

## DESCRIPTION

The 4N29, 4N30, 4N31, 4N32, 4N33 have a gallium arsenide infrared emitter optically coupled to a silicon planar photodarlington.

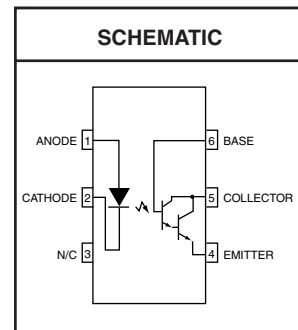
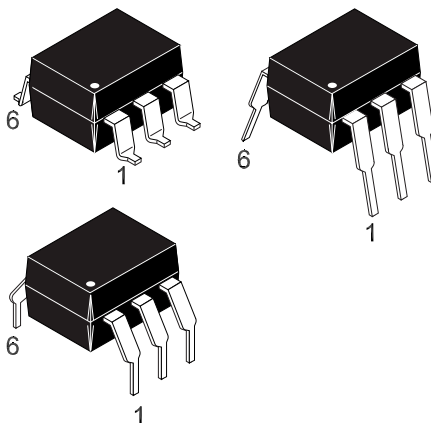
**4N29    4N30    4N31    4N32    4N33**

## 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., 4N29.300)

## APPLICATIONS

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



## ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ Unless otherwise specified.)

| Parameter  | Symbol           | Value          | Units                |
|--|------------------|----------------|----------------------|
| <b>TOTAL DEVICE</b>  |                  |                |                      |
| Storage Temperature  | $T_{STG}$        | -55 to +150    | $^\circ\text{C}$     |
| Operating Temperature                                      | $T_{OPR}$        | -55 to +100    | $^\circ\text{C}$     |
| Lead Solder Temperature                                    | $T_{SOL}$        | 260 for 10 sec | $^\circ\text{C}$     |
| Total Device Power Dissipation @ $T_A = 25^\circ\text{C}$  | $P_D$            | 250            | mW                   |
| Derate above $25^\circ\text{C}$                            |                  | 3.3            | mW/ $^\circ\text{C}$ |
| <b>EMITTER</b>   |                  |                |                      |
| Continuous Forward Current                                 | $I_F$            | 80             | mA                   |
| Reverse Voltage  | $V_R$            | 3              | V                    |
| Forward Current - Peak (300 $\mu\text{s}$ , 2% Duty Cycle) | $I_F(\text{pk})$ | 3.0            | A                    |
| LED Power Dissipation @ $T_A = 25^\circ\text{C}$           | $P_D$            | 150            | mW                   |
| Derate above $25^\circ\text{C}$                            |                  | 2.0            | mW/ $^\circ\text{C}$ |
| <b>DETECTOR</b>  |                  |                |                      |
| Collector-Emitter Breakdown Voltage                        | $BV_{CEO}$       | 30             | V                    |
| Collector-Base Breakdown Voltage                           | $BV_{CBO}$       | 30             | V                    |
| Emitter-Collector Breakdown Voltage                        | $BV_{ECO}$       | 5              | V                    |
| Detector Power Dissipation @ $T_A = 25^\circ\text{C}$      | $P_D$            | 150            | mW                   |
| Derate above $25^\circ\text{C}$                            |                  | 2.0            | mW/ $^\circ\text{C}$ |
| Continuous Collector Current                               | $I_C$            | 150            | mA                   |



# GENERAL PURPOSE 6-PIN PHOTODARLINGTON OPTOCOUPLEDERS

4N29 4N30 4N31 4N32 4N33

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

### INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter                            | Test Conditions                                    | Symbol             | Min | Typ   | Max | Unit |
|--------------------------------------|--|--------------------|-----|-------|-----|------|
| <b>EMITTER</b>                       |  |                    |     |       |     |      |
| *Input Forward Voltage               | (I <sub>F</sub> = 10 mA)                           | V <sub>F</sub>     |     | 1.2   | 1.5 | V    |
| *Reverse Leakage Current             | (V <sub>R</sub> = 3.0 V)                           | I <sub>R</sub>     |     | 0.001 | 100 | μA   |
| *Capacitance                         | (V <sub>F</sub> = 0 V, f = 1.0 MHz)                | C                  |     | 150   |     | pF   |
| <b>DETECTOR</b>                      |  |                    |     |       |     |      |
| *Collector-Emitter Breakdown Voltage | (I <sub>C</sub> = 100 μA, I <sub>B</sub> = 0)      | BV <sub>CEO</sub>  | 30  | 60    |     |      |
| *Collector-Base Breakdown Voltage    | (I <sub>C</sub> = 100 μA, I <sub>E</sub> = 0)      | BV <sub>CBO</sub>  | 30  | 100   |     | V    |
| *Emitter-Collector Breakdown Voltage | (I <sub>E</sub> = 100 μA, I <sub>B</sub> = 0)      | BV <sub>ECCO</sub> | 5.0 | 8     |     | V    |
| *Collector-Emitter Dark Current      | (V <sub>CE</sub> = 10 V, Base Open)                | I <sub>CEO</sub>   |     | 1     | 100 | nA   |
| DC Current Gain                      | (V <sub>CE</sub> = 5.0 V, I <sub>C</sub> = 500 μA) | h <sub>FE</sub>    |     | 5000  |     |      |

### TRANSFER CHARACTERISTICS

| DC Characteristic   | Test Conditions  | Symbol               | Min      | Typ | Max | Units  |
|---|--|----------------------|----------|-----|-----|--------|
| *Collector Output Current <sup>(1,2)</sup> (4N32, 4N33)     | (I <sub>F</sub> = 10 mA, V <sub>CE</sub> = 10 V, I <sub>B</sub> = 0) | I <sub>C</sub> (CTR) | 50 (500) |     |     | mA (%) |
| (4N29, 4N30)  |  |                      | 10 (100) |     |     |        |
| (4N31)  |  |                      | 5 (50)   |     |     |        |
| *Saturation Voltage <sup>(2)</sup> (4N29, 4N30, 4N32, 4N33) | (I <sub>F</sub> = 8.0 mA, I <sub>C</sub> = 2.0 mA)                   | V <sub>CE(sat)</sub> |          |     | 1.0 | V      |
| (4N31)  |  |                      |          |     | 1.2 |        |

### TRANSFER CHARACTERISTICS

| AC Characteristic                         | Test Conditions  | Symbol          | Min | Typ | Max | Units |
|---|--|-----------------|-----|-----|-----|-------|
| Turn-on Time <sup>(3)</sup>               | (I <sub>F</sub> = 200 mA, I <sub>C</sub> = 50 mA, V <sub>CC</sub> = 10 V)<br>(Fig.7) | t <sub>on</sub> |     |     | 5.0 | μs    |
| Turn-off Time <sup>(3)</sup> (4N32, 4N33) |  |                 |     |     | 100 |       |
| (4N29, 4N30, 4N31)                        |  |                 |     |     | 40  |       |
| Bandwidth <sup>(4,5)</sup>                |  | BW              |     | 30  |     | KHz   |

### ISOLATION CHARACTERISTICS

| Characteristic  | Test Conditions  | Symbol           | Min  | Typ              | Max | Units    |
|---|--|------------------|------|------------------|-----|----------|
| Input-Output Isolation Voltage <sup>(6)</sup><br>(4N29, 4N30, 4N31, 4N32, 4N33) | (I <sub>I-O</sub> ≤ 1 μA, V <sub>Rms</sub> , t = 1 min.) | V <sub>ISO</sub> | 5300 |                  |     | Vac(rms) |
| * (4N32)  |  |                  | VDC  | 2500             |     | V        |
| * (4N33)  |  |                  | VDC  | 1500             |     |          |
| Isolation Resistance <sup>(6)</sup>   | (V <sub>I-O</sub> = 500 VDC)                             | R <sub>ISO</sub> |      | 10 <sup>11</sup> |     | Ω        |
| Isolation Capacitance <sup>(6)</sup>  | (V <sub>I-O</sub> = ∅, f = 1 MHz)                        | C <sub>ISO</sub> |      | 0.8              |     | pf       |

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Fig. 1 Output Current vs. Input Current

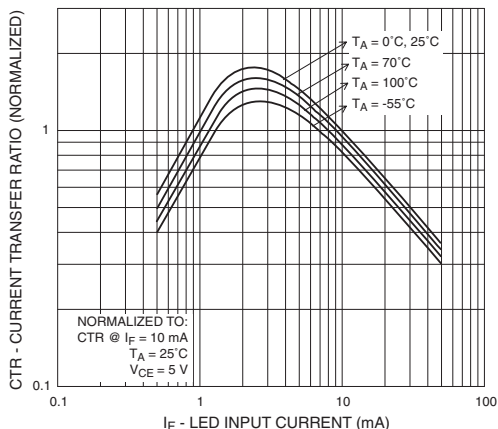


Fig. 2 Current Transfer Ratio vs. Ambient Temperature

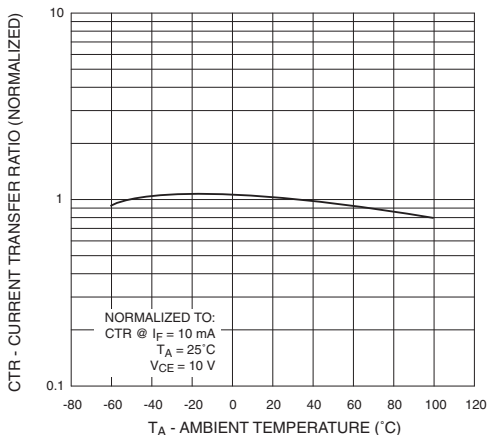


Fig. 3 Collector Current vs. Collector-Emitter Voltage

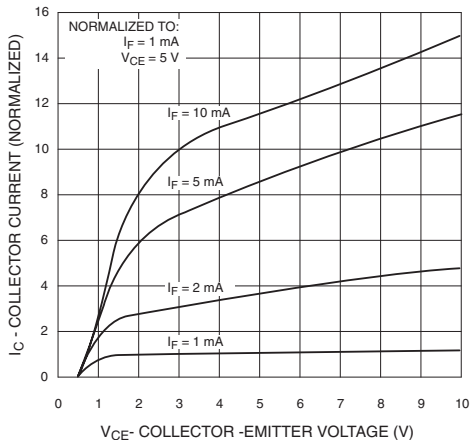


Fig. 4 Dark Current vs. Ambient Temperature

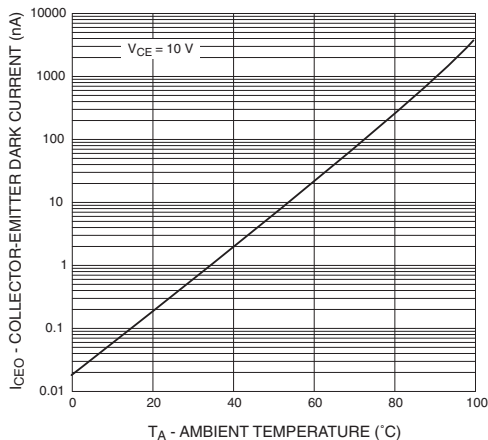


Fig. 5 Turn-On Time vs. Input Current

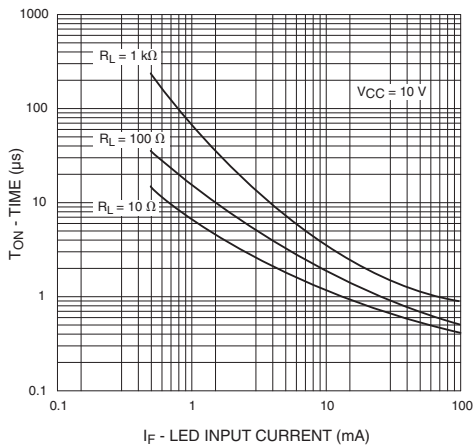
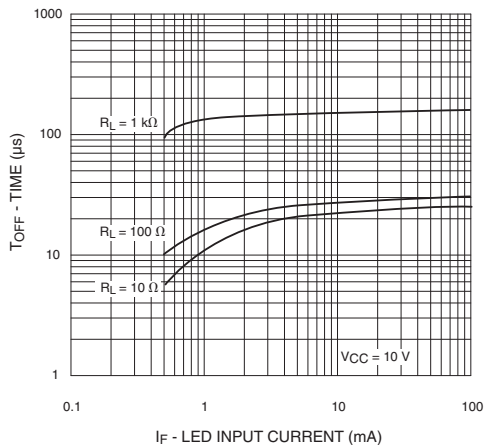


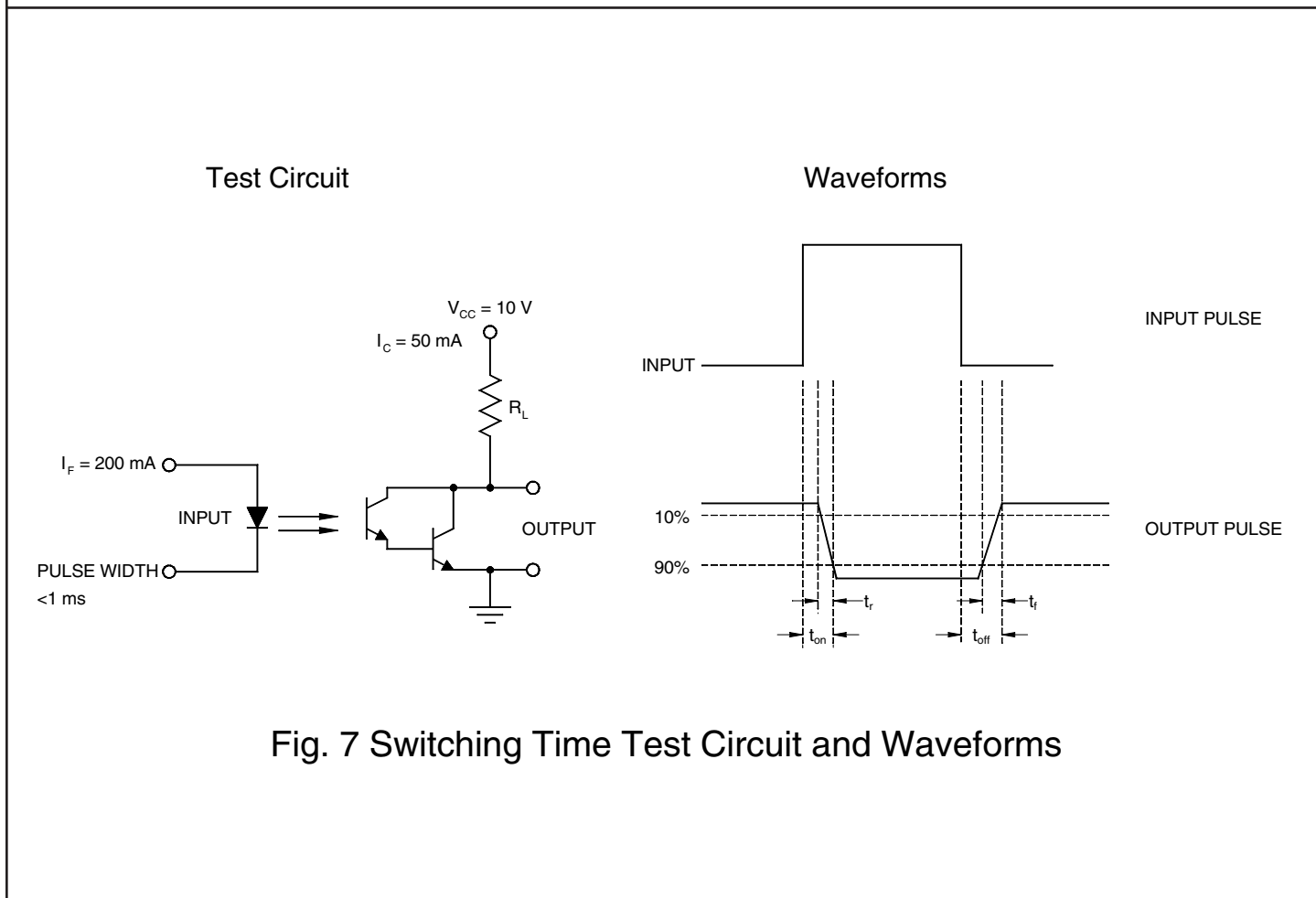
Fig. 6 Turn-Off Time vs. Input Current



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## TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

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



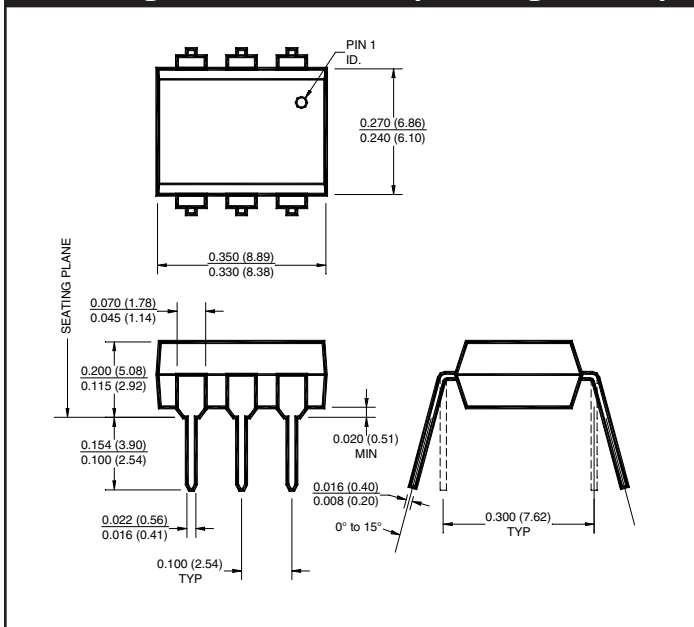
### Notes

\* Indicates JEDEC registered data.

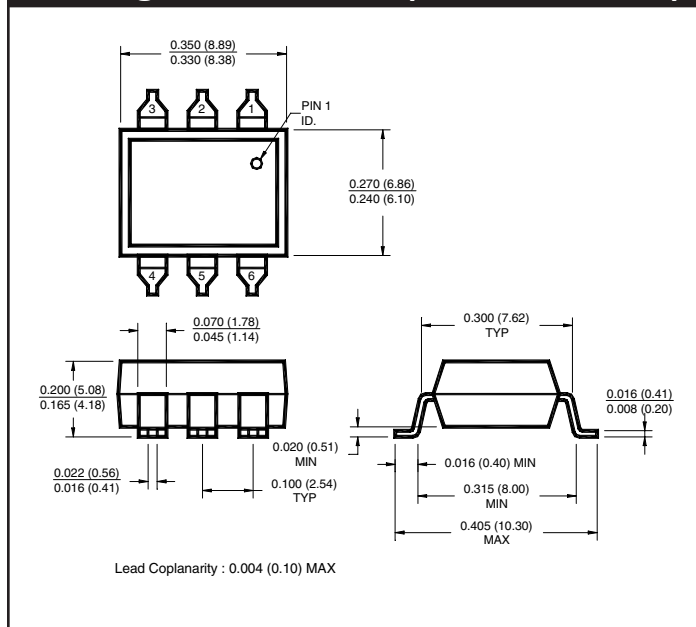
1. The current transfer ratio ( $I_C/I_F$ ) is the ratio of the detector collector current to the LED input current with  $V_{CE}$  @ 10 V.
2. Pulse test: pulse width = 300 $\mu$ s, duty cycle  $\leq$  2.0% .
3. For test circuit setup and waveforms, refer to figure 7..
4.  $I_F$  adjusted to  $I_C = 2.0$  mA and  $I_C = 0.7$  mA rms.
5. The frequency at which  $I_C$  is 3dB down from the 1 KHz value.
6. For this test, LED pins 1 and 2 are common, and phototransistor pins 4,5 and 6 are common.

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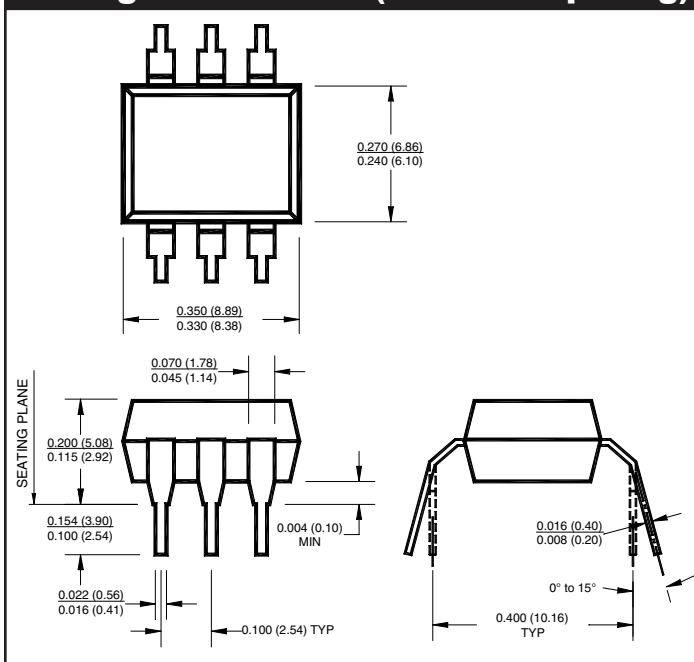
## Package Dimensions (Through Hole)



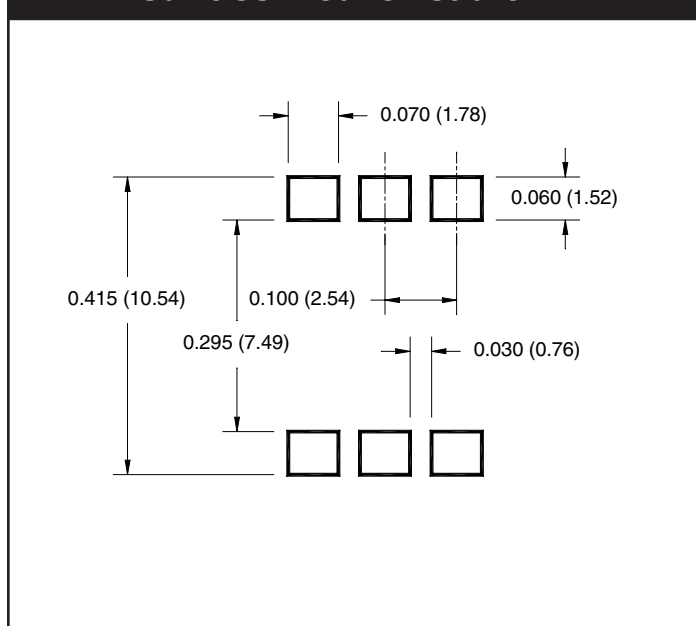
## Package Dimensions (Surface Mount)



## Package Dimensions (0.4" Lead Spacing)



## Recommended Pad Layout for Surface Mount Leadform



### NOTE

All dimensions are in inches (millimeters)

Call QT Optoelectronics for more information or the phone number of your nearest distributor.

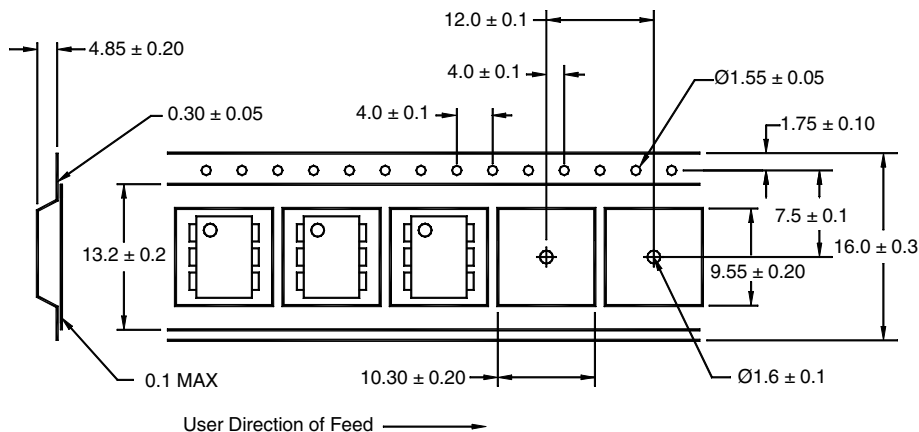
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|      |      |      |      |      |
|------|------|------|------|------|
| 4N29 | 4N30 | 4N31 | 4N32 | 4N33 |
|------|------|------|------|------|

## 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 in millimeters

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