Remote Display

-LED Matrix-

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1 Project Description

1.1 Introduction

The Remote Display utilises a simple static scrolling LED display and make is accessible from a nearby location using the Bluetooth Low Energy (BLE) feature of an Android phone. Using such a feature the user can modify the display at will and with ease, this reduces the time to manually reprogram the controlling unit and does not require any computer. Having remote access makes the display very handy for a users who keeps the display at a non accessible location.

The Remote Display works around a 16x8 RED Light Emitting Diode (LED) matrix which is controlled by the Micro-controller Unit (MCU).

1.2 Hardware

1.2.1 MCU

The remote display is built around a ATmega328P Alf and Vegards RISC (AVR) microcontroller. This MCU is based on advanced Reduced Instruction Set Computer (RISC) [1] architecture, 8 bit MCU and 23 programmable Input and Output Line (I/O) lines. For controlling the REMOTE DISPLAY shift registers are used, 2 for Column and 1 for row, due to shift registers few MCU I/O lines are used.

1.2.2 LED Matrix

Single colour RED 5mm LED used to build the matrix, total of 128 LED required for 16x8 matrix. An array of transistors configured as switch to provide required current for each row of LED matrix.

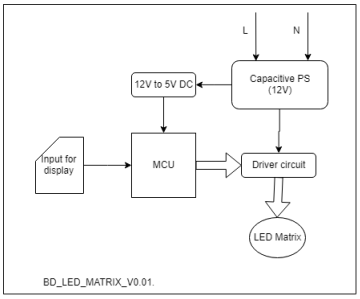

Figure 1: Block Diagram V1.0

1.2.3 Power supply

The project utilises a transformerless capacitive power supply design. Such a design is helpful in reducing the overall cost of project and also utilises fewer components thus saving space and cost.

1.2.4 Input

The project is aimed to dynamically modify the display commands through an input source like computer or BLE. Such a feature helps in modifying the display at will rather than modifying the source code.

2 List Of Tools

2.1 Introduction

Enter some text here

3 Hardware

3.1 Introduction

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3.2 Control Unit

3.2.1 MCU

The MCU is the central processing unit of the system. For this application/project the ATmega328P, by Atmel corporation, provides all the feature required. Following is the list of features [1].

- Advanced RISC architecture
- 32K bytes of in-system self-programmable flash program memory.
- 1Kbytes EEPROM.
- 2Kbytes SRAM.
- Two 8-bit Timer/Counters
- One 16-bit Timer/Counter

- Six PWM channels
- 8-channel 10-bit ADC
- USART
- Master/slave SPI
- I2C
- watchdog timer
- On-chip analog comparator
- Six sleep modes

3.2.2 Oscillator Circuit

3.2.3 Reset

3.2.4 Port Assignment

3.2.5 Voltage Level Indicator

3.2.6 Display Intensity controller

3.3 Power Supply

3.3.1 Power Switch

3.3.2 Capacitive Power Supply

3.3.3 Filter

3.3.4 voltage Regulation

3.3.5 Current Consumption

3.4 LED Matrix

3.4.1 LED

3.4.2 Transistors

3.4.3 Shift Registers

3.5 Input

4 Software

4.1 Introduction

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5 PCB Design

5.1 Introduction

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6 Mechanical CAD

6.1 Introduction

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Acronyms

AVR Alf and Vegards RISC. 1

BLE Bluetooth Low Energy. 1, 2

I/O Input and Output Line. 1

LED Light Emitting Diode. 1

MCU Micro-controller Unit. 1

References

[1] Atmel Corporation, 1600 Technology Drive, San Jose, CA 95110 USA. *ATmega328P Datasheet.*