



AVR&PIC DEM 2

User's Guide

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NOTES:

AVRDEM Product Version : Ver 1.1

PICDEM Product Version : Ver 2.1

Document Version : Ver 1.0

Chapter1.Overview and Main Feature

1-1. Gallery

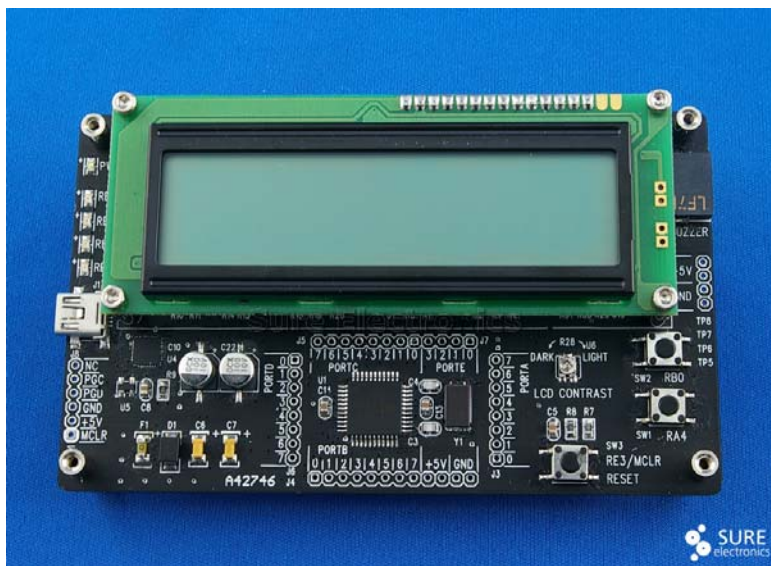
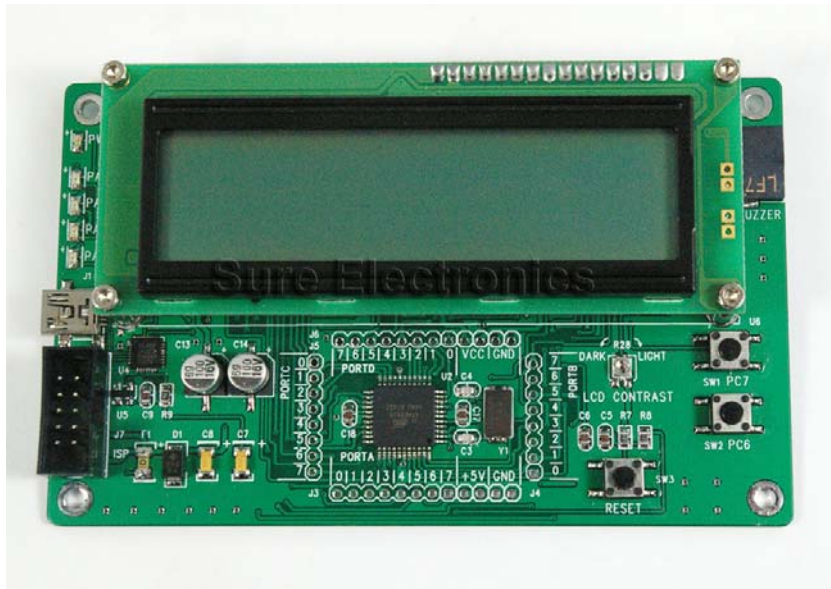


Figure1 AVRDEM Top View with LCD Module

Overview and Main Feature

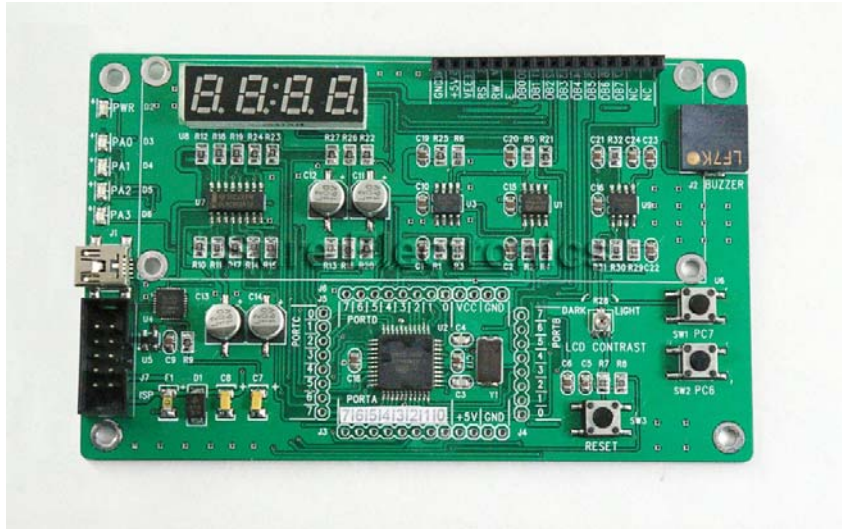


Figure3 AVRDEM Top Views without LCD Module

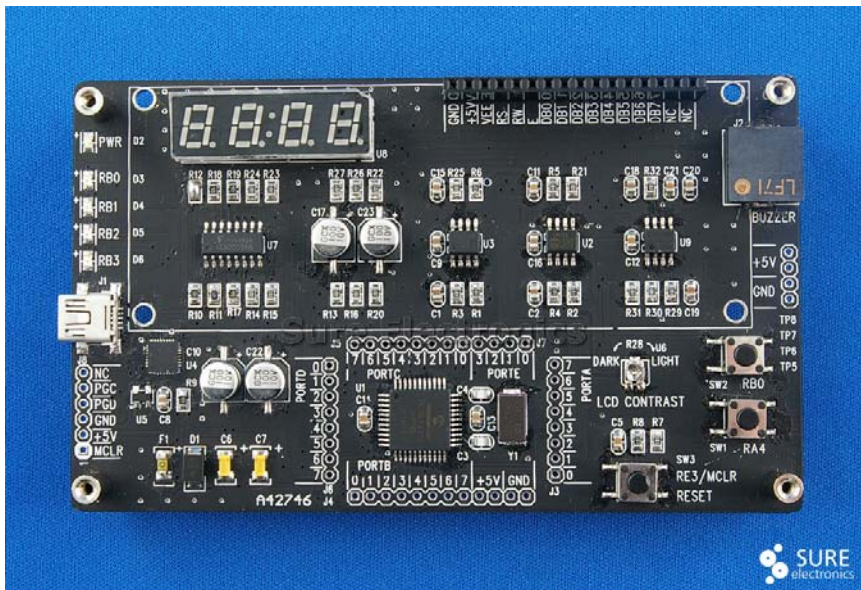


Figure4 Top Views without LCD Module

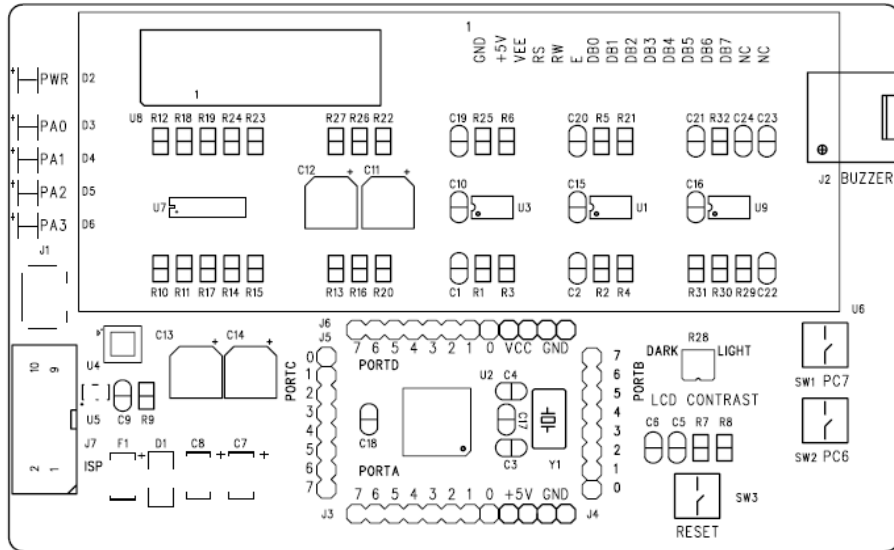


Figure5 AVRDEM Parts Layout

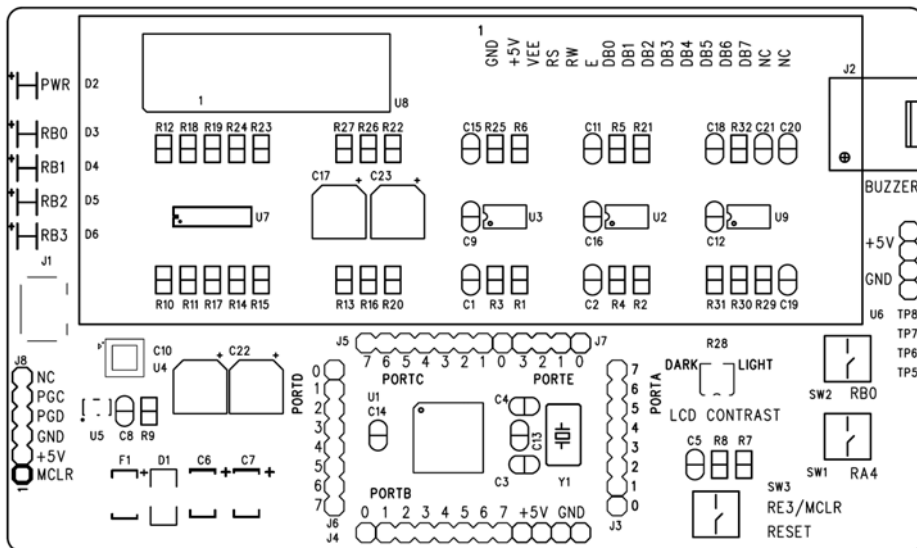


Figure6 PICDEM Parts Layout

1-2. Main Features

- Mini USB power supply.
- ATMEGA16 microcontroller on AVRDEM board. PIC18F4520-I/PT microchip on PICDEM board. It may be replaced by PIC18LF4520 or 16F877A microchip. All the I/O ports are drawn out for convenient reach.
- 12 MHz high-speed crystal oscillator.
- 10 pin ISP socket on AVRDEM board. 6 pin ICD/ICSP socket on PICDEM board.
- 24C02N IIC EEPROM on board.
- LM75 IIC digital temperature sensor.
- There is a 24*2 character LCD module on AVRDEM board and a 16*2 character LCD module on PICDEM board. Pre-installed 4-digit 7-segment LEDs is under the LCD module. They could be workable after removing LCD module.
- Use ULN2003 Darlington transistors array to drive LED segments and speaker.
- LCD module contrast can be adjusted by LM358 dual OP-Amps or Potentiometers R28
- There are 3 function keys SW1, SW2 and SW3 connected to RESET, PC7 and PC6 pins of ATMEGA16 microcontroller on AVRDEM board, but RA4, RB0 and RE3/MCLR pins of PIC18F4520 microcontroller on PICDEM board.
- One Power indicator (Green). Four red port indicators are connected to PA0-3 ports of ATMEGA16 microcontroller on AVRDEM board, but RB0-3 ports of PIC18F4520 microcontroller on PICDEM board.

Chapter2. Getting Started

2-1. Install the driver of CP2102 single-chip USB to UART Bridge

All the corresponding software/drivers, their installation instructions and how to build a project with the program software can be found on our web under the General Software menu.

2-2. Application Notes

LCD Module

Power provided by the USB, and connects to the USB. Then the demo board will keep running.

- When power on, Sure Electronics and Ver1.1 (AVRDEM)/Ver2.1 (PICDEM) will be displayed first.
- "Sure Electronics" will always be displayed on Line1 of LCD. The displaying information on Line2 of LCD should be changed as SW1 (AVRDEM)/SW2 (PICDEM) is pressed down. That is the current centigrade temperature, current Fahrenheit temperature and contrast percentage should be shown in turn.
- When Contrast percentage is displaying, its value can be increased by 10% degrees as SW2 (AVRDEM)/SW1 (PICDEM) is pressed down every time.
- Send temperature information to PC about every 10 seconds, if the board is connected to the personal computer, and then you could see information in Hyper Terminal like the following.

Current Temperature

11.6Centigrade

24.0Fahrenheit

Here, 11.6 and 24.0 is only a sample temperature data.

LED Segments

Remove the LCD module from the board. Power provided by the USB, and connects to the USB. Then the demo board will keep running.

- When power on, Sure Electronics and Ver1.1 will be displayed first.
- The displaying information on LEDs should be changed as SW1 (AVRDEM)/SW2 (PICDEM) is pressed down once a time. The displaying information include "SurE", "1.1", centigrade temperature value, and Fahrenheit temperature value.

Getting Started

➤ When SW2 (AVRDEM)/SW1 (PICDEM) is pressed down, all the information, that is “SurE”, “1.1”, centigrade temperature value, and Fahrenheit temperature value, should be shown in turn.

➤ Send temperature information to PC about every 10 seconds, if the board is connected to the personal computer, and then you could see information in Hyper Terminal like the following.

Current Temperature

11.6Centigrade

24.0Fahrenheit

Here, 11.6 and 24.0 is only a sample temperature data.

Notice:

If ATMEGA16 microchip on AVRDEM board should be programmed by AVRSTK500 programmer, demo board should be powered on before the 10-pin ISP socket being injected into program interface. Otherwise programming may be failed.

2-3. How to Communicate between PC and Demo board

This demo board can transmit temperature information to PC every 10 seconds. You should install CP2102 driver first. Then check which port that demo board is connected to. Following step show you how to find the port (COM & LPT).

➤ How to find the right communication port

Right click “My Computer” icon to choose “Properties” option or press Windows + Break shortcut key to open “System Properties” screen as follow.

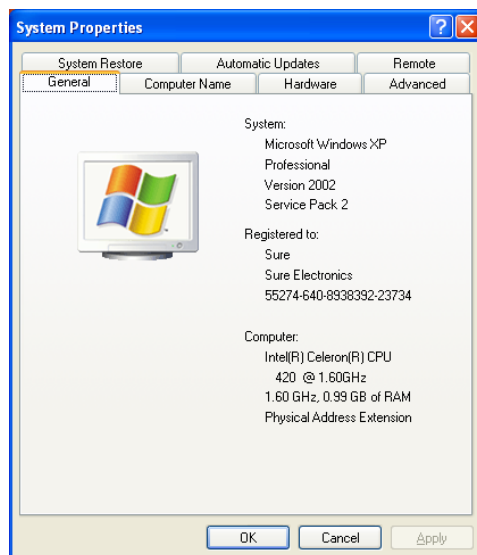


Figure7

Click “Hardware” button

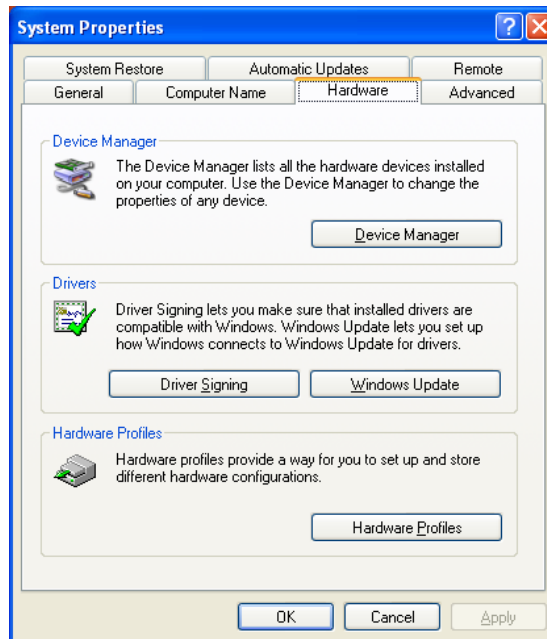


Figure8

Click “Device Manager” button to display Device Manager screen.

Find a port like “Silicon Labs CP210x USB to UART Bridge (COM6)”. Here COM6 is just an example. Different PC may have different COM.

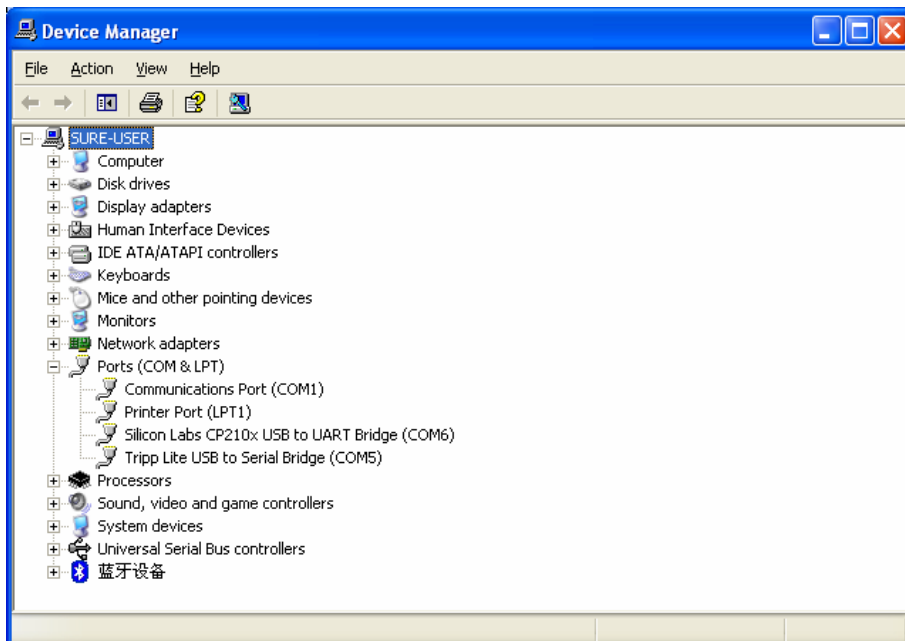


Figure9

➤ Communication via Hyper Terminal

Getting Started

After the board being connected to personal computer, you could see below information in Hyper Terminal (Start Menu→ All Programs→ Accessories→ Communications→ Hyper Terminal).



Figure10

Write a name on the dialog box. Click OK to display setting dialog box as follow.



Figure11

Choose the right port. “OK” to display the follow screen.

In the corresponding communication port properties dialogue box choose right Baud Rate. Default Baud Rate is 57600. Click “OK” button to connect demo board to PC. Then information will be shown in the Hyper Terminal window.

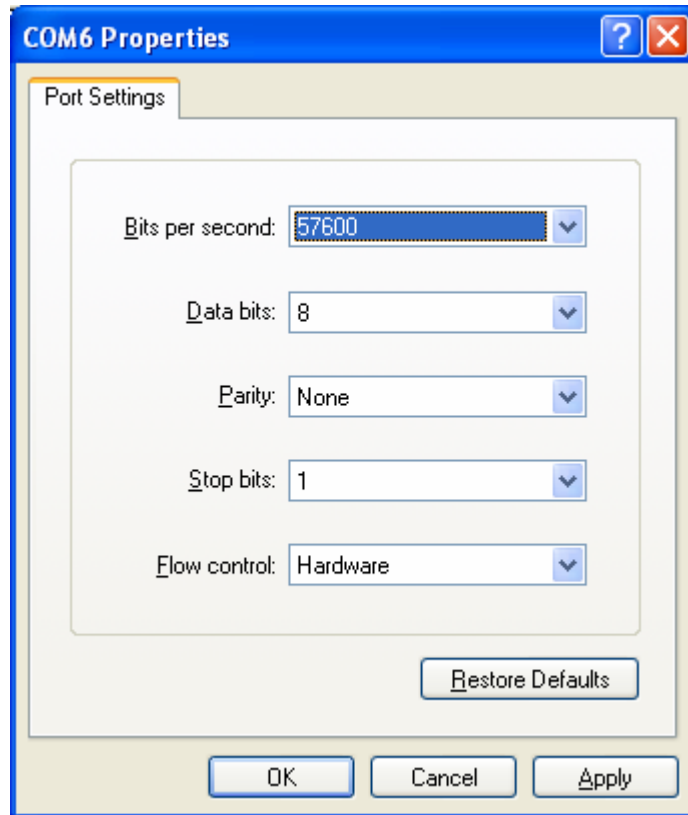


Figure12

In the corresponding communication port properties dialogue box choose right Baud Rate.

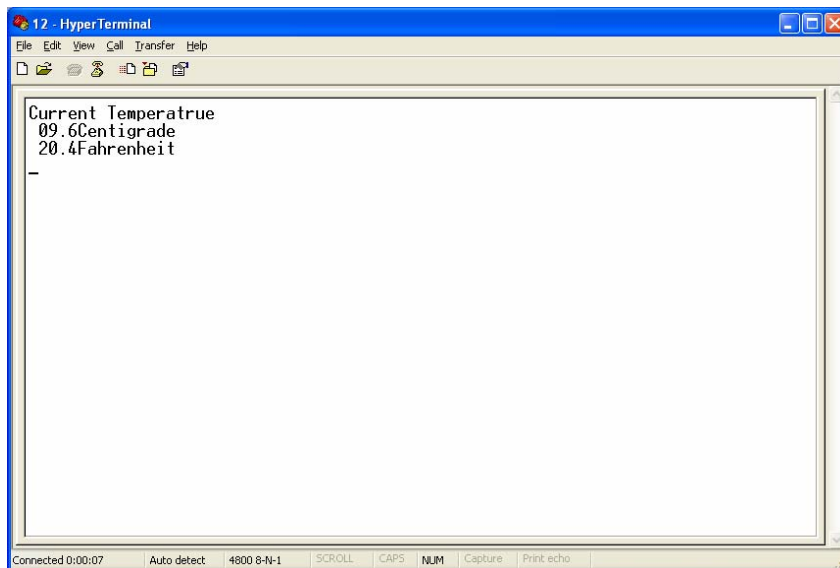


Figure13

Chapter3. Hardware Detail

3-1. Schematic

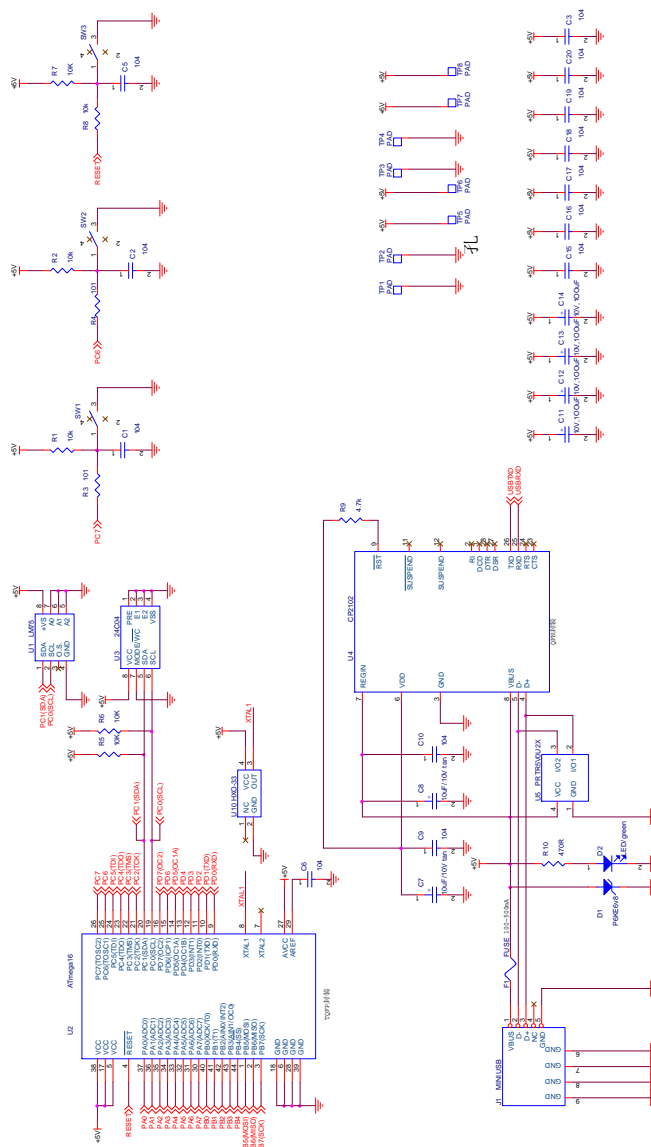


Figure14 Schematic of Main controller, Power and Keypad of AVRDEM

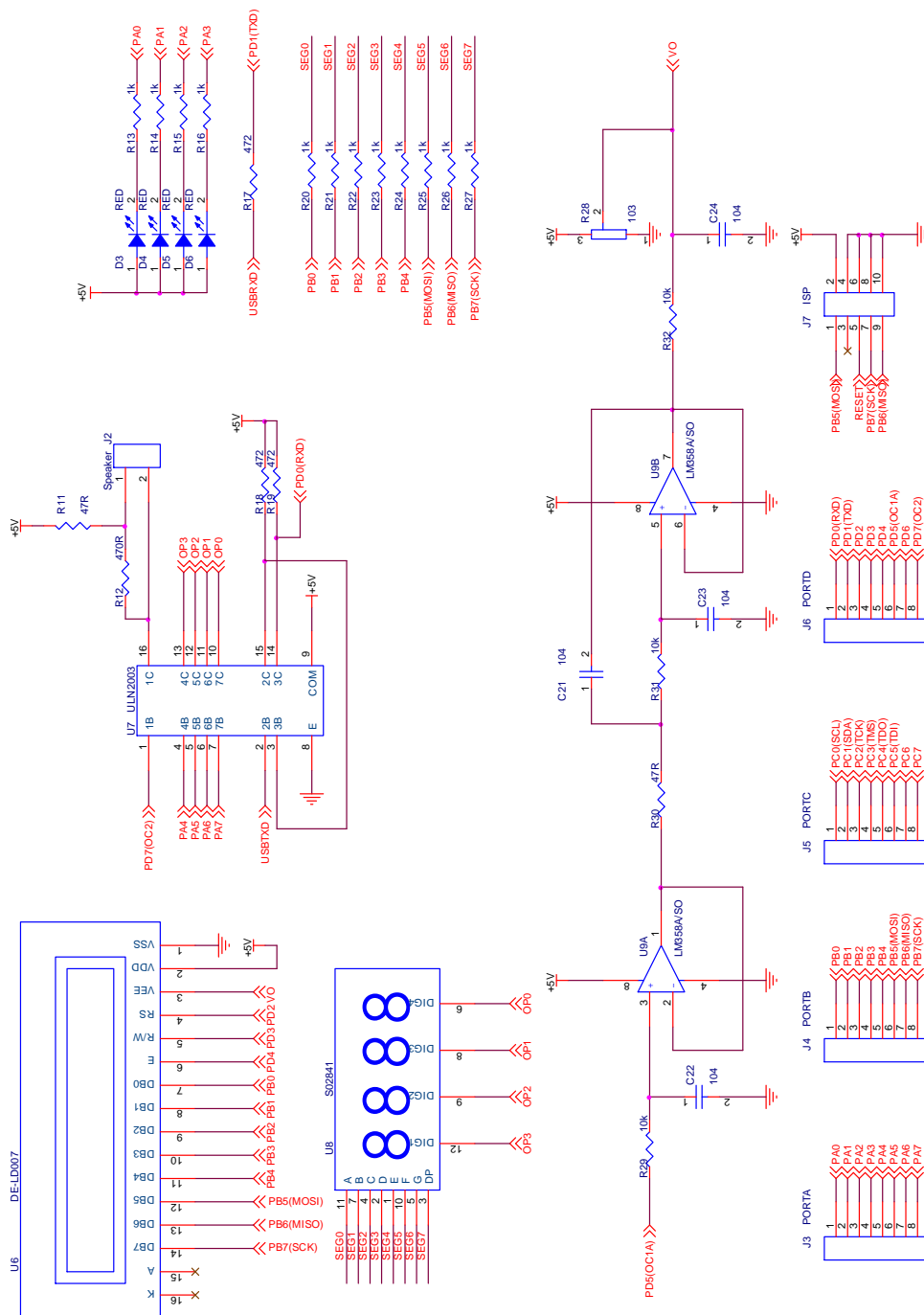


Figure15 Schematic of LED and LCD Module of AVRDEMO

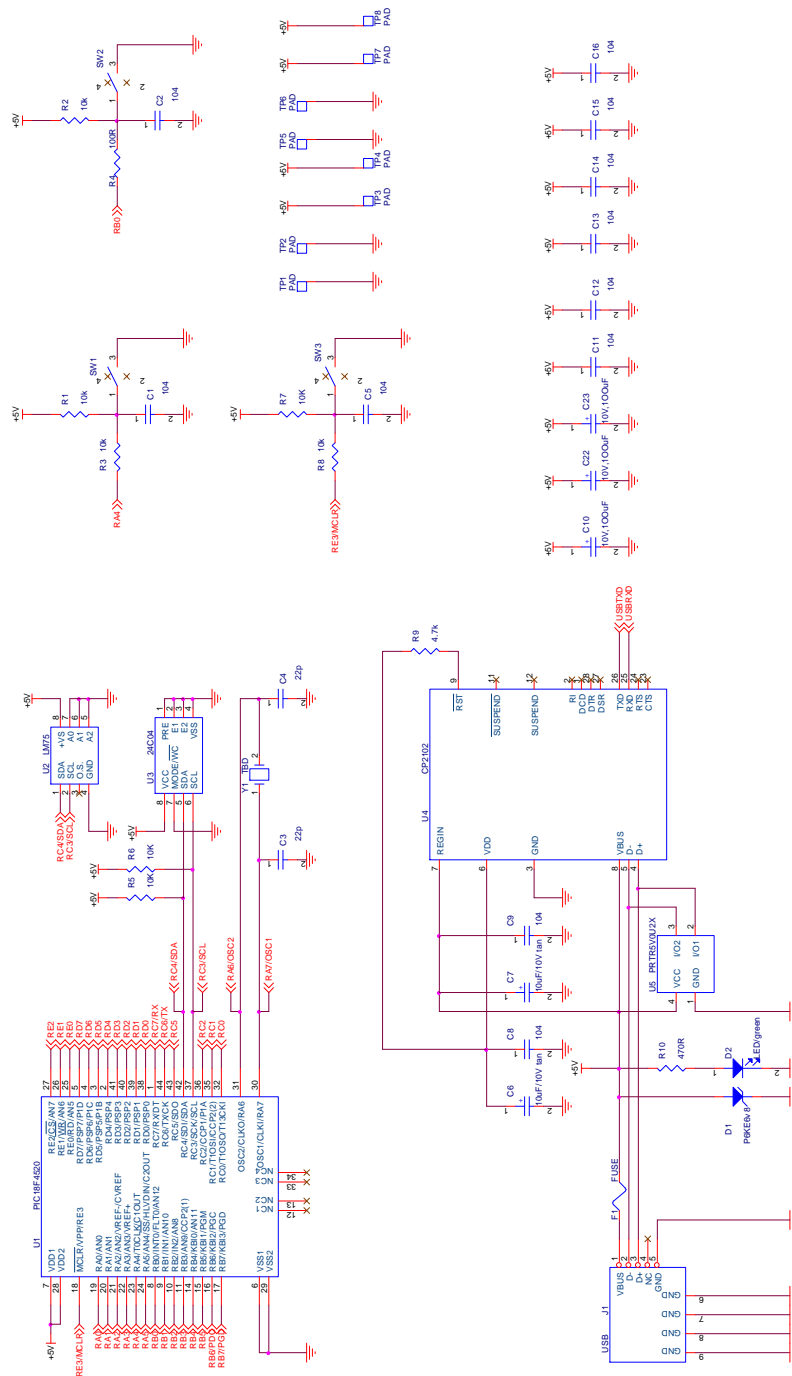
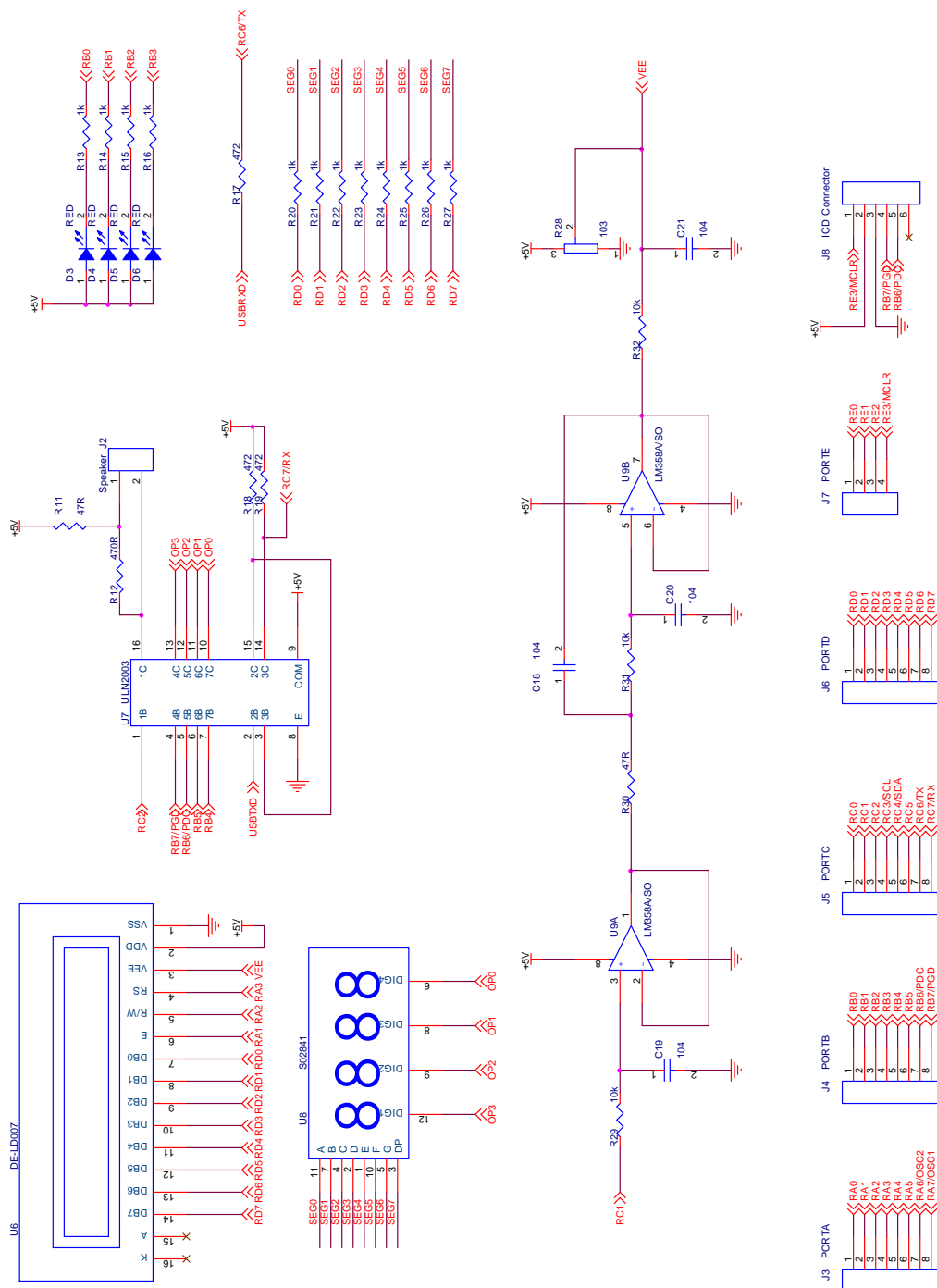
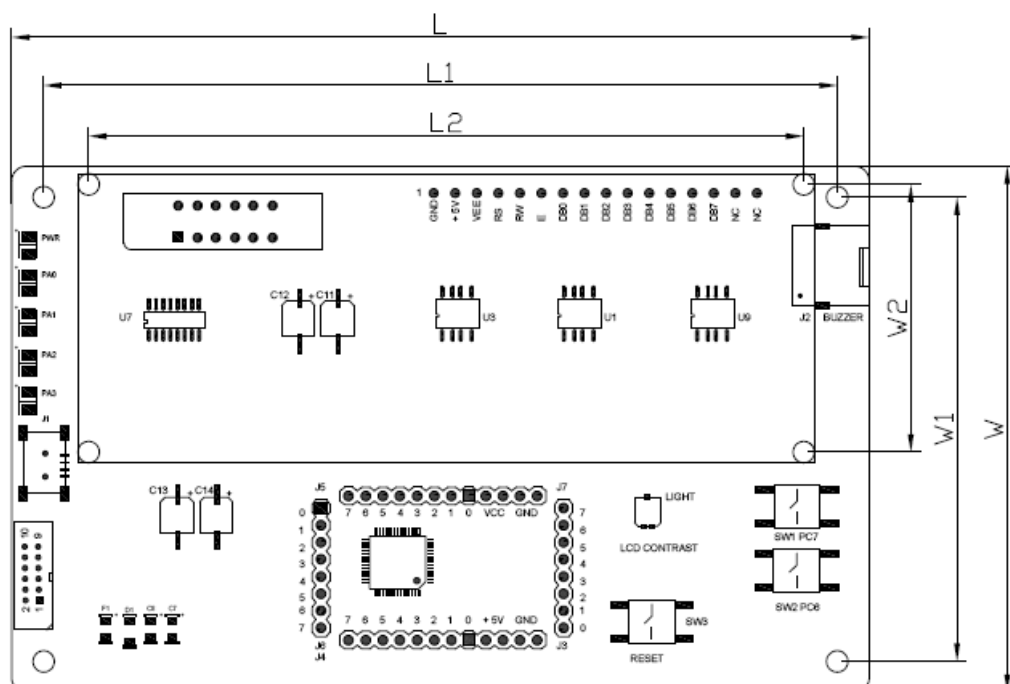


Figure16 Schematic of Main controller, Power and Keypad of PICDEM Board

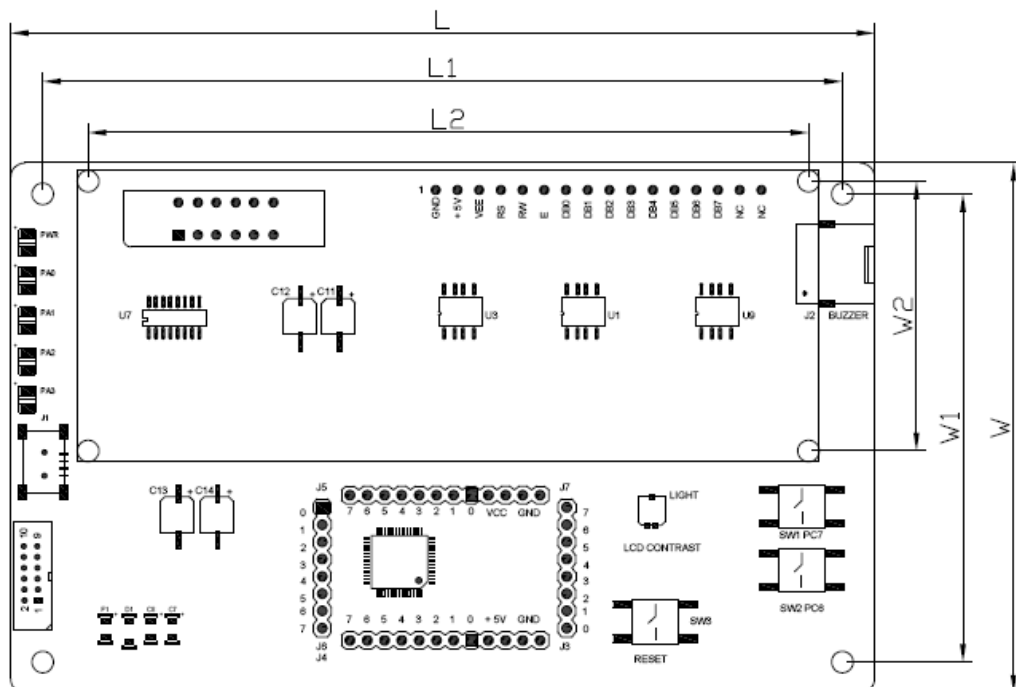


3-2. Physical Dimension



Symbol	L	L 1	L 2	W	W1	W2
Inch	4.70	4.35	3.82	2.89	2.55	1.41
mm	119.38	110.49	96.93	73.36	64.77	35.71

Figure18 Physical Dimension of AVRDEM 2 PLUS



Symbol	L	L 1	L 2	W	W1	W2
Inch	4.70	4.35	3.82	2.89	2.55	1.41
mm	119.38	110.49	96.93	73.36	64.77	35.71

Figure19 Physical Dimension of PICDEM 2 PLUS

3-3. Electric Characteristics

Power Supply: MiniUSB

DC Current per I/O Pin: 20.0mA sink and draw

Maximum Tested Baud Rate on MiniUSB Port: 115k bps

Operating Temperature: -10°C to +55°C

Storage Temperature: -20°C to +75°C

3-4. Port Definition

3-4-1. Power Supply Port

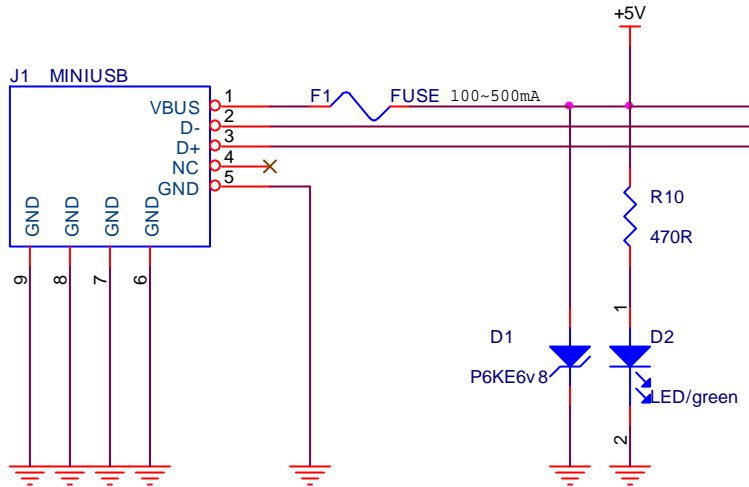


Figure20

J1 is the MiniUSB power supply adapter socket.

3-4-2. Speaker Port

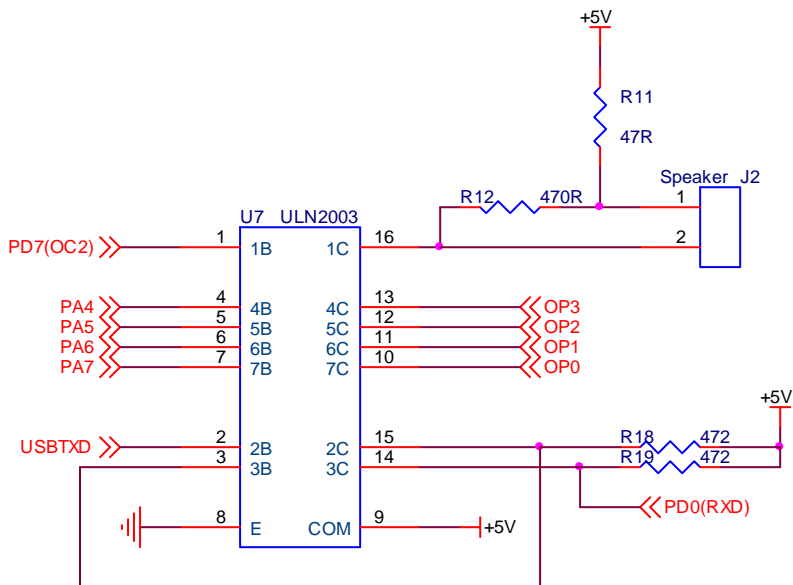


Figure21 Speaker Driven Circuit on AVRDEM Board

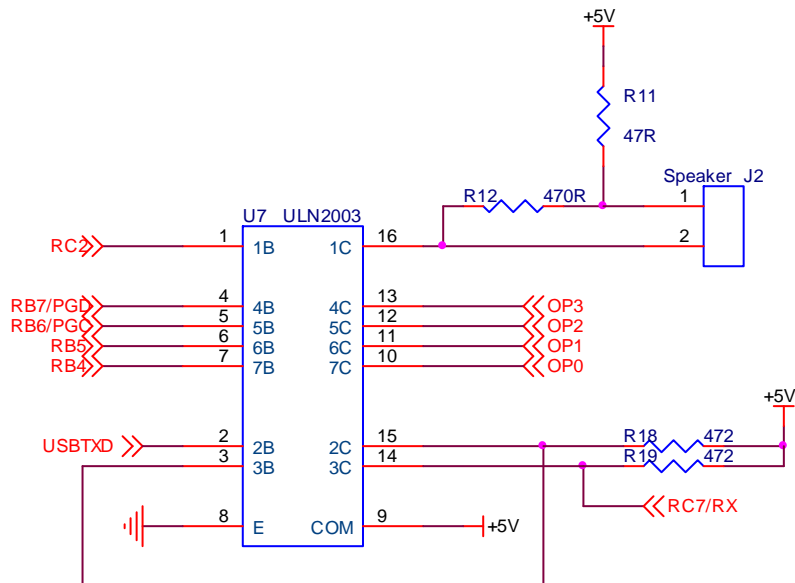
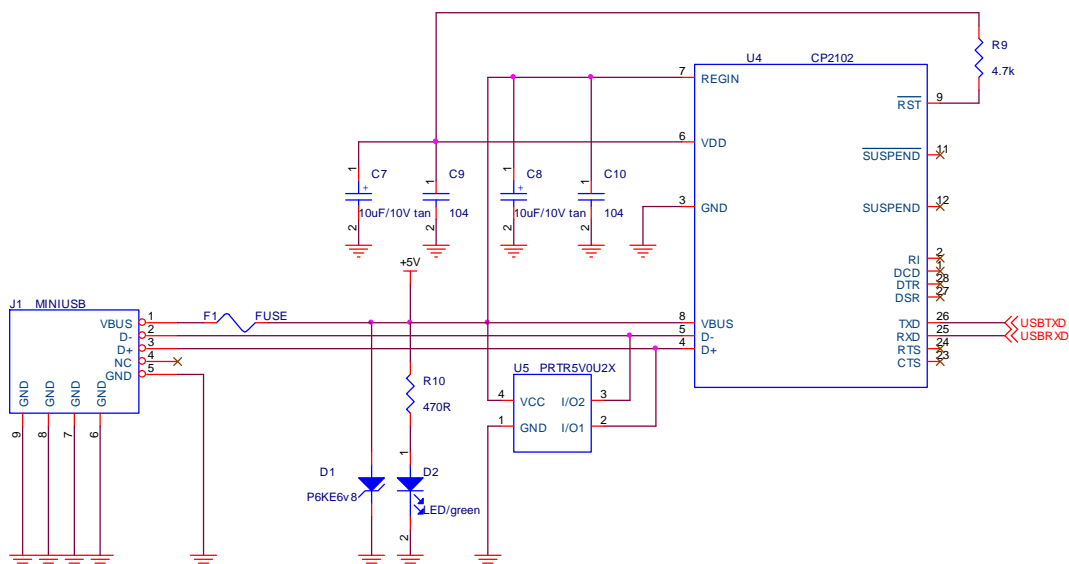


Figure22 Speaker Driven Circuit on PICDEM Board

J2 is the speaker on this demo board, as shown in Figure23/24. PWM output of the microcontroller has been connected to a NPN transistor amplifier built in ULN2003. User could adjust PWM wave to change the freq of the speaker beeping, and could adjust the sound loudness by tune the duty of PWM wave.

3-4-3. USB Port



Hardware Detail

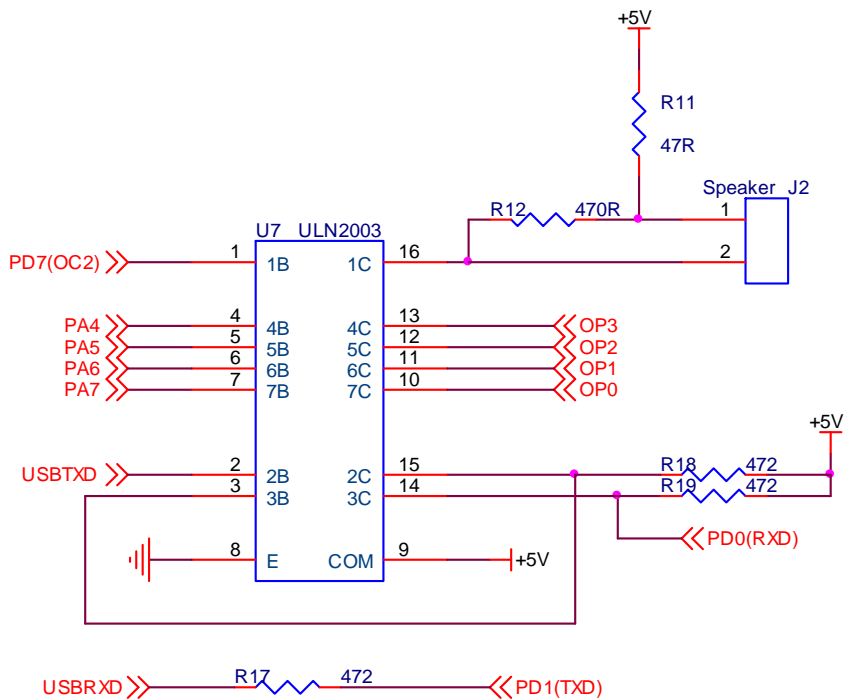
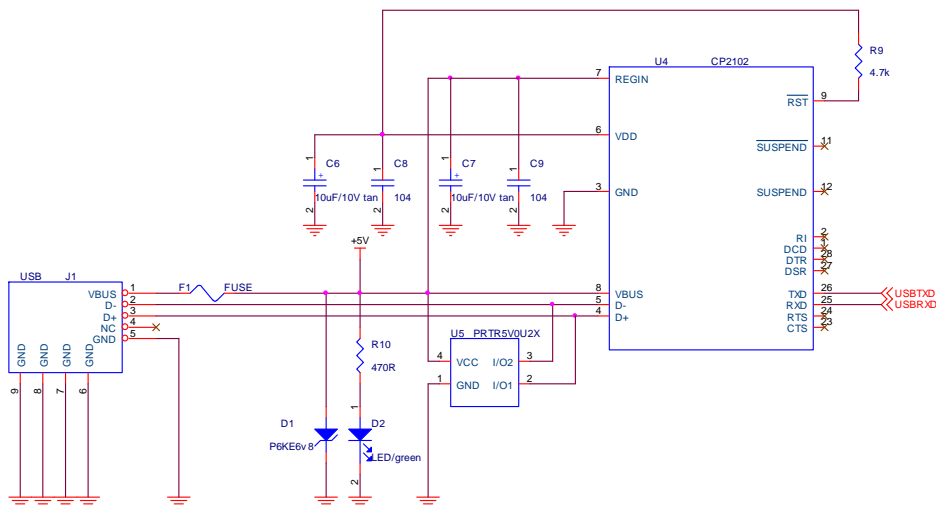


Figure23 USB Circuit on AVRDEM Board

The USB Port on AVRDEM board is connected to PD1/ TXD and PD0/RXD of ATMEGA16 microchip through CP2102, Resistor and UNL2003.





3-4-4. Program/Debug Port

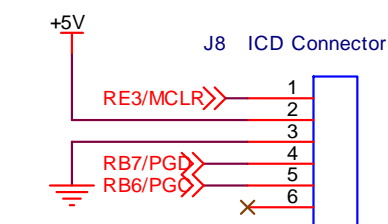


Figure26 Program/Debug Port
on PICDEM Board

J8 is a 6-pin 100mil pitch program/debug interface for PIC microchip as shown in figure 26. Pin1 is MCLR of PIC18F4520, Pin2 is +5V, Pin3 is GND, Pin4 is for program data and Pin5 is for program clock. It is very easy (convenient) to connect it to a Pickit2 or MPLAB ICD2 of Sure Electronics.

Hardware Detail

3-4-5. LCD Module

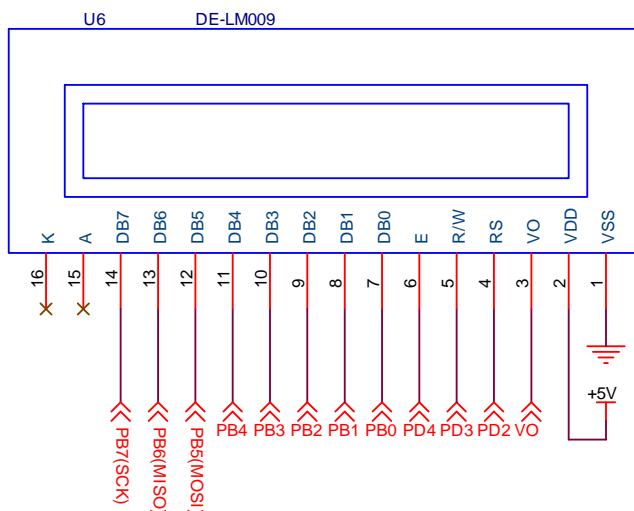


Figure27

A 24*2 character LCD module (no backlight) is installed on the AVRDEM board.

A 16*2 character LCD module (no backlight) is installed on the PICDEM board.

3-4-6. Processor I/O Port

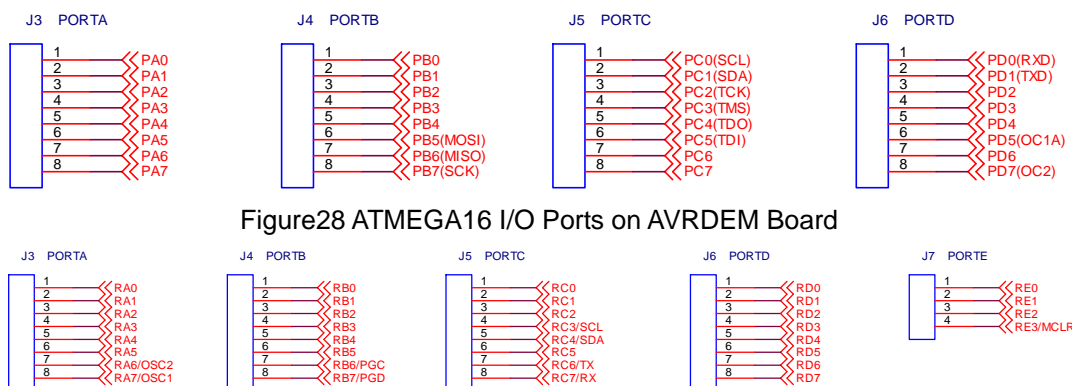


Figure28 ATMEGA16 I/O Ports on AVRDEM Board

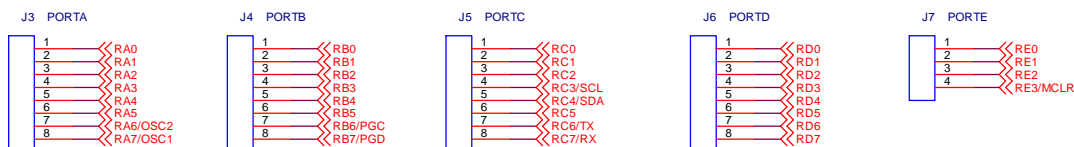


Figure29 PIC18F4520 I/O Ports on PICDEM Board

All 4 I/O ports of ATMEGA16 control microchip are fetched out, as shown in figure28.

All 5 I/O ports of PIC18F4520 control microchip are fetched out, as shown in figure29.

3-4-7. Push Button

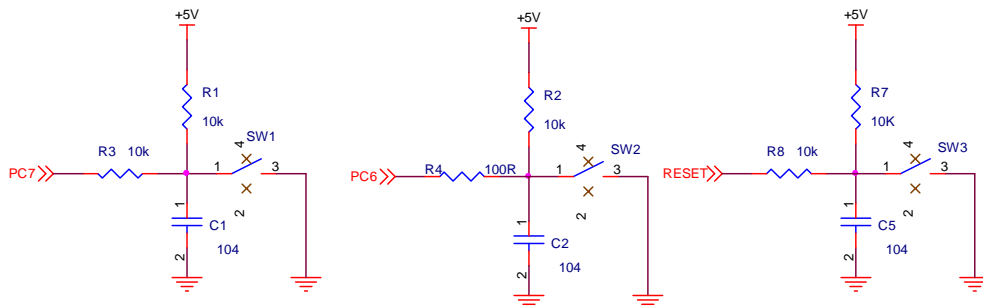


Figure30 Push Button on AVRDEM Board

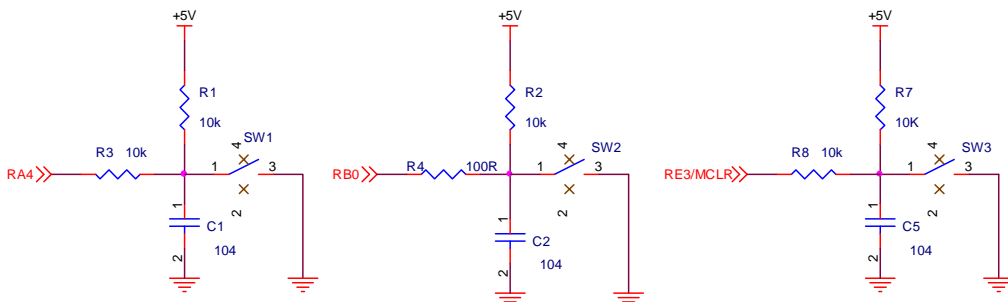


Figure31 Push Button on PICDEM Board

Three push buttons SW1, SW2 and SW3 are installed on the demo board to complete some function.

3-4-8. PWM Module

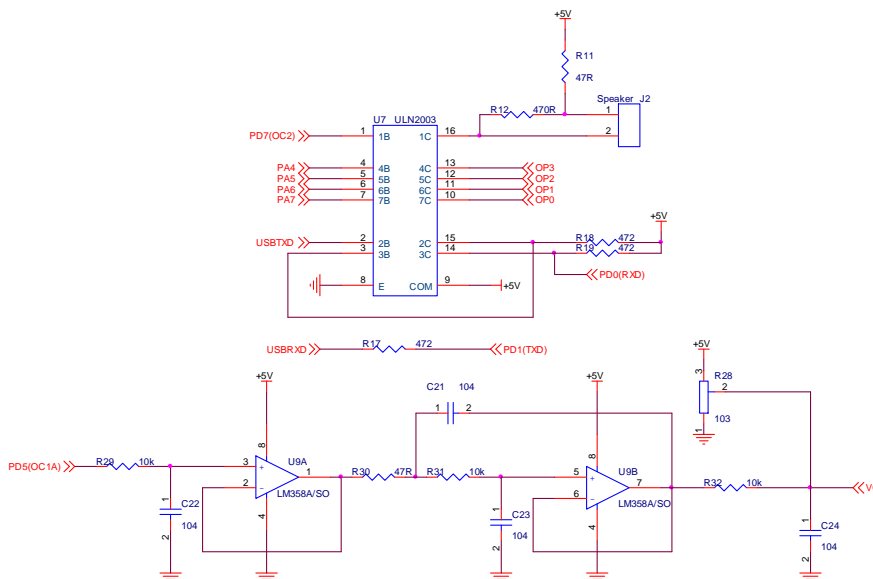


Figure32 PWM Circuit on AVRDEM Board



RC2/CCP2 on PICDEM board will be regulated to PWM for speaker port.

Contrast of the LCD module could be adjusted by screwing R28 adjustable resistance too.



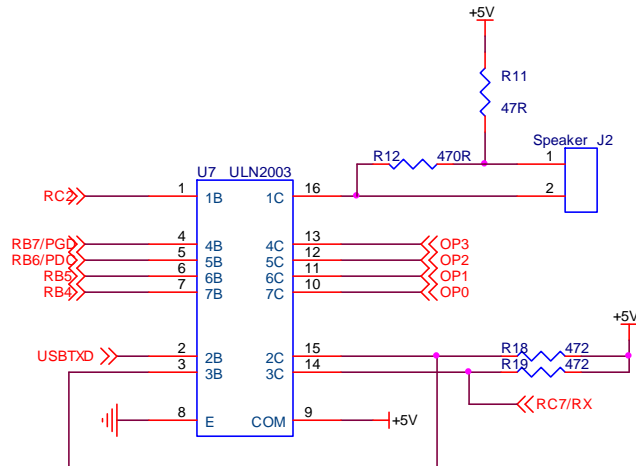


Figure35 LED Segment Driven Circuit on PICDEM Board

PA7 (AVRDEM)/RB4 (PICDEM) will control the right-hand digit of the 4-digit LED segments. PA6 (AVRDEM)/RB5 (PICDEM) control the third-order digit of the 4-digit LED segments. PA5 (AVRDEM)/RB6 (PICDEM) control second-order digit of the 4-digit LED segments. PA4 (AVRDEM)/RB7 (PICDEM) control left-hand digit of the 4-digit LED segments.

3-4-10. LED Indication Light

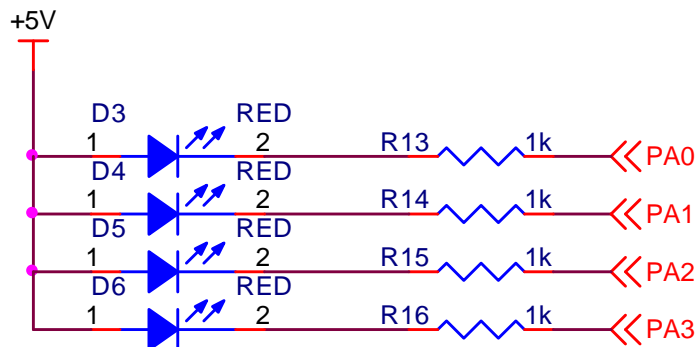


Figure36 LED Indication Light
on AVRDEM Board

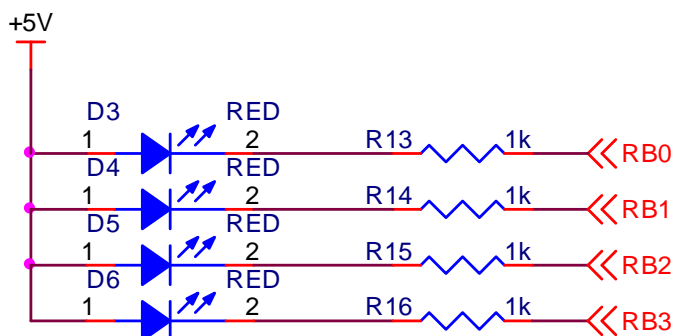


Figure37 LED Indication Light
on PICDEM Board

As shown in figure 36, on AVRDEM board D3-6 could be light by setting PA0-3 to low level. As shown in figure 37, on PICDEM board D3-6 could be light by setting RB0-3 to low level.

3-4-11. IIC Bus Components

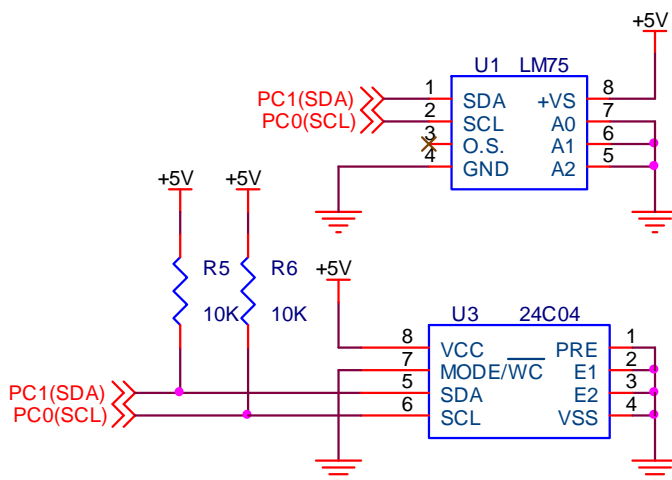


Figure38 IIC Bus Components
on AVRDEM Board

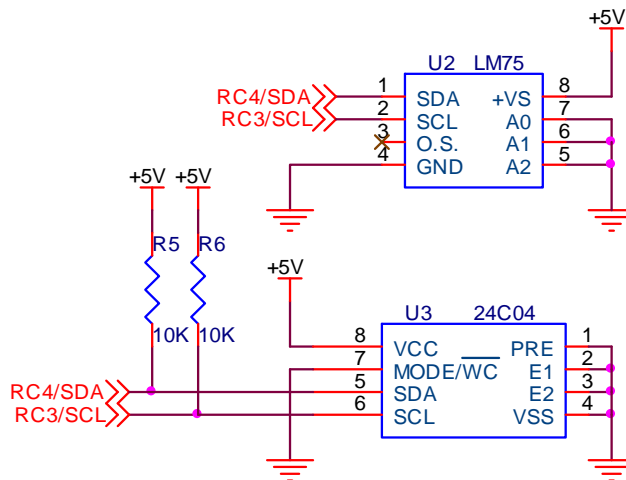


Figure39 IIC Bus Components
on PICDEM Board

A 24LC02 or Atmel 24C02 EEPROM chip and a LM75A temperature sensor are built in the demo board. Their addresses are 0xA0 and 0x90. Connection is shown in figure 38/39. Sample codes can be found in accessory CD-ROM. Please check up in the CD-ROM or on original manufacture' website for more information of these chips.

Chapter4. Sample Code

4-1. Sample Code for AVRDEM 2 PLUS

All the codes were tested and work on the demo board. But please note that all those codes are only for test and study use, we can not guarantee any non proper aftereffect of using those demo codes.

All those demo codes are based on WinAVR (GCC).

Sample 1. Light LEDs Associated With PORTA

Sample 2. Make the Buzzer Beep

Sample 3. Read Temperature from Built-in IIC Temperature Sensor

Sample 4. Transmitter Data through the USART of ATMEGA16

Sample 5. How to Display Information with 7-segment LEDs

Sample 6. How to Display Information on HD44780 LCD Module

Sample 7. LED Mode Code

Sample 8. Display data on the LCD Module

4-2. Sample Code for PICDEM 2 PLUS

All those demo codes are based on MPLAB IDE and MCC18 C compiler.

Sample 1. Light LEDs Associated With PORTB

Sample 2. Make the Buzzer Beep

Sample 3. Read Temperature from Built-in IIC Temperature Sensor

Sample 4. How to Read and Write to the Data EEPROM Memory

Sample 5. Transmitter Data through the USART of 18F4520

Sample 6. How to Display Information with 7-segment LEDs

Sample 7. How to Display Information on HD44780 LCD Module

Sample 8. LED Mode Code

Sample 9. Display data on the LCD Module

All sample code can be found in the accessory CD-ROM.

Chapter5. Contact Us

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