CT815 DC Input 4-Pin Photodarlington Optocoupler

Features
- High isolation 5000 V_{RMS}
- DC input with Darlington output
- External Creepage ≥ 7.5mm (S/SL Type)
- External Creepage ≥ 8.0mm (SLM Type)
- Operating temperature range - 55 °C to 110 °C
- Regulatory Approvals
  - UL - UL1577 (E364000)
  - VDE - EN60747-5-5(VDE0884-5)
  - CQC – GB4943.1, GB8898
  - IEC60065, IEC60950

Description
The CT815 series consists of a photodarlington transistor optically coupled to a gallium arsenide Infrared-emitting diode in a 4-lead DIP package with bending option.

Applications
- Power supply regulators
- Digital logic outputs
- Microprocessor inputs

Package Outline

Schematic

Anode 1
Cathode 2
Collector 4
Emitter 3
## Absolute Maximum Rating at 25°C

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Ratings</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>VISO</td>
<td>Isolation voltage</td>
<td>5000</td>
<td>V_RMS</td>
<td></td>
</tr>
<tr>
<td>T_OPR</td>
<td>Operating temperature</td>
<td>-55 ~ +110</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>T_STG</td>
<td>Storage temperature</td>
<td>-55 ~ +150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>T_SOL</td>
<td>Soldering temperature</td>
<td>260</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>P_TOT</td>
<td>Total power dissipation</td>
<td>200</td>
<td>mW</td>
<td></td>
</tr>
</tbody>
</table>

### Emitter

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Ratings</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_F</td>
<td>Forward current</td>
<td>60</td>
<td>mA</td>
</tr>
<tr>
<td>I_F(TRANS)</td>
<td>Peak transient current</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>V_R</td>
<td>Reverse voltage</td>
<td>6</td>
<td>V</td>
</tr>
<tr>
<td>P_D</td>
<td>Power dissipation</td>
<td>100</td>
<td>mW</td>
</tr>
</tbody>
</table>

### Detector

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Ratings</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>P_C</td>
<td>Power dissipation</td>
<td>150</td>
<td>mW</td>
</tr>
<tr>
<td>B_VCEO</td>
<td>Collector-Emitter Breakdown Voltage</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>B_VECO</td>
<td>Emitter-Collector Breakdown Voltage</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>I_C</td>
<td>Collector Current</td>
<td>80</td>
<td>mA</td>
</tr>
</tbody>
</table>
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DC Input 4-Pin Photodarlington Optocoupler

Electrical Characteristics \( T_A = 25^\circ C (\text{unless otherwise specified}) \)

**Emitter Characteristics**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_F )</td>
<td>Forward voltage</td>
<td>( I_F = 10mA )</td>
<td>-</td>
<td>1.24</td>
<td>1.4</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>( I_R )</td>
<td>Reverse Current</td>
<td>( V_R = 6V )</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>( \mu )A</td>
<td></td>
</tr>
<tr>
<td>( C_{IN} )</td>
<td>Input Capacitance</td>
<td>( f = 1MHz )</td>
<td>-</td>
<td>30</td>
<td>250</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

**Detector Characteristics**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>( B_{VCEO} )</td>
<td>Collector-Emitter Breakdown</td>
<td>( I_C = 100\mu A )</td>
<td>40</td>
<td>-</td>
<td>-</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>( B_{VCEO} )</td>
<td>Emitter-Collector Breakdown</td>
<td>( I_E = 100\mu A )</td>
<td>7</td>
<td>-</td>
<td>-</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>( I_{CEO} )</td>
<td>Collector-Emitter Dark Current</td>
<td>( V_{CE} = 10V, I_F = 0mA )</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>( \mu )A</td>
<td></td>
</tr>
</tbody>
</table>

**Transfer Characteristics**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>( CTR )</td>
<td>Current Transfer Ratio</td>
<td>( I_F = 1mA, V_{CE} = 2V )</td>
<td>600</td>
<td>-</td>
<td>7500</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>( V_{CE(SAT)} )</td>
<td>Collector-Emitter Saturation Voltage</td>
<td>( I_F = 20mA, I_C = 5mA )</td>
<td>-</td>
<td>0.8</td>
<td>1</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>( R_{IO} )</td>
<td>Isolation Resistance</td>
<td>( V_{IO} = 500V_{DC} )</td>
<td>( 5x10^{10} )</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( C_{IO} )</td>
<td>Isolation Capacitance</td>
<td>( f = 1MHz )</td>
<td>-</td>
<td>0.25</td>
<td>1</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

**Switching Characteristics**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameters</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>( t_r )</td>
<td>Rise Time</td>
<td>( I_C = 10mA, V_{CE} = 2V, R_L = 100 )</td>
<td>-</td>
<td>-</td>
<td>300</td>
<td>( \mu )S</td>
<td></td>
</tr>
<tr>
<td>( t_f )</td>
<td>Fall Time</td>
<td></td>
<td>-</td>
<td>-</td>
<td>250</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CT815
DC Input 4-Pin Photodarlington Optocoupler

Typical Characteristic Curves

Figure 1: Forward Current vs. Ambient Temperature

Figure 2: Forward Current vs. Forward Voltage

Figure 3: Detector Power Dissipation vs. Ambient Temperature

Figure 4: Collector Dark Current vs. Ambient Temperature

Figure 5: Current Transfer Ratio vs. Forward Current

Figure 6: Collector Current vs. Ambient Temperature

Normalized to:
- $I_p=1\text{mA}$
- $V_{pe}=2\text{V}$
- $T_a=25^\circ\text{C}$
DC Input 4-Pin Photodarlington Optocoupler

Package Dimension *Dimensions in mm unless otherwise stated*

**Standard DIP – Through Hole**

![Diagram of Standard DIP – Through Hole](image)

**Gullwing (400mil) Lead Forming – Through Hole (M Type)**

![Diagram of Gullwing (400mil) Lead Forming – Through Hole (M Type)](image)
Surface Mount Lead Forming (S Type)

Surface Mount (Low Profile) Lead Forming (SL Type)
DC Input 4-Pin Photodarlington Optocoupler

Surface Mount (Gullwing) Lead Forming (SLM Type)
Recommended Solder Mask

Dimensions in mm unless otherwise stated

Surface Mount Lead Forming & Surface Mount (Low Profile) Lead Forming

Surface Mount (Gullwing) Lead Forming

Marking Information

Note:
CT : Denotes “CT Micro”
815 : Part Number
V : VDE Option
Y : Fiscal Year
WW : Work Week
K : Manufacturing Code
CT815
DC Input 4-Pin Photodarlington Optocoupler

Ordering Information

CT815(Y)(Z)-G

Y = Lead form option (S, SL, M, SLM or none)
Z = Tape and reel option (T1, T2, T3, T4 or none)
G = Material option (G: Green, None: Non-green)

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>Standard 4 Pin DIP</td>
<td>100 Units/Tube</td>
</tr>
</tbody>
</table>
Carrier Tape Specifications *Dimensions in mm unless otherwise stated*

Option S(T1) & SL(T1)

```
Input Direction
```

```
4.00  2.00  1.75
 7.50  16.00
8.00
```

Option S(T2) & SL(T2)

```
Input Direction
```

```
4.00  2.00  1.75
 7.50  16.00
8.00
```

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Option S(T3) & SL(T3)

**Input Direction**

<table>
<thead>
<tr>
<th>4.00</th>
<th>2.00</th>
<th>Ø1.50</th>
<th>1.75</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.00</td>
<td>7.50</td>
<td>4.80</td>
<td></td>
</tr>
</tbody>
</table>

Option S(T4) & SL(T4)

**Input Direction**

<table>
<thead>
<tr>
<th>4.00</th>
<th>2.00</th>
<th>Ø1.50</th>
<th>1.75</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.00</td>
<td>7.50</td>
<td>4.80</td>
<td></td>
</tr>
</tbody>
</table>
Option SLM(T1)

Input Direction

Option SLM(T2)

Input Direction
Reflow Profile

Profile Feature | Pb-Free Assembly Profile
---|---
Temperature Min. (Tsmin) | 150°C
Temperature Max. (Tmax) | 200°C
Time (ts) from (Tsmin to Tmax) | 60-120 seconds
Ramp-up Rate (tl to tp) | 3°C/second max.
Liquidous Temperature (Tl) | 217°C
Time (tl) Maintained Above (Tl) | 60 – 150 seconds
Peak Body Package Temperature | 260°C +0°C / -5°C
Time (tp) within 5°C of 260°C | 30 seconds
Ramp-down Rate (Tp to Tl) | 6 °C/second max
Time 25°C to Peak Temperature | 8 minutes max.
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