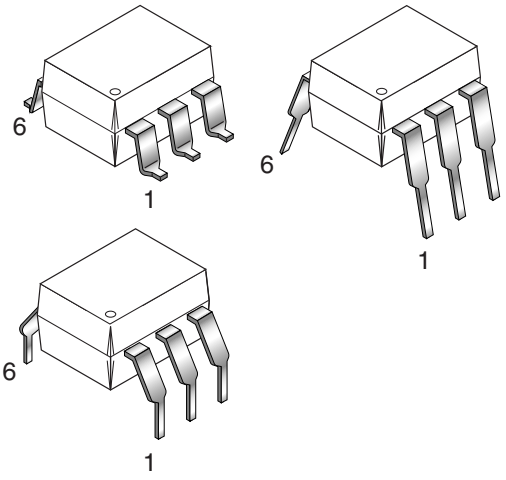
FAIRCHILD
SEMICONDUCTOR®

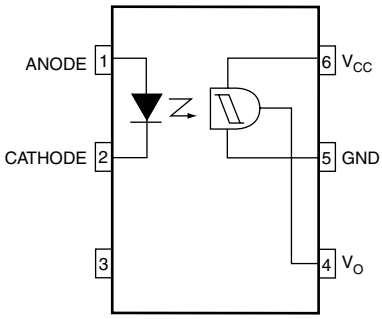
# 6-PIN DIP OPTOISOLATORS LOGIC OUTPUT

**H11L1M** **H11L2M** **H11L3M**

## PACKAGE




## SCHEMATIC




## DESCRIPTION

The H11LXM series has a high speed integrated circuit detector optically coupled to a gallium-arsenide infrared emitting diode. The output incorporates a Schmitt trigger, which provides hysteresis for noise immunity and pulse shaping. The detector circuit is optimized for simplicity of operation and utilizes an open collector output for maximum application flexibility.

### Truth Table

| Input | Output |
|---|---|
| H | L |
| L | H |

## FEATURES

- High data rate, 1 MHz typical (NRZ)
- Free from latch up and oscilliation throughout voltage and temperature ranges.
- Microprocessor compatible drive
- Logic compatible output sinks 16 mA at 0.4 V maximum
- Guaranteed on/off threshold hysteresis
- Wide supply voltage capability, compatible with all popular logic systems
- Underwriters Laboratory (UL) recognized—file #E90700, Volume 2
- VDE recognized – File#102497 – Add option V (e.g., H11LIVM)

## APPLICATIONS

- Logic to logic isolator
- Programmable current level sensor
- Line receiver—eliminate noise and transient problems
- A.C. to TTL conversion—square wave shaping
- Digital programming of power supplies
- Interfaces computers with peripherals

## ABSOLUTE MAXIMUM RATINGS

| Parameters | Symbol | Device | Value | Units |
|---|---|---|---|---|
| **TOTAL DEVICE** | | | | |
| Storage Temperature | $T_{STG}$ | All | -55 to +150 | °C |
| Operating Temperature | $T_{OPR}$ | All | -40 to +85 | °C |
| Lead Solder Temperature | $T_{SOL}$ | All | 260 for 10 sec | °C |
| Total Device Power Dissipation @ 25°C | $P_D$ | All | 250 | mW |
| Derate Above 25°C | | | 2.94 | mW/°C |
| **EMITTER** | | | | |
| Continuous Forward Current | $I_F$ | All | 60 | mA |
| Reverse Voltage | $V_R$ | All | 6 | V |
| Forward Current - Peak (1 µs pulse, 300 pps) | $I_F$(pk) | All | 3.0 | A |
| LED Power Dissipation 25°C Ambient | $P_D$ | All | 120 | mW |
| Derate Linearly From 25°C | | | 1.41 | mW/°C |
| **DETECTOR** | | | | |
| Detector Power Dissipation @ 25°C | $P_D$ | All | 150 | mW |
| Derate Linearly from 25°C | | | 2.0 | mW/°C |
| $V_{45}$ Allowed Range | $V_O$ | All | 0 to 16 | V |
| $V_{65}$ Allowed Range | $V_{CC}$ | All | 3 to 16 | V |
| $I_4$ Output Current | $I_O$ | All | 50 | mA |

## ELECTRICAL CHARACTERISTICS ($T_A$ = 25°C Unless otherwise specified.)

## INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameters | Test Conditions | Symbol | Device | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| **EMITTER** | | | | | | | |
| Input Forward Voltage | $I_F$ = 10 mA | $V_F$ | All | | 1.2 | 1.5 | V |
| | $I_F$ = 0.3 mA | | | 0.75 | 1.0 | | |
| Reverse Current | $V_R$ = 3 V | $I_R$ | All | | | 10 | µA |
| Capacitance | V = 0, f = 1.0 MHz | $C_J$ | All | | | 100 | pF |
| **DETECTOR** | | | | | | | |
| Operating Voltage Range | | $V_{CC}$ | All | 3 | | 15 | V |
| Supply Current | $I_F$ = 0, $V_{CC}$ = 5V | $I_{CC(off)}$ | All | | 1.6 | 5.0 | mA |
| Output Current, High | $I_F$ = 0, $V_{CC}$ = $V_O$ = 15V | $I_{OH}$ | All | | | 100 | µA |

## ISOLATION CHARACTERISTICS

| Parameters | Test Conditions | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Input-Output Isolation Voltage | t =1 sec. | $V_{ISO}$ | 7500 | | | $V_{PEAK}$ |
| Isolation Capacitance | $V_{I-O}$ = 0V, f = 1 MHz | $C_{ISO}$ | | 0.4 | 0.6 | pF |
| Isolation Resistance | $V_{I-O}$ = ±500 VDC | $R_{ISO}$ | $10^{11}$ | | | Ω |

## TRANSFER CHARACTERISTICS

| DC Characteristics | Test Conditions | Symbol | Device | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Supply Current | $I_F$ = 10mA, $V_{CC}$ = 5V | $I_{CC(on)}$ | All | | 1.6 | 5.0 | mA |
| Output Voltage, low | $R_L$=270Ω,$V_{CC}$=5V, $I_F$=$I_{F(on)}$ max. | $V_{OL}$ | All | | 0.2 | 0.4 | V |
| Turn-On Threshold Current | $R_L$=270Ω, $V_{CC}$ = 5V | $I_{F(on)}$* | H11L1M | | | 1.6 | mA |
| | | | H11L2M | | | 10.0 | |
| | | | H11L3M | | | 5.0 | |
| Turn-Off Threshold Current | $R_L$=270Ω, $V_{CC}$ = 5V | $I_{F(off)}$ | All | 0.3 | 1.0 | | mA |
| Hysteresis Ratio | $R_L$=270Ω, $V_{CC}$ = 5V | $I_{F(off)}/I_{F(on)}$ | All | 0.50 | 0.75 | 0.90 | |
| **AC Characteristics** | **Test Conditions** | **Symbol** | **Device** | **Min** | **Typ** | **Max** | **Units** |
| **SWITCHING SPEED** | | | | | | | |
| Turn-On time | $R_L$=270Ω, $V_{CC}$ = 5V, $I_F$=$I_{F(on)}$, $T_A$=25°C | $t_{on}$ | All | | 1.0 | | µs |
| | | | | | 0.65 | | |
| | | | | | | 4 | |
| Fall Time | $R_L$=270Ω, $V_{CC}$ = 5V, $I_F$=$I_{F(on)}$, $T_A$=25°C | $t_f$ | All | | 0.1 | | µs |
| | | | | | .05 | | |
| | | | | | 0.1 | | |
| Turn-Off Time | $R_L$=270Ω, $V_{CC}$ = 5V, $I_F$=$I_{F(on)}$, $T_A$=25°C | $t_{off}$ | All | | 2.0 | | µs |
| | | | | | 1.2 | | |
| | | | | | | 4 | |
| Rise time | $R_L$=270Ω, $V_{CC}$ = 5V, $I_F$=$I_{F(on)}$, $T_A$=25°C | $t_r$ | All | | 0.1 | | µs |
| | | | | | 0.07 | | |
| | | | | | 0.1 | | |
| Data Rate | | | All | | 1.0 | | MHz |

**NOTE:**
*Maximum $I_{F(ON)}$ is the maximum current required to trigger the output. For example, a 1.6mA maximum trigger current would require the LED to be driven at a current greater than 1.6mA to guarantee the device will turn on. A 10% guard band is recommended to account for degradation of the LED over its lifetime. The maximum allowable LED drive current is 60mA.

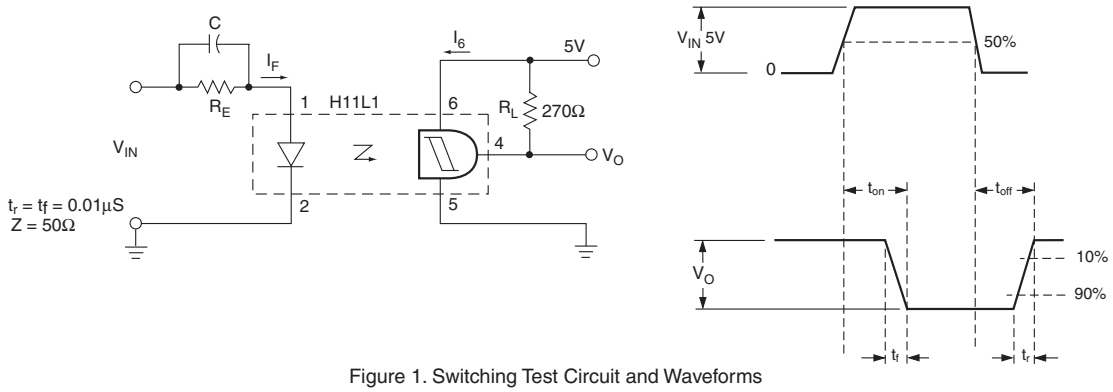



Figure 1. Switching Test Circuit and Waveforms

## TYPICAL PERFORMANCE CURVES

Figure 2. Transfer Characteristics

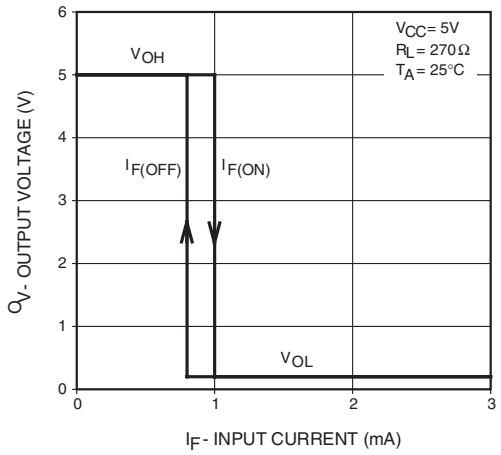



Figure 3. Threshold Current vs. Supply Voltage

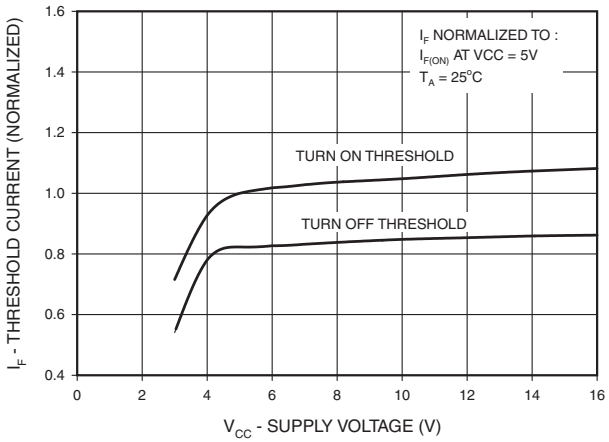



Figure 4. Threshold Current vs. Supply Temperature

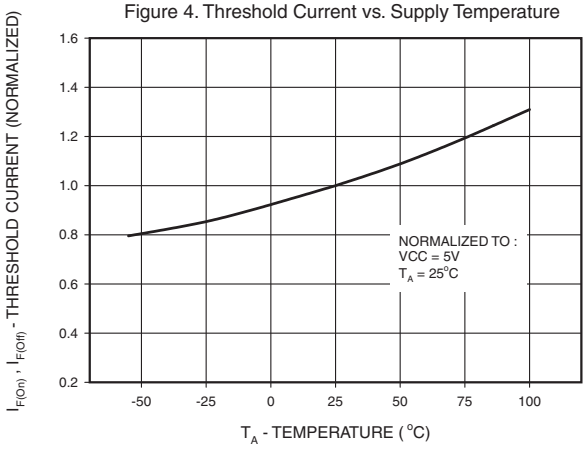
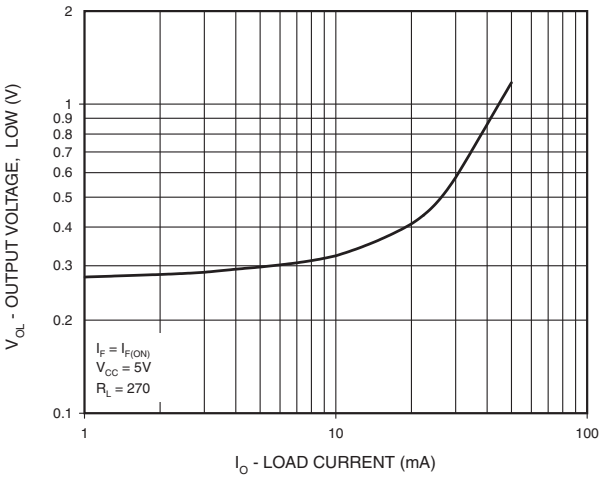



Figure 5. Output Voltage, Low vs. Load Current



## TYPICAL PERFORMANCE CURVES

Figure 6. Supply Current vs. Supply Voltage

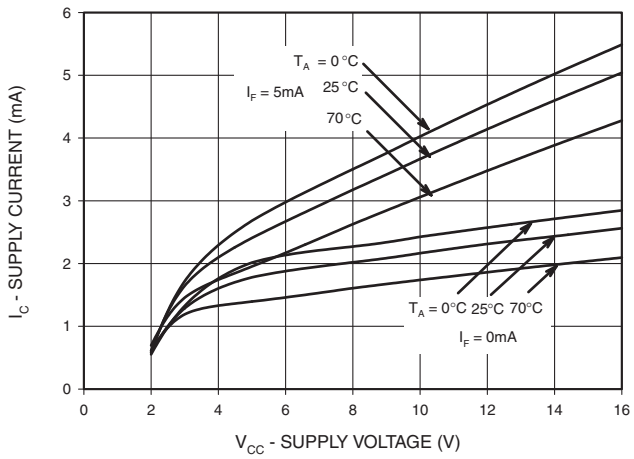
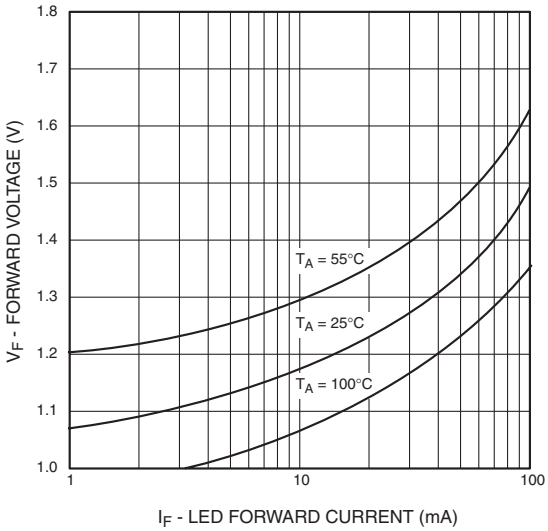
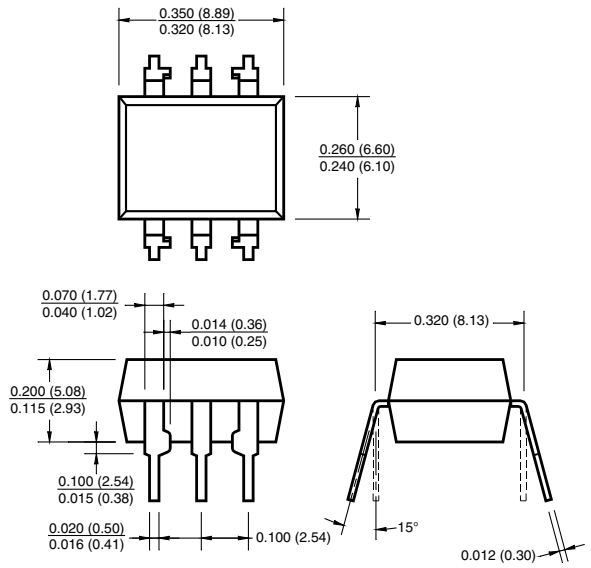


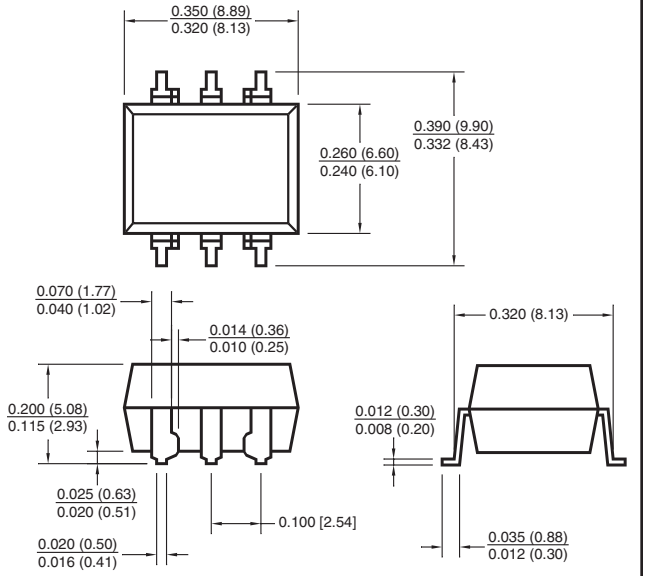

Figure 7. LED Forward Voltage vs. Forward Current



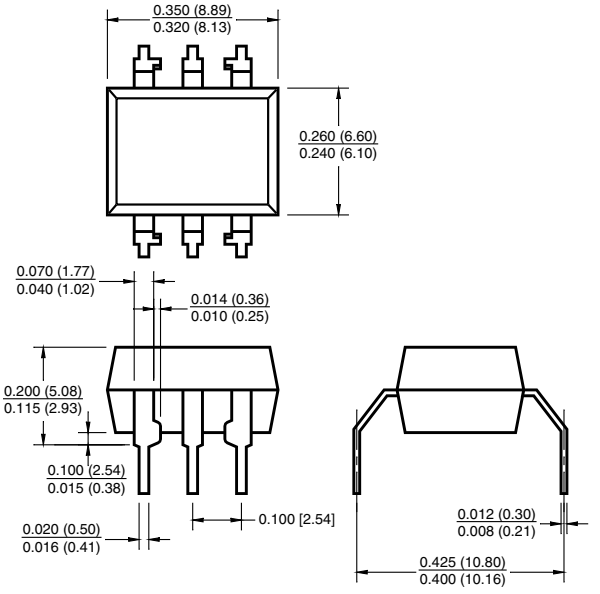
## Package Dimensions (Through Hole)



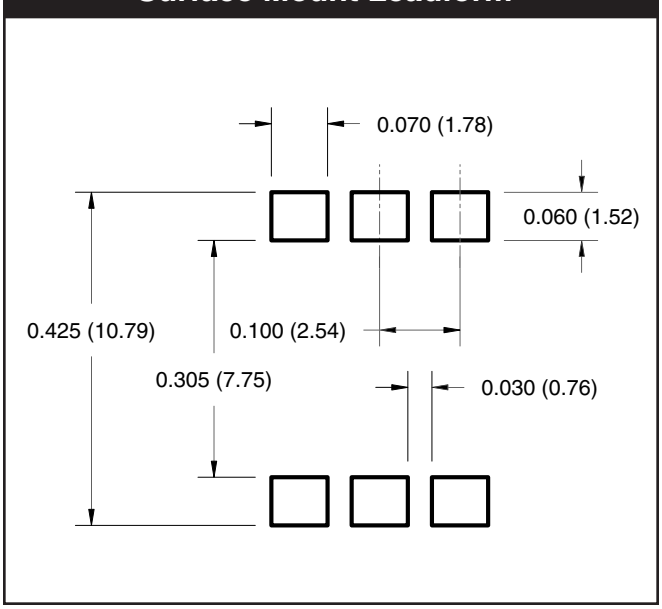

## Package Dimensions (Surface Mount)




## Package Dimensions (0.4” Lead Spacing)




## Recommended Pad Layout for Surface Mount Leadform

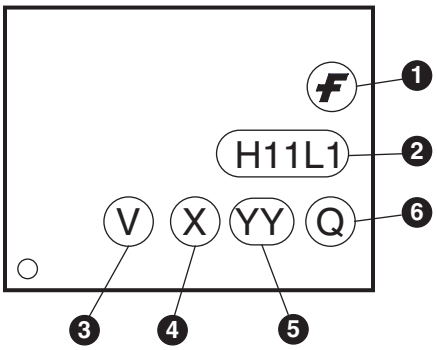



**NOTE**
All dimensions are in inches (millimeters)

## ORDERING INFORMATION

| Option/Order Entry Identifier | Description |
|---|---|
| S | Surface Mount Lead Bend |
| SR2 | Surface Mount; Tape and reel |
| T | 0.4" Lead Spacing |
| V | VDE 0884 |
| TV | VDE 0884, 0.4" Lead Spacing |
| SV | VDE 0884, Surface Mount |
| SR2V | VDE 0884, Surface Mount, Tape & Reel |

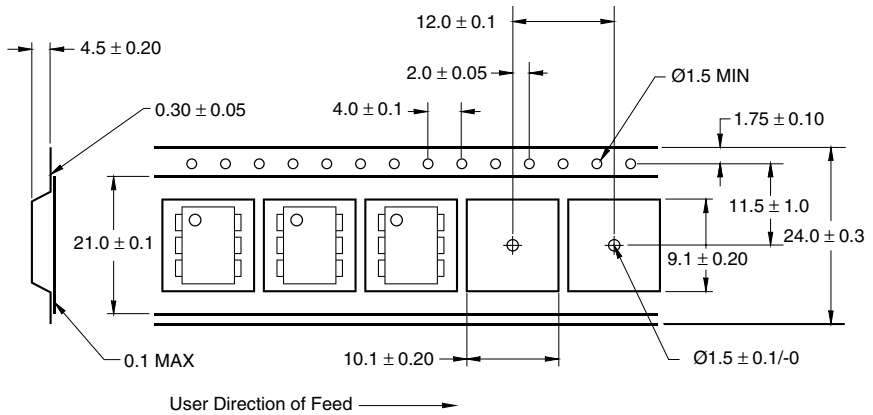
## MARKING INFORMATION




| Definitions | |
|---|---|
| 1 | Fairchild logo |
| 2 | Device number |
| 3 | VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table) |
| 4 | One digit year code, e.g., '3' |
| 5 | Two digit work week ranging from '01' to '53' |
| 6 | Assembly package code |

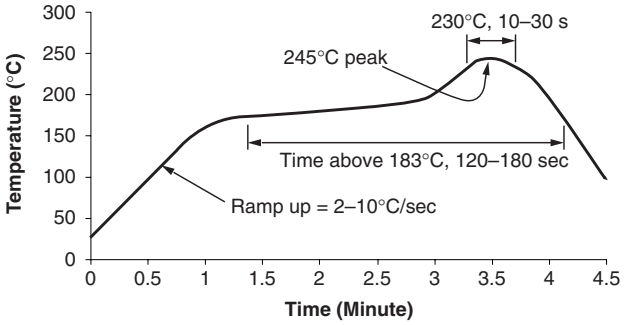
*Note – Parts that do not have the 'V' option (see definition 3 above) that are marked with date code '325' or earlier are marked in portrait format.

## Carrier Tape Specifications




**NOTE**
All dimensions are in inches (millimeters)

## Reflow Profile




- Peak reflow temperature: 245°C (package surface temperature)
- Time of temperature higher than 183°C for 120–180 seconds
- One time soldering reflow is recommended

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.