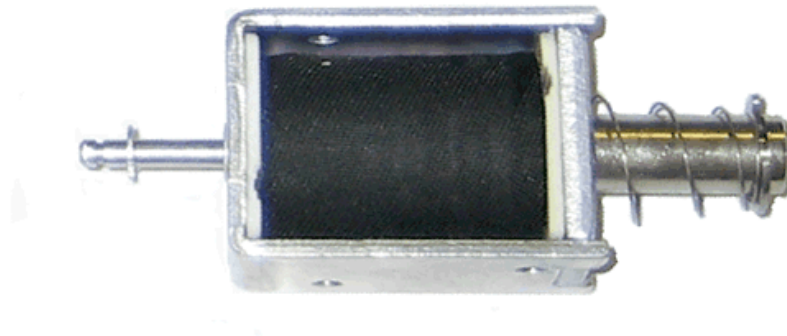# Solenoids

tutorials

Circuit:

http://www.arduino.cc/playground/uploads/Learning/solenoid_driver.pdf

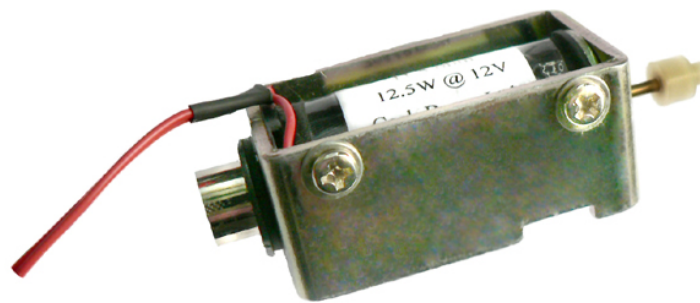General intro analog+digital input+output:

http://www.tinker.it/en/uploads/v3_arduino_small.pdf

Solenoids

– push–type

– pull–type

Note:

Both types require a mechanism (spring etc.) to move the shaft back into the rest position.

Reversing the polarity will not turn a push–type into a pull–type solenoid

Duty cycle + Maximum on time

duty cycle:

sum of on time plus off time

for instance: the solenoid is on for 1 second, and off for 2 seconds, the duty cycle is 1/1+2 = 1/3 = 0.33 = 33 %

maximum on time:

after which the solenoid must be turned off for the rest of the duty cycle

If a solenoid has a 20 % duty cycle

and the maximum on time of 0.1 seconds

then it cannot be turned of for more than 0.1 seconds every half second

20% = 1/5 = 1/1_part_on+4_parts_off

1_part_on = 0.1 sec

4_parts_off = 4 x 0.1 = 0.4 sec

duty cycle: 0.5 sec

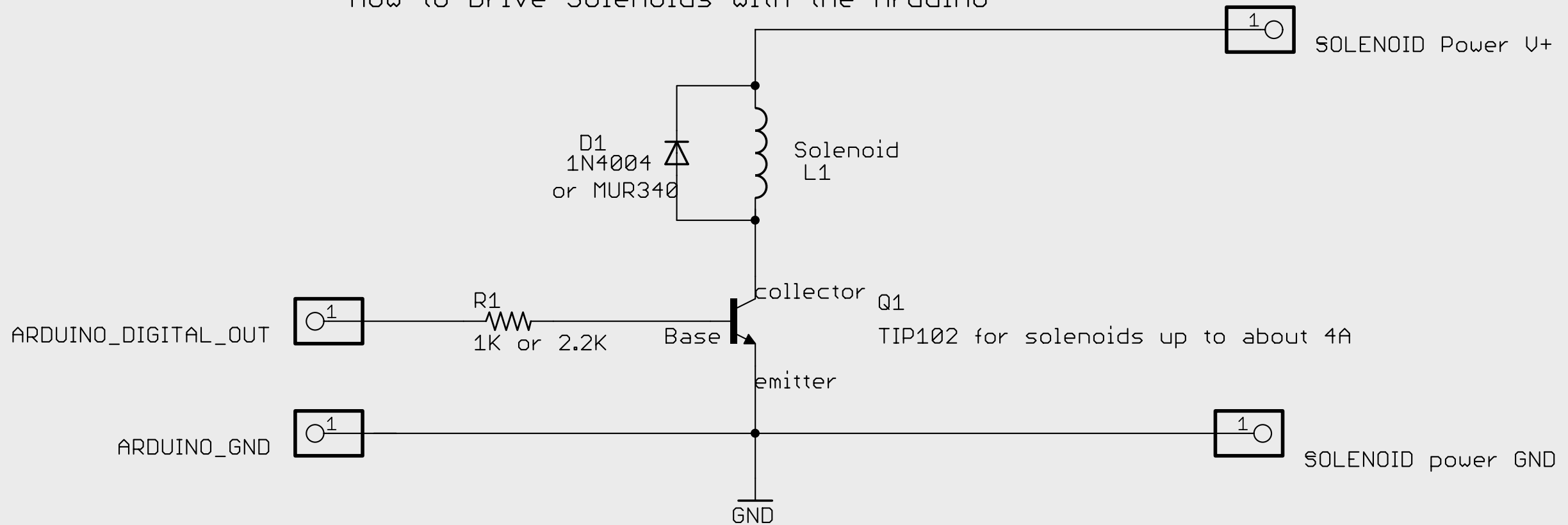# Arduino Code <small>(Solenoid controlled by push button, see circuit diagram next page)</small>

```
int ledPin = 13;                    // onboard LED

int inputPin = 2;                   // input pin

int outPin = 0;

int state = 0;                        // pin status


void setup() {
  pinMode(ledPin, OUTPUT);       // declare LED as output

  pinMode(outPin, OUTPUT);       // declare outPin as output

  pinMode(inputPin, INPUT);      // declare pushbutton as input

}


void loop(){
  state = digitalRead(inputPin);  // read input value

  if (state == HIGH) {             // check if the input is HIGH

    digitalWrite(ledPin, LOW);     // turn LED OFF

    digitalWrite(outPin, LOW);     // turn Solenoid OFF

  } else {

    digitalWrite(ledPin, HIGH);    // turn LED ON

    digitalWrite(outPin, HIGH);    // turn Solenoid OFF

  }

}
```

How to Drive Solenoids with the Arduino

SOLENOID Power V+

D1
1N4004
or MUR340

Solenoid
L1

ARDUINO_DIGITAL_OUT

R1
1K or 2.2K

collector Q1

Base

TIP102 for solenoids up to about 4A

emitter

ARDUINO_GND

SOLENOID power GND

GND

Notes:

-- you will most likely need a heat sink on the transistor.

-- This diagram is for DC solenoids rated up to about 24W: i.e. 12V@2A, 6V@4A, 24V@1A etc.

-- The protection diode should preferable be a schottky type, which has better response times.
   Something like a MUR340 is good for loads up to 3A.

http://www.arduino.cc/playground/uploads/Learning/solenoid_driver.pdf