# A COMPACT HIGH PRECISION AC/DC DIGITAL AMMETER

***Mini Project(20EE607)***

***Report submitted by***


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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
(Accredited by NBA)


MAY 2023

# Abstract

An ammeter can be said to be the most basic component used in many of the fields in this modern world with its fast developing technologies. Ammeters can be roughly classified into two types based on the way it shows the values Analog meters and Digital meters. A digital ammeter is an electronic measuring device used to measure the current flowing in an electrical circuit. Unlike analog ammeters, which use a moving pointer to display readings, digital ammeters provide highly accurate measurements through digital displays that show the current in amperes (A) or milliamperes (mA). These devices are designed to be easy to use and read, making them ideal for a range of applications, from simple hobby projects to complex industrial systems. Digital ammeters typically incorporate advanced features such as automatic ranging making them versatile and reliable tools for measuring and analyzing electrical current. Analog meters are generally bulky and have low resolution where as a digital ammeter is more compact and has high value of resolution

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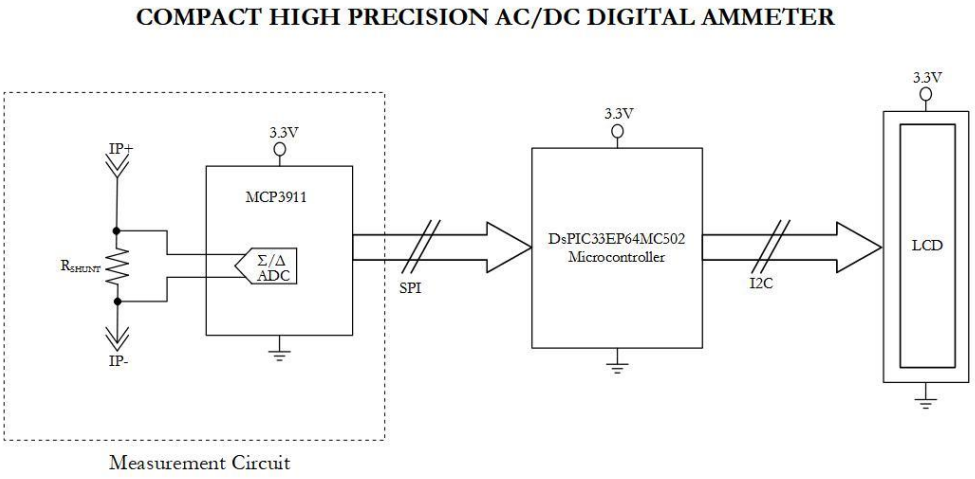
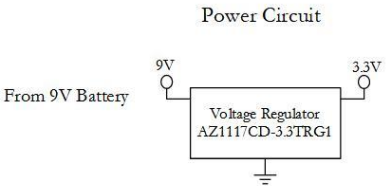
# Introduction

An ammeter is a device used to measure electric current. It is most commonly used in electrical systems, such as in homes and businesses, to measure the flow of electricity.The project a compact high precision AC/DC digital ammeter can measure both AC and DC current and display the accurate value with proper notations with the help of Autoranging.The device basically consists of a Shunt Resistance of very low value across which the current to be measure is passed , the output voltage across the shunt is given to an Analog to Digital converter and resulting signal from the ADC is fed to the Microcontroller where is it processed and the value of current measured is displayed on the LCD display with appropriate notations and high value of precision.A 9V battery is used to power the circuit and a battery voltage measuring circuit is used to monitor the battery voltage.

# Methodology

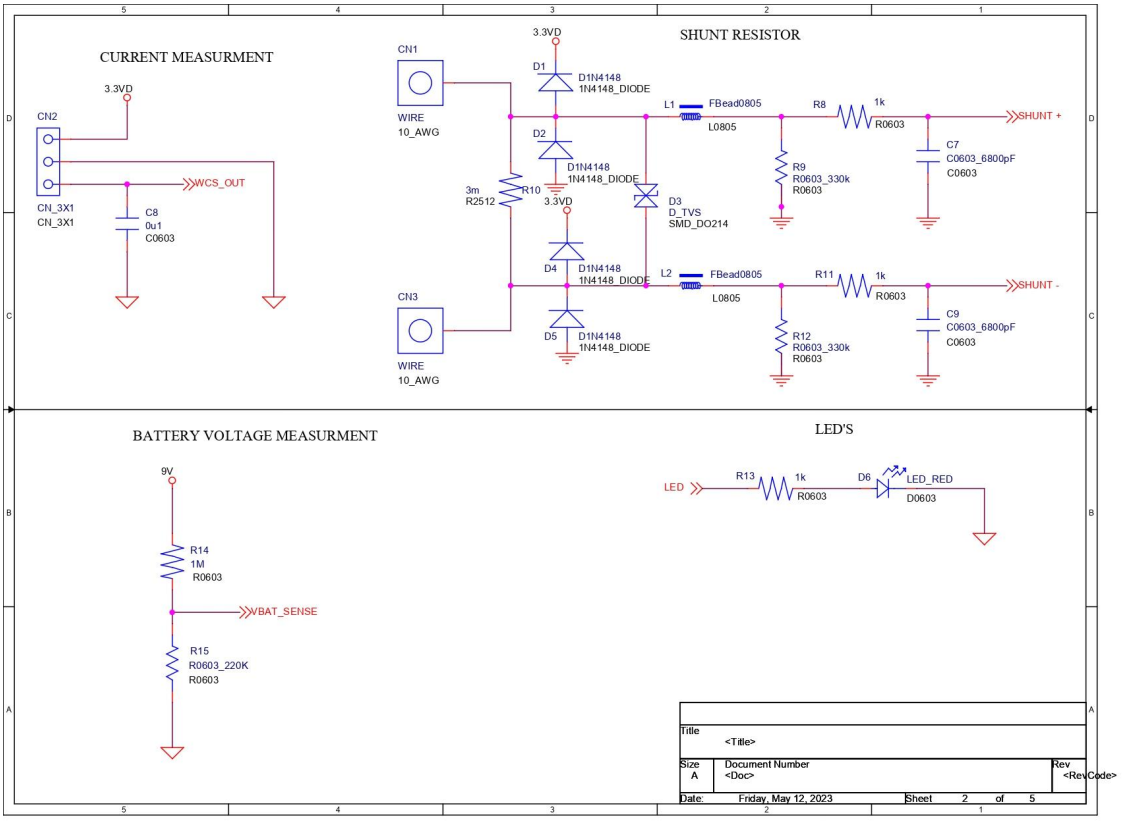
The Digital ammeter circuit consists of the controller circuit , measuring circuit , power circuit , battery voltage measurement circuit.The general working involves the shunt resistance of very low value through which the current to be measure is passed and the voltage across it is given to the Analog to Digital Converter and the resulting output signal is fed to the controller where the value of current is calculated and the resulting value is displayed on the LCD display with proper notations and high resolution.A 9V battery is used to power the circuit  and battery measuring circuit is used to monitor the battery voltage.



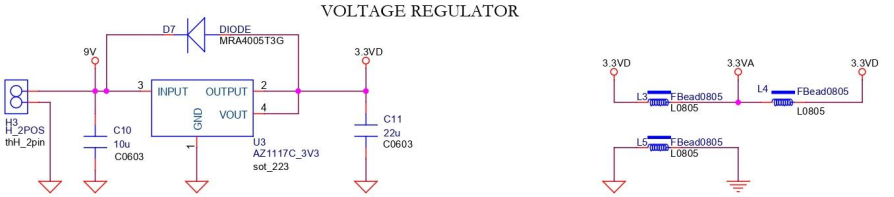



# Hardware/Software Implementations

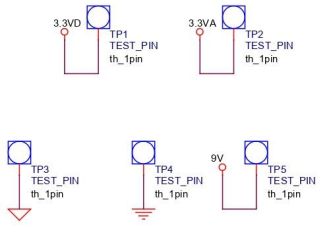
For this project we have used a 24-bit ADC(MCP3911) for higher resolution of the measured value, a Shunt resistance of 3 milliohm with a power rating of 5W,a 9V battery to power the circuit, an LCD display(16x2) to the show the measured value,a voltage regulator(AZ1117C) to convert the 9V to required 3.3V and a microcontroller(dsPIC33EP64MC502) for the overall processing of the signal and the calculation of current applied.The MCLR pin provides two specific device functions Device Reset and Device Programming and Debugging.a battery voltage measurement circuit is used to monitor the battery voltage.Several test points are set up on the board for the testing of pcb



## VOLTAGE REGULATOR




## TEST POINTS




## MOUNTING HOLES

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| Department- | Electrical & Electronics Engineering |
| Project Name - | A compact high precision AC/ DC DIGITAL AMMETER |
| Title | - |
| Prepared By | -Kanzal Haq A, Anwesh R shetty, Akash P, Dhanush |
| Reviewed By | - |

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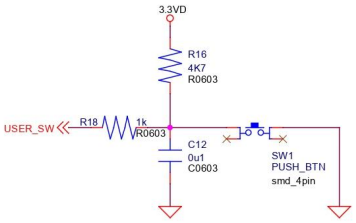
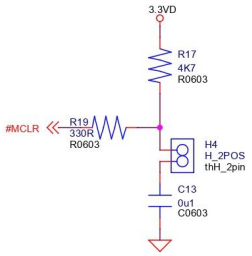
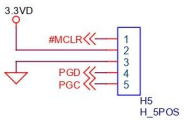
## USER SWITCH



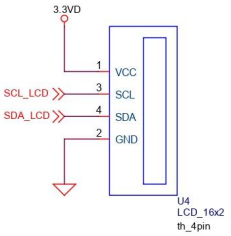

## MCLR/RESET SWITCH




## PICKIT CONNECTORS




## LCD CIRCUIT

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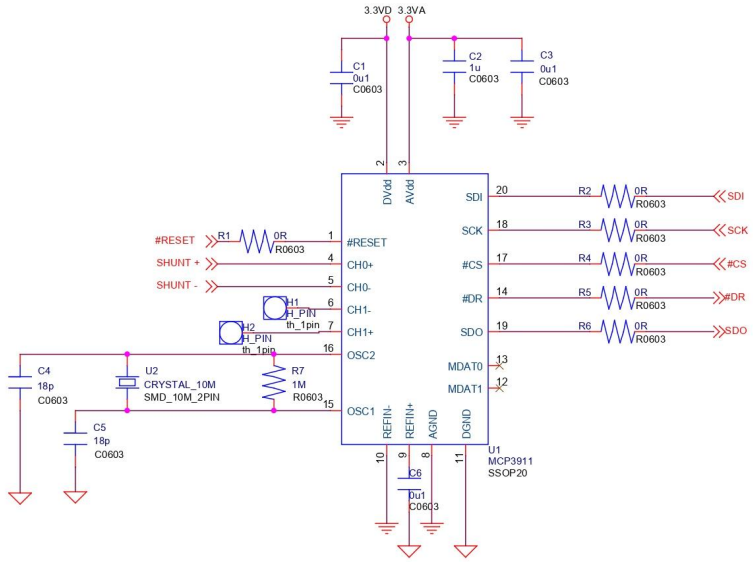
## MCP3911 CIRCUIT

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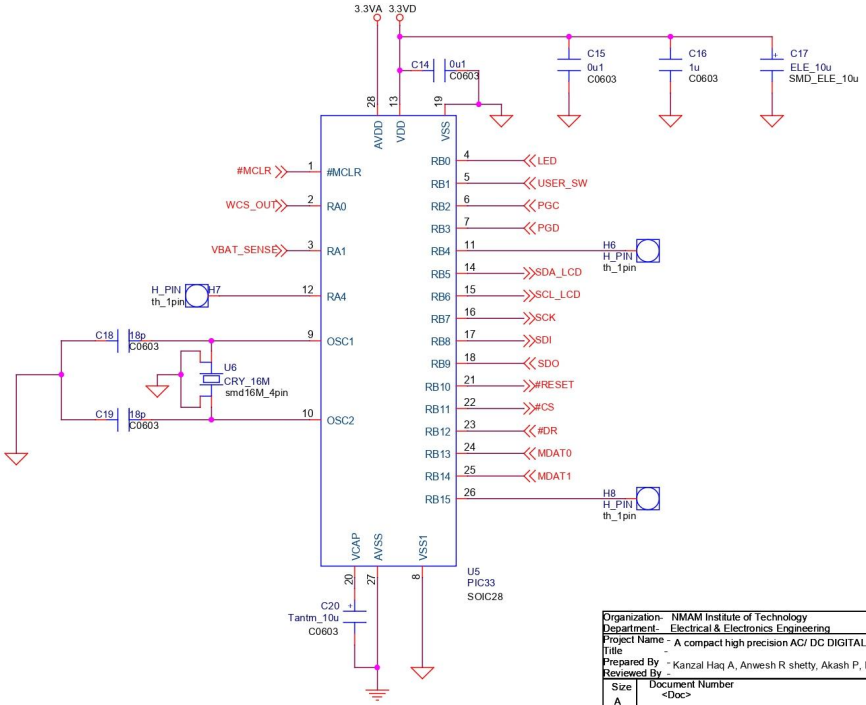
## DSPIC33 CIRCUIT

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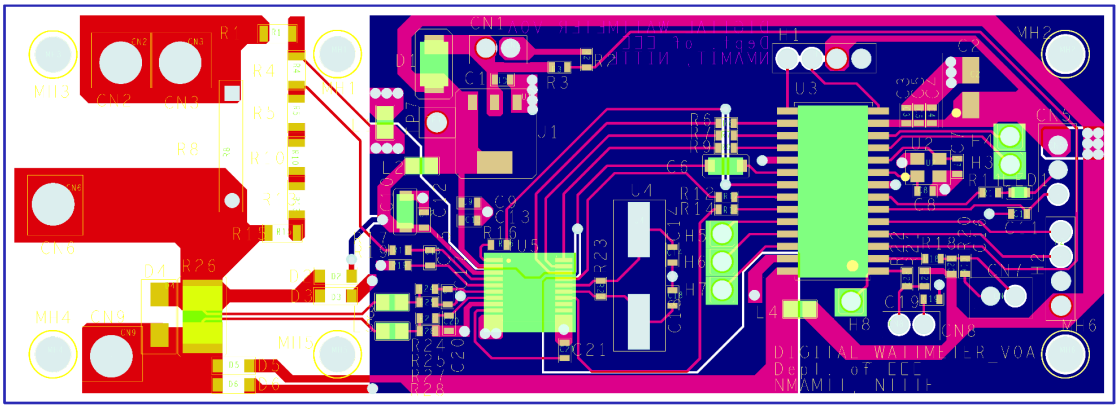
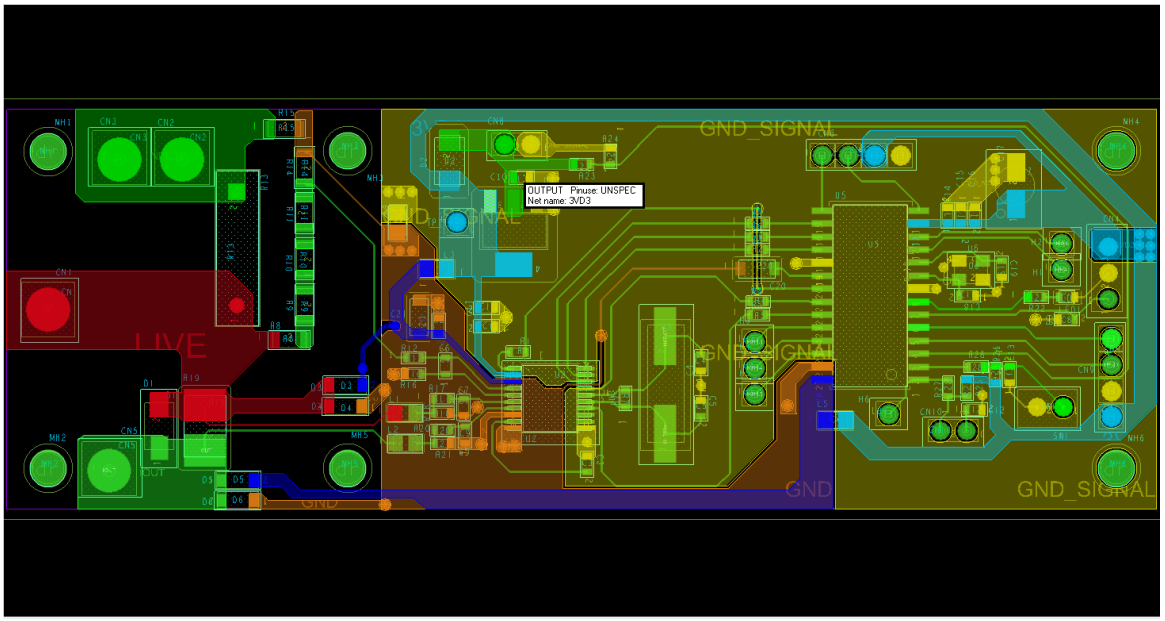
# Result Analysis and Discussion

The Digital ammeter circuit consists of the controller circuit , measuring circuit , power circuit , battery voltage measurement circuit.The layout designed for this project is that of a digital wattmeter and the ammeter section the layout plays the role of measuring the current. The layout after multiple reviews and through inspection has been given for manufacture.the the software part  of the project is being developed and will be completed at the earliest





# Conclusions

The proposed device A Compact High Precision AC / DC Digital Ammeter aims at the accurate measurement of AC and DC current within a range of 100mA to 30A.This device enables for simple and accurate measurement of current in industries and laboratories without consuming much space and it is portable.

# References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- L. Sevgi, " Digital Multimeters and Basic Measurements," in IEEE Antennas and PropagationMagazine, vol. 49, no. 4, pp. 232-237, Aug. 2007, doi: 10.1109/MAP.2007.4385653