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Implementation of A Wireless-Based Digital Display System

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ABSTRACT

In today's rapidly advancing technology market, most conventional digital display systems are now being implemented using individual logic gates and integrated circuits such as microprocessor and microcontroller chips which contain the circuitry necessary to create logic functions being used to implement digital systems, The advent of new technologies has made information in form of electronic display in the world of advertisement and promotion. The LED dot matrix display is used in information dissemination to a larger audience within the location in which it is situated. It has three sections; power, control, and display. This could be grouped into two main parts; the hardware and software. The display system physically conveys a set of programmed data on the WIFI W62 series controller card, the hardware part comprises of number of LED modules, power supply modules, a controller card, and the casing. The software part is the part on the controller card that stores the received programmed data from HD2008v Software from a PC or LED Art software from an Android device. It uses a volatile memory with a storage capacity of 8megabyte which allows reprogramming and memory formatting for a maximum of 1000 times. The casing of the display system comprises of rectangular screwed and riveted aluminum rod, Board, and transparent plastic which covers it both in the front and back. The system is controlled with power switches whenever it is plugged to the AC supply and it has a minimum efficient life span of 50,000 hours and a maximum viewing angle and distance of 140 degrees and 25 meters.

Keywords: *Display; Dot matrix; Interface; Light emitting diode; Module, controller card.*

1. INTRODUCTION:

An electronic wireless based digital display system is a system used for presentation of images, text, or video transmitted electronically without producing a permanent record like conventional billboard. Electronic visual displays include television sets, computer monitors, and digital signage. Electronic visual display present visual information according to the electrical input signal (analogue or digital) either by emitting light or alternatively, by modulating available light during the process of reflection or transmission (light modulators are called passive displays). Electrically operated display devices were developed from electromechanical systems for display of text, up to all-electronic devices capable of full-motion 3D colour graphic displays. Electromagnetic devices, using a solenoid coil to control a visible flag or flap, were the earliest type, and were used for text displays such as stock market prices and arrival/departure display times.

An information display is a way of providing information and it is also used as an object for promotion. It can be seen in the form of cardboard or tarpaulin at stores /shops/sign posts, placards, notice boards and electronic display boards. There is different type of technologies used to create the various displays in use today. The Electroluminescent Display (ELDs), is a type of Flat panel display created by sandwiching a layer of electroluminescent material such as Gallium arsenide (GaAs) between two layers of conductors. When current flows, the layer of material emits radiation in the form of visible light. Electroluminescence is an optical and electrical phenomenon where a material emits light in response to an electric current passed through it, or to a strong electric field. ELDs works by exciting atoms, when an electric current is passed through them, it causes them to emit photons. By varying the material being excited, the colour of the light emitted can be changed. The actual ELD is constructed using flat, opaque electrode strips running parallel to each other, covered by a layer of electroluminescent material, followed by another layer of electrodes, running perpendicular to the bottom layer. This top layer must be transparent in order to let light escape. At each intersection, the material lights up creating a pixel. Electroluminescent devices are fabricated using either organic or inorganic electroluminescent materials. The active materials are generally semiconductors of wide enough bandwidth to allow exit of the light. Electroluminescent materials are used in cars speedometer, backlights in billboards.

Theoretical Framework:

A wireless display is any type of display such as flat panel LED, LCD, projector, video wall, etc. that can be accessed wirelessly from a separate device such as a laptop, tablet, or smartphone. The vast majority of the wireless display solutions available in the market operate over standard IP networks like Wi-Fi. In other words, users join the WiFi network that the wireless display is attached to in order to connect. In general, today's enterprise wireless

display solutions are separate consoles or dongles that plug into existing displays to make the displays wirelessly accessible. This display uses wireless communication networks such as GSM, GPRS, CDMA, 3G to achieve the release of the LED display remote, real -time and large -scale network information release. Realized remote operation technology, it is not restrained by regional, distance, wiring, etc. Wireless LED display sends information through Wireless networks and uses a TCP/IP network transmission protocol.

2.0 REVIEW OF RELATED WORK

Digital Electronic Display system creates colored pixels by combining red, green and blue sub pixels in close proximity. The degree of saturation of each primary color, thus CRTs, use different color phosphorus and liquid crystal use different color filters. A wide of range of colors is possible (Alt & Noda, 1998) as cited in (Wisnieff & Ritsko, 2000). Emilo (2010) also designed 15 LEDs by 7 LEDs scroll message advertising billboards, this project uses 105 LEDs to produce a screen 15 LEDs long, by 7 LEDs High for running messages. Larger displays showed more letters but this is the largest display that can be produced with a single PIC16F628 micro. Ketkar, et al. (2013) designed and implemented a LED scrolling message display system. The system hardware consists of an AT89C51 controller which serves as the heart of the system. The inclusion of the buzzer and alarm units into the design limits its area of application and makes the system unduly complex. In addition, Ukpa, et al. (2013) developed a SMS Controlled Digital Display System using multiple microcontrollers namely PIC16F877 and PIC16F628 and a SAGEM MYX5-2 phone. Dresden (2008) designed and implemented alternative transparent electrodes for organic light emitting diodes (OLED). In his work, he studied the use of two types of alternative transparent electrodes, ZnO:AL and PEDOT. These were developed for organic OLEDs. The evolution of light bulbs in the 1880s brought about the use of electric lighting as a standard technology. The use of flourescent and incandescent lamps has dominated the world today because of their low cost and long-term stability.Solid state lighting (SSL) is a new environmental friendly light source with potentially high efficiency. So far, LEDs and OLEDs have been presented as candidates for solid state lighting (Alstair, 2013). Advertisement is a major business function for disseminating product information to the consumers or building product awareness among them. For an advertisement campaign to be effective, the information has to be delivered to the right people at the right time and the right place. The amount of information shown and the way in which it can be exhibited depend on successfully matching the capabilities of display to human visual system making this channel as wide, as fast and as effective as possible has been the goal of electronic display development for the last fifty years. The Cathode Ray Tube (CRT) which has been the dominant display device used in offices and homes is the display devices on which the personal computer and the graphical user interface were developed (Wisnieff & Ritsko, 2000).

DESIGN METHODOLOGY

3.0 METHODOLOGY

Rapid Application Development (RAD) methodology was used for this project. The RAD methodology consists of planning/analysis, prototype cycle (design, interfacing and testing), implementation and maintenance. Top down design approach was adopted for the project design. The 8 LED modules, control unit, Power supply unit was made available first before the HD2018 software was used for authentication of the design. The program for the control unit was written in HD2018 software using PC while that of mobiles was develop using Led-Art android mobile software and the control unit wifi modules HD62 W-series programmed using laptop before GSM to send written message through WIFI. The authenticated design was later implemented, tested and packaged.

Materials

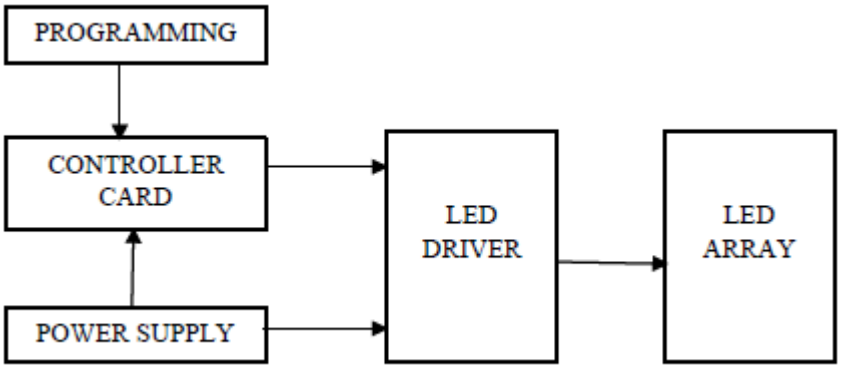
The material used for the implementation are:

1. Printed Board
2. 24x12 LCD module
3. Soldering lead
4. Jumper wire
5. Casing
6. Digital Multimeter
7. HD 2018 software
8. HD W62 Wifi Module
9. LedArt Android App
10. Mobile Device
11. Knobs
12. Metal Aluminum

13. Toggle Switch
14. Switch mode power supply (SMPS)
15. IDC Cables
16. 2pin Jack connector

Hardware Design and Interfacing

The major modules/subunits required for the operation the Digital Display System are shown in block diagram of fig. 3.1.



Led drivers:

This is an electrical device which regulates the power to an LED or a string of LED. An LED driver responds to the changing needs of the LED or LED circuit by producing a constant quantity of the power to the LED as the electrical properties changes with temperature and some other environmental factors. The type of LED module has an inbuilt LED driver which may not be visible because of the surface mounted technology. The design made use of the ring counter which is connected into the shift register, to enable driving of the LEDs. On the module circuit is found this IC and the following is written on it (TC5020DAP) and (DP4536). These both drives the column and row arrangement of the LED

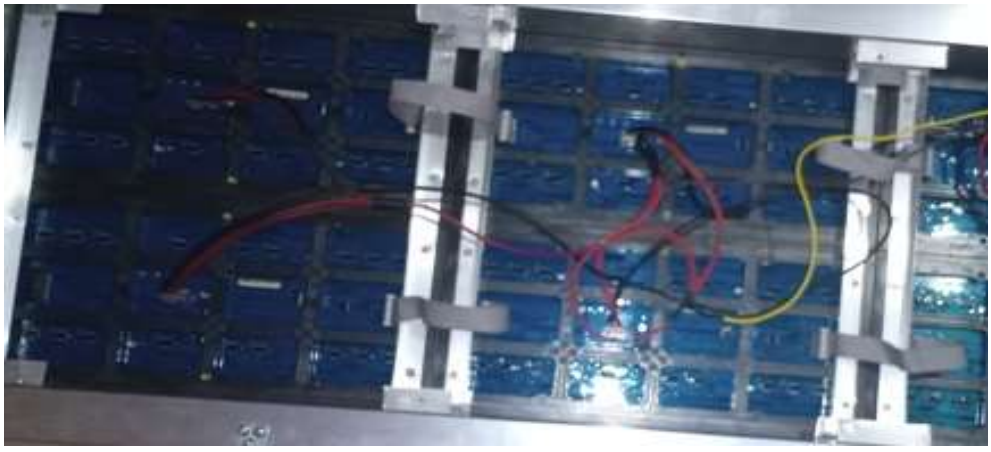


Fig 3.0: Connection view of the Digital Display System

The design block diagram indicates the stages involved and the working operations of the LED dot matrix display, linking both the software and hardware parts. It shows the first stage which is the programming stage from which instructions is being sent to the controller module and is done by dedicated user interface software which states what is to be displayed on the set of modules. It also shows the power supply stage which is the heart of the operations i.e., the power source which energizes the controller card and the led modules

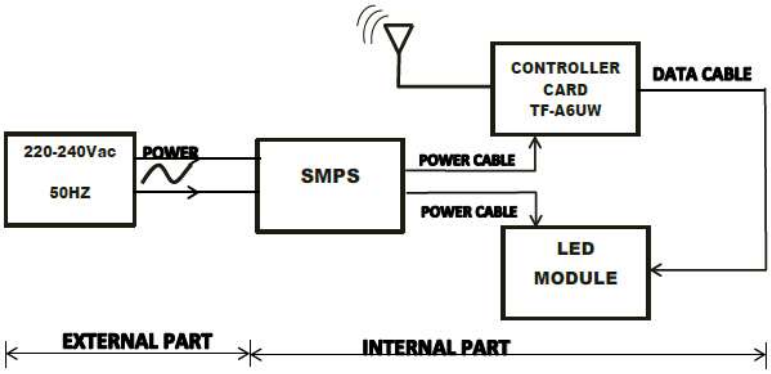


Fig. 3.6: Complete block diagram of Digital Display System

Fig 3.1 Block Diagram of the Digital Display System

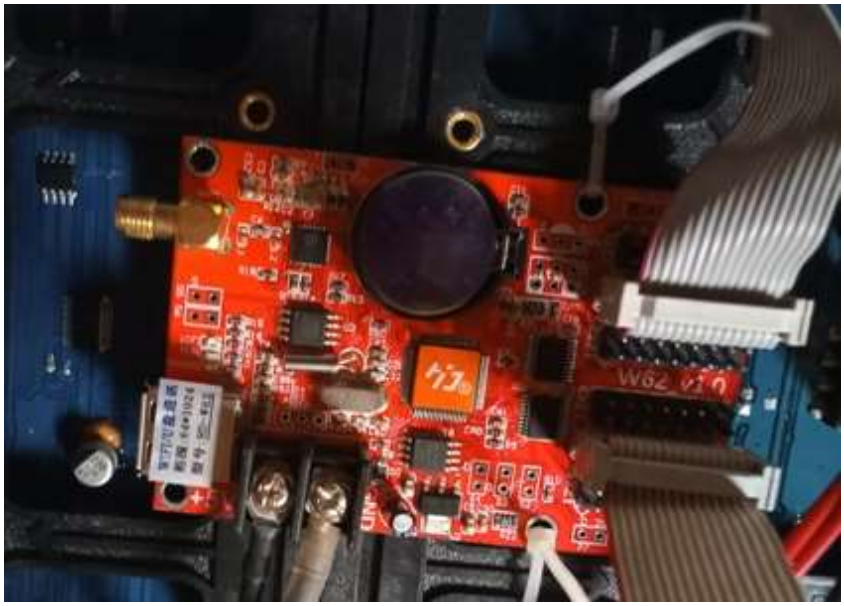


Fig 3.2: Controller Unit of the Digital Display System

Fig 3.3: Display Unit of Digital Display System

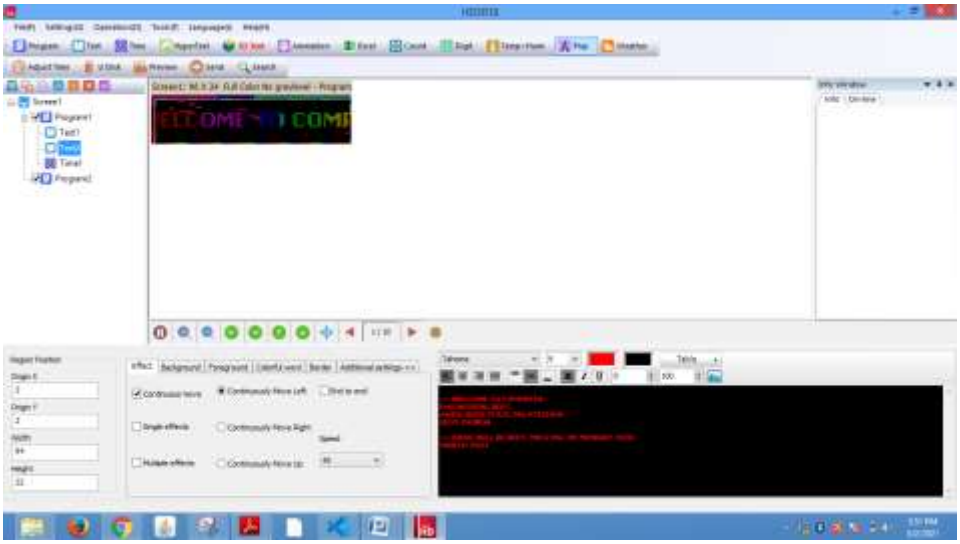


Fig 3.4: Software programing interfere and setting

Programming Design

The programming of the controller card is the process of writing of instruction to be displayed on the display and this will be done by the (HD2018) and the parameter needed are the information to be displayed and also the password required to access the controller or establish a communication medium between controller card and the computer to set up the panel on the Power LED software. The transmission process is done in seconds, with a high-speed using the Wi-Fi.

Design calculation

Electrical power consuming materials are:

1. LED Modules

2. Controller card

3. Power supply module.

- **LED module consumption:** Each Led module has 512 LEDs. And at Maximum brightness, the module draws a current of 3Amps at 5Vdc:

So the power consumption of each LED module is;

Power consumed P=IV watts

Where I=3 Amps, and V=5 V

P=3 × 5=15 watts for a single LED module

Using 8 LED modules,

The total No of current drawn at maximum performance is;

Total current= current of 1 module x No of module= 3Amps x 8 =24 Amps. Total power=Power of each × No of LED module = 15 x 8 = 120w

- **Controller Card:** Each controller card is rated 0.6 Amps

Total power=IV =0.6 Amps × 5Vdc=3W

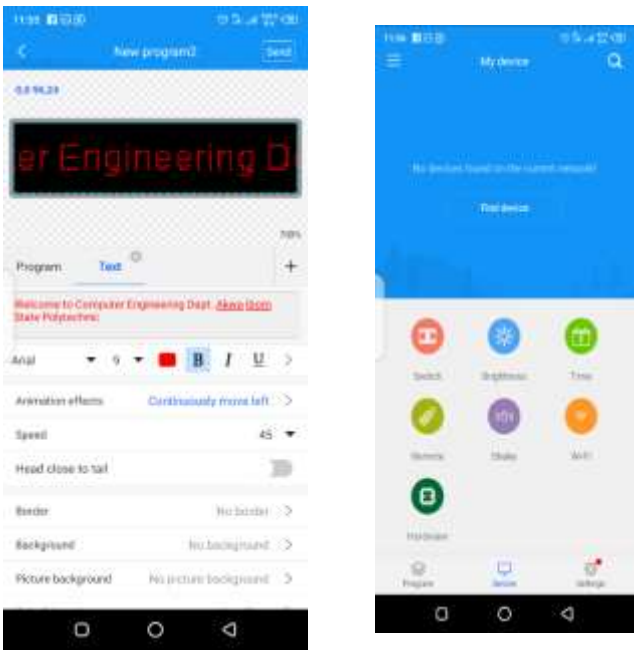
- **Power supply unit**

Power consumed in connecting cable and PCB for each

Module=0.25 W

Hence 8 modules=8 × 0.25=2 W.

The power supply unit is rated to supply at maximum 5Vdc at 40Amps (ie. 200watt.)



(d) The Android device software programming interface

4.5 PERFORMANCE TEST FOR INFRMATION DISPLAY

The system cannot perform any task successfully without the software on PC or android device, we can make use of computer or android device but computer is more preferable because it has more functions than the phone, for example setting to change messages. "Wi-fi" deals with internet but this does not deal with internet or data, it does not require recharging of line or subscription. The chips control gets the message from the computer and displayed it as a message on the modules. The software is a HD 2018 LED software version of 9.2.

Steps 1: On the computer, under tools we have module setup which required a password, we inserted the password.

Steps 2: We have control setup which also required a password and the password was inserted as well, without the password we cannot go further or allowed to write any characters.

Step 3: We go to the selection page, under selection page we have, Speed, Edge, Hold, Rotational, 3D, fly to right, left to but animation text right, swing etc.

Step 4: We click on add program; program is not a text but animation text.

Program 1: The character **"Computer Engineering"** was inputted, then we click on the size, then the speed etc and then we click on send and it displayed the message on the LED modules.

Program 2: The character **"Welcome to Computer Engineering Department, Akwa Ibom State Polytechnic Ikot Osurua "** was also inputted, then we click on the size, then the speed etc and then we click on send and it displayed the message on the modules.

Fig

4.2: Display Unit of the System

Program 3: The character **"Date"** which is "**07.09.2021",** was inputted, then we click on the size, then the speed etc and then we click on send and it displayed the message on the modules.

Program 4: The character **"Time"** which is "**1:30:pm",** was inputted, then we click on the size, then the speed etc and then we click on send and it displayed the message on the modules.

4.0 RESULTS AND DISCUSSION RESULTS

The result of the design and construction of an LED dot matrix display dimensioned (4.9ft × 1.9ft) is a gradual process which includes the construction of a frame capable of housing 24 x12 single LED modules and the use of a power supply module capable of supplying the LEDs and other circuits involve, the use of a controller card capable of storing and conveying information required to be display and coverings such as the transparent plastic and aluminums board which gives physical protection from environmental hazards. This project has enabled student to put into practice theoretical classroom room-based knowledge in the production of tangible electronic device, thereby bridging the gap between the classroom theory and their practical application. The implementation of the research work has broadened and enhance knowledge on the practical application of the following; wireless communication, principle of operation and a common connection and control of the light emitting diode, applications of some computer program and their interaction to the environment, the use of different Integrated Circuit (ICs). The paper will also contribute to technological growth in the aspect of information dissemination involving display boards and add to the beauty of the environment. It will increase the percentage of people getting information due to its attractive, viewing angle and viewing distance. It is our belief that a highly improved version of this project can be achieved by adding special features to the already produced ones.

CONCLUSION AND RECOMMENDATION

CONCLUSION

The wireless based Digital Display System noticed board circuit was carefully designed and implemented in this research work has proved to be efficient and cost-effective. After successful implementation, text messages sent from an authorized Personal Computer or mobile phone, via a wifi network, were received by WIFI modem and consequently, the message were instantly displayed on the LED display board. The design was implemented via a wireless network which eliminates both the unnecessary wired connections and the task of manual reprogramming of the microcontroller whenever a new message has to be displayed. The design utilized the advantage of inbuilt microcontrollers to reduce the size of the design and build the entire system in a lot more compact and mobile form. Also, the design has proven to be cost-effective taking the advantages of inexpensive components and time consumption in completing this research work on time. The digital Display System has been modernized with sophisticated electronic devices which Centre on the urgent needs in our advertising industry. They provide various applications in different aspects of our economy such as Banks, Airport, Restaurants, Superstores, Institutions, Entertainment, Stock Exchange, Market and Directional venue guides. The light emitting diode which constituted of the hardware system is mainly used to display alphanumeric characters and symbols in various systems such as digital clocks, micro wave oven, stereo tuners and calculators.

RECOMMENDATION

Based on the research results, the system can be recommended considering a wireless LED display system for digital display needs. The use of wireless communication techniques, such as Wi-Fi, GSM, GPRS, CDMA, and 5G, can provide secure and reliable connectivity for indoor and outdoor digital signage. Additionally, the selection of the right wireless digital signage solution vendor is crucial for successful, secure, and cost-effective digital signage management. Some specific products and technologies, such as the HD-W60-75 controller, Digi's wireless design services, and purpose-built router options, can be explored for the development of a wireless-based digital display system. This paper describes the selection of an appropriate LED display, a controller system, a communication system, and software for a wireless LED-based display. By considering the information and technologies presented in the paper, you can make an informed decision and choose the most suitable wireless-based digital display system for your specific purpose and requirements for business, offices and organization.

REFERENCES

Qureshi, A.I. (2014). Let make LED matrix displays. Microtronics, Pakistan, pp. 192-194.Augarter, S. (2009). The most widely used computer on a chip, a photographic history of integrated circuit. Ticknor & Fields, New York, pp. 1-2. Bellu, R. (2006). Automobile. All French cars, History & Collections Nr 78s.

Worcester, pp. 1-4. Kapoor, D., Pandey, R., Vaid, R., & Patil, M.V. (2016). Electronic dice using dot matrix display. Thomson Reuters, India, pp. 1-2. Ibrahim, D., & Louis. (2006). 30 projects using pic basic and pic basic pro. Mpg books ltd, Great Britain, pp. 1-3. Fahmy, F.H., Sadek, S.M., Ahmed, N.M.,

Zahran, M.B., & Nafeh, A.S.A. (2010). Microcontroller based moving message display powered by photovoltaic energy. Re & Pad, Egypt, International Conference on Renewable Energies and Power Quality Research, Granada,

Spain.Kasilingnam, G., Ramaligam, M., & Sekar, C. (2014). A survey of light emitting diode (LED) display board. Indian Journal of Science and Technology, 7, 188-185.Pang,

G.K.H., Chan, C.H., & Kwan, T.T.O. (2004). Tricolour light emitting diode dot matrix display system with audio output. University of Hong Kong Annual Journal, pp. 1-10.

Steve, H. (2003). Embedded systems design (2nd edn). Newness, Burlington MA, USA, pp. 11-12. Wikipedia. (n.d.). History of display technology. [Wikipedia]. URL: https://en.wikipedia.org/wiki/History_of_display_technology

Rubadou, B., & Hansen, S.D. (2012). Colour dot matrix proof of concept.

San, H.T., New, C.M., & Tun, H.M. (2014). Implementation of pic based LED displays. International Journal of Electronics and Computer Science Engineering, 3, 191-198.

Linda, L., & Chris. (2012). Discovering computers. University of Florida archived, Chapter 6, pp. 30-35.

Silverstein, L.D., Roosendaal, S.J., & Jak, M.J.J. (2006). Hybrid spatial temporal colouN synthesis and its applications. Journal of Society for Display, 14, 3-1.

Matick, R.E., Link, D.T., Gupta, S., & Dill, F. (2006). All point addressable raster display memory. Journal of Research and Development, 28, 325. Newbiehack. (n.d.). Microcontroller Introduction: A Beginner's Guide to the Atmel AVR Atmega32. URL: www.newbiehack.com/Microcontroller Introduction A Beginners Guide to the AtmelAVRAtmega32.aspxMicrochip Technology Inc. (2008). SMPS AC/DC Reference design user guide. DS70320B, pp. 1-10

Microchip Technology Inc. (2008). SMPS AC/DC Reference design user guide. DS70320B, pp. 1-1