

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<sup>11</sup> 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<sub>A</sub> = 25°C  
 (LED plus Detector) 250 mW  
 Derate Linearly from 25°C 3.3 mW/°C

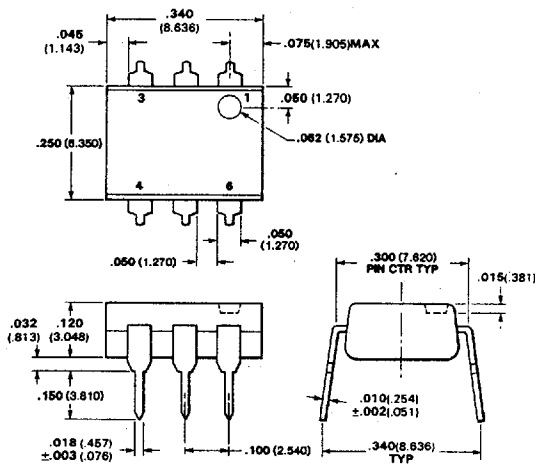
**Input Diode**

V<sub>R</sub> Reverse Voltage 3.0 V  
 I<sub>F</sub> Forward dc Current 80 mA  
 I<sub>pk</sub> Peak Forward Current (1 μs pulse width, 300 pps) 3.0 A  
 P<sub>D</sub> Power Dissipation at T<sub>A</sub> = 25°C 150 mW  
 Derate Linearly from 25°C 2.0 mW/°C

**Output Transistor (Darlington)**

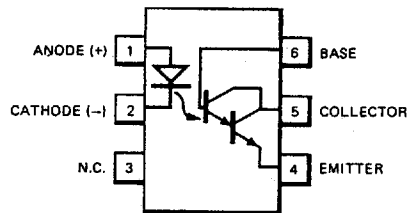
V<sub>CE</sub> Collector-to-Emitter Voltage 30 V  
 V<sub>CB</sub> Collector-to-Base Voltage 30 V  
 V<sub>EC</sub> Emitter-to-Collector Voltage 7.0 V  
 P<sub>D</sub> Power Dissipation at T<sub>A</sub> = 25°C (I<sub>C(max)</sub> 100 mA at V<sub>CE</sub> = 1.5 V) 150 mW  
 Derate Linearly from 25°C 2.0 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 (+)  
 2 Cathode (-) } Input Diode  
 3 NC  
 4 Emitter  
 5 Collector  
 6 Base } Output npn Phototransistor



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**Typical Electrical Characteristics**

**FCD860/C/D  
FCD865/C/D**

**Electrical Characteristics—Input Diode  $T_A = 25^\circ\text{C}$**

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

**Electrical Characteristics—Output Transistor  $T_A = 25^\circ\text{C}$  (Darlington)**

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

**Electrical Characteristics—Coupled  $T_A = 25^\circ\text{C}$**

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

**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.