FAIRCHILD SEMICONDUCTOR®

January 2008

H21L Series
OPTOLOGIC® Optical Interrupter Switch

Features

- Low cost
- 0.035" apertures
- Black plastic opaque housing
- Mounting tabs on housing
- Choice of inverter or buffer output functions
- Choice of open-collector or totem-pole output configuration
- TTL/CMOS compatible output functions

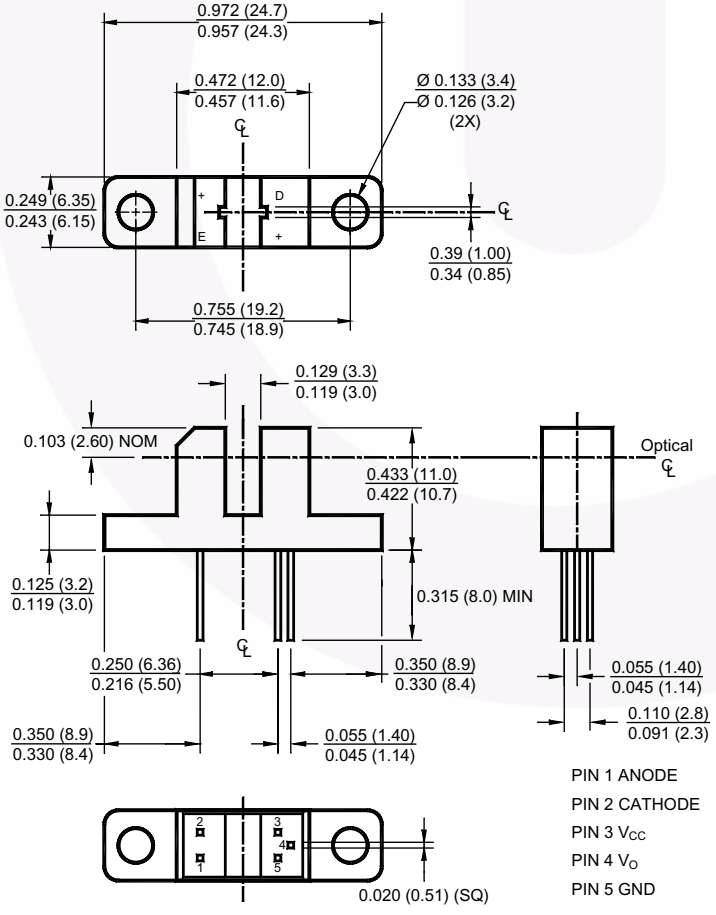
Description

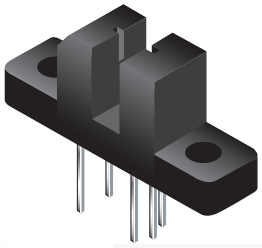
The H21L series are slotted optical switches designed for multipurpose non contact sensing. They consist of a GaAs LED and a silicon OPTOLOGIC® sensor packaged in an injection molded housing and facing each other across a .124" (3.15 mm) gap. The output is either inverting or non-inverting, with a choice of totem-pole or open-collector configuration for TTL/CMOS compatibility.

Part Number Definitions

H21LTB, Totem-pole, buffer output
H21LTI, Totem-pole, inverter output
H21LOB, Open-collector, buffer output
H21LOI, Open-collector, inverter output

Package Dimensions





PIN 1 ANODE
PIN 2 CATHODE
PIN 3 V_{CC}
PIN 4 V_O
PIN 5 GND

Notes:

1. Dimensions for all drawings are in inches (mm).
2. Tolerance of ± .010 (.25) on all non-nominal dimensions unless otherwise specified.

Absolute Maximum Ratings (T_A = 25°C Unless otherwise specified)

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter	Rating	Units
T_{OPR}	Operating Temperature	-40 to +85	°C
T_{STG}	Storage Temperature	-40 to +85	°C
T_{SOL-I}	Soldering Temperature (Iron)[5][6][7][8]	240 for 5 sec	°C
T_{SOL-F}	Soldering Temperature (Flow)[5][6][8]	260 for 10 sec	°C
INPUT (Emitter)			
I_F	Continuous Forward Current	50	mA
V_R	Reverse Voltage	6	V
P_D	Power Dissipation[3]	100	mW
OUTPUT (Sensor)			
I_O	Output Current	50	mA
V_{CC}	Supply Voltage	4.0 to 16	V
V_O	Output Voltage	30	V
P_D	Power Dissipation[4]	150	mW

Notes:

3. Derate power dissipation linearly 1.67mW/°C above 25°C.
4. Derate power dissipation linearly 2.50mW/°C above 25°C.
5. RMA flux is recommended.
6. Methanol or isopropyl alcohols are recommended as cleaning agents.
7. Soldering iron 1/16" (1.6mm) from housing.
8. As long as leads are not under any stress or spring tension.

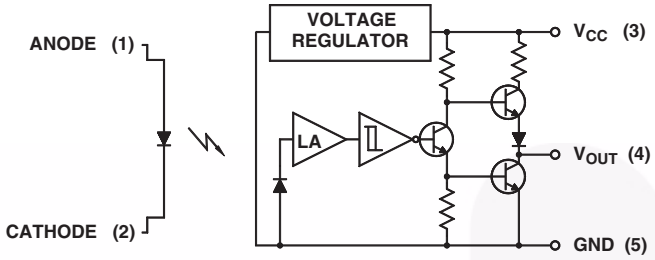
Electrical/Optical Characteristics (T_A = 25°C)

Symbol	Parameter	Test Conditions	Min.	Typ	Max.	Units
INPUT (Emitter)						
V_F	Forward Voltage	I_F = 20mA			1.5	V
I_R	Reverse Leakage Current	V_R = 5 V			10	µA
OUTPUT (Sensor)						
I_{CC}	Supply Current	V_{CC} = 5 V			5	mA
COUPLED						
V_{OL}	Low Level Output Voltage H21LTB, H21LOB	I_F = 0mA, V_{CC} = 5V, I_{OL} = 16mA			0.4	V
	Low Level Output Voltage H21LTI, H21LOI	I_F = 15mA, V_{CC} = 5V, I_{OL} = 16mA			0.4	
V_{OH}	High Level Output Voltage H21LTB	I_F = 15mA, V_{CC} = 5V, I_{OH} = -1mA	2.4			V
	High Level Output Voltage H21LTI	I_F = 0mA, V_{CC} = 5V, I_{OH} = -1mA	2.4			
I_{OH}	High Level Output Current H21LOB	I_F = 15mA, V_{CC} = 5 V, V_{OH} = 30V			100	µA
	High Level Output Current H21LOI	I_F = 0 mA, V_{CC} = 5 V, V_{OH} = 30 V			100	
$I_F(+)$	Turn on Threshold Current	V_{CC} = 5V			15	mA
$I_F(-)$	Turn off Threshold Current	V_{CC} = 5V	0.50			mA
$I_F(+) / I_F(-)$	Hysteresis Ratio			1.2		
t_{PLH}, t_{PHL}	Propagation Delay, H21LOI, H21LOB	V_{CC} = 5V, R_L = 300Ω (Fig. 9)		6		µs
	Propagation Delay, H21LTI, H21LTB	V_{CC} = 5V, R_L = 300Ω (Fig. 9)		6		
t_r, t_f	Output Rise and Fall Time, H21LOI, H21LOB	V_{CC} = 5V, R_L = 300Ω (Fig. 9)		100		ns
	Output Rise and Fall Time, H21LTI, H21LTB	V_{CC} = 5V, R_L = 300Ω (Fig. 9)		70		

Input/Output Table

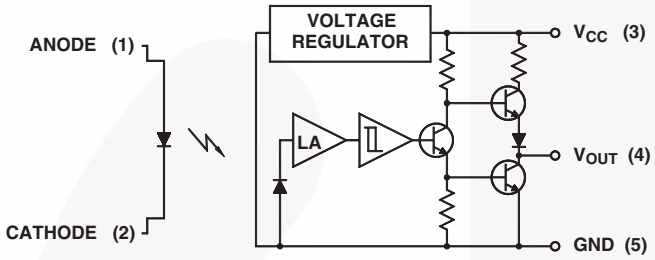
Part Number	LED	Output
H21LTB	On	High
H21LTB	Off	Low
H21LTI	On	Low
H21LTI	Off	High
H21LOB	On	High
H21LOB	Off	Low
H21LOI	On	Low
H21LOI	Off	High

Circuit Schematics



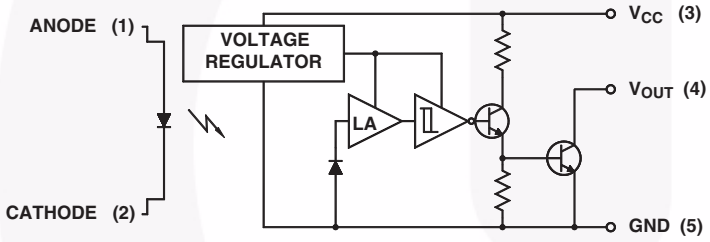
H21LTB

Totem-Pole Output Buffer



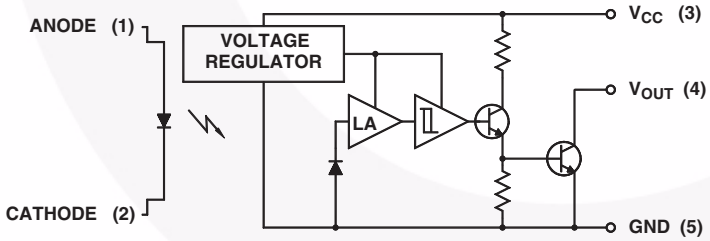
H21LTI

Totem-Pole Output inverter



H21LOB

Open-Collector Output Buffer



H21LOI

Open-Collector Output Inverter

Typical Performance Characteristics

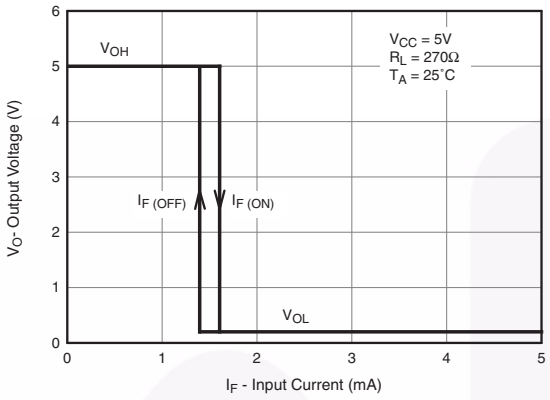


Figure 1. Output Voltage vs. Input Current (Inverters)

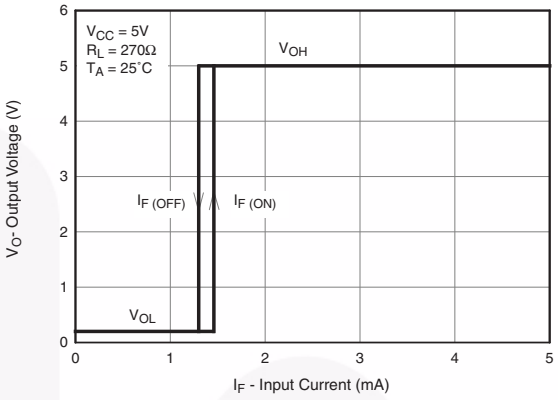


Figure 2. Output Voltage vs. Input Current (Buffers)

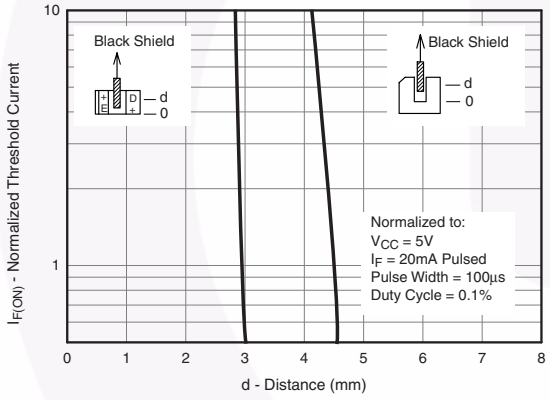


Figure 3. Normalized Threshold Current vs. Shield Distance

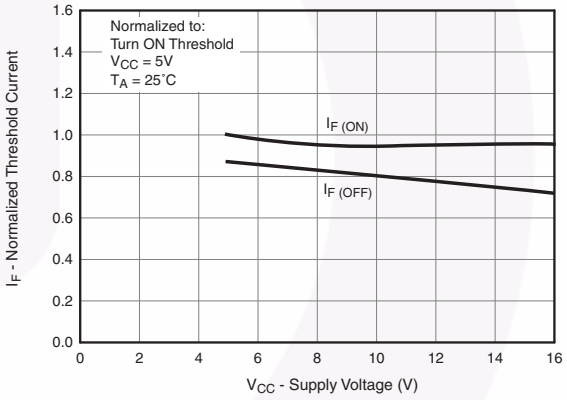


Figure 4. Normalized Threshold Current vs. Supply Voltage

Typical Performance Characteristics (Continued)

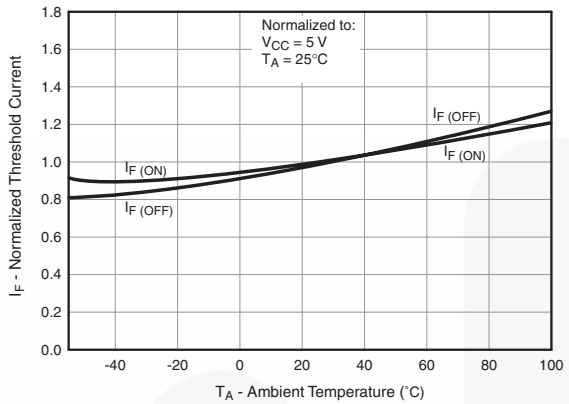


Figure 5. Normalized Threshold Current vs. Ambient Temperature

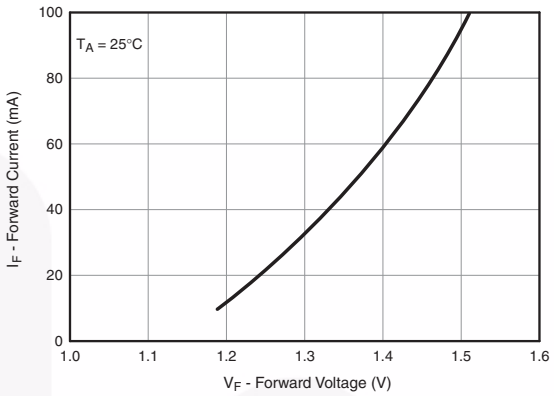


Figure 6. Forward Current vs. Forward Voltage

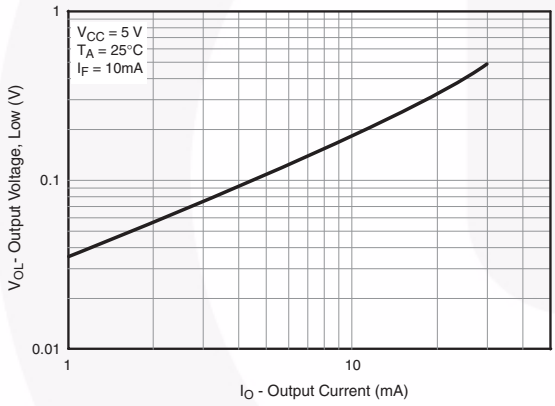


Figure 7. Low Output Voltage vs. Output Current

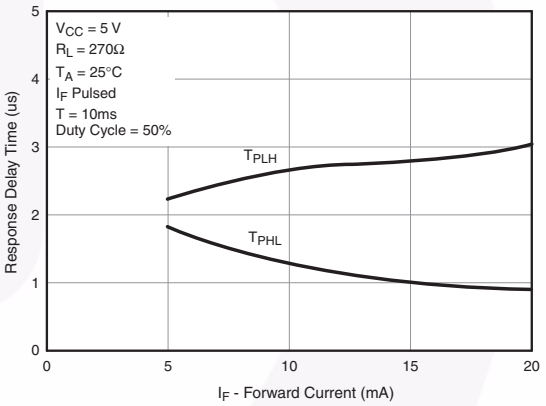
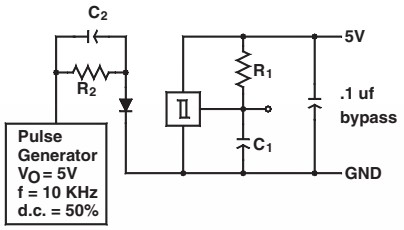


Figure 8. Response Time vs. Forward Current

Figure 9. Switching Speed Test Circuit



R_1 = 300Ω
R_2 = 180Ω

C_1 = 15pF
C_2 = 20pF

C_1 and C_2 include probe and stray wire capacitance

Figure 10. Typical Operating Circuit

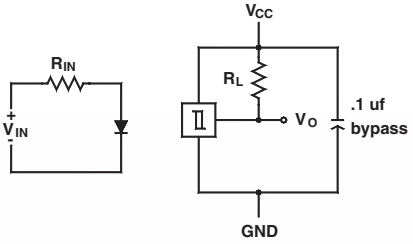


Figure 11. Switching Times Definition for Buffer

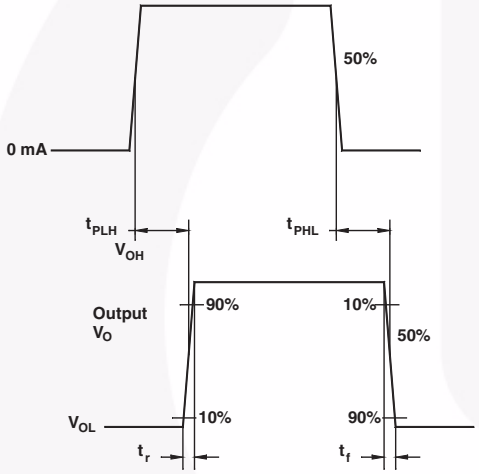
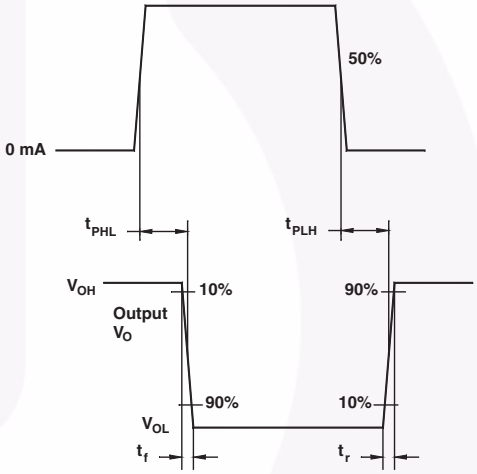


Figure 12. Switching Times Definitions for Inverters



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