

# OPTOLOGIC® OPTICAL INTERRUPTER SWITCH

**FAIRCHILD**  
SEMICONDUCTOR®

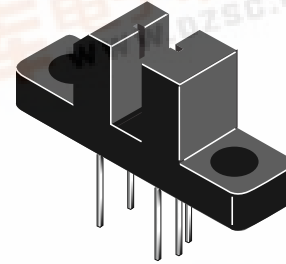
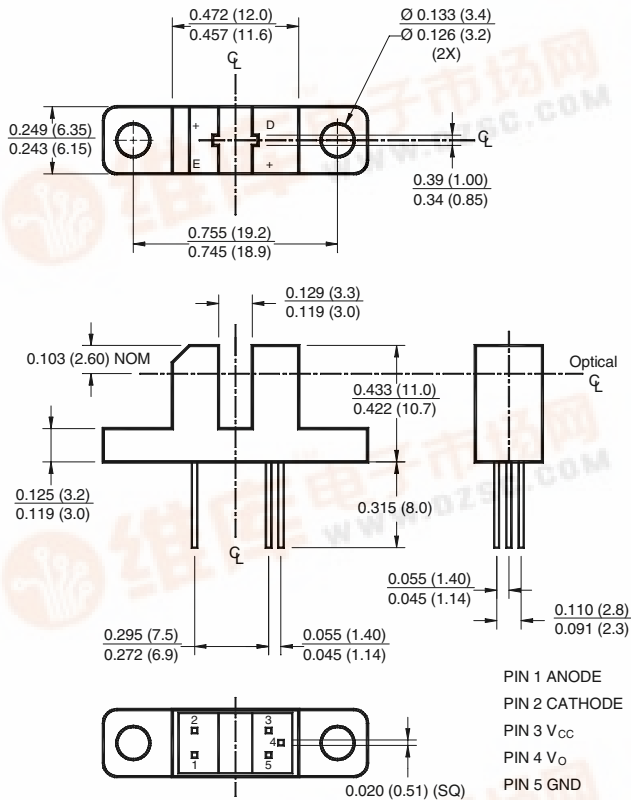
**H21LTB**

**H21LTI**

**H21LOB**

**H21LOI**

## PACKAGE DIMENSIONS



## PART NUMBER DEFINITIONS

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

## 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

### NOTES:

- Dimensions for all drawings are in inches (mm).
- Tolerance of  $\pm .010$  (.25) on all non-nominal dimensions unless otherwise specified.

## 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

## 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



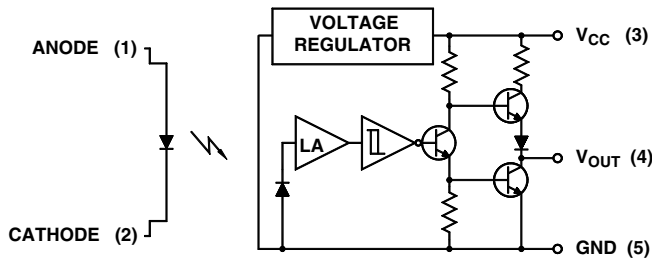
**H21LTB**

**H21LTI**

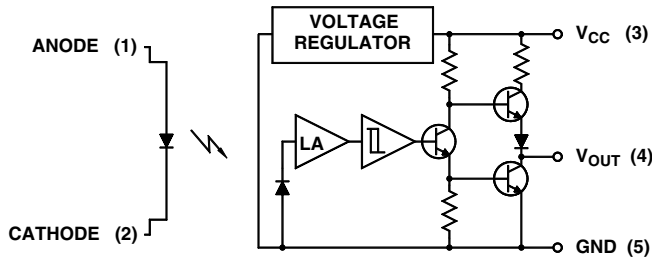
**H21LOB**

**H21LOI**

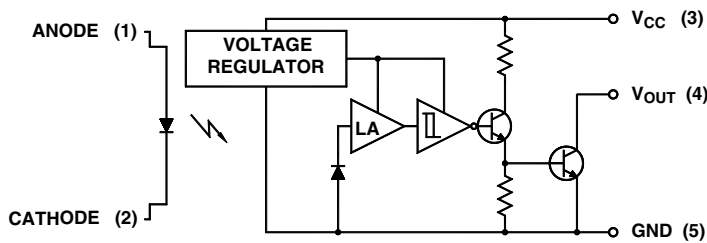
**SCHEMATICS**



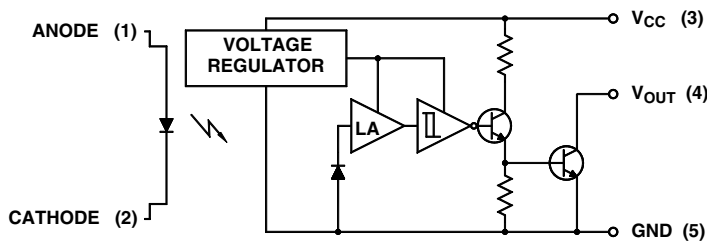
**H21LTB**  
Totem-Pole Output Buffer



**H21LTI**  
Totem-Pole Output inverter



**H21LOB**  
Open-Collector Output Buffer



**H21LOI**  
Open-Collector Output Inverter

**H21LTB**

**H21LTI**

**H21LOB**

**H21LOI**

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise specified)			
Parameter	Symbol	Rating	Units
Operating Temperature	$T_{OPR}$	-40 to +85	$^\circ\text{C}$
Storage Temperature	$T_{STG}$	-40 to +85	$^\circ\text{C}$
Soldering Temperature (Iron) <sup>(3,4,5,6)</sup>	$T_{SOL-I}$	240 for 5 sec	$^\circ\text{C}$
Soldering Temperature (Flow) <sup>(3,4,6)</sup>	$T_{SOL-F}$	260 for 10 sec	$^\circ\text{C}$
<b>INPUT (EMITTER)</b>			
Continuous Forward Current	$I_F$	50	mA
Reverse Voltage	$V_R$	6	V
Power Dissipation <sup>(1)</sup>	$P_D$	100	mW
<b>OUTPUT (SENSOR)</b>			
Output Current	$I_O$	50	mA
Supply Voltage	$V_{CC}$	4.0 to 16	V
Output Voltage	$V_O$	30	V
Power Dissipation <sup>(2)</sup>	$P_D$	150	mW

**NOTES** (Applies to Max Ratings and Characteristics Tables.)

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

**H21LTB**

**H21LTI**

**H21LOB**

**H21LOI**

<b>ELECTRICAL / OPTICAL CHARACTERISTICS</b> (T <sub>A</sub> =25°C)						
PARAMETER	TEST CONDITIONS	SYMBOL	MIN.	TYP.	MAX.	UNITS
<b>INPUT (EMITTER)</b>						
Forward Voltage	I <sub>F</sub> = 20 mA	V <sub>F</sub>	—		1.5	V
Reverse Leakage Current	V <sub>R</sub> = 5 V	I <sub>R</sub>	—		10	μA
<b>OUTPUT (SENSOR)</b>						
Supply Current	V <sub>CC</sub> = 5 V	I <sub>CC</sub>	—		5	mA
<b>COUPLED</b>						
Low Level Output Voltage H21LTB, H21LOB	I <sub>F</sub> = 0 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 100 Ω	V <sub>OL</sub>	—		0.4	V
Low Level Output Voltage H21LTI, H21LOI	I <sub>F</sub> = 15 mA, V <sub>CC</sub> = 5 V, R <sub>L</sub> = 360 Ω	V <sub>OL</sub>	—		0.4	V
High Level Output Voltage H21LTB	I <sub>F</sub> = 15 mA, V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -800 μA	V <sub>OH</sub>	2.4		—	V
High Level Output Voltage H21LTI	I <sub>F</sub> = 0 mA, V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -800 μA	V <sub>OH</sub>	2.4		—	V
High Level Output Current H21LOB	I <sub>F</sub> = 0 mA, V <sub>CC</sub> = 5 V, I <sub>OH</sub> = -800 μA	I <sub>OH</sub>			100	μA
High Level Output Current H21LOI	I <sub>F</sub> = 0 mA, V <sub>CC</sub> = 5 V, V <sub>OH</sub> = 30 V	I <sub>OH</sub>	—		100	μA
Turn on Threshold Current	V <sub>CC</sub> = 5 V, R <sub>L</sub> = 360 Ω	I <sub>F</sub> (+)	—		15	mA
Turn off Threshold Current	V <sub>CC</sub> = 5 V, R <sub>L</sub> = 360 Ω	I <sub>F</sub> (-)	0.50		—	mA
Hysteresis Ratio		I <sub>F</sub> (+) / I <sub>F</sub> (-)		1.2		
Propagation Delay	V <sub>CC</sub> = 5 V, R <sub>L</sub> = 360 Ω (See Fig. 9)	t <sub>PLH</sub> , t <sub>PHL</sub>		5		μs
Output Rise and Fall Time	V <sub>CC</sub> = 5 V, R <sub>L</sub> = 360 Ω (See Fig. 9)	t <sub>r</sub> , t <sub>f</sub>		70		ns

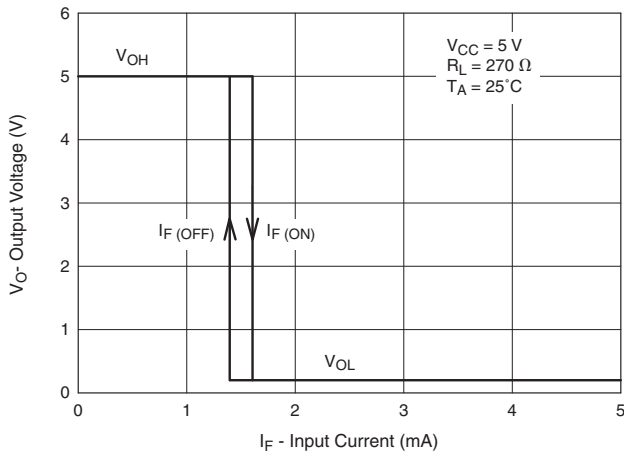
**H21LTB**

**H21LTI**

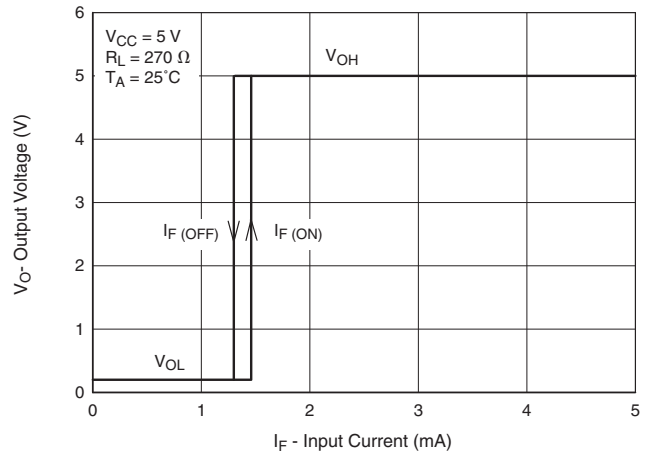
**H21LOB**

**H21LOI**

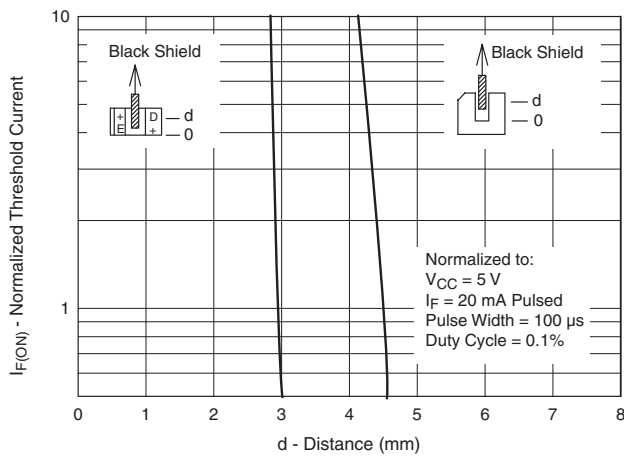
**Fig. 1 Output Voltage vs. Input Current (Inverters)**



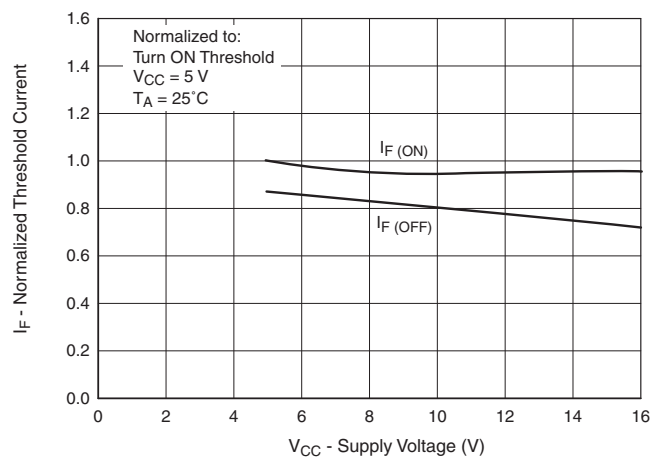
**Fig. 2 Output Voltage vs. Input Current (Buffers)**



**Fig. 3 Normalized Threshold Current vs. Shield Distance**



**Fig. 4 Normalized Threshold Current vs. Supply Voltage**



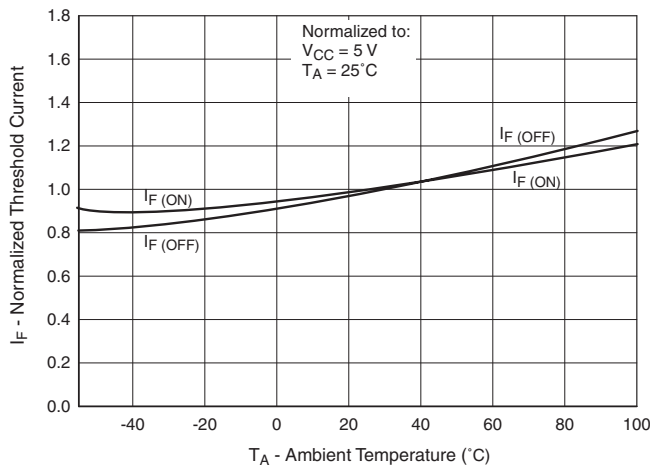
**H21LTB**

**H21LTI**

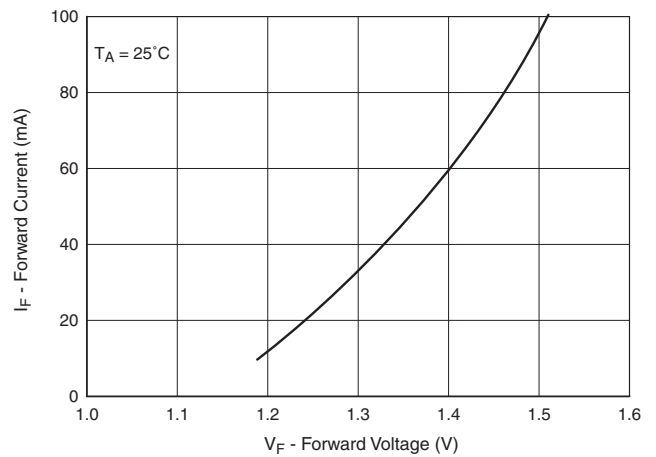
**H21LOB**

**H21LOI**

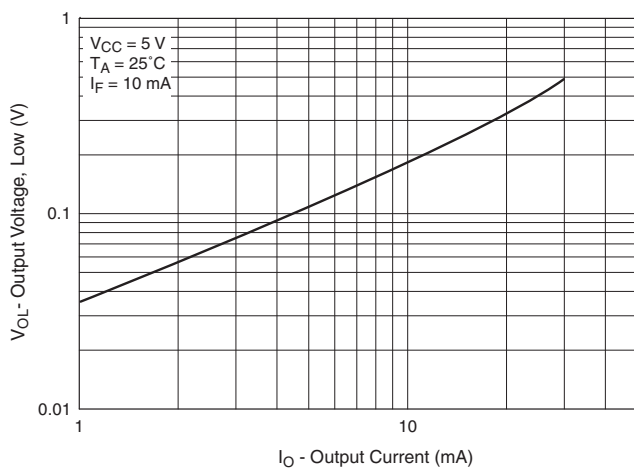
**Fig. 5 Normalized Threshold Current vs. Ambient Temperature**



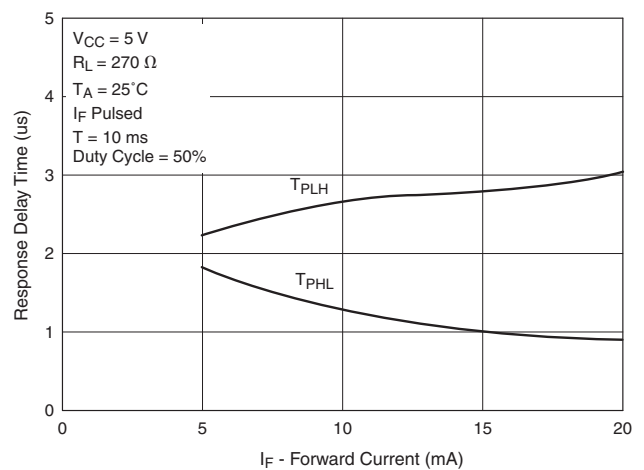
**Fig. 6 Forward Current vs. Forward Voltage**



**Fig. 7 Low Output Voltage vs. Output Current**



**Fig. 8 Response Time vs. Forward Current**



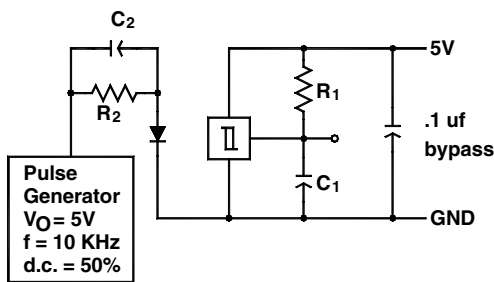
H21LTB

H21LTI

H21LOB

H21LOI

Fig. 9 Switching Speed Test Circuit



$R_1 = 360 \ \Omega$        $C_1 = 15 \text{ pf}$        $C_1$  and  $C_2$  include probe and  
 $R_2 = 180 \ \Omega$        $C_2 = 20 \text{ pf}$       stray wire capacitance

Fig. 10 Typical Operating Circuit

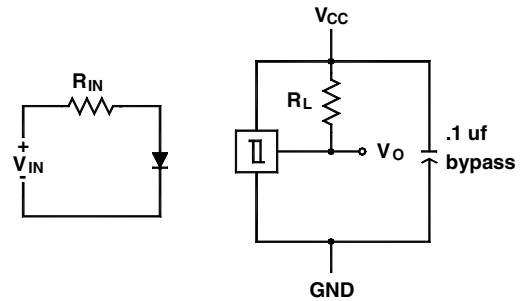


Fig. 11 Switching Times Definition for Buffers

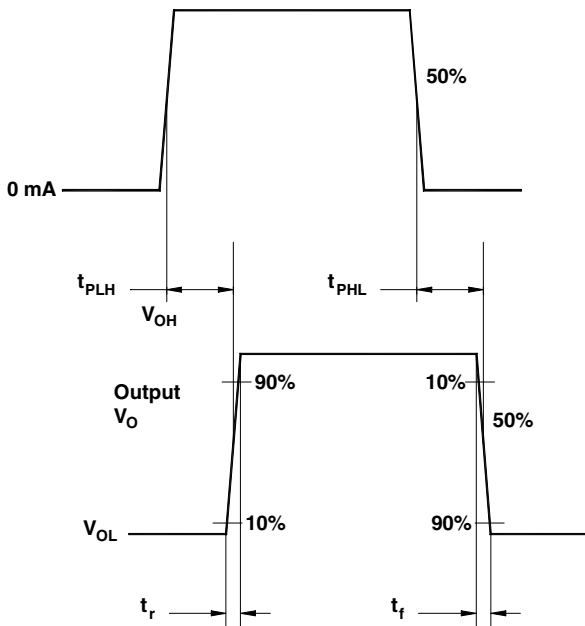
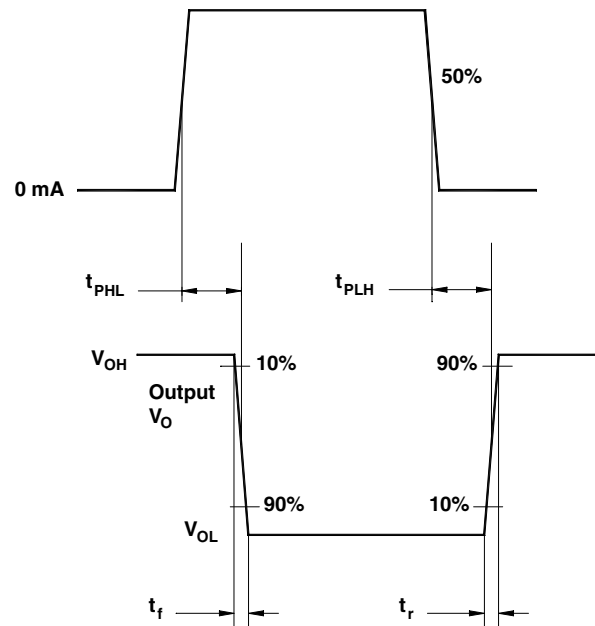


Fig. 12 Switching Times Definition for Inverters



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**H21LTB**

**H21LTI**

**H21LOB**

**H21LOI**

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