



GENERAL PURPOSE 6-PIN PHOTODARLINGTON OPTOCOUPLERS

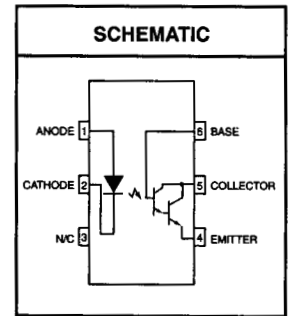
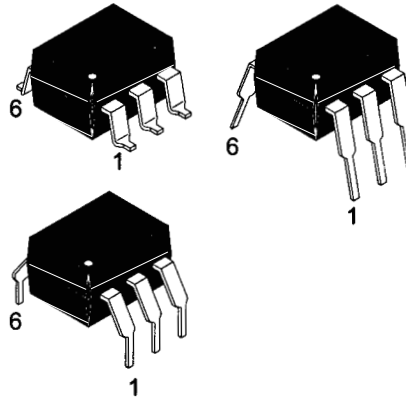
DESCRIPTION

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°C Unless otherwise specified.)

| Parameter | Symbol | Value | Units |
|--|--------------------|----------------|-------|
| TOTAL DEVICE | | | |
| Storage Temperature | T _{STG} | -55 to +150 | °C |
| Operating Temperature | T _{OPR} | -55 to +100 | °C |
| Lead Solder Temperature | T _{SOL} | 260 for 10 sec | °C |
| Total Device Power Dissipation @ T _A = 25°C | P _D | 250 | mW |
| Derate above 25°C | | 3.3 | mW/°C |
| EMITTER | | | |
| Continuous Forward Current | I _F | 80 | mA |
| Reverse Voltage | V _R | 3 | V |
| Forward Current - Peak (300 μs, 2% Duty Cycle) | I _{F(pk)} | 3.0 | A |
| LED Power Dissipation @ T _A = 25°C | P _D | 150 | mW |
| Derate above 25°C | | 2.0 | mW/°C |
| DETECTOR | | | |
| 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°C | P _D | 150 | mW |
| Derate above 25°C | | 2.0 | mW/°C |
| Continuous Collector Current | I _C | 150 | mA |

GENERAL PURPOSE 6-PIN PHOTODARLINGTON OPTOCOUPLEDERS

4N29 4N30 4N31 4N32 4N33

ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless otherwise specified.)

INDIVIDUAL COMPONENT CHARACTERISTICS

| Parameter | Test Conditions | Symbol | Min | Typ | Max | Unit |
|--------------------------------------|--|-------------------|-----|-------|-----|------|
| EMITTER | | | | | | |
| *Input Forward Voltage | (I _F = 10 mA) | V _F | | 1.2 | 1.5 | V |
| *Reverse Leakage Current | (V _R = 3.0 V) | I _R | | 0.001 | 100 | μA |
| *Capacitance | (V _F = 0 V, f = 1.0 MHz) | C | | 150 | | pF |
| DETECTOR | | | | | | |
| *Collector-Emitter Breakdown Voltage | (I _C = 100 μA, I _B = 0) | BV _{CEO} | 30 | 60 | | |
| *Collector-Base Breakdown Voltage | (I _C = 100 μA, I _E = 0) | BV _{CBO} | 30 | 100 | | V |
| *Emitter-Collector Breakdown Voltage | (I _E = 100 μA, I _B = 0) | BV _{ECO} | 5.0 | 8 | | V |
| *Collector-Emitter Dark Current | (V _{CE} = 10 V, Base Open) | I _{CEO} | | 1 | 100 | nA |
| DC Current Gain | (V _{CE} = 5.0 V, I _C = 500 μA) | h _{FE} | | 5000 | | |

TRANSFER CHARACTERISTICS

| DC Characteristic | Test Conditions | Symbol | Min | Typ | Max | Units |
|---|--|----------------------|----------|-----|-----|--------|
| *Collector Output Current ^(1,2) (4N32, 4N33) | (I _F = 10 mA, V _{CE} = 10 V, I _B = 0) | I _C (CTR) | 50 (500) | | | mA (%) |
| (4N29, 4N30) | | | 10 (100) | | | |
| (4N31) | | | 5 (50) | | | |
| *Saturation Voltage ⁽²⁾ (4N29, 4N30, 4N32, 4N33) | (I _F = 8.0 mA, I _C = 2.0 mA) | V _{CE(sat)} | | | 1.0 | V |
| (4N31) | | | | | 1.2 | |

TRANSFER CHARACTERISTICS

| AC Characteristic | Test Conditions | Symbol | Min | Typ | Max | Units |
|---|--|-----------------|-----|-----|-----|-------|
| Turn-on Time ⁽³⁾ | (I _F = 200 mA, I _C = 50 mA, V _{CC} = 10 V) (Fig.7) | t _{on} | | | 5.0 | μs |
| Turn-off Time ⁽³⁾ (4N32, 4N33) | | | | | 100 | |
| (4N29, 4N30, 4N31) | | | | | 40 | |
| Bandwidth ^(4,5) | | BW | | 30 | | KHz |

ISOLATION CHARACTERISTICS

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

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Fig. 1 Output Current vs. Input Current

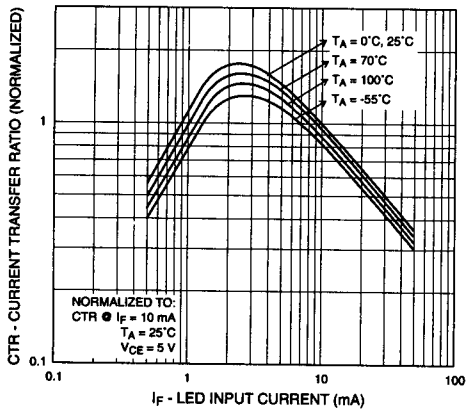


Fig. 2 Current Transfer Ratio vs. Ambient Temperature

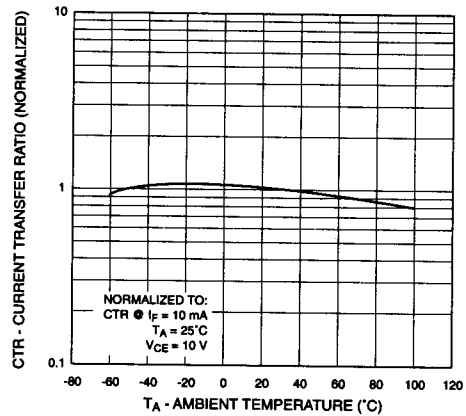


Fig. 3 Collector Current vs. Collector-Emitter Voltage

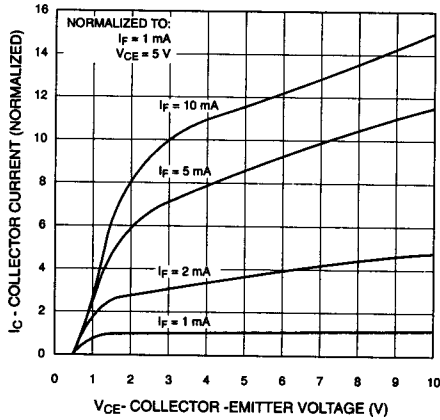


Fig. 4 Dark Current vs. Ambient Temperature

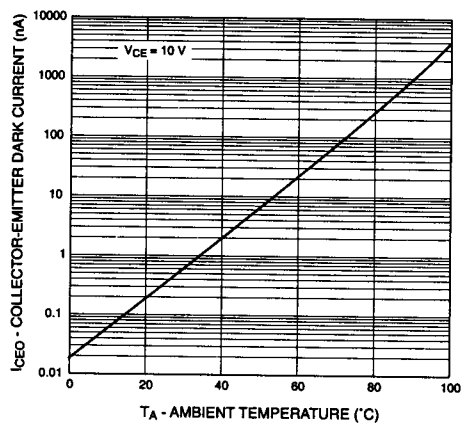


Fig. 5 Turn-On Time vs. Input Current

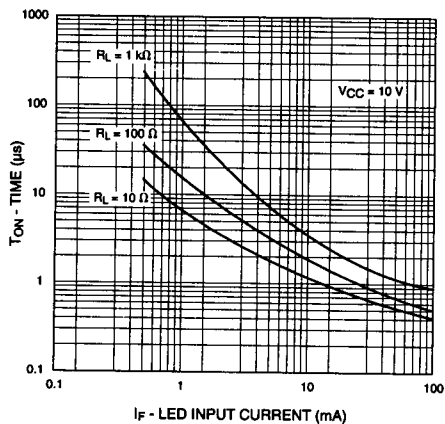
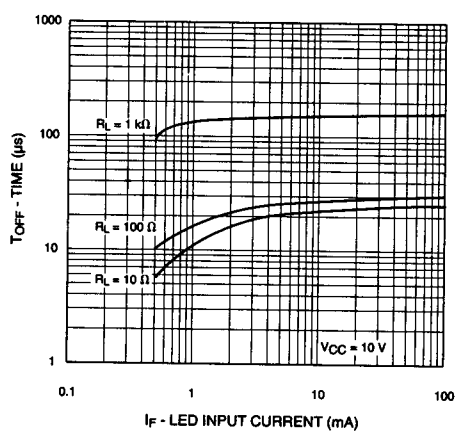


Fig. 6 Turn-Off Time vs. Input Current



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TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES

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

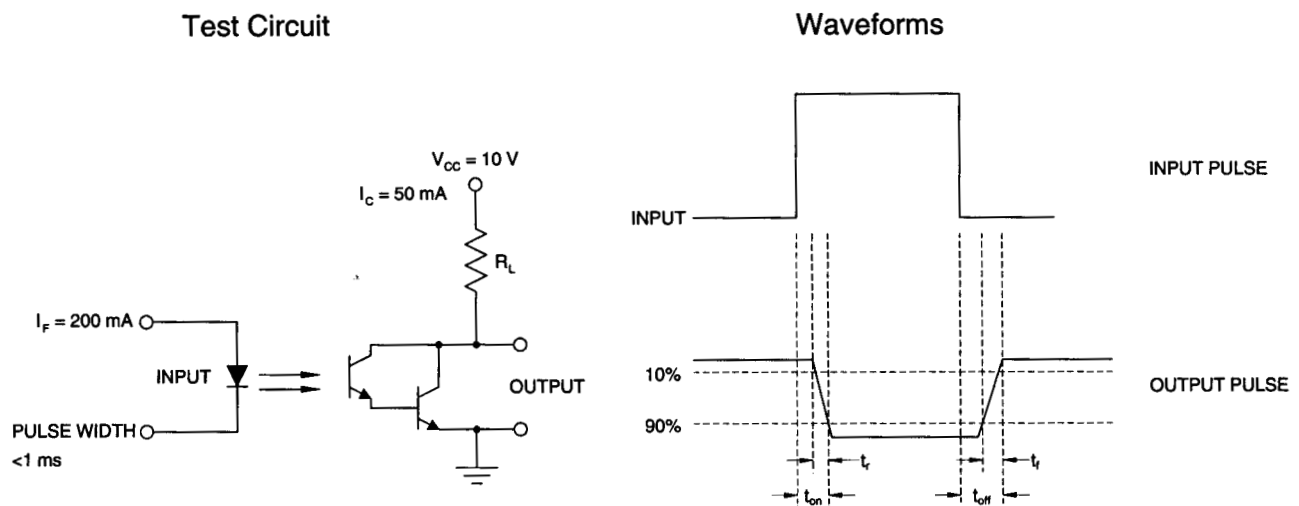


Fig. 7 Switching Time Test Circuit and Waveforms

Notes

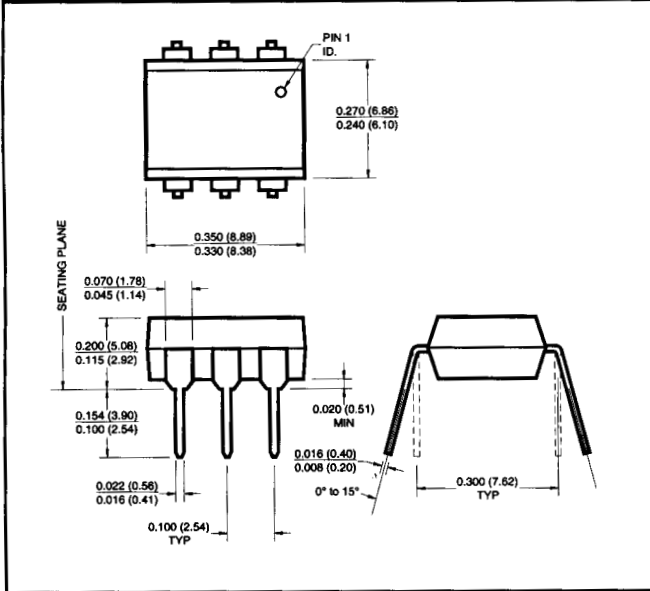
* Indicates JEDEC registered data.

1. The current transfer ratio (I_C/I_F) is the ratio of the detector collector current to the LED input current with $V_{CE} @ 10 \text{ V}$.
2. Pulse test: pulse width = $300 \mu\text{s}$, duty cycle $\leq 2.0\%$.
3. For test circuit setup and waveforms, refer to figure 7.
4. I_F adjusted to $I_C = 2.0 \text{ mA}$ and $I_C = 0.7 \text{ mA rms}$.
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.

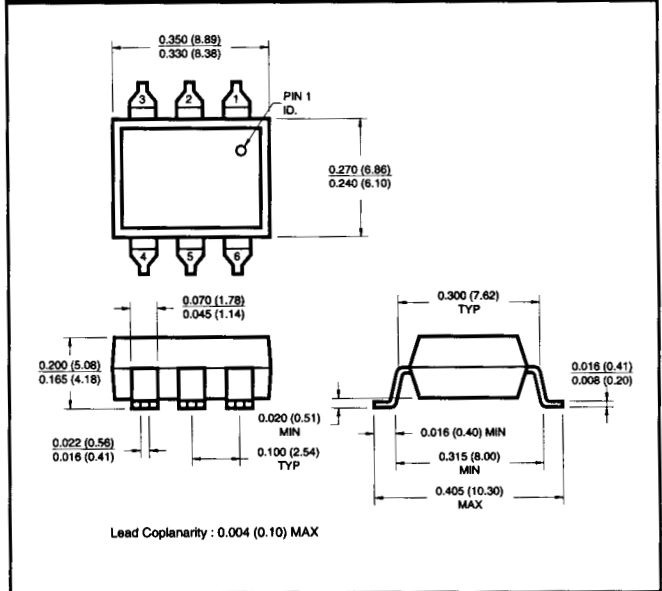
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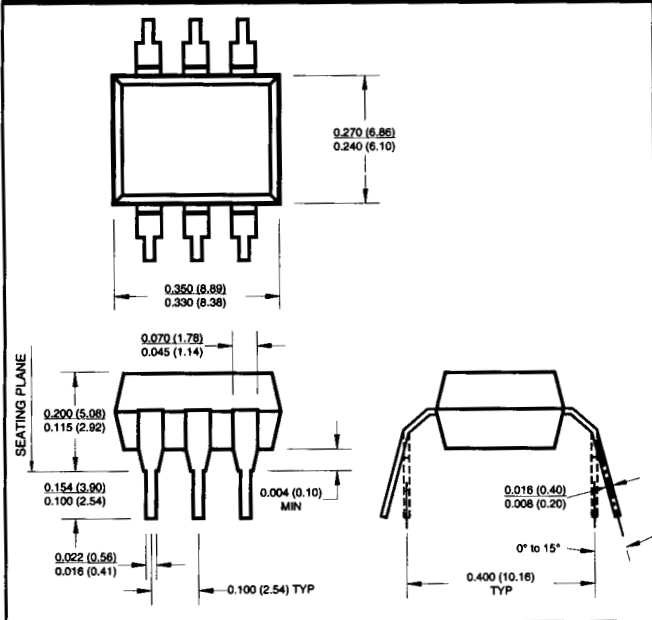
Package Dimensions (Through Hole)



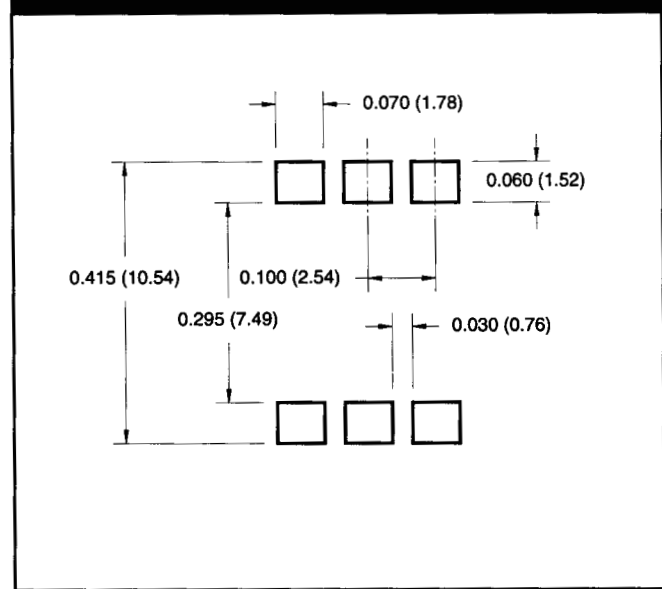
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform



NOTE

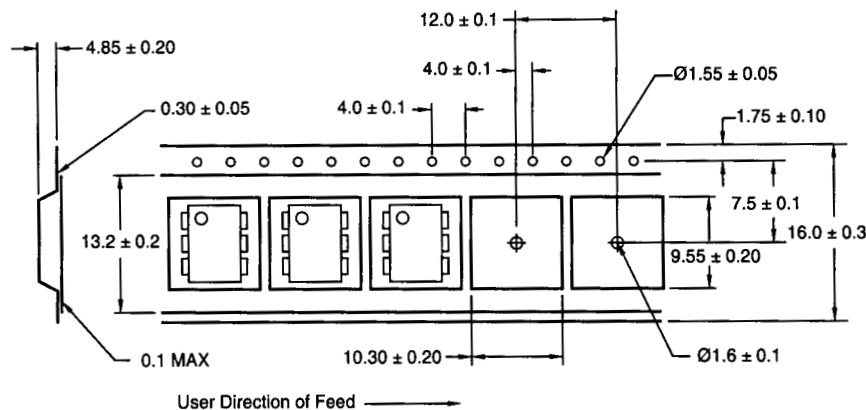
All dimensions are in inches (millimeters)

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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 |

QT Carrier Tape Specifications ("D" Taping Orientation)



NOTE

All dimensions are in millimeters

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