

Programmable Power Supply Using AVR

Krushnakant Kalaskar, Milind E Rane

Department of Electronics ,Vishwakarma Institute Of Tecchnology,Pune

ABSTRACT—In these days lots of electronic appliances are working on DC supply and the power required for such appliances is reducing day by day due to lot of development in technology lesser and lesser voltages are required for electronic appliances used in day to day life Here we are trying to develop search power supply which works in 0 to 5 volt range requires current in the range of 20 mA where we are using microcontroller ,keypad and LCD display Whenever exact voltage is required such kind of power supplies are very useful this power supply has 0.1 volt precision We can increase or decrease voltage by pressing the buttons in terms of this precision this power supply is very useful for dealing with Semiconductor devices and OLED Technology.

Index Terms— Atmega16, KeyPad, LCD, PWM.

I. INTRODUCTION

We are going to design a power supply which is Programmable and which can be operated through keypad which has 16 buttons. so five buttons are for 1 to 5 volt it means the first button is for 1 volt second button is for 2 volt and so on the buttons of Plus and minus are for increasing the Precision value by point 1 volt if you press plus button at the time it increases the voltage with 0.1 volt and if you plus minus button it will decrease the voltage by 0.1 volt such way voltage can be increased from 0.1 volt to 0.9 volt So we can have 50 Different voltages Such Programmable power supply is useful for Semiconductor devices to observe their transfer characteristics. we are going to use Atmega16 microcontroller of AVR for designing zero to 5 volt range actually this this Programmable power supply works on the current provided by the microcontroller and the voltage provided by the microcontroller Atmega16 can provide upto 32 mA for each pin of its port LCD will display the voltage on the screen

II. RELATED WORK

There are different approaches to design a Programmable power supply or any kind of power supply for simple power supply we use either opamps LM 317 circuit with Potentiometer and transformer is also required according to voltage Ranges Any microcontroller like 8051 lpc 2148 We Are Family arduino can be used to design such power supply generally we use microcontroller for less voltage and less current Ranges we are using Atmega16 microcontroller because it has comparatively high current at its port pins Most of the power supplies are made of 8051 but it requires ADC analog to digital converter externally which increases cost and size of product .this problem has been overcome by arduino and AVR family they have this peripheral inbuilt .key components for project are

2.1 4x4 keypad

Keypad has 16 buttons and it is interfaced with ADC port of microcontroller according to input It is converted from analog to digital and the pwm is generated according to the width of pulse the voltage changes Keypad is very important in case of power supply we can add as many as functions as no of Keys through programming

2.2 LCD display

lcd display is for displaying the voltage we are using 16 x2 LCD display which is interfaced with atmega16 to its C port Lcd has 16 pins 8 are data pins RS,r/w,En (4,5,6)are control pins

Logic 0 stands for command and 1 stands for data register there is feature of contrast adjustment through variable register Similarly logic 0 stands for read and one stands for write here pin 4 is connected to pin PB1 and pin no 6 is connected to ground it means it is always in read mode

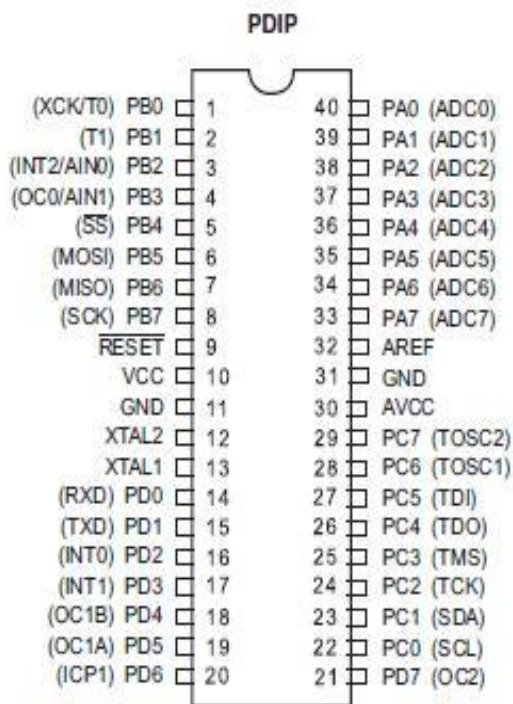
Table 1: 16x2 LCD Pinout

Pin No	Function	Name
1	Ground (0V)	Ground
2	Supply voltage; 5V (4.7V – 5.3V)	V _{CC}
3	Contrast adjustment; through a variable resistor	V _{EE}
4	Selects command register when low; and data register when high	Register Select
5	Low to write to the register; High to read from the register	Read/write
6	Sends data to data pins when a high to low pulse is given	Enable
7	8-bit data pins	DB0
8		DB1
9		DB2
10		DB3
11		DB4
12		DB5
13		DB6
14		DB7
15	Backlight V _{CC} (5V)	Led+
16	Backlight Ground (0V)	Led-

2.3 ATmega16

It is 8 bit microcontroller having 16 Kbytes of In-System it has Self-programmable Flash program memory and 512 Bytes EEPROM with 1 Kbyte Internal SRAM it can Write/Erase Cycles: 10,000 it has Peripheral Features like Two 8-bit Timer/Counters with Separate Prescalers and Compare Modes One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode Real Time Counter with Separate Oscillator it has Four PWM Channels which has benefit in this project because it works on pulse width modulation and ADC The microcontroller has 8-channels, 10-bit ADC 8 Single-ended Channels7 Differential Channels in TQFP Package Only two Differential Channels with Programmable Gain at 1x, 10x, or 200x, Byte-oriented Two-wire Serial Interface ,Programmable Serial USART Master/Slave SPI Serial Interface Programmable Watchdog Timer with Separate On-chip Oscillator On-chip Analog Comparator Special Microcontroller Features Power-on Reset and Programmable Brown-out Detection internal Calibrated RC Oscillator External and Internal Interrupt Sources Six Sleep Modes: Idle, ADC Noise Reduction, Power-save, Power-down, Standby and Extended Standby I/O and Packages are 32 Programmable I/O Lines ,0-pin PDIP, 44-lead TQFP, and 44-pad QFN/MLF Operating Voltage range is 2.7V - 5.5V for ATmega16L 4.5V - 5.5V for ATmega16Speed Grades 0 - 8 MHz for ATmega16L0 - 16 MHz for ATmega16 Power Consumption @ 1 MHz, 3V, and 25°C for ATmega16L in Active mode 1.1 mA Idle Mode: 0.35 mA in Power-down Mode: < 1 μA

Fig. 1 Pin out of Atmega 16



III. MAIN BODY OF THE PAPER

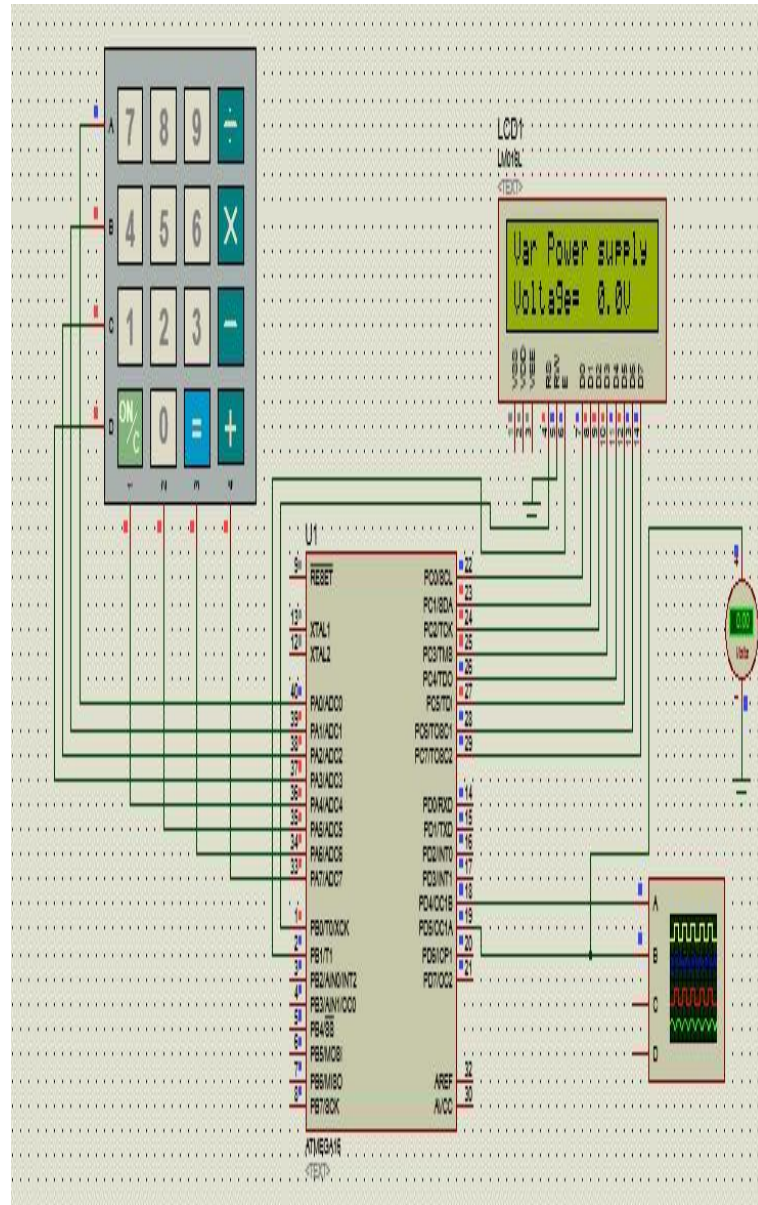


Fig. 2 Circuit Diagram

The programmable power supply uses PWM i.e pulse width modulation to increase or decrease voltage according to the input through key pad and the code stored in microcontroller uses its peripherals PWM and ADC analog to digital converter to get the desired output here keypad is interfaced with port A and we can get output at PD4 pin LCD is interfaced with port C .it shows voltage with 0.1 V precision The pulse width modulation is always better than

Potentiometer and register networks because its high power loss Atmega16 has 8 bit resolution and while showing the results on LCD the analog o/p is provided to the ADC and it converts the o/p in $2^8 \approx 255$ different levels where 5volts stands for 255 levels and 0 for 0 level so every $5/255 \approx 20\text{mA}$ per unit

Actually the whole circuit works on maximum current and voltage output of microcontroller So power supply cannot exceed the o/p voltage and current of Atmega16

IV. SPECIFICATIONS

- i. o/p voltage range 0-5V
- ii. i/p voltage 12V
- iii. min o/p current 10mA
- iv. max o/p current 30mA
- v. with precision of 0.1V

V. APPLICATIONS

this power supply is very useful to study transfer characteristics of semiconductor devices and calculating the cutoff point and helpful in studying characteristics of JEFET and MOSFET Devices like accelerometer OLEDs how voltage range of zero to 5 volt even some of them work on 3.3 volt for such devices Programmable power supply is very useful This power supply I can be used for controlling the motor speed and also the brightness of LED because such components works on PWM

VI. RESULT

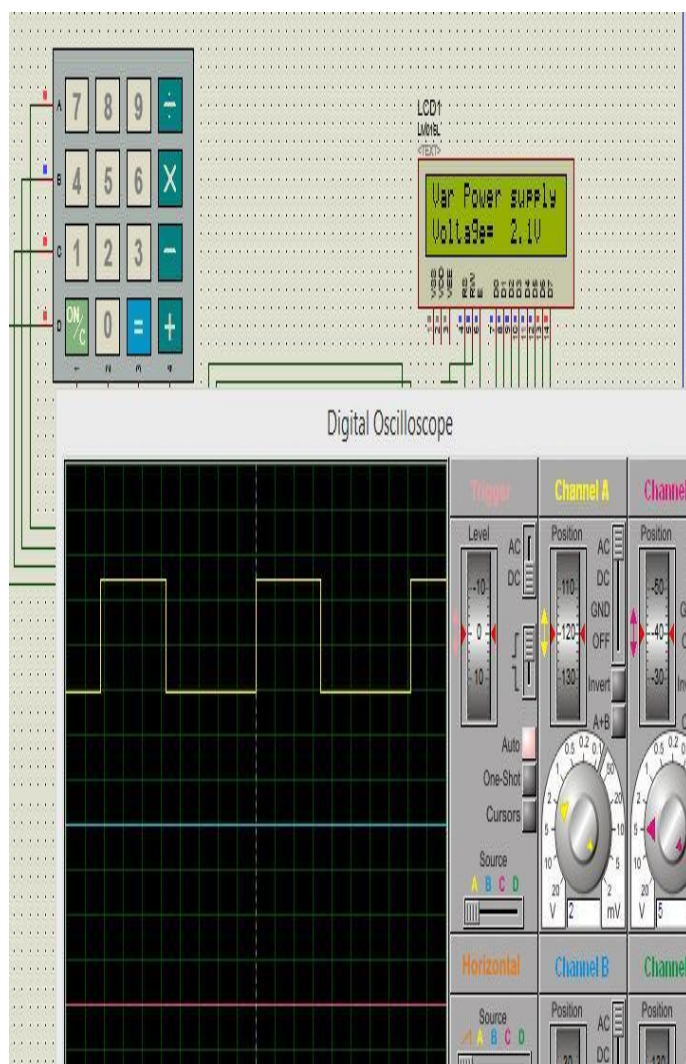


Fig. 3 Output on DSO

The figure shows the PWM output generated by microcontroller Atmega 16 on simulation via proteus

PROGRAMMABLE POWER SUPPLY 0 TO 5V



Fig. 4 Prototype

VII. CONCLUSION

0 to 5V power supplies are useful to observe transfer characteristics of Semiconductor devices and we can switch to any voltage whenever we want between the range of 0-5 volt we can jump from one volt to 5 volt directly in case of other power supplies they have potentiometer which has more power losses and we have to go through entire stages from one voltage level two other voltage level while transferring from lower level to high level for example from zero volt to 5 volt we have to go through all 5 voltages but in case of Programmable power supply we can directly switch to the desired voltage

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First Author Krushnakant Kalaskar ,Department of electronics Vishwakarma institute of technology pune,BTech student

Second Author Prof .Milind E Rane Department of electronics Vishwakarma institute of technology pune,