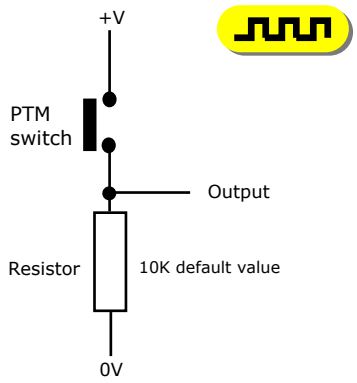
INPUT

Present sensor

Diagram:



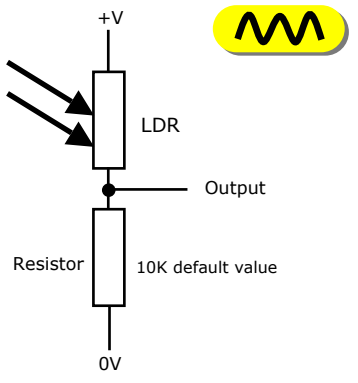
Function:

When the switch is **press** it closes the circuit and the output goes to +V. When the switch is not pressed the output is at 0V.

INPUT

Light sensor

Diagram:



Function:

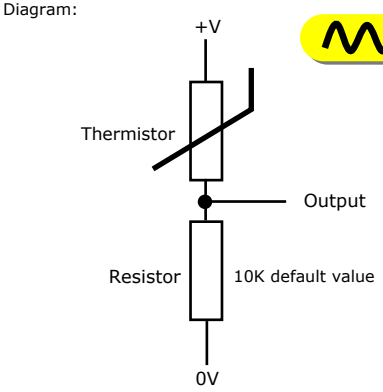
When the LDR is **light** it's resistance is low, making the output +V. When it is dark it's resistance is high making the output 0V.

Varying the light level will create varying voltages at the output. Resistor can be a VR to add adjustment.

INPUT

Hot sensor

Diagram:



Function:

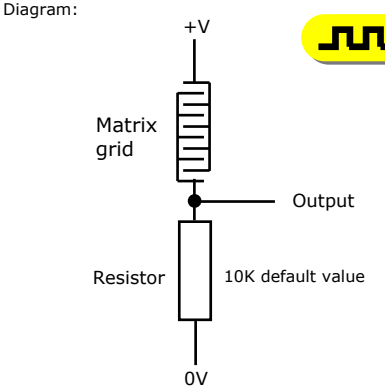
When thermistor is **hot** it's resistance is low, making the output +V. When it is dark it's resistance is high making the output 0V.

Varying temperature will create varying voltages at the output. Resistor can be a VR to add adjustment.

INPUT

Moisture sensor

Diagram:



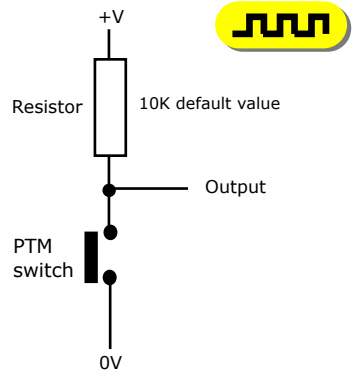
Function:

When the sensor is **wet**, a connection is made and the output will be at +V. When it is dry no connection is made and the output will be at 0V.

INPUT

Not present sensor

Diagram:



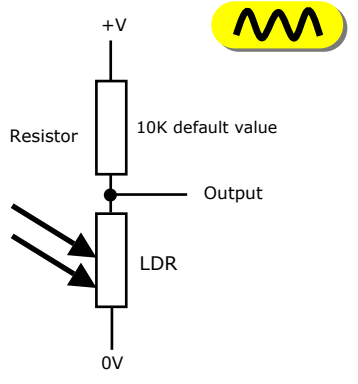
Function:

When the switch is **not press** the output will be at +V. When it is pressed it closes the circuit and the output goes to 0V.

INPUT

Dark sensor

Diagram:



Function:

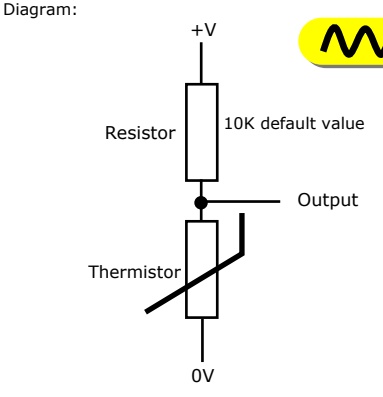
When the LDR is **dark** it's resistance is high, making the output +V. When it is light it's resistance is low making the output 0V.

Varying the light level will create varying voltages at the output. Resistor can be a VR to add adjustment.

INPUT

Cold sensor

Diagram:



Function:

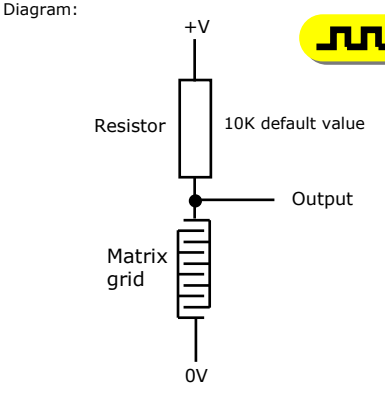
When the thermistor is **cold** it's resistance is high, making the output +V. When it is hot it's resistance is low making the output 0V.

Varying the temperature will create varying voltages at the output. Resistor can be a VR to add adjustment.

INPUT

Dry sensor

Diagram:



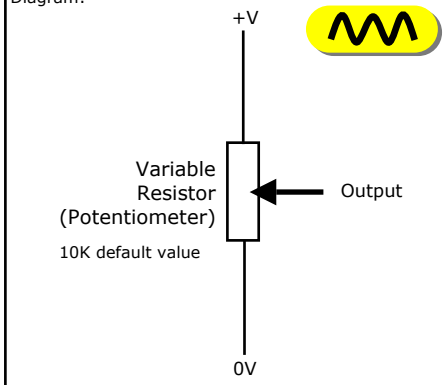
Function:

When the sensor is **wet**, a connection is made and the output will be at +V. When it is dry no connection is made and the output will be at 0V.

INPUT

Position sensor 0-270°

Diagram:



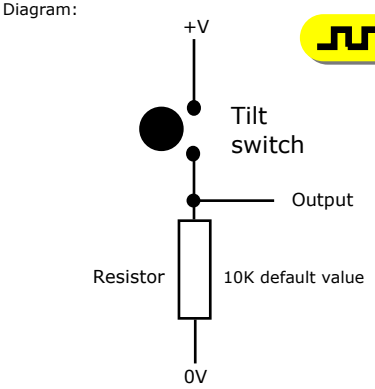
Function:

The output varies with the position of the wiper, one end is 0V and the other is +V, other voltages depend upon its position. It is usually used to set a voltage or one due to its position.

INPUT

Tilt sensor

Diagram:



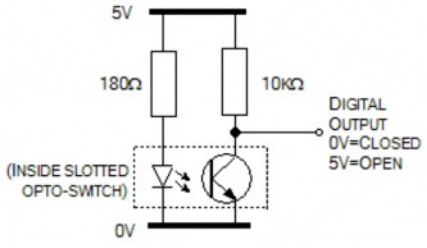
Function:

In one position the ball closes the switch and the output will be at +V. In the other the ball doesn't close the switch so the output will be at 0V

INPUT

Slotted Opto switch

Diagram:



Function:

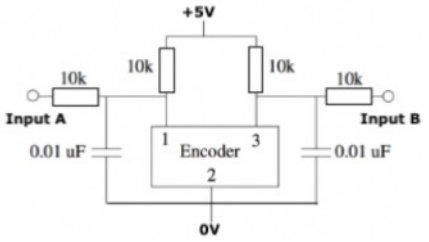
This is used to detect gaps in a slotted disc, used to count rotations, such as found Robots for distance counting.

The LED emits an IR beam which broken by the gaps in the disc and counted.

INPUT

Rotary Encoder

Diagram:



Function:

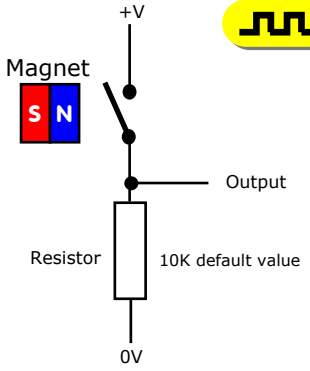
A rotary encoder is a dial which rotates both clockwise and anti-clockwise, AKA a Jog Wheel, good for digital controls.

It produces a set of pulses which give a direction turned and a count of distance turned.

INPUT

Magnetic switch

Diagram:



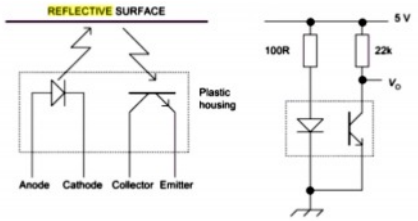
Function:

The output will be at 0V if **NO** magnet is present, since the switch is open. When the magnet is near the switch it closes and the output will be at +V.

INPUT

Reflective Opto switch

Diagram:



Function:

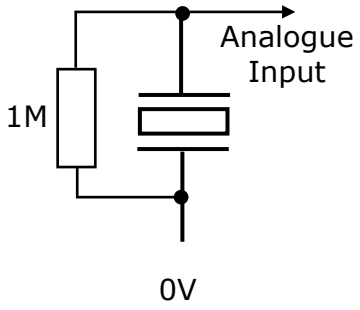
This is used to detect reflective surfaces such as found in white line following Robots.

The LED emits an IR beam which is detected or not by a photo transistor, which produces a high with no reflection & low with a reflection

INPUT

Vibration sensor

Diagram:



Function:

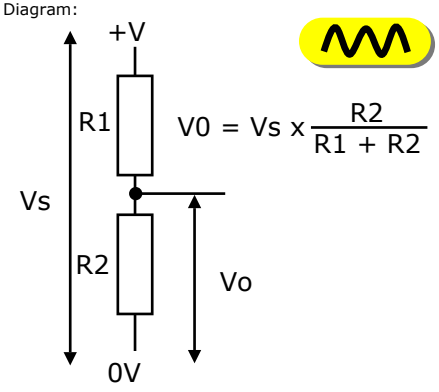
The Piezo transducer when tapped or flexed will produce a voltage which can be read using an analogue input on a microcontroller.

This effect is reversible and is used in the speaker mode of operation - a voltage produces a change in shape.

INPUT

Potential Divider Calculation

Diagram:



Function:

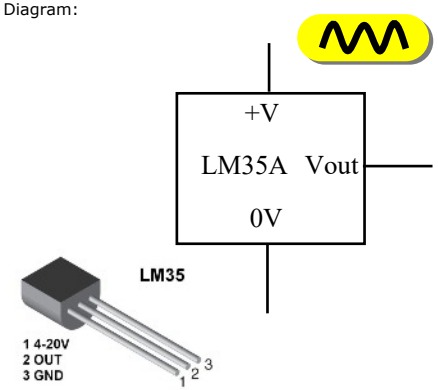
The size of the output voltage is controlled by the sizes of the two resistors and the supply voltage, using the calculation above.

It is a simple ratio, by using 10K for each division you need it is easy to count up how many you for R1 & R2

INPUT

Temperature IC Sensor

Diagram:



Function:
The **LM35A** is analogue temperature sensor, whose output is proportional to °C in 10mV steps.

For example 22°C gives an output of 0.22V. Works well with microcontroller circuits.

INPUT

Flex Sensor

Diagram:

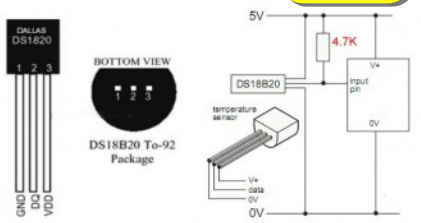
An easy way to sense the flexing of a material or even a fabric.

Function:
The Flex sensor changes it's resistance when it is bent, it varies from 30kΩ resistor when unbent, to 70kΩ at a 90° angle. By combining the flex sensor with a fixed resistor to create a **voltage divider,** you can produce a variable voltage that can be read by a microcontroller's ADC.

INPUT

DS18B20 Temperature Sensor

Diagram:



Compatible with:

PICAXE GENIE AVR ARDUINO

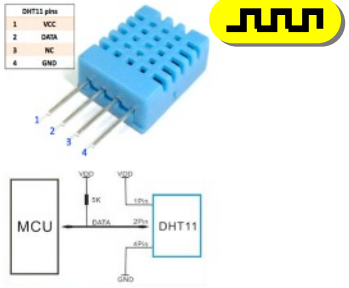
Function:
This temperature IC has a temperature range of -55°C to 125°C, it can **only** be used with a microcontroller since it communicates using the 1-Wire® protocol.

The code required is quite simple, as it is a standard device and is well supported.

INPUT

DHT11 Temp & Humidity Sensor

Diagram:



Notes:

Humidity 20 - 80% ±5%

Temp 0-50°C ±2°C

Function:
The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor. It supplies new readings every 2 secs via a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data.

INPUT

Force sensing resistor

Diagram:

Needs to be used in a potential divider circuit and read using a microcontroller's ADC input

Function:
It is a resistor that changes its resistance depending on how much its pressed. These sensors are fairly low cost, and easy to use but they're rarely accurate. They can detect weight, they're a bad choice for accurate measurements. Can be used in place of pressure switches.

INPUT

Force Sensing Linear Potentiometer

Diagram:

A microcontroller with 2 ADC's is needed to read data from this component.

Function:
The FSLP is effectively a force-sensing resistor (FSR) that can also simultaneously sense position and the force used. Using a microcontroller with an ADC, you can easily determine where and how hard the strip is being pressed, to create touch-control user interfaces or sophisticated tactile sensors.

INPUT

PIR HC-SR505

Diagram:

Function:
The HC-SR505 is a mini passive infra red sensor, triggered by movement in the sensing area. The output goes high when motion is detected, the output can be used to trigger a digital input on a microcontroller.

INPUT

PIR HC-SR501

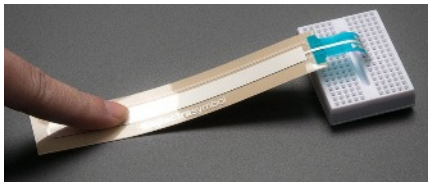
Diagram:

Function:
The HC-SR501 is a passive infra red sensor, triggered by movement in the sensing area. The output goes high when motion is detected, the output can be used to trigger a digital input on a microcontroller. It has controls for sensitivity and time delay, you can also set the output action - repeat trigger is the normal setting.

INPUT

Linear 'SoftPot'

Diagram:



To use Connect one side pin to ground via a 10K resistor in series. Connect the other side pin to your +V power line (3V, 5V etc) via a different 10K resistor in series. Then read the analog voltage on the center pin. It will range from 1/3 +V to 2/3 +V. **Do not connect to Ground and Power**

Function:

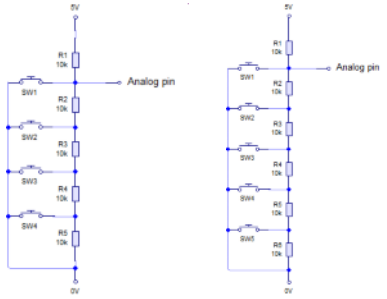
The 'SoftPot' acts like a potentiometer when it is pressed, the wiper is connected **only** when it is pressed, it needs to be read using a microcontroller's ADC input, a weak pullup resistor of 100K needs to be used on the wiper output so that the ADC input doesn't float with no pressure applied.

INPUT

Resistor Ladder

Diagram:

4 Button input **5 Button input**



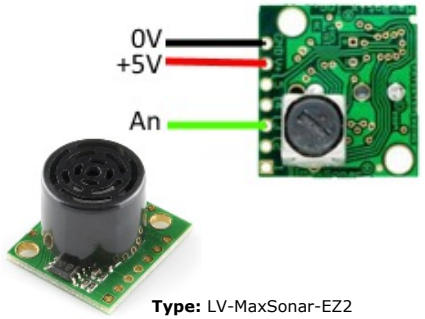
Function:

Using an analog pin on a microcontroller and a resistor ladder more than one button can be used. In this case each button will generate a unique voltage which can be checked for and use to selected the required function. The number of buttons can be increased if desired with an upper limited of approx 32.

INPUT

Ultrasonic Distance Sensor 1

Diagram:



Type: LV-MaxSonar-EZ2

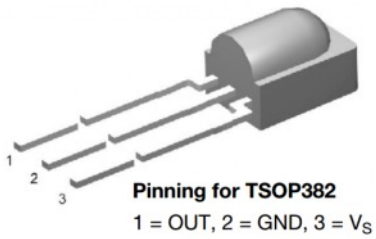
Function:

This is a simple to use ultrasonic distance/range finder. It produces an analog signal which can easily be connected to a microcontroller's ADC , it provides very accurate readings of 0 to 6.45m in 2.5cm increments.

INPUT

38KHz IR Detector

Diagram:



Type: TSOP38238

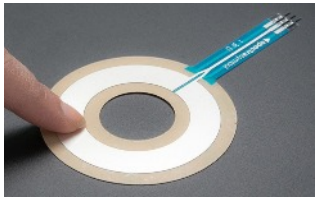
Function:

The TSOP38238 is a 38KHz IR detector, it produces an output when it detects a 38KHz infra red signal, it produces a demodulated output which can be fed straight into a microcontroller for remote control solutions. It requires an IR signal of 950nm from a suitable IR LED.

INPUT

Circular 'SoftPot'

Diagram:



To use Connect one side pin to ground via a 10K resistor in series. Connect the other side pin to your +V power line (3V, 5V etc) via a different 10K resistor in series. Then read the analog voltage on the center pin. It will range from 1/3 +V to 2/3 +V. **Do not connect to Ground and Power directly!**

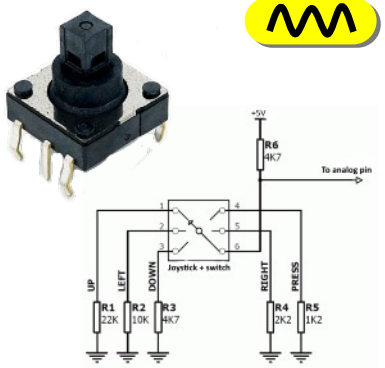
Function:

The 'SoftPot' acts like a potentiometer when it is pressed, the wiper is connected **only** when it is pressed, it needs to be read using a microcontroller's ADC input, a weak pullup resistor of 100K needs to be used on the wiper output so that the ADC input doesn't float with no pressure applied.

INPUT

Mini Joystick

Diagram:



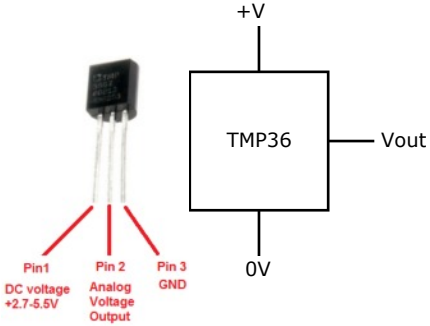
Function:

A useful input device is a joystick, but usually needs 5 inputs, however, using an analog input on a microcontroller, the five inputs can be read as different voltages and then used to do different actions within your code. This is similar to the **Resistor Ladder** method.

INPUT

Temperature IC Sensor 2

Diagram:



Function:

The **TMP36** is analogue temperature sensor, whose output is proportional to °C in 10mV steps.

For example 22°C gives an output of 0.22V. Works well with microcontroller circuits.

INPUT

IR Distance Sensor

Diagram:

Type: Sharp GP2Y0A21YK0F

Note: A 10uF capacitor needs to be connected across the supply to ensure correct operation.

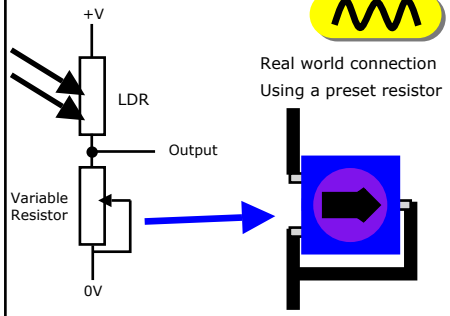
Function:

This IR sensor is a popular choice projects that require accurate distance measurements. Interfacing to most microcontrollers is straightforward: the single analog output can be connected to an ADC for taking distance measurements. The detection range of this version is approximately 10 cm to 80 cm.

INPUT

Making a sensor adjustable

Diagram:



Note How the variable resistor is connected, it is good practice to connect the wiper to the 0V end of the resistor.

Function:

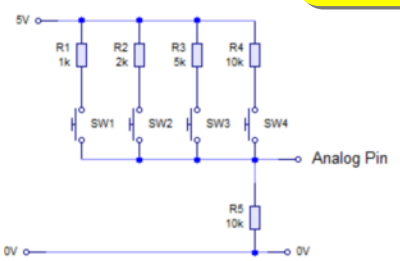
A common need in sensor circuits is to make it more or less sensitive, we need to **adjust** the output value from the sensor to **trigger** the attached circuit at the right time. To make it adjustable, the fixed resistor is changed to a variable resistor of the same or slightly larger value.

INPUT

Multi Switch Input

Diagram:

4 Button input example



Note: SW1 = 4.55V, SW2 = 4.17V, SW3 = 3.3V and SW4 = 2.50V. See the Potential Divider Calculation card for further details.

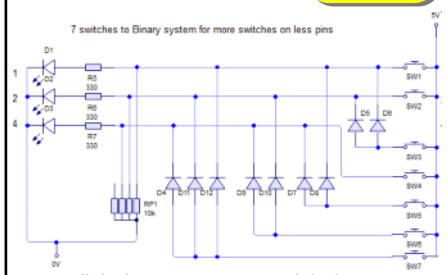
Function:

Using an analog pin on a microcontroller and a set of switched Potential Dividers more than one button can be used. In this case each button will generate a unique voltage which can be checked for and use to selected the required function. You will need to take resistor tolerance into account.

INPUT

Binary input from switches

Diagram:



Note: All diodes are 1N4148 signal diodes. More switches and diodes can be added if another pin is available.

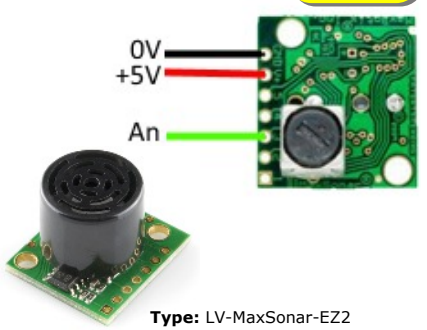
Function:

A circuit for 7 switches to input a binary number to 3 pins of a microcontroller. **NO** switches pressed the 3 pins are 0, if switch 1 is pressed 1=on, 2=off & 3=off. Giving binary for 1 to 7, when a switch is pressed. Diodes provide routing when more than one pin is used, stopping back flow to the other switches.

INPUT

Ultrasonic Distance Sensor 1

Diagram:



Type: LV-MaxSonar-EZ2

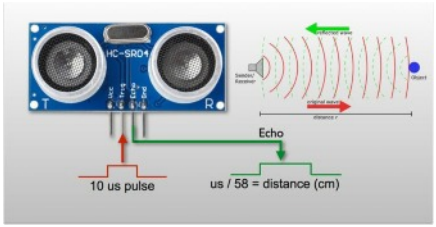
Function:

This is a simple to use ultrasonic distance/range finder. It produces an analog signal which can easily be connected to a microcontroller's ADC , it provides very accurate readings of 0 to 6.45m in 2.5cm increments.

INPUT

Ultrasonic Distance Sensor 2

Diagram:



Type: HC-SR04

Note: This uses 2 I/O pins plus +5V and 0V

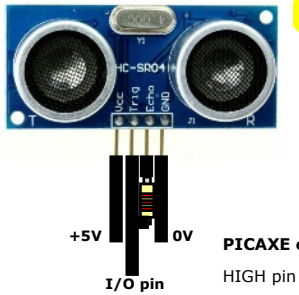
Function:

This is a simple to use ultrasonic distance/range finder. It produces a set of pulses when triggered and listens for the echo, this is used to calculate the distance. It needs 2 I/O pins to be operated, if you only have one see **single pin** version card

INPUT

Using HC-SR04 with single pin

Diagram:



Type: HC-SR04

PICAXE code:

HIGH pin

PULSIN pin, 1, w0

Note: This uses 1 I/O pins plus +5V and 0V

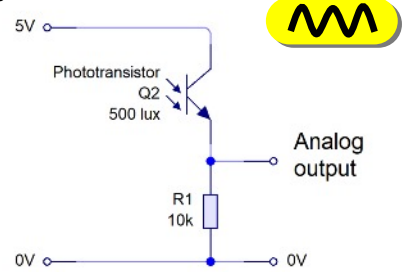
Function:

This is a simple to use ultrasonic distance/range finder, using a single I/O pin. Connect Echo pin to the Trigger pin using a 1K8 to 2K2 resistor. The code for a PICAXE solution is shown above, it can easily to adjust to suit many microcontrollers.

INPUT

Light sensor - Photo transistor

Diagram:



Example parts

Kitronik SKU 35139 LTR-4206

Rapid SKU 65-4449 TEPT4400

Function:

This is a simple to use light sensor which uses a photo transistor instead of an LDR (issues with cadmium). It operates in the same way as an LDR circuit and has a better response in the visual range than an LDR. Should be used instead of an LDR if possible.