PIR Sensor (#555-28027)

General Description

The PIR (Passive Infra-Red) Sensor is a pyroelectric device that detects motion by measuring changes in the infrared levels emitted by surrounding objects. This motion can be detected by checking for a high signal on a single I/O pin.
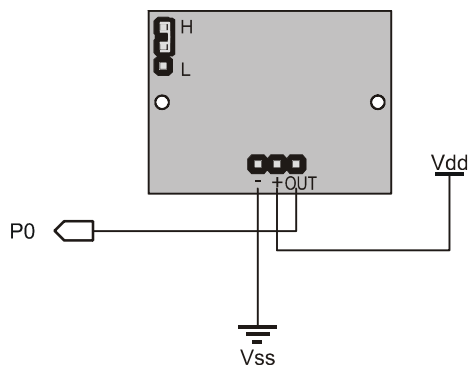
Features

- Single bit output
- Small size makes it easy to conceal
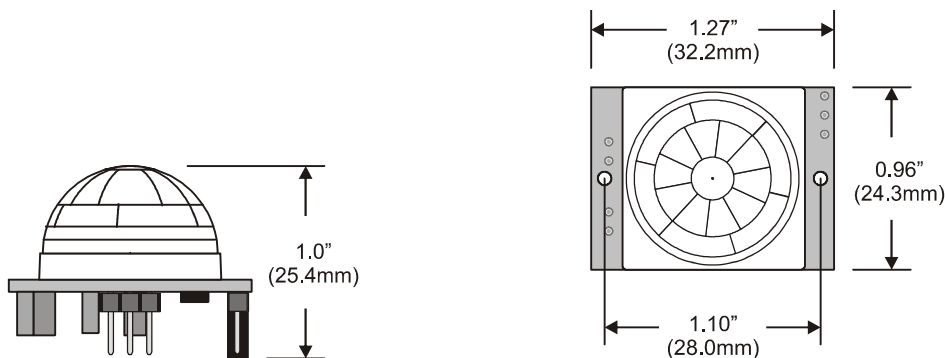- Compatible with all Parallax microcontrollers

Application Ideas

- Alarm Systems
- Halloween Props
- Robotics

Quick Start Circuit

Note: The sensor is active high when the jumper (shown in the upper left) is in either position.

Module Dimensions

Theory of Operation

Pyroelectric devices, such as the PIR sensor, have elements made of a crystalline material that generates an electric charge when exposed to infrared radiation. The changes in the amount of infrared striking the element change the voltages generated, which are measured by an on-board amplifier. The device contains a special filter called a Fresnel lens, which focuses the infrared signals onto the element. As the ambient infrared signals change rapidly, the on-board amplifier trips the output to indicate motion.

Pin Definitions and Ratings

Pin	Name	Function
-	GND	Connects to Ground or Vss
+	V+	Connects to +5 VDC or Vdd
OUT	Output	Connects to an I/O pin set to INPUT mode

Connecting and Testing

Connect the 3-pin header to your circuit so that the minus (-) pin connects to ground or Vss, the plus (+) pin connects to +5 volts or Vdd and the OUT pin connects to your microcontroller's I/O pin. One easy way to do this would be to use a standard servo/LCD extension cable, available separately from Parallax (#805-00002). This cable makes it easy to plug sensor into the servo headers on our Board Of Education or Professional Development Board. If you use the Board Of Education, be sure the servo voltage jumper (located between the 2 servo header blocks) is in the Vdd position, not Vin. If you do not have this jumper on your board you should manually connect to Vdd through the breadboard.

You may also plug the sensor directly into the edge of the breadboard and connect the signals from there. Remember the position of the pins when you plug the sensor into the breadboard.

Once the sensor warms up (settles) the output will remain low until there is motion, at which time the output will swing high for a couple of seconds, then return low. If motion continues the output will cycle in this manner until the sensors line of sight of still again.

Calibration

The PIR Sensor requires a 'warm-up' time in order to function properly. This is due to the settling time involved in 'learning' its environment. This could be anywhere from 10-60 seconds. During this time there should be as little motion as possible in the sensors field of view.

Sensitivity

The PIR Sensor has a range of approximately 20 feet. This can vary with environmental conditions. The sensor is designed to adjust to slowly changing conditions that would happen normally as the day progresses and the environmental conditions change, but responds by toggling its output when sudden changes occur, such as when there is motion.

Resources and Downloads

Check out the PIR Sensor product page for example programs and more:

http://www.parallax.com/detail.asp?product_id=555-28027

Source Code

BASIC Stamp® 1 Program

This program will display the current status of the output pin from the PIR Sensor connected to P0 by lighting an active high LED connected to P1 when motion is detected.

```
' ===========================================================================
'   File...... PIR_Simple.bs1
'   Purpose... Show Output State Of PIR Sensor
'   Author.... Parallax, Inc.
'   E-mail.... support@parallax.com
'   Started... 12-14-2005
'   {$STAMP BS1}
'   {$PBASIC 1.0}
'
' -----[ Program Description ]-----------------------------------------------

' This program displays the current state of the PIR Sensor connected to P0
' by lighting an active high LED connected to P1 when motion is detected.

' -----[ I/O Definitions ]---------------------------------------------------

SYMBOL          PIR =   PIN0            ' I/O Pin For PIR Sensor
SYMBOL          LED =   PIN1            ' I/O Pin For LED

' -----[ Initialization ]----------------------------------------------------

LET             DIRS =  %00000010       ' Set Pin Directions

' -----[ Program Code ]------------------------------------------------------

Main:
  LET LED = PIR
  GOTO Main
```

BASIC Stamp® 2 Program

This program will display the current status of the output pin from the PIR Sensor connected to P0 using the Debug Terminal.

```
' ===========================================================================
'   File...... PIR_Simple.bs2
'   Purpose... Show Output State Of PIR Sensor
'   Author.... Parallax, Inc.
'   E-mail.... support@parallax.com
'   Started... 12-14-2005
'   {$STAMP BS2}
'   {$PBASIC 2.5}
'
' -----[ Program Description ]-----------------------------------------------

' This program displays the current state of the PIR Sensor connected to P0
' on the DEBUG screen.
```

```
' -----[ Program Code ]-------------------------------------------------

Main:
  DO
    DEBUG HOME, BIN1 IN0              ' Display Status Of P0 At Home Pos.
    PAUSE 100                        ' Small Delay
  LOOP                               ' Repeat Forever
```

SX Microcontroller Application

This program will display the current status of the output pin from the PIR Sensor connected to RC.7 by lighting an active high LED connected to RC.6 when motion is detected.

```
' =========================================================================
'
'   File...... PIR_Simple.SXB
'   Purpose... Demonstrate Reading The PIR Sensor
'   Author.... Parallax, Inc.
'   E-mail.... support@parallax.com
'   Started... 12-14-2005
'
' Program Description
' -------------------------------------------------------------------------

' This program will display the status of the output of the PIR sensor
' connected to RC.7 by lighting an active high LED connected to RC.6 when
' motion is detected.  Use a 220 or 330 ohm series resistor with the LED.

' Device Settings
' -------------------------------------------------------------------------

DEVICE          SX28, OSC4MHZ, TURBO, STACKX, OPTIONX
FREQ            4_000_000


' IO Pins
' -------------------------------------------------------------------------


PIR             VAR       RC.7          ' I/O Pin For PIR Sensor
LED             VAR       RC.6          ' I/O Pin For LED

' Program Code
' -------------------------------------------------------------------------

Start:
  TRIS_C        =         %10111111     ' Set I/O Pin Directions

Main:
  LED = PIR                             ' Make LED Follow PIR
  GOTO Main
```