ET 8001

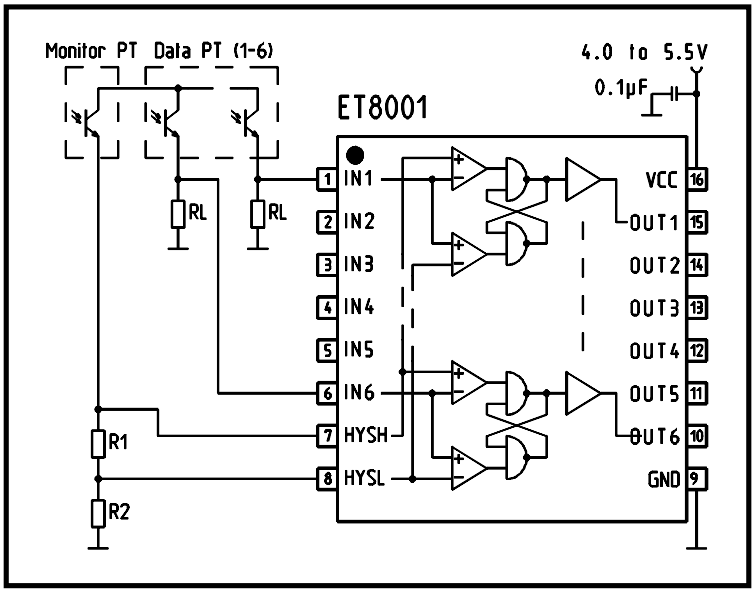
6-Channel precision amplifier with automatic hysteresis tracking function for encoders

Features

- **Designed for optical encoders and light barriers**
- **Automatic Hysteresis monitoring and tracking function generates precise digital outputs**
- **Phase stable outputs over a wide range of conditions**
- **No thermal drift or LED optical power degradation problems from – 40° to +85° C.**

Applications

- **Optical Encoders absolute, multiturn, incremental.**
- **Light barriers**



Package: SO16 small outline

Absolute Maximum Ratings

Ambient Temperature	-40 °C to +85 °C *
Supply Voltage	4.0 V to 5.5 V
Output Drive Capability	4 mA

*** extended temperature range up to 125°C available**

Functional Description

The ET8001 solves one of the most common problems in the encoder world – the phase angle stability of the digital outputs of an optical or magnetic al encoder under changing operating conditions.

During the lifetime of an encoder, the LED as a lightsource is degrading continuously.

At higher ambient temperatures the optical power output of an LED is up to 40% lower than it is at room temperature.

All these variations are unwanted, because they change the phase angle of the digital outputs. Thus, if the encoder has i.e. 12 bit, the gray or binary „word“ can be siginificantly distorted (please see table 1).

This problem has led to the “differential reading” of the tracks of the code disc. This method is unaffected by light level changes – but very expensive to manufacture and difficult to maintain in absolute encoders.

To overcome these problems, OPTOLAB as a specialist in optical sensors for encoders for more than 12 years has developed the ET8001. This integrated circuit does :

Light tracking

Automatic hysteresis control and setting

Error signal

For high performance optical or magnetical encoders

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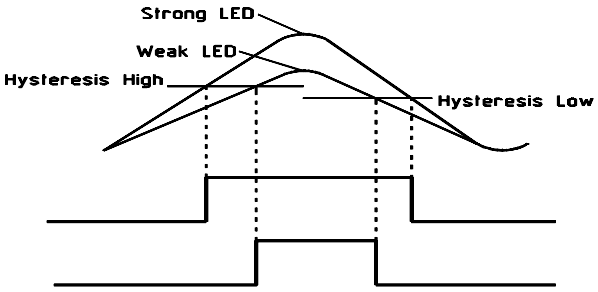
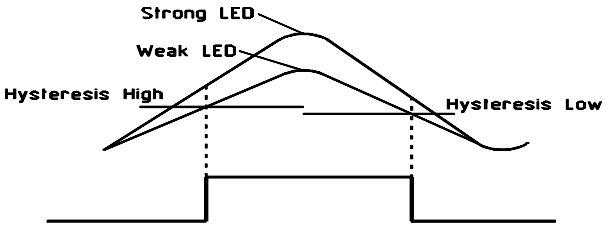
With an conventional encoder design the analog output signal of the data track sensor varies due to LED conditions. The hysteresis is fixed at the designed level. If the signal weakens and the hysteresis stays the same a „shrinking" output signal is the result.



With the ET 8001 the hysteresis is not fixed. Track is kept about the actual LED power and the hysteresis is tied to this level, thus always following.

As seen in the lower image, the margin of Hysteresis High and Low is much smaller, due to smaller optical power. As a result you get a perfect digital output !

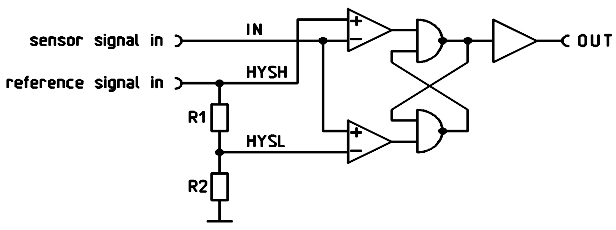


Electrical Characteristics (Values are at 25 °C and V_{CC} = 5.5 V, unless otherwise noted)

VCC = 4.0 - 5.5V ; Ta = -40°C to +85°C

Parameter	Pin	Condition	Min	Max	Unit
Trigger level HIGH(Offset)	IN	HYSH =550mV HYSL = 450mV	540	560	mV
Trigger level LOW(Offset)	IN	HYSH =550mV HYSL = 450mV	440	460	mV
Input voltage range	IN,HYSH, HYSL	VCC = -4.0 to 5.5V	0	VCC-2V	V
Input current	IN,HYSH HYSL	Vin = 0V to VCC - 2V		+/-1	µA
Supply current	VCC			2.5	mA
Output voltage LOW	O	HYSH =550mV HYSL=450mV Vin =0V Ioutl = 4mA		0.4	V
Output voltage HIGH	O	HYSH =550mV HYSL=450mV Vin =1V Iouth = 4mA	VCC-0.8V		V
Risetime / falltime	IN,O	See test circuit		0,2	µs

Test circuit



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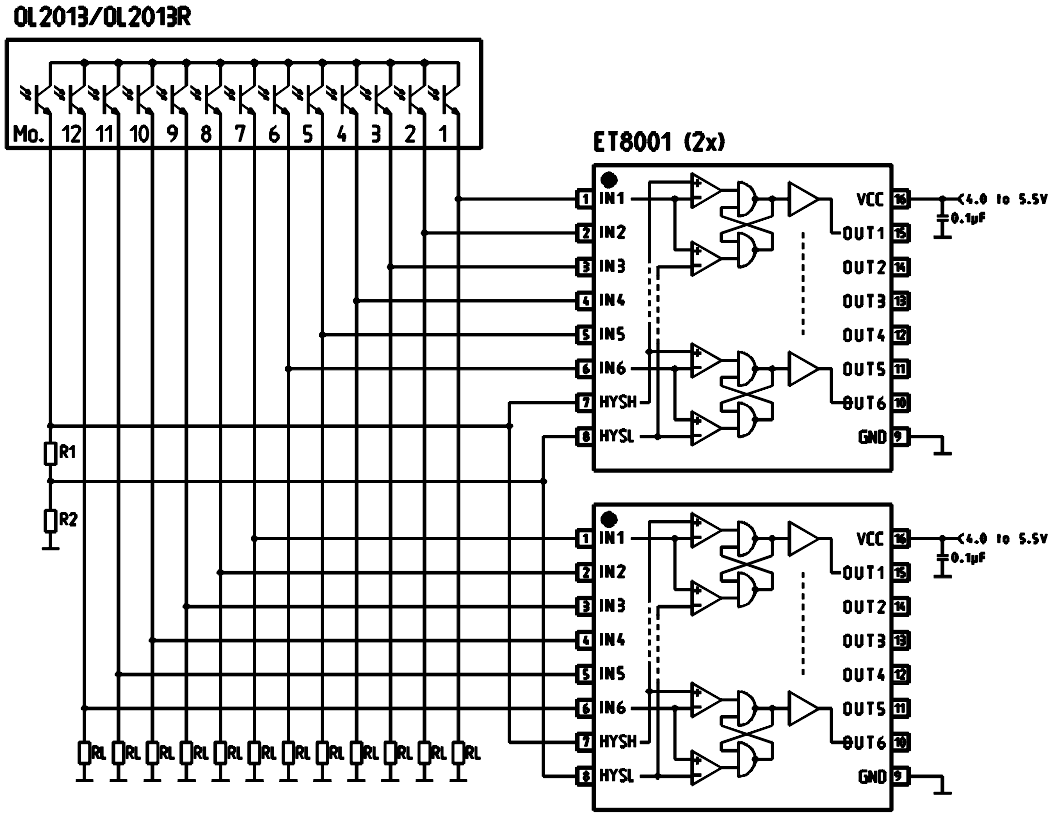
Application Note

This application note describes an “easy to build” high performance 12 bit optical encoder. As sensor there is a 12bit high speed photo transistor array (with or without premounted reticle/grating) available from OPTOLAB.

For “bullett – proof “ output linedrivers we recommend our ET7272. Short circuit proof up to 30V, 4in8out channels and an operating voltage from 3.3 to 30 V makes a big difference !



Description

We can see 12 data tracks and one “monitor” track . The monitor photo transistor (PT) should be constantly illuminated by the LED (which is also illuminating the data tracks).
The resistors R1 and R2 are used to set the HYSH (High level) and HYSL (Low level) of the hysteresis. There are no trimpots needed in manufacturing.
To set the system and find the right values for the resistors following lab procedure is recommended :

1. Switch on LED, measure one DATA track, which is fully lit. Adjust the load resistor (R_L) until you see 1V at the emitter of the PT. (we have found values of 4 – 8Kohm, depending on LED power). This voltage we call herein “signal”. Use the same load resistor value for all data tracks.
2. 50% of our signal is the hysteresis center, in our example 500mV. Now we want to set the ET8001 to switch precisely ON at 550mV and OFF at 450mV, no matter what. This is done by the resistors R1 and R2 (a total of 10K might do it).
3. By varying R1 the hysteresis window width (high and low trip points) can be adjusted (set 550mV to appear at HYSH and set 450mV to appear at HYSL)
4. By varying R2 the center of the hysteresis window (all more up or down the sine wave) can be adjusted.
5. All set !

When finished, turn on your encoder, let the disc spin and watch the digital outputs. Vary the LED current to simulate degradation or high temperature. You will find no change of the phase of the digital outputs at all !