UV LED with Timer Control

November 26, 2018

1 UV LED with Timer Control

1.1 Background

I wish to irradiate small samples in a capillary with 365nm UV. Because the irradiation time is important, I decided to use an Arduino for timing. The LED has it's own lens and requires a current of ~700mA.

The working is kept simple. The serial monitor asks for a led irradiation time and then for a start. Subsequently any character can be used to stop it early.

1.2 Current source

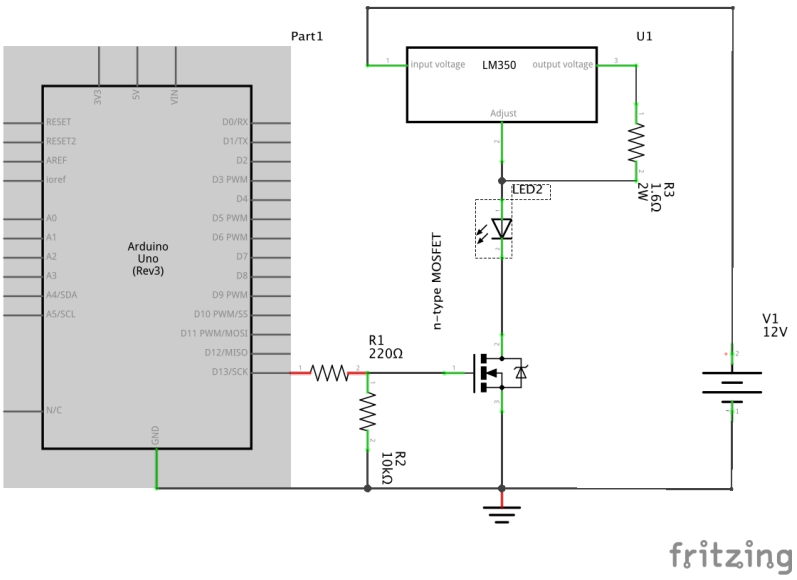
Because of the non linear behavior and heating associated change in resistance of the LED, it is better to use a current source, which I constructed from a LM350 positive adjustment regulator (Fairchild). The idea of it I got from http://www.bristolwatch.com/ccs/LM317.htm. Basically, the voltage between Vout and Vajdust is always kept at 1.25V, with neglible current flowing from the Vadj pin. The desired current is somewhere around 750mA, hence a 1.66Ohm resistor is needed. I choose a 1.6 Ohm resistor, with a 2Watt maximum load.

1.3 Mosfet switch

To switch the LED on and off, I used a N-type mosfet (FQP20N06L, Fairchild). This allows a low power low voltage logic output from the Arduino to turn the LED on and off. As can be seen from the diagram below, I use a 10kOhm pull down resistor. I am not completely sure the 220Ohm resistor is necessary, it is just there to prevent too high current drain that the Arduino wouldn't able to handle.

1.4 Schematic

Below you'll find the final schematic, as made and tested. Drawing made using Fritzing. The power supply is actually a variable lab DC power supply (Delta elektroniks)


Part1
U1
input voltage
LM350
output voltage
Adjust
R3
1.6Ω
2W
LED2
n-type MOSFET
V1
12V
R1
220Ω
R2
10kΩ
Arduino
Uno
(Rev3)
RESET
RESET2
AREF
Ioref
A0
A1
A2
A3
A4/SDA
A5/SCL
N/C
3V3
5V
VIN
GND
D0/RX
D1/TX
D2
D3 PWM
D4
D5 PWM
D6 PWM
D7
D8
D9 PWM
D10 PWM/SS
D11 PWM/MOSI
D12/MISO
D13/SCK
fritzing