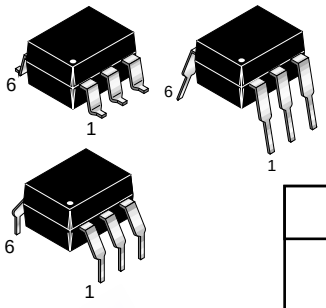
# 6-PIN PHOTOTRANSISTOR OPTOCOUPLERS

**CNX35U CNX36U CNX38U CNX39U**

## DESCRIPTION

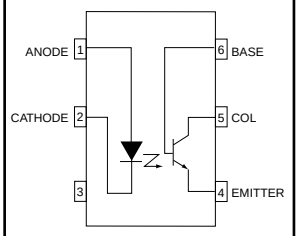
The CNX35U, CNX36U CNX38U and CNX39U are optically coupled isolators consisting of an infrared emitting GaAs diode and a silicon NPN phototransistor with accessible base. These devices are housed in 6-pin dual-in-line packages (DIP).




## 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)

**SCHEMATIC**




## APPLICATIONS

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



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

## 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 | | 1.15 | 1.5 | V |
| Reverse Current | $V_R$ = 5 V | $I_R$ | All | | | 10 | µA |
| **DETECTOR** | $V_{CE}$ = 10 V | $I_{CEO}$ | CNX35U,CNX36U,CNX39U | | 2 | 50 | nA |
| | $V_{CE}$ = 50 V | | CNX38U | | 2 | 50 | nA |
| Leakage Current Collector to Emitter | $V_{CE}$ = 10 V, $T_A$ = 70°C | | CNX35U,CNX36U,CNX39U | | | 10 | µA |
| | $V_{CE}$ = 50 V, $T_A$ = 70°C | | CNX38U | | | 10 | µA |
| | $V_{CE}$ = 10 V | $I_{CBO}$ | All | | | 20 | nA |
| Breakdown Voltage | | | | | | | |
| Collector to Emitter | $I_C$ = 1 mA, $I_F$ = 0 | $BV_{CEO}$ | CNX35U,CNX36U,CNX39U | 30 | | | V |
| | | | CNX38U | 80 | | | |
| Collector to Base | $I_C$ = 0.1 mA, $I_F$ = 0 | $BV_{CBO}$ | CNX35U,CNX36U,CNX39U | 70 | | | V |
| | | | CNX38U | 120 | | | |
| Emitter to Collector | $I_E$ = 0.1 mA, $I_F$ = 0 | $BV_{ECO}$ | All | 7 | | | V |

### ISOLATION CHARACTERISTICS

| Characteristic | Test Conditions | Symbol | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| Input-Output Isolation Voltage | t = 1 min. | $V_{ISO}$ | 5,300 | | | $V_{RMS}$ |
| Isolation Resistance | $V_{I-O}$ = 500 VDC | $R_{ISO}$ | 1 | 10 | | TΩ |
| Isolation Capacitance | IF =0, V = 0V, f = 1 MHz | $C_{ISO}$ | | 0.6 | 1.3 | pF |

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

| DC Characteristics | Test Conditions | Symbol | Device | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|---|
| Output/Input Current Transfer Ratio | $I_F$ = 10 mA, $V_{CE}$ = 0.4 V | CTR | CNX35U | 40 | | 160 | % |
| | | | CNX39U | 60 | | 100 | |
| | | | CNX36U | 80 | | 200 | |
| | $I_F$ = 10 mA, $V_{CE}$ = 10 V | | CNX38U | 70 | | 210 | |
| | $I_F$ = 16 mA, $V_{CE}$ = 0.4 V | | | 50 | | | |
| | $I_F$ = 2 mA, $V_{CE}$ = 5 V | | All | 15 | | | |
| Collector-Emitter Saturation Voltage | $I_F$ = 10 mA, $I_C$ = 2 mA | $V_{CE(SAT)}$ | CNX35U, CNX39U | | 0.15 | 0.4 | V |
| | $I_F$ = 10 mA, $I_C$ = 4 mA | | CNX36U | | 0.19 | 0.4 | |
| | $I_F$ = 16 mA, $I_C$ = 2 mA | | CNX38U | | 0.2 | 0.4 | |
| **AC Characteristics** | **Test Conditions** | **Symbol** | **Device** | **Min** | **Typ** | **Max** | **Units** |
| **Non-Saturated Switching Times** Turn-On Time See Fig. 1 and Fig. 2 | $R_L$ = 100 Ω, $I_C$ = 2 mA, $V_{CC}$ = 5 V | $t_{on}$ | CNX35U | | | 20 | µs |
| | | | CNX39U | | | 20 | |
| | | | CNX36U | | | 20 | |
| | $R_L$ = 100 Ω, $I_C$ = 4 mA, $V_{CC}$ = 5 V | | CNX38U | | | 20 | |
| Turn-Off Time See Fig. 1 and Fig. 2 | $R_L$ = 100 Ω, $I_C$ = 2 mA, $V_{CC}$ = 5 V | $t_{off}$ | CNX35U | | | 20 | µs |
| | | | CNX39U | | | 20 | |
| | | | CNX36U | | | 20 | |
| | $R_L$ = 100 Ω, $I_C$ = 4 mA, $V_{CC}$ = 5 V | | CNX38U | | | 20 | |
| **Saturated Switching Times** Turn-On Time See Fig. 1 and Fig. 2 | $R_L$ = 1 kΩ, $I_C$ = 2 mA, $V_{CC}$ = 5 V | $t_{on}$ | CNX35U | | | 50 | µs |
| | | | CNX39U | | | 50 | |
| | | | CNX36U | | | 50 | |
| | $R_L$ = 1 kΩ, $I_C$ = 4 mA, $V_{CC}$ = 5 V | | CNX38U | | | 50 | |
| Turn-Off Time See Fig. 1 and Fig. 2 | $R_L$ = 1 kΩ, $I_C$ = 2 mA, $V_{CC}$ = 5 V | $t_{off}$ | CNX35U | | | 50 | µs |
| | | | CNX39U | | | 50 | |
| | | | CNX36U | | | 50 | |
| | $R_L$ = 1 kΩ, $I_C$ = 4 mA, $V_{CC}$ = 5 V | | CNX38U | | | 50 | |

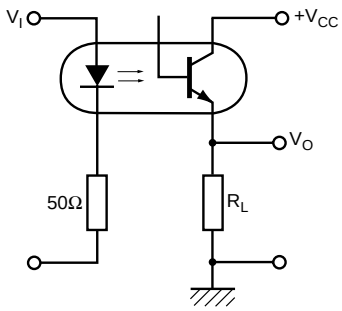



**Fig. 1 Switching Test Circuit**

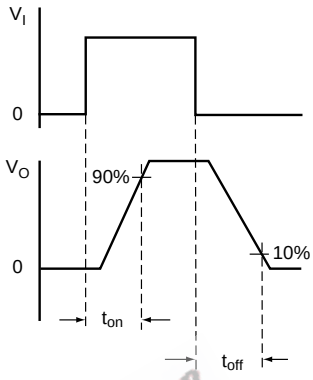



**Fig. 2 Switching Test Waveforms**

**Fig. 3 LED Forward Voltage vs. Forward Current**

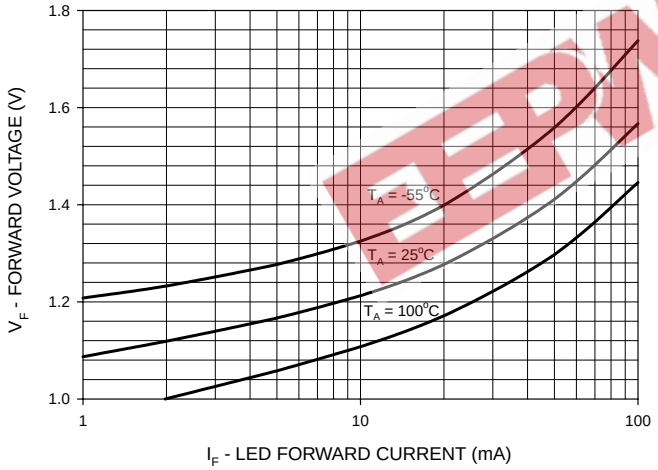



**Fig. 4 Normalized CTR vs. Forward Current**

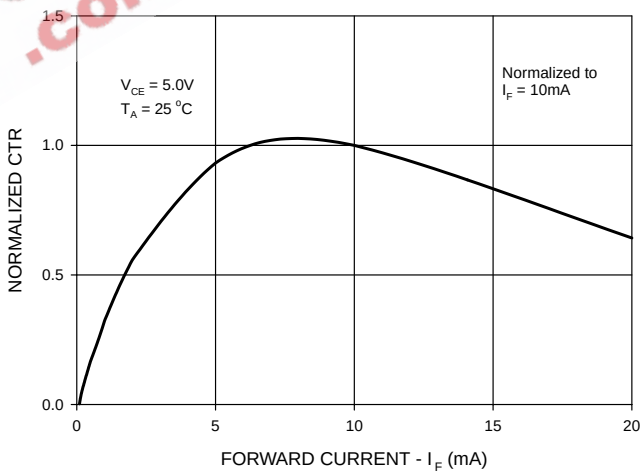



**Fig. 5 Normalized CTR vs. Temperature**

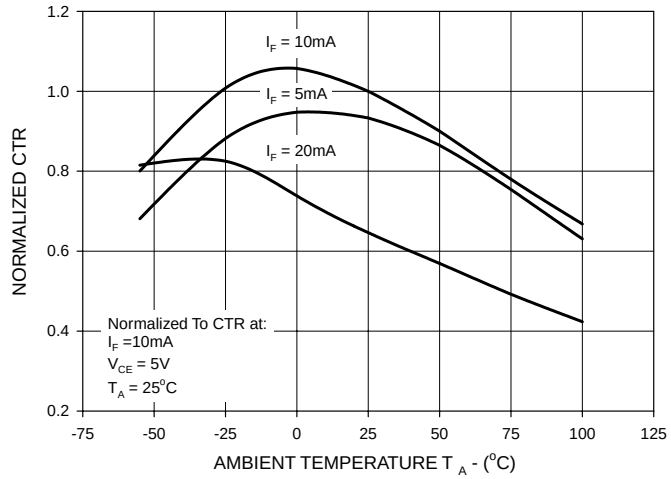



**Fig. 6 CTR vs. RBE (Unsaturated)**

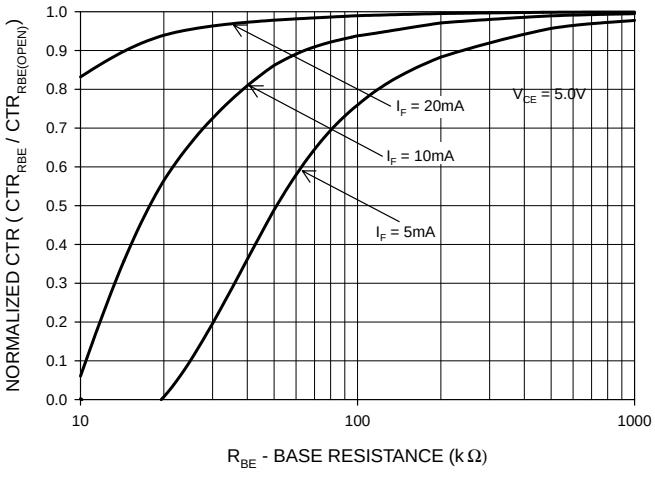


**Fig. 7 CTR vs. RBE (Saturated)**

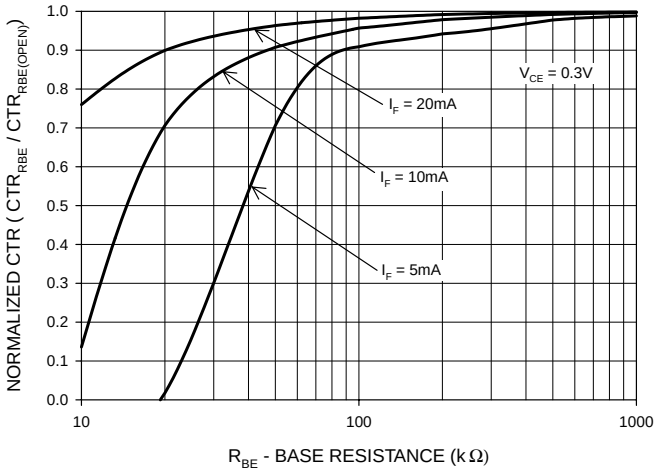



**Fig. 8 Normalized $t_{on}$ vs. $R_{BE}$**

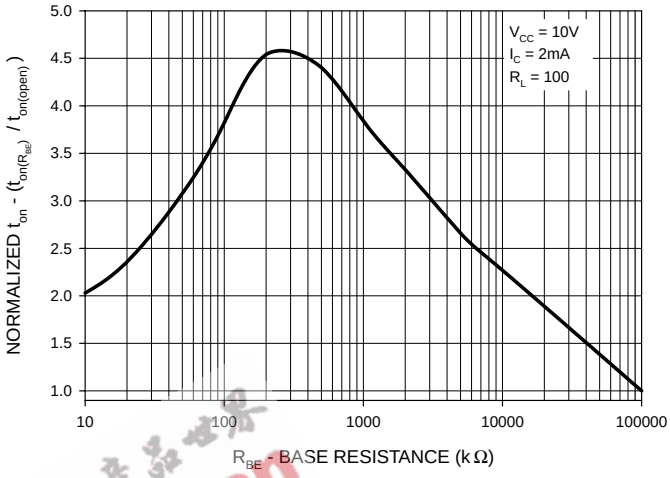



**Fig. 9 Normalized $t_{off}$ vs. $R_{BE}$**

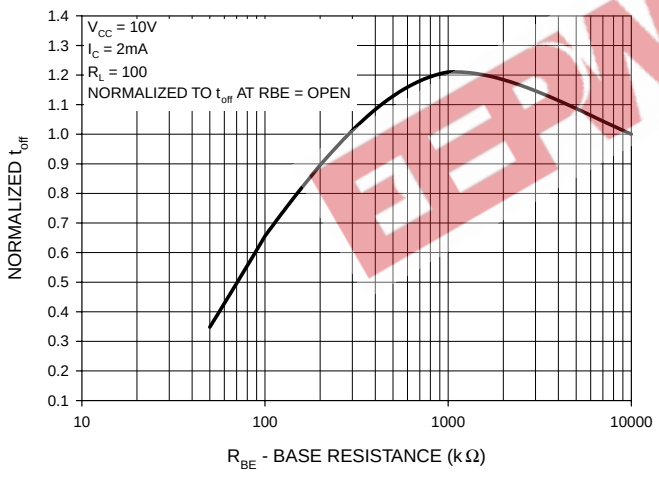



**Fig. 10 Switching Speed vs. Load Resistor**

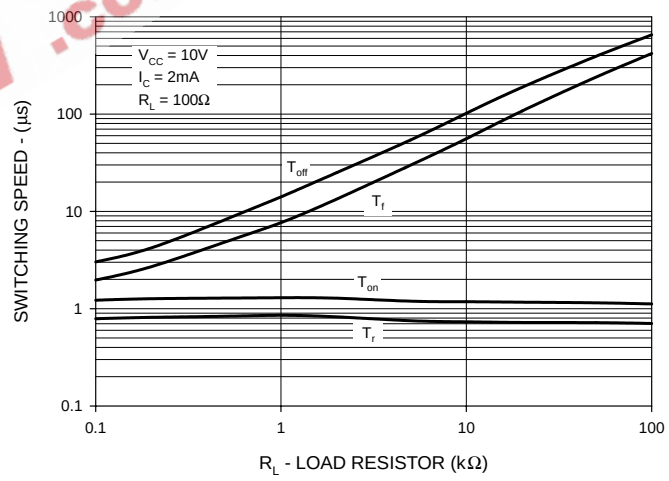
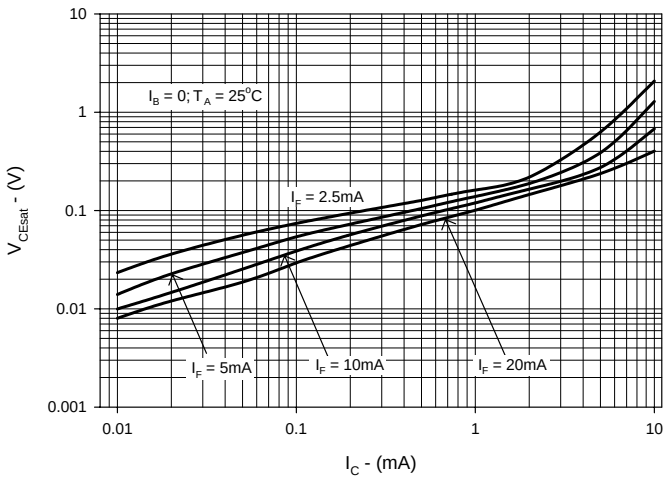


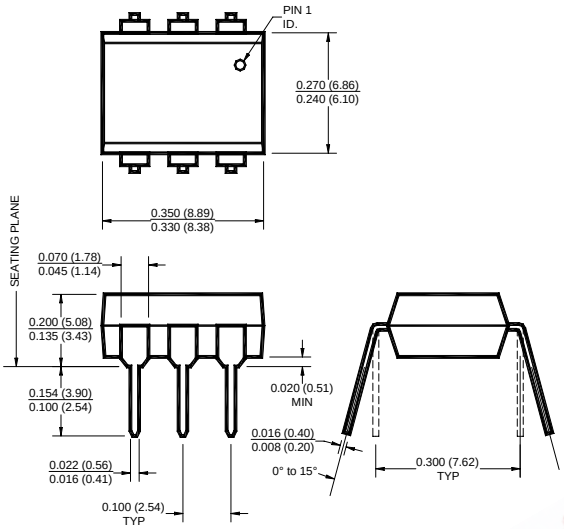

**Fig. 11 Collector-Emitter Saturation Voltage as a Function of Collector Current**



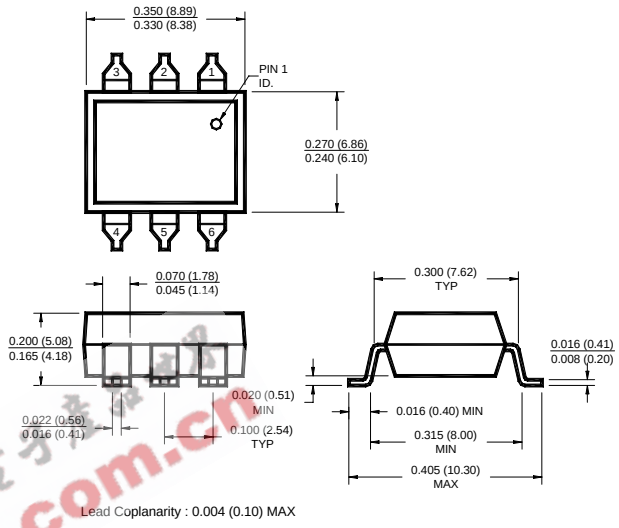
# 6-PIN PHOTOTRANSISTOR OPTOCOUPLERS

**CNX35U CNX36U CNX38U CNX39U**

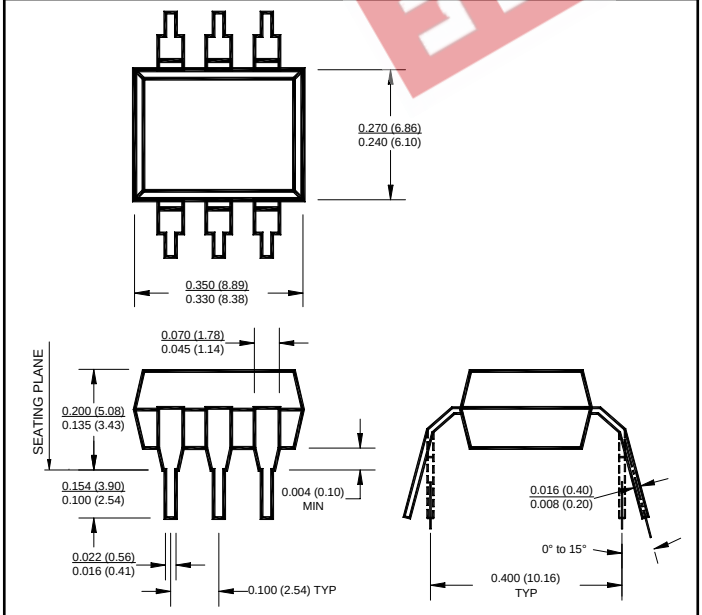
## Package Dimensions (Through Hole)



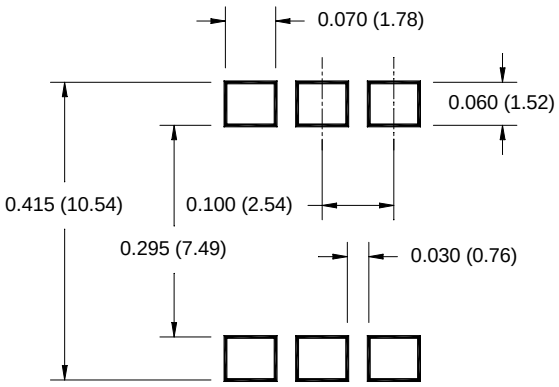

## Package Dimensions (Surface Mount)




## Package Dimensions (0.4”Lead Spacing)




## Recommended Pad Layout for Surface Mount Leadform



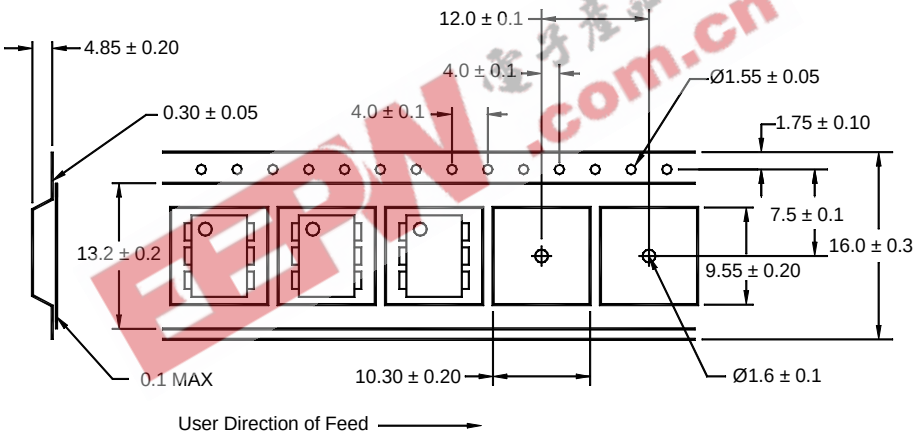

**NOTE**

All dimensions are in inches (millimeters)

## ORDERING INFORMATION

| Option | Order Entry Identifier | Description |
|---|---|---|
| S | .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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