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H11N1M、H11N2M、H11N3M 6 引脚 DIP 施密特触发器输出光电耦合器

特性

- 高数据率，典型值为 5 MHz (NRZ)
- 在整个电压和温度范围内无闭锁效应和振荡效应
- 微处理器兼容驱动
- 在 0.5 V 条件下，逻辑兼容最大输出灌电流 16 mA
- 稳定的通断阈值滞回
- 宽广电源电压能力，与所有常见的逻辑系统兼容
- 安全和法规认证：
 - UL1577, 4170 VAC_{RMS} (1 分钟)
 - DIN-EN/IEC60747-5-5, 850 V 峰值工作绝缘电压

应用

- 逻辑至逻辑隔离器
- 可设置电流值传感器
- 线路接收器 - 解决噪声和瞬态问题
- AC 至 TTL 转换 - 方波整形
- 与外围设备接口计算机
- 电源的隔离电源 MOS 驱动器

描述

H11NXM 系列具备高速集成电路检测器，该检测器光学耦合至铝砷化镓 (AlGaAs) 红外线发光二极管。输出包含施密特触发器，为抗噪能力和脉冲整形提供滞后。检测器电路有所优化，操作简化并利用开路集电极输出实现最大程度的应用灵活性。

示意图

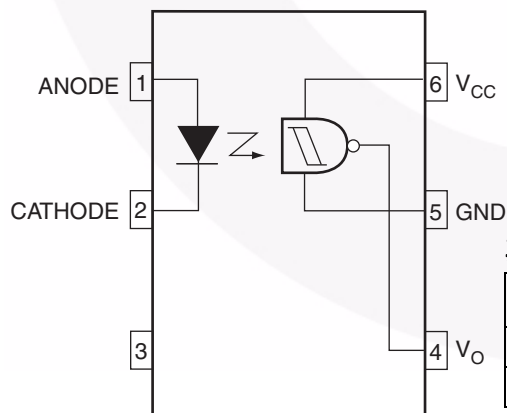


图 1. 示意图

真值表

| 输入 | 输出 |
|----|----|
| H | L |
| L | H |

封装轮廓

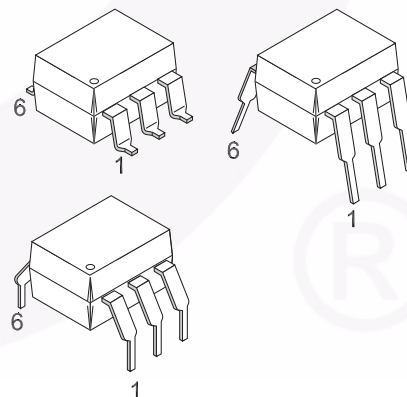


图 2. 封装轮廓

安全性和绝缘标准

根据 DIN EN/IEC 60747-5-5, 此光电耦合器仅适用于安全极限数据之内的“安全电气绝缘”。通过保护性电路确保各项安全标准达标。

| 参数 | | 特性 |
|------------------------------------------|------------------------|-----------|
| 基于 DIN VDE 0110/1.89 表 1 的安装分类, 提供额定电源电压 | < 150 V _{RMS} | I–IV |
| | < 300 V _{RMS} | I–IV |
| 气候分类 | | 55/100/21 |
| 污染等级 (DIN VDE 0110/1.89) | | 2 |
| 相比漏电起痕指数 | | 175 |

| 符号 | 参数 | 数值 | 单位 |
|-----------------------|-------------------------------------------------------------------------------------------------|-------------------|-------------------|
| V _{PR} | 输入至输出测试电压, 方法 A, $V_{IORM} \times 1.6 = V_{PR}$, 型式和样品测试, $t_m = 10\text{ s}$, 局部放电 < 5 pC | 1360 | V _{peak} |
| | 输入至输出测试电压, 方法 B, $V_{IORM} \times 1.875 = V_{PR}$, 100% 生产测试, $t_m = 1\text{ s}$, 局部放电 < 5 pC | 1594 | V _{peak} |
| V _{IORM} | 最大工作绝缘电压 | 850 | V _{peak} |
| V _{IOTM} | 最高允许过电压 | 6000 | V _{peak} |
| | 外部爬电距离 | ≥ 7 | mm |
| | 外部绝缘间隙 | ≥ 7 | mm |
| | 外部绝缘间隙 (适用于选项 TV, 0.4" 引脚间隔) | ≥ 10 | mm |
| DTI | 绝缘穿透距离 (绝缘厚度) | ≥ 0.5 | mm |
| T _S | 壳体温度 ⁽¹⁾ | 175 | °C |
| I _{S,INPUT} | 输入电流 ⁽¹⁾ | 350 | mA |
| P _{S,OUTPUT} | 输出功率 ⁽¹⁾ | 800 | mW |
| R _{IO} | T _S 、V _{IO} = 500 V ⁽¹⁾ 时的绝缘阻抗 | > 10 ⁹ | Ω |

注:

1. 安全极限值 – 发生故障时允许的最大值。

绝对最大额定值

应力超过绝对最大额定值，可能会损坏器件。在超出推荐的工作条件的情况下，该器件可能无法正常工作，所以不建议让器件在这些条件下长期工作。此外，长期在高于推荐的工作条件下工作，会影响器件的可靠性。绝对最大额定值仅是应力规格值。除非另有说明， $T_A = 25^\circ\text{C}$ 。

| 符号 | 参数 | 数值 | 单位 |
|--------------------|------------------------------|--------------|-------|
| 整个器件 | | | |
| T _{STG} | 存储温度 | -40 至 +125 | °C |
| T _{OPR} | 工作温度 | -40 至 +85 | °C |
| T _J | 结温 | -40 至 +125 | °C |
| T _{SOL} | 引脚焊接温度 | 260 时持续 10 秒 | °C |
| P _D | 器件总功耗（25°C 时） 超过 25°C 时降额 | 210 | mW |
| | | 2.94 | mW/°C |
| 发射极 | | | |
| I _F | 连续正向电流 | 30 | mA |
| V _R | 反向电压 | 6 | V |
| I _{F(pk)} | 正向电流 - 峰值（1 μs 脉冲、300 pps） | 100 | mA |
| P _D | LED 功耗 | 60 | mW |
| 检测器 | | | |
| P _D | 检测器功耗 | 150 | mW |
| V _O | V ₄₅ 允许范围 | 0 至 16 | V |
| V _{CC} | V ₆₅ 允许范围 | 3 至 16 | V |
| I _O | I ₄ 输出电流 | 50 | mA |

电气特性

除非另有说明， $T_A = 25^\circ\text{C}$ 。

独立元器件特性

| 符号 | 参数 | 测试条件 | 器件 | 最小值 | 典型值 | 最大值 | 单位 |
|----------------------|----------|---------------------------------------|----|------|------|-----|---------------|
| 发射极 | | | | | | | |
| V_F | 输入正向电压 | $I_F = 10\text{ mA}$ | 所有 | | 1.4 | 2.0 | V |
| | | $I_F = 0.3\text{ mA}$ | | 0.75 | 1.25 | | |
| I_R | 反向电流 | $V_R = 5\text{ V}$ | 所有 | | | 10 | μA |
| C_J | 电容值 | $V = 0, f = 1.0\text{ MHz}$ | 所有 | | | 100 | pF |
| 检测器 | | | | | | | |
| V_{CC} | 工作电压范围 | | 所有 | 4 | | 15 | V |
| $I_{CC(\text{off})}$ | 电源电流 | $I_F = 0, V_{CC} = 5\text{ V}$ | 所有 | | 6 | 10 | mA |
| I_{OH} | 输出电流，高电平 | $I_F = 0, V_{CC} = V_O = 15\text{ V}$ | 所有 | | | 100 | μA |

电气特性 (续)除非另有说明, $T_A = 25^\circ\text{C}$ 。**转换特性**

| 符号 | 直流特性 | 测试条件 | 器件 | 最小值 | 典型值 | 最大值 | 单位 |
|------------------------|-----------|------------------------------------------------------------------------|--------|------|-----|------|----|
| $I_{CC(on)}$ | 电源电流 | $I_F = 10\text{ mA}$, $V_{CC} = 5\text{ V}$ | 所有 | | 6.5 | 10.0 | mA |
| V_{OL} | 输出电压, 低电平 | $R_L = 270\ \Omega$, $V_{CC} = 5\text{ V}$, $I_F = I_{F(on)}$ 最大值 | 所有 | | | 0.5 | V |
| $I_{F(on)}$ | 导通阈值电流 | $R_L = 270\ \Omega$, $V_{CC} = 5\text{ V}^{(2)}$ | H11N1M | 0.8 | | 3.2 | mA |
| | | | H11N2M | 2.3 | | 5.0 | |
| | | | H11N3M | 4.1 | | 10.0 | |
| $I_{F(off)}$ | 关断阈值电流 | $R_L = 270\ \Omega$, $V_{CC} = 5\text{ V}$ | 所有 | 0.3 | | | mA |
| $I_{F(off)}/I_{F(on)}$ | 滞回率 | $R_L = 270\ \Omega$, $V_{CC} = 5\text{ V}$ | 所有 | 0.65 | | 0.95 | |

开关速度

| 符号 | 交流特性 | 测试条件 | 器件 | 最小值 | 典型值 | 最大值 | 单位 |
|-----------|------|-----------------------------------------------------------------------|----|-----|-----|-----|-----|
| t_{on} | 导通时间 | $C = 120\text{ pF}$, $t_p = 1\ \mu\text{s}$, $R_E = ^{(3)}$ 、图 9 | 所有 | | 100 | 330 | ns |
| t_r | 上升时间 | $C = 120\text{ pF}$, $t_p = 1\ \mu\text{s}$, $R_E = ^{(3)}$ 、图 9 | 所有 | | 7.5 | | ns |
| t_{off} | 关断时间 | $C = 120\text{ pF}$, $t_p = 1\ \mu\text{s}$, $R_E = ^{(3)}$ 、图 9 | 所有 | | 150 | 330 | ns |
| t_f | 下降时间 | $C = 120\text{ pF}$, $t_p = 1\ \mu\text{s}$, $R_E = ^{(3)}$ 、图 9 | 所有 | | 12 | | ns |
| | 数据速率 | | 所有 | | 5 | | MHz |

绝缘特性

| 符号 | 参数 | 测试条件 | 最小值 | 典型值 | 最大值 | 单位 |
|-----------|----------|-----------------------------------------------------------|-----------|-----|-----|----------------|
| V_{ISO} | 输入输出绝缘电压 | $t = 1\text{ 分钟}$ | 4170 | | | $V_{AC_{RMS}}$ |
| C_{ISO} | 绝缘电容 | $V_{I-O} = 0\text{ V}$, $f = 1\text{ MHz}$ | | 0.4 | 0.6 | pF |
| R_{ISO} | 绝缘电阻 | $V_{I-O} = \pm 500\text{ VDC}$, $T_A = 25^\circ\text{C}$ | 10^{11} | | | Ω |

注意:

- 最大 $I_{F(on)}$ 是触发输出要求的最大电流。例如, 最大 3.2 mA 触发电流要求由大于 3.2 mA 的电流驱动 LED, 以确保器件导通。推荐提供 10% 的保护带, 用以承受 LED 整个生命周期中的退化。允许的最大 LED 驱动电流是 30 mA。
- H11N1: $R_E = 910\ \Omega$, H11N2: $R_E = 560\ \Omega$, H11N3: $R_E = 240\ \Omega$

典型性能曲线

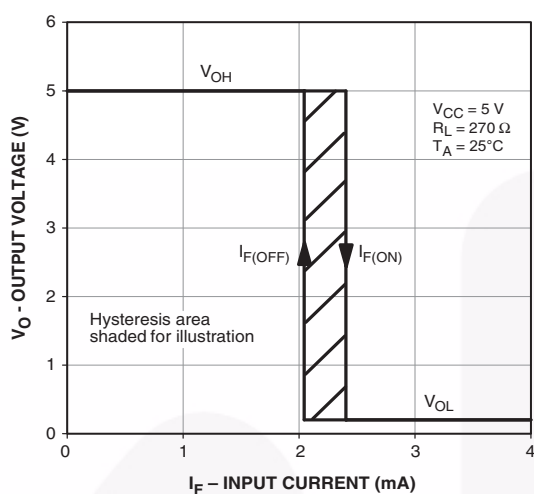


图 3. 传输特性

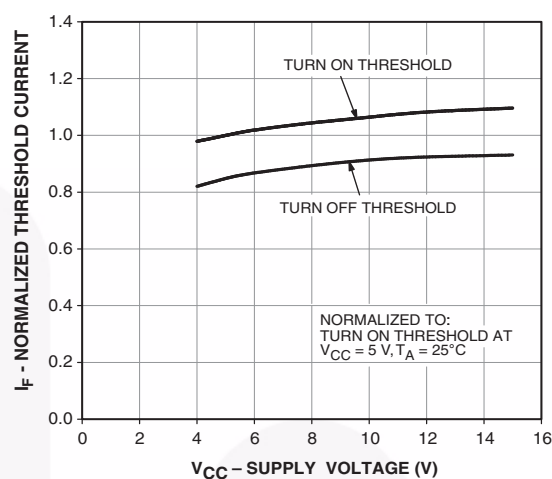


图 4. 阈值电流与源电压

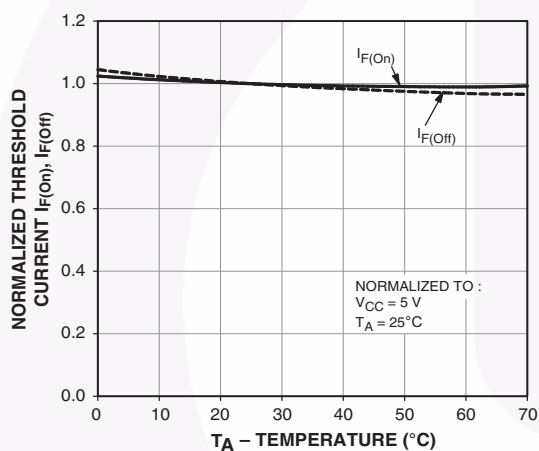


图 5. 阈值电流与温度

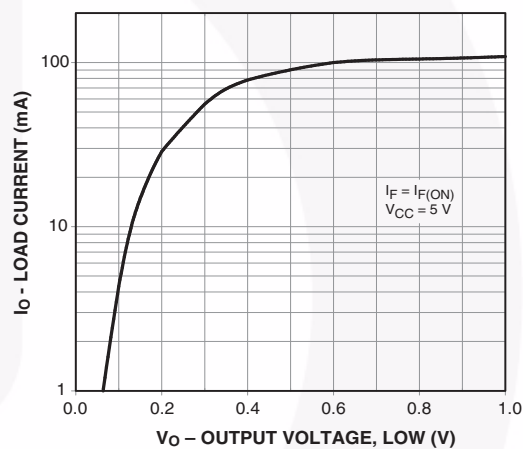


图 6. 负载电流与输出电压

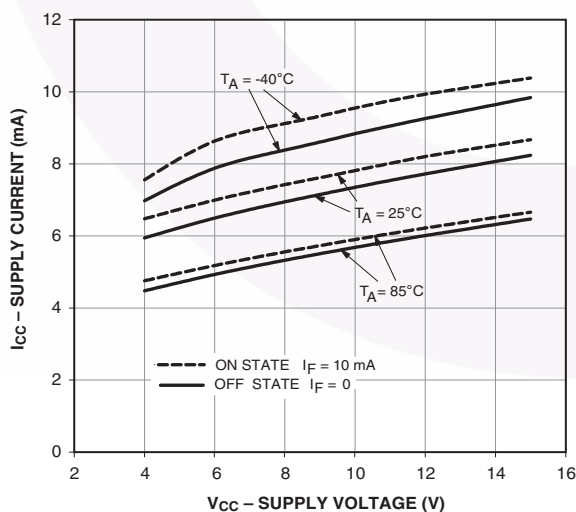


图 7. 源电流与源电压

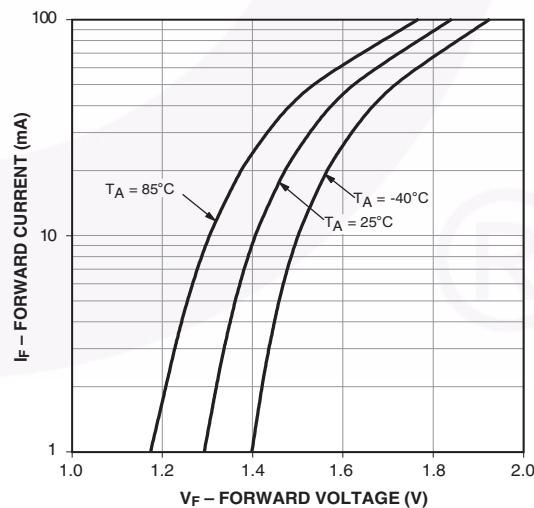


图 8. LED 正向电流与正向电压

开关测试电路与波形

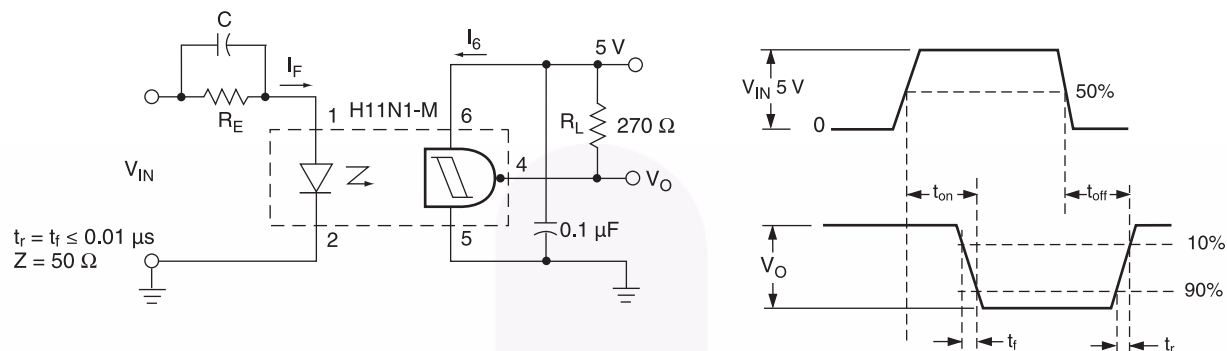


图 9. 开关测试电路与波形

回流焊数据

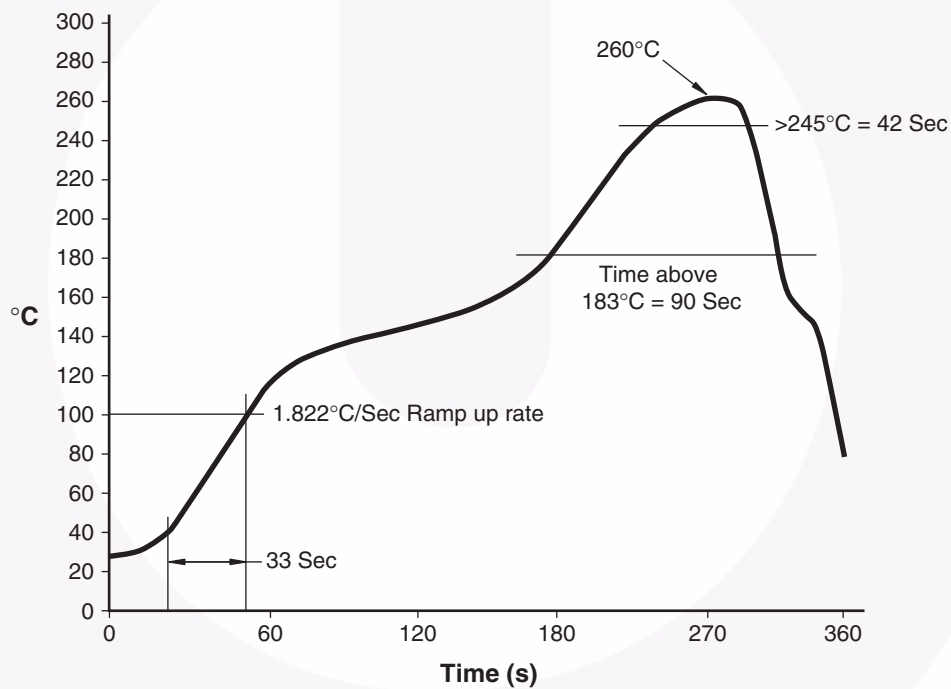


图 10. 回流曲线

订购信息

| 器件编号 | 封装 | 包装方法 |
|------------|--------------------------------------------|---------------|
| H11N1M | DIP 6 引脚 | 管状包装（50 单位） |
| H11N1SM | SMT 6 引脚（引脚弯曲） | 管状包装（50 单位） |
| H11N1SR2M | SMT 6 引脚（引脚弯曲） | 卷带包装（1000 单位） |
| H11N1VM | DIP 6 引脚、DIN EN/IEC 60747-5-5 选项 | 管状包装（50 单位） |
| H11N1SVM | SMT 6 引脚（弯曲引线）、DIN EN/IEC 60747-5-5 选项 | 管状包装（50 单位） |
| H11N1SR2VM | SMT 6 引脚（弯曲引线）、DIN EN/IEC 60747-5-5 选项 | 卷带包装（1000 单位） |
| H11N1TVM | DIP 6 引脚、0.4" 引脚间距、DIN EN/IEC 60747-5-5 选项 | 管状包装（50 单位） |

注：
4. 该表格中列出的产品订购部件编号系统还适用于 H11N2M 和 H11N3M 产品系列。

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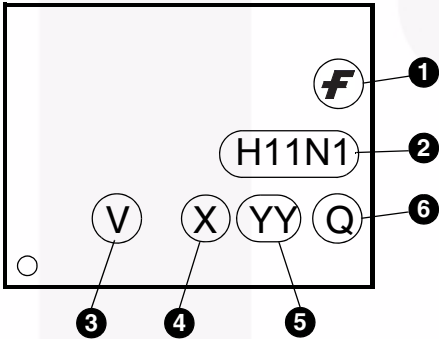
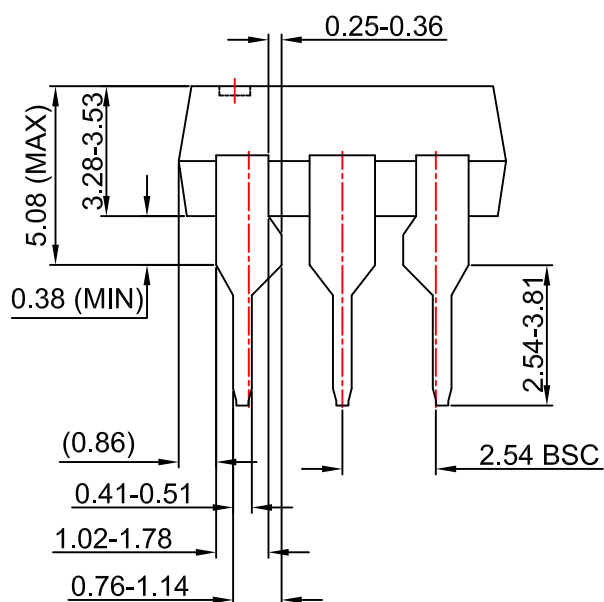
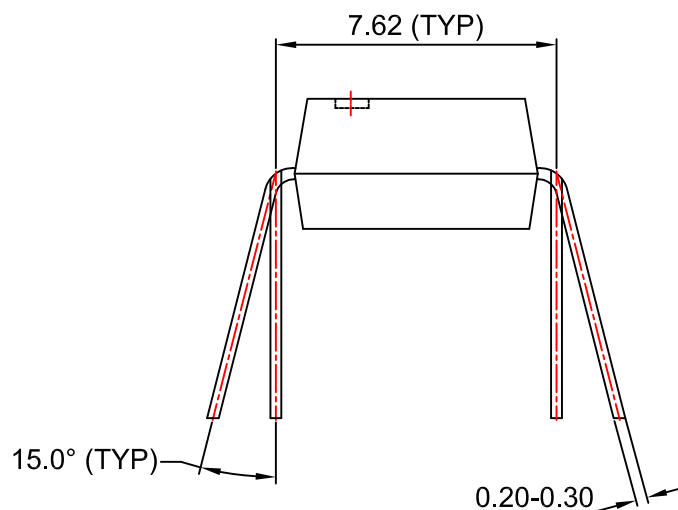
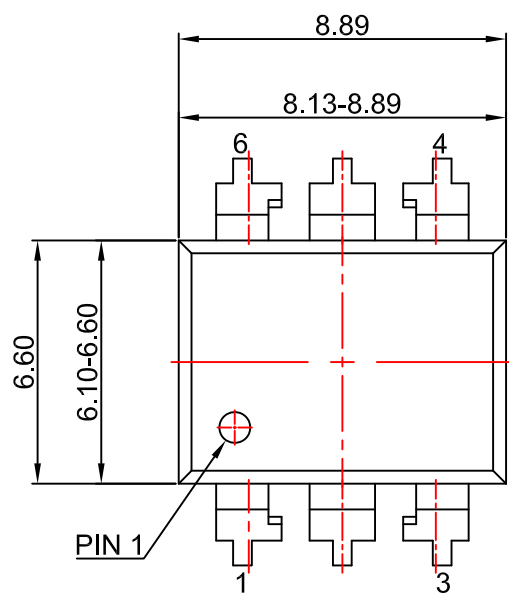


图 11. 顶标

表 1. 顶标定义

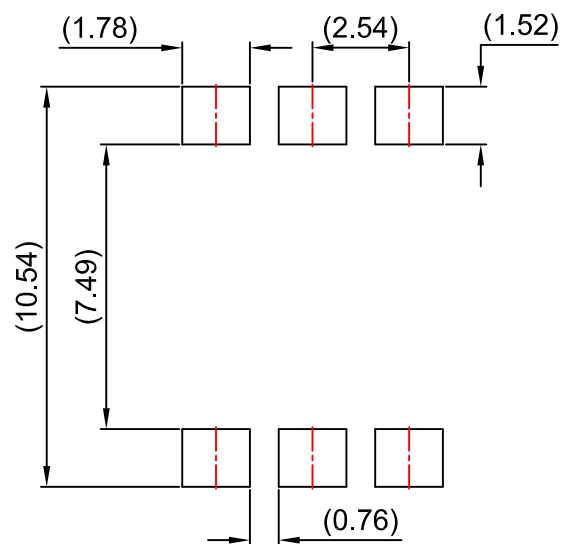
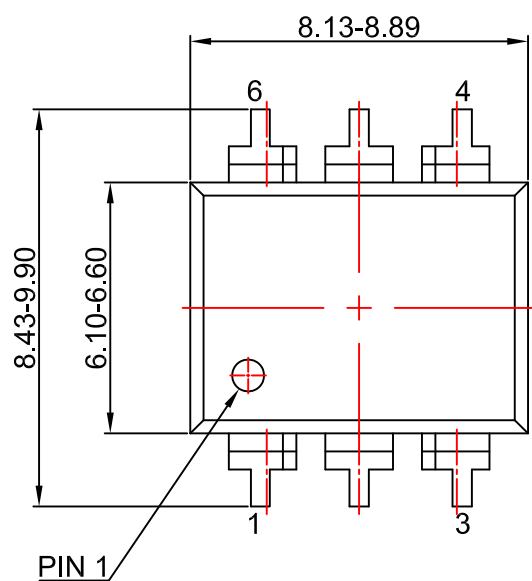
| | |
|---|----------------------------------------|
| 1 | 飞兆徽标 |
| 2 | 器件编号 |
| 3 | DIN EN/IEC60747-5-5 选项（只有组件订购附带此选项时出现） |
| 4 | 一位数年份代码，如“4” |
| 5 | 工作周数，范围从“01”至“53” |
| 6 | 装配封装码 |



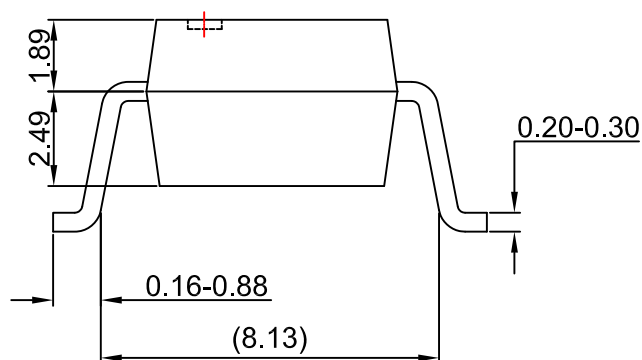
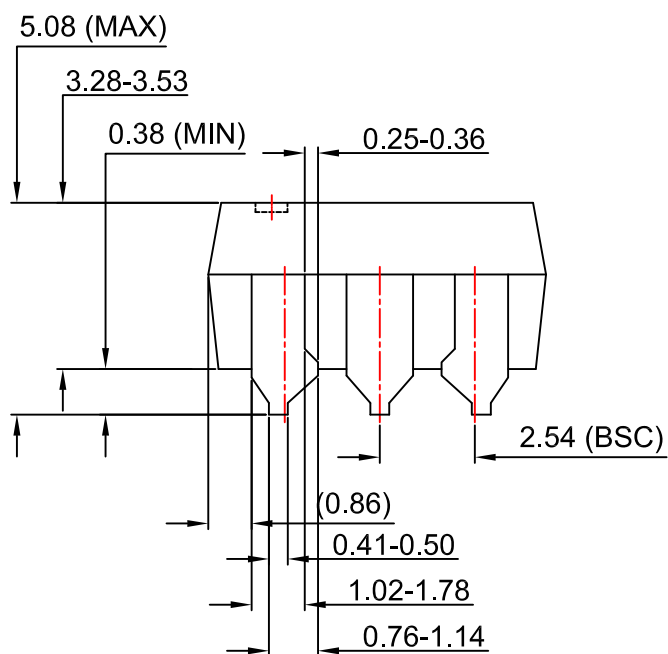
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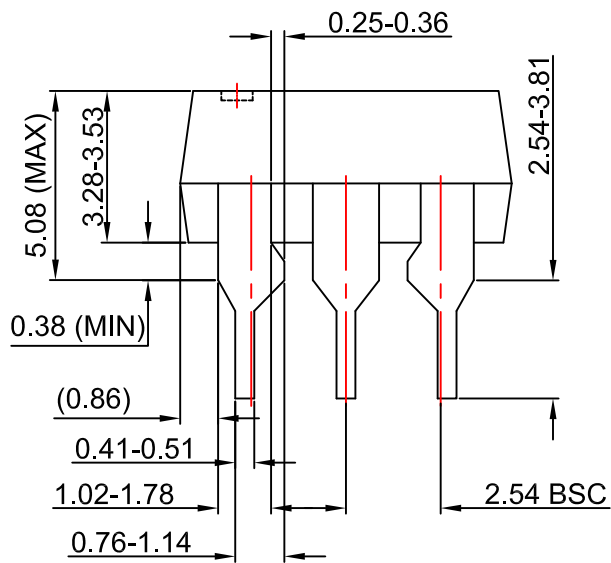
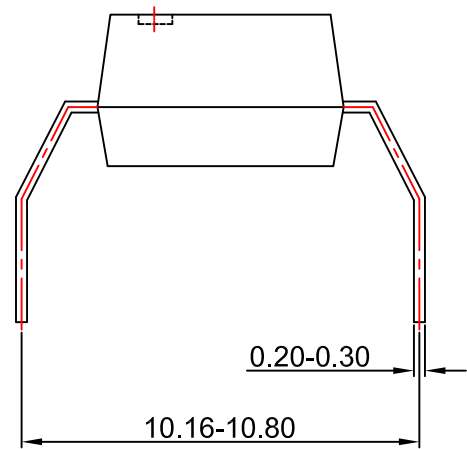
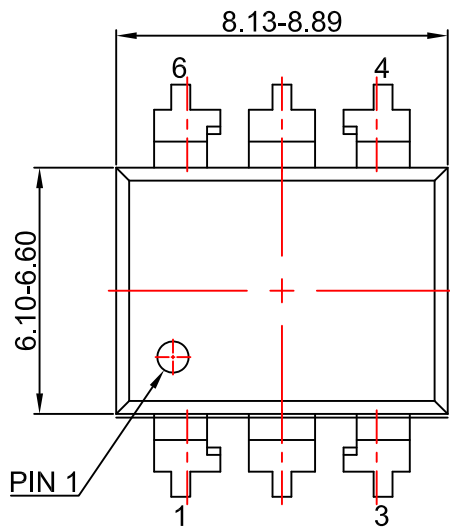
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