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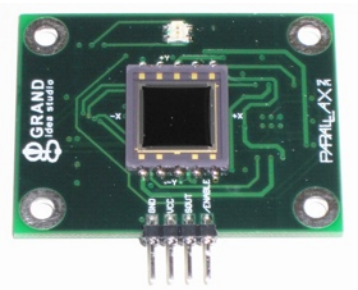
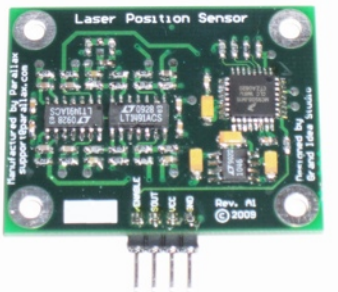
Laser Position Sensor

Product Brief





Introduction

Designed in cooperation with Grand Idea Studio (www.grandideastudio.com), the Laser Position Sensor (LPS) module is an optical position sensor that measures and provides the two-dimensional coordinates of a spot of visible red laser light (630-694nm typical) shined onto its surface with a resolution of 0.0001", an accuracy of 0.001", and a measurement range of +/-0.2" (+/-5mm). The module measures 1.8" x 1.4". Applications include positioning and alignment, long-range beam-break/security trip wires, remote device control, data communications, and high-speed photography.

This module is based, with permission, on Roger Johnson and Chris Lentz's "2-D Optical Position Sensor" article (Circuit Cellar #152, March 2003, www.circuitcellar.com/library/print/0303/index.htm) and modified for a more integrated form-factor and reduced cost. Technical details of position sensitive detectors (PSDs) and the associated signal processing and mathematical equations can be found in their article.

Connections

The Laser Position Sensor easily interfaces to any host microcontroller using only four connections (GND, VCC, SOUT, /ENABLE).

Pin	Pin Name	Type	Function
1	GND	G	System ground. Connect to power supply's ground (GND) terminal.
2	VCC	P	System power. +5V DC input.
3	SOUT	O	Serial output to host. TTL-level interface, 9600 bps, 8 data bits, no parity, 1 stop bit.
4	/ENABLE	I	Module enable pin. Active LOW digital input. Bring this pin LOW to enable the sensor. Bring this pin HIGH or leave unconnected for idle state.

Note: Type: I = Input, O = Output, P = Power, G = Ground

Usage

The Laser Position Sensor takes approximately four (4) seconds to calibrate upon power-up. During this time, do not shine a laser onto the face of the sensor, as the module will improperly calibrated.

Visual indication of the Laser Position Sensor's state is given with the on-board LED. During calibration, the LED will be ORANGE (combining RED and GREEN). When the module is in an idle state, the LED will be GREEN. When the module is activated by pulling the /ENABLE pin low, the LED will pulse RED.

Communication Protocol

All communication is 8 data bits, no parity, 1 stop bit, and least significant bit first (8N1) at 9600 bps.

The Laser Position Sensor transmits data as 5V TTL-level, non-inverted asynchronous serial.

After the /ENABLE line is pulled LOW and when the module is ready for operation, it will send a single '*' character (0x2A) to the host.

When a laser spot is detected on the surface of the Laser Position Sensor, the module returns the two-dimensional coordinates from the center origin of the sensor in ASCII format in thousandths of an inch. For example:

```
X+1234 Y-0123
```

Corresponds to X = +0.1234" and Y = -0.0123" from center.

When no laser spot is detected on the surface of the Laser Position Sensor, no data is sent.

The maximum range of either dimension is +/-0.1968".

DC Characteristics

At V_{CC} = +5.0V and T_A = 25ºC unless otherwise noted

Parameter	Symbol	Test Conditions	Specification			Unit
			Min.	Typ.	Max.	
Supply Voltage	V_{CC}	---	4.5	5.0	5.5	V
Supply Current, Calibration	I_{CAL}	---	---	26	---	mA
Supply Current, Idle	I_{IDLE}	---	---	10.5	---	mA
Supply Current, Active	I_{CC}	---	13	15	17	mA
Input LOW voltage	V_{IL}	V_{CC} = +5V	---	---	1.75	V
Input HIGH voltage	V_{IH}	V_{CC} = +5V	3.25	---	---	V
Output LOW voltage	V_{OL}	V_{CC} = +5V	---	---	1.5	V
Output HIGH voltage	V_{OH}	V_{CC} = +5V	3.5	---	---	V

Additional Information

Complete engineering documentation, including schematic, bill-of-materials, PCB files, assembly drawing, firmware, system-level test procedure, and demonstration code, is available from Grand Idea Studio's web site (www.grandideastudio.com/portfolio/laser-position-sensor/) and the Parallax web site (www.parallax.com).