IoT Based Load Scheduling Inverter

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Abstract- *The aim of this project is to construct an Iot based load scheduling device for loads powered by an inverter. An inverter provides uninterrupted power supply to homes on a day to day basis in case of power failure. In case of long hours of power failure or blackouts in the area due to natural or manmade causes the main supply is cut for several days. So we depend on a backup power supply which is mostly provided in households by an inverter. In most cases we are unaware of the remaining amount of power that the battery can provide. So our project focuses on helping us use the inverter power efficiently by scheduling the light loads in the house efficiently. The device alerts the user in case of low power based on predefined power levels and provide options to perform load scheduling ie; to select between appliances to suit their needs while saving power by using it in an efficient manner.*

Keywords- Inverter, IoT, Load Scheduling, Preferential Load

I. INTRODUCTION

The large population of the world demands large power. Renewable energy sources are now used to reduce the pressure on power grids which mainly use conventional resourses to generate power. Even this do not ensure uninterrupted power or unwavering power quality. Standby or backup power is a must .Power shortage and consequent power cuts are inevitable. In households an inverter is the most common and economical option.

But with the ever rising technological advances the inverter is expected to be much smarter than it is now. One way of doing it is to let the consumer monitor the power status remotely and control which devices need to operate based on consumer preferences on a long time basis. We mainly focus on monitoring of inverter's battery and controlling of loads wirelessly. Most consumers are caught off-guard when the inverter's battery dies out as the existing inverters lack the ability to alert the users about the power consumption and battery life remaining. Hence there is scope for retrofitting the existing inverters to make them more user-friendly by displaying the battery status which will also promote judicious use of available energy by the consumer. For this Iot is used.

The Internet of Things, or IoT, refers to the billions of physical devices around the world that are now connected to the internet, all collecting and sharing data. It describes the network of physical objects "things" that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the Internet. So using the various benefits that IoT provides we can make the inverters that we use in our houses more efficient and user friendly and available remotely.

II. LITRATURE SURVEY

Load scheduling is a form of load management that allows a household or industry to save energy by minimizing their load demands at a given time. In order to perform load scheduling efficiently power logging and recording of sessions at regular intervals are done to measure the use of power at regular intervals basically for peak times, full load, in emergency situations etc.

In any household or industry for continuous, uninterrupted supply of power backup power is a must as it is an alternative when power supply ceases due to problems in the generation station or distribution lines, change in power quality, faults in the system etc. Power failures are particularly critical at sites where the environment and public safety are at risk. The commonly used, current devices make sure there is uninterrupted supply of power. But idea about the amount of backup power required for a foreseeable amount of time which could run a given number of equipment is one which is hard to quantify based on just habit of the user. The fact that the efficient use of backup power for longer periods when there is an indefinite delay in restoring the main supply depends mostly on the number and power rating of the equipment that we choose to use at that time and normally the user is not in control of this and uses power irresponsibly.

For any person to use power responsibly they must know how much any appliance in the household must consume. Therefore the users must be informed about the power ratings and quality of these appliances. With this knowledge if he is able to choose between the given loads on the basis of preference or minimal power consumption then it

could be said that the use of backup power can be very much be extended in an optimum, efficient manner

III. COMPONENTS

First we construct the inverter part of the IoT Based Load Scheduling Inverter. The components used to make the circuit consist of DSPIC30F2010 controller which is a 28 pin controller.The FAN7392 is a monolithic high and low side gate drive IC that can drive high-speed MOSFETs and IGBTs that operate up to +600V.

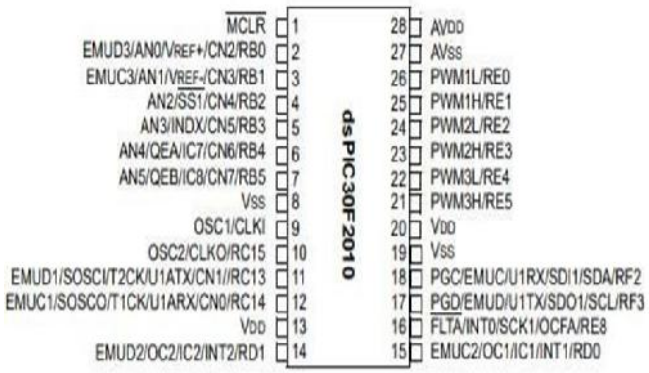


Fig 1-DSPIC30F2010

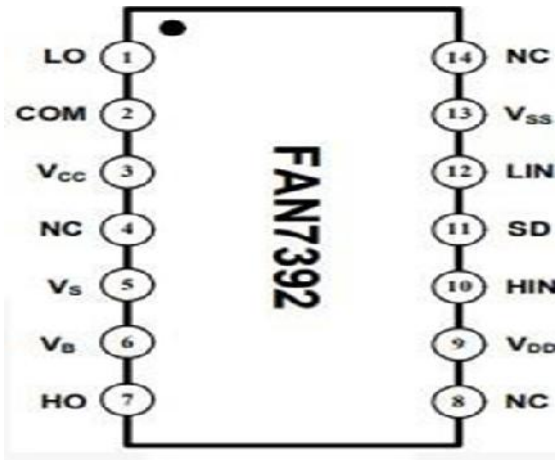


Fig 2-FAN7392

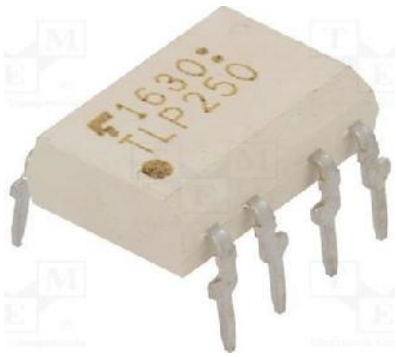


Fig 3-TLP250F

Here we will also use a TLP250F which consists of an infrared emitting diode and an integrated photodetector. It is suitable for gate driving circuits of IGBT or power MOSFET.We are using IRFP250 MOSFET which is a power MOSFET.

Fig 4-IRFP250 MOSFET

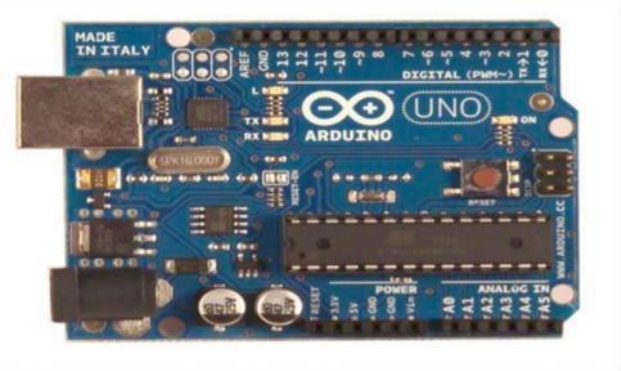


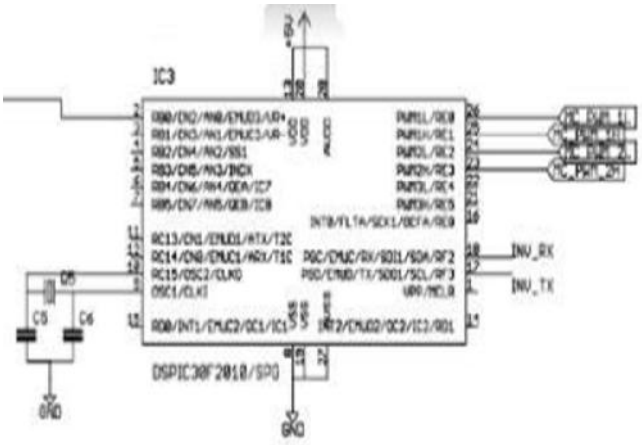
Fig 5-ARDUINO UNO

Fig 6-ESP8266 wifi module

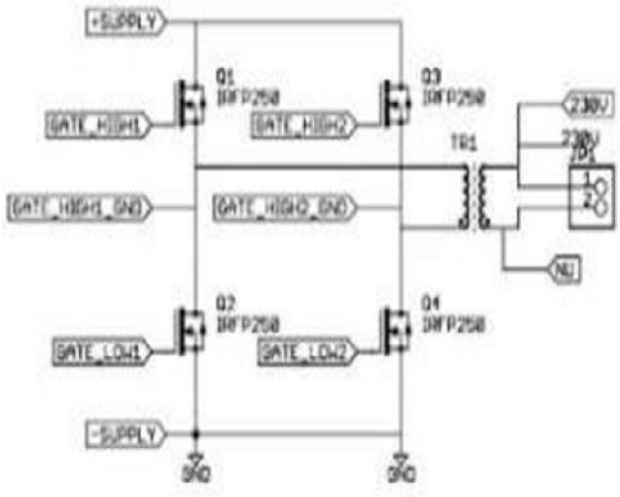
The main components of the IoT circuit includes ARDUINO UNO which is a microcontroller board based on the ATmega328.It also consists of an ESP8266 Wi-fi module which is suitable for adding Wi-Fi functionality to an existing microcontroller project via a UART serial connection.

IV. CIRCUIT DIAGRAMS

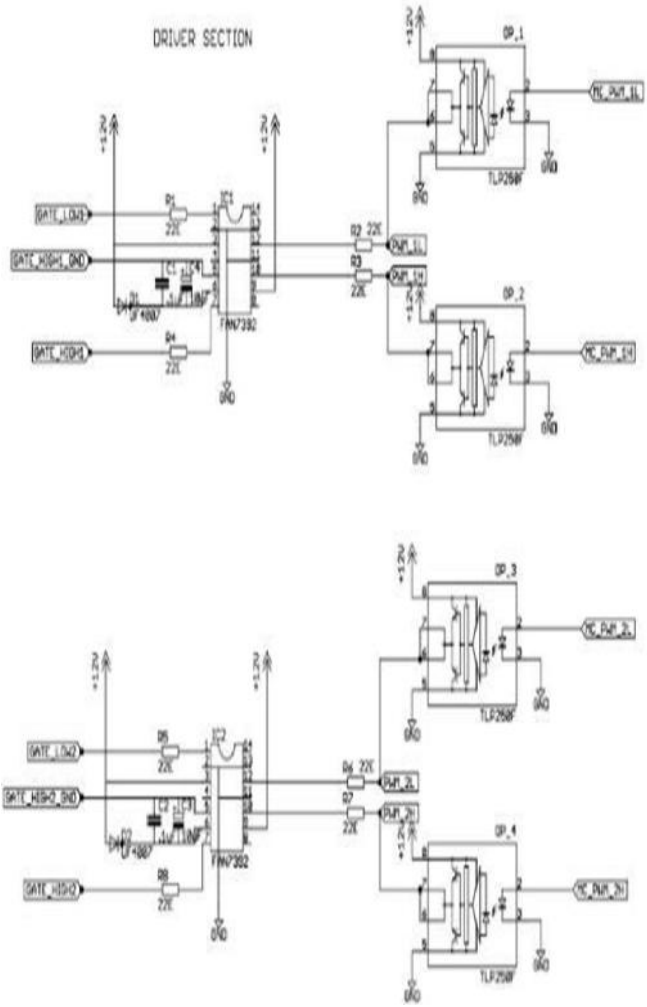
The inverter circuitry consists of a DSPIC30F2010, a driver section and an inverter and transformer section.



Crkt 1-DSPIC30F2010

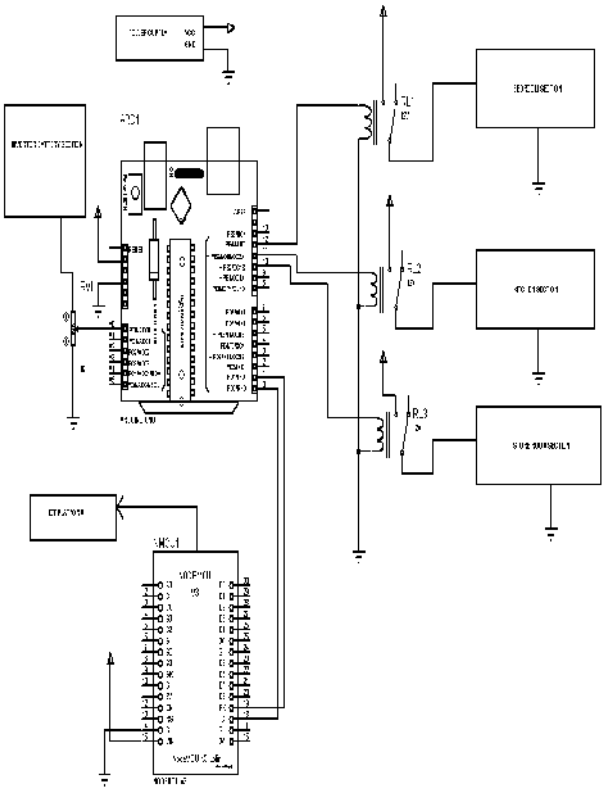


Crkt 3- Inverter and Transformer section



Crkt 2-Driver Section

The Iot circuit can be depicted using proteus software.



Crkt 4-IoT Circuit

V. WORKING

The main working procedure can be understood using a block diagram.

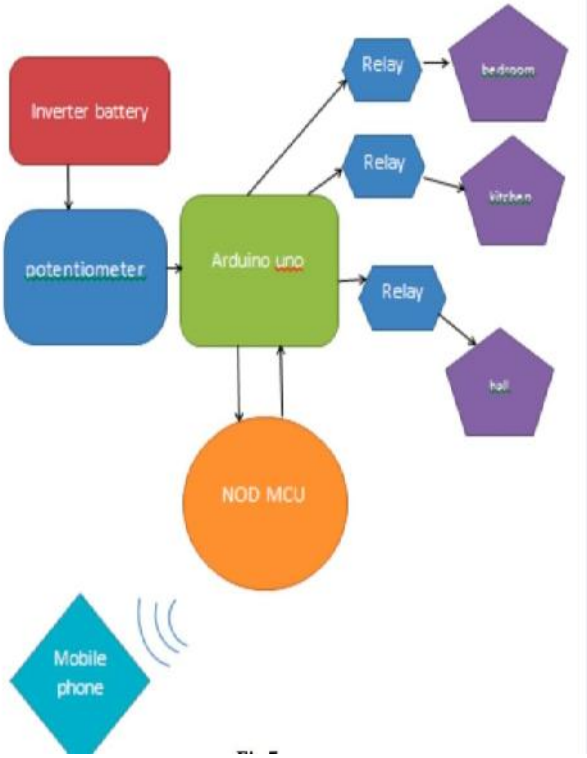


Fig 7- Block Diagram

As per the block diagram DSPIC30F2010 is connected to the inverter. The DSPIC30F2010 creates the sine pwm. Switching signal from DSPIC30F2010 goes to TSP250F and then to FAN 7392 MOSFET driver and then to the mosfets. Here a X bridge inverter is used. The output of the inverter is connected to the primary of a transformer. From the secondary side a sine wave is obtained after switching from the primary side. Our device uses this sine wave.

The inverter is then connected to the arduino and also arduino is connected with the nod mcu or wifi module which allows the data transfer with the user phone. It also allows to provide notification when the battery charge decrease below 50% or any chosen value. In between the nod mcu and arduino there is a two way data transfer. The arduino is also connected to the 3 relay which is connected to the 3 loads mainly bedroom, kitchen and hall.

When the battery reaches the chosen value , all the relay will trip and a notification is send to the users phone and allows the user to set the relay according to his use. So this project alerts the user so that he can control the inverter battery usage by selecting preferential loads ,sitting anywhere in the world. Controlling is done using the blynk app.

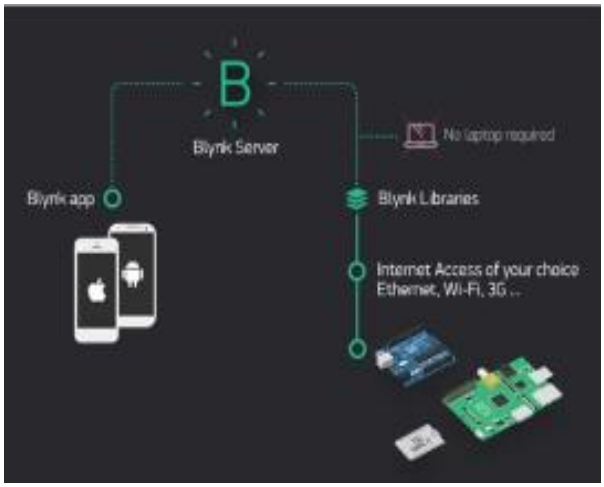


Fig 8-Blynk app

ACKNOLEDGEMENT

We are deeply indebted to our beloved Executive Director Rev. Fr. George Pareman, Principal Dr. Nixon Kuruvila, Director Dr. Elizabeth Elias , Joint Director Dr. Sudha George Valavi and Head of the Department Mr. Sebin Davis K of Sahrdaya College of Engineering & Technology, for their sole cooperation in fostering an excellent academic culture in the college.

We are extremely grateful to our Project Coordinator, Ms. AshnaMohan , and our project guide Ms Merry Mathew for their constant support and encouragement.

We articulate our gratitude to all our classmates for their encouragement and cooperation without which our project would not have been possible.

Above all, we thank Lord Almighty for providing us with the courage and confidence to take up this project.

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