# Optically-Coupled Darlington Isolator

# TIL113 TIL119

Optoelectronic Products



**General Description**

The TIL113 and TIL119 optical isolators are electrical and mechanical replacements for the Texas Instrument series. Optical coupling provides a high degree of ac and dc isolation. A capability for continuous operation of the input diode results in a frequency response extending to dc. Connection to the base is also provided for design flexibility.

**Glassolated™**
**Electrically Equivalent to TI Devices**
**Pin-for-Pin Equivalent**
**Availability of Base Pin for Flexible Design**

**Absolute Maximum Ratings**

| | |
|---|---|
| Storage Temperature | −55°C to +150°C |
| Operating Temperature | −55°C to +100°C |
| Pin Temperature (Soldering, 10 s) | 260°C |
| Total Package Power Dissipation at $T_A$ = 25°C (LED plus Detector) | 250 mW |
| Derate Linearly from 25°C | 3.3 mW/°C |

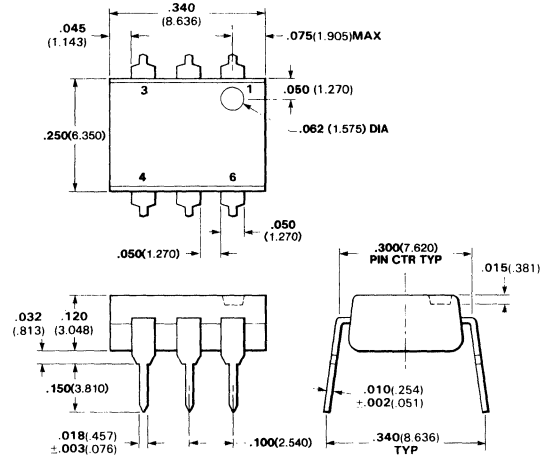
**Input Diode**

| | | |
|---|---|---|
| $I_F$ | Forward dc Current Continuous | 100 mA |
| $V_R$ | Reverse Voltage | 3.0 V |
| $I_{pk}$ | Peak Forward Current, 1 μs pulse width, 300 pps | 3.0 A |
| $P_D$ | Power Dissipation at $T_A$ = 25°C | 150 mW |
| | Derate Linearly from 25°C | 2.0 mW/°C |

**Output Transistor (Darlington)**

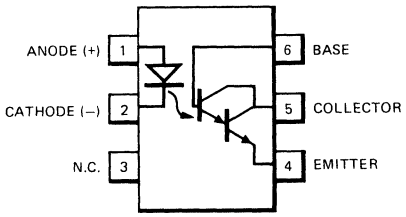
| | | |
|---|---|---|
| $V_{CE}$ | Collector-to-Emitter Voltage | 30 V |
| $V_{CB}$ | Collector-to-Base Voltage | 30 V |
| $V_{EC}$ | Emitter-to-Collector Voltage | 7.0 V |
| $P_D$ | Power Dissipation at $T_A$ = 25°C, $I_{C(max)}$ 100 mA, $V_{CE}$ = 1.5 V | 150 mW |
| | Derate Linearly from 25°C | 2.0 mW/°C |

**Package Outline**




**Notes**
All dimensions in inches **bold** and millimeters (parentheses)
Tolerance unless specified = ±.015 (0.381)

**Connection Diagram DIP (Top View)**




**Pin**

| | | |
|---|---|---|
| 1 | Anode (+) | Input Diode |
| 2 | Cathode (−) | |
| 3 | NC | |
| 4 | Emitter | Output npn Phototransistor |
| 5 | Collector | |
| 6 | Base | |

**Electrical Characteristics—Input Diode** $T_A$ = 25°C

| Symbol | Characteristic | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | | | 1.5 | V | $I_F$ = 10 mA |
| $I_R$ | Reverse Current | | | 100 | μA | $V_R$ = 3.0 V |

# Typical Electrical Characteristics

# TIL113
# TIL119

**Electrical Characteristics—Output Transistor (Darlington)** $T_A = 25°C$

| Symbol | Characteristic | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $BV_{CEO}$ | Collector-to-Emitter Breakdown Voltage | 30 | | | V | $I_C$ = 1.0 mA, $I_F$ = 0 |
| $BV_{CBO}$ | Collector-to-Base Breakdown Voltage TIL113 | 30 | | | | IC = 10 μA, $I_F$ = 0 |
| $BV_{ECO}$ | Emitter-to-Collector Breakdown Voltage TIL119 | 7.0 | | | V | $I_E$ = 10 μA, $I_F$ = 0 |
| $BV_{EBO}$ | Emitter-to-Base Breakdown Voltage TIL113 | 7.0 | | | V | $I_E$ = 10 μA, $I_F$ = 0 |
| $I_{CEO}$ | Collector-to-Emitter Leakage Current | | | 100 | nA | $V_{CE}$ = 10 V, $I_F$ = 0 |
| $h_{FE}$ | Forward Current Gain TIL113 | | 15 k | | | $V_{CE}$ = 1.0 V, $I_C$ = 10 mA, $I_F$ = $\phi$ |

**Electrical Characteristics—Coupled** $T_A = 25°C$

| Symbol | Characteristic | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $I_C$ | Collector Output Current (Pulsed) TIL113 | 30 | 100 | | mA | $I_F$ = 10 mA, $V_{CE}$ = 1.0 V |
| | TIL119 | 30 | 160 | | mA | $I_F$ = 10 mA, $V_{CE}$ = 2.0 V |
| $V_{ISO}$ | Isolation Voltage (Note 2) | 1.5 k | | | V | Peak |
| $R_{ISO}$ | Isolation Resistance | $10^{11}$ | | | Ω | V = 500 V |
| $V_{CE(sat)}$ | Collector-to-Emitter Saturation Voltage TIL113 | | | 1.0 | V | $I_C$ = 125 mA, $I_B$ = 0, $I_F$ = 50 mA |
| | TIL119 | | | 1.0 | V | $I_C$ = 10 mA, $I_F$ = 10 mA |
| $C_{ISO}$ | Isolation Capacitance | | 1.0 | 1.3 | pF | V = 0, f = 1.0 MHz |
| $t_r$, $t_f$ | Rise and Fall Time (Note 1) TIL113 | | 300 | | μs | $I_C$ = 125 mA, $V_{CC}$ = 15 V, $R_L$ = 100 Ω |
| $t_r$, $t_f$ | Rise and Fall Time (Note 1) TIL119 | | 300 | | μs | $I_C$ = 2.5 mA, $V_{CC}$ = 10 V, $R_L$ = 100 Ω |

**Notes**
1. Rise time is defined as the time for the (base collector) current to rise from 10% to 90% of peak value. Fall time is defined as the time required for the current to decrease from 90% to 10% of peak value.
2. Isolation voltage defined as minimum of 5 s continuous application.