ECE401 Final Report

- In OneNote create a Section and label it Final Report
- Create a Page for a Video of your functioning PCB
- Create a Page for your Poster, and install your .pdf
- Create a Page for your Project Parts list
- Schedule a time to demonstrate your final project. Sign up sheet is outside of EE201

If taking the course On line, email Jacob.glower@ndsu.edu or Jeffrey.Erickson@ndsu.edu to set up a zoom call.

Final Report

ECE 401 - Homework #9

1-on-1 Demo

- Schedule a 1/2 hour time to demonstrate final project
- Requires a functioning PCB

Poster

- 11" x 17" in size
- Group Designator listed
- Project Name Listed
- Use the NDSU Format design
- Project Description/Requirements
- Applications
- Component List or (BOM)
- Circuit lab Schematic
- PCB Schematic
- Top PCB Design (copy image from OshPark)
- Bottom PCB Design (Copy image from OshPark)
- Formula(s)

How to order posters

- Once Posters are completed the files need to be sent to Jeffrey.erickson@ndsu.edu or jacob.glower@ndsu.edu for authorization to print.

Updated Lab Notebook (should include...)

- Previous mini-project assignments
- Bill of materials in Excel format
- Schematic
- Front and back pcture of PCB from Oshpark
- Test point signals from CircutLab / Breadboard / PCB
- { 9V, 5V, ground, Input, Output, Collector }

NDSU Electrical & Computer Engineering

SENIOR DESIGN I Fa22

PROJECT TITLE

Team Members:

Mentor(s):

Sponsor:

SAMPLE HEADING

SAMPLE
SAMPLE
SAMPLE
SAMPLE
SAMPLE
SAMPLE
SAMPLE

https://www.bisonacademy.com/ECE401/Forms/ECE%20401%20Poster%20Template.pptx

NDSU ELECTRICAL AND COMPUTER ENGINEERING

Stop Light: Software Based

SENIOR DESIGN I FALL 2022

SD401-F22-09

Team members: [redacted]

Mentors: [redacted]

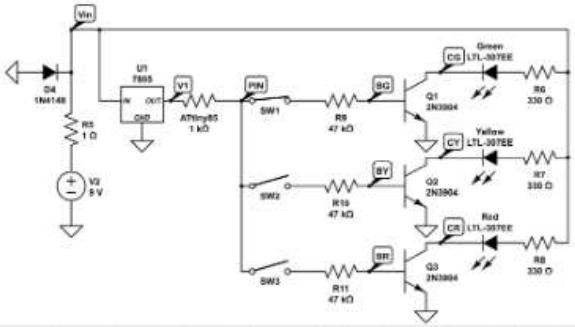
Project Description/Requirements

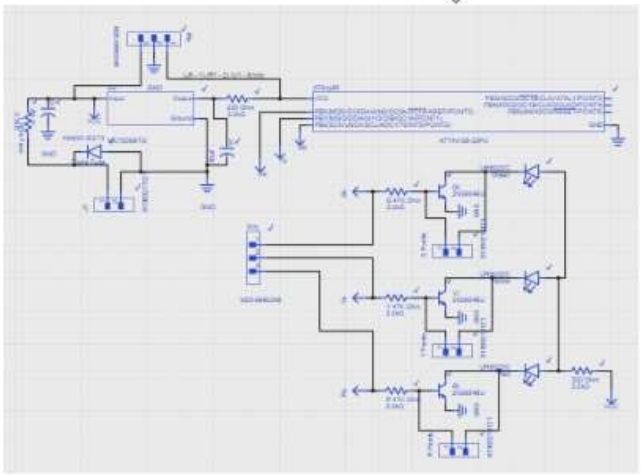
This project should be software based, Yellow LED: 3 sec, switches to Red LED: 6 sec, Green LED: 6 sec and repeats.

- One IC Required
- Test points Required
- 9V battery Required
- No surface mount components
- Must have a reverse current protection diode
- Must have a 1/4 Watt 1-Ohm resistor in series with power supply
- Must use a 9V to 5V converter

Application

A Stoplight can be used at intersections of roads, pedestrian crossings, or other locations with competing flows of traffic. Although this project uses smaller lights, its ment as more a proof of concept. Swap out the LEDs with relays and you can control the 120V 25-60 Watt bulbs used in actual traffic lights. The use of the ATtiny85 Microcontroller allows for the customer to change the timing of the lights to what is needed with a few changes to the code, and with an 8-pin processor and only 5-pins used the customer has three pins to add additional features as needed. Such as pedestrian crossing buttons, emergency lights or confirmation lights.



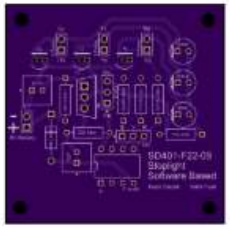


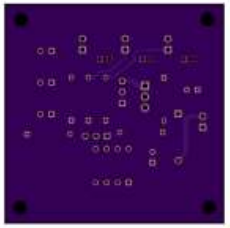
Component List

- Resistors (1x1 Ω, 1x220 Ω, 1x330 Ω, 3x47 kΩ)
- Capacitors (1x0.1 µF, 1x10 µF)
- Voltage Regulator (MC7805CT)
- 5mm LEDs (1xRED, 1xYELLOW, 1xGREEN)
- Diode (1x1N4001)
- Transistor (3x2N3904)
- Microcontroller (1xATtiny85)

Approximate Price Per-Unit

- $1.78383 (Parts) + $6.73333 (PCB cos)
  $8.51716





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NDSU

SENIOR DESIGN Fall 2022

Hardware Based Freezer Alarm

Team Number: SD401-F22-01

Team Members: [redacted]

Mentor(s): [redacted]

Project Description

An alarm that will go off when the temperature is above 30 °F and will turn off once it gets cold enough at 10 °F

Applications

- Freezers
- Morgues
- Ice Cream Shops
- Organ Transportation

Requirements

- Turn on at 30 °F
- Turn off once it reaches 10 °F
- Tolerance +/- 2 degrees

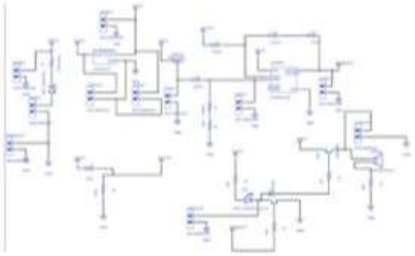
Approach

- Output Voltage controlled by a Schmitt Trigger
- Input voltage controlled by a voltage divider
- Sinking NPN transistor driving our LED
- Sourcing PNP transistor supplying power to our Piezo Buzzer
- Equation for thermistor $R = 10000e^{3962\left(\frac{1}{T_{298.15}} - \frac{1}{T_{298.15}}\right)}$

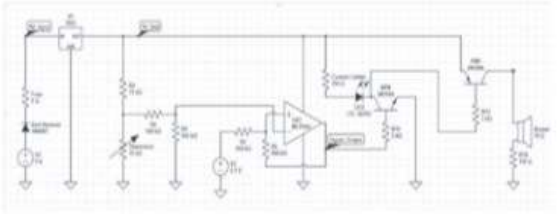
Component List

- Piezo buzzer
- NPN Transistor
- PNP Transistor
- Various Resistors
- LED
- Capacitors
- MCP602 OpAmp
- Diode
- Thermistor
- 5V Regulator
- 100k Potentiometer

Upverter Schematic

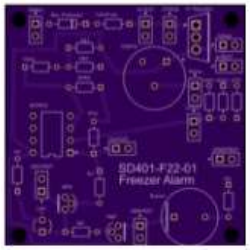


CircuitLab Schematic

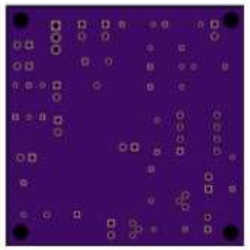


3D PCB

Top PCB



Bottom PCB



Final PCB

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Final Report Parts List Place in OneNote.

Part	Vendor	Vendor Part Number	Description	Price/Unit
Green 5mm LED	Digi-Key	2368-NTE3145-ND	Yellow-Green 567nm LED Indication	$0.11620/100
Yellow 5mm LED	Digi-Key	2368-NTE3146-ND	Yellow 585nm LED Indication	$0.11620/100
Red 5mm LED	Digi-Key	2368-NTE3144-ND	Red 633nm LED Indication	$0.11620/100
2N3904 Transistor	Digi-Key	2721-2N3904-ND	Bipolar (BJT) Transistor NPN 40 V 200 mA 300MHz 625 mW Through Hole TO-92	$0.02350/4,000
MC7805CT Voltage Regulator	Digi-Key	MC7805ACTGOS-ND	Linear Voltage Regulator IC Positive Fixed 1 Output 1A TO-220	$0.30523/5,000
47k Ohm Resistor	Digi-Key	4491-CF1/4W47KJTB-ND	47k Ohms ±5% 0.25W, 1/4W Through Hole Resistor Axial Carbon Film	$0.01144/5,000
330 Ohm Resistor	Digi-Key	4491-CF1/4W330RJTB-ND	330 Ohms ±5% 0.25W, 1/4W Through Hole Resistor Axial Carbon Film	$0.01144/5,000
220 Ohm Resistor	Digi-Key	4491-CF1/4W220RJTB-ND	220 Ohms ±5% 0.25W, 1/4W Through Hole Resistor Axial Carbon Film	$0.01144/5,000
1 Ohm Resistor	Digi-Key	4491-CF1/4W1RJTTB-ND	1 Ohms ±5% 0.25W, 1/4W Through Hole Resistor Axial Carbon Film	$0.0234/100
1N4001 Diode	Digi-Key	2156-1N4001-FSTR-ND	Diode Standard 50 V 1A Through Hole DO-204AL (DO-41)	$0.02/15,000
ATtiny85	Digi-Key	ATTINY85-20PU-ND	IC MCU 8BIT 8KB FLASH 8DIP	$1.78
10uF capacitor	Digi-Key	1189-2322-ND	10 µF 50 V Aluminum Electrolytic Capacitors Radial	$0.07085/5,000
0.1uF capacitor	Digi-Key	493-1095-ND	0.1 µF 50 V Aluminum Electrolytic Capacitors Radial	$0.05543/5,000

Order this document by MC7800/D

MOTOROLA

Three-Terminal Positive Voltage Regulators

MC7800, MC7800A, LM340, LM340A Series

THREE–TERMINAL POSITIVE FIXED VOLTAGE REGULATORS

SEMICONDUCTOR TECHNICAL DATA

These voltage regulators are monolithic integrated circuits designed as fixed–voltage regulators for a wide variety of applications including local, on–card regulation. These regulators employ internal current limiting, thermal shutdown, and safe–area compensation. With adequate heatsinking they can deliver output currents in excess of 1.0 A. Although designed primarily as a fixed voltage regulator, these devices can be used with external components to obtain adjustable voltages and currents.

- Output Current in Excess of 1.0 A
- No External Components Required
- Internal Thermal Overload Protection
- Internal Short Circuit Current Limiting
- Output Transistor Safe–Area Compensation
- Output Voltage Offered in 2% and 4% Tolerance
- Available in Surface Mount D^{2}PAK and Standard 3–Lead Transistor Packages
- Previous Commercial Temperature Range has been Extended to a Junction Temperature Range of –40°C to +125°C

DEVICE TYPE/NOMINAL OUTPUT VOLTAGE

MC7805AC LM340AT–5	5.0 V	MC7812C LM340T–12	12 V
MC7805C LM340T–5		MC7815AC LM340AT–15	15 V
MC7806AC MC7806C	6.0 V	MC7815C LM340T–15	
MC7808AC MC7808C	8.0 V	MC7818AC MC7818C	18 V
MC7809C	9.0 V	MC7824AC MC7824C	24 V
MC7812AC LM340AT–12	12 V		

ORDERING INFORMATION

Device	Output Voltage Tolerance	Operating Temperature Range	Package
MC78XXACT	2%	T_J = –40° to +125°C	Insertion Mount
LM340AT–XX			
MC78XXACD2T			Surface Mount
MC78XXCT	4%		Insertion Mount
LM340T–XX			
MC78XXCD2T			Surface Mount

XX indicates nominal voltage.

T SUFFIX
PLASTIC PACKAGE
CASE 221A

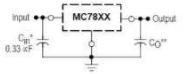
Heatsink surface connected to Pin 2.

Pin 1. Input
2. Ground
3. Output

D2T SUFFIX
PLASTIC PACKAGE
CASE 936
(D^{2}PAK)

Heatsink surface (shown as terminal 4 in case outline drawing) is connected to Pin 2.

STANDARD APPLICATION



A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

XX, These two digits of the type number indicate nominal voltage.

* C_{in} is required if regulator is located an appreciable distance from power supply filter.

** C_O is not needed for stability; however, it does improve transient response. Values of less than 0.1 µF could cause instability.

Rev 5

DATA SHEET

2N3904
NPN switching transistor

Product specification
Supersedes data of 1999 Apr 23

2004 Oct 11

Philips
Semiconductors

PHILIPS

Conclusion:

- ✓ Although not completed as of yet
- ✓ ECE401 or SD401 has a variety of tools necessary to be successful in the upcoming Semesters and will be widely used in furthering your progress in SD403, SD405.
- ✓ Using the value of a Digital Lab Notebook (OneNote)
- ✓ Project Management: Gant Chart- (Waterfall)
- ✓ Paper Design- sometimes referred to as a napkin drawing
- ✓ Converting a paper design using a Simulation program(Circuit Lab)
- ✓ The Importance of locating and reading datasheets
- ✓ Breadboarding a project
- ✓ Testing via measurements to validate the design
- ✓ And the creation of a PCB, using one of many ECAD Schematic Editor and PCB Design programs (Fusion 360)
- ✓ Soldering basics
- ✓ And Concludes with a Final report