Please note that the 2018 edition contains the following items as opposed to the list included in the document!:

Starterkit
- 1 Arduino Uno R3
- 1 USB A-B Cable, 40 cm

Connectivity
- 1 set of jumper wires, male-male
- 2 wire + crocodile clamp, red + CRCL-lead

Active
- 1 RC servo, mini (SG90)
- 1 DC motor
- 1 battery clip

Passive components
- 1 potentionmeters, ALPS, 10k
- 2 capacitor 10 uF, 16V
- 2 capacitor 100 nF, 16V
- 10 resistor 100R
- 10 resistor 330R
- 10 resistor 1k
- 10 resistor 10k
- 10 resistor 100k
- 10 resistor 220k
- 10 resistor 1M
- 10 resistor 10M
- 2 inductor, 22 mH
- 2 inductor, 10 mH

Semiconductors
- 2 BC337 transistor
- 1 opamp TLC272
- 1 timer NE555
- 2 LED 5mm RED
- 2 LED 5mm BLUE
- 2 LED 5mm GREEN
- 2 LED 5mm YELLOW
- 1 LED 5mm RGB
- 1 LED 5mm infrared
- 2 diode, 1N4148

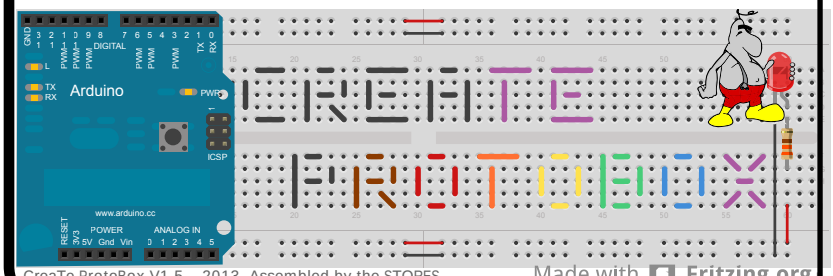
Sensing
- 1 NTC
- 2 LDR
- 1 Electret microphone capsule
- 1 IR receiver TSOP4838
- 2 pushbuttons
- 1 CNY70
- 1 photodiode, 5mm, clear
- 1 piezo buzzer, passive

Quick reference sheet for the

CreaTe ProtoBox

http://fritzing.org
http://arduino.cc

Version 1.5 - STORES - 2013



contents

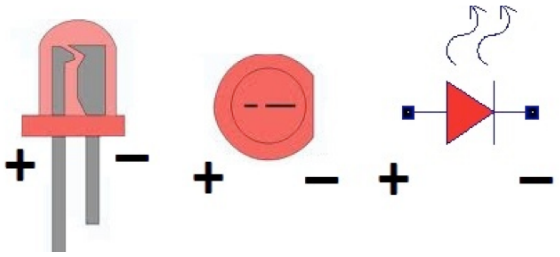
Core:
1 Arduino Uno
1 USB A-B cable
1 Breadboard
1 Set wires
2 clamp-wires

Support:
10 Resistor 330R
4 Resistor 1k
4 Resistor 10k
8 Resistor 100k
8 Resistor 220k
4 Resistor 10M
2 Transistor BC337
1 OpAmp TL272
1 Timer NE555
2 Diode 1N4148
2 Capacitor 100nF
2 Capacitor 10uF

Output:
1 Piezo Buzzer
1 LED RGB
2 LED Blue
2 LED Green
2 LED Yellow
2 LED Red
1 LED IR
1 DC motor

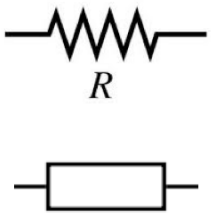
Input:
1 Microphone
1 NTC
1 CNY70 refl. sensor
1 IR sensor 38kHz
1 phototransistor
1 LDR
2 Pushbutton
1 Potentiometer
1 9V battery and clip

LED



Note polarity!
Also use a series resistor. LED 's can take 20mA.
In most cases 330R is good enough.

Resistor

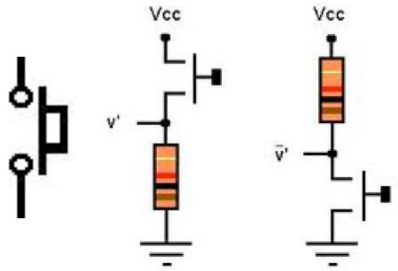


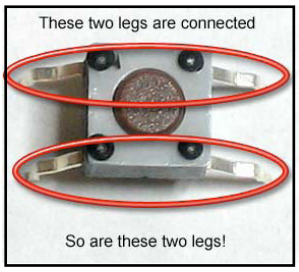
Color	Color Name	1st digit 1st stripe	2nd digit 2nd stripe	Multiplier 3rd stripe	Tolerance 4th stripe
	Black	0	0	x1	-
	Brown	1	1	x10	1%
	Red	2	2	x100	2%
	Orange	3	3	x1,000	3%
	Yellow	4	4	x10,000	4%
	Green	5	5	x100,000	-
	Blue	6	6	x1,000,000	-
	Violet	7	7	-	-
	Grey	8	8	-	-
	White	9	9	-	-
	Gold	-	-	x0,1	5%
	Silver	-	-	x0,01	10%

Resistors do not have polarization. Colored rings are used to denote the value. Ohm 's law applies: V=I*R

Pushbutton

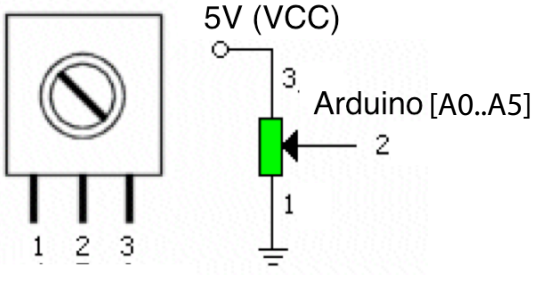
(switch)





A switch can be connected using a 10k pull-up resistor. (or pull-down)
You might have to straighten the legs to t the breadboard

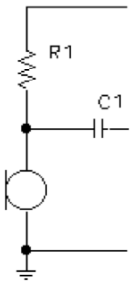
Potentiometer 10k



10k Potentiometer
Can be connected to analog input, or can be used to reduce an analog signal.

Electret Microphone

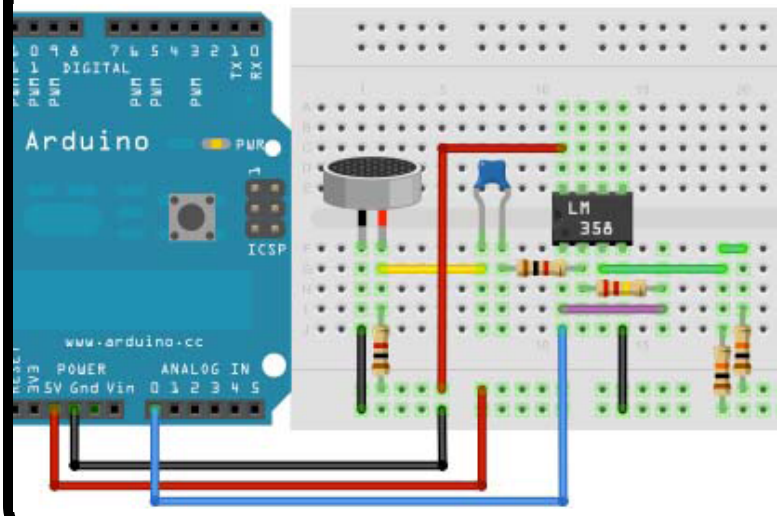
This microphone needs a voltage using a [1..2.2k] pull-up resistor, decoupling capacitor and an ampli er circuit.

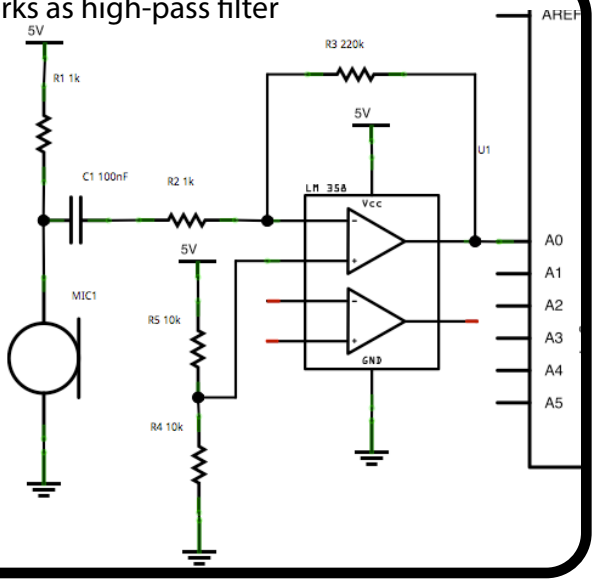


Note polarity!

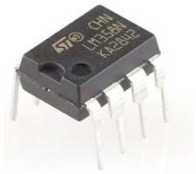
The negative side is connected with the casing (see backside)

220x amplifier+ offset voltage. The 100nF capacitor works as high-pass filter

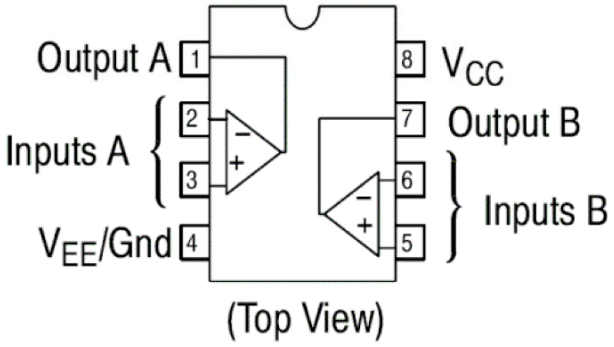




TL272 OpAmp (LM358 is compatible)

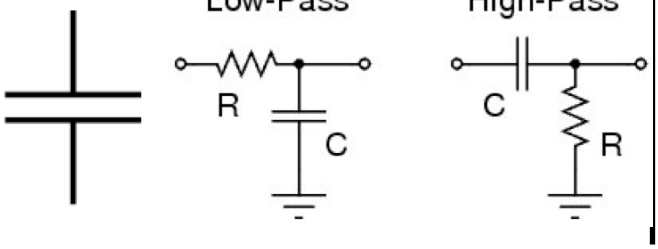


OpAmp stands for ‘operational ampli er’.



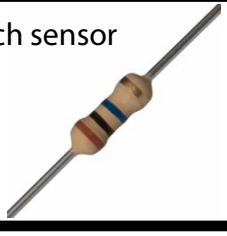
The polarization is given using a dot on the first pin, the small notch also denotes the side with pin 1. The chip contains two OpAmps and requires a supply voltage of at least 5V

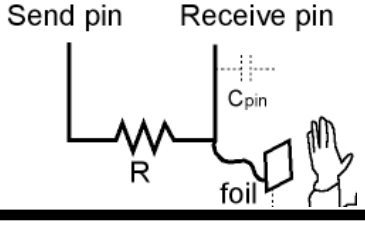
Ceramic capacitor 100 nF



This is a small capacitor, used in analog signal schematics. It has no polarization. Mostly used in RC-networks as lter.

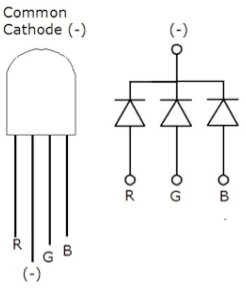
Touch sensor

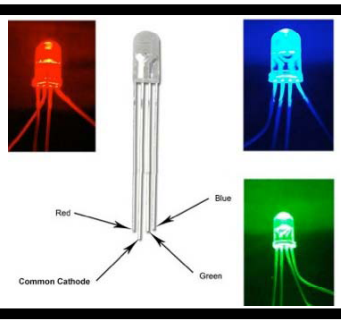




Using the large 10M resistor and two Arduino pins you can make a capacitive touch sensor. Check http://www.arduino.cc/playground/Main/CapSense

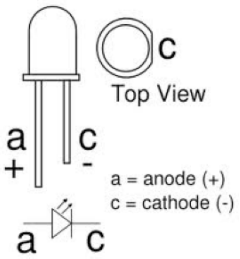
RGB LED





An RGB LED contains three separate LED 's which share a common cathode(-)

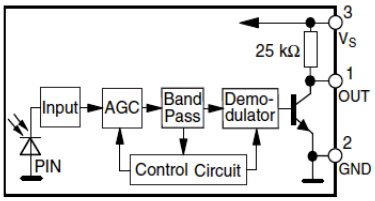
IR LED

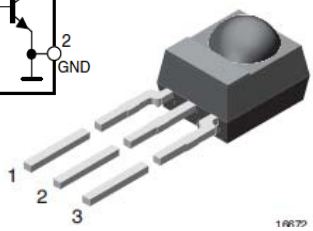


Connection is the same as with normal LED 's. This LED can be used to mimic your IR remote signals using Arduino library IRremote.h

Note polarity! Light of this LED is not visible with the eye. Most digital camera 's can detect IR. Also use a series resistor.

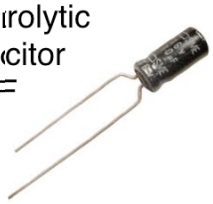
TSOP4838 IR receiver

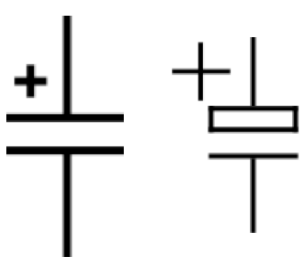


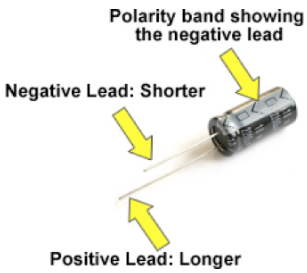


This sensor can detect and decode IR signals sent by a remote control. Use Arduino library IRremote.h by Ken Shirriff to decode most of the available remotes. Connect sensor OUT to an Arduino in put.

Electrolytic capacitor 10 uF



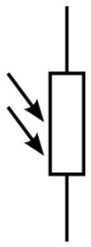


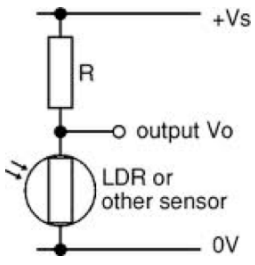


This is the larger capacitor, also used in analog signal schematics and power supply stabilization Note the polarization!

LDR

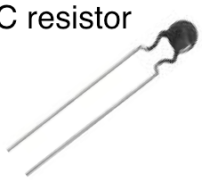
(Light sensor)





An LDR has no polarity. It can be connected using a pull-up resistor of 10k to an Arduino input.

NTC resistor

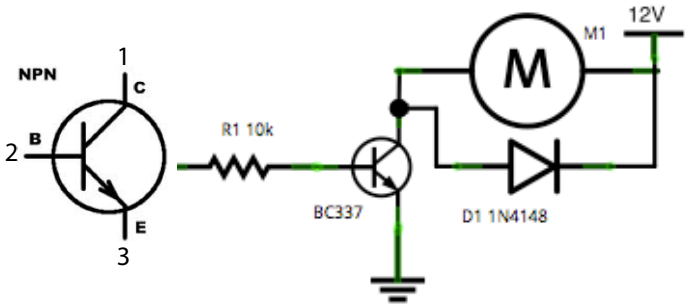


(temperature sensor)

The NTC resistor needs a pull-up resistor of 10k. It can detect temperatures between -55 and +125 degrees C. The resistor has a value of 100k at room temperature

The NTC resistor has no polarization, it is a resistive sensor.

BC337 transistor (NPN)



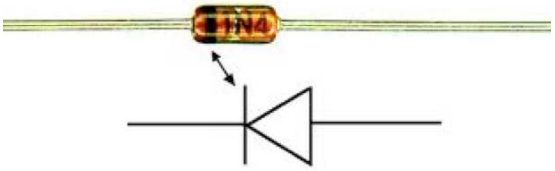
Note polarity and pinning. Use this transistor to amplify signals or switch loads up to 1A at 35V (max). Use a reverse diode to prevent back EMF

Piezo buzzer

When ampli cation of the beeps is necessary, the transistor circuit described here can be used. Also making a physical (horn) shape around the buzzer can increase the volume...

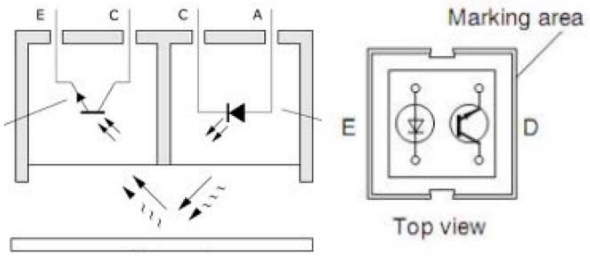
Piezo buzzer can be connected directly to Arduino's output pins. Use the tone library (build in) to make bleeps. Connect to (-) and to an output pin.

1N4148 diode



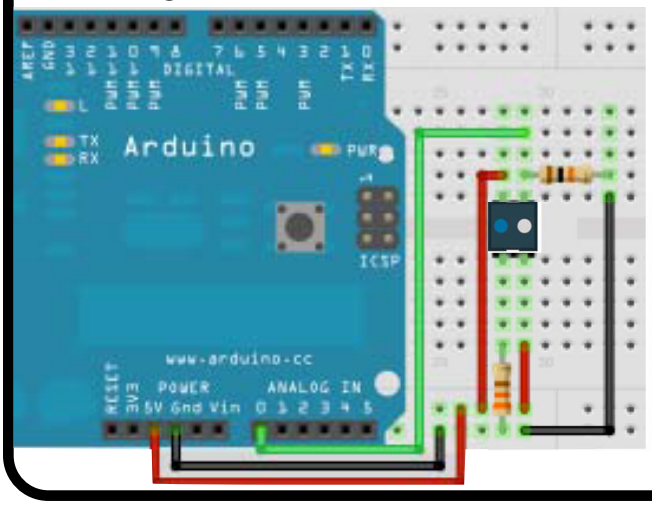
Note polarity. Diodes conduct current only in one way (when the stripe is connected to a (-), it will conduct)

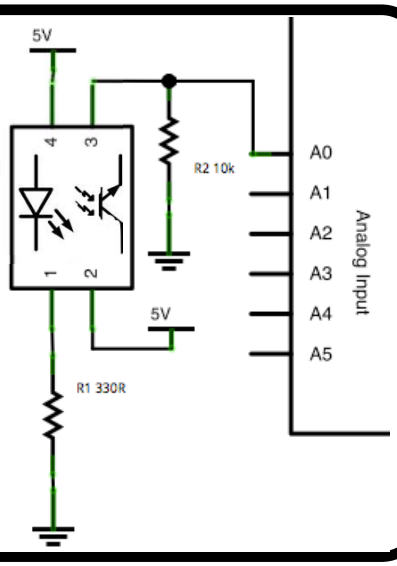
CNY 70 reflection sensor



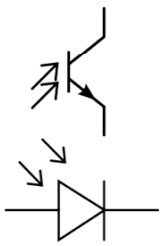
This sensor contains one phototransistor and one IR LED. Together they act as re ection sensor. Use a series resistor with the LED and a pull-up resistor for the transistor. The wires should be bent

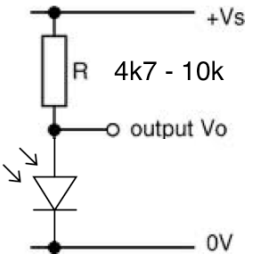
Interfacing the CNY70 reflection sensor





Phototransistor





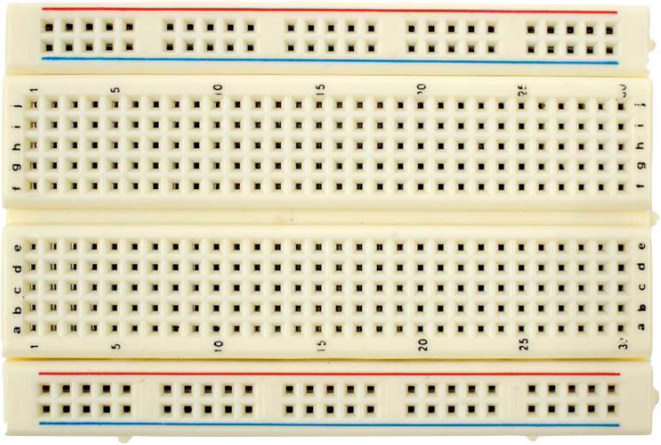
Note polarity. The same markings used with an LED apply, although the wire length is different. A phototransistor or photodiode conducts current depending on received light intensity. Use a pull-up resistor.

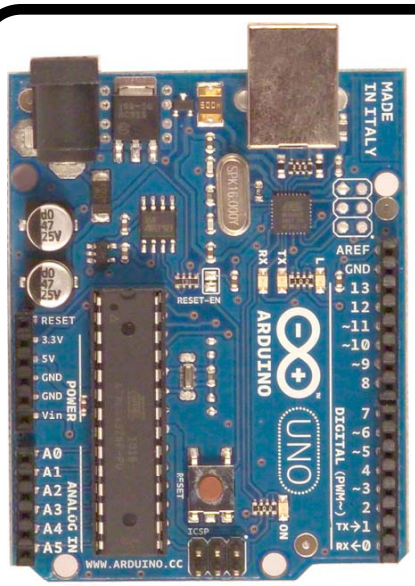
Breadboard

The horizontal rows are called 'rail' and are mostly used for connecting power and ground. Note that on larger breadboards there can be one or more gaps in these rails.

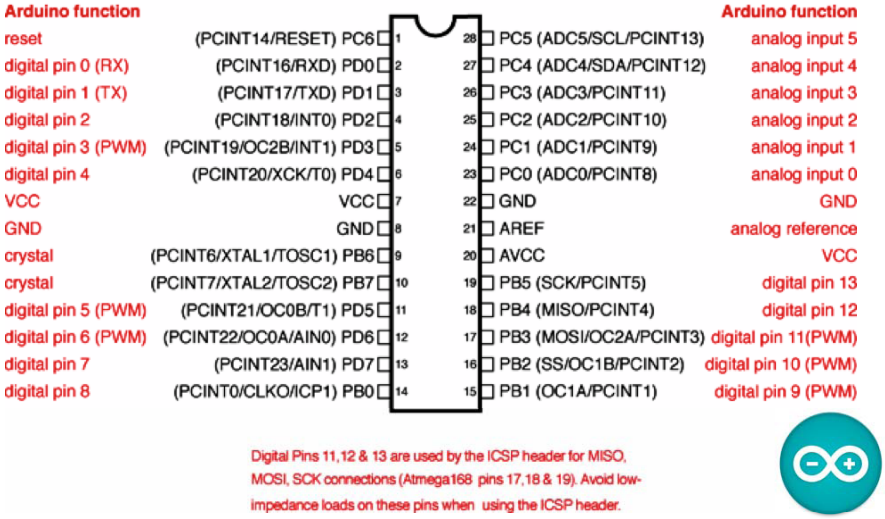
The vertical columns are used to connect the components. They are grouped in rows of 5 connection points.

Breadboards do not have infinite life. connections can become flaky over time,



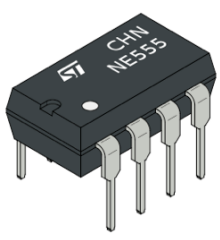


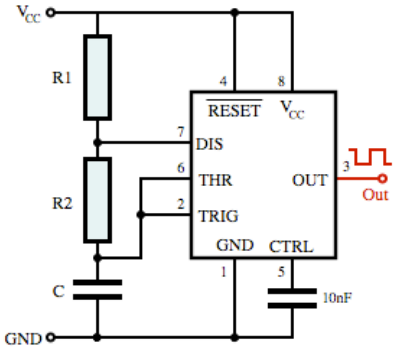
Atmega168 Pin Mapping



Digital Pins 11,12 & 13 are used by the ICSP header for MISO, MOSI, SCK connections (Atmega168 pins 17,18 & 19). Avoid low-impedance loads on these pins when using the ICSP header.

NE555 timer





Versatile timing chip. Can be used to make oscillators, PWM generators, delay timers etc. In this circuit:

Frequency = $1.44/ (R_1 + 2R_2) C$ [Hz]
Dutycycle = $R_2 / (R_1 + 2R_2)$ [%]

Checkout
http://en.wikipedia.org/wiki/555_timer_IC