

# LIGHT-ACTIVATED INVERTER IC WITH OPEN-COLLECTOR OUTPUT AND ADJUSTABLE OPTICAL THRESHOLD

## ET6505B

### FEATURES

- Supply Voltage Range 4.5V to 18V
- NPN open-collector output
- Optical Sensitivity Adjustable over 7:1 range
- Operate point only 0.23mW/cm<sup>2</sup> (480nW) typical
- Sensitivity tracks the temperature coefficient of power output of the GaAIAs LEDs
- Spectral response optimized for 880nm LED

### APPLICATIONS

- Industrial Controls
- Light to voltage conversion

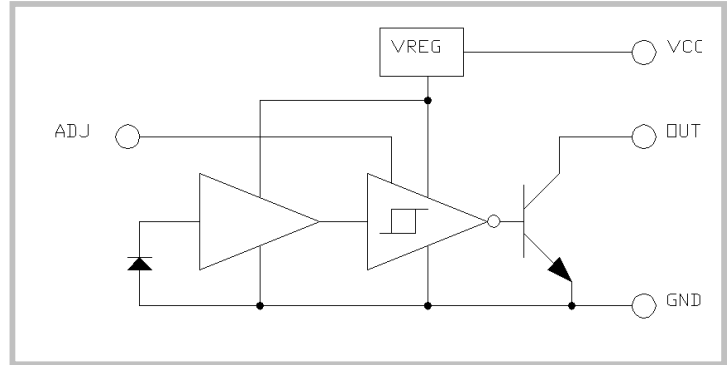


Table showing threshold adjustments.

ADJ Resistor	Normalized Threshold
Open	1.00
10K	1.95
4.7K	2.73
2.2K	3.80
1K	4.98
Short	7.23

### DESCRIPTION

This device incorporates an integral photodiode, amplifier, Schmitt trigger, and open-collector output stage. An on-chip voltage regulator allows operation over a wide range of available supply voltage. The phase of the digital output is considered to be inverted from the optical input, so that the output is HI when the light source is OFF, and the output is LOW when the light source is ON.

An adjust pin (ADJ) is provided to allow the user to alter the optical threshold at which the output changes state. Decreasing the resistance between this pin and ground causes the output to switch at higher and higher input levels, to a maximum of about 1.66mW/cm<sup>2</sup>, or about 3.5μW on the photodiode.

### ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min.	Max.	Units	Ref.
Operating Temperature Range	T <sub>A</sub>	-40	85	°C	Note 1.
Supply Voltage Range	V <sub>CCD</sub>	-0.5	18	V	Note 1.
Voltage at ADJ pin	V <sub>ADJ</sub>	-0.5	3	V	Note 1.
Voltage at OUT (output off)	V <sub>OUT_MAX</sub>	-0.5	18	V	Note 1.
Sink current (output on)	I <sub>SINK</sub>	-	30	mA	Note 1.

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## ELECTRICAL CHARACTERISTICS

Unless otherwise specified,  $T_A = 25^\circ\text{C}$  and  $V_{CC} = 5\text{V}$ , ADJ pin open. LED on denotes an optical input of 720nW @ 880nm. LED off denotes a dark condition.

Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Vcc Voltage Range	Vcc	4.5	5	18	V	
Supply Current @ 5V, Output Low	Icc1	1.1	1.6	2.3	mA	LED source on
Supply Current @ 5V, Output High	Icc2	1.8	2.5	3.5	mA	LED source off
Supply Current @ 18V, Output Low	Icc3	1.5	2.2	3.1	mA	LED source on
Supply Current @ 18V, Output High	Icc4	2.2	3.1	4.4	mA	LED source off
Dark-Light Optical Threshold, 5V	$P_{T5}$	320	480	720	nW	
Dark-Light Optical Threshold, 18V	$P_{T18}$	320	520	790	nW	
Optical Hysteresis Ratio	HYS	1.20	1.33	1.50	-	
Low Level Output, 5V	$V_{OL1}$	-	290	400	mV	LED on, $I_{OL} = 16\text{mA}$
Low Level Output, 18V	$V_{OL2}$	-	285	400	mV	LED on, $I_{OL} = 16\text{mA}$
High Level Output Current	$I_{OH}$	-	0	10	$\mu\text{A}$	$V_{CC} = 4.5\text{V}$ , $V_{out} = 18\text{V}$ , LED off

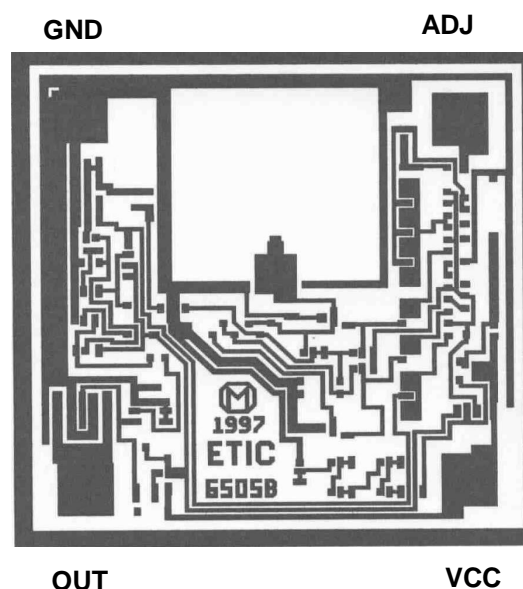
## AC SWITCHING CHARACTERISTICS

Values given at  $V_{CC} = 5\text{V}$ ,  $T_A = 25^\circ\text{C}$ ,  $C_L = 15\text{pF}$ , and  $R_L = 10\text{K}$ , and with optical input @ 940 nW (this is equal to 1.3 times the threshold).

Parameters	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Propagation delay, dark to light	$T_{PHL}$	-	1.8	3.6	$\mu\text{s}$	Note 1.
Propagation delay, light to dark	$T_{PLH}$	-	2.0	4.0	$\mu\text{s}$	Note 1.
Output Rise Time	$T_R$	-	440	600	ns	Note 1.
Output Fall Time	$T_F$	-	16	30	ns	Note 1.

## NOTES:

1. This is not a test parameter, but for information only.
2. The chip dimensions are 44 x 44 x 15 mils. The photodiode is located 21.3 mils from the left edge, and 12.7 mils from the top edge. (One mil = .001 inch.)



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