系

Fig 3. V_{OL} vs Ambient Temperature

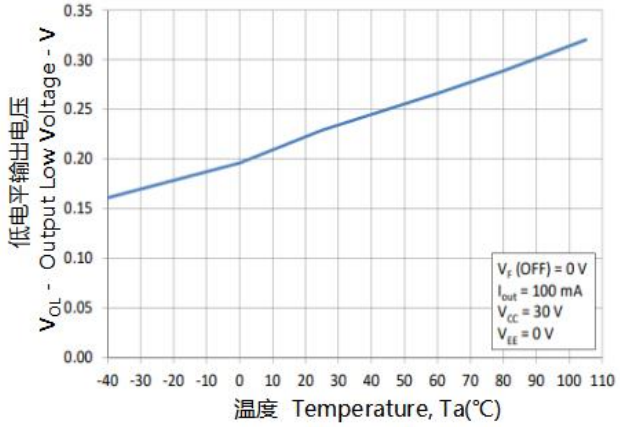


图4. 电源电流和环境温度的关系

Fig 4. I_{CC} vs Ambient Temperature

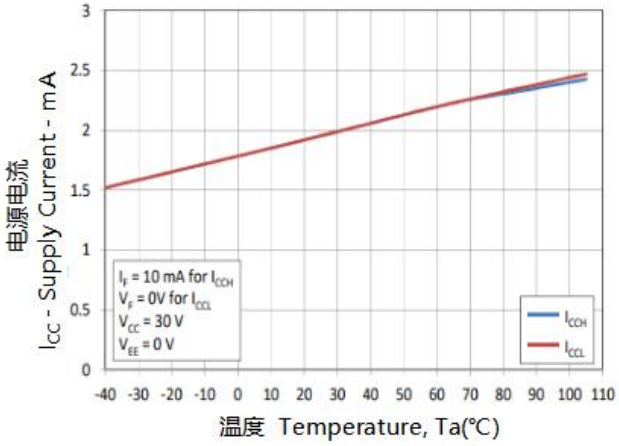


图5. 供电电流和电源电压的关系

Fig 5. Supply Current vs Supply voltage

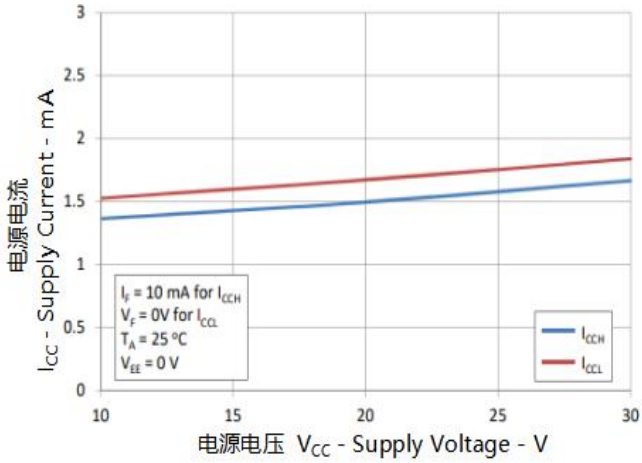


图6. 输入阈值电流滞后

Fig 6. I_{FLH} hysteresis

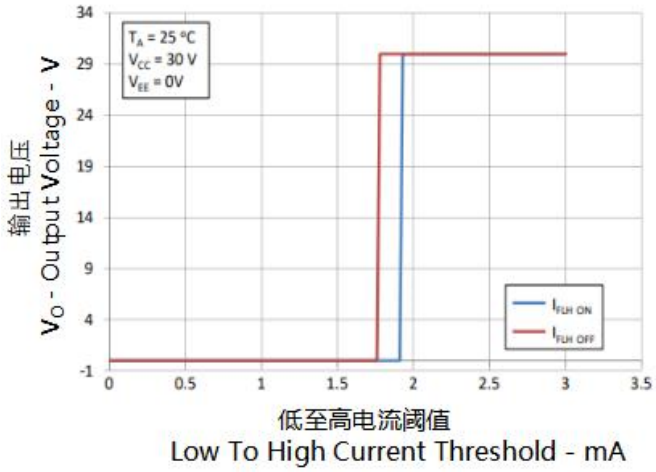


图7. 阈值输入电流和环境温度的关系

Fig 7. I_{FLH} vs Ambient Temperature

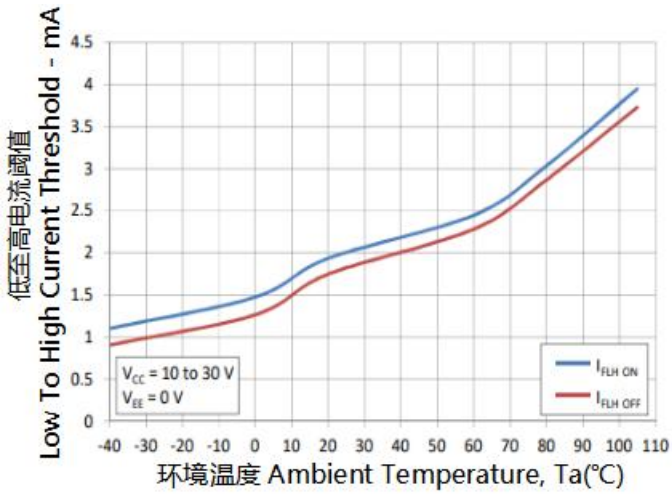


图8. 传播延迟和电源电压的关系

Fig 8. Propagation delays vs V_{CC}

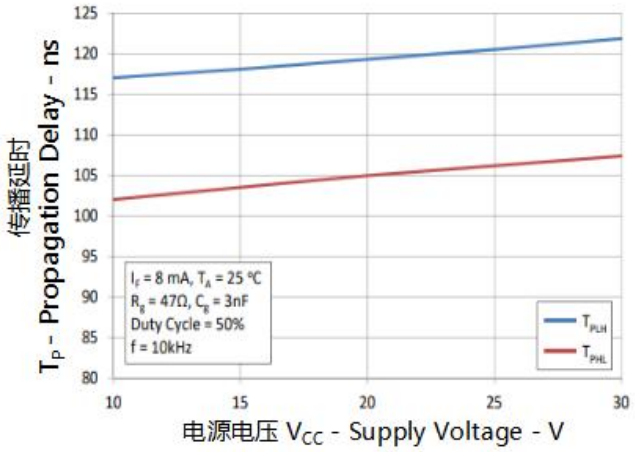


图9. 传播延迟和正向电流的关系

Fig 9. Propagation Delay vs I_F

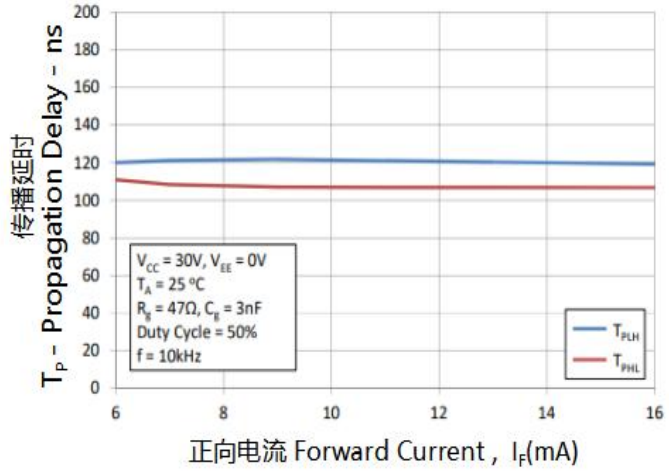


图10. 传播延迟和环境温度的关系

Fig 10. Propagation Delay vs Temperature

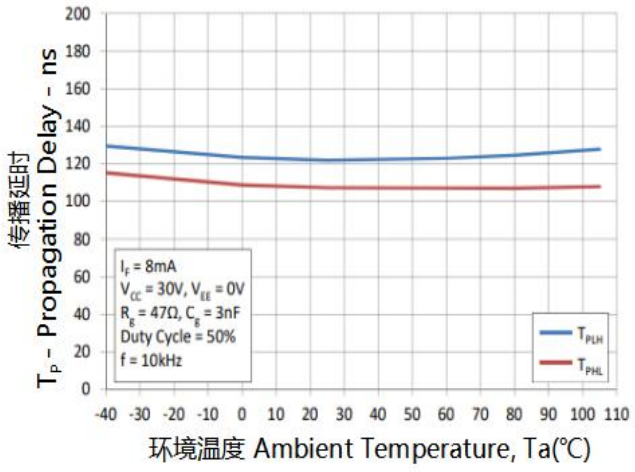


图11. 传播延时和负载电阻的关系

Fig 11. Propagation Delay vs Series Load Resistance

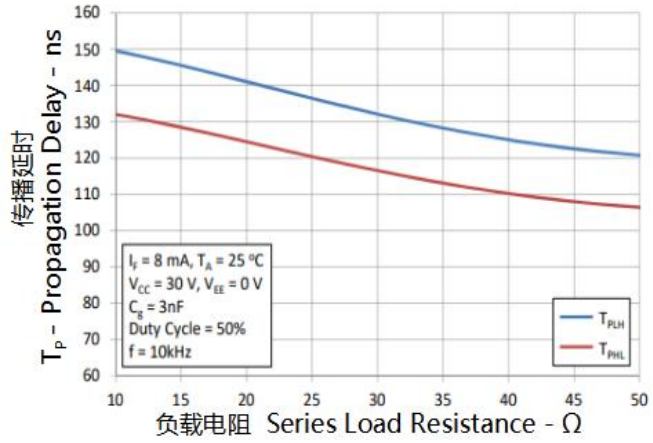


图12. 传播延时和负载电容的关系

Fig 12. Propagation Delay vs Load Capacitance

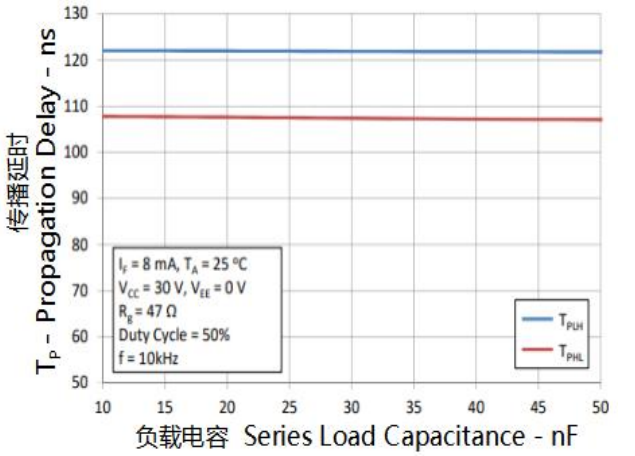


图13. 正向电流比与正向电压的关系

Fig 13. Forward Current vs Forward Voltage

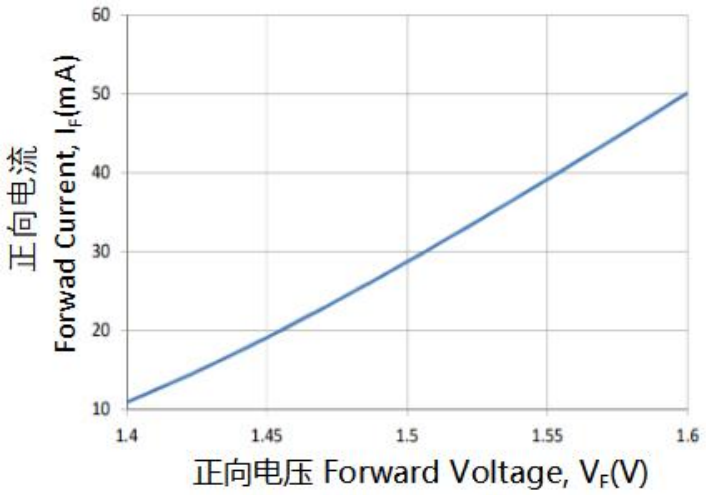


图14.I_{OH}测试电路

Fig 14. I_{OH} Test circuit

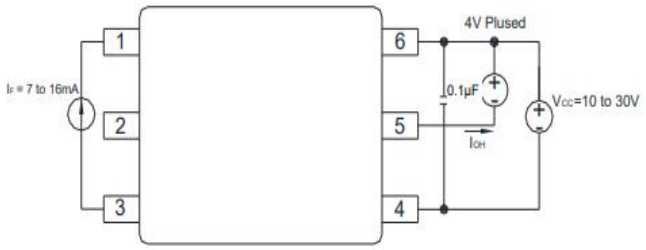


图15. I_{OL}测试电路

Fig 15. I_{OL} Test circuit

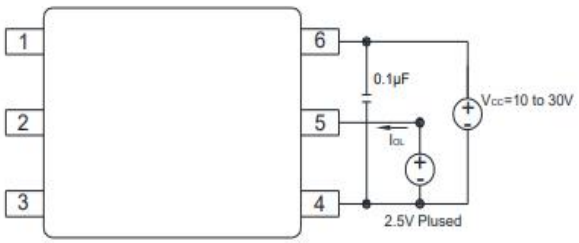


图16.V_{OH}测试电路

Fig 16. V_{OH} Test circuit

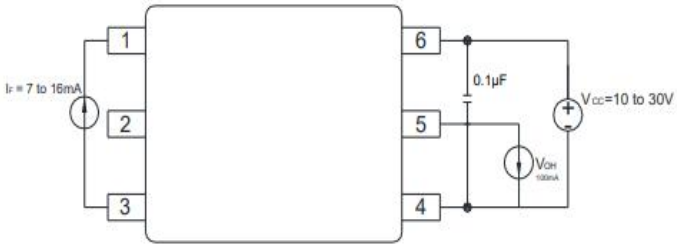


图17. V_{OL}测试电路

Fig 17. V_{OL} Test circuit

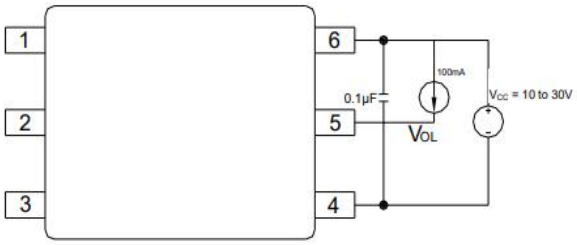


图18.I_{FHL}测试电路

Fig 18. I_{FHL} Test circuit

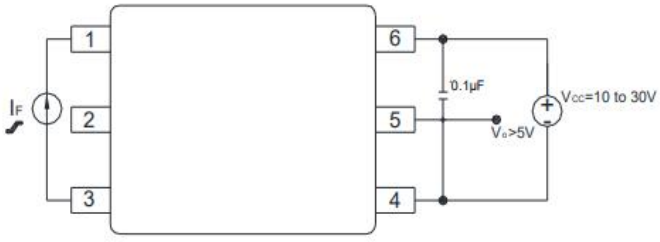


图19. UVLO测试电路

Fig 19. UVLO Test circuit

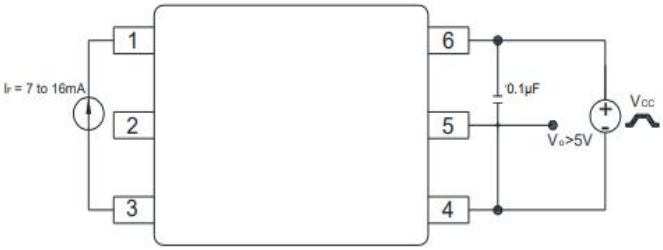


图20. 开关时间测试电路

Fig 20. Switching Time Test circuit

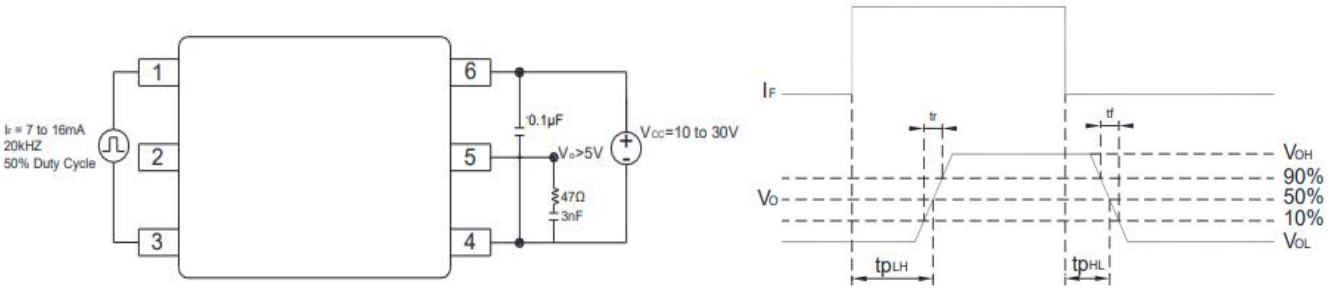
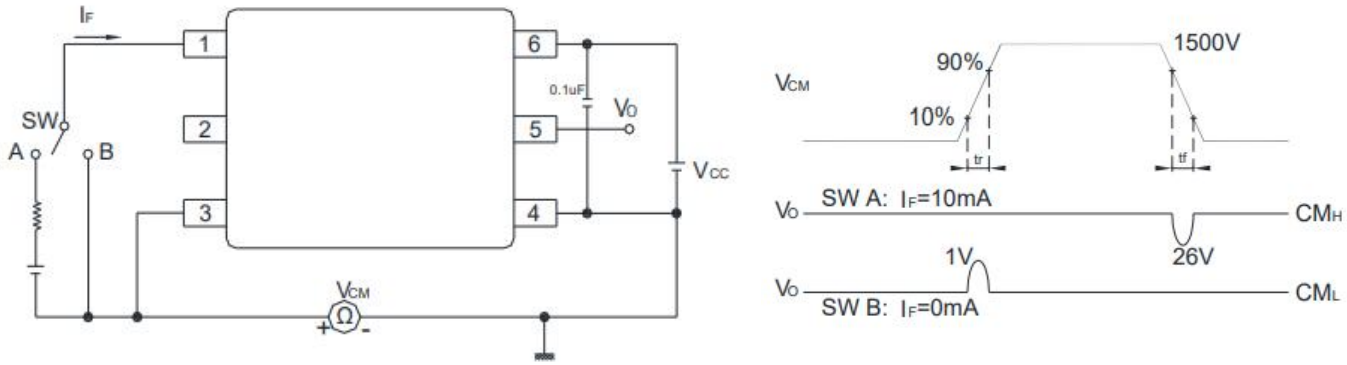


图21. CMR 测试电路

Fig 21. CMR Test circuit



8. 订单信息 Order Information

• 材料编号 Part Number

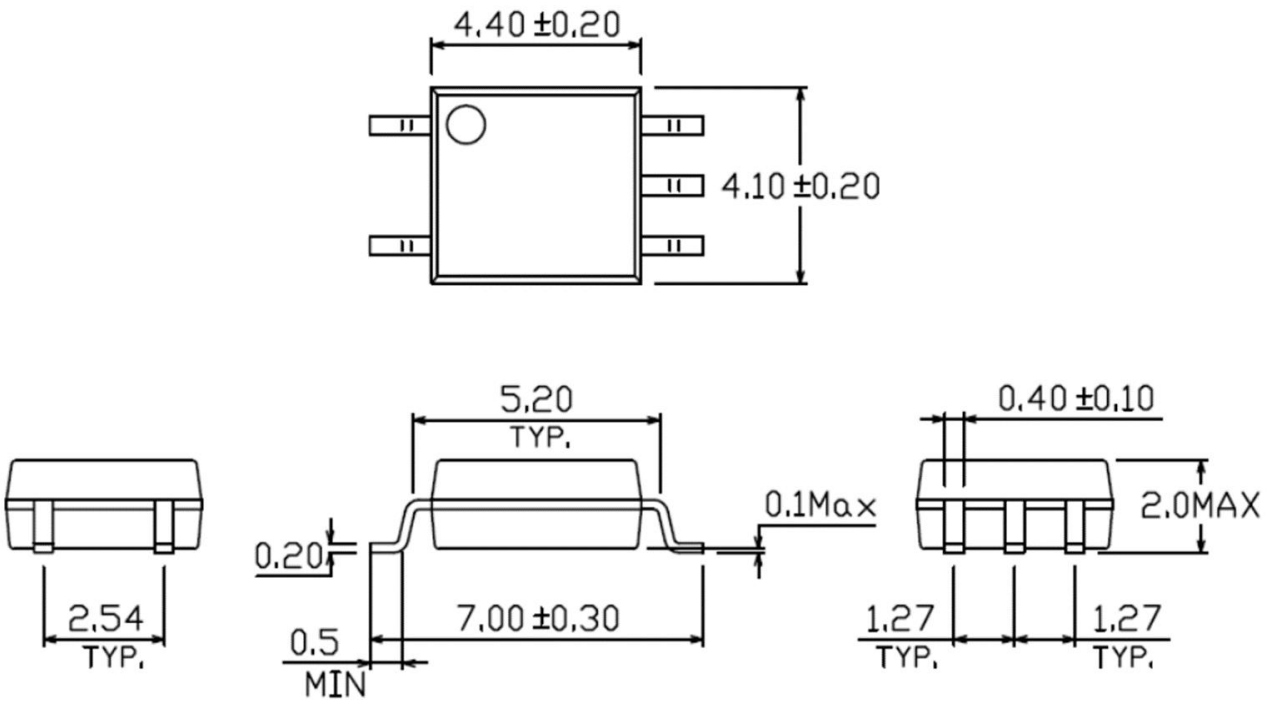
KL155E-Z-V

附注(Notes):

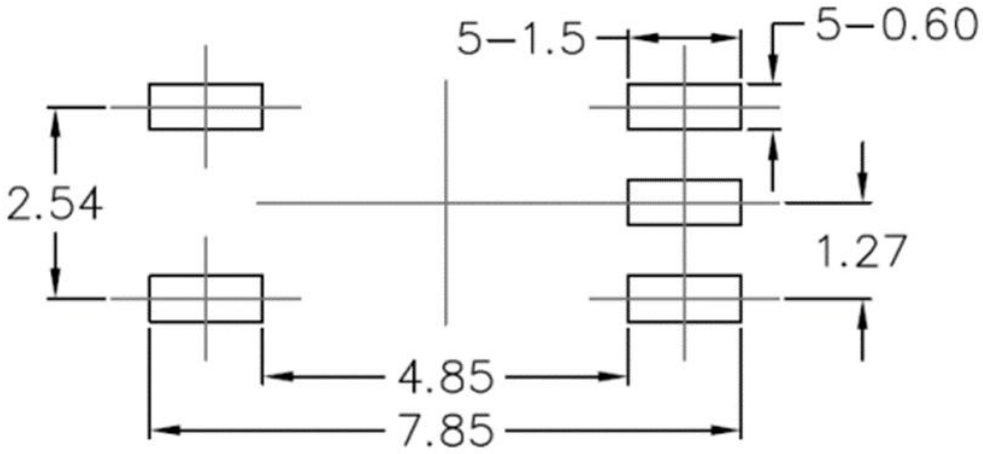
Z = 料带和卷轴选项(TA或TB)
Tape and reel option (TA or TB)
V = 表示VDE标识(客户指定镭射字符才加"V")
VDE (Only add "V" to laser characters specified by the customer)

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: 10inner boxes	每箱90000pcs 90000pcs per Carton

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



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



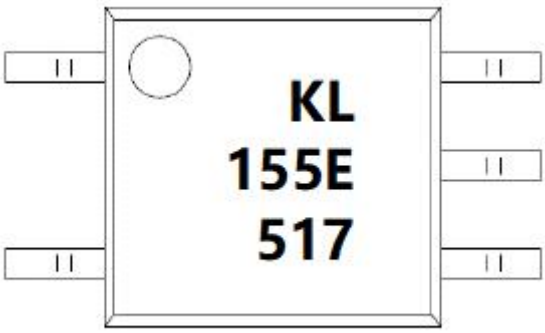
备注 Notes

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

155E = 表示材料部件号 Denotes Device Part Number

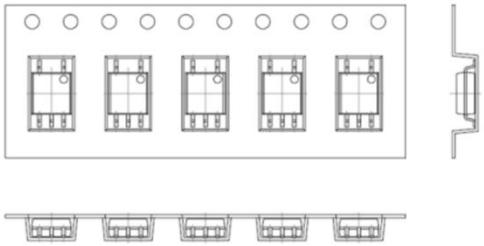
Y = 表示1位年份代码Denotes 1 digit Year code

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)

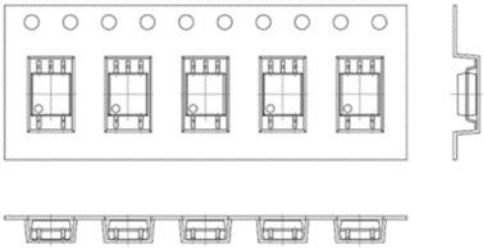
11.料带和卷轴包装规格 Tape & Reel Packing Specifications

• 选择TA Option TA



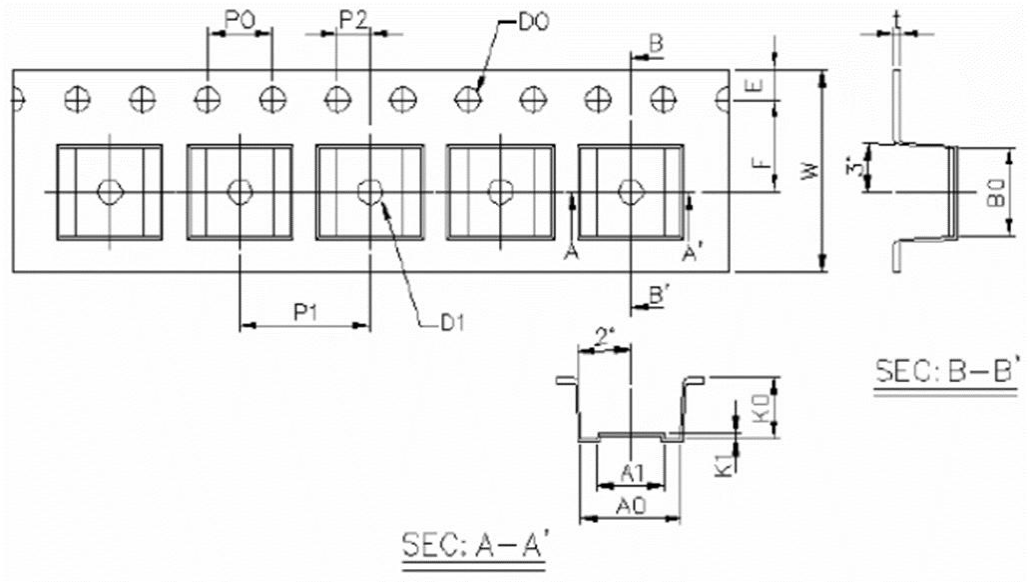
卷轴进给方向 Direction of feed from reel

• 选择TB Option TB



卷轴进给方向 Direction of feed from reel

料带尺寸Material belt size



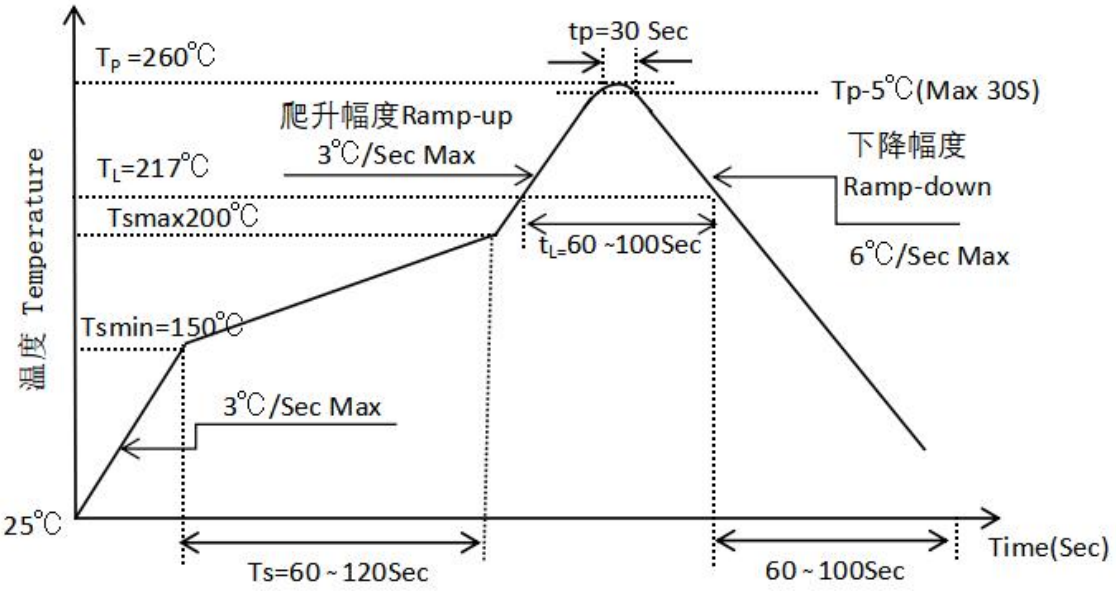
尺寸编号 Dimension No.	A0	A1	B0	D0	D1	E
尺寸(mm) Dimension(mm)	6.2±0.1	4.1±0.1	5.28±0.1	1.5±0.1	1.5±0.3	1.75±0.1
尺寸编号 Dimension No.	P0	P1	P2	t	W	K0
尺寸(mm) Dimension(mm)	4.0±0.1	8.0±0.1	2.0±0.1	0.4±0.1	12.0+0.3/-0.1	3.7±0.1

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