

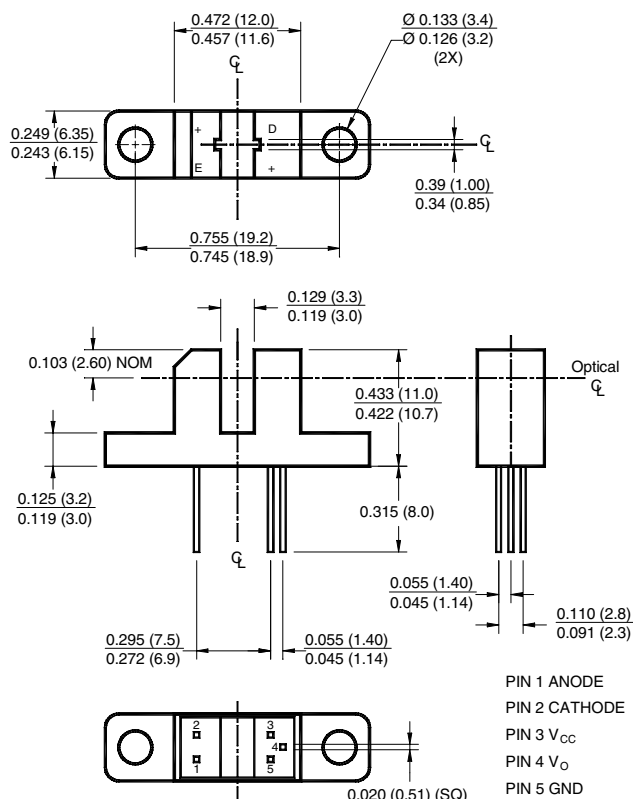
**H21LTB**

**H21LTI**

**H21LOB**

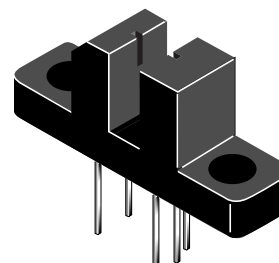
**H21LOI**

**PACKAGE DIMENSIONS**



**NOTES:**

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



**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   |

**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

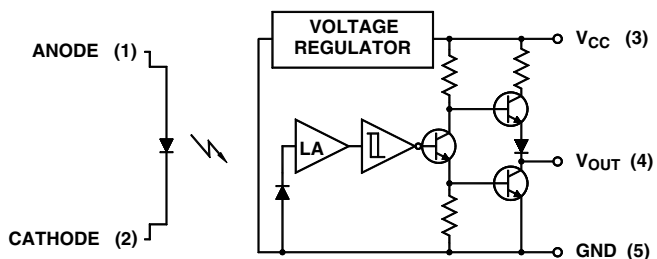
**H21LTB**

**H21LTI**

**H21LOB**

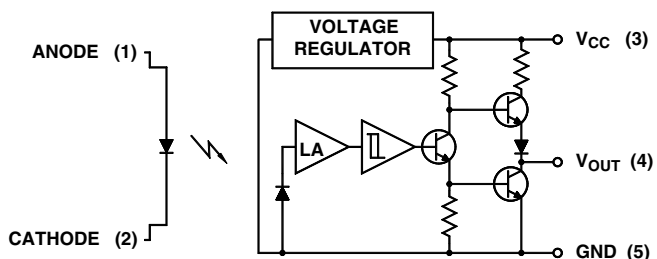
**H21LOI**

**SCHEMATICS**



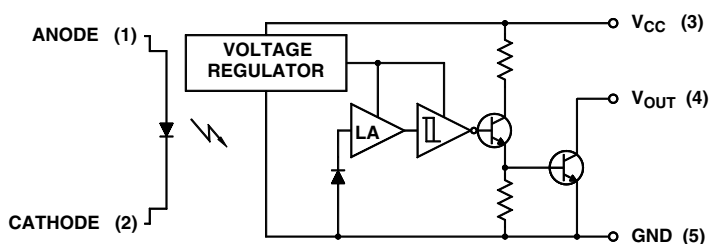
**H21LTB**

**Totem-Pole Output Buffer**



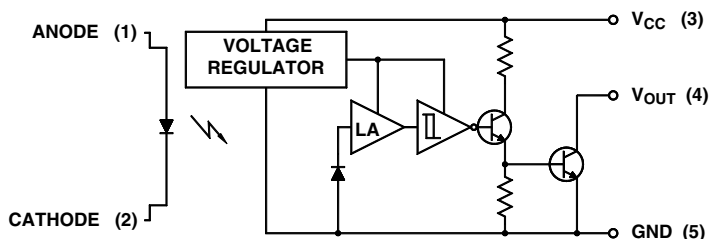
**H21LTI**

**Totem-Pole Output inverter**



**H21LOB**

**Open-Collector Output Buffer**



**H21LOI**

**Open-Collector Output Inverter**

**H21LTB**

**H21LTI**

**H21LOB**

**H21LOI**

**ABSOLUTE MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  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**

**ELECTRICAL / OPTICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$ )

| PARAMETER                                  | TEST CONDITIONS   | SYMBOL                | MIN. | TYP. | MAX. | UNITS         |
|--|---|-----------------------|------|------|------|---------------|
| <b>INPUT (EMITTER)</b>                     |   |                       |      |      |      |               |
| Forward Voltage                            | $I_F = 20\text{ mA}$  | $V_F$                 | —    |      | 1.5  | V             |
| Reverse Leakage Current                    | $V_R = 5\text{ V}$  | $I_R$                 | —    |      | 10   | $\mu\text{A}$ |
| <b>OUTPUT (SENSOR)</b>                     |   |                       |      |      |      |               |
| Supply Current                             | $V_{CC} = 5\text{ V}$   | $I_{CC}$              | —    |      | 5    | mA            |
| <b>COUPLED</b>                             |   |                       |      |      |      |               |
| Low Level Output Voltage<br>H21LTB, H21LOB | $I_F = 0\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 100\ \Omega$           | $V_{OL}$              | —    |      | 0.4  | V             |
| Low Level Output Voltage<br>H21LTI, H21LOI | $I_F = 15\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $R_L = 360\ \Omega$          | $V_{OL}$              | —    |      | 0.4  | V             |
| High Level Output Voltage<br>H21LTB        | $I_F = 15\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $I_{OH} = -800\ \mu\text{A}$ | $V_{OH}$              | 2.4  |      | —    | V             |
| High Level Output Voltage<br>H21LTI        | $I_F = 0\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $I_{OH} = -800\ \mu\text{A}$  | $V_{OH}$              | 2.4  |      | —    | V             |
| High Level Output Current<br>H21LOB        | $I_F = 0\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $I_{OH} = -800\ \mu\text{A}$  | $I_{OH}$              |      |      | 100  | $\mu\text{A}$ |
| High Level Output Current<br>H21LOI        | $I_F = 0\text{ mA}$ , $V_{CC} = 5\text{ V}$ , $V_{OH} = 30\text{ V}$        | $I_{OH}$              | —    |      | 100  | $\mu\text{A}$ |
| Turn on Threshold Current                  | $V_{CC} = 5\text{ V}$ , $R_L = 360\ \Omega$                                 | $I_F(+)$              | —    |      | 15   | mA            |
| Turn off Threshold Current                 | $V_{CC} = 5\text{ V}$ , $R_L = 360\ \Omega$                                 | $I_F(-)$              | 0.50 |      | —    | mA            |
| Hysteresis Ratio                           |   | $I_F(+)$ / $I_F(-)$   |      | 1.2  |      |               |
| Propagation Delay                          | $V_{CC} = 5\text{ V}$ , $R_L = 360\ \Omega$ (See Fig. 9)                    | $t_{PLH}$ , $t_{PHL}$ |      | 5    |      | $\mu\text{s}$ |
| Output Rise and Fall Time                  | $V_{CC} = 5\text{ V}$ , $R_L = 360\ \Omega$ (See Fig. 9)                    | $t_r$ , $t_f$         |      | 70   |      | ns            |

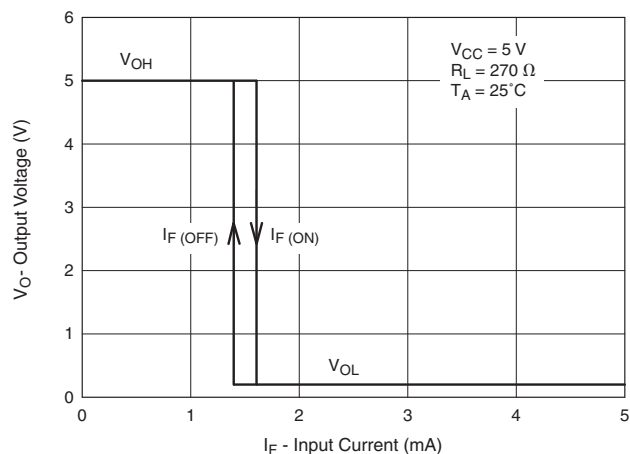
**H21LTB**

**H21LTI**

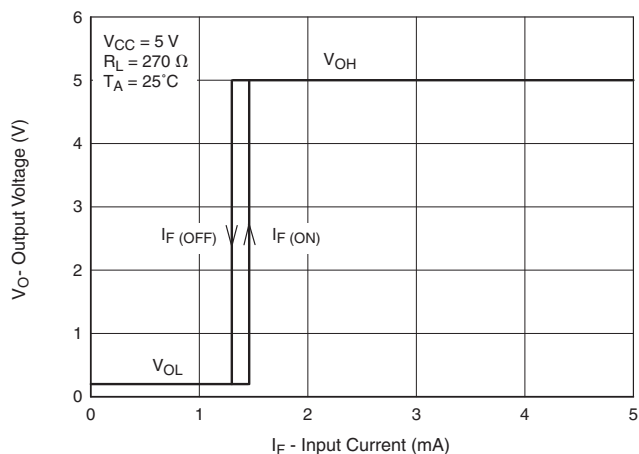
**H21LOB**

**H21LOI**

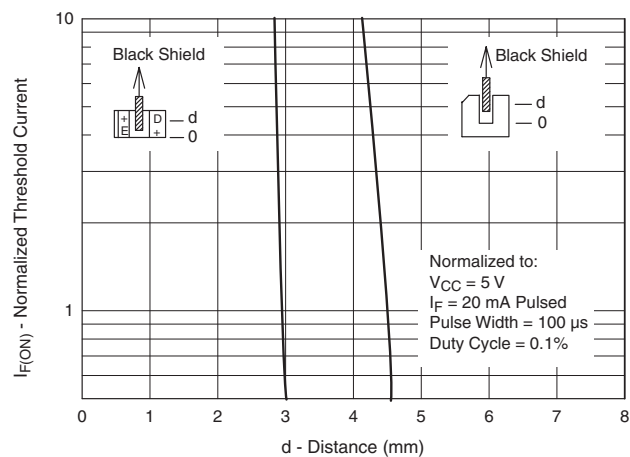
**Fig. 1 Output Voltage vs. Input Current (Inverters)**



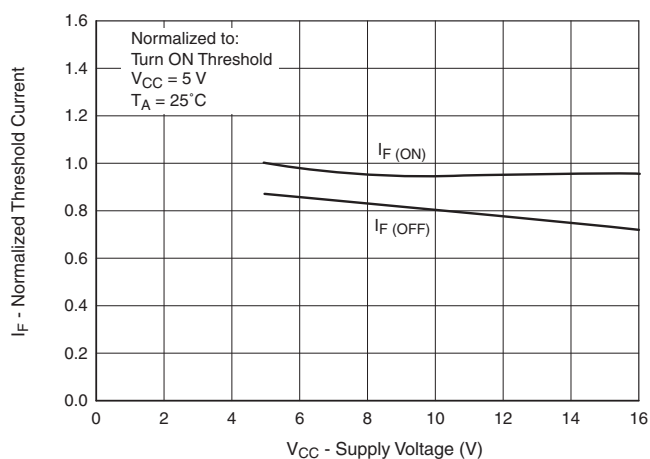
**Fig. 2 Output Voltage vs. Input Current (Buffers)**



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



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



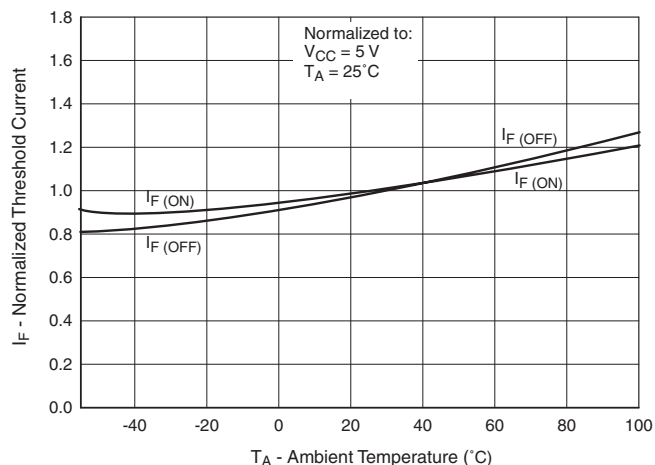
**H21LTB**

**H21LTI**

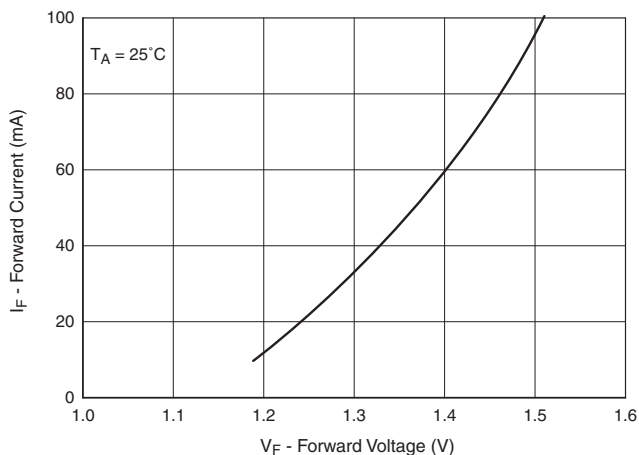
**H21LOB**

**H21LOI**

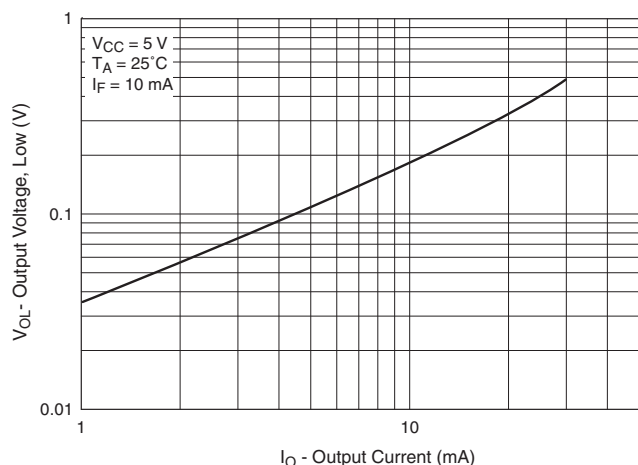
**Fig. 5 Normalized Threshold Current  
vs. Ambient Temperature**



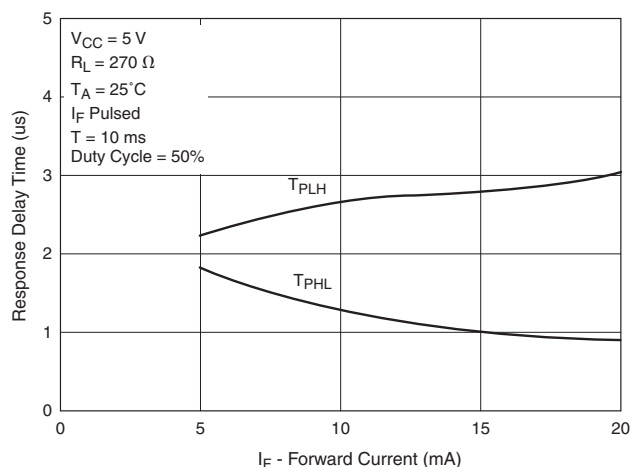
**Fig. 6 Forward Current vs. Forward Voltage**



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



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



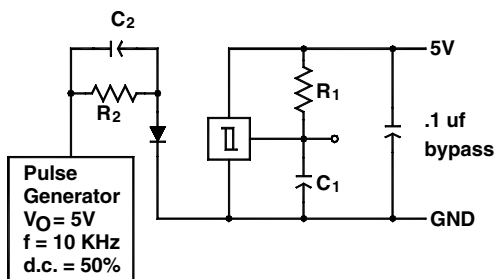
**H21LTB**

**H21LTI**

**H21LOB**

**H21LOI**

Fig. 9 Switching Speed Test Circuit



$R_1 = 360 \ \Omega$   
 $R_2 = 180 \ \Omega$

$C_1 = 15 \text{ pf}$   
 $C_2 = 20 \text{ pf}$

$C_1$  and  $C_2$  include probe and  
stray wire capacitance

Fig. 10 Typical Operating Circuit

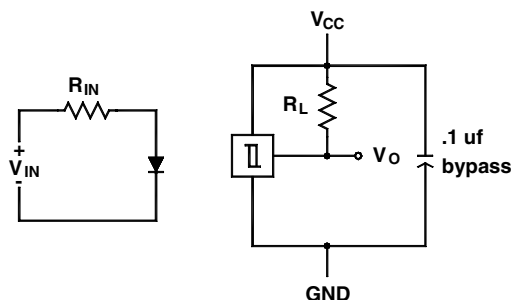


Fig. 11 Switching Times Definition for Buffers

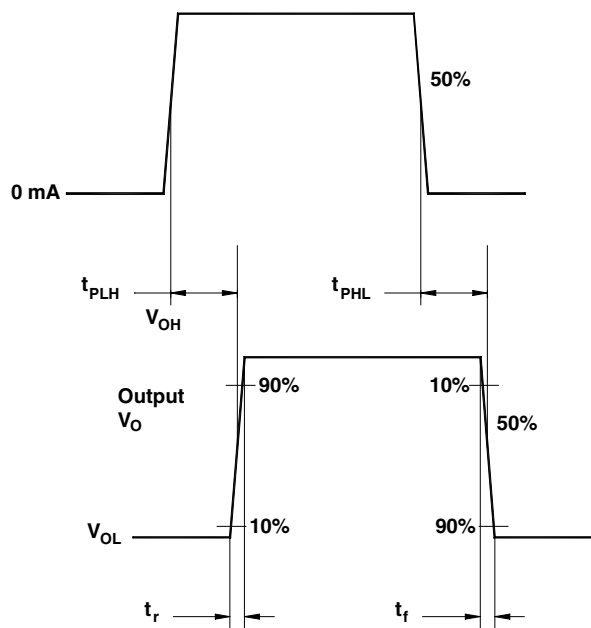
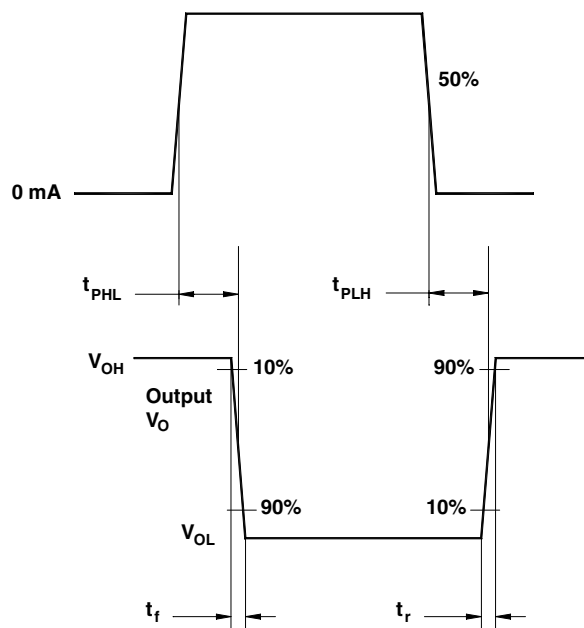


Fig. 12 Switching Times Definition for Inverters



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**H21LTB**

**H21LTI**

**H21LOB**

**H21LOI**

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