



HIGHNESSTM

HM080SV101ST-UR
8" Color TFT-LCD

FUNCTIONAL DRAFT SPECIFICATION

(This document is meant for customers' approval)

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1 Introduction

1.1 Brief Introduction

The HM080SV101ST-UR has been conceived as **TFT monitor & Touch controller**. It includes processor, control program, driver, flash memory, RS232/RS485/TTL port, touchscreen, power supply etc., so it is a whole display system based on the powerful & easy operating system, which can be controlled by Any MCU.

The HM080SV101ST-UR can be used to perform all basic functions, such as text display, image display, curve display as well as touch function, Video & Audio function etc. The User Interface can be more abundant and various. And the flash memory can store your data, configuration files and images etc.

1.2 Warranty

All products purchased from our company are guaranteed to keep in good repair for **1 year**. If quality problems (except human error) happen in guarantee period, our company will maintain for free or replace the broken one unconditionally.

1.3 Product Characteristics

- With Cortex CPU & Driving device
- Controlled by any MCU
- Display Picture/ Text /Curve
- 65536 colour TFT display
- With/without Touch Screen
- RS232/ RS485/ TTL UART Interface & USB port
- Wide voltage range
- Easy to use! Powerful function! Saving cost and time!

1.4 Application Area

Widely used in various industrial field

- Medical & Beauty Equipment
- Engineering Machinery and Vehicle Equipment
- Electronic Instrument
- Industrial Control System
- Electric Power Industry
- Civil Electronic Equipment
- Automation Equipment
- Traffic
- Etc.

1.5 Working Principle

The Intelligent TFT-LCD Module communicates with the Customer's MCU via Commands (HEX Code), and then the MCU would control its connected equipment to work according to the received commands.

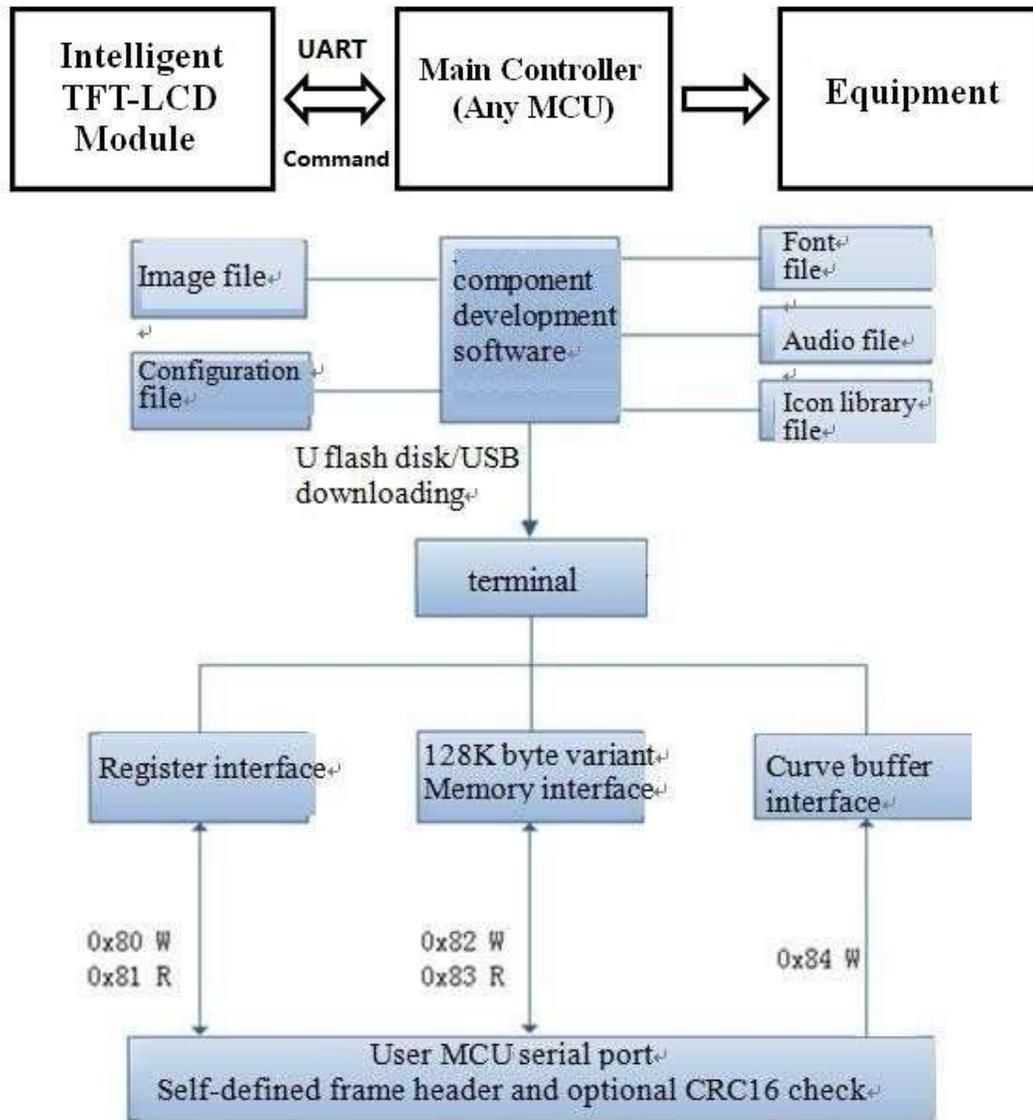


Figure 1.3-1 Configuration and process control phases

1.6 Operation Processing

Only **3 steps** to use our TFT-LCD Module:

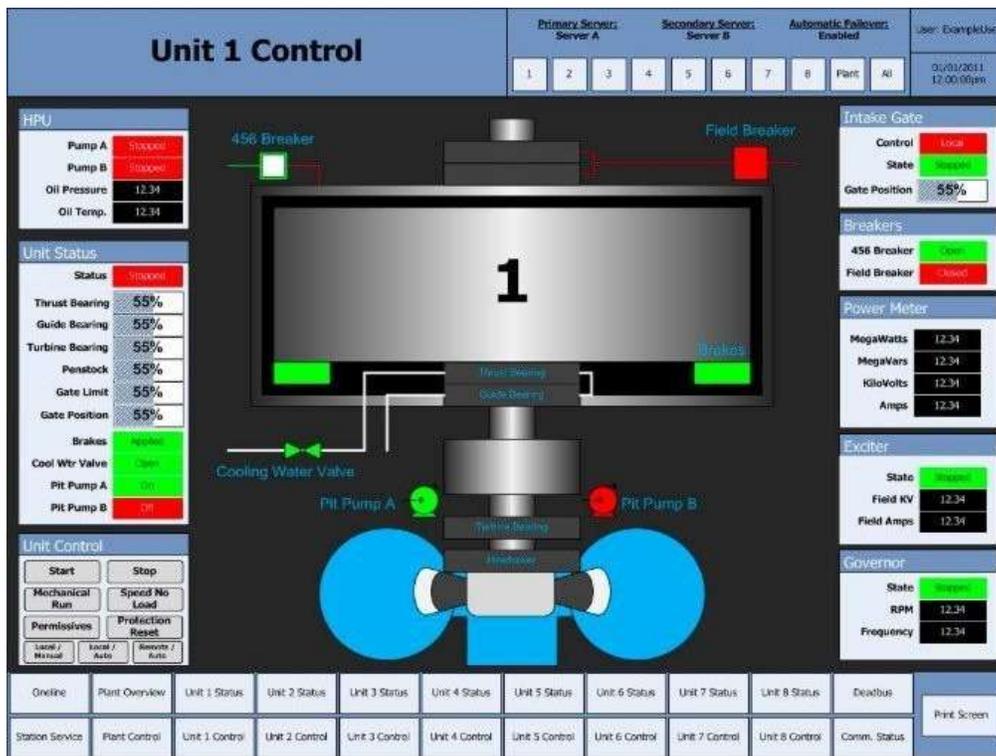
1. Design a group of Beautiful "Graphical User Interface". (Ref. Picture 1.4-1)
2. Connect with customer's MCU through RS232, RS485 or TTL level directly. Plug and play.
3. Write a simple program for MCU to control the TFT-LCD Module via Command. (HEX Code).
That's all.

The TFT LCD module serial port command frame is composed of 5 data blocks, shown as the table 1-1.6. All serial port commands or data are represented with hex format. The data transfer in MSB manner. E.g. for 0x1234, first send 0x12 and then send 0x34.

Table 1-1.6 Command Frame

Definition	Frame header	Data length	Command	Data	CRC check code
Length (byte)	2	1	1	N	2
Description	R3:RA definition	Including command, data and check	0x80-0x84	-	Check if R2.4 is enabled
Example	0xA5,0x5A	0x05	0x81	0x00,0x10	0x20,0x24

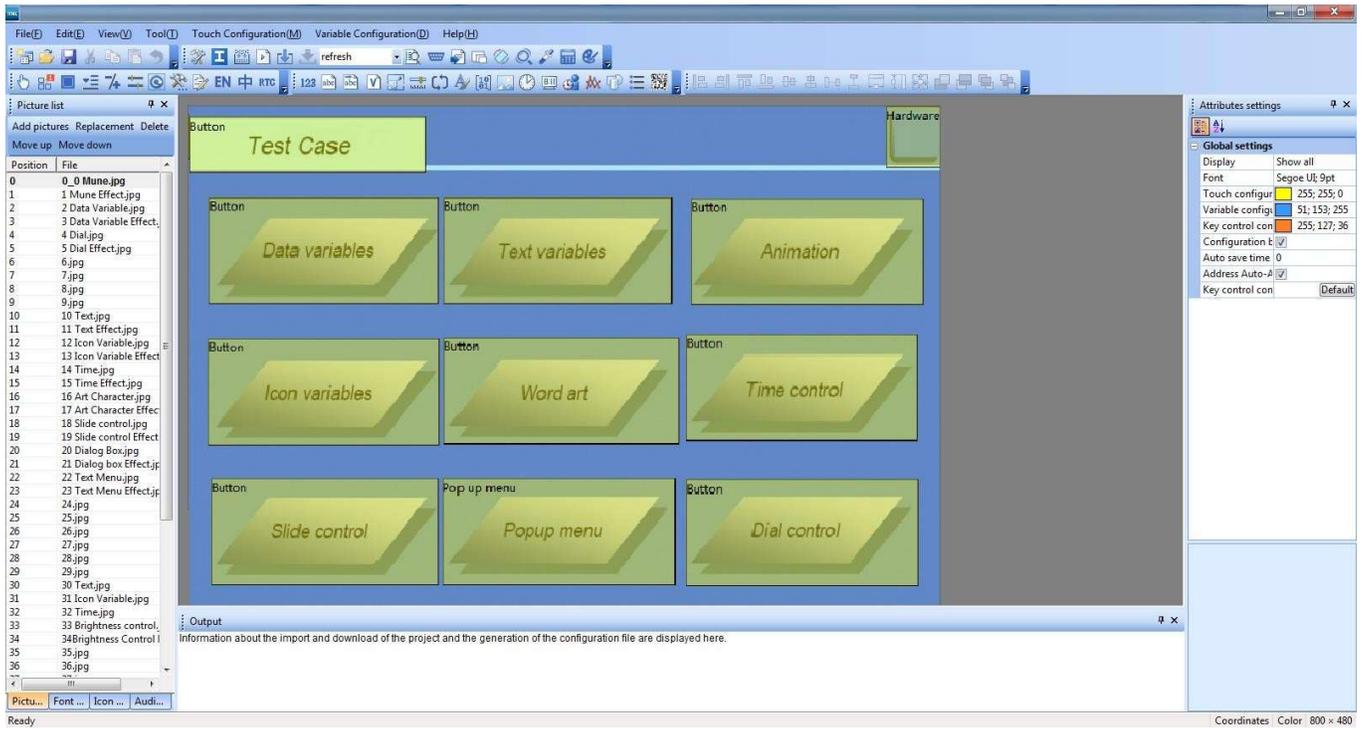
More information, please reference the document of Development Guide.



Picture 1.4-1

1.7 Software Operation

We will offer simple "Tool Software" to help you to design the new project file for Intelligent TFT-LCD Module on computer.



2 Technical Parameters

This chapter contains technical data on:

- Physical Parameters:

Physical Parameters

Display

- Hardware Parameters:

Processor

Memory

Interface

Power Supply

- Storage & Test

Electrical Characteristics

Ambient Conditions

Noise Immunity

Radio Interference

- Support Device

Support Device

Physical Parameter	
Size	8 inch
Resolution	800×RGB×600
Pixel Spacing	0.1905mm×0.0635mm (H×V)
Color	65536 colors (16 bit)
Viewing Area	162mm×121.5mm
Display Dimension	164mm× 123.5mm
Overall Dimension	203mm×148.8mm×15.8mm(N)/ 17.4mm(T)
Net Weight	435g(N)/550g(T)

Display	
Backlight Type	LED
Brightness	300cd/m ² (Brightness can be adjustable in 100 levels)
Contrast	500:1
Backlight life	20,000 hours
Viewing Angle	70°/70°/50°/70°(L/R/U/D)
TFT Panel	A Class Industry Panel
Touch Screen	Industry Level 4 wire resistance / without touch screen (Optional)
Screen Mode:	Digital

Processor	
CPU	CortexM4
Refresh Rate	200MHz
Update Speed of per frame	47 ms/frame (21 images/s)

Memory	
Flash Memory	Standard 128MB, Extension 1GB
Memory Amount for picture	According to the capability of the image, Suggest "JPG" format.

Interface				
Interface	RS232/ RS485/ TTL/USB Interface			
Image downloading	USB2.0 (12Mbps) downloading	&	U	storage Disk

Power Supply	
Rated voltage	+12 V DC
Permissible voltage range	+6.0...+35.0 V DC
Max. permissible transients	+35 V
Time between two transients	50 sec minimum
Internal Fuse	Electronic
Power consumption	2.8 W

Electrical Characteristics					
Parameter		Condition	Min	Type	Max
Supply Current		VIN=12V (Max brightness)		260mA	
		VIN=12V (close brightness)		80mA	
Signal Input Voltage	TTL level	VIH	2.1V		
		VIL			0.9V
	RS232 level	V range	-15V		+15V
	RS485 level	Different Threshold	-0.2V		+0.2V
Signal Output Voltage	TTL level	VOH	3V		3.3V
		VOL	0V		0.1V
	RS232 level	V range	-15V		+15V
	RS485 level	Different Driver			5V
Baud Rate			1200 bps		921600 bps
Note: As the brightness lower, the current will also reduce.					

Ambient Conditions	
Max. permissible ambient temperature	
Operation	-20°C ~ +70°C
Storage	-30°C ~ +80°C
Relative humidity	
Operation	55°C, 85%
Storage	60°C, 90%
Shock loading	
Operation	15 g/11 msec
Storage	25 g/6 msec
Vibration	
Operation	0.035 mm (10 - 58 Hz)/ 1 g (58 - 500 Hz)
Storage	3.5 mm (5 - 8,5 Hz)/ 1 g (8.5 - 500 Hz)
Barometric pressure	
Operation	706 to 1030 hPa
Storage	581 to 1030 hPa

Noise Immunity	
Static discharge (contact discharge/air discharge)	EN 61000-4-2 6 kV/8 kV
RF irradiation	EN 61000-4-3 10 V/m, 80% AM 1 kHz
Pulse modulation	ENV 50204 900 MHz ± 5 MHz 10 V/m _{eff.} , 50% ED, 200 Hz
RF conduction	EN 61000-4-6 150 kHz - 80 MHz 10 V, 80% AM, 1 kHz
Burst interference	EN 61000-4-4
Supply lines	2kV
Process data lines	2kV
Signal lines	1kV

Radio Interference	
Radio interference level complying to EN 55011	Class A

Support Device	
Buzzer	Support
RTC	Support
USB port	Support
Touch Screen	4 Wire Resistance
Default Font	6×12/ 8×16/ 12×24/16×32 /24×48 /32×64 /48×96 /64×128 (Dot Matrix)
Picture	Support JPG Format
Storage Data	Support
Command Set	Unified Simplified Command Sets

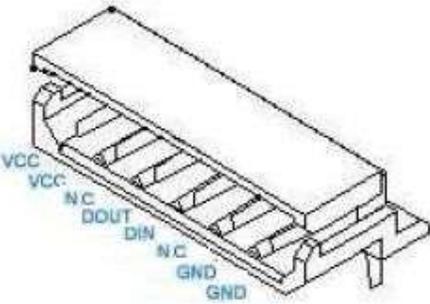
3 Interface Description

This chapter contains the description of the interfaces:

- VVC
- NC
- DOUT
- DIN
- GND
- Baud Rate

Please notify the interface type before ordering. RS232/ RS485/ TTL level interface.

Communication Interface Definition :

	Pin Name	Pin NO.	Pin Type	Interpret
	GND	1,2	P	Power Ground
	DIN	4	I	Data Input
	DOUT	5	O	Data Output
	NC	3,6		None
	VCC	7,8	P	Power Supply Input

I: Input O: Output P: Power

Note A: 1. Adopting the 8 Pin 2mm spacing socket.

2. Direction of the signal was defined with TFT-LCD Module;

“I” refers to the signal from the user’s system transmitted to the TFT-LCD Module.

3. Pins with the same definition are connected together in the module inside.

4. RS232, TTL or RS485 port can be default which need to point out in the order.

Note B: The selection of Baud rate for the serial interface:

Baud rate (bps)	1200	2400	4800	9600	19200	38600	57600	115200
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4 Physical Dimensions

This chapter contains the information of Physical Dimensions.

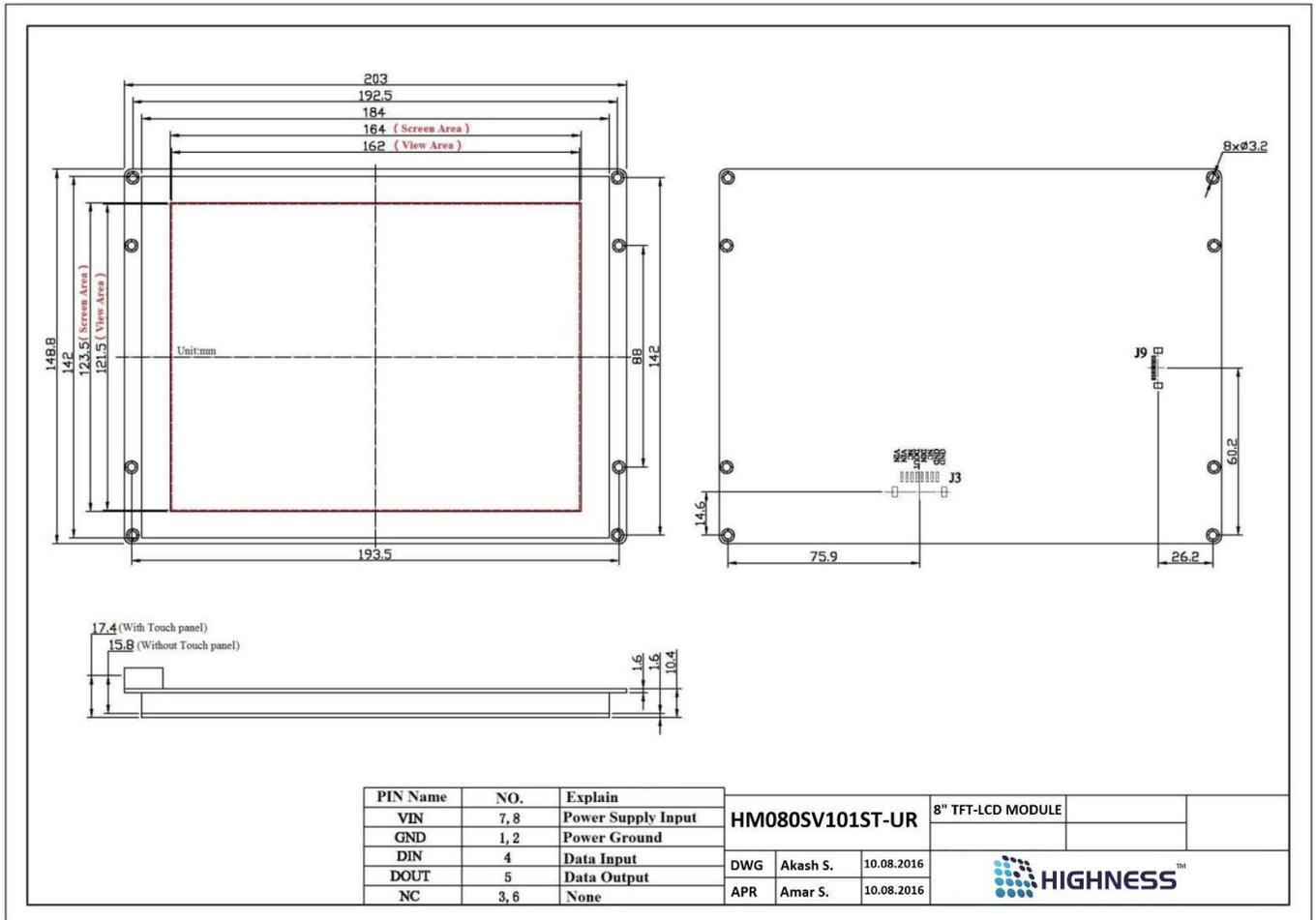


Figure 4-1 HM080SV101ST-UR dimension

5 Command Set Table

This chapter describes the Commands:

- Access register interface
- Access variant register interface
- Write curve buffer interface

Command List

Function	Command	Data	Description
Access register interface	0x80	Distributed: register address (0x00-0xFF)+ write data	Write register data at the specified address
	0x81	Distributed: register address (0x00-0xFF) + length of reading byte (0x00-0xFF)	Start to read the register data of the specified byte length from specified address
		Response: register address (0x00-0xFF) + length of byte data + reading register data	Read TFT LCD module response of the register
The TFT LCD module has 256Byte register, which mainly controls related hardware and is addressed by the byte.			
Access variant register interface	0x82	Distributed: variant address (0x0000-0xFFFF) + written variant data	Start to write data (byte data) to variant memory area from the specified variant address
	0x83	Distributed: variant address (0x0000-0xFFFF) + length of reading variant data word (0x00-0x7F)	Start to read the data of the specified byte length from the specified address of the variant memory area
		Response: variant memory address + variant data length + reading variant data	Read TFT LCD module response of the data memory
<p>The TFT LCD module is driven by variants. The variant value is separated from the variant display format. The variant display format is downloaded to the TFT LCD module via the pre-configured file. The variant values are transmitted to the TFT LCD module Terminal in real time via the serial port. The variant memory is used to store the received variant value.</p> <p>The TFT LCD module includes 64K word (128K Byte) variant memory, which is addressed by word. The address is 0x0000-0xFFFF. When the user plans the variants, the variant memory address is manually allocated by the variant length.</p>			
Write curve buffer interface	0x84	<p>CH_Mode (Byte) +DATA0 (Word) +...+DATAn</p>	<p>Write data to curve buffer.</p> <p>The CH_Mode defines the channel ranking sequence of further data; Each bit of CH_Mode corresponds to a channel; CH_Mode.0 corresponds to the channel 0. 7 corresponds to the channel 7.</p> <p>1 of corresponding position indicates that the corresponding channel data exists; 0 of corresponding position indicates that the corresponding channel data does not exist;</p> <p>The low-channel data is ranked first.</p> <p>E.g. CH_Mode=0x83 (1000011B) indicates that the format of further data is (channel 0+channel 1+channel 7) +...+(channel 0+channel 1+channel 7)</p>
<p>The TFT LCD module includes a 8 K Word, can store the buffer of 8 curves, and can simply and quickly display the curve for users.</p> <p>The data in the curve buffer are 16-bit unsigned numbers.</p>			

6 APPENDIX

- A MCU Sample Program**
- B MCU Circuit Design**
- C ESD Guidelines**


```

void delay_ms(uchar n)
{
    uint i,j;
    for(i=1000;i>0;i--) {
        for(j=25*n;j>0;j--) {};
    }
}

//-----
// Syslnit                                // "Initialization of system"
//-----
void Syslnit(void)
{
    PCON |=0x80;
    SCON=0x50;
    TMOD=0x21;
    TH1=255;
    TL1=255;
    TR1=1;

    ES=0;
    TH0=0xDC;
    TL0=0x00;
    TR0=1;
    ET0=1;
}

//-----
// pic_str                                // "Picture switching sub-function"
//-----
void pic_str(uchar i)
{
    pic[2]=i;
    send_str(pic,3);    // "Send the command of picture switching"
    en();
}

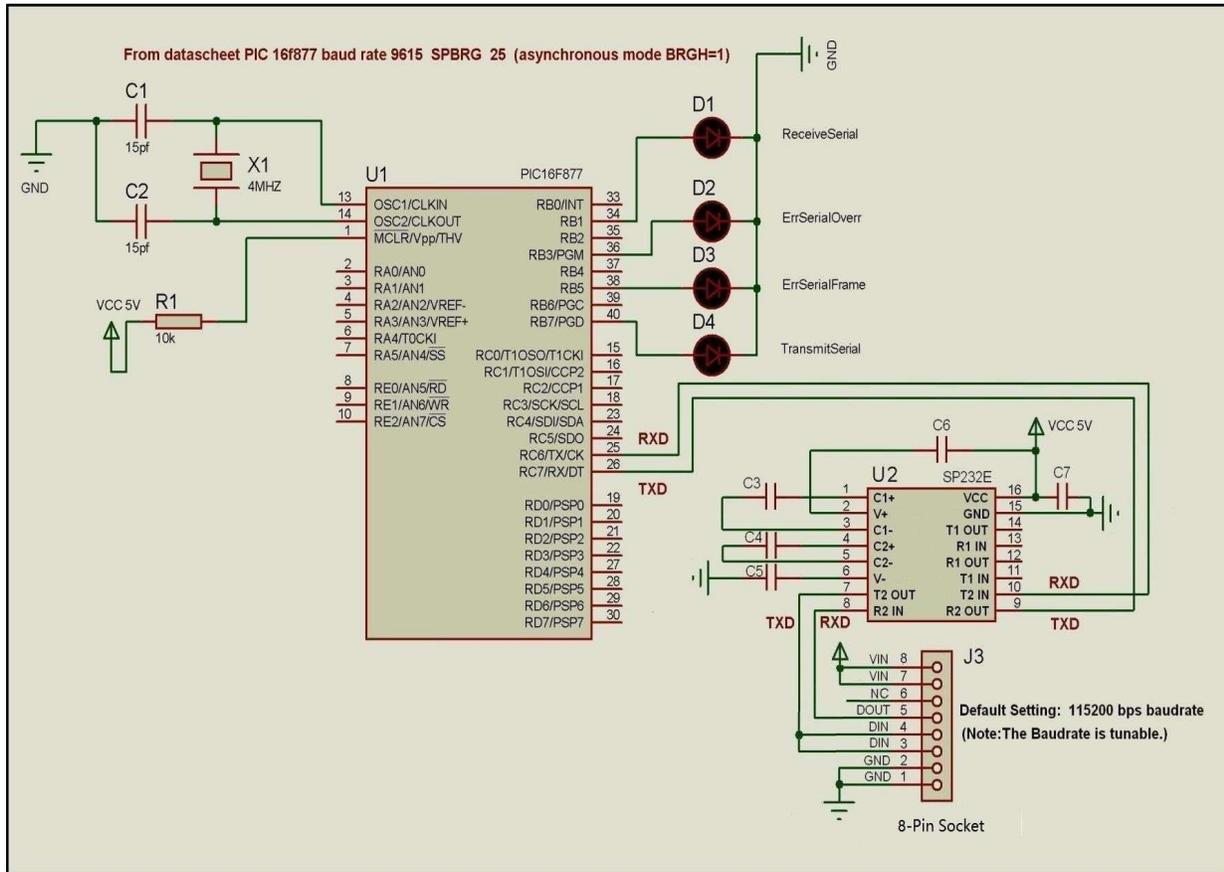
//-----
// main() Routine
//-----
void main (void)                                // "main function"
{
    EA=0;                                        // "Close Interruption"
    Syslnit();
    EA=1;                                        // "Open Interruption"
    delay_ms(40);

    while (1)
    {
        pic_str();                                // "Picture switching"
    }
    Return 0;
}

//-----
// End Of File
//-----

```

B. MCU Circuit Design



C. ESD Guidelines

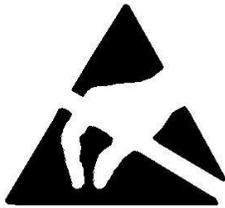
What does ESD mean?

Virtually all present-day modules incorporate highly integrated MOS devices or components. For technological reasons, these electronic components are very sensitive to overvoltages and consequently therefore to electrostatic discharge:

The more frequent international name is:

°ESD° (E lectrostatic S ensitive D evice)

The following symbol on plates on cabinets, mounting racks or packages draws attention to the use of electrostatic sensitive devices and thus to the contact sensitivity of the assemblies concerned:



ESDs may be destroyed by voltages and energies well below the perception threshold of persons. Voltages of this kind occur as soon as a device or an assembly is touched by a person who is not electrostatically discharged. Devices exposed to such over voltages cannot immediately be detected as defective in the majority of cases since faulty behavior may occur only after a long period of operation.

Precautions against electrostatic discharge

Most plastics are capable of carrying high charges and it is therefore imperative that they be kept away from sensitive components.

When handling electrostatic sensitive devices, make sure that persons, workplaces and packages are properly grounded.

Handling ESD assemblies

A general rule is that assemblies should be touched only when this cannot be avoided owing to the work that has to be performed on them. Under no circumstances should you handle printed-circuit boards by touching device pins or circuitry.

You should touch devices only if

- you are grounded by permanently wearing an ESD wrist strap or
- you are wearing ESD shoes or ESD shoe-grounding protection straps in conjunction with an ESD floor.

Before you touch an electronic assembly, your body must be discharged. The simplest way of doing this is to touch a conductive, grounded object immediately beforehand ± for example, bare metal parts of a cabinet, water pipe etc.

Assemblies should not be brought into contact with charge-susceptible and highly insulating materials such as plastic films, insulating table tops and items of clothing etc. containing synthetic fibers.

Assemblies should be deposited only on conductive surfaces (tables with an ESD coating, conductive ESD cellular material, ESD bags, ESD shipping containers).

Do not place assemblies near visual display units, monitors or television sets (minimum distance to screen > 10 cm).

Measuring and modifying ESD assemblies

Perform measurements on ESD assemblies only when

- the measuring instrument is grounded ± for example, by means of a protective conductor ± or
- the measuring head has been briefly discharged before measurements are made with a potential-free measuring instrument ± for example, by touching a bare metal control cabinet.

When soldering, use only grounded soldering irons.

Shipping ESD assemblies

Always store and ship assemblies and devices in conductive packing ± for example, metallized plastic boxes and tin cans.

If packing is not conductive, assemblies must be conductively wrapped before they are packed. You can use, for example, conductive foam rubber, ESD bags, domestic aluminum foil or paper (never use plastic bags or foils).

With assemblies containing fitted batteries, make sure that the conductive packing does not come into contact with or short-circuit battery connectors. If necessary, cover the connectors beforehand with insulating tape or insulating material.

Glossary



Baud rate

Rate of speed at which data is downloaded. Baud rate is specified in Bit/s.

Boot

A loading process which downloads the operating system in the working memory of the operating unit.



Command Set

Hex Code, the MCU can control the TFT Module via the command set.

Configuration file

It can be created by the software's.



Download

Download the image, configuration files and data through mini USB port or USB port.

Download mode

Through mini USB port or USB port.

**Flash memory**

Programmable memory which can be electrically deleted and written to again segment-by-segment.

**Half Brightness Life**

The period of time after which the brightness tube only achieves 50% of the original value.

**Input field**

Enables the user to enter values which are subsequently send to the **MCU**.

**MCU**

Micro Control Unit, it is widely used in the industrial control.

**Normal operation**

Operating unit operating mode in which messages are displayed and screens can be operated.



Output field

Displays current values from the **MCU** on the operating unit.



Process screen

The display of process values and process progress on the operating unit in the form of screens, which may contain graphics, texts and values.



RS485

Standard interface for serial data transfer at a very high transmission rate.



Screen

A screen displays all the logically related process data on the operating unit, whereby the individual values can be modified.



Touch panel

This is an operating unit without keyboard. The touch panel (abbreviated to TP) is operated via the contact-sensitive screen elements.