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A Peripheral Interface Controller for Bidirectional Wireless Power Transfer

M.Dhanapal, C.Poobalan, D.Ragavi, S.Sanjith Raja, D.Thafith

Assistant Professor, Dept. of EEE, K.S.Rangasamy College of Technology, Tiruchengode, Tamilnadu, India

UG Student, Dept. of EEE, K.S.Rangasamy College of Technology, Tiruchengode, Tamilnadu, India

UG Student, Dept. of EEE, K.S.Rangasamy College of Technology, Tiruchengode, Tamilnadu, India

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ABSTRACT: Transferring the electricity is the important one for the consumers. By transferring the electricity through the wire causes more number of losses. To reduce the losses in the transmission we are moving to the Wireless Power Transfer technic. By transferring the electricity to one place to another without using any wires is Wireless Power Transfer. Here we have to control this technic so we need a controller. PIC Controller is used to control the Bidirectional Wireless Power Transfer. By using the C program coding in controller it is used to control the transferring electricity. Transmission of the power in the nearest field, (i.e. in the short distance up to 5-10 Centimetres) using Inductive Coupling. By transferring the power from primary side to the pickup side inductive coil is used. Strong magnetic rays are formed during the transmission. Magnetic fields interact very weakly with biological organisms. To transmit the wireless transmission of signals is not like that which we used in the cell phones. In cell phones, signals are sent in the form of micro waves whereas in this mode of transition electricity is transferred in the form of magnetic rays.

KEYWORDS: Electricity Transmission, PIC Controller, Magnetic Field, Inductive Coupling.

I. INTRODUCTION

Now-a-days usage of electricity is increased day by day, without usage of electricity we cannot live even a minute. By transferring the electricity from one place to another then transmission losses will occur. To avoid losses in the transmission line there will be a technic called “Wireless Power Transmission”. By using the wireless power transfer technic there will be a reduced usage of wires. By reducing the usage of wire then there will be also reducing the e-waste. We can even transfer the power through walls and any metal obstacles.To transfer a power using Bidirectional Wireless Power Transfer System is the main objective. To transfer the electricity without using connections between input and load is termed as wireless electricity. To transmit the wireless transmission of signals is not like that which we used in the cell phones. In cell phones, signals are sent in the form of micro waves whereas in this mode of transition electricity is transferred in the form of magnetic rays.

In other proposed system they are transferred the power up to 2cm only. In this project, transmission of the power in the nearest field, (i.e. in the short distance up to 5-10 Centimetres) using Inductive Coupling. When the coil winding is increased then the strength of the power transmission is also increased.In other systems, they send the power to the batteries. But in this project, we send the power directly to the loads. Wireless Power Transfer is the non-radioactive mode of energy transfer. There will be no radiations will emits during the wireless power transmission. Magnetic fields interact very weakly with biological organisms. Since there will be no harmful for people and animals and are scientifically regarded to be safe. Wireless Electricity technology is based on sharply resonant strong coupling. For short range of transferring the electricity we use the inductive coupling. It is able to transfer power efficiently even when the distances between the power source and capture device are several times the size of the devices themselves. By increasing the winding then increase the strength of the magnetic field between the two sides as primary side and to the pickup side.

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Here we are used to control the transmission of electricity so we have move on to the control strategy. PIC Controller is the device which is used to control the transmission of power flow during the bidirectional wireless power transfer. By giving the proper command to the PIC Controller it is act as the controller to control the power flow directions. The coding which is given to the PIC Controller is C programming coding.

II. PIC CONTROLLER

It is the type of controller which is used to perform the control operation. By using the C programming coding the PIC controller could be activated. The C programming should be displayed in the LCD display. By using this LCD display we could view what type of program should be given to the PIC controller. PIC Controller is one of the microcontroller device. The expansion of PIC microcontroller is Peripheral Interface Controller.

By the time of olden days, the PIC microcontroller should only have the storage memory as ROM or EPROM. But in now-a-days, flash memory will use for the storage. Now PIC controller should also have been reprogrammed for our convenient. If first we write program in the PIC controller that program should not be work properly and then we erase it and add a new program also. This is the major advantage in this controller.

PIC controller should be smaller in size so it could be easily placed where ever we want. It is also be portable and also be low in cost. In the wireless power transfer the PIC controller contribution will be more powerful. Whatever coding we applied to the controller that program should be applied to the entire system. This program should control the entire system of the power transfer.

The device is manufactured high density non-volatile memory technology with 8051 instruction set. The special features are 4k bytes of flash, 128 bytes of RAM, 32 I/O lines, 16 bit timer/counter, full duplex serial port and clock circuitry. Here we are using 16*2 display is used. 16*2 means 16 characters and having 2 lines.

III. PROPOSED SYSTEM

Transferring the electricity without using any wire is the wireless power transfer technic. First we placed a 5V DC controller(i.e. PIC controller) as shown in figure 1. Here we give a program instruction to the controller and it controls the entire power transfer system. The input is taken as 5V power from the transformer. The transformer contains only AC supply. AC supply could not be transferred as effectively so we convert AC supply into the DC supply by using the bridge rectifier. The boost converter is placed and inside the boost converter MOSFET is also placed. MOSFET should not generate the pulses for 5V input supply. So here we are using the driver circuit and transfer the power supply of 12V. then the boost converter 12V DC supply will boost up to 220V. The compensation circuit is placed in the primary side as well as in the pickup side. The compensation circuit will be used for transferring the power supply as the fixed supply. If we placed the compensation circuit then there will be to deviation in the power supply. It is used for the constant and fixed transformation of power supply.

Another compensation circuit is also placed in the pickup side for fixed transformation. Then one converter is used to convert the DC power supply into AC supply. Because here we transferring the power directly to the load. In other proposed system we cannot directly transfer the power to the load instead we send the power to the battery. All the wireless power transfer systems require a transmitter to send signals, a receiver to receive the signals and a medium. The driver circuit is used to convert 5v pulses into 12v pulses. It gives pulses for the triggering circuit in MOSFET. we can also provide electrical isolation between an input source and an output load using just light by using a very common and valuable electronic component called an Optocoupler. An optocoupler or opto-isolator consists of a light emitter, the LED and a light sensitive receiver which can be a single photo-diode, photo-transistor, photo-resistor, photo-SCR, or a photo-TRIAC with the basic operation of an optocoupler being very simple to understand.

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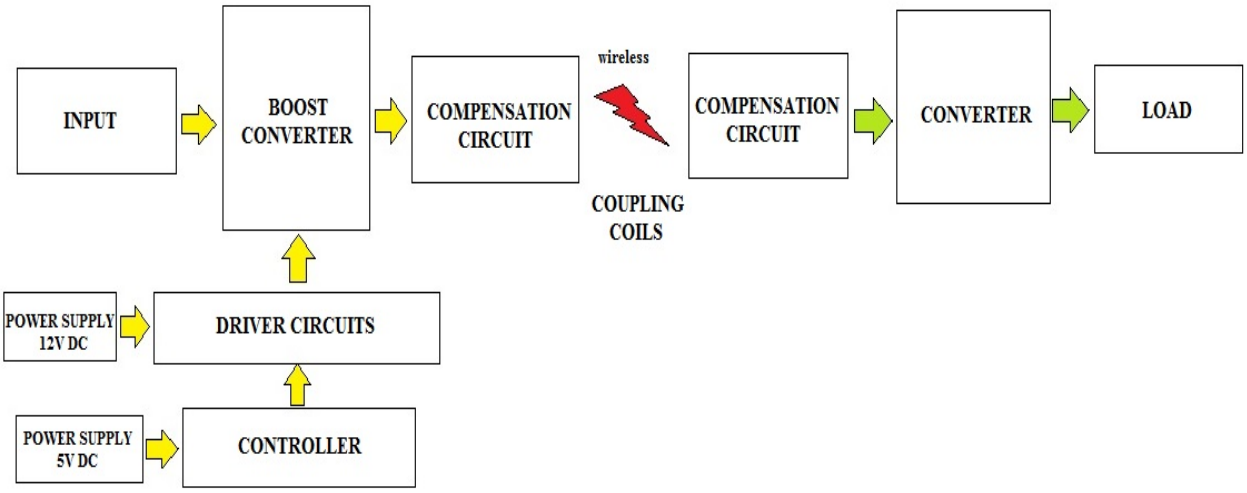

Figure 1 Block Diagram

IV. MODULES WITH WORKING PRINCIPLE

POWER SUPPLY

A power supply is an device which is used as the electrical component that supplies electric power to an electric load which we are used. Its primary function is to convert electric current from source to correct voltage, current and frequency to the power load. Here obtained the power supply from the transformer and we take 5V power supply for the input.

BOOST CONVERTER

A boost converter is a step up converter that steps up the voltage from input to its output(load). The switched mode supplies can be used for many purposes including DC to DC converters. A Direct Current supply, such as a battery may be available, its available voltage is not suitable for the system being supplied. For example, the motors which are used in driving electric automobiles require much higher voltages up to 500V than could be supplied by a battery alone. Even though if we are used banks of batteries, the extra weight and space taken up would be too great to be practical. The answer to this problem is to use fewer batteries and to boost the available Direct Current voltage to the required level by using a boost converter. Another problem with batteries, large or small, is that their output voltage can be varies as the available charge is used up, and at some point the battery voltage becomes too low to power the circuit being supplied. However, if this low output level can be boosted back up to a useful level again, by using a boost converter, the life of the battery can be extended.The Direct Current input to a boost converter can be from many sources as well as batteries, such as rectified Alternating Current from the mains supply, or DC from solar panels, fuel cells, dynamos and DC generators. In our project we convert the 12V power supply into 220V. this sudden increase in output will be done by using only boost converter.

MOSFET

The metal–oxide–semiconductor (MOS) field-effect transistor (MOSFET, MOS-FET, or MOS-FET) is a transistor used for amplifying or switching electronic signals. It has a four-terminal device with source (S), gate (G), drain (D), and body (B) terminals, the body (or substrate) of the MOSFET often is connected to the source terminal, making it a three-terminal device like other field-effect transistors. The MOSFET is by far the most common transistor in both digital and analog circuits, though the bipolar junction transistor was at one time much more common. In enhancement mode MOSFETs, a voltage drop across the oxide induces a conducting channel between the source and drain contacts throughthe field effect. The term "enhancement mode" refers to the increase of conductivity. And also with increase in

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oxide field that adds carriers to the channel. It is also referred to as the inversion layer.In the less common depletion mode MOSFET, detailed on the channel consists of carriers in a surface impurity layer of opposite type to the substrate, and there will be decreased in conductivity by application of a field that depletes carriers from this surface layer. In our project MOS-FET is used as a switching condition. Two modes of switch on and off conditions. If we 5V power supply the MOSFET should not be on. Therefore by using the driver circuit we change the power supply into 12V then the pulse will be generated by MOSFET.

COMPENSATION CIRCUIT

A compensation circuit in electric circuit is used to keeping its output the same within a given range of output. Compensation circuit is a circuit which is used to give the fixed output.

DRIVER CIRCUIT

The driver circuit is used to convert 5v pulses into 12v pulses. It gives pulses for the triggering circuit in MOSFET.We already about Transformers that they transfer the power from the primary side to the secondary side. It can provide a step-down (or step-up) voltage and also they provide “electrical isolation” between the higher voltage on the primary side and the lower voltage on the secondary side. In other words, transformers isolate the primary input voltage from the secondary output voltage using electromagnetic coupling by the principle of electrostatic induction. This is achieved using the magnetic flux circulating within their laminated iron core.

CONTROLLER

The PIC(Peripheral Interface Controller) is a microcontroller board based on the RISC architecture. It has 14 digital input/output pins (of which 6 can be used as Pulse Width Modulation outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. We can also reprogram itself whenever the mistakes will be identified.

LCD DISPLAY

The display which is used in our project is Liquid Crystal Display. The size of the display is 16*2. By using this display whatever the program will be given to the controller is identified easily. It displays everything that we given to the controller.

V. RESULT AND DISCUSSION

Proteus is a simulation software for various designs with microcontroller. This proteus software is one among popular when compared to other software. This program is very easy to handle for testing the program and who are all interested in embedded system are always choose this type of program. By using this softwarewe can practise the programming of microcontroller in Proteus Simulation Software. After Simulating this circuit in Proteus Software we can directly make PCB design.

The first thing we need to do is setup our project in the VSM Studio IDE. Thus we are using a virtual development board in the procedure then it should be much simplified one.

Open up the VSM Studio IDE and select 'New Project' from the File Menu.

Select ‘*PIC16F1 Evaluation Board*’ from the ‘*Demonstration Projects*’ and then click the next button.Everything on the controller selection dialogue should be pre-populated and correct.Click the OK button and save the project.

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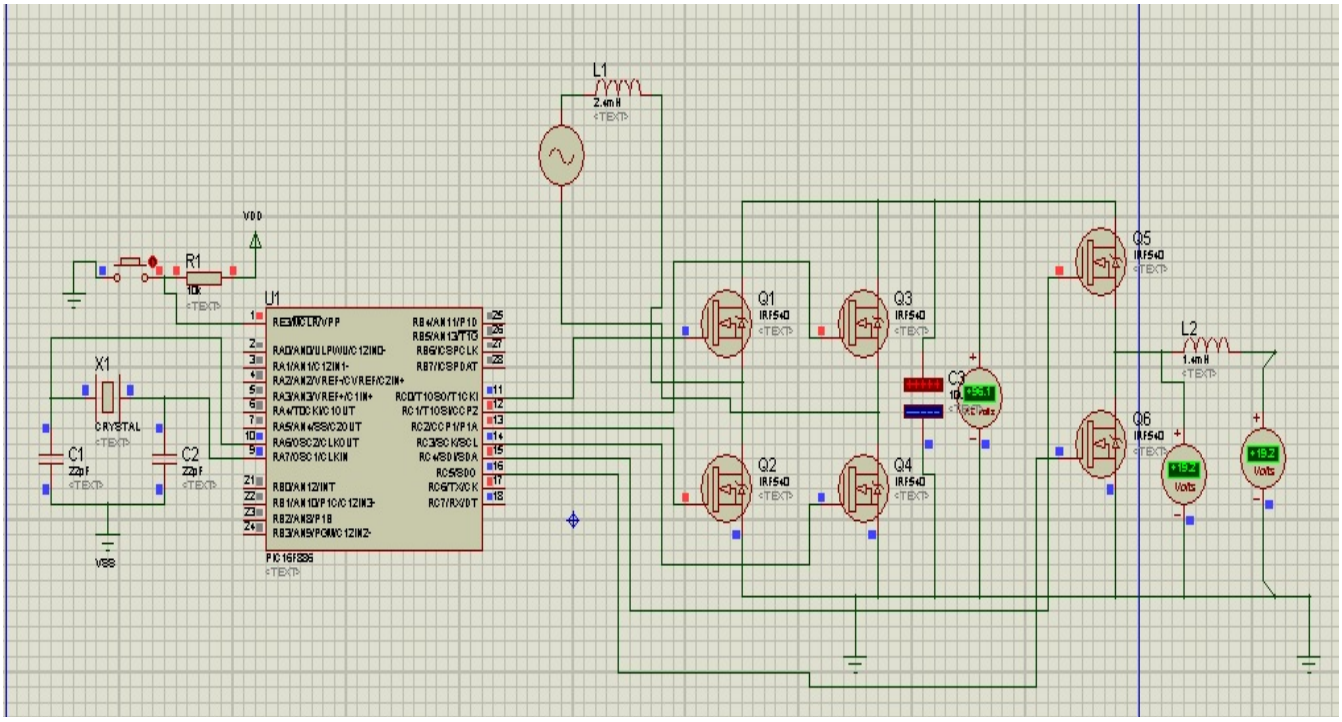

Figure 2 Simulation Output

The output which is obtained finally in the simulation process is shown in the figure 2.

VI. CONCLUSION

Wireless power transfer involves the transmission of power from a source to an electrical load without connectors, across an air gap.No need for meter rooms and electrical closets while using this wireless power transfer. There will be no additional meters for the measurement of power. By eliminating the need for power cords there will be less usage of wires. There will be also reduction of e-waste.Need more light in your office, no need for electrician or other electrical components. Our wireless power transfer is also portable and we can also transfer the power in whatever places we need. Simply wherever we need the lamp we place the lamp and electric supply is given to that lamp by using this wireless power supply.Non-radioactive mode of energy transfer. There will no radiations that will be will be emitted.Magnetic fields interact very weakly with biological organismspeople and animals and are scientifically regarded to be safe.It can transfer the power through walls and any metal obstacles.

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