7" Character Height 7-Segment LED Information Board

User's Guide

7" CHARACTER HEIGHT 7-SEGMENT LED INFORMATION BOARD USER'S GUIDE

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NOTES:

Product Version : Ver 3.1

Document Version : Ver 1.0

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Chapter 1. Overview

1.1 Overview

4 digits 7segment panels are manufactured by Sure Electronics. This series includes 5 different size panels, they are 1.5inches, 1.8inches, 2.3inches, and 4inches, 7inches (character height). All those panels are driven by SPI like interface and all work in full static mode. They are easy to be interfaced to any Microcontrollers. They could be widely used in panel meters, big clocks and any other information display usage.

Sure Electronics providing series of such information boards is to reduce your development time and make them standard. In this series, most boards are 4 digits and static, if customer need any special digits and special size ones, could contact us with the contact information at the end of this document. The 7 inch character height one is 1 digit/board.

This document is used to describe how to use 7inches character height panels.

FIGURE 1-1 OVERVIEW

1.2 Features

- 1 digit 7-segment 7inch LEDs are installed on this panel. Those segments are common anode type.
- 2*10pin interfaces for power serialization and data transfer. Data is input from J1 and flow out from J2.
- A 74HC00 NAND chip is used to buffer CLK_IN and DIMM_IN control signal.

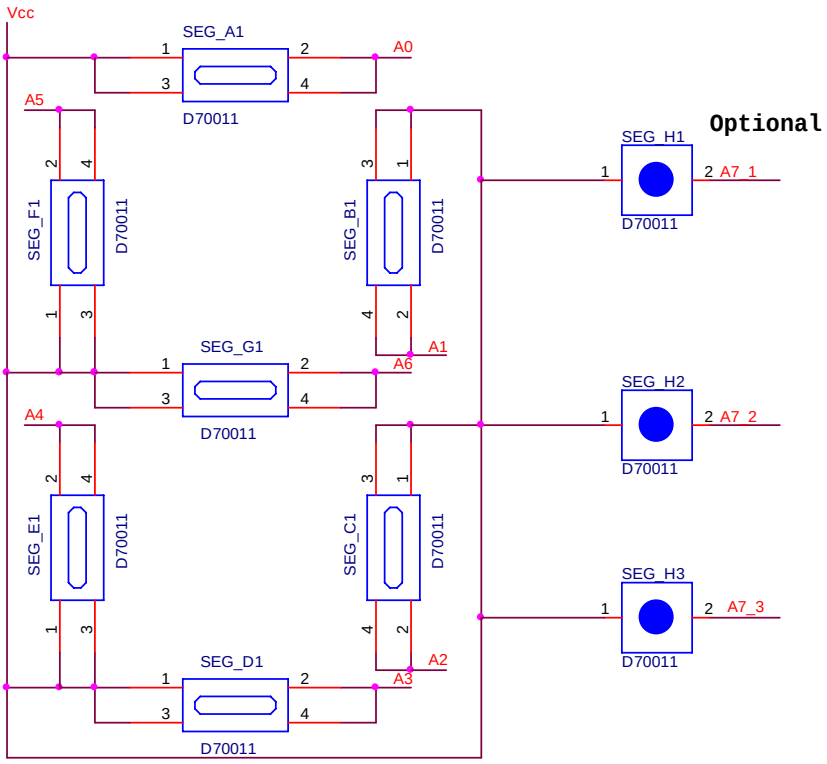
- LED driver chips are 1pcs of 74HC595 and 1pcs of ULN2003 connected to them, and they are serialized to each other. The first chip accept data from Microcontroller or the board ahead, the final chip shift data to next boards. Data should be clocked in from CLK_IN and DATA_IN in J1, and DIMM_IN pin should be pull to low to enable display. ULN2003 is used to drive the cathode of those led segments.

Chapter 2. Hardware Detail

2.1 7-segment LED

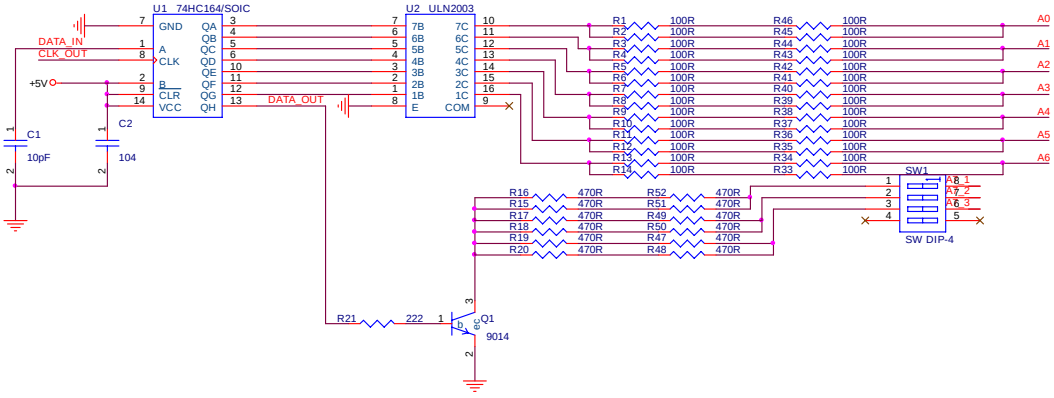
1 Digits of 7 inch, common anode, high brightness red 7-segment LEDs are installed on this board. They are marked as SEG_A1 - SEG_G1, SEG_H1, SEG_H2 and SEG_H3.

FIGURE 2-1 7-SEGMENT LEDS



2.2 Shift Register Data Driver

FIGURE 2-2 SHIFT REGISTER DATA DRIVER



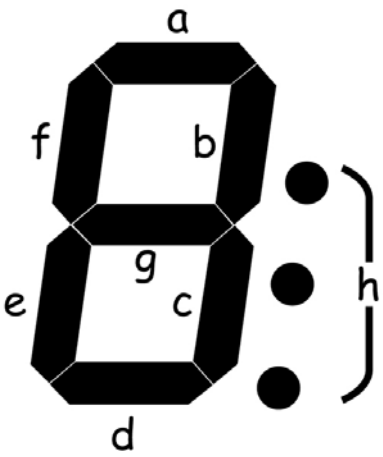
74HC595 is used as a shift register in this board, marked as U1. The parallel output of those 74HC595 was connected to the base of ULN2003, and collector of those ULN2003 was connected to the LED segments. CLK_OUT is driven by a buffered output from CLK_IN with 74HC00. DATA_IN is data input pin of the first 74HC595, then

74HC595 of cascaded boards will be serialized. All those pins accept only CMOS signals. DIMM_IN signal is for brightness control usage, you could add simple on/off or PWM signal on this signal, when this signal is set to low, all segments will light on if valid data is shifted out from the 74HC595 chip. If you are changing the data in the 74HC595 driven chip, set this pin to low then the hash signal will not affect the display. Of course if you want to adjust the brightness of those LEDs, PWM signal could be applied on the DIMM_IN pin. It is buffered with a 74HC00, and DIMM_IN signal will drive this board and next. Once you clocked in correct data through these 2 pins, and ensure that PWM signal or ON/OFF signal were applied correctly on the DIMM_IN pin, the board will begin display.

TABLE 2-1 CODING RULES

Low Bit	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5	Bit6	Bit7	High Bit
-	a	b	c	d	e	f	g	h	-

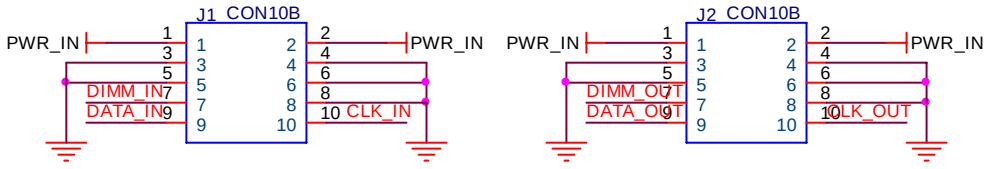
FIGURE 2-3 CODING RULES



Take  for example, the binary code is 0b00000110=0x06.

2.3 Data Ports Definition

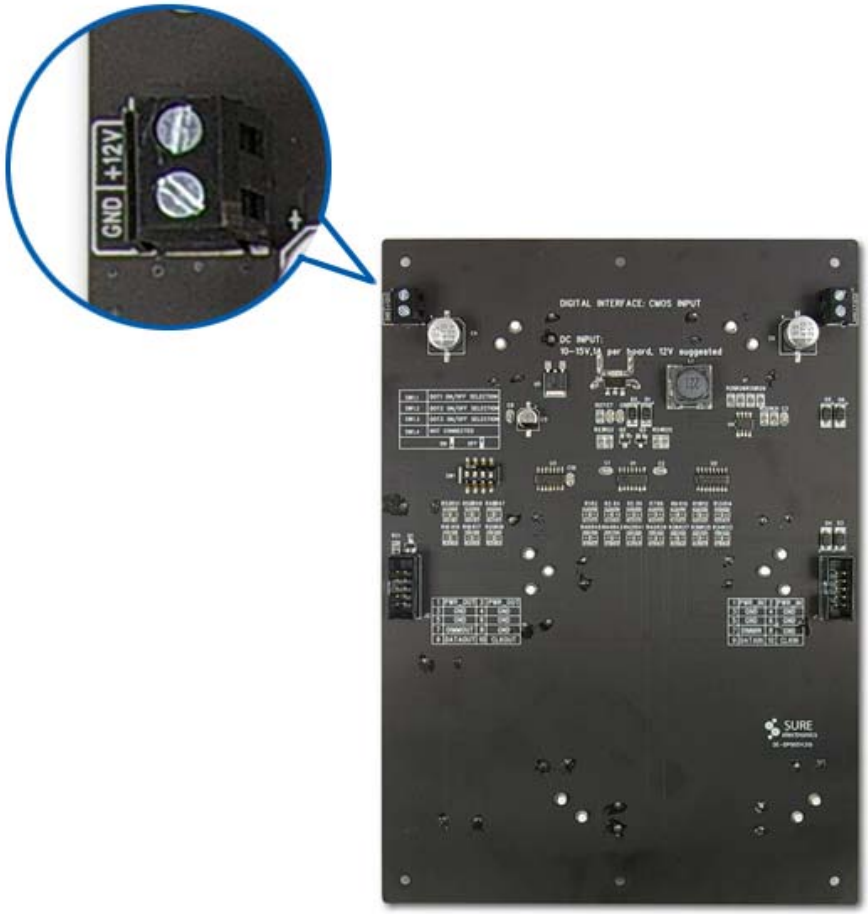
FIGURE 2-4 DATA PORTS DEFINITION



2 IDC sockets are located on the board. They are data input and output interface, marked as J1 and J2. The definition is shown in Figure 12. When the board is working separately, connect J1 to the Microcontroller board and leave J2 open. If lots of same boards were in series, connect each board's input to another's output. Then you could connect up to 20 boards in series. Notice if over 4pcs of such boards were serialized, you must add auxiliary power cable to some boards to enhance the current transfer.

2.4 Auxiliary Power Port

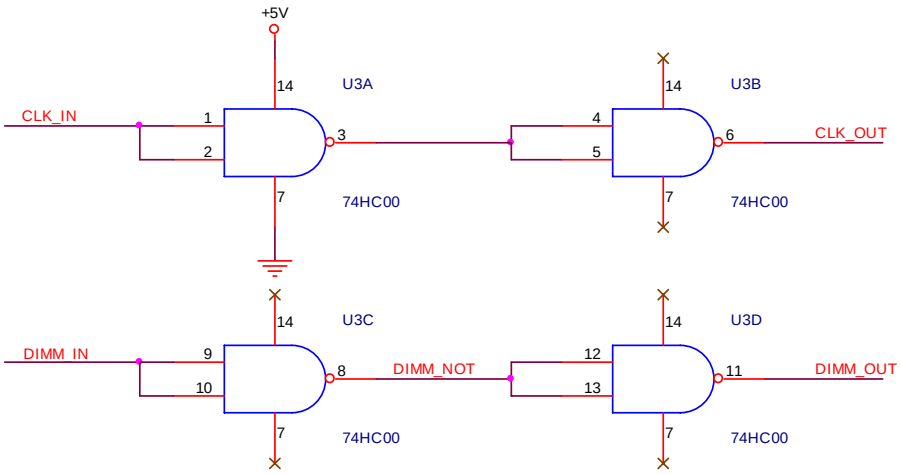
FIGURE 2-5 AUXILIARY POWER PORT



There are 2 auxiliary power ports on this board. If you use less than 4pcs of such boards in series, you could simply use a 10pin IDC flat cable to connect those boards. But if over 4 boards connected together, you must add additional power supply to some of those boards, or the current may be lacking. Just apply +12V to some boards on the AUX power port. And be sure the polarity is correct.

2.5 Data Buffer

FIGURE 2-6 DATA BUFFER



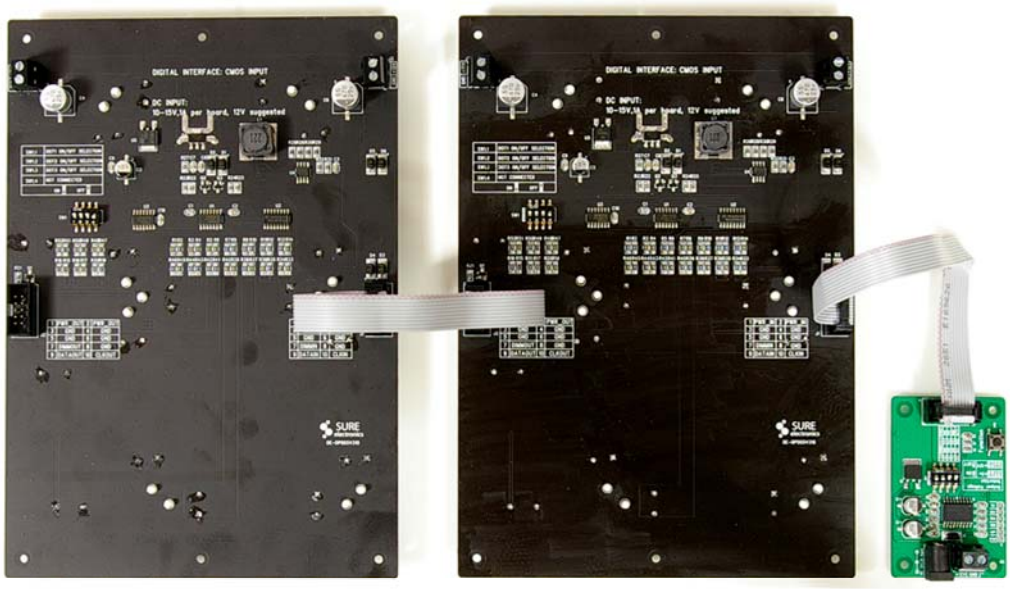
74HC00 chip is used to buffer Clock and DIMM signal in this board. A CMOS chip is not

able to drive over 10pcs CMOS input if the cable is so long, here 74HC00 is used as NOT gate, and 2 gates in series is a buffer.

2.6 Connection in Series

To cascade our signal enhancing board, please refer to the specific connection diagram as follows:

FIGURE 2-7 CONNECTION IN SERIES



Chapter 3. Electrical Characteristics

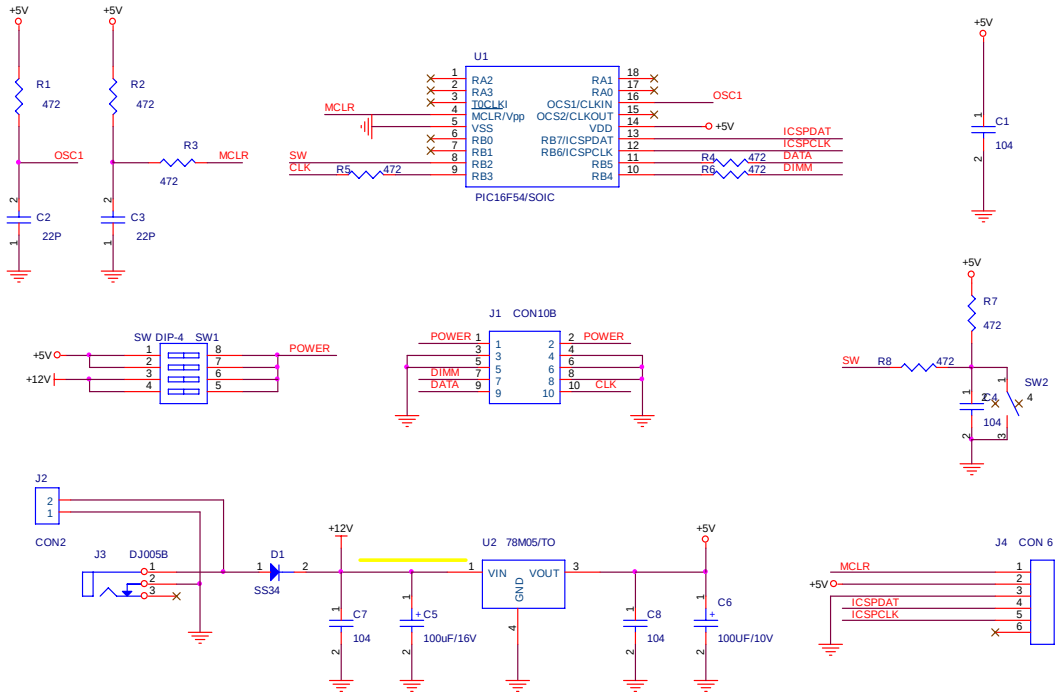
ELECTRICAL CHARACTERISTICS

- Power Supply: DC5V-12V 0.2A/pcs (Maximum). For each additional panel, add another 0.2A. If voltage is less than 5V, the brightness would not be enough.
- For over 4 panels, user must add auxiliary power on the auxiliary power, or the 10pin communication port could not carry so much current.
- Maximum clock freq:
  1MHz, 4 boards serialized
  100kHz, 20 boards serialized
- If the communication speed is too high, it may cause communication problems.
- Suggested Refresh Rate:
  Less than 10Hz if DIMM is not used
  Less than 50Hz if DIMM is used.
- Drive Current/segment: 10mA +3mA/-2mA, this value may be changed based on the production batch, and the dot uses different current.
- Drive Method: Fully static.
- Connection Method: 74HC164 in series, SPI like interface.
- Maximum Cascade Level: clock less than 100KH when 20 boards in series.
- Interface Voltage Level: VDD*0.8-VDD+0.5V, standard CMOS level. If you need TTL/CMOS compatible interface in batch, please contact us but the quantity should be no less than 100pcs.

Chapter 4. Sample Codes

4.1 LED Segment Drive Demo Board's Schematic

FIGURE 4-1 LED SEGMENT DRIVE DEMO BOARD'S SCHEMATIC



4.2 How to Connect Load

FIGURE 4-2 CONNECT LOAD

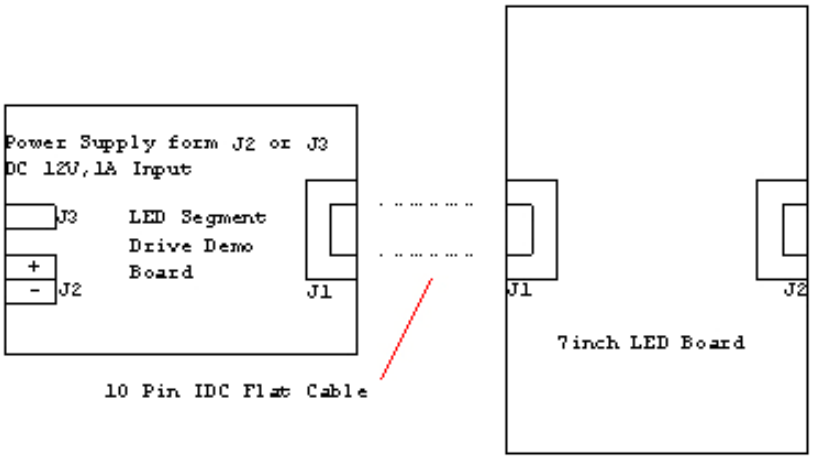
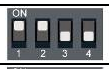
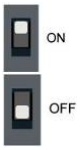


TABLE 4-1 ENCODER POSITION SETTING

Output Voltage	DIP Switch Settings	
5V	 +5V	
12V	 +12V	
0V	 +0V	

Note:

1. DIP switch only has the 3 ways as shown above to work; any other switching ways are prohibited.
2. Users shouldn't change the voltage while LED Segment Drive Demo Board is working. It is only allowed to change it before applying the current.

4.3 How to Display Data with PIC16F54 and PICC9.60 Environment

Source code is shown below.

TABLE 4-2 SOURCE CODE

C code:

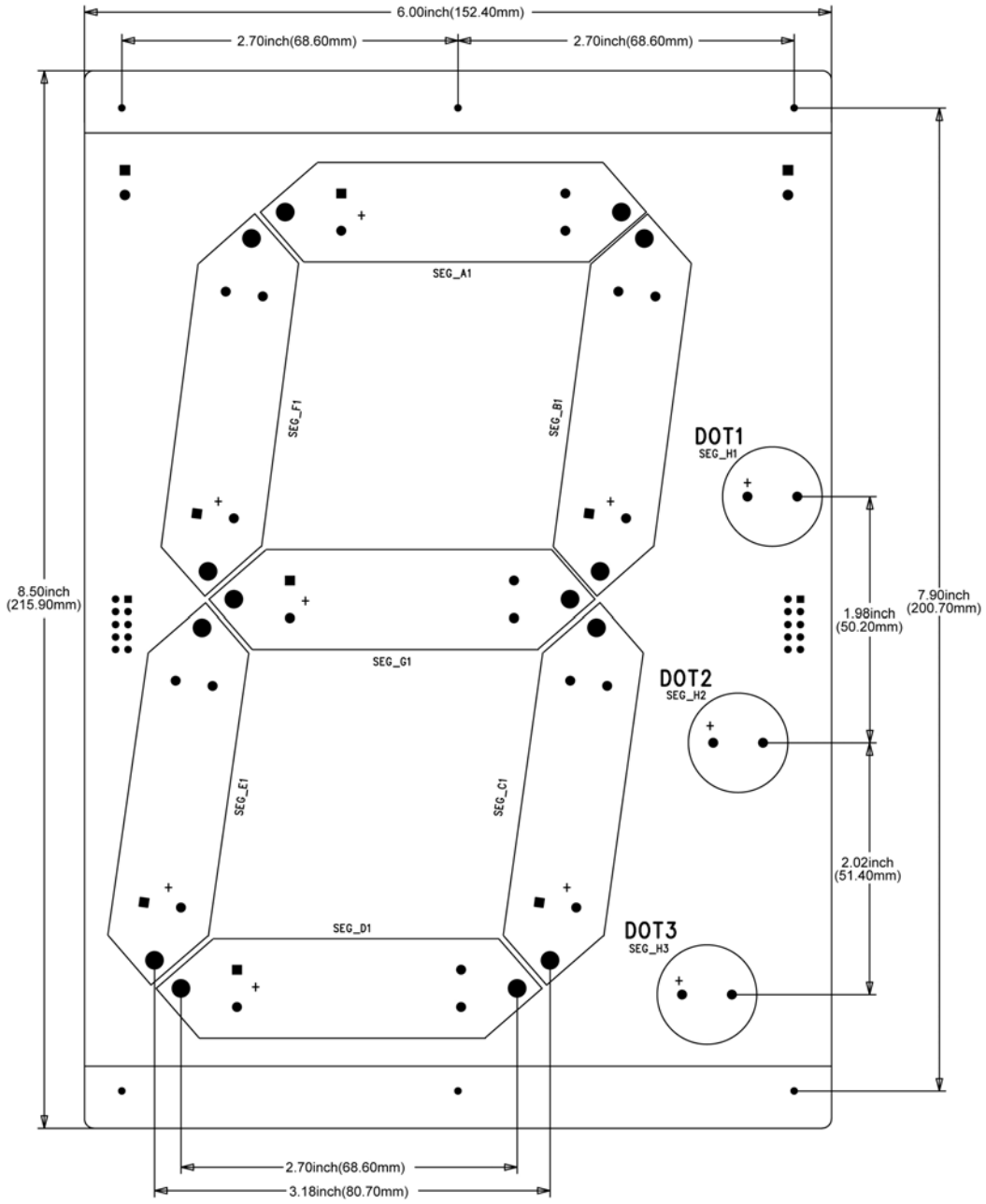
```
#include<pic.h>

__CONFIG(RC & WDTEN & UNPROTECT);

#define uchar unsigned char
#define uint unsigned int
#define DATA RB5
#define CLK    RB3
#define EN     RB4
#define keydown RB2

const uchar
TAB[19]={0x06,0x5b,0x4f,0x66,0x6d,0x7d,0x07,0x7f,0x6f,0x3f,0x01,0x02,0x04,0x08,0x
10,0x20,0x40,0xff,0x00};

uchar n;
uchar flag_g;
void delayus(uchar i)
{
      while(i--);
}

void init(void)
{
       TRISA=0;
       RA2=1;
       TRISB=0B00000100;
       CLK=0;
       OPTION=0B11000111;

       n=0;
       flag_g=0;
}

void sent_data(uchar sdata)
{
       uchar i;

       EN=1;
```

```
      for(i=0;i<8;i++)
      {
            CLK=0;
            delayus(5);
            if((sdata&0x80)==0x80) DATA=1;
           else DATA=0;
           sdata=(sdata<<1);
           CLK=1;
           delayus(5);
      }
            CLK=0;
      EN=0;
}

void delaytime(uchar i)
{
    uint j;
     for(;i>0;i--)
          for(j=0;j<400;j++)asm("clrwdt");
}


void scankey(void)
{
      uchar i,j;
      if(keydown==0)
      {
           delaytime(25);
           if(keydown==0)
          {
           while(keydown!=1) asm("clrwdt");
                 n++;
                 n=n%18;
                 for(i=0;i<19;i++)
                       {
                       for(j=0;j<16;j++)
                             {
                              sent_data(TAB[i]);
                             }
                             delaytime(200);
                       }
           }
       }
}

void main()
{
      init();
      while(1)
       {
           asm("clrwdt");
           scankey();
       }

}
```

Chapter 5. Mechanical Drawing

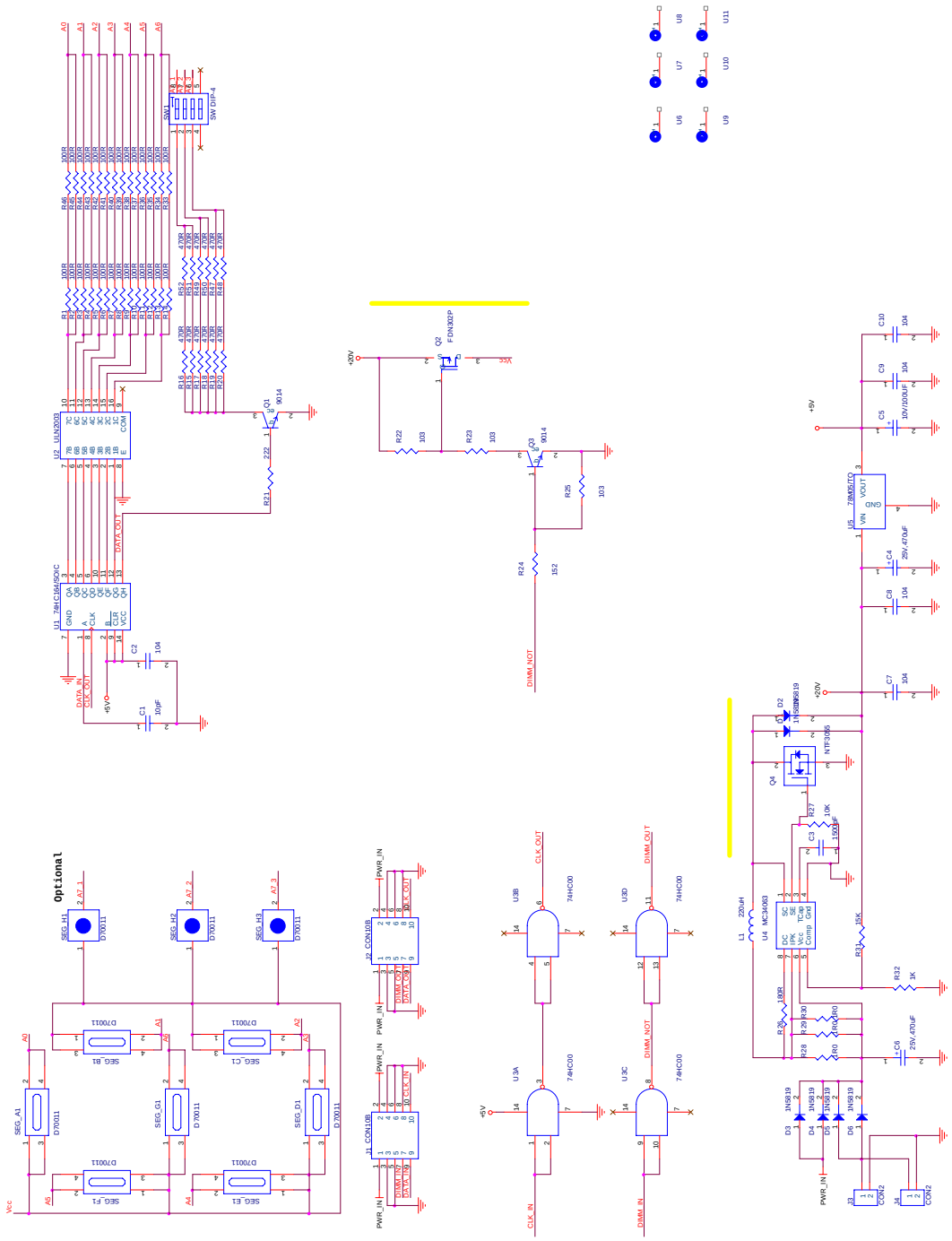
5.1 Mechanical Drawing

FIGURE 5-1 MECHANICAL DRAWING



5.2 Schematic

FIGURE 5-2 SCHEMATIC



Chapter 6. Contact Us

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