

## DESCRIPTION

The CNX48U, H11BX, MOC8080 and TIL113 have a gallium arsenide infrared emitter optically coupled to a silicon planar photodarlington.

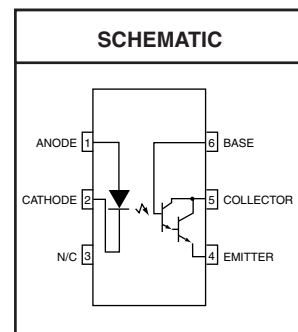
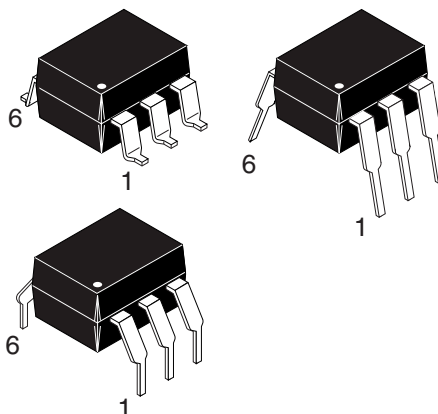
|         |        |       |         |       |
|---------|--------|-------|---------|-------|
| CNX48U  | H11B1  | H11B2 | H11B255 | H11B3 |
| MOC8080 | TIL113 |       |         |       |

## FEATURES

- High sensitivity to low input drive current
- Meets or exceeds all JEDEC Registered Specifications
- VDE 0884 approval available as a test option  
-add option .300. (e.g., H11B1.300)

## APPLICATIONS

- Low power logic circuits
- Telecommunications equipment
- Portable electronics
- Solid state relays
- Interfacing coupling systems of different potentials and impedances.



| Parameter                                                                   | Symbol             | Device                                  | Value          | Units |
|-----------------------------------------------------------------------------|--------------------|-----------------------------------------|----------------|-------|
| TOTAL DEVICE                                                                |                    |                                         |                |       |
| Storage Temperature                                                         | T <sub>STG</sub>   | All                                     | -55 to +150    | °C    |
| Operating Temperature                                                       | T <sub>OPR</sub>   | All                                     | -55 to +100    | °C    |
| Lead Solder Temperature                                                     | T <sub>SOL</sub>   | All                                     | 260 for 10 sec | °C    |
| Total Device Power Dissipation @ T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>     | All                                     | 250            | mW    |
|                                                                             |                    |                                         | 3.3            | mW/°C |
| EMITTER                                                                     |                    |                                         |                |       |
| Continuous Forward Current                                                  | I <sub>F</sub>     | All                                     | 100            | mA    |
| Reverse Voltage                                                             | V <sub>R</sub>     | All                                     | 6              | V     |
| Forward Current - Peak (300 μs, 2% Duty Cycle)                              | I <sub>F(pk)</sub> | All                                     | 3.0            | A     |
| LED Power Dissipation @ T <sub>A</sub> = 25°C<br>Derate above 25°C          | P <sub>D</sub>     | All                                     | 100            | mW    |
|                                                                             |                    |                                         | 1.8            | mW/°C |
| DETECTOR                                                                    |                    |                                         |                |       |
| Collector-Emitter Breakdown Voltage                                         | BV <sub>CEO</sub>  | CNX48U, TIL113                          | 30             | V     |
|                                                                             |                    | H11B1, H11B2<br>H11B3                   | 25             |       |
|                                                                             |                    | H11B255<br>MOC8080                      | 55             |       |
| Collector-Base Breakdown Voltage                                            | BV <sub>CBO</sub>  | CNX48U, H11B1<br>H11B2, H11B3<br>TIL113 | 30             | V     |
|                                                                             |                    | H11B255<br>MOC8080                      | 55             | V     |
| Emitter-Collector Breakdown Voltage                                         | BV <sub>ECO</sub>  | All                                     | 7              | V     |
| Detector Power Dissipation @ T <sub>A</sub> = 25°C<br>Derate above 25°C     | P <sub>D</sub>     | All                                     | 150            | mW    |
|                                                                             |                    |                                         | 2.0            | mW/°C |

|                |               |              |                |              |
|----------------|---------------|--------------|----------------|--------------|
| <b>CNX48U</b>  | <b>H11B1</b>  | <b>H11B2</b> | <b>H11B255</b> | <b>H11B3</b> |
| <b>MOC8080</b> | <b>TIL113</b> |              |                |              |

## ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C Unless otherwise specified.)

### INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter                                                     | Test Conditions                                  | Symbol            | Device                                       | Min | Typ** | Max | Unit |
|---------------------------------------------------------------|--------------------------------------------------|-------------------|----------------------------------------------|-----|-------|-----|------|
| <b>EMITTER</b><br><br>Input Forward Voltage                   | (I <sub>F</sub> = 10 mA)                         | V <sub>F</sub>    | H11B1, H11B2<br>H11B255<br>MOC8080<br>TIL113 | 0.8 | 1.2   | 1.5 | V    |
|                                                               | (I <sub>F</sub> = 10 mA)                         |                   | CNX48U                                       |     | 1.2   | 1.3 |      |
|                                                               | (I <sub>F</sub> = 10 mA, T <sub>A</sub> = -55°C) |                   | MOC8080                                      | 0.9 | 1.3   | 1.7 |      |
|                                                               | (I <sub>F</sub> = 10 mA, T <sub>A</sub> = 100°C) |                   |                                              | 0.7 | 1.05  | 1.4 |      |
|                                                               | (I <sub>F</sub> = 50 mA)                         |                   | H11B3                                        |     | 1.35  | 1.5 |      |
| Reverse Leakage Current                                       | (V <sub>R</sub> = 6 V)                           | I <sub>R</sub>    | All                                          |     | 0.001 | 10  | μA   |
| Capacitance                                                   | (V <sub>F</sub> = 0 V, f = 1.0 MHz)              | C                 | All                                          |     | 50    |     | pF   |
| <b>DETECTOR</b><br><br>Collector-Emitter<br>Breakdown Voltage | (I <sub>C</sub> = 1 mA, I <sub>F</sub> = 0)      | BV <sub>CEO</sub> | CNX48U                                       | 30  | 60    |     | V    |
|                                                               | (I <sub>C</sub> = 100 μA, I <sub>F</sub> = 0)    |                   | TIL113                                       |     |       |     |      |
|                                                               | (I <sub>C</sub> = 10 mA, I <sub>F</sub> = 0)     |                   | H11B1, H11B2<br>H11B3                        | 25  | 60    |     |      |
|                                                               | (I <sub>C</sub> = 100 μA, I <sub>F</sub> = 0)    |                   | H11B255                                      | 55  | 70    |     |      |
|                                                               | (I <sub>C</sub> = 1 mA, I <sub>F</sub> = 0)      |                   | MOC8080                                      |     |       |     |      |
| Collector-Base<br>Breakdown Voltage                           | (I <sub>C</sub> = 100 μA, I <sub>E</sub> = 0)    | BV <sub>CBO</sub> | CNX48U, H11B1<br>H11B2, H11B3<br>TIL113      | 30  | 100   |     | V    |
|                                                               | (I <sub>C</sub> = 100 μA, I <sub>F</sub> = 0)    |                   | H11B255<br>MOC8080                           | 55  | 100   |     |      |
| Emitter-Collector<br>Breakdown Voltage                        | (I <sub>E</sub> = 100 μA, I <sub>B</sub> = 0)    | BV <sub>ECO</sub> | All                                          | 7   | 10    |     | V    |
| Collector-Emitter<br>Dark Current                             | (V <sub>CE</sub> = 10 V, Base Open)              | I <sub>CEO</sub>  | All                                          |     | 1     | 100 | nA   |

Note

\*\* Typical values at T<sub>A</sub> = 25°C

|                |               |              |                |              |
|----------------|---------------|--------------|----------------|--------------|
| <b>CNX48U</b>  | <b>H11B1</b>  | <b>H11B2</b> | <b>H11B255</b> | <b>H11B3</b> |
| <b>MOC8080</b> | <b>TIL113</b> |              |                |              |

## TRANSFER CHARACTERISTICS (T<sub>A</sub> = 25°C Unless otherwise specified.)

| DC Characteristics                      | Test Conditions                                                                                                   | Symbol               | Device                         | Min        | Typ** | Max  | Units  |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------------|------------|-------|------|--------|
| Collector Output Current <sup>(1)</sup> | (I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 5 V)                                                                   | I <sub>C</sub> (CTR) | MOC8080                        | 50 (500)   |       |      | mA (%) |
|                                         |                                                                                                                   |                      | H11B255                        | 10 (100)   |       |      |        |
|                                         | (I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 1 V)                                                                   |                      | CNX48U                         | 60 (600)   |       |      |        |
|                                         |                                                                                                                   |                      | TIL113                         | 30 (300)   |       |      |        |
|                                         | (I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V)                                                                    |                      | H11B1                          | 5 (500)    |       |      |        |
|                                         |                                                                                                                   |                      | H11B2                          | 2 (200)    |       |      |        |
|                                         |                                                                                                                   |                      | H11B3                          | 1 (100)    |       |      |        |
|                                         | (I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 1 V)                                                                    |                      | CNX48U                         | 5 (500)    |       |      |        |
|                                         | (I <sub>F</sub> = 0.5 mA, V <sub>CE</sub> = 1 V)                                                                  |                      |                                | 1.75 (350) |       |      |        |
| Saturation Voltage                      | (I <sub>F</sub> = 1 mA, I <sub>C</sub> = 1 mA)                                                                    | V <sub>CE(sat)</sub> | H11B1, H11B2<br>H11B3, MOC8080 |            |       | 1.0  | V      |
|                                         | (I <sub>F</sub> = 5 mA, I <sub>C</sub> = 10 mA)                                                                   |                      | CNX48U                         |            |       | 1.0  |        |
|                                         | (I <sub>F</sub> = 50 mA, I <sub>C</sub> = 50 mA)                                                                  |                      | H11B255                        |            |       | 1.0  |        |
|                                         | (I <sub>F</sub> = 8 mA, I <sub>C</sub> = 2 mA)                                                                    |                      | TIL113                         |            |       | 1.25 |        |
| AC Characteristics                      | (I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 10 V)<br>(R <sub>L</sub> = 100 Ω) (Fig.7)                              | t <sub>on</sub>      | H11B1<br>H11B2                 |            | 25    |      | μs     |
|                                         |                                                                                                                   | t <sub>off</sub>     | H11B255<br>H11B3               |            | 18    |      |        |
|                                         | (I <sub>F</sub> = 10 mA, V <sub>CC</sub> = 5 V)<br>(R <sub>E</sub> = 100 Ω), (R <sub>BE</sub> = 1MΩ)<br>(Fig. 8)  | t <sub>on</sub>      | CNX48U                         |            | 3.5   |      |        |
|                                         |                                                                                                                   | t <sub>off</sub>     |                                |            | 36    |      |        |
|                                         | (I <sub>F</sub> = 1 mA, V <sub>CC</sub> = 5 V)<br>(R <sub>E</sub> = 1kΩ), (R <sub>BE</sub> = 10MΩ)<br>(Fig. 8)    | t <sub>on</sub>      |                                |            | 70    |      |        |
|                                         |                                                                                                                   | t <sub>off</sub>     |                                |            | 190   |      |        |
|                                         | (I <sub>F</sub> = 5 mA, V <sub>CC</sub> = 10 V)<br>(R <sub>L</sub> = 100 Ω) (Fig.7)                               | t <sub>on</sub>      | MOC8080                        |            | 3.5   |      |        |
|                                         |                                                                                                                   | t <sub>off</sub>     |                                |            | 25    |      |        |
|                                         | (I <sub>F</sub> = 200 mA, I <sub>C</sub> = 50 mA)<br>(V <sub>CC</sub> = 10 V) (R <sub>L</sub> = 100 Ω)<br>(Fig.7) | t <sub>on</sub>      | TIL113                         |            | 0.35  | 5    |        |
|                                         |                                                                                                                   | t <sub>off</sub>     |                                |            | 55    | 100  |        |

## ISOLATION CHARACTERISTICS

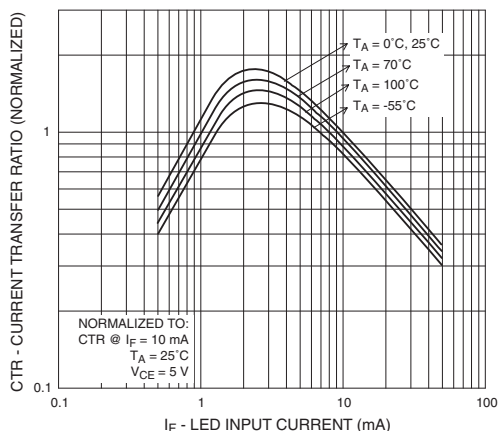
| Characteristic                                | Test Conditions                                          | Symbol           | Min  | Typ**            | Max | Units    |
|-----------------------------------------------|----------------------------------------------------------|------------------|------|------------------|-----|----------|
| Input-Output Isolation Voltage <sup>(2)</sup> | (I <sub>I-O</sub> ≤ 1 μA, V <sub>rms</sub> , t = 1 min.) |                  | 5300 |                  |     | Vac(rms) |
| Isolation Resistance <sup>(2)</sup>           | (V <sub>I-O</sub> = 500 VDC)                             | R <sub>ISO</sub> |      | 10 <sup>11</sup> |     | Ω        |
| Isolation Capacitance <sup>(2)</sup>          | (V <sub>I-O</sub> = ∅, f = 1 MHz)                        | C <sub>ISO</sub> |      | 0.8              |     | pf       |

Note

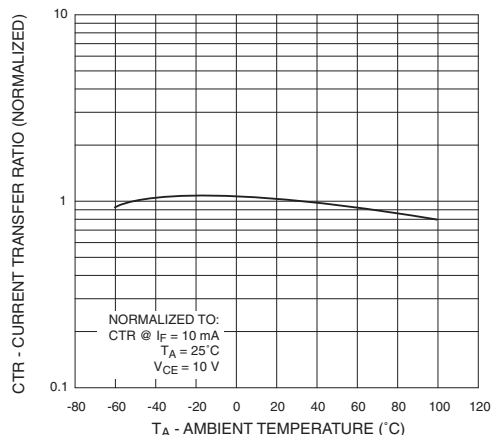
\*\* Typical values at T<sub>A</sub> = 25°C

|         |        |       |         |       |
|---------|--------|-------|---------|-------|
| CNX48U  | H11B1  | H11B2 | H11B255 | H11B3 |
| MOC8080 | TIL113 |       |         |       |

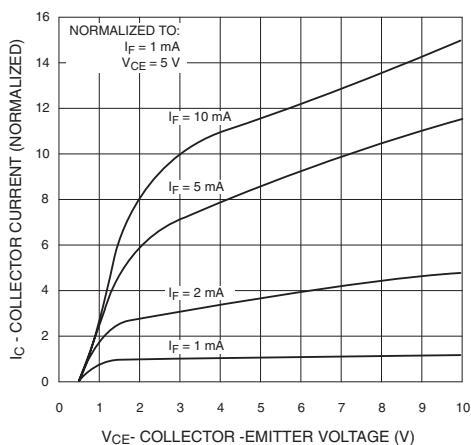
**Fig. 1 Output Current vs. Input Current**



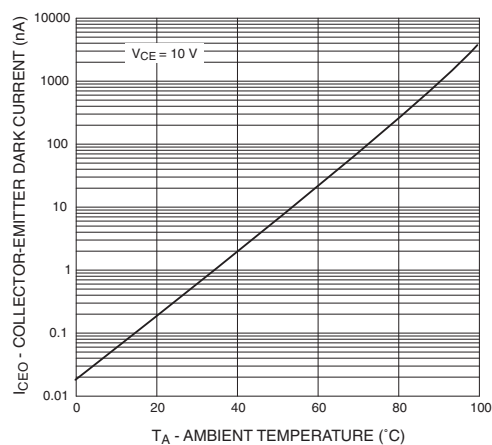
**Fig. 2 Current Transfer Ratio vs. Ambient Temperature**



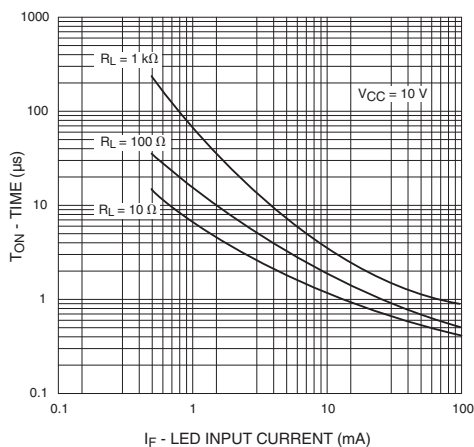
**Fig. 3 Collector Current vs. Collector-Emitter Voltage**



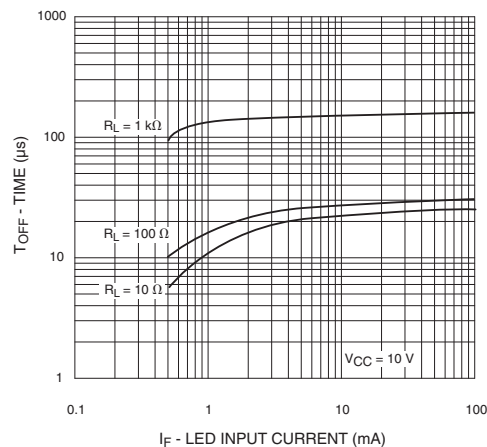
**Fig. 4 Dark Current vs. Ambient Temperature**



**Fig. 5 Turn-On Time vs. Input Current**



**Fig. 6 Turn-Off Time vs. Input Current**



|         |        |       |         |       |
|---------|--------|-------|---------|-------|
| CNX48U  | H11B1  | H11B2 | H11B255 | H11B3 |
| MOC8080 | TIL113 |       |         |       |

## TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

(25°C Free air temperature unless otherwise specified) (Cont.)

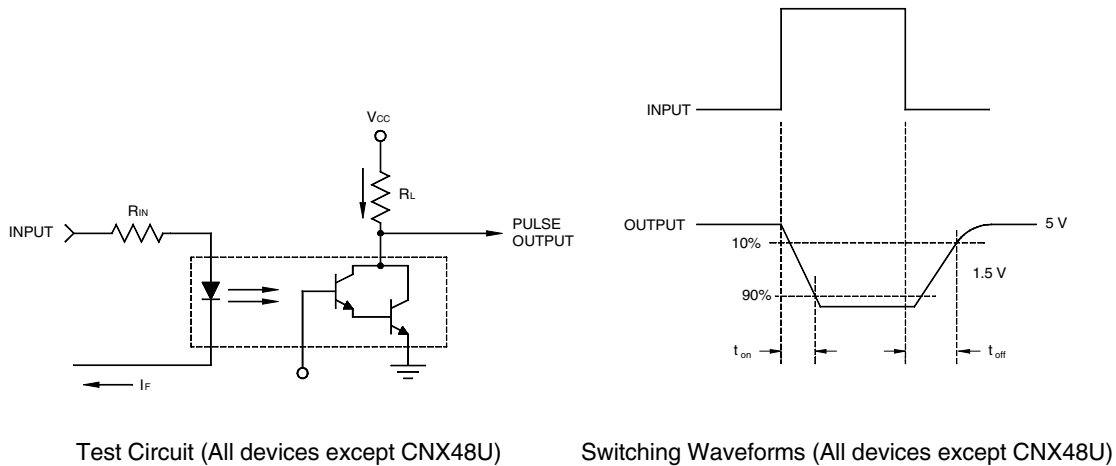


Fig. 7 Switching Time Test Circuit and Waveforms (All devices except CNX48U)

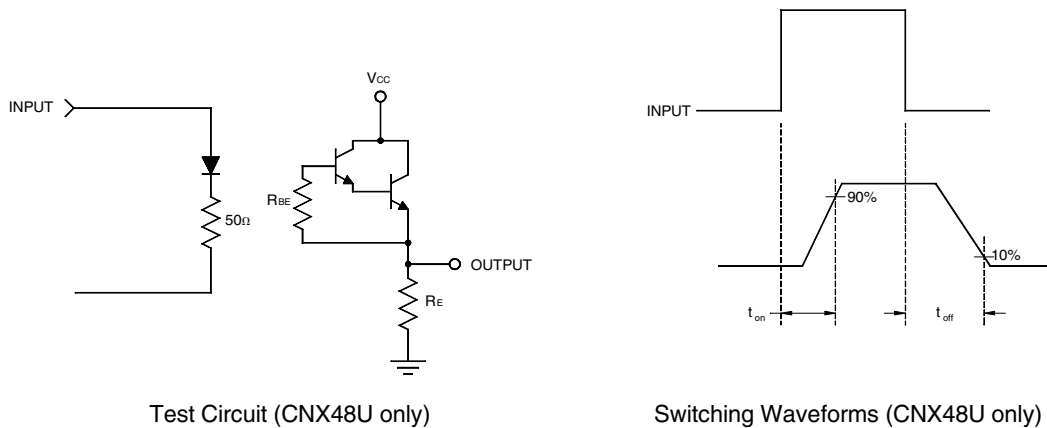


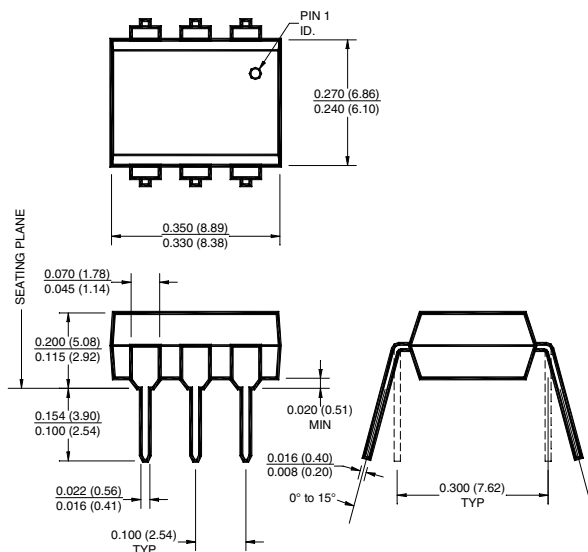
Fig. 8 Switching Time Test Circuit and Waveforms (CNX48U only)

### Notes

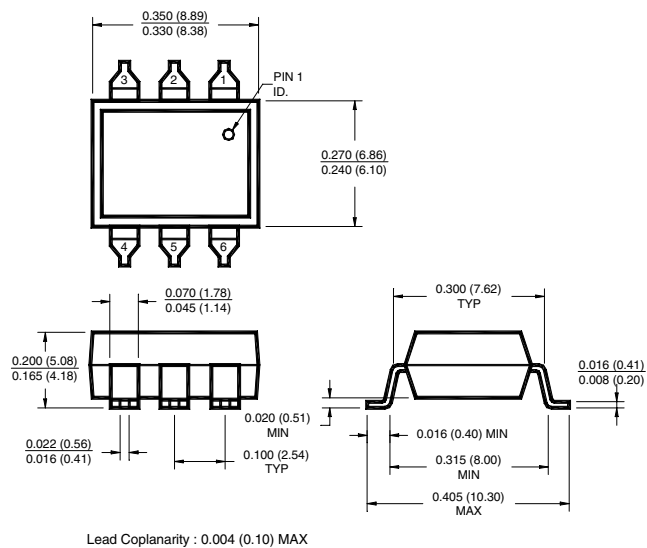
1. The current transfer ratio ( $I_C/I_F$ ) is the ratio of the detector collector current to the LED input current with  $V_{CE}$  @ 10 V.
2. For this test, LED pins 1 and 2 are common and phototransistor pins 4,5 and 6 are common.

CNX48U H11B1 H11B2 H11B255 H11B3  
MOC8080 TIL113

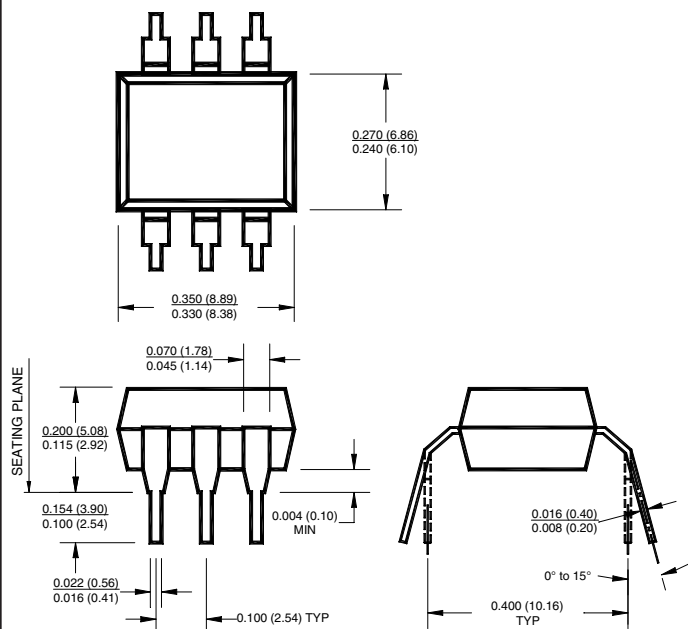
## Package Dimensions (Through Hole)



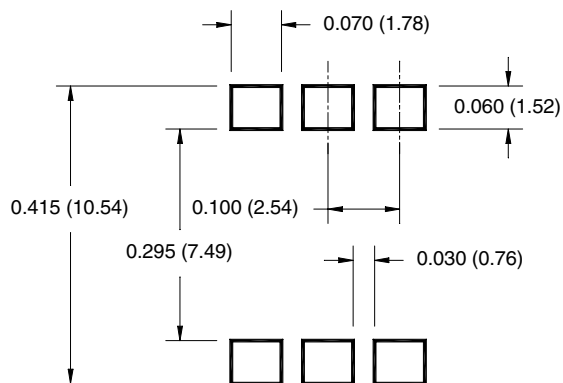
## Package Dimensions (Surface Mount)



## Package Dimensions (0.4" Lead Spacing)



## Recommended Pad Layout for Surface Mount Leadform



### NOTE

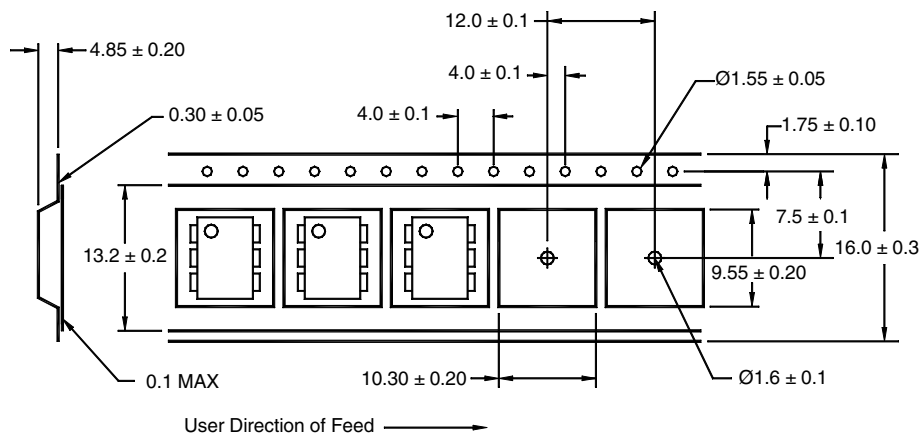
All dimensions are in inches (millimeters)

|         |        |       |         |       |
|---------|--------|-------|---------|-------|
| CNX48U  | H11B1  | H11B2 | H11B255 | H11B3 |
| MOC8080 | TIL113 |       |         |       |

## ORDERING INFORMATION

| Option | Order Entry Identifier | Description                          |
|--------|------------------------|--------------------------------------|
| S      | .S                     | Surface Mount Lead Bend              |
| SD     | .SD                    | Surface Mount; Tape and reel         |
| W      | .W                     | 0.4" Lead Spacing                    |
| 300    | .300                   | VDE 0884                             |
| 300W   | .300W                  | VDE 0884, 0.4" Lead Spacing          |
| 3S     | .3S                    | VDE 0884, Surface Mount              |
| 3SD    | .3SD                   | VDE 0884, Surface Mount, Tape & Reel |

## QT Carrier Tape Specifications ("D" Taping Orientation)



## NOTE

All dimensions are millimeters

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