T-41-85

# ABORN ELECTRONICS, INC.

# Optically-Coupled Darlington Isolator

Optoelectronic Products

# FCD860/C/D
# FCD865/C/D

**General Description**
The FCD860, FCD865 series of optoisolators have a silicon npn Planar Darlington phototransistor coupled to a GaAs diode. Each is mounted in a 6-pin plastic dual in-line package. The series was designed specifically as a high-sensitivity type for operation in the 1.0/mA input region.

**Glassolated™**
**High Current Transfer Ratio at Low Input Current**
**1500 V to 6000 V Minimum Isolation**
**Input-to-Output**
**$10^{11}$ Ω Isolation Resistance**
**Low Coupling Capacitance—Typically 1.5 pF**

**Absolute Maximum Ratings**

**Maximum Temperature and Humidity**

| | |
|---|---|
| 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 |

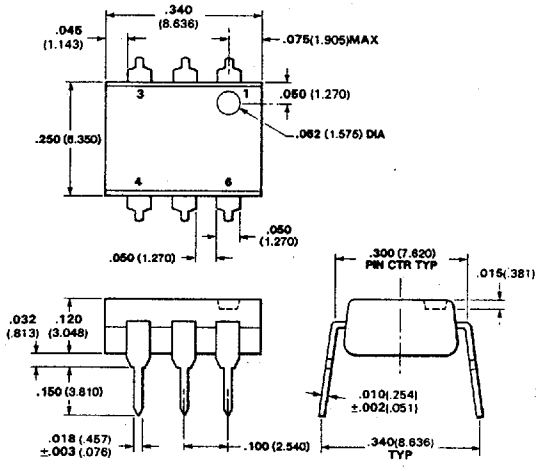
**Input Diode**

| | | |
|---|---|---|
| $V_R$ | Reverse Voltage | 3.0 V |
| $I_F$ | Forward dc Current | 80 mA |
| $I_{pk}$ | 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)**

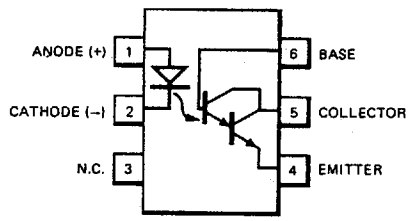
| | | |
|---|---|---|
| $V_{CE}$ | Collector-to-Emitter Voltage | 30 V |
| $V_{CB}$ | Collector-to-Base Voltage | 30 V |
| $V_{EC}$ | Emitter-to-Collector Voltage | 7.0 V |
| $P_D$ | Power Dissipation at $T_A$ = 25°C ($I_{C(max)}$ 100 mA at $V_{CE}$ = 1.5 V) | 150 mW |
| | Derate Linearly from 25°C |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

**Package Outline**




**Notes**
All dimensions in inches bold and millimeters (parentheses)
Tolerance unless specified = ±.015 (±.381)

**Connection Diagram**
**DIP (Top View)**




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

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# Typical Electrical Characteristics

# FCD860/C/D FCD865/C/D

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

| Symbol | Characteristic | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | | 1.25 | 1.5 | V | $I_F = 20$ mA |
| $BV_R$ | Reverse Breakdown Voltage | 3.0 | 5.0 | | V | $I_R = 10\ \mu A$ |
| C | Capacitance | | 150 | | pF | $V_R = 0$ V, f = 1 MHz |

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

| Symbol | Characteristic | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{CEO}$ | Collector-to-Emitter Voltage | 30 | | | V | $I_C = 1.0$ mA, $I_F = 0$ |
| $V_{CBO}$ | Collector-to-Base Voltage | 30 | | | V | $I_C = 10\ \mu A$, $I_F = 0$ |
| $V_{ECO}$ | Emitter-to-Collector Voltage | 7.0 | | | V | $I_E = 100\ \mu A$, $I_F = 0$ |
| $V_{EBO}$ | Emitter-to-Base Voltage | 6.0 | 8.0 | | V | $I_E = 100\ \mu A$, $I_F = 0$ |
| $I_{CEO}$ | Collector-to-Emitter Leakage Current | | | 100 | nA | $V_{CE} = 10$ V, $I_F = 0$ |
| $h_{FE}$ | Forward Current Gain | | 20 k | | | $V_{CE} = 5.0$ V, $I_C = 25$ mA |

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

| Symbol | Characteristic | Min | Typ | Max | Units | Test Conditions |
|---|---|---|---|---|---|---|
| $V_{IO}$ | Input-to-Output Voltage (Note 1) | | | | | |
| | FCD860, FCD865 | 1500 | | | $V_{rms}$ | |
| | FCD860C, FCD865C | 5000 | | | $V_{pk}$ | |
| | FCD860D, FCD865D | 6000 | | | $V_{pk}$ | |
| $V_{CE(sat)}$ | Collector-to-Emitter Saturation Voltage | | | 1.0 | V | $I_C = 4.0$ mA, $I_F = 2.0$ mA |
| $I_C$ | Collector Output Current | | | | | |
| | FCD860, FCD860C | 4.0 | | | mA | $V_{CE} = 1.0$ V, $I_F = 2.0$ mA |
| | FCD865, FCD865C | 2.0 | | | mA | $V_{CE} = 1.0$ V, $I_F = 0.5$ mA |
| $R_{IO}$ | Input-to-Output Resistance | | $10^{11}$ | | Ω | $V_{IO} = 500$ V |
| $C_{IO}$ | Input-to-Output Capacitance | | 1.5 | | pF | $V_{IO} = 0$, f = 1.0 MHz |
| $t_r$, $t_f$ | Rise and Fall Times (Note 2) | | 80 | | μs | $I_C = 10$ mA, $V_{CC} = 10$ V, $R_L = 100\ \Omega$ |

**Notes**

1. Isolation voltage defined as minimum of 5 s continuous application.
2. Rise time is defined as the time for the 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.