Abstract— Turned-off electric home appliances does not mean not consuming any electric power and they still require standby power when they are plugged into the ac socket. During the standby state the oven consumes 1-3W. This paper present a way to reduce the standby power of a microwave oven. In this design the oven consumes 0.002W when the oven is turned off using current sensor. The oven is controlled by GSM modem using UART. The controlling technic is a greater advantages of this paper because the user in the remote area can also able to control the oven. The user can receive an SMS allot based on that we can on/off the oven.

Keywords—Microwave, oven; standby power consumption; current sensor; Gsm modem.

I. INTRODUCTION

Standby power is electrical power used by appliances and equipment while switched off or not performing their primary function, often waiting to be activated by a remote controller. That power is consumed by internal or external power supplies, remote control receivers, text or light displays, circuits energized when the device is plugged in even when switched off, etc.

Standby power is also called vampire power or leaking electricity refer to the electric power consumed by electronic and electrical appliance while they are switched off.

An electric device is switched off does not that it not consuming electric power. Many modern home appliance contain clock, memories, remote controls, micro processors and instant on features that consumes electricity when they are plugged into the ac socket.

A microwave oven heats food by passing microwave radiation through it. Microwaves are a form of non-ionizing electromagnetic radiation with a frequency higher than ordinary radio waves but lower than infrared light. Microwave ovens use frequencies in one of the ISM (industrial, scientific, medical) bands, which are reserved for this use, so they don’t interfere with other vital radio services.

Consumer ovens usually use 2.45 gigahertz (GHz)—a wavelength of 12.2 cm (4.80 in)—while large commercial ovens often use 915 megahertz (MHz)—32.8 cm (12.9 in). Water, fat, and other substances in the food absorb energy from the microwaves in a process called dielectric heating. Many molecules (such as those of water) are electric dipoles, meaning that they have a partial positive charge at one end and a partial negative charge at the other, and therefore rotate as they try to align themselves with the alternating electric field of the microwaves. Rotating molecules hit other molecules and put them into motion, thus dispersing energy.
This energy, when dispersed as molecular vibration in solids and liquids (i.e., as both potential energy and kinetic energy of atoms), is heat. Sometimes, microwave heating is explained as a resonance of water molecules, but this is incorrect; such resonances occur only at above 1 terahertz (THz).

In general, the touch panel microwave oven has three power states: the cut-off state, the standby state and the heating state. When in the cut-off state, the oven is unplugged from its power source and does not consume any electricity. In the standby state the microwave oven is connected to the ac power source but does not heat. In the heating state the microwave oven heats the food. Though the microwave oven in the standby state is not performing its main function of heating, it performs some internal functions like waiting to respond to a button being pressed that cannot be switched off unless the unit is unplugged. These internal functions require power to operate, and this power used while in the standby state is called standby power.

II. PROPOSED SYSTEM

The AVR(ATMEGA-8) is a modified Harvard architecture 8-bit RISC single chip microcontroller which was developed by Atmel in 1996. The AVR was one of the first microcontroller families to use on-chip flash memory for program storage, as opposed to one-time programmable ROM, EPROM, or EEPROM used by other microcontrollers at the time. The CPU takes values from two input registers INPUT-1 and INPUT-2, performs is happens in 1 execute the logical operation and stores the value into the OUTPUT register. AVR is an 8-bit microcontroller belonging to the family of Reduced Instruction Set Computer (RISC). In RISC architecture the instruction set of the computer are not only fewer in number but also simpler and faster in operation. The other type of categorization is CISC (Complex Instruction Set Computers).

We will explore more on this when we will learn about the architecture of AVR microcontrollers in following section. The ATmega8 is a low-power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing powerful instructions in a single clock cycle, the ATmega8 achieves throughputs approaching 1 MIPS per MHz, allowing the system designer to optimize power consumption versus processing speed. The AVR core combines a rich instruction set with 32 general purpose working registers.

A current transformer (CT) is used for measurement of alternating electric currents. Current transformers, together with voltage transformers (VT) (potential transformers (PT)), are known as instrument transformers. When current in a circuit is too high to apply directly to measuring instruments, a current transformer produces a reduced current accurately proportional to the current in the circuit, which can be conveniently connected to measuring and recording instruments.
A current transformer also isolates the measuring instruments from what may be very high voltage in the monitored circuit. Current transformers are commonly used in metering and protective relays in the electrical power industry.

A current transformer has a primary winding, a magnetic core and a secondary winding. The alternating current flowing in the primary produces an alternating magnetic field in the core, which then induces an alternating current in the secondary winding circuit. An essential objective of current transformer design is to ensure that the primary and secondary circuits are efficiently coupled, so that the secondary current bears an accurate relationship to the primary current.

The most common design of CT consists of a length of wire wrapped many times around a silicon steel ring passed 'around' the circuit being measured. The CT's primary circuit therefore consists of a single 'turn' of conductor, with a secondary of many tens or hundreds of turns. The primary winding may be a permanent part of the current transformer, with a heavy copper bar to carry current through the magnetic core. Window-type current transformers (aka zero sequence current transformers, or ZSCT) are also common, which can have circuit cables run through the middle of an opening in the core to provide a single-turn primary winding. When conductors passing through a CT are not cantered in the circular (or oval) opening, slight inaccuracies may occur. Shapes and sizes can vary depending on the end user or switchgear manufacturer.

The ATmega8 features a 10-bit successive approximation ADC. The ADC is connected to an 8-channel Analog Multiplexer which allows eight single-ended voltage inputs constructed from the pins of Port C. The single-ended voltage inputs refer to 0V (GND).

The ADC contains a Sample and Hold circuit which ensures that the input voltage to the ADC is held at a constant level during conversion. The ADC has a separate analog supply voltage pin, AVCC. AVCC must not differ more than ± 0.3V from VCC.

Linear Technology manufactures a broad line of high performance step-up boost switching regulator ICs and boost switching controller ICs with both synchronous and non-synchronous switches. These switching voltage regulators offer typical input voltage capability from less than 2V up to 100V+, switching frequencies up to 4MHz and high efficiency operation up to 96%. Also with Burst Mode operation, quiescent currents in the tens of micro-amps level can be attained. This combination of features allows very small, low profile boost switching regulator circuit implementations with minimum external components.

Electronic circuit that produces an output signal whose positive or negative amplitude, or both, is limited to some predetermined value above which the peaks become flattened also called clipper.

Relay is an electromagnetic device which is used to isolate two circuits electrically and connect them magnetically. They are very useful devices and allow one circuit to switch another one while they are completely separate. They are often used to interface an electronic circuit (working at a low voltage) to an electrical circuit which works at very high voltage. For example, a relay can make a 5V DC battery circuit to switch a 230V AC mains circuit. Thus a small sensor circuit can drive, say, a fan or an electric bulb.

A relay switch can be divided into two parts: input and output. The input section has a coil which generates magnetic field when a small voltage from an electronic circuit is applied to it. This voltage is called the operating voltage.
Commonly used relays are available in different configuration of operating voltages like 6V, 9V, 12V, 24V etc. The output section consists of contactors which connect or disconnect mechanically. In a basic relay there are three contactors: normally open (NO), normally closed (NC) and common (COM). At no input state, the COM is connected to NC. When the operating voltage is applied the relay coil gets energized and the COM changes contact to NO. Different relay configurations are available like SPST, SPDT, DPDT etc, which have different number of changeover contacts. By using proper combination of contactors, the electrical circuit can be switched on and off. Get inner details about structure of a relay switch.

A power supply is a device that supplies electric power to an electrical load. The term is most commonly applied to electric power converters that convert one form of electrical energy to another, though it may also refer to devices that convert another form of energy (mechanical, chemical, solar) to electrical energy. A regulated power supply is one that controls the output voltage or current to a specific value; the controlled value is held nearly constant despite variations in either load current or the voltage supplied by the power supply’s energy source.

A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. A GSM modem can be an external device or a PC Card / PCMCIA Card. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. A GSM modem in the form of a PC Card / PCMCIA Card is designed for use with a laptop computer.

It should be inserted into one of the PC Card / PCMCIA Card slots of a laptop computer. Like a GSM mobile phone, a GSM modem requires a SIM card from a wireless carrier in order to operate.

### III. System Implementation

Integrated Development Environment (IDE) is a comprehensive editor, project manager and design desktop for application development of embedded designs using Microchip PIC micro MCUs and ds PIC DSCs. MPLAB IDE is a software program that runs on a PC to develop applications for Microchip microcontrollers. The strength of its architecture has allowed us to integrate first conventional graph based simulation and with PROTEUS VSM - interactive circuit simulation into the design environment.

Ever it is possible to draw a complete circuit for a microcontroller based system and then test it interactively, all from within the same piece of software. Meanwhile, ISIS retains a ho