Portable BJT VI Characteristics Plotter

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Abstract-*In this era of electronics, automation is at peak means by using electronic. We can reduce the human efforts by creating instruments which have their own control system and the microcontroller is main block of that system, which works as brain of that instrument. We here tried to add our little contribution to it by making automatic and portable BJT VI characteristics plotter which can plot output characteristics of any BJT placed in common emitter configuration, on any android device or windows by using Bluetooth module and graph plotter application. So we don't need to measure every time the collector current for every value of Vcc and again all this for different value of base current it will automatically change this by using digital potentiometer and variable voltage regulator circuit.*

Keywords-VI characteristics plotter, Bluetooth module , graph plotter app, microcontroller.

I. INTRODUCTION

In the human involved process of plotting VI characteristics of BJT is very lengthy or we have to take so many samples to plot the graph and its a waste of time in it. So we needed a device which automatically plots the graph on a portable device with the help of Bluetooth module and graph plotter app so our objective is to plot characteristics graph automatically. In this we used a digital potentiometer IC to change the base and collector voltage and a current sensing IC for sensing the collector and base currents.

II. EXISTING SYSTEM

In present time, the VI characteristics plotting is not automatic there are some software's which can plot graph but we have to take output by ourselves which is the main lengthy work. And time taken in this process is comparatively very high with respect to our process.

III. PROPOSED SYSTEM

In this paper, we are proposing a system which is automatically plot the graph of any BJT placed in common emitter mode. This system is having an application, which save the graph data as data type   for that particular BJT. And when sometime we don't know exactly which BJT we have,

so we can get it by just matching its data with our saved data type.
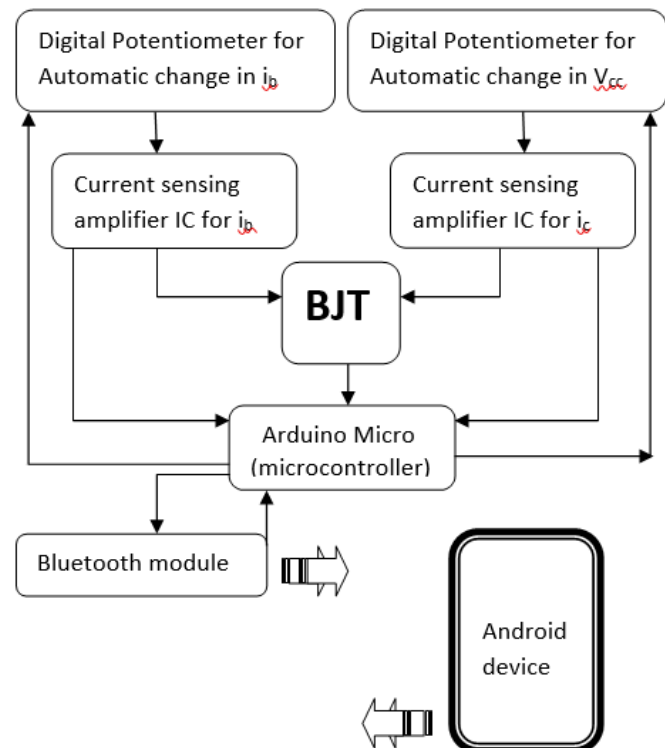
IV. BLOCK DIAGRAM

Fig 4.1: Block diagram

V. KEY COMPONENTS
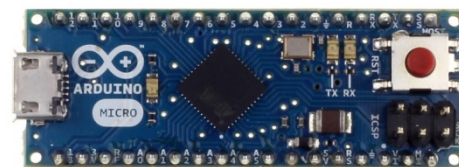
1. Arduino Micro:

Fig 5.1: Arduino Micro

- Microcontroller   Atmega32U4
- Operating Voltage   5VInput
- Voltage (recommended)   7-12V

- Input Voltage (limit)   6-20V
- Digital I/O Pins   20
- PWM Channels   7
- Analog Input Channels   12
- SRAM   2.5 KB
- EEPROM   1 KB
- Clock Speed   16 MHz
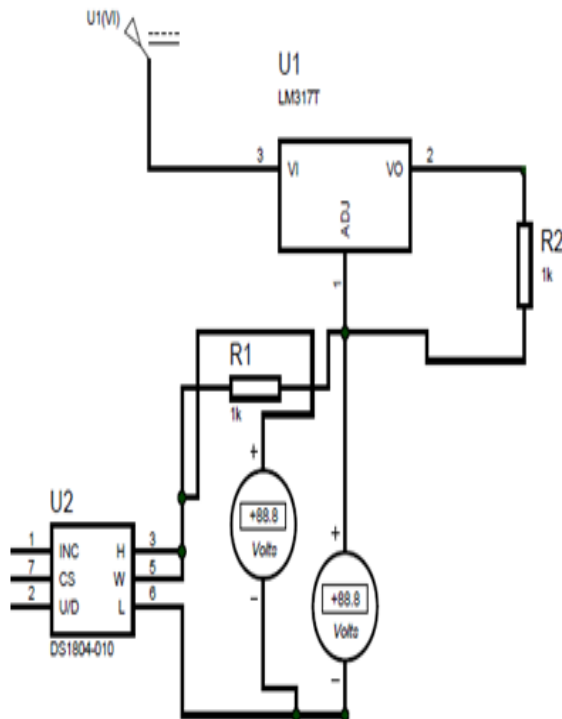
2. Digitally controlled voltage circuit:

Fig 5.2: Digitally controlled voltage circuit

- IC used DS1804 and LM317.
- DS1804 digital potentiometer.
- LM317 variable voltage regulator.
- The DS1804 potentiometer is digital potentiometer that has 100 positions.
- This port consists of the control inputs CS ,INC and U/d.
- DS1804 will operate from 3V or 5V supplies.
- DS1804 has input signals control a 7-bit up/down counter.
- LM317 supplying up to 1.5 A of current.
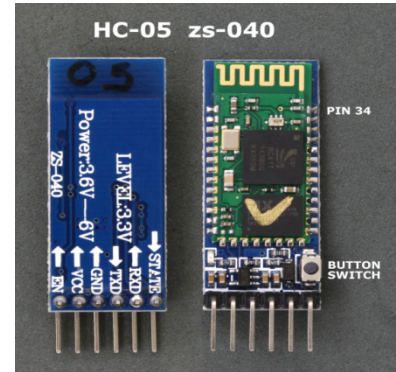- LM317 has voltage range of 1.25 V to 37 V.

3. Bluetooth Module:

Fig 5.3: Blutooth Module

HC-05 module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connection setup..

- Typical -80dBm sensitivity .
- Up to +4dBm RF transmit power.
- Low Power 1.8V Operation ,1.8 to 3.6V I/O
- UART interface with programmable baud rate
- Control via AT commands.

VI. FLOW CHART
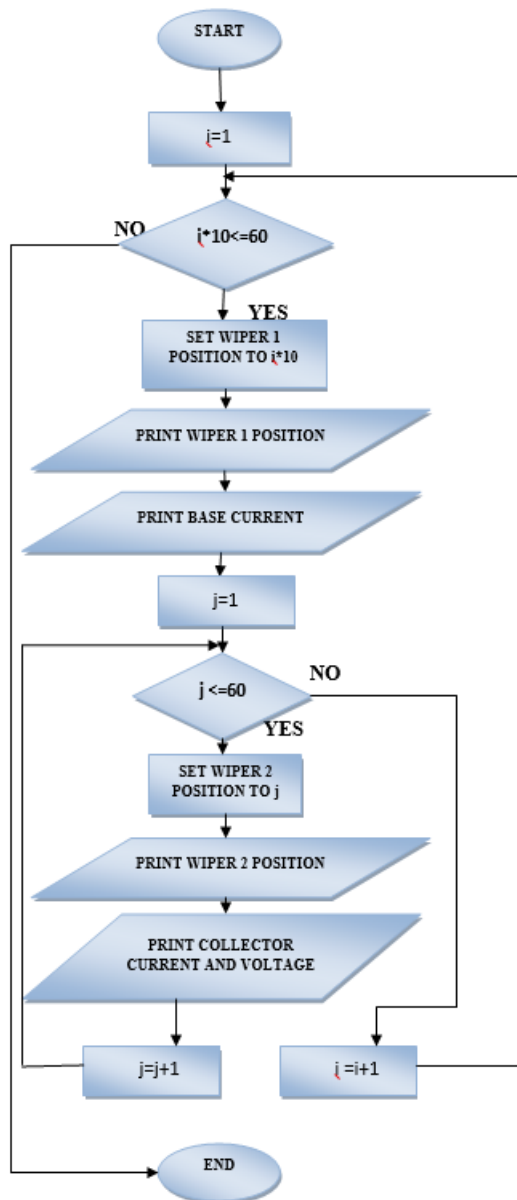
Description:

- The flowchart demonstrates the working of our project, of plotting vi characteristics graph.
- At starting we have to set wiper of first DS1804 at position i=1 and increment till i*10<=60 which are exactly changing the base voltage and if its false we end the the process.
- We use another for loop for changing value of Vcc from changing wiper position of second DS1804 by giving j=1 to j<=60 if its false then it back to increment the value of i.
- Then it prints the value of base current collector current and collector voltage.
- And finally we calculate the value of hfe from the base current and collector current.

VI. APPLICATIONS

- Modelling of BJT circuit according to regions that we get from characteristics graph required to our application.
- Automatic VI characteristics graph plotting in the colleges and schools.

VIII. ADVANTAGES

- Portability.
- Saves time.
- Low cost.
- Compact and very simple circuit design.
- Less power consumption.

XI. DISADVANTAGES

- Our designed system is only able to plot the VI characteristics of BJT.

X. CONCLUSION

In this 21st century time is important factor. To plot VI characteristics manually is very tedious work, so by using our project this plotting of graph is very easy . In future we can plot the characteristics of Diode, MOSFETS and other semiconductor devices.

ACKNOWLEDGEMENT

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