

CNX35U CNX36U CNX38U CNX39U

## DESCRIPTION

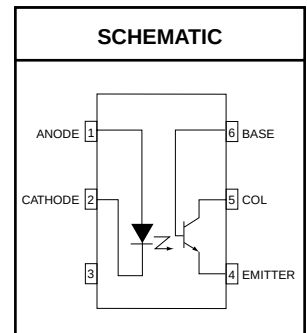
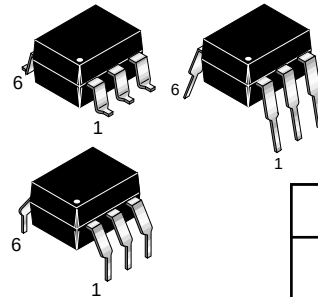
The CNX35U, CNX36U CNX38U and CNX39U are optically coupled isolators consisting of an infrared emitting GaAs diode and a silicon NPN phototransistor with accessible base. These devices are housed in 6-pin dual-in-line packages (DIP).

## FEATURES

- High output/input DC current transfer ratio
- Low saturation voltage
- UL recognized (File # E90700)
- VDE recognized (File # 94766)
- Ordering option '300' (e.g. CNX35U.300)

## APPLICATIONS

- Power supply regulators
- Digital logic inputs
- Microprocessor inputs
- Appliance sensor systems
- Industrial controls



| Parameters                                                                 | Symbol             | Device                 | Value          | Units |
|----------------------------------------------------------------------------|--------------------|------------------------|----------------|-------|
| TOTAL DEVICE                                                               |                    |                        |                |       |
| Storage Temperature                                                        | T <sub>STG</sub>   | All                    | -55 to +150    | °C    |
| Operating Temperature                                                      | T <sub>OPR</sub>   | All                    | -40 to +100    | °C    |
| Lead Solder Temperature                                                    | T <sub>SOL</sub>   | All                    | 260 for 10 sec | °C    |
| EMITTER                                                                    |                    |                        |                |       |
| Continuous Reverse Voltage                                                 | V <sub>R</sub>     | All                    | 5              | V     |
| Continuous Forward Current                                                 | I <sub>F</sub>     | All                    | 100            | mA    |
| Forward Current - Peak (10 μs pulse, δ = 0.01)                             | I <sub>F(pk)</sub> | All                    | 3.0            | A     |
| Total Power Dissipation up to 25°C Ambient<br>Derate Linearly from 25°C    | P <sub>D</sub>     | All                    | 200            | mW    |
|                                                                            |                    | All                    | 2.0            | mW/°C |
| DETECTOR                                                                   |                    |                        |                |       |
| Collector to Emitter Voltage (open base)                                   | V <sub>CEO</sub>   | CNX38U                 | 80             | V     |
|                                                                            |                    | CNX35U, CNX36U, CNX39U | 30             |       |
| Collector to Base Voltage (open emitter)                                   | V <sub>CBO</sub>   | CNX38U                 | 120            | V     |
|                                                                            |                    | CNX35U, CNX36U, CNX39U | 70             |       |
| Emitter to Collector Voltage (open base)                                   | V <sub>ECO</sub>   | All                    | 7              | V     |
| DC Collector Current                                                       | I <sub>C</sub>     | All                    | 100            | mA    |
| Detector Power Dissipation up to 25°C Ambient<br>Derate Linearly from 25°C | P <sub>D</sub>     | All                    | 200            | mW    |
|                                                                            |                    | All                    | 2.0            | mW/°C |

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

### INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameters                           | Test Conditions                               | Symbol            | Device                 | Min | Typ  | Max | Units |
|--------------------------------------|-----------------------------------------------|-------------------|------------------------|-----|------|-----|-------|
| <b>EMITTER</b>                       |                                               |                   |                        |     |      |     |       |
| Input Forward Voltage                | I <sub>F</sub> = 10 mA                        | V <sub>F</sub>    | All                    |     | 1.15 | 1.5 | V     |
| Reverse Current                      | V <sub>R</sub> = 5 V                          | I <sub>R</sub>    | All                    |     |      | 10  | μA    |
| <b>DETECTOR</b>                      |                                               |                   |                        |     |      |     |       |
| Leakage Current Collector to Emitter | V <sub>CE</sub> = 10 V                        | I <sub>CEO</sub>  | CNX35U, CNX36U, CNX39U |     | 2    | 50  | nA    |
|                                      | V <sub>CE</sub> = 50 V                        |                   | CNX38U                 |     | 2    | 50  | nA    |
|                                      | V <sub>CE</sub> = 10 V, T <sub>A</sub> = 70°C |                   | CNX35U, CNX36U, CNX39U |     |      | 10  | μA    |
|                                      | V <sub>CE</sub> = 50 V, T <sub>A</sub> = 70°C |                   | CNX38U                 |     |      | 10  | μA    |
|                                      | V <sub>CE</sub> = 10 V                        | I <sub>CBO</sub>  | All                    |     |      | 20  | nA    |
| Breakdown Voltage                    |                                               |                   |                        |     |      |     |       |
| Collector to Emitter                 | I <sub>C</sub> = 1 mA, I <sub>F</sub> = 0     | BV <sub>CEO</sub> | CNX35U, CNX36U, CNX39U | 30  |      |     | V     |
|                                      |                                               |                   | CNX38U                 | 80  |      |     |       |
| Collector to Base                    | I <sub>C</sub> = 0.1 mA, I <sub>F</sub> = 0   | BV <sub>CBO</sub> | CNX35U, CNX36U, CNX39U | 70  |      |     | V     |
|                                      |                                               |                   | CNX38U                 | 120 |      |     |       |
| Emitter to Collector                 | I <sub>E</sub> = 0.1 mA, I <sub>F</sub> = 0   | BV <sub>ECO</sub> | All                    | 7   |      |     | V     |

### ISOLATION CHARACTERISTICS

| Characteristic                 | Test Conditions                       | Symbol           | Min   | Typ | Max | Units            |
|--------------------------------|---------------------------------------|------------------|-------|-----|-----|------------------|
| Input-Output Isolation Voltage | t = 1 min.                            | V <sub>ISO</sub> | 5,300 |     |     | V <sub>RMS</sub> |
| Isolation Resistance           | V <sub>I-O</sub> = 500 VDC            | R <sub>ISO</sub> | 1     | 10  |     | TΩ               |
| Isolation Capacitance          | I <sub>F</sub> = 0, V = 0V, f = 1 MHz | C <sub>ISO</sub> |       | 0.6 | 1.3 | pF               |

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| TRANSFER CHARACTERISTICS (T <sub>A</sub> = 25°C Unless otherwise specified.) |                                                                      |                      |                |                                                 |      |     |       |
|------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------|----------------|-------------------------------------------------|------|-----|-------|
| DC Characteristics                                                           | Test Conditions                                                      | Symbol               | Device         | Min                                             | Typ  | Max | Units |
| Output/Input Current Transfer Ratio                                          | I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 0.4 V                      | CTR                  | CNX35U         | 40                                              |      | 160 | %     |
|                                                                              |                                                                      |                      | CNX39U         | 60                                              |      | 100 |       |
|                                                                              |                                                                      |                      | CNX36U         | 80                                              |      | 200 |       |
|                                                                              | I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 10 V                       |                      | CNX38U         | 70                                              |      | 210 |       |
|                                                                              |                                                                      |                      |                | I <sub>F</sub> = 16 mA, V <sub>CE</sub> = 0.4 V | 50   |     |       |
|                                                                              | I <sub>F</sub> = 2 mA, V <sub>CE</sub> = 5 V                         |                      | All            | 15                                              |      |     |       |
| Collector-Emitter Saturation Voltage                                         | I <sub>F</sub> = 10 mA, I <sub>C</sub> = 2 mA                        | V <sub>CE(SAT)</sub> | CNX35U, CNX39U |                                                 | 0.15 | 0.4 | V     |
|                                                                              | I <sub>F</sub> = 10 mA, I <sub>C</sub> = 4 mA                        |                      | CNX36U         |                                                 | 0.19 | 0.4 |       |
|                                                                              | I <sub>F</sub> = 16 mA, I <sub>C</sub> = 2 mA                        |                      | CNX38U         |                                                 | 0.2  | 0.4 |       |
|                                                                              |                                                                      |                      |                |                                                 |      |     |       |
| AC Characteristics                                                           | Test Conditions                                                      | Symbol               | Device         | Min                                             | Typ  | Max | Units |
| Non-Saturated Switching Times                                                |                                                                      |                      |                |                                                 |      |     |       |
| Turn-On Time<br>See Fig. 1 and Fig. 2                                        | R <sub>L</sub> = 100 Ω, I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 5 V | t <sub>on</sub>      | CNX35U         |                                                 |      | 20  | μs    |
|                                                                              |                                                                      |                      | CNX39U         |                                                 |      | 20  |       |
|                                                                              |                                                                      |                      | CNX36U         |                                                 |      | 20  |       |
|                                                                              | R <sub>L</sub> = 100 Ω, I <sub>C</sub> = 4 mA, V <sub>CC</sub> = 5 V |                      | CNX38U         |                                                 |      | 20  |       |
| Turn-Off Time<br>See Fig. 1 and Fig. 2                                       | R <sub>L</sub> = 100 Ω, I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 5 V | t <sub>off</sub>     | CNX35U         |                                                 |      | 20  | μs    |
|                                                                              |                                                                      |                      | CNX39U         |                                                 |      | 20  |       |
|                                                                              |                                                                      |                      | CNX36U         |                                                 |      | 20  |       |
|                                                                              | R <sub>L</sub> = 100 Ω, I <sub>C</sub> = 4 mA, V <sub>CC</sub> = 5 V |                      | CNX38U         |                                                 |      | 20  |       |
| Saturated Switching Times                                                    |                                                                      |                      |                |                                                 |      |     |       |
| Turn-On Time<br>See Fig. 1 and Fig. 2                                        | R <sub>L</sub> = 1 kΩ, I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 5 V  | t <sub>on</sub>      | CNX35U         |                                                 |      | 50  | μs    |
|                                                                              |                                                                      |                      | CNX39U         |                                                 |      | 50  |       |
|                                                                              |                                                                      |                      | CNX36U         |                                                 |      | 50  |       |
|                                                                              | R <sub>L</sub> = 1 kΩ, I <sub>C</sub> = 4 mA, V <sub>CC</sub> = 5 V  |                      | CNX38U         |                                                 |      | 50  |       |
| Turn-Off Time<br>See Fig. 1 and Fig. 2                                       | R <sub>L</sub> = 1 kΩ, I <sub>C</sub> = 2 mA, V <sub>CC</sub> = 5 V  | t <sub>off</sub>     | CNX35U         |                                                 |      | 50  | μs    |
|                                                                              |                                                                      |                      | CNX39U         |                                                 |      | 50  |       |
|                                                                              |                                                                      |                      | CNX36U         |                                                 |      | 50  |       |
|                                                                              | R <sub>L</sub> = 1 kΩ, I <sub>C</sub> = 4 mA, V <sub>CC</sub> = 5 V  |                      | CNX38U         |                                                 |      | 50  |       |

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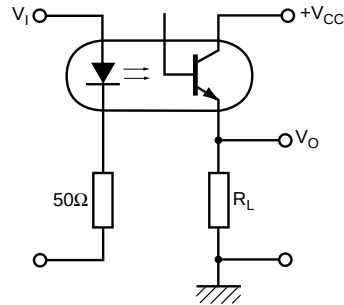


Fig. 1 Switching Test Circuit

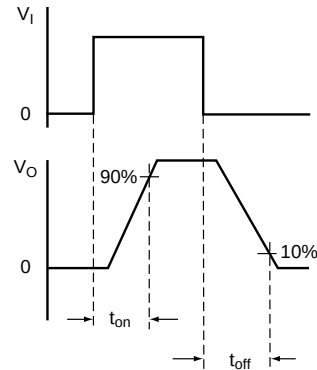


Fig. 2 Switching Test Waveforms

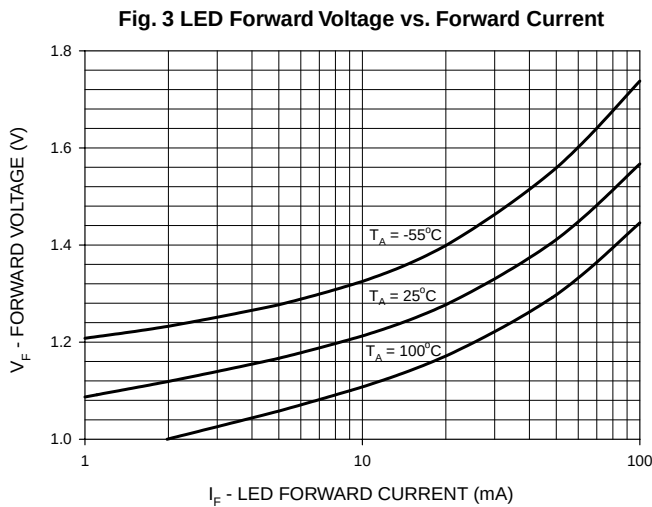


Fig. 3 LED Forward Voltage vs. Forward Current

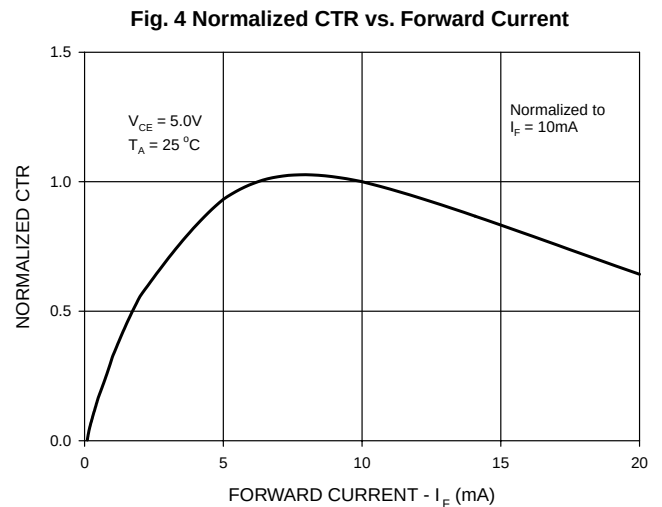


Fig. 4 Normalized CTR vs. Forward Current

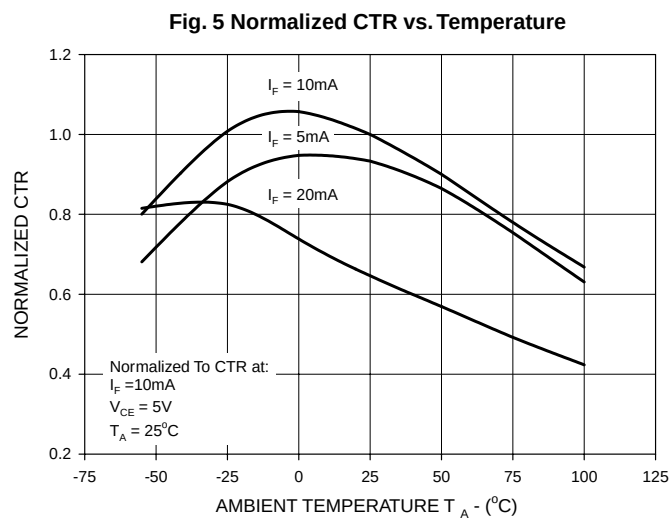


Fig. 5 Normalized CTR vs. Temperature

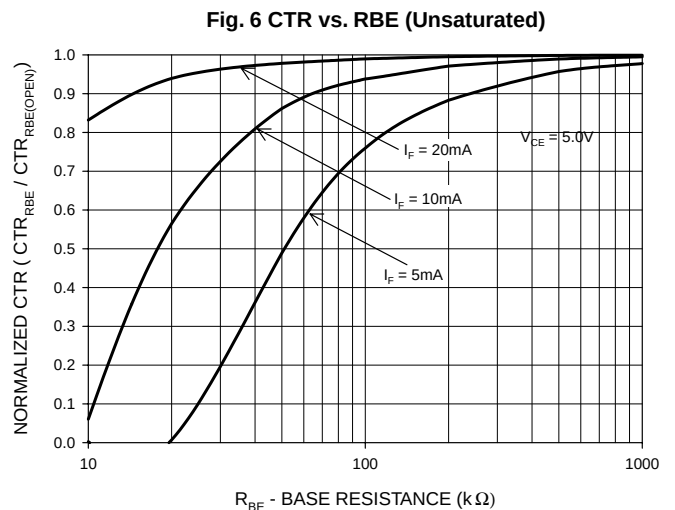
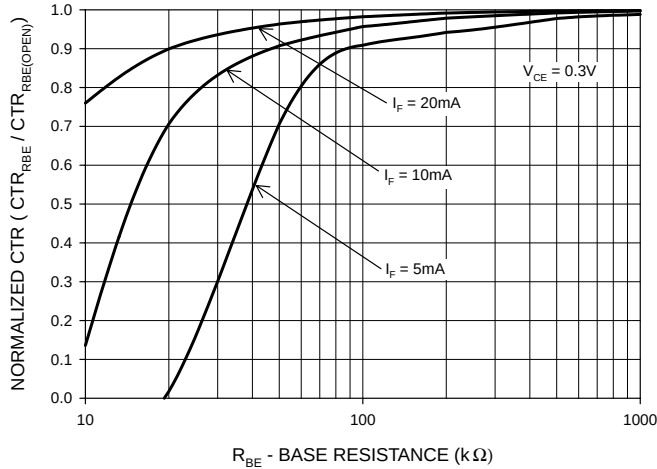


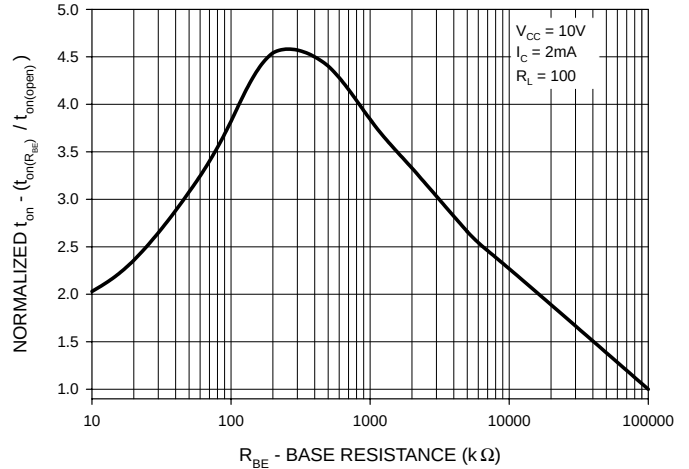
Fig. 6 CTR vs. RBE (Unsaturated)

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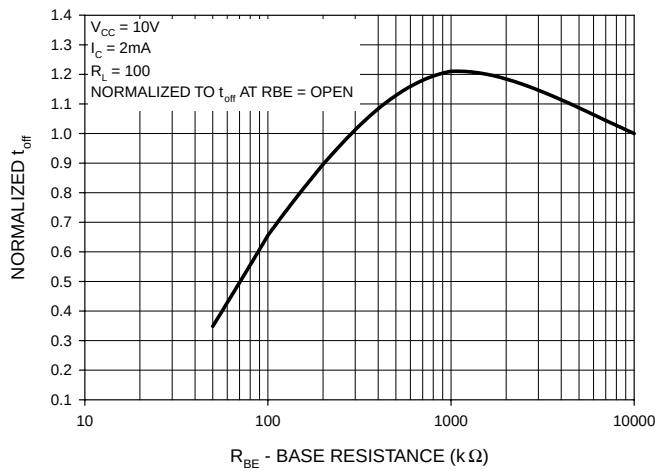
**Fig. 7 CTR vs. R<sub>BE</sub> (Saturated)**



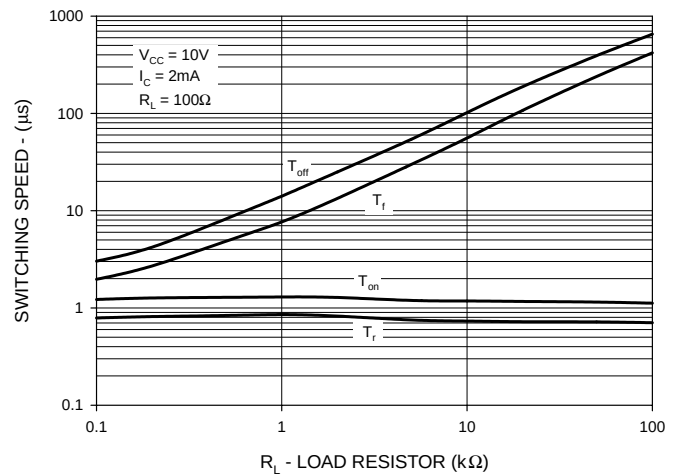
**Fig. 8 Normalized t<sub>on</sub> vs. R<sub>BE</sub>**



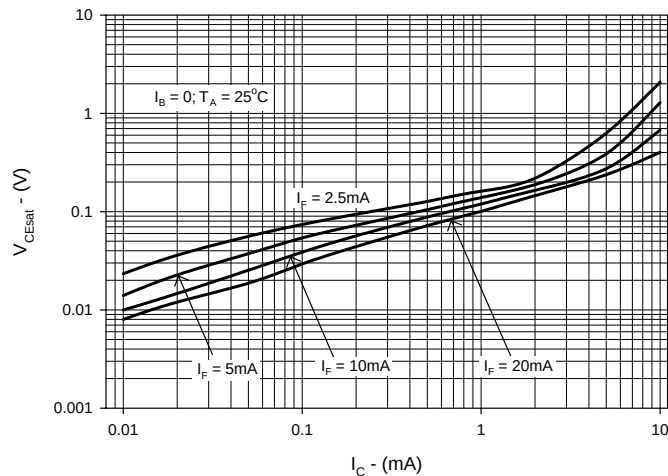
**Fig. 9 Normalized t<sub>off</sub> vs. R<sub>BE</sub>**



**Fig. 10 Switching Speed vs. Load Resistor**

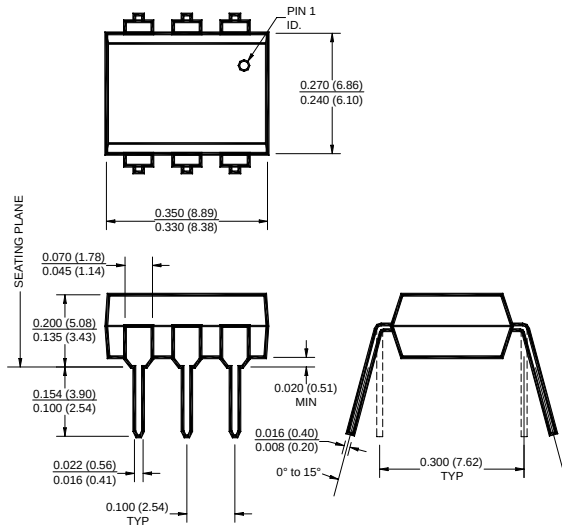


**Fig. 11 Collector-Emitter Saturation Voltage as a Function of Collector Current**

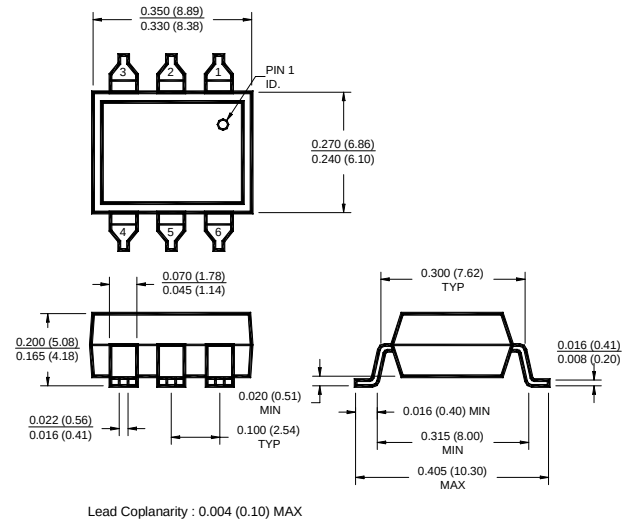


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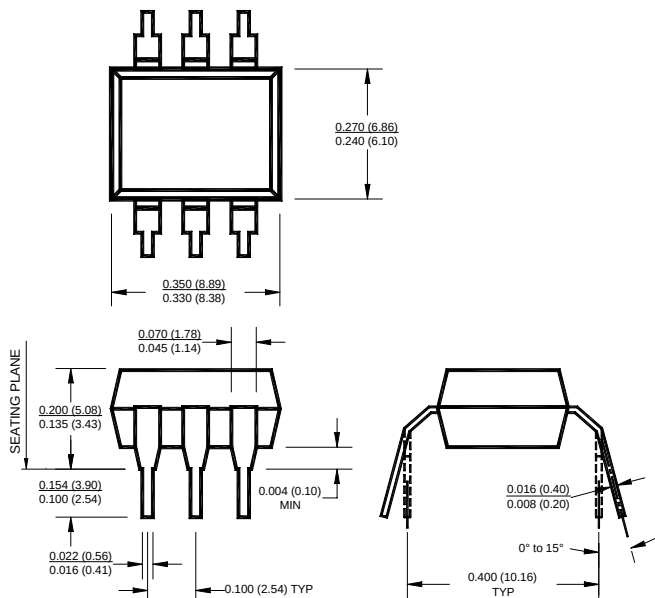
## Package Dimensions (Through Hole)



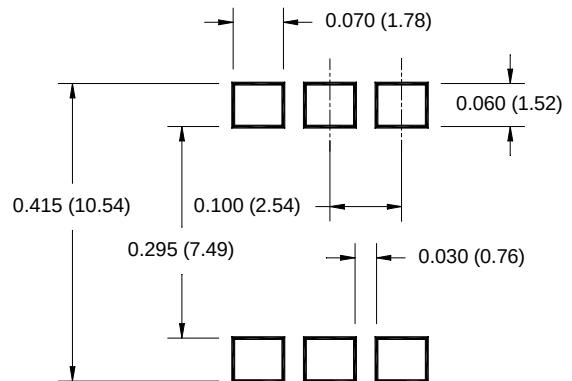
## Package Dimensions (Surface Mount)



## Package Dimensions (0.4" Lead Spacing)



## Recommended Pad Layout for Surface Mount Leadform



### NOTE

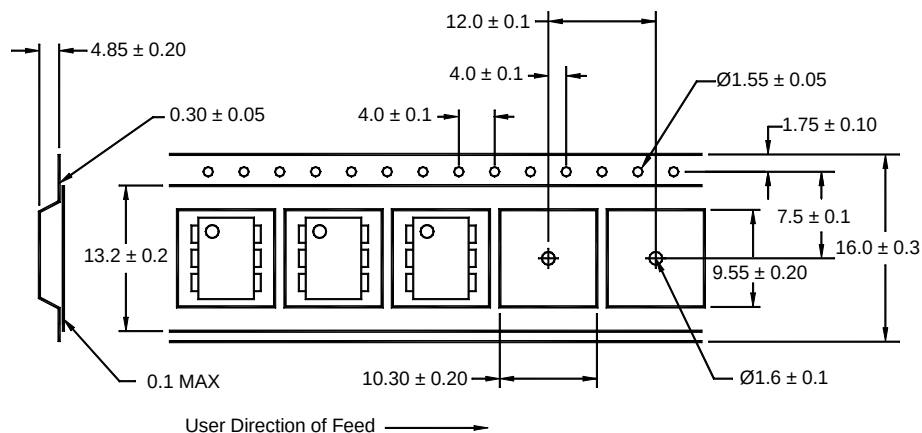
All dimensions are in inches (millimeters)

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## 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 |

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



## NOTE

All dimensions are in inches (millimeters)

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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.