

# FCD820 • FCD820C

## OPTICALLY-COUPLED ISOLATOR

### OPTOELECTRONICS PRODUCT GROUP

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**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
- $10^{11} \Omega$  ISOLATION RESISTANCE
- LOW COUPLING CAPACITANCE – TYPICALLY 1.0 pF

#### 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 $T_A = 25^\circ\text{C}$ (LED plus Detector)	250 mW
Derate Linearly from 25°C	3.3 mW/°C

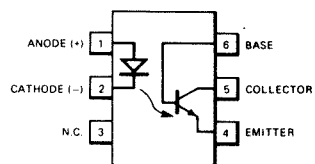
#### INPUT DIODE

$V_R$	Reverse Voltage	3.0 V
$I_F$	Forward Current	60 mA
$i_f$	Peak Forward Current (1 $\mu\text{s}$ pulse width, 300 pps)	3.0 A
$P_D$	Power Dissipation at $T_A = 25^\circ\text{C}$	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 $T_A = 25^\circ\text{C}$	150 mW
	Derate Linearly from 25°C	2.0 mW/°C

**CONNECTION DIAGRAM  
DIP (TOP VIEW)**



#### PIN NUMBERS

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

#### ELECTRICAL CHARACTERISTICS – INPUT DIODE: $T_A = 25^\circ\text{C}$

SYMBOL	CHARACTERISTIC	MIN	TYP	MAX	UNITS	TEST CONDITIONS
$V_F$	Forward Voltage		1.2	1.5	V	$I_F = 60 \text{ mA}$
$BV_R$	Reverse Breakdown Voltage	3.0	8.0		V	$I_R = 10 \mu\text{A}$

## FAIRCHILD • FCD820 • FCD820C

### ELECTRICAL CHARACTERISTICS – OUTPUT TRANSISTOR: $T_A = 25^\circ\text{C}$

SYMBOL	CHARACTERISTIC	MIN	TYP	MAX	UNITS	TEST CONDITIONS
$V_{CE0}$	Collector-Emitter Voltage	30	65		V	$I_C = 1.0\text{ mA}$ , $I_F = 0$
$V_{CBO}$	Collector-Base Voltage	70	165		V	$I_C = 100\ \mu\text{A}$ , $I_F = 0$
$I_{CEO}$	Collector-Emitter Leakage Current			50	nA	$V_{CE} = 10\text{ V}$ , $I_F = 0$
$I_{CBO}$	Collector-Base Leakage Current			20	nA	$V_{CB} = 10\text{ V}$ , $I_F = 0$
$h_{FE}$	Forward Current Gain	100	250			$V_{CE} = 5.0\text{ V}$ , $I_C = 100\ \mu\text{A}$
$C_{cb}$	Collector-Base Capacitance		20		pF	$V_{CB} = 10\text{ V}$
$C_{eb}$	Emitter-Base Capacitance		10		pF	$V_{EB} = 0$

### ELECTRICAL CHARACTERISTICS – COUPLED: $T_A = 25^\circ\text{C}$

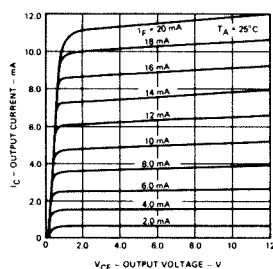
SYMBOL	CHARACTERISTIC	MIN	TYP	MAX	UNITS	TEST CONDITIONS
$V_{IO}$	Input-to-Output Voltage					
	FCD820	1500			$V_{rms}$	
	FCD820C	5000			$V_{pk}$	
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage		0.24	0.40	V	$I_C = 2.2\text{ mA}$ , $I_F = 15\text{ mA}$ (FCD820, $I_C = 2.0\text{ mA}$ , $I_F = 10\text{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

#### NOTES:

- Collector current transfer ratio is defined as the ratio of the collector current to the forward bias input current.
- 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

