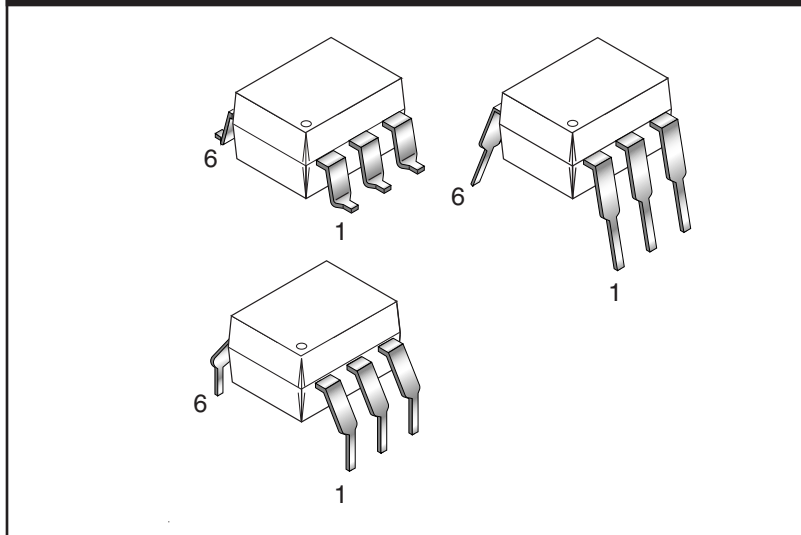


**H11L1M**

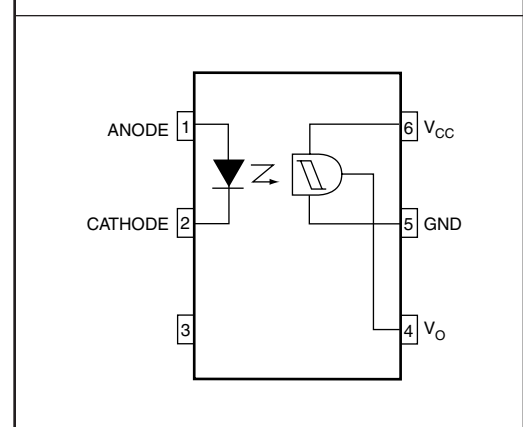
**H11L2M**

**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.

**FEATURES**

- High data rate, 1 MHz typical (NRZ)
- Free from latch up and oscillation 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., H11L1VM)

**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

**Truth Table**

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

**H11L1M**

**H11L2M**

**H11L3M**

**ABSOLUTE MAXIMUM RATINGS**

| Parameters  | Symbol      | Device | Value          | Units       |
|---|-------------|--------|----------------|-------------|
| <b>TOTAL DEVICE</b>   |             |        |                |             |
| 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<br>Derate Above 25°C      | $P_D$       | All    | 250<br>2.94    | mW<br>mW/°C |
| <b>EMITTER</b>  |             |        |                |             |
| Continuous Forward Current                                      | $I_F$       | All    | 60             | mA          |
| Reverse Voltage   | $V_R$       | All    | 6              | V           |
| Forward Current - Peak (1 $\mu$ s pulse, 300 pps)               | $I_{F(pk)}$ | All    | 3.0            | A           |
| LED Power Dissipation 25°C Ambient<br>Derate Linearly From 25°C | $P_D$       | All    | 120<br>1.41    | mW<br>mW/°C |
| <b>DETECTOR</b>   |             |        |                |             |
| Detector Power Dissipation @ 25°C<br>Derate Linearly from 25°C  | $P_D$       | All    | 150<br>2.0     | mW<br>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** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

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

**H11L1M**

**H11L2M**

**H11L3M**

**ISOLATION CHARACTERISTICS**

| Parameters                     | Test Conditions                  | Symbol           | Min              | Typ | Max | Units             |
|--------------------------------|----------------------------------|------------------|------------------|-----|-----|-------------------|
| Input-Output Isolation Voltage | t = 1 sec.                       | V <sub>ISO</sub> | 7500             |     |     | V <sub>PEAK</sub> |
| Isolation Capacitance          | V <sub>I-O</sub> = 0V, f = 1 MHz | C <sub>ISO</sub> |                  | 0.4 | 0.6 | pF                |
| Isolation Resistance           | V <sub>I-O</sub> = ±500 VDC      | R <sub>ISO</sub> | 10 <sup>11</sup> |     |     | Ω                 |

**TRANSFER CHARACTERISTICS**

| DC Characteristics         | Test Conditions  | Symbol                                  | Device | Min  | Typ  | Max  | Units |
|----------------------------|--|---|--------|------|------|------|-------|
| Supply Current             | I <sub>F</sub> = 10mA, V <sub>CC</sub> = 5V  | I <sub>CC(on)</sub>                     | All    |      | 1.6  | 5.0  | mA    |
| Output Voltage, low        | R <sub>L</sub> =270Ω, V <sub>CC</sub> =5V, I <sub>F</sub> =I <sub>F(on)</sub> max.                       | V <sub>OL</sub>                         | All    |      | 0.2  | 0.4  | V     |
| Turn-On Threshold Current  | R <sub>L</sub> =270Ω, V <sub>CC</sub> = 5V   | I <sub>F(on)</sub> *                    | H11L1M |      |      | 1.6  | mA    |
|                            |  |   | H11L2M |      |      | 10.0 |       |
|                            |  |   | H11L3M |      |      | 5.0  |       |
| Turn-Off Threshold Current | R <sub>L</sub> =270Ω, V <sub>CC</sub> = 5V   | I <sub>F(off)</sub>                     | All    | 0.3  | 1.0  |      | mA    |
| Hysteresis Ratio           | R <sub>L</sub> =270Ω, V <sub>CC</sub> = 5V   | I <sub>F(off)</sub> /I <sub>F(on)</sub> | All    | 0.50 | 0.75 | 0.90 |       |
| AC Characteristics         | Test Conditions  | Symbol                                  | Device | Min  | Typ  | Max  | Units |
| <b>SWITCHING SPEED</b>     |  |   |        |      |      |      |       |
| Turn-On time               | R <sub>L</sub> =270Ω, V <sub>CC</sub> = 5V, I <sub>F</sub> =I <sub>F(on)</sub> ,<br>T <sub>A</sub> =25°C | t <sub>on</sub>                         | All    |      | 1.0  |      | μs    |
|                            |  |   |        |      | 0.65 |      |       |
|                            |  |   |        |      |      | 4    |       |
| Fall Time                  | R <sub>L</sub> =270Ω, V <sub>CC</sub> = 5V, I <sub>F</sub> =I <sub>F(on)</sub> ,<br>T <sub>A</sub> =25°C | t <sub>f</sub>                          | All    |      | 0.1  |      | μs    |
|                            |  |   |        |      | .05  |      |       |
|                            |  |   |        |      | 0.1  |      |       |
| Turn-Off Time              | R <sub>L</sub> =270Ω, V <sub>CC</sub> = 5V, I <sub>F</sub> =I <sub>F(on)</sub> ,<br>T <sub>A</sub> =25°C | t <sub>off</sub>                        | All    |      | 2.0  |      | μs    |
|                            |  |   |        |      | 1.2  |      |       |
|                            |  |   |        |      |      | 4    |       |
| Rise time                  | R <sub>L</sub> =270Ω, V <sub>CC</sub> = 5V, I <sub>F</sub> =I <sub>F(on)</sub> ,<br>T <sub>A</sub> =25°C | t <sub>r</sub>                          | All    |      | 0.1  |      | μs    |
|                            |  |   |        |      | 0.07 |      |       |
|                            |  |   |        |      | 0.1  |      |       |
| Data Rate                  |  |   | All    |      | 1.0  |      | MHz   |

**NOTE:**

\*Maximum I<sub>F(ON)</sub> 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.

**H11L1M**

**H11L2M**

**H11L3M**

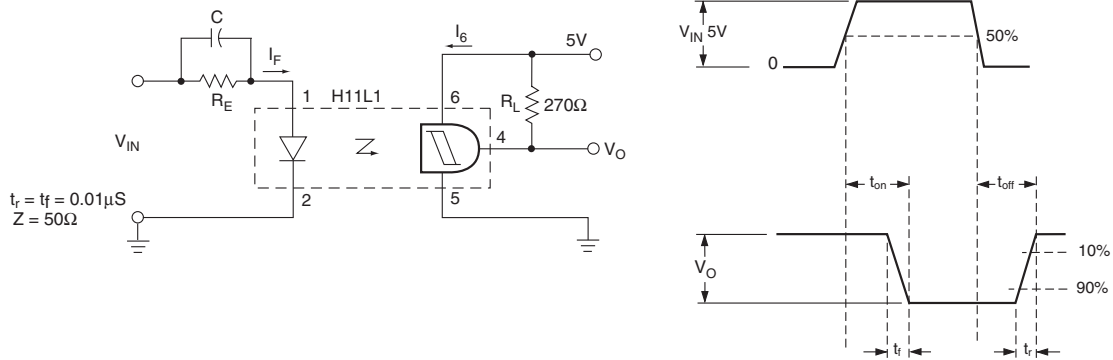


Figure 1. Switching Test Circuit and Waveforms

**TYPICAL PERFORMANCE CURVES**

Figure 2. Transfer Characteristics

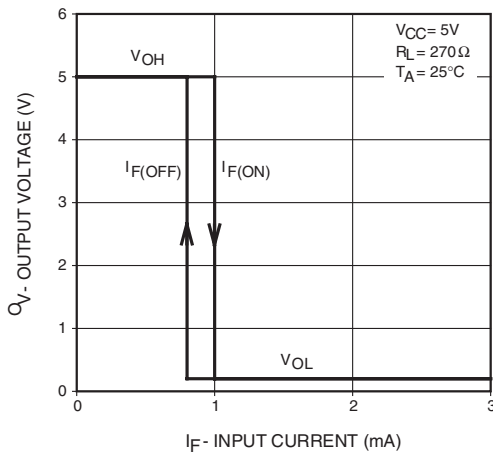


Figure 3. Threshold Current vs. Supply Voltage

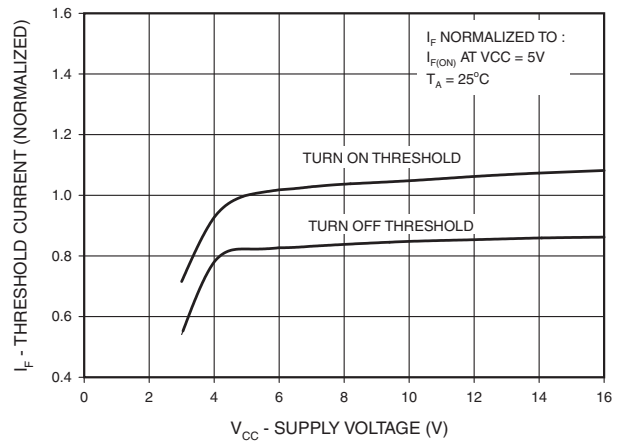


Figure 4. Threshold Current vs. Supply Temperature

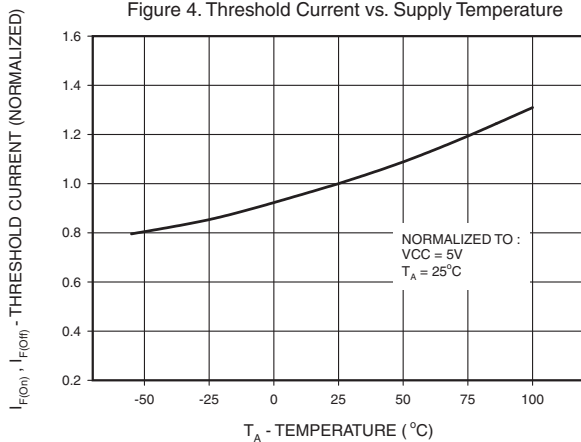
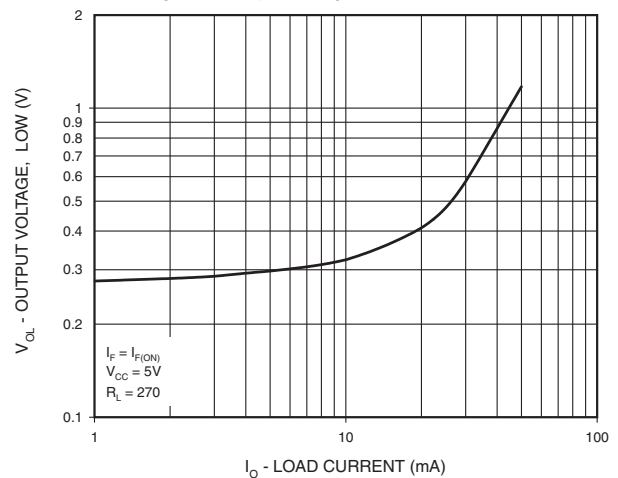


Figure 5. Output Voltage, Low vs. Load Current



**H11L1M**

**H11L2M**

**H11L3M**

**TYPICAL PERFORMANCE CURVES**

Figure 6. Supply Current vs. Supply Voltage

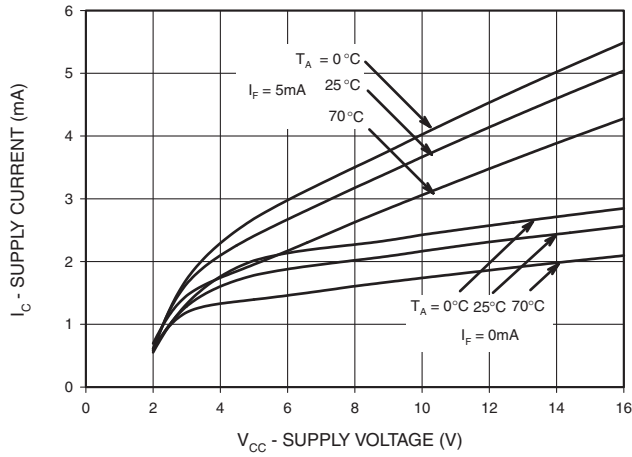
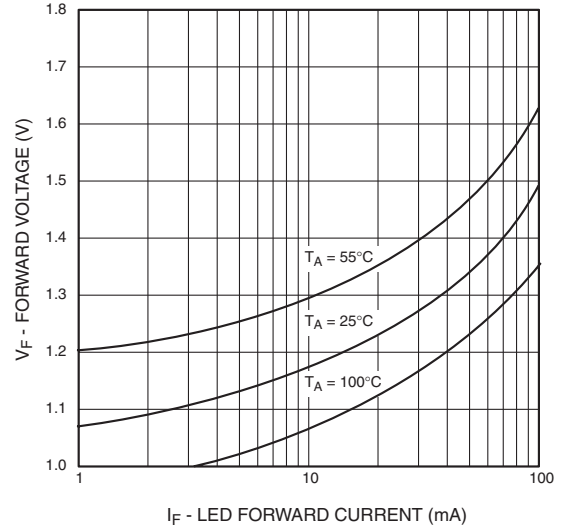


Figure 7. LED Forward Voltage vs. Forward Current

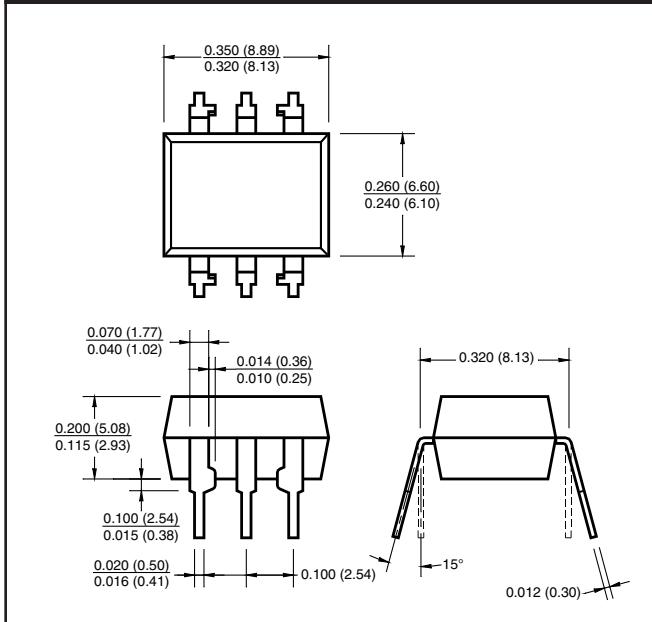


**H11L1M**

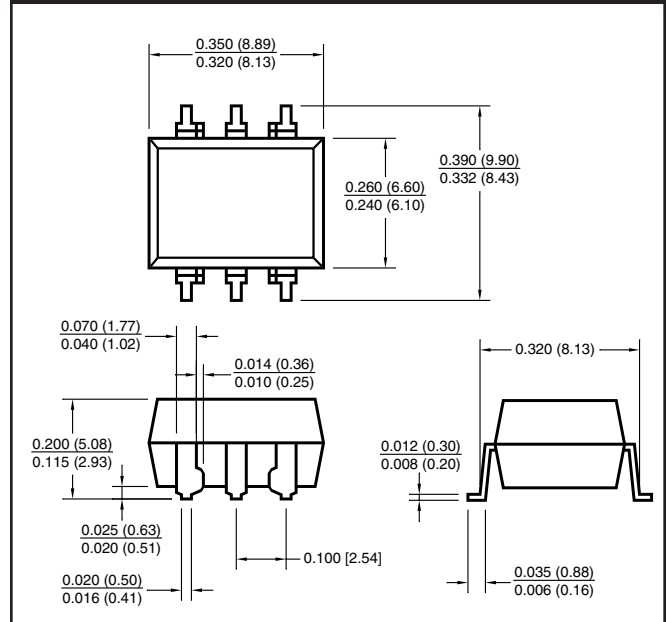
**H11L2M**

**H11L3M**

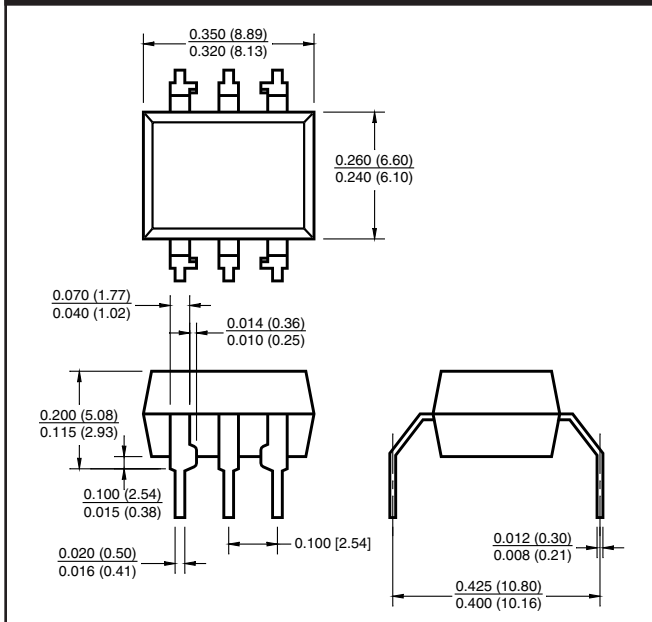
**Package Dimensions (Through Hole)**



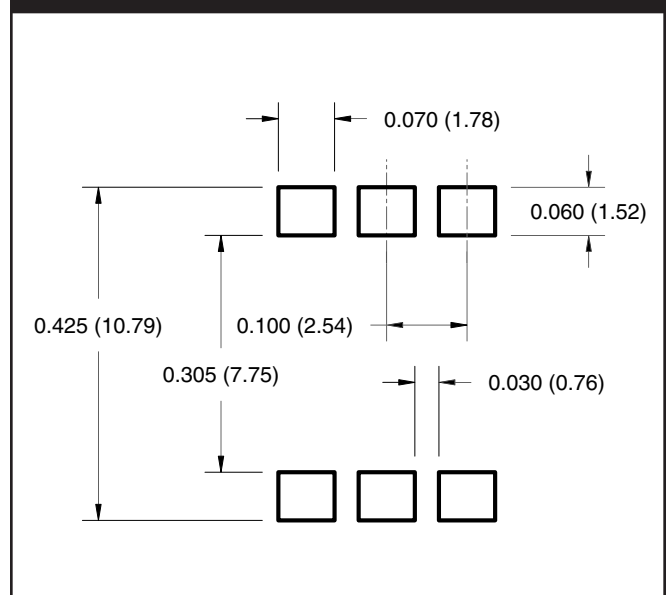
**Package Dimensions (Surface Mount)**



**Package Dimensions (0.4" Lead Spacing)**



**Recommended Pad Layout for  
Surface Mount Leadform**



**NOTE**

All dimensions are in inches (millimeters)

**H11L1M**

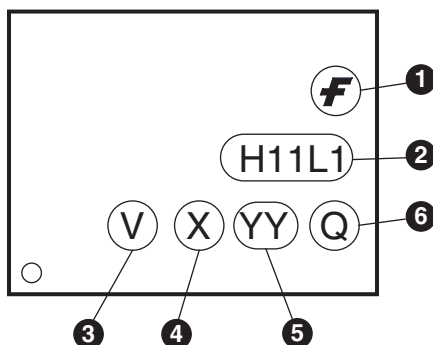
**H11L2M**

**H11L3M**

**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  |

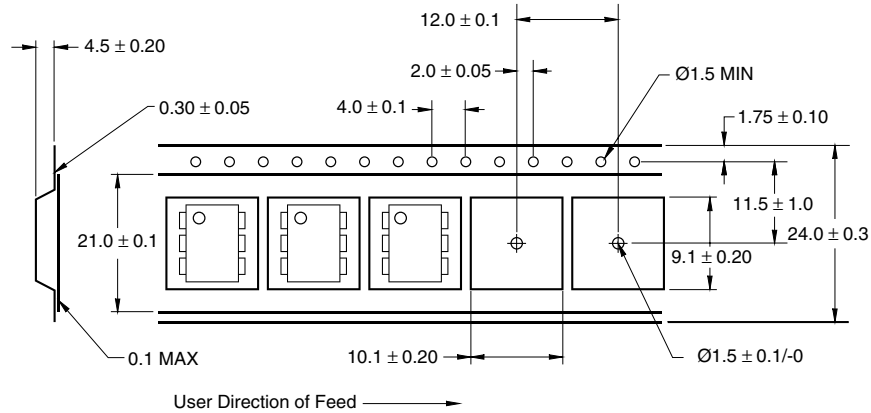
\*Note – 'V' option parts marked with date code '325' or earlier are marked in portrait format.

H11L1M

H11L2M

H11L3M

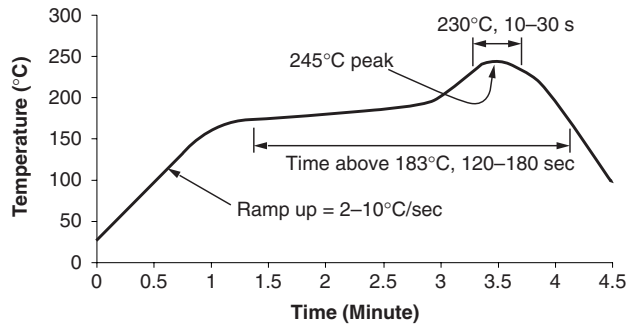
**Carrier Tape Specifications**



**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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**H11L1M**

**H11L2M**

**H11L3M**

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