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

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.)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL DEVICE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>T_STG</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>T_OPR</td>
<td>-55 to +100</td>
<td>°C</td>
</tr>
<tr>
<td>Lead Solder Temperature</td>
<td>T_SOL</td>
<td>260 for 10 sec</td>
<td>°C</td>
</tr>
<tr>
<td>Total Device Power Dissipation @ T_A = 25°C</td>
<td>P_D</td>
<td>250</td>
<td>mW</td>
</tr>
<tr>
<td>Derate above 25°C</td>
<td></td>
<td>3.3</td>
<td>mW/°C</td>
</tr>
<tr>
<td>EMMITER</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Forward Current</td>
<td>I_F</td>
<td>80</td>
<td>mA</td>
</tr>
<tr>
<td>Reverse Voltage</td>
<td>V_R</td>
<td>3</td>
<td>V</td>
</tr>
<tr>
<td>Forward Current - Peak (300 µs, 2% Duty Cycle)</td>
<td>I_F(pk)</td>
<td>3.0</td>
<td>A</td>
</tr>
<tr>
<td>LED Power Dissipation @ T_A = 25°C</td>
<td>P_D</td>
<td>150</td>
<td>mW</td>
</tr>
<tr>
<td>Derate above 25°C</td>
<td></td>
<td>2.0</td>
<td>mW/°C</td>
</tr>
<tr>
<td>DETECTOR</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-Emitter Breakdown Voltage</td>
<td>BVCEO</td>
<td>30</td>
<td>V</td>
</tr>
<tr>
<td>Collector-Base Breakdown Voltage</td>
<td>BV_CBO</td>
<td>30</td>
<td>V</td>
</tr>
<tr>
<td>Emitter-Collector Breakdown Voltage</td>
<td>BV_ECO</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>Detector Power Dissipation @ T_A = 25°C</td>
<td>P_D</td>
<td>150</td>
<td>mW</td>
</tr>
<tr>
<td>Derate above 25°C</td>
<td></td>
<td>2.0</td>
<td>mW/°C</td>
</tr>
<tr>
<td>Continuous Collector Current</td>
<td>I_C</td>
<td>150</td>
<td>mA</td>
</tr>
</tbody>
</table>
## GENERAL PURPOSE 6-PIN PHOTODARLINGTON OPTOCOUPLERS

### INDIVIDUAL COMPONENT CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EMITTER</strong></td>
<td><em>(Input Forward Voltage)</em> $(I_F = 10 \text{ mA})$</td>
<td>$V_F$</td>
<td>1.2</td>
<td>1.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td><strong>EMITTER</strong></td>
<td><em>(Reverse Leakage Current)</em> $(V_R = 3.0 \text{ V})$</td>
<td>$I_R$</td>
<td>0.001</td>
<td>100</td>
<td>µA</td>
<td></td>
</tr>
<tr>
<td><strong>EMITTER</strong></td>
<td><em>(Capacitance)</em> $(V_F = 0 \text{ V}, f = 1.0 \text{ MHz})$</td>
<td>$C$</td>
<td>150</td>
<td></td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td><strong>DETECTOR</strong></td>
<td><em>(Collector-Emitter Breakdown Voltage)</em> $(I_C = 100 \text{ µA}, I_B = 0)$</td>
<td>$B_{V_{CEO}}$</td>
<td>30</td>
<td>60</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td><strong>DETECTOR</strong></td>
<td><em>(Collector-Base Breakdown Voltage)</em> $(I_C = 100 \text{ µA}, I_E = 0)$</td>
<td>$B_{V_{CBO}}$</td>
<td>30</td>
<td>100</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td><strong>DETECTOR</strong></td>
<td><em>(Emitter-Collector Breakdown Voltage)</em> $(I_E = 100 \text{ µA}, I_B = 0)$</td>
<td>$B_{V_{EEO}}$</td>
<td>5.0</td>
<td>8</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td><strong>DETECTOR</strong></td>
<td><em>(Collector-Emitter Dark Current)</em> $(V_{CE} = 10 \text{ V}, \text{Base Open})$</td>
<td>$I_{CEO}$</td>
<td>1</td>
<td>100</td>
<td>nA</td>
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### DC CHARACTERISTICS

<table>
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<tr>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
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</thead>
<tbody>
<tr>
<td>$I_C(CTR)$</td>
<td>50 (500)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_{CE(sat)}$</td>
<td>1.0</td>
<td>1.2</td>
<td></td>
</tr>
</tbody>
</table>

### TRANSFER CHARACTERISTICS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Test Conditions</th>
<th>Symbol</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Turn-on Time</strong></td>
<td>$(IF = 200 \text{ mA}, IC = 50 \text{ mA}, VCC = 10 \text{ V})$ (Fig.7)</td>
<td>$t_{on}$</td>
<td>5.0</td>
<td></td>
<td>µs</td>
</tr>
<tr>
<td><strong>Turn-off Time</strong></td>
<td>$(4N32, 4N33)$</td>
<td>$t_{off}$</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Bandwidth</strong></td>
<td>$(4N29, 4N30, 4N31)$</td>
<td>BW</td>
<td>30</td>
<td></td>
<td>KHz</td>
</tr>
<tr>
<td><strong>Input-Output Isolation Voltage</strong></td>
<td>$(I_{IO} = 1 \text{ µA}, Vrms, t = 1 \text{ min.})$</td>
<td>$V_{ISO}$</td>
<td>5300</td>
<td></td>
<td>Vac(rms)</td>
</tr>
<tr>
<td><strong>Isolation Resistance</strong></td>
<td>$(V_{IO} = 500 \text{ VDC})$</td>
<td>$R_{ISO}$</td>
<td>10$^{11}$</td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td><strong>Isolation Capacitance</strong></td>
<td>$(V_{IO} = 0, f = 1 \text{ MHz})$</td>
<td>$C_{ISO}$</td>
<td>0.8</td>
<td></td>
<td>pf</td>
</tr>
</tbody>
</table>
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
TYPICAL ELECTRO-OPTICAL CHARACTERISTIC CURVES
(25°C Free air temperature unless otherwise specified) (Cont.)

Notes
* Indicates JEDEC registered data.
1. The current transfer ratio (IC/IF) is the ratio of the detector collector current to the LED input current with VCE @ 10 V.
2. Pulse test: pulse width = 300µs, duty cycle ≤ 2.0%.
3. For test circuit setup and waveforms, refer to figure 7.
4. IF adjusted to IC = 2.0 mA and IC = 0.7 mA rms.
5. The frequency at which IC 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.
Call QT Optoelectronics for more information or the phone number of your nearest distributor.
United States 800-533-6786 • France 33 [0] 1.45.18.78.78 • Germany 49 [0] 89/96.30.51 • United Kingdom 44 [0] 1296 394499 • Asia/Pacific 603-7248193

www.qtopto.com
### ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Option</th>
<th>Order Entry Identifier</th>
<th>Description</th>
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<tbody>
<tr>
<td>S</td>
<td>.S</td>
<td>Surface Mount Lead Bend</td>
</tr>
<tr>
<td>SD</td>
<td>.SD</td>
<td>Surface Mount; Tape and reel</td>
</tr>
<tr>
<td>W</td>
<td>.W</td>
<td>0.4” Lead Spacing</td>
</tr>
<tr>
<td>300</td>
<td>.300</td>
<td>VDE 0884</td>
</tr>
<tr>
<td>300W</td>
<td>.300W</td>
<td>VDE 0884, 0.4” Lead Spacing</td>
</tr>
<tr>
<td>3S</td>
<td>.3S</td>
<td>VDE 0884, Surface Mount</td>
</tr>
<tr>
<td>3SD</td>
<td>.3SD</td>
<td>VDE 0884, Surface Mount, Tape &amp; Reel</td>
</tr>
</tbody>
</table>

### QT Carrier Tape Specifications (“D” Taping Orientation)

- **4.65 ± 0.20**
- **12.0 ± 0.1**
- **1.75 ± 0.10**
- **1.55 ± 0.05**
- **7.5 ± 0.1**
- **16.0 ± 0.3**
- **9.55 ± 0.20**
- **10.30 ± 0.20**
- **0.1 MAX**
- **0.30 ± 0.05**
- **4.85 ± 0.20**
- **4.0 ± 0.1**
- **4.0 ± 0.1**
- **13.2 ± 0.2**
- **16.0 ± 0.3**
- **0.1 MAX**
- **4.0 ± 0.1**

**User Direction of Feed**

**NOTE**

All dimensions are in millimeters.

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

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MARKING INFORMATION

Definitions

1. Fairchild logo
2. Device number
3. VDE mark (Note: Only appears on parts ordered with VDE option – See order entry table)
4. Two digit year code, e.g., ‘03’
5. Two digit work week ranging from ‘01’ to ‘53’
6. Assembly package code

Reflow Profile (Black Package, No Suffix)

- Peak reflow temperature: 225°C (package surface temperature)
- Time of temperature higher than 183°C for 60–150 seconds
- One time soldering reflow is recommended
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MicroFET™
MicroPak™
MICROWIRE™
MSX™
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POPTM
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2. A critical component is 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.

PRODUCT STATUS DEFINITIONS

Definition of Terms

<table>
<thead>
<tr>
<th>Datasheet Identification</th>
<th>Product Status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advance Information</td>
<td>Formative or In Design</td>
<td>This datasheet contains the design specifications for product development. Specifications may change in any manner without notice.</td>
</tr>
<tr>
<td>Preliminary</td>
<td>First Production</td>
<td>This datasheet contains preliminary data, and supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.</td>
</tr>
<tr>
<td>No Identification Needed</td>
<td>Full Production</td>
<td>This datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice in order to improve design.</td>
</tr>
<tr>
<td>Obsolete</td>
<td>Not In Production</td>
<td>This datasheet contains specifications on a product that has been discontinued by Fairchild semiconductor. The datasheet is printed for reference information only.</td>
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