Programmable Adaptor for Home Applications

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Abstract: ***In the present scenario of gadget based modern living, portable devices are on high demand. Categorically, they require charging, which in turn demands suitable adaptors. The flipside of an adaptor is its large size and weight which cause lot of inconvenience to the end user. Also, each device has its own specified adaptor, concurrently leading to numerous adaptors lying around. Our project attempts to change the way a switchboard is approached. The user simply chooses an option in the interface provided. Corresponding to this option, a specified voltage and current is provided as the output. The user can connect a conductor from the output port to the device to power it. The switchboard is capable of providing any voltage and current as required by the user. This remodeled switchboard mitigates the inconvenience caused by big and heavy adaptors and proves to be user friendly. It is easy to use and hassle free.***

Keywords: Arduino, DAC, Emitter follower(EF), Substractor (SUB), Current source(CS), Current divider (CD), Resister (R).

1. Introduction

In modern living, portable devices are on high demand, they require battery that as to be charged using suitable adaptors. The flipside of an adaptor is its large size and weight which cause lot of inconvenience to the end user. Also, each device has its own specified adaptor, concurrently leading to numerous adaptors lying around and usage becomes cumbersome. And also several techniques have been used to for converting the AC input to required voltage/current to drive for the portable device like Laptop, Mobile, and PDA etc. to be charged to require current.

2. Objective

Our project attempts to change the way a switchboard is approached. The user simply chooses an option in the interface provided. Corresponding to this option, a specified voltage and current is provided as the output. The user can connect a conductor from the output port to the device to power it. The switchboard is capable of providing any voltage and current as required by the user.

3. Hardware and Software Requirements

Hardware requirements:

1. Microcontroller(MC)
2. Digital to Analog Converter (DAC)
3. Common Source (CS)
4. Emitter Follower (EF)
5. Common divider (CD)
6. Substractor (SUB)
7. Resister(R)

4. Block Diagram

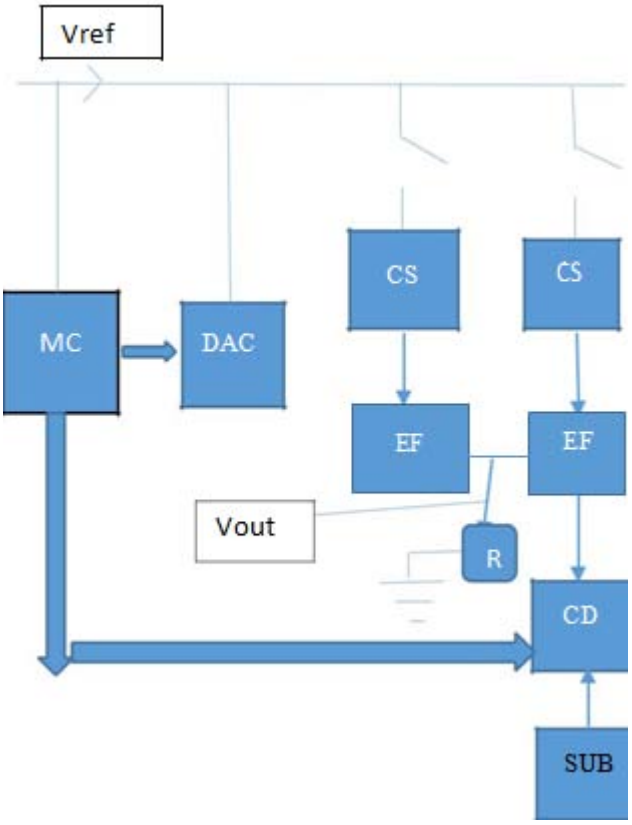


Figure 1: Block diagram

5. Explanation of Block Diagram

1) Microcontroller
The microcontroller is responsible for generating the required hex value for the DAC and also for controlling the relay switches. The Microcontroller is interfaced with a 4X4 hex keypad. The input chosen is searched by using a defined Look-up table (LUT). The LUT specifies the voltage and current rating of the selected device and necessary bits are generated.

2) Digital to Analog Converter (DAC)
Using the digital data sent by the MC (as per user's choice) as analog voltage (which is DC in nature) is generated. Since these bits are sent continuously the same

voltage appears at the output acting as the required output voltage.

3) Current Source (CS)

After obtaining the required voltage**,** we must achieve the required current also. Two current source, each providing 1A of current is designed using PNP power transistor. The resisters used in this circuit is also a power resister. In this prototype we have restricted ourselves to generate 2A of current but it can be extended to achieve higher levels of currents.

4) Emitter Follower (EF)

The current source and emitter follower are connected in series. The Emitter follower is implemented using an NPN transistor. The input to the emitter follower is the obtained DAC voltage and are also controlled by switches.

5) Common Divider (CD)

The Common divider is a network of 10 pairs of equivalent resistors connected in parallel. In each pair the resistors are in series with the switch. These switches are always complementary to each. For example to generate 0.1A, 1A is divided into 10 branches of equal resistor, hence giving us ten 0.1 A branches. Out of these 9 are connected to the output of the substractor and other branch is connected to the load.

6) Subtractor (SUB)

The subtractor is used to ensure that 0.1A flows through each branch that is connected to its output. The output of subtractor is always such that the voltage difference between the resistors is 1V. This ensures flow of 0.1A.

6. Implementation

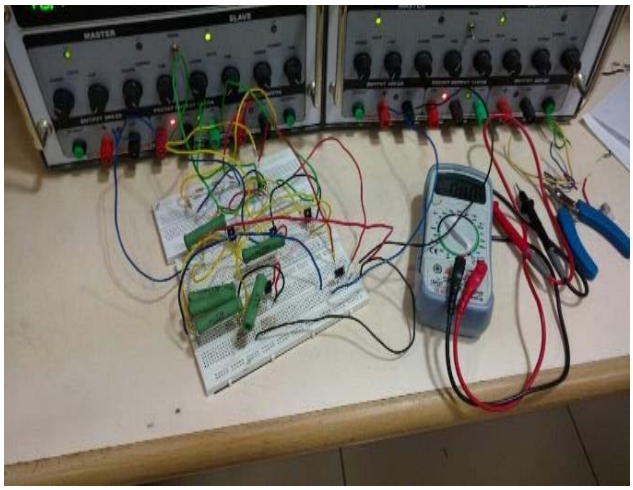
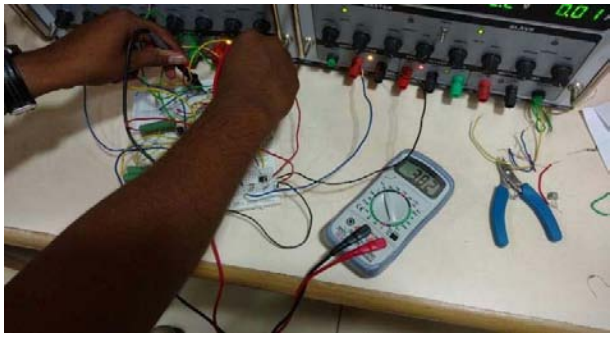
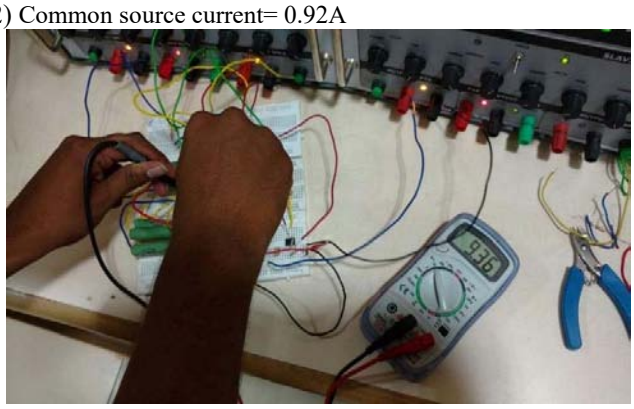


Figure 4: Prototype overview

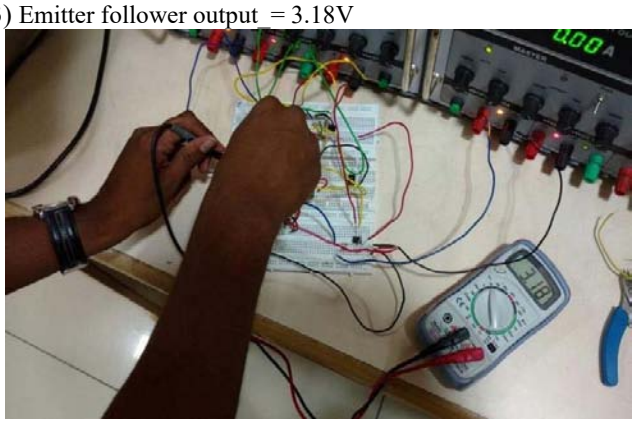
(1) DAC output = 3.92 V



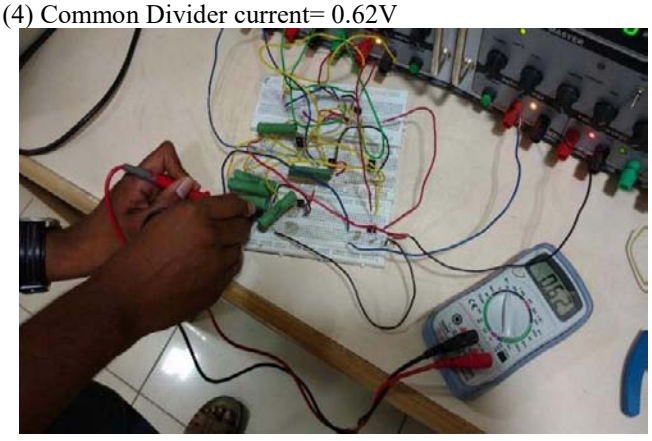
(2) Common source current= 0.92A



(3) Emitter follower output = 3.18V



(4) Common Divider current= 0.62V



7. Comparison Table

Device	Theoretical values	Practical values
DAC	3.75V	3.92V
CS	1A	0.92A
EF	3.15	3.18V
CD	0.7V	0.62V

8. Applications

- Apartments
- Office
- Malls
- Cinema Theaters

9. Conclusion & Further Scope

Here we aimed at arriving the changes of present switched board were user simply chooses an option in the interface provided. Corresponding to this option, a specified voltage and current is provided as the output. The user can connect a conductor from the output port to the device to power it. The prototype for such an switchboard is implemented and tested.

10. Acknowledgment

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