

SMART BOARD

USER MANU ver:05E



ILLUMINANT

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History

| TIME | Page | Content |
|------------|------|--|
| 2012/10/01 | 7, 8 | Add one command to assign working layer. Add function for hollow-word and hollow-picture. |
| 2012/10/28 | | Change command, modify |
| 2012/11/09 | | Add command for back light turn on/off. Add command for back light lever from 00h to 10h. Add modify dimension of Smart board. |
| 2012/11/21 | 8 | Modify Dimension |

1 Introduction :

『Easy Operation, Powerful Functions』

TFT43 SMART BOARD is a TFT monitor which is very easy for operation. You use this smart board without setting any initial values. It supports hot-swap, Traditional Chinese, Simplified Chinese, ASCII text display and simple drawing instruction. You can draw point, line, circle, square and triangle on LCM. You also can make waveforms on LCM. This is powerful to display heartbeat, blood pressure, and engineering waveform.

The special feature is picture input and display. LCM can load your pictures easily with our tool. Every picture is given an UI number. You just call the UI number; LCM will show the picture at the specified position on the screen. We also provide AP for windows system. With these completed supports, you can develop product more quickly and easily. PC can control LCM via USB or RS232. With this window program, you can check the input code to LCM and the output code from LCM. No matter what kind of controller you use, LCM will show the input codes as same as what you input.

2 Features :

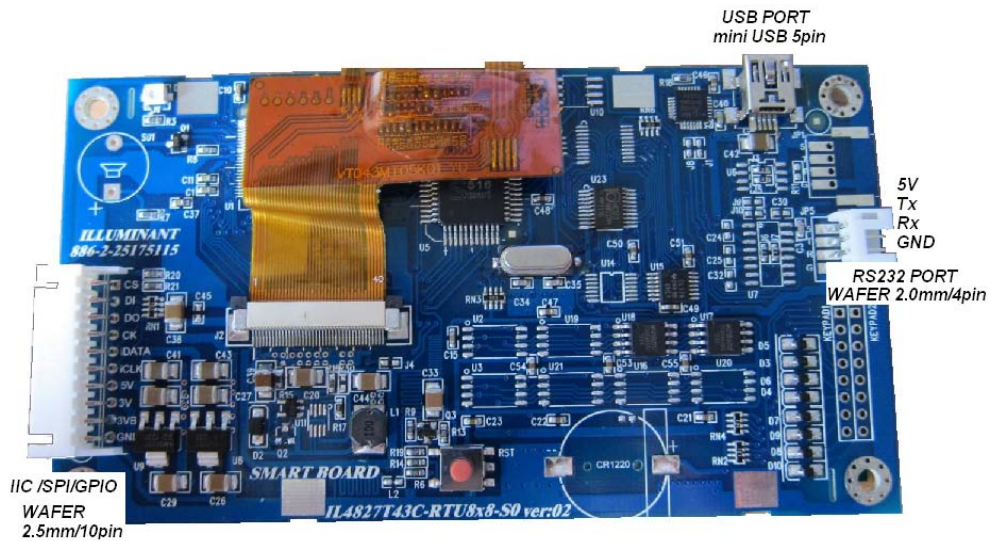
- You can choose straight or horizontal screen.
- Simple Chinese / traditional Chinese word bank: ASCII、BIG5、GB、UNICODE; 4 Chinese font size: 20x20 standard, 32x32 standard, 42x42 standard and 20x20 bold.
- You can draw graph and pattern with our embedded code (hollow and solid point, line, circle, square, rectangular, triangular)
- You can make waveform graph. You just set the parameters and input the data module, smart board will make the waveform automatically
- Standard module can save 32 pieces of 480x272 full color picture. If the picture is smaller than 480x272, Smart board can save more. Smart board can save 256 pieces of 480x272 full color picture after expanding memory, if customers require.
- Setting booting LOGO display. After setting, LCM will display the specified picture after booting.
- Smart board provides the commands for 16 ranks of backlight adjustment.
- Smart board has the command for user to calibrate touch panel.

After calibration, TFT module will provide user the coordinates of touch screen immediately when touch panel is touched. Users can read the position of the touch screen easily.

- Smart board supports the corresponding values of 4x8 keypad. TFT module will provide user the corresponding value of keypad when keypad is touched. User can read the keypad positions easily.
- Customers can change waveform, input pictures and check input/output signals with our computer program.
- We welcome customers' requirements, ex: RS485, RTC, GPIO control. If customers require these futures, we can make in this Smart board without making new one.

3 I/O PORT Define :

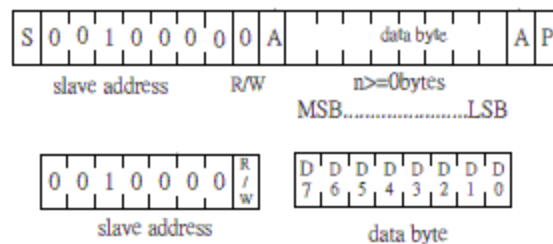
3.1 Input/output interface: LCM has 4 interfaces, as shown below. Standard board provides UART and USB transfers.



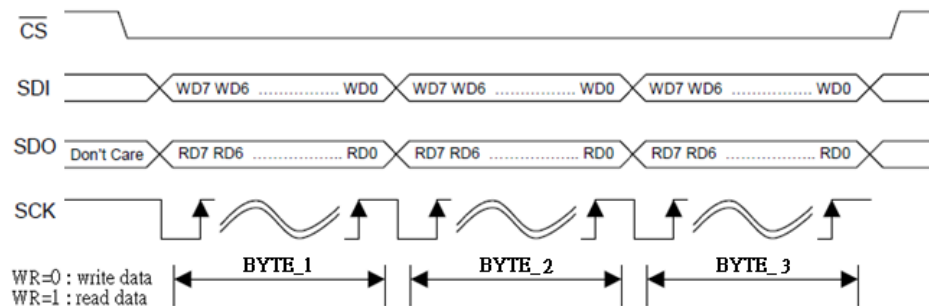
3.1.1 UART transfer: using RS232 interface, the baud rate is 115200bps, N81 format. Standard module is IC interface (3V signal) or RS232 interface (12V).

3.1.2 USB transfer: embedded USB to UART bridge (CP2102). User can control LCM via USB after adding driver. The transfer format is the same as above UART transfer.

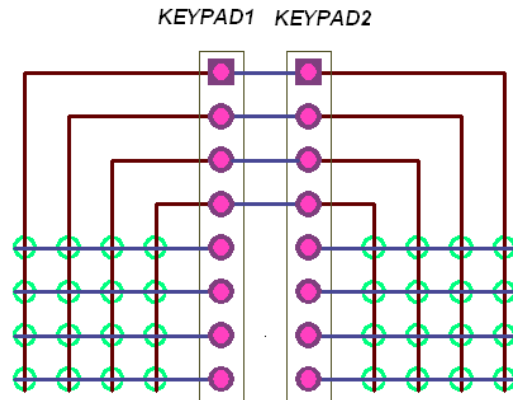
3.1.3 IIC transfer: IIC address is fixed as 0x10, the baud rate is 60KHz.



3.1.4 SPI4L transfer: 4 lines transfers, the format is as below. The baud rate is 60KHz.

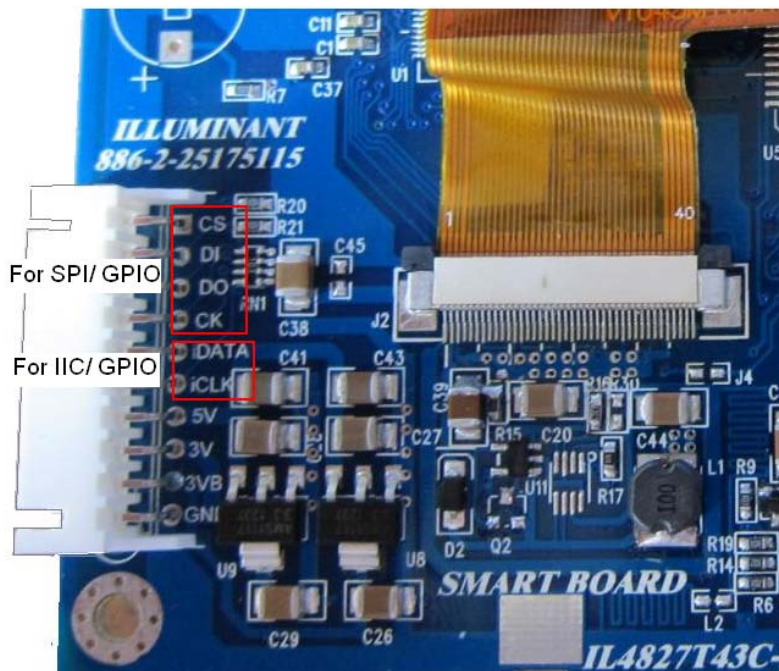


3.2 Keypad introduction: SMART BOARD keypad is dot-matrix structure.



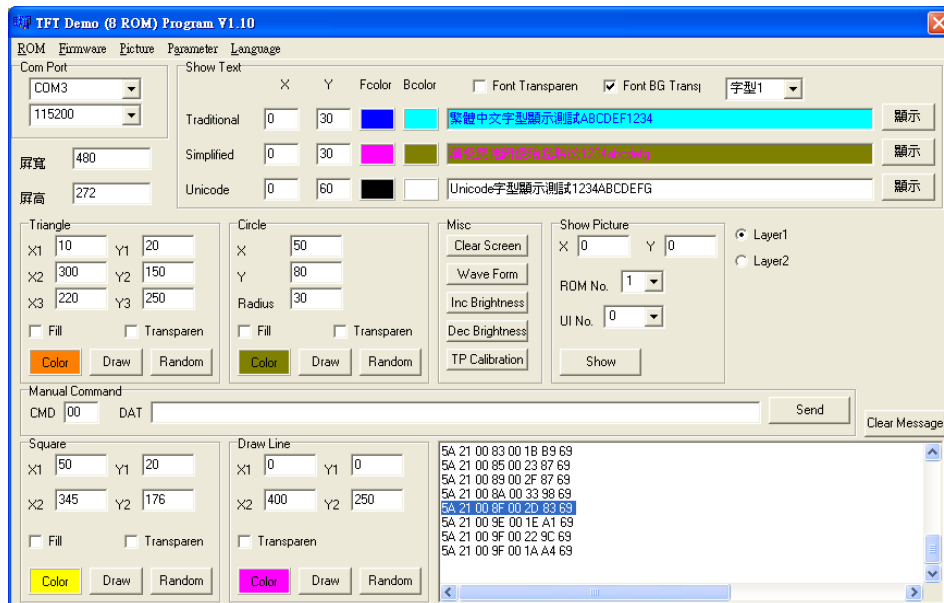
3.3 IIC/SPI/GPIO port introduction:

These ports are for IIC, SPI or GPIO. We don't identify the functions in standard module. If customers require these functions, we can provide customers the firmware



3.4 Touch panel introduction

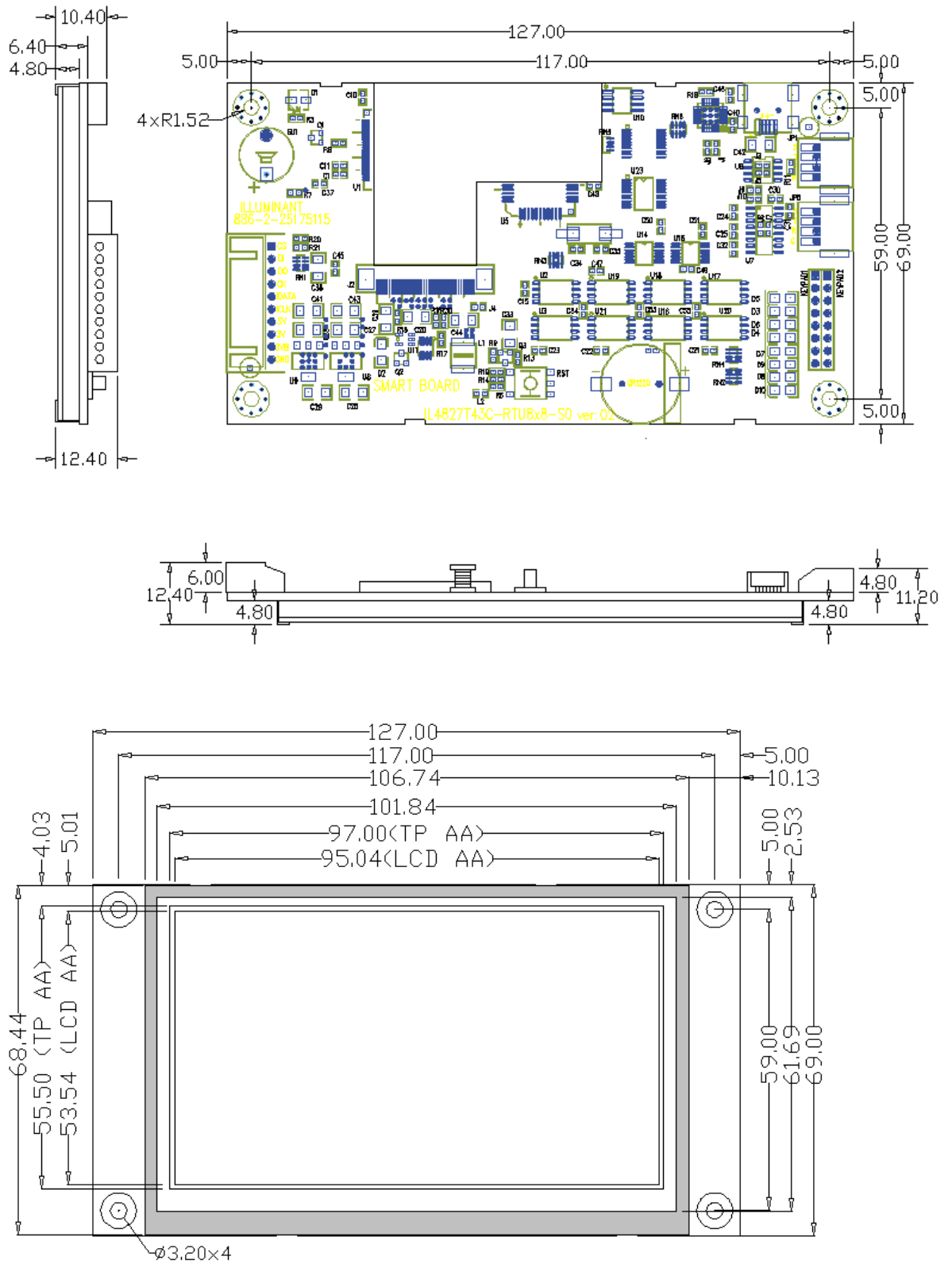
The transfer interface is USB or RS232. LCM will display X position and Y position from feedback commands when touch panel is touched. The X range is from 0 to 479 and Y range is from 0 to 271 for horizontal screen display. The signals will feed back to I/O port. You also can find the information from the lower-right window of AP program



3.5 Power

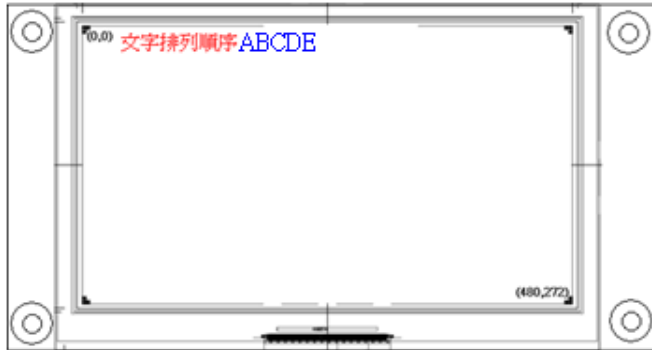
- 3.5.1 USB module will provide SMART BOARD DC+5V when you use USB port. We recommend for USB2.0
- 3.5.2 You can input DC+5V to module when you use RS232 port. The pin sequence of RS232 port is 5V , Tx , Rx , GND . You can input DC+5V at “5V” pin.
- 3.5.3 You can input 5V or 3V when you use IIC/SPI. If you want to input 5V to SMART BOARD, please input 5V power at “5V” pin and do not contact “3V” pin and “3VB” pin. If you want to input 3.3V to SMART BOARD, please input 3.3V at “3V” and “3VB” pin, and do not contact “5V” pin.

4 Dimension :

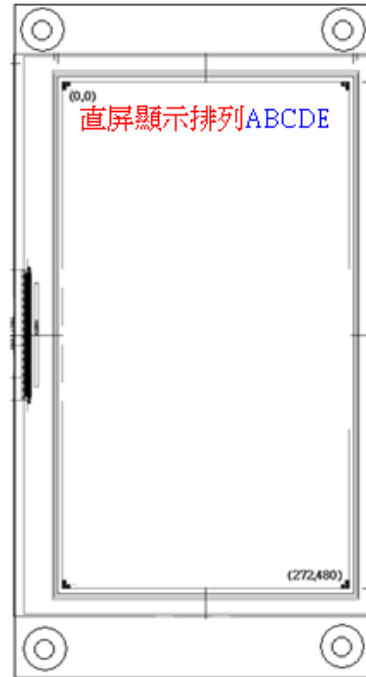


5 TFT43 display identification:

Horizontal screen



Straight screen



6 Layer definition:

6.1 SMART BOARD can be set as two-layer display. We define layer1 and layer2.

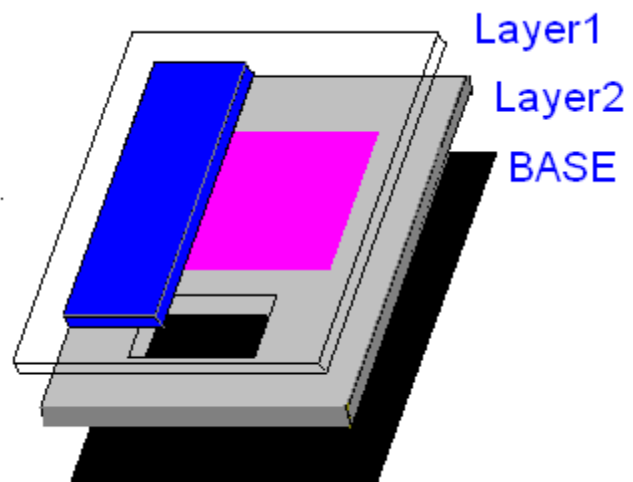
Layer2 is base map, the transparent parts will show black; Layer1 is overlay, the transparent parts will show the color of layer2.

6.2 If you set coordinates in the command, the bit15 of x coordinate will be as layer1 and bit14 will be as layer14. Ex: You input an "A" with first font at (100, 100) on layer2.

The command should be

```
『 5A 0D 07 00 40 64 00  
64 00 1F 00 20 41 34 69 』.
```

X will be 0x8064 at layer1 or 0x4064 at layer2. If the command of x is 0xC064 or 0x0064, the x will be defined at layer1.



7 ROM Select :

SMART BOARD has maximum 8 ROMs. ROM1 to ROM8 can save picture and font data. Standard module will have 2 ROMs, ROM7 is for picture data and ROM8 is for font data. Please select ROM carefully when you burn or display graphical information.

8 Font style :

SMART BOARD supports multiple fonts output. Standard module has 4 font styles, 20x20 standard, 32x32 standard, 42x42standard and 20x20 bold.

9 Checksum definition

Run XOR logic on each byte with CRC32 format,.

| X | Y | Z |
|---|---|----------|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

10 COMMAND LIST :

StartByte, Length, Command, -, - - - -, CheckSum, EndByte ◦

StartByte=0x5A ◦

Length is the Byte of whole command which doesn't include StartByte or EndByte.

EndByte=0x69 ◦

10.1 Clean screen

Clean layer1, 5A 04 01 00 05 69

Clean layer2, 5A 04 01 01 04 69

10.2 Change color of layer1

Clean layer1, 5A 06 02 00 colorH ColorL 00 35 69

Clean layer2, 5A 06 02 01 colorH ColorL 00 35 69

10.3 Waveform setting

0x5A, 0x0B, 0x17, Index, (Layer+x_H), x_L, y_H, y_L, colorH, colorL, xStep, checksum, 0x69

If select Layer1, Layer+x_H == 0x80+x_H ◦

If select Layer2, Layer+x_H == 0x40+x_H ◦

Ex: 5A 0B 17 01 80 0A 00 64 07 E0 01 15 69

The waveform data of curve number 1 at layer1

10.4 Show Waveform

0x5A, n>=6, 0x18, Index, y1_H, y1_L, y2_H, y2_L ----- , checksum, 0x69

Ex: 5A 06 18 01 00 64 7B 69

Input and display the increment of curve number 1

Ex: 5A 0A 18 01 00 61 00 60 01 00 16 69

Input and display 3 increments of curve number 1

10.5 LINE

0x5A, 0x0D, 0x10, (Layer+x_H), x1_L, y1_H, y1_L, x2_H, x2_L, y2_H, y2_L, colorH, colorL, checksum, 0x69

10.6 Hollow circle

0x5A, 0x0A, 0x12, (Layer+x_H), x_L, y_H, y_L, Rath, colorH, colorL, checksum, 0x69

10.7 Hollow square

0x5A, 0x0D, 0x13, (Layer+x_H), x1_L, y1_H, y1_L, x2_H, x2_L, y2_H, y2_L, colorH, colorL, checksum, 0x69

10.8 Solid square

0x5A, 0x0D, 0x14, (Layer+x_H), x1_L, y1_H, y1_L, x2_H, x2_L, y2_H, y2_L, colorH, colorL, checksum, 0x69

10.9 Hollow triangle

0x5A, 0x11, 0x15, (Layer+x_H), x1_L, y1_H, y1_L, x2_H, x2_L, y2_H, y2_L, x3_H, x3_L, y3_H, y3_L, colorH, colorL, checksum, 0x69

10.10 Solid triangle

0x5A, 0x11, 0x16, (Layer+x_H), x1_L, y1_H, y1_L, x2_H, x2_L, y2_H, y2_L, x3_H, x3_L, y3_H, y3_L, colorH, colorL, checksum, 0x69

10.11 UI 圖片 Show UI picture

0x5A, 0x09, 0x0A, Rom_NO. , UI_No, (Layer+x_H), x_L, y_H, y_L, checksum, 0x69

10.12 Show Text with BIG5 code

0x5A, Length>=12, 0x07, **FontType**, (Layer+x_H), x_L, y_H, y_L, FcolorH, FcolorL, BcolorH, BcolorL, Big5-code, checksum, 0x69

10.13 Show Text with GB code

0x5A, Length>=12, 0x07, **FontType**, (Layer+x_H), x_L, y_H, y_L, FcolorH, FcolorL, BcolorH, BcolorL, GB-code, checksum, 0x69

10.14 Show Text with Unicode

0x5A, Length>=12, 0x07, **FontType**, (Layer+x_H), x_L, y_H, y_L, FcolorH, FcolorL, BcolorH, BcolorL, Uni-code, checksum, 0x69

10.15 Set BackLight 0x5A, 0x04, 0xb2, lever, checksum, 0x69

Back Light adjust lever from 00h to 10h.

- 10.16 Increase backlight 0x5A, 0x03, 0xb1, checksum, 0x69
- 10.17 Reduce backlight 0x5A, 0x03, 0xb0, checksum, 0x69
- 10.18 Close BackLight 0x5A, 0x04, 0xb3, ref, checksum, 0x69
- 10.19 Output 4x8 keypad Corresponding code
0x5A, 0x22, X, Y, checksum, 0x69
- 10.20 touch panel correction 0x5A, 0x03, 0x30, checksum, 0x69
- 10.21 output the coordinates of touch screen
0x5A, 0x21, X_H, X_L, Y_H, Y_L, checksum, 0x69
- 10.22 KeyPad Feedback Data 0x5A, 0x22, X, Y, checksum, 0x69
- 10.23 Touch Panel Feedback Data
0x5A, 0x21, X_H, X_L, Y_H, Y_L, checksum, 0x69

11 COMMAND ECHO 0x5A, Command, State, Reference, 0x69

11.1 For RS232 interface,

11.1.1 When State=0x01,

Reference=0, the command format is correct

Reference =1, the command length is wrong.

Reference =2, the command has problems.

Reference =3, the command parameter is out of range.

Reference =4, no FLASH

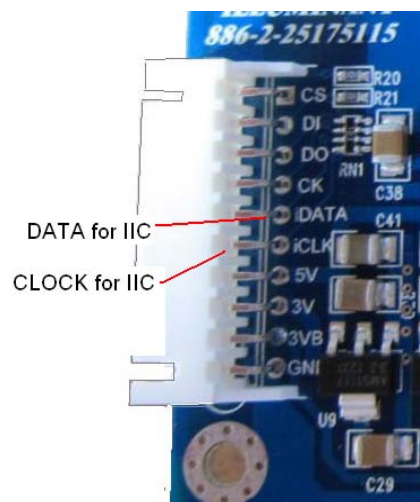
Reference =5, don't find such command format.

11.1.2 When State=0x02 , Reference is LCM feedback value which is several byte.

11.2 For IIC interface,

How to connector IIC :

if Address=0x10, we want read data of touch panel or keypad, the



command is [0x21, 0x21, byte_1, byte_2, byte_3, byte_4] , if byte_3 is 0xFF , this data byte[1..4] is for touchpanel, or not is for keypad .

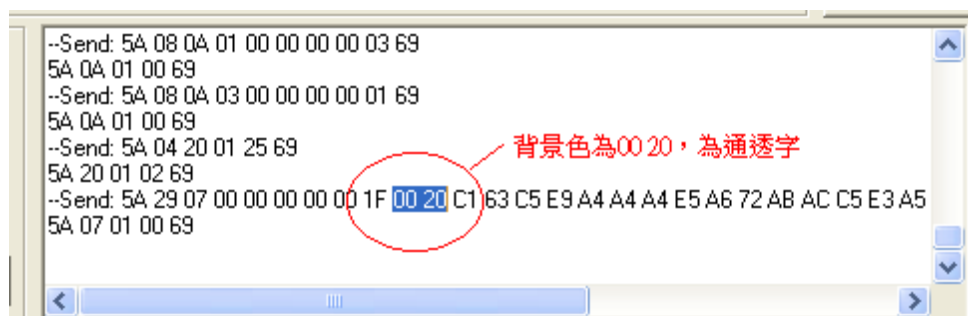
12 Penetrant picture:

12.1 User can set the color in the picture as 0x0020, the background will be hollow.

12.2 With our AP, the color selection and R00/G04/B00 setting of hollow words are equal to 0x0020.



In the information window, the words will be hollow if the background color is 0x0020



12.3 User can input picture as layer1 and set the color as 0x0020, then the picture will be hollow.

13 General information :

| Item | Specification Unit | Unit |
|-------------------|------------------------------|--------|
| Outline Dimension | 127*69.2*14 (Typ.) | mm |
| Display area | 95.04*53.85 | mm |
| Number of Pixel | 480 RGB(H) x 272(V) | pixels |
| Pixel pitch | 0.198 x 0.198 | mm |
| Pixel arrangement | RGB Vertical stripe | |
| Display mode | Normally white | |
| Surface treatment | Antiglare, Hard-Coating | |
| Weight | TBD. | g |
| Back-light | Single LED (Side-Light type) | |
| B/L System | | |
| Power Consumption | 0.792 (Typ.) | w |

14 Mechanical Information :

(Module Size)

| item | Min. | Typ. | Max. | Unit |
|---------------|------|------|------|------|
| Horizontal(H) | 126 | 127 | 128 | mm |
| Vertical(V) | 68.2 | 69.2 | 70.2 | mm |
| Depth(D) | | 14 | 14.5 | mm |

15 Mechanical Information :

| Item | Symbol | Min. | Typ. | Max. | Unit. |
|----------------------|--------|------|------|------|-------|
| Power supply current | 5V | | 650 | | mA |
| | 3.3V | | | | mA |

Note:

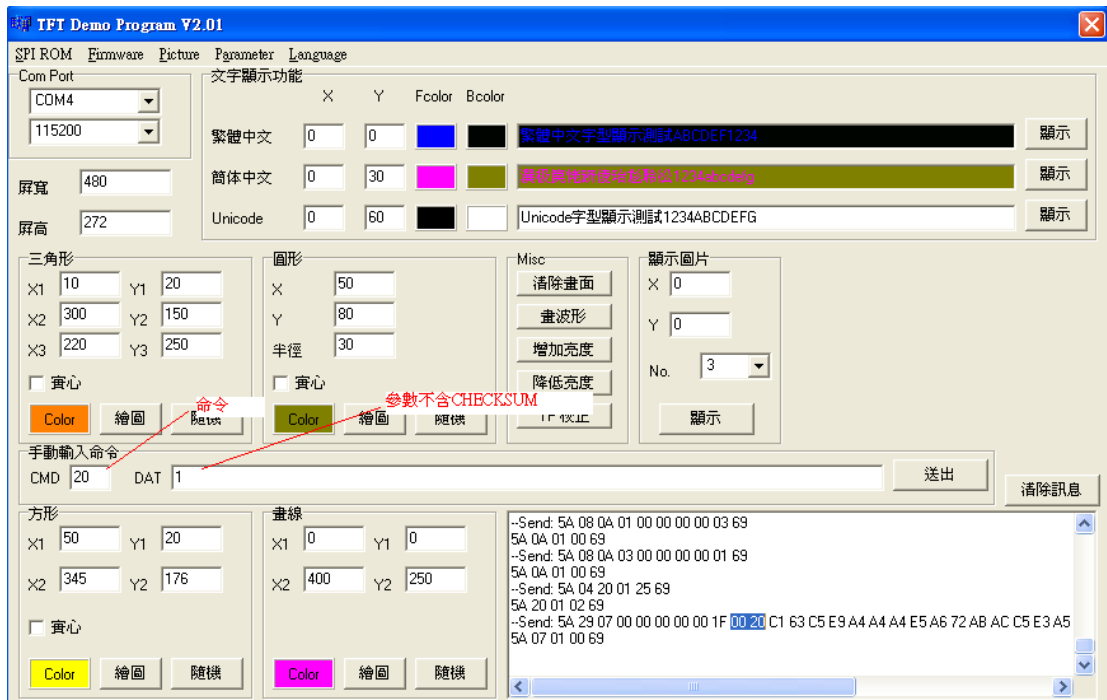
- (1) Only 5V or only 3.3V for power supply, Don't connecter both.
- (2) Ta =25±2°C

16 Environment Absolute Rating :

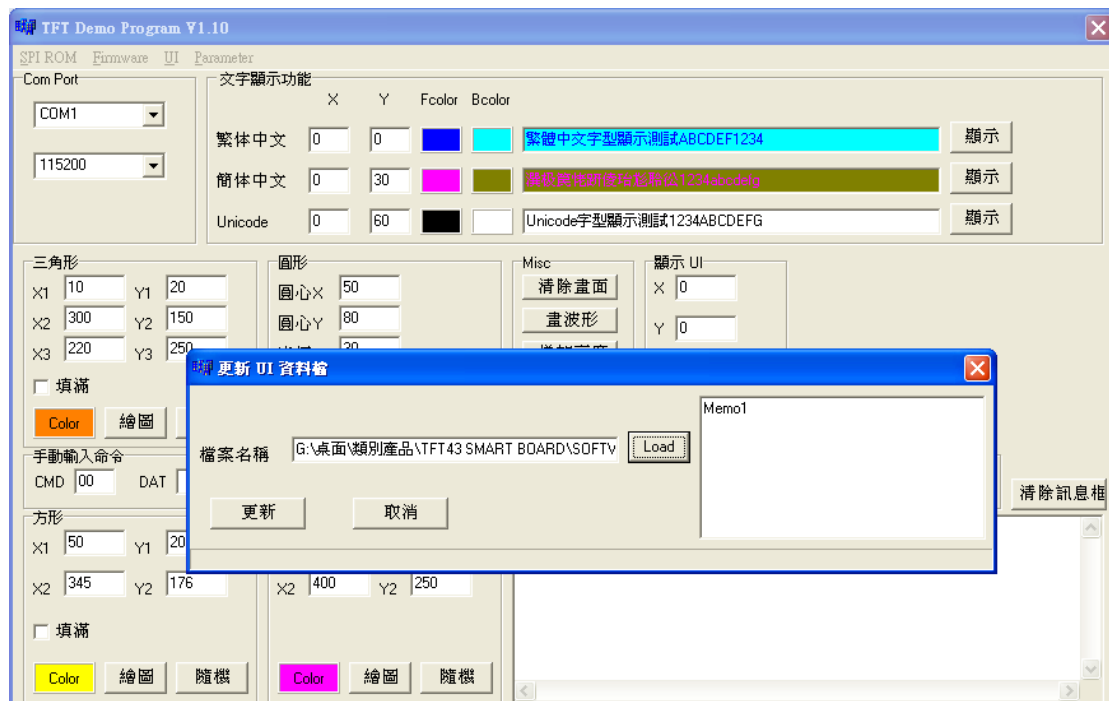
- Operating Temperature : -20 ~ +70 °C
- Storage Temperature : -30 ~ +80 °C

17 Application Program on Windows :

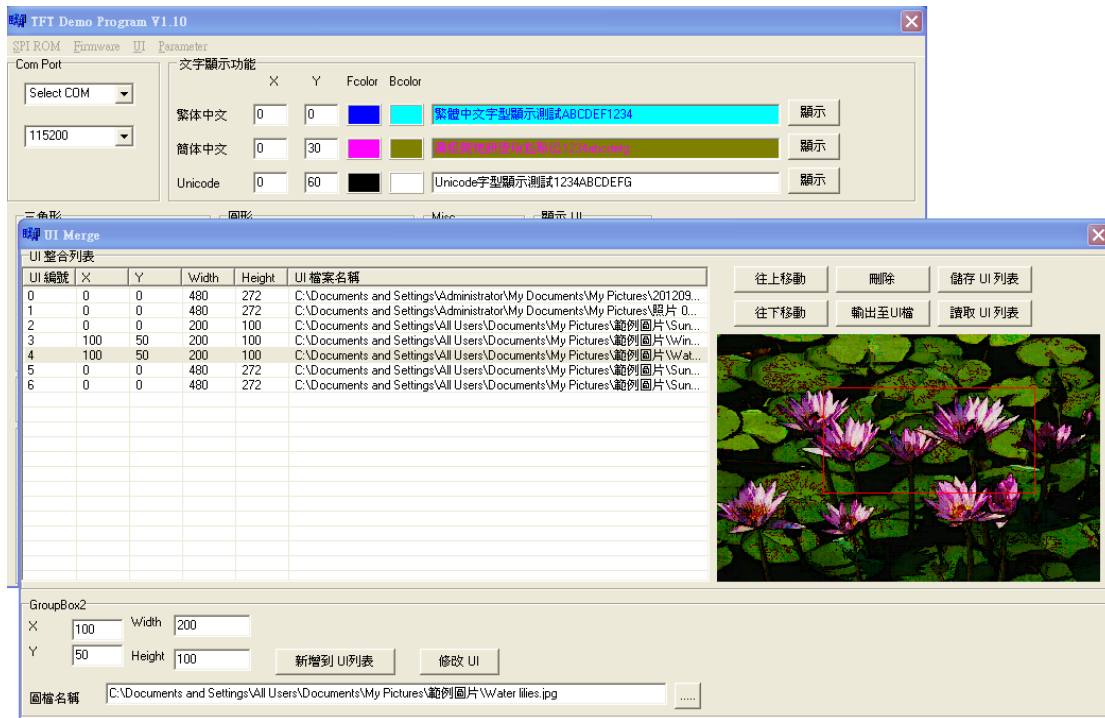
We provide AP for WINDOWS system. With our support, you can develop products easily and quickly.



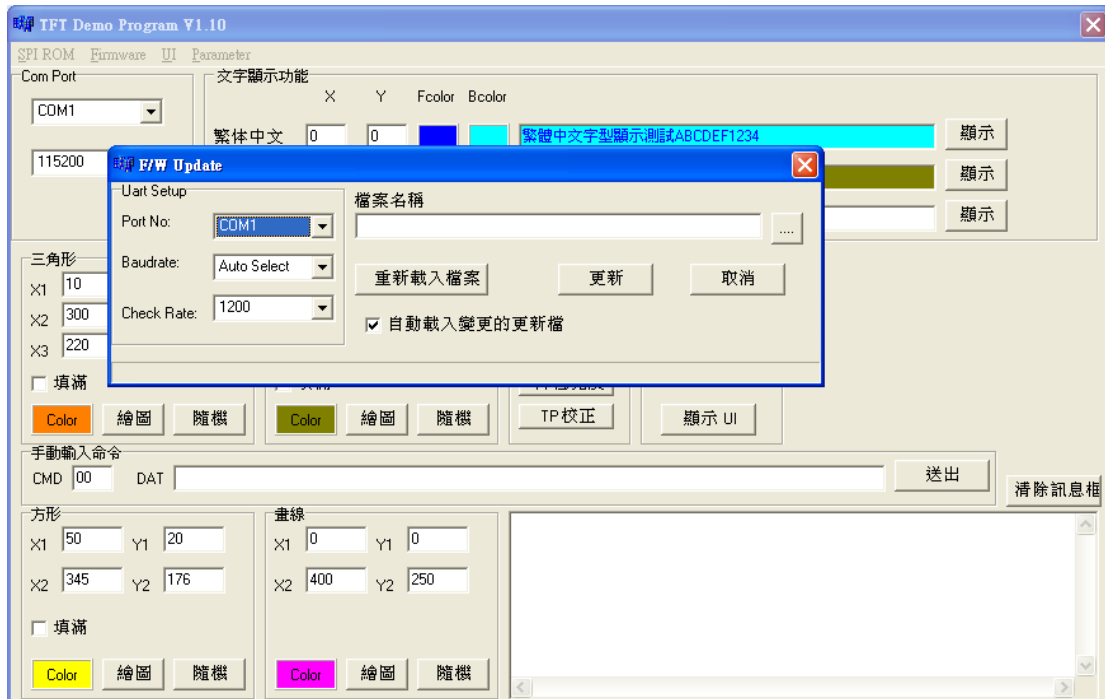
<COMMAND ENTRY and test >



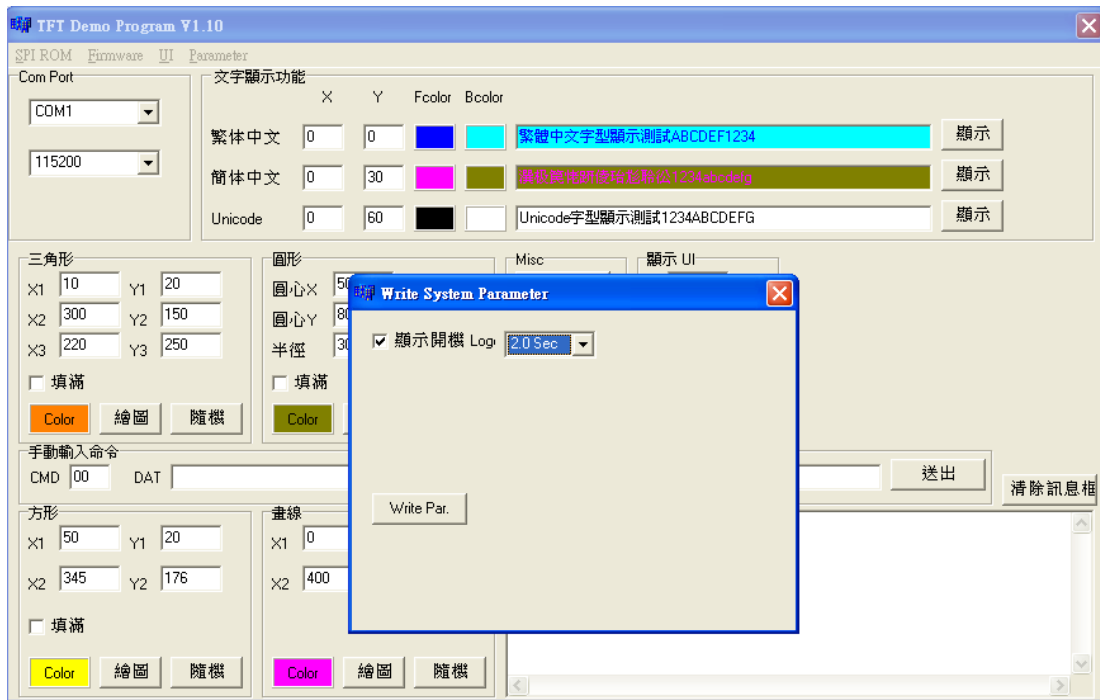
<Write Graphic data to LCM>



<Select graphic (BMP/JPG) and make UI file >

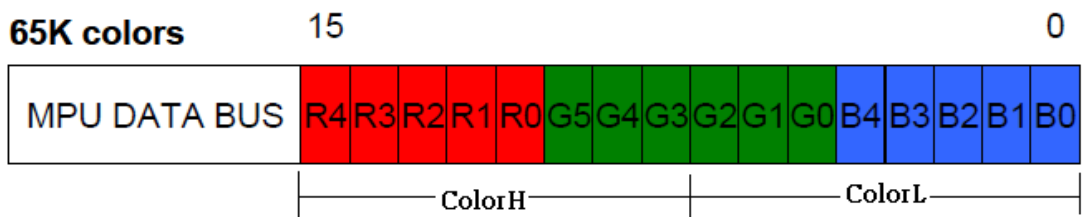


<Firmware update>



< LOGO DISPLAY when POWER ON >

Reference.1 COLOR DEPTH , 16bits RGB :



Reference.2 IIC Interface :

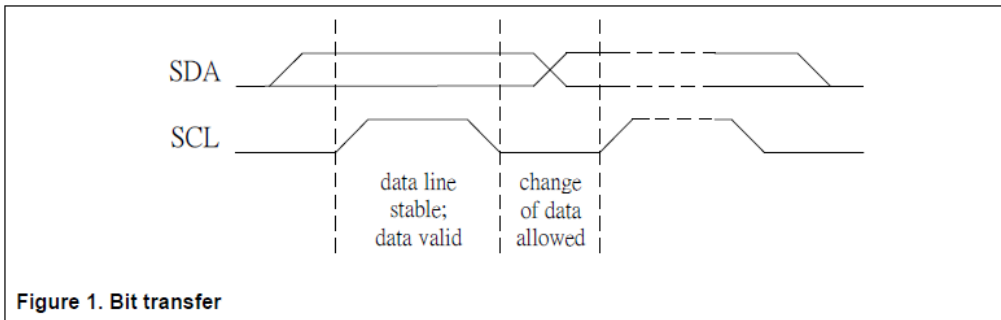


Figure 1. Bit transfer

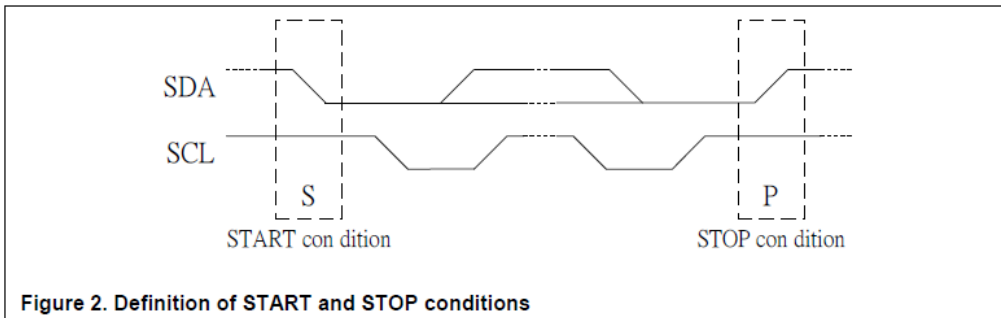


Figure 2. Definition of START and STOP conditions

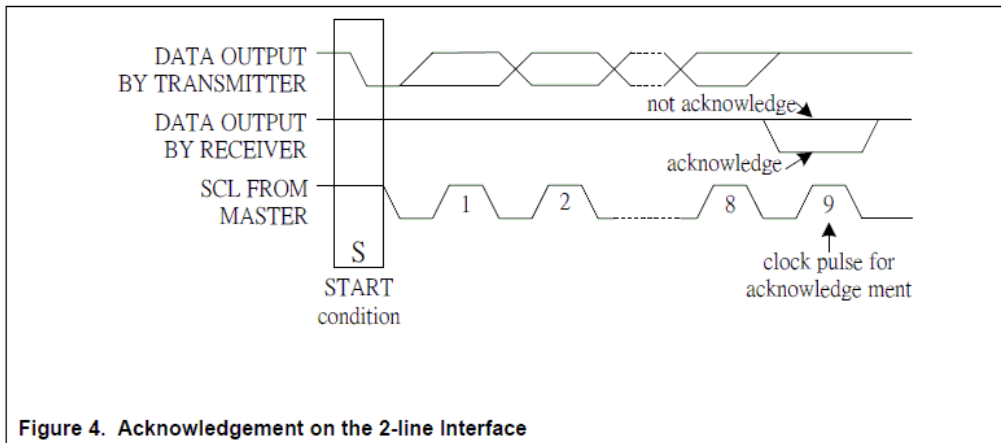


Figure 4. Acknowledgement on the 2-line Interface

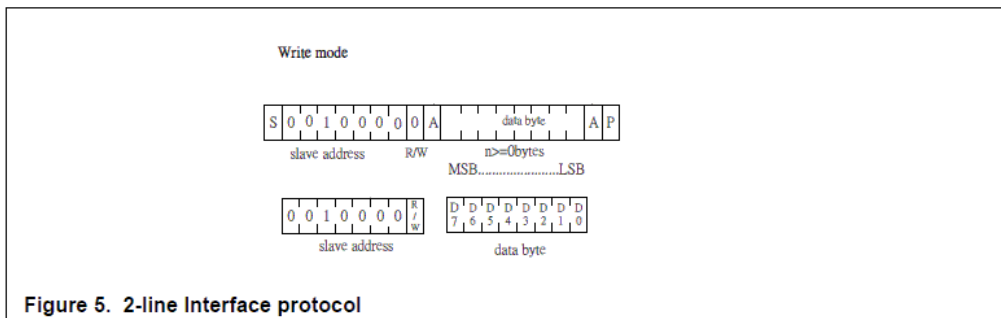


Figure 5. 2-line Interface protocol

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