EEET2490 – Embedded Systems: Operating Systems and Interfacing

LABORATORY 1

**ATmega32 Microcontroller Essentials & Functions**

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# INTRODUCTION

# TASK 1 – Toggling LEDs

In this task, the OUSB is used to toggle an LED via a General Purpose Input/Ouput (GPIO) pin. For each GPIO pin of the ATmega32 microprocessor, the output DC voltage and current is 5V and 40.0mA respectively [1]. However, common LEDs operates ideally at forward voltage varying between 1.7 to 3.5V and forward current at around 20mA [2]. The LED used in this task is a red one, thus the typical operating voltage is 2.2V [2]. Therefore, some resistance should be added to the circuit in serial with the LED, so as to limit the current and ensure the life of the LED. The resistance value is calculated as followed:

Since a 140 was not available, it was replaced with a 150 resistor instead. Below is the schematic of the circuit, where the microcontroller is sourcing the LED.

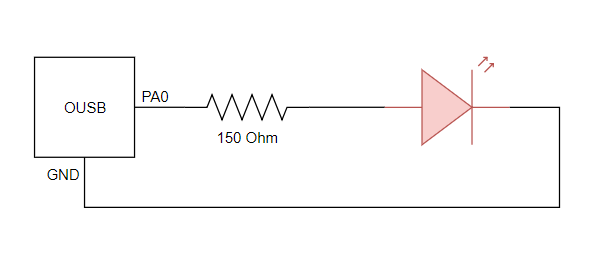


Figure . OUSB sourcing LED

Refer *Appendix 1* for the full code of the task. In the first scenarior, the program is designed to toggle the LED every second, which means that the Pin 0 of Port A is set to output HIGH signal, followed by a delay of 1000 millisecond, and then set to output LOW signal with another delay of the same time. The same method is applied to the second scenarior where the LED is required to toggle five times every second, or five times every 1000 millisecond, so the delay between each command is reduced to 200 millisecond.

Next, a green LED is used to create a connection where the OUSB board is sinking it, while the red LED circuit is kept as above. The HIGH voltage source is now set to VCC instead of a GPIO pin, and GND is substituted with GPIO Pin 1 of Port A. The schematic is described as followed:

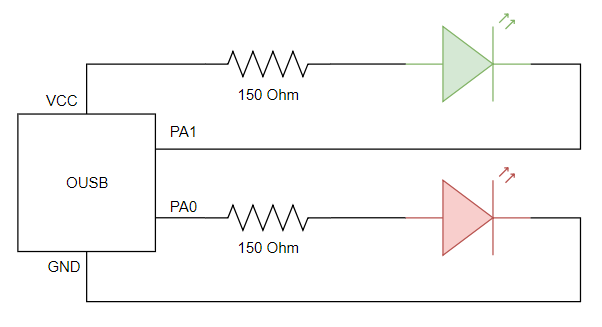


Figure . OUSB sourcing red LED and sinking green LED

# TASK 2 – Controlling the Brightness of LEDs

# TASK 3 – Controlling LEDs with a Push Button

# TASK 4 – Controlling the Brightness of an LED with a Timer

# TASK 5 – Toggling an LED Using a Timer

# TASK 6 – Toggling the Flashing Rate of an LED Using Interrupts

# CONCLUSION

# REFERENCES

# APPENDIX