2016

Power Buddy

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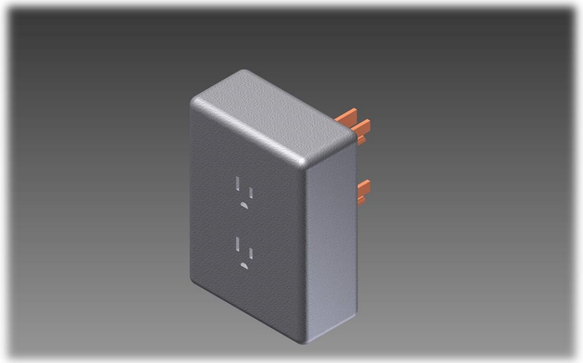
Overview

The Power Buddy monitors the power consumption of any device that plugs into a standard outlet and provides remote access to that data and other helpful information.

Users gain insight into how much power a device uses to assess whether a new energy efficient one would save money and reduce their carbon footprint.



Design

The product enclosure is compact enough to easily fit behind a fridge or small countertop appliance, while simultaneously being capable of housing a powerful device to meet the following requirements:

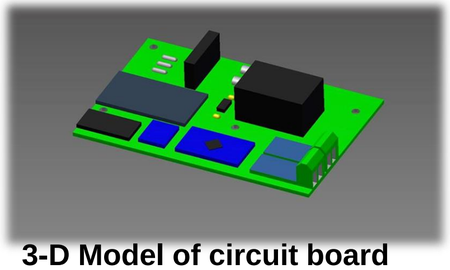
- Read voltage and Current per socket
- Store a substantial history of power use
- Connect remotely to a computer to transmit and receive information
- Be compatible with up to 240 VAC

Hardware

The hardware design uses the following components:

- Arduino Pro Mini 328p (5v, 16MHz)
- ACS712 Hall Effect Current sensors
- ESP8266 2.4 GHz Wi-Fi module
- Micro SD card module
- 120-220VAC to 5VDC converter
- Custom Voltage sensing circuit
- Custom PCB

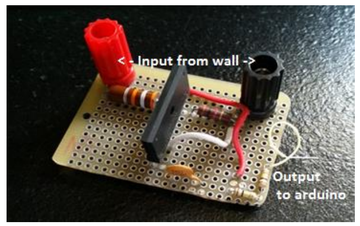
Components were carefully chosen due to our extremely limited size constraints.



3-D Model of circuit board

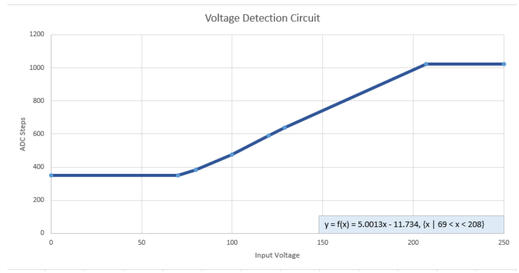
There was no Commercial-Off-The-Shelf voltage sensor, which required us to design our own. The voltage sensor is an essential part of our design, allowing us to read an accurate outlet voltage within the rang of 70-208VAC. This is achieved through the following equation:

$$VAC = \left(\frac{VDC}{Step\ Res} + 11.734\right) 5.0013^{-1}$$



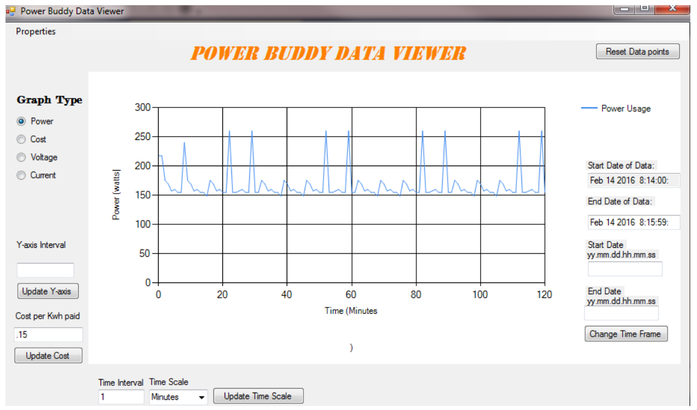
Prototype Voltage Sensor

Voltage Sensor I/O Relation



User Interface

The user views the data collected from the physical device using our Windows application. The application has a varied time scale to facilitate convenient viewing of extended time periods with respect to Power, Current, Voltage, and Cost. To provide accurate cost estimation, the user is able to input their provider's KWH pricing.



This project was made possible in part by donations from our sponsor:

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