# FCD820 • FCD820C

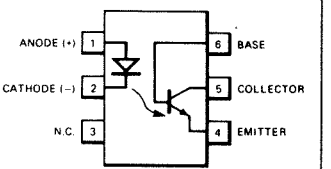
## OPTICALLY-COUPLED ISOLATOR

OPTOELECTRONICS PRODUCT GROUP

**GENERAL DESCRIPTION** – The FCD820 series of optoisolators combines a gallium arsenide infrared emitting diode and a silicon npn phototransistor in close proximity. Optical intercoupling 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 transistor base is also provided for design flexibility. The FCD820 is covered under U.L. component recognition program, reference file E55299.

- **GLASSOLATED™**
- **HIGH CURRENT TRANSFER RATIO – TYPICALLY 50%**
- **1500 V TO 6000 V MINIMUM ISOLATION INPUT-TO-OUTPUT**
- **$10^{11}$ Ω ISOLATION RESISTANCE**
- **LOW COUPLING CAPACITANCE – TYPICALLY 1.0 pF**

**CONNECTION DIAGRAM**
**DIP** (TOP VIEW)




PIN NUMBERS

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

**ABSOLUTE MAXIMUM RATINGS**

| | | |
|---|---|---|
| Storage Temperature | | −55°C to +150°C |
| Operating Temperature | | −55°C to +100°C |
| Pin Temperature (Soldering, 5 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 Current | 60 mA |
| $i_f$ | Peak Forward Current (1 μs pulse width, 300 pps) | 3.0 A |
| $P_D$ | Power Dissipation at $T_A$ = 25°C | 100 mW |
| | Derate Linearly from 25°C | 1.33 mW/°C |
| OUTPUT TRANSISTOR | | |
| $V_{CE}$ | Collector to Emitter Voltage | 30 V |
| $V_{CB}$ | Collector to Base Voltage | 70 V |
| $I_C$ | Collector Current | 25 mA |
| $P_D$ | Power Dissipation at $T_A$ = 25°C | 150 mW |
| | Derate Linearly from 25°C | 2.0 mW/°C |

**ELECTRICAL CHARACTERISTICS – INPUT DIODE:** $T_A$ = 25°C

| SYMBOL | CHARACTERISTIC | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | | 1.2 | 1.5 | V | $I_F$ = 60 mA |
| $BV_R$ | Reverse Breakdown Voltage | 3.0 | 8.0 | | V | $I_R$ = 10 μA |

**ELECTRICAL CHARACTERISTICS – OUTPUT TRANSISTOR:** $T_A = 25°C$

| SYMBOL | CHARACTERISTIC | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| $V_{CEO}$ | Collector-Emitter Voltage | 30 | 65 | | V | $I_C = 1.0$ mA, $I_F = 0$ |
| $V_{CBO}$ | Collector-Base Voltage | 70 | 165 | | V | $I_C = 100\ \mu A$, $I_F = 0$ |
| $I_{CEO}$ | Collector-Emitter Leakage Current | | | 50 | nA | $V_{CE} = 10$ V, $I_F = 0$ |
| $I_{CBO}$ | Collector-Base Leakage Current | | | 20 | nA | $V_{CB} = 10$ V, $I_F = 0$ |
| $h_{FE}$ | Forward Current Gain | 100 | 250 | | | $V_{CE} = 5.0$ V, $I_C = 100\ \mu A$ |
| $C_{cb}$ | Collector-Base Capacitance | | 20 | | pF | $V_{CB} = 10$ V |
| $C_{eb}$ | Emitter-Base Capacitance | | 10 | | pF | $V_{EB} = 0$ |

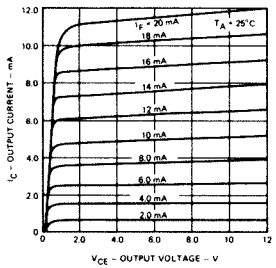
**ELECTRICAL CHARACTERISTICS – COUPLED:** $T_A = 25°C$

| SYMBOL | CHARACTERISTIC | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
|---|---|---|---|---|---|---|
| $V_{IO}$ | Input-to-Output Voltage | | | | | |
| | FCD820 | 1500 | | | $V_{rms}$ | |
| | FCD820C | 5000 | | | $V_{pk}$ | |
| $V_{CE(SAT)}$ | Collector-Emitter Saturation Voltage | | 0.24 | 0.40 | V | $I_C = 2.2$ mA, $I_F = 15$ mA (FCD820, $I_C = 2.0$ mA, $I_F = 10$ mA) |
| $I_C/I_F(CTR)$ | Collector Current Transfer Ratio (Note 1) | 20 | 50 | | % | $V_{CE} = 10$ V, $I_F = 10$ mA (FCD820, $V_{CE} = 0.4$ V) |
| $R_{IO}$ | Input-to-Output Resistance | $10^{11}$ | | | Ω | $V_{IO} = 500$ V |
| $C_{IO}$ | Input-to-Output Capacitance | | 1.0 | | pF | f = 1.0 MHz |
| $t_r, t_f$ | Collector Rise and Fall Times (Note 2) | | 2.5 | | μs | $I_C = 2.0$ mA, $V_{CE} = 10$ V, $R_L = 100\ \Omega$ |

NOTES:
1. Collector current transfer ratio is defined as the ratio of the collector current to the forward bias input current.
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.

## TYPICAL ELECTRICAL CHARACTERISTIC CURVES

**LOW LEVEL TRANSFER CHARACTERISTICS**




**MAXIMUM POWER DISSIPATION RATING VERSUS AMBIENT TEMPERATURE**