TFT DISPLAY SPECIFICATION

WINSTAR Display Co.,Ltd.
華凌光電股份有限公司

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SPECIFICATION

CUSTOMER : _____

MODULE NO.: WFN0286A2T0WADNN000

APPROVED BY: **(FOR CUSTOMER USE ONLY)**	**PCB VERSION:** **DATA:** ☐ TFT Display Inspection Specification: https://www.winstar.com.tw/technology/download.html ☐ Precaution in use of TFT module: https://www.winstar.com.tw/technology/download/declaration.html

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE:	**2026/04/07**		

Winstar Display Co., LTD
華凌光電股份有限公司

MODLE NO：

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	**SUMMARY**
0	2025/11/21		First issue
A	2026/01/22		Modify Match connector
B	2026/04/07		Add item (With /Without TP)

Contents

1.Module Classification Information

W	F	N	0286	A2	T	0W	A	D	N	N	0	00
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬

①	Brand：WINSTAR DISPLAY CORPORATION
②	Display Type：F→TFT Type, J→Custom TFT
③	N: Normal　E：EFD　M：MIP
④	Display Size：2.86” TFT
⑤	Model serials no.

⑥ Backlight Type：

F：	CCFL, White	T：	LED, White
S：	LED, High Light White	Z：	Nichia LED, White
N：	With out Backlight	A：	Front Light

⑦ LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction

Operating Temperature	Normal temperature					Super Wide temperature					
LCD tape	TN			IPS	VA	TN				IPS	VA
View angle	6H	12H	3H			6H	12H	O-Film	OD-Film		
Reflective	AA	-	-	-	AT	AN	-	-	-	AW	AV
Transflective	0B	0E	BN	AC	02	0M	0P	-	-	08	04
Transmissive	0C	0F	-	0A	0T	0N	0Q	0R	0S	0W	0V

Operating Temperature	Wide temperature									
LCD tape	TN								IPS	VA
View angle	6H	12H	2H	3H	9H	O-Film	OD-Film	All View		
Reflective	AG	AJ	AB	-	AW	-	-	05	AY	AX
Transflective	0H	0K	-	0G	-	0U	-	-	07	03
Transmissive	0I	0L	-	-	0W	0Z	0J	-	0Y	0X

⑧

A：	TFT LCD	G：	TFT+ Screw holes
B：	TFT+ Screw holes+ Control board	H：	TFT+ D/V board
C：	TFT+ Screw holes + A/D board	I：	TFT+ Screw holes +D/V board
D：	TFT+ Screw holes + A/D board + Control board	J：	TFT+ Power board
E：	TFT+ Screw holes + Power board	Z：	TFT+ Power board (Embedded)
F：	TFT+ Control board		

⑨

A：Analog	B：6-bits parallel	D：Digital	E：eDP
L：LVDS	M：MIPI	S：SPI	

⑩ Interface:

A：8Bit	B：16Bit	E：eDP	H：HDMI	I：I2C Interface	L：LVDS
M：MIPI	N：Without Control board	P：DP	R：RS232	S：SPI	U：USB

⑪ TS:

A：	CTP + Optical bonding	B：	CTP + USB	C：	CTP
D：	CTP + USB + Optical bonding	E：	RTP + Optical bonding	F：	CG + Optical bonding
H：	CTP + Only G-sensor	J：	CTP + Only G-sensor + USB	L：	CTP+ Hover Touch
N：	Without TS	Q：	in-cell	R：	on-cell
T：	RTP	U：	CG	V：	in-cell + CG
W：	on-cell + CG				

⑫	Version:
⑬	Serial No.: Serial number (00~99)

2.Summary

TFT 2.86” is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This TFT LCD has a 2.86 inch diagonally measured active display area with 376x960 (376 horizontal by 960 vertical pixel) resolution.

3.General Specifications

Item	Dimension	Unit
Size	2.86”	inch
Dot Matrix	376 x RGB x 960 (TFT)	dots
Module dimension	31.2 (W) x 76.6 (H) x 2.23 (D)	mm
Active area	26.508 x 67.68	mm
Pixel Pitch	0.0705 x 0.0705	mm
LCD type	TFT, Normally Black, Transmissive	
Viewing angle	85/85/85/85	
Aspect Ratio	1：2.5	
TFT Interface	3W SPI+RGB24bit	
TFT Driver IC	ST7701P or Equivalent	
Backlight Type	LED ,Normally White	
With /Without TP	Without TP	
Surface	Glare	

*Color tone slight changed by temperature and driving voltage.

4.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+85	℃
Storage Temperature	TST	-30	—	+85	℃

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. ≦ 60℃, 90% RH MAX. Temp.＞60℃, Absolute humidity shall be less than 90% RH at 60℃

5.Electrical Characteristics

5.1. Operating conditions

Item	Symbol	Min	Typ	Max	Unit
Interface Supply Voltage	VCC	2.5	2.8	3.3	V
Current for Drive	IVCC	—	25	40	mA
Input voltage 'H'level	VIH	0.7*VCC	—	VCC	V
Input voltage 'L'level	VIL	GND	—	0.3*VCC	V
Output voltage 'H'level	VOH	0.8* VCC	—	VCC	V
Output voltage 'L'level	VOL	GND	—	0.2* VCC	V

Note: to avoid power supply noise, please avoid using driving conditions close to min, or max value

5.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	—	—	20	—	mA	—
LED voltage	VLED+	19.6	21	22.4	V	Note 1
LED Life Time	—	50,000	—	—	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED

Backlight LED Circuit

Note 2 : Ta = 25 ℃

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case

6.AC Characteristics

6.1. Serial Interface Characteristics (3-line serial):

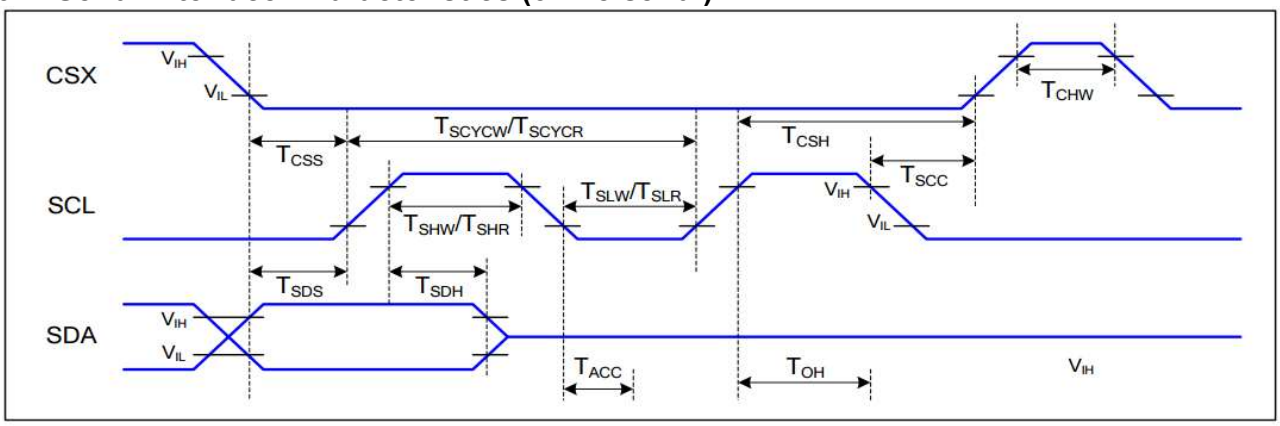


Figure 1 3-line serial Interface Timing Characteristics

Signal	Symbol	Parameter	Min	Max	Unit	Description
CSX	Tcss	Chip select setup time (write)	15		ns	
	TCSH	Chip select hold time (write)	15		ns	
	Tcss	Chip select setup time (read)	60		ns	
	Tscc	Chip select hold time (read)	60		ns	
	TCHW	Chip select "H" pulse width	40		ns	
SCL	TSCYCW	Serial clock cycle (Write)	66		ns	
	TSHW	SCL “H" pulse width (Write)	15		ns	
	TSLW	SCL "L" pulse width (Write)	15		ns	
	TSCYCR	Serial clock cycle (Read)	150		ns	
	TSHR	SCL “H” pulse width (Read)	60		ns	
	TSLR	SCL “L" pulse width (Read)	60		ns	
SDA (DIN)	Tsos	Data setup time	10		ns	
	TSDH	Data hold time	10		ns	

6.2. RGB Interface Characteristics :

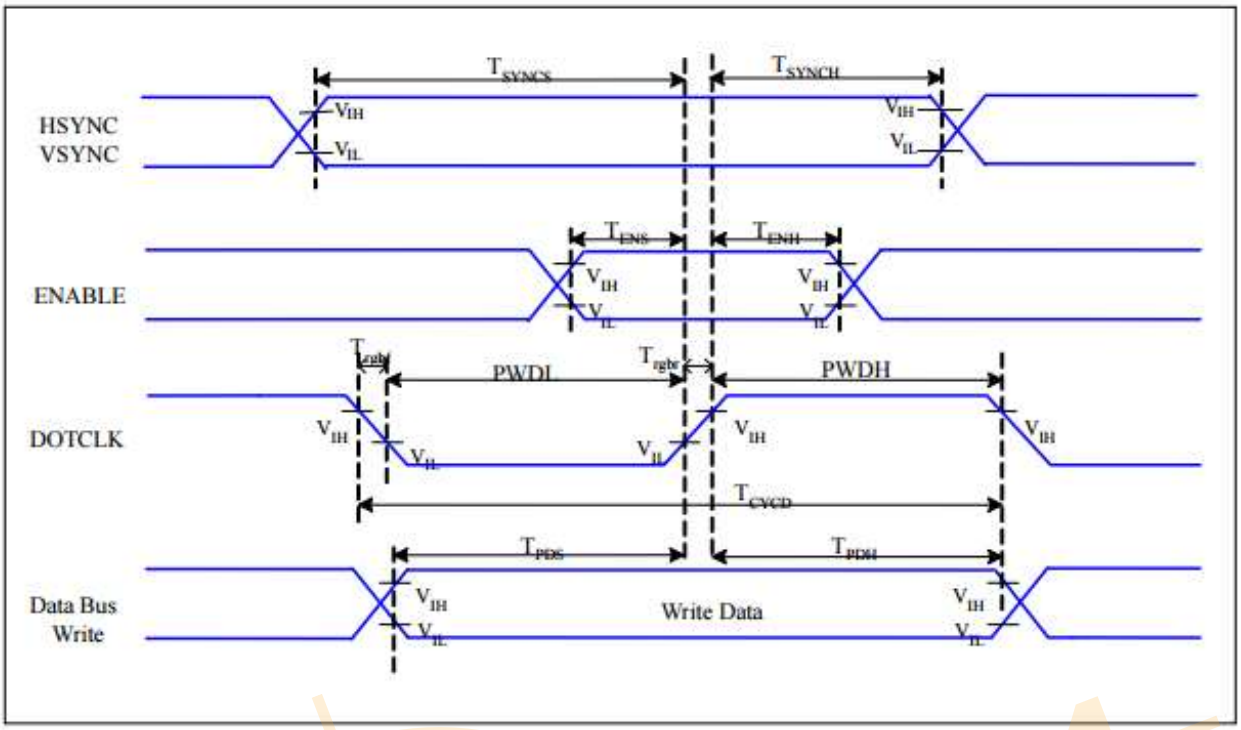


Figure 2 RGB Interface Timing Characteristics

VCC=2.8V,DGND=0V, Ta=25 ℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYNC. HSYNC Setup Time	5	-	ns	
ENABLE	T_{ENS}	Enable Setup Time	5	-	ns	
	T_{ENH}	Enable Hold Time	5	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	15	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	15	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	33	-	ns	
	Trghr. Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	5	-	ns	
	T_{PDH}	PD Data Hold Time	5	-	ns	

Table 1 18/16 Bits RGB Interface Timing Characteristics

7.Reset Timing

7.1. Reset Timing

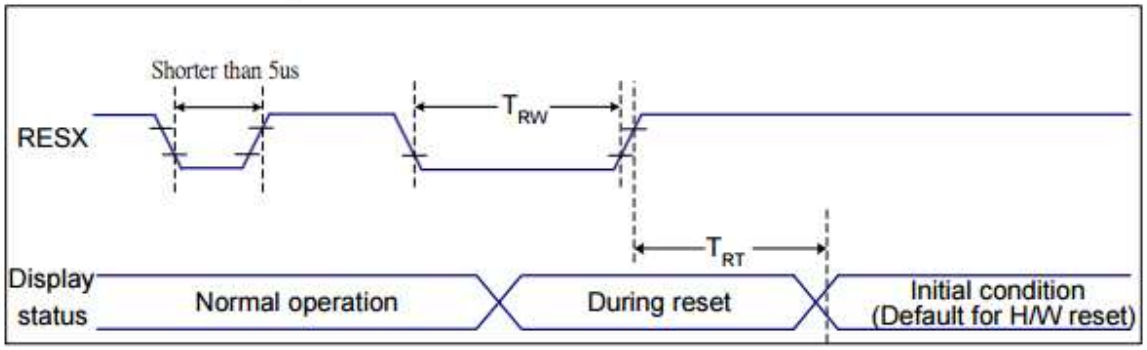


Table 2 Reset Timing

Signal	Symbol	Parameter	Min	Max	Unit
RESX	t_{RW}	Reset pulse duration	10		uS
	t_{RT}	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

Notes:

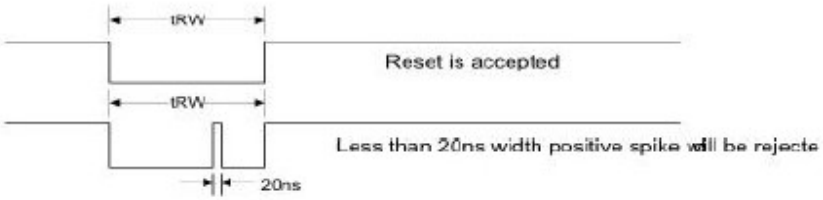
1.The reset cancel also includes required time for loading ID bytes, VCOM setting and other settings fromEEPROM (or similar device) to registers.
This loading is done every time when there is HW reset cancel time (tRT) within 10 ms after a rising edgeof RESX.

2.Spike due to an electrostatic discharge on RESX line does not cause irregular system reset accordingto the table below:

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset starts

3.During the Resetting period, the display will be blanked(The display is entering blanking sequence,which maximum time is 120 ms, when Reset Starts at Sleep-Out status. The display remains the blank state in Sleep-In mode). Then return to Defaultcondition for Hardware Reset

4.Spike Rejection also applies during a valid reset pulse as shown below ：



5.When Reset applied during Sleep-In Mode.

6.When Reset applied during Sleep-Out Mode

7.It is necessary to wait 10ms after releasing RESX before sending commands. Also Sleep Outcommand cannot be sent for 120 ms.

8.Function Description

8.1. Serial Interface (only command)

The serial interface is either 3-lines/9-bits for communication between the micro controller and the LCD driver. The 3-lines serial interface use: CSX (chip enable), SCL (serial clock) and SDA (serial data input/output) is used for interface with MCU only, so it can be stopped when no communication is necessary

Pin description
3-line serial interface (9 bits)

Pin Name	Description
CSX	Chip selection signal
SCL	Serial input CLK
SDA	Serial input data

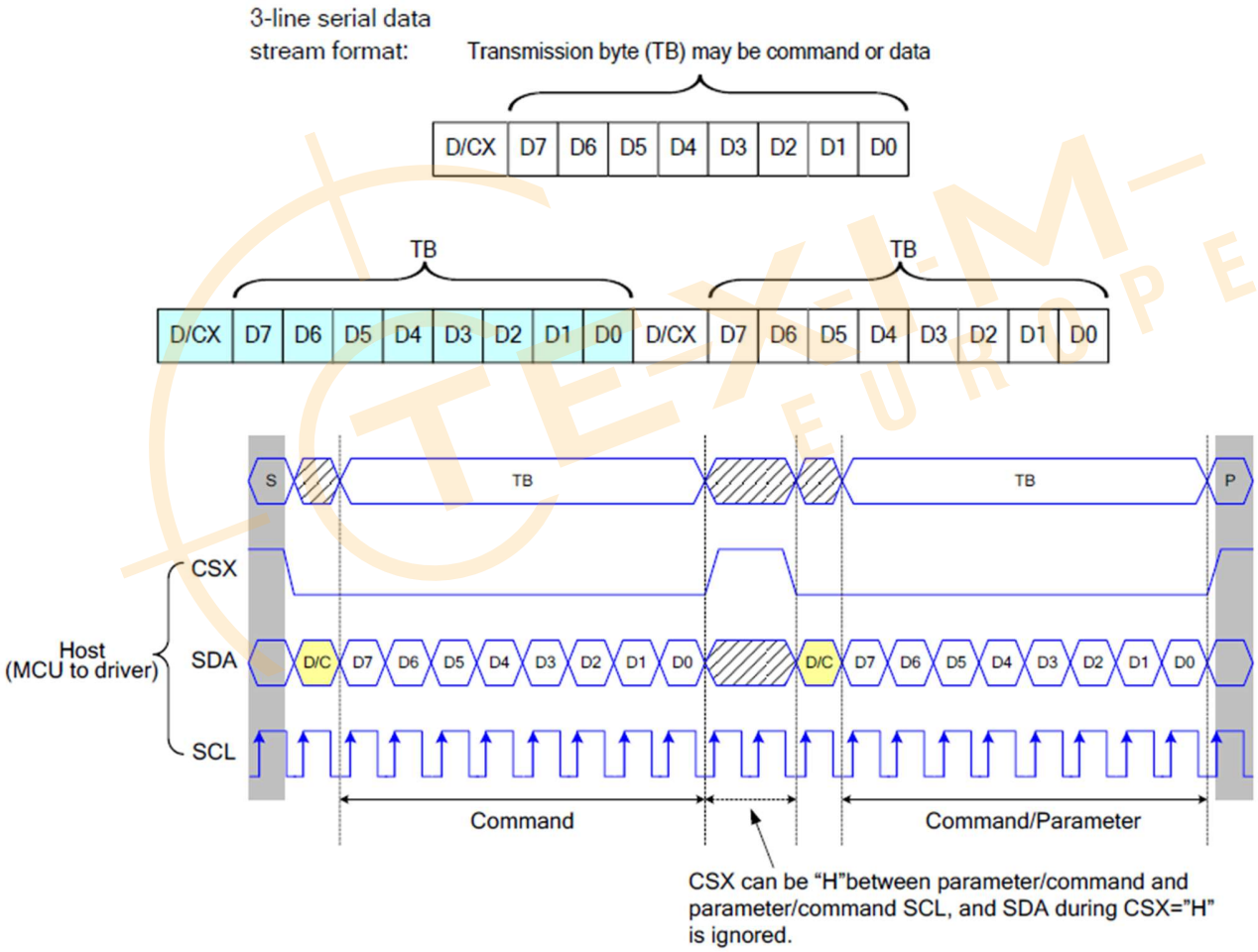


Figure 3 3-line serial interface write protocol (write to register with control bit in transmission)

8.2. RGB Interface

The ST7701P support RGB interface Mode 1 and Mode 2..
The Mode 1 and Mode 2 function is select by setting in the Command 2, please reference application note.
In RGB Mode 1, writing data to line buffer is done by PCLK and Video Data Bus (D[23:0]), when DE is high state.
The external clocks (PCLK, VS and HS) are used for internal displaying clock. So, controller must always transfer PCLK, VS and HS signal to ST7701P.
In RGB Mode 2, back porch of Vsync is defined by VBP_HVRGB [7:0] of RGBCTR command. And back porch of Hsync is defined by HBP_HVRGB [7:0] of RGBCTR command. Front porch of Vsync are not setting by this mode.

RGB I/F Mode	PCLK	DE	VS	HS	DB[23:0]	Register for Blanking Porch setting
RGB Mode 1	Used	Used	Used	Used	Used	Not Used
RGB Mode 2	Used	Not Used	Used	Used	Used	Used

Symbol	Name	Description
PCLK	Pixel clock	Pixel clock for capturi ng pixels at display in terface
HS	Horizontal sync	Horizontal synchronization timing signal
VS	Vertical sync	Vertical synchronization timing signal
DE	Data enable	Data enable signal (assertion indicates valid pixels)
DB[23:0]	Pixel data	Pixel data in 16-bit,18-bit and 24-bit format

Table 3 The interface signals of RGB interface

1.RGB Color Format

ST7701P supports two kinds of RGB interface, DE mode (mode 1) and HV mode (mode 2), and 16bit/18bit and 24bit data format. When DE mode is selected and the VSYNC, HSYNC, DOTCLK, DE, D[23:0] pins can be used; when HV mode is selected and the VSYNC, HSYNC, DOTCLK, D[23:0] pins can be used. When using RGB interface, only serial interface can be selected.

Pad name	24 bits configuration VIPF[3:0]=0111	18 bits configuration VIPF[3:0]=0110		16 bits configuration VIPF[3:0]=0101
		MDT=0	MDT=1	
DB[23]	R7	Not used	Not used	Not used
DB[22]	R6	Not used	Not used	Not used
DB[21]	R5	R5	Not used	Not used
DB[20]	R4	R4	Not used	R4
DB[19]	R3	R3	Not used	R3
DB[18]	R2	R2	Not used	R2
DB[17]	R1	R1	R5	R1
DB[16]	R0	R0	R4	R0
DB[15]	G7	Not used	R3	Not used
DB[14]	G6	Not used	R2	Not used
DB[13]	G5	G5	R1	G5
DB[12]	G4	G4	R0	G4
DB[11]	G3	G3	G5	G3
DB[10]	G2	G2	G4	G2
DB[09]	G1	G1	G3	G1
DB[08]	G0	G0	G2	G0
DB[07]	B7	Not used	G1	Not used
DB[06]	B6	Not used	G0	Not used
DB[05]	B5	B5	B5	Not used
DB[04]	B4	B4	B4	B4
DB[03]	B3	B3	B3	B3
DB[02]	B2	B2	B2	B2
DB[01]	B1	B1	B1	B1
DB[00]	B0	B0	B0	B0

Table 4 The interface color mapping of RGB interface

2.RGB Interface Definition

The display operation via the RGB interface is synchronized with the VSYNC, HSYNC, and DOTCLK signals. The data can be written only within the specified area with low power consumption by using window address function. The back porch and front porch are used to set the RGB interface timing.

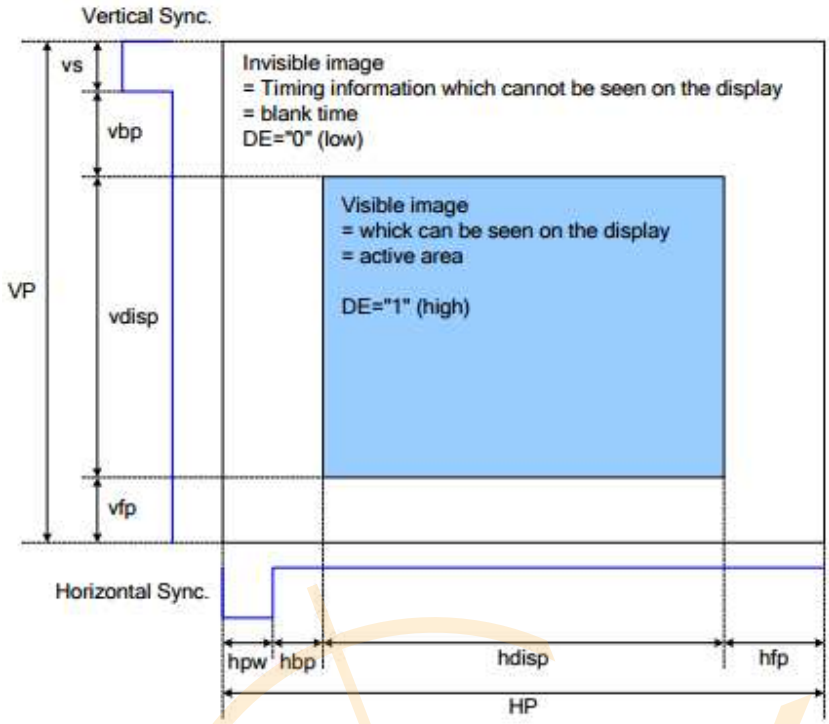


Figure 4 Access Area by RGB Interface

Timing Characteristics

Horizontal input timing

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	-	20	-	MHz
Horizontal Total	HP	-	432	-	DCLK
Hsync Pulse width	hpw	-	10	-	
Horizontal Back Porch	hbp	-	16	-	
Horizontal Valid Data	hdisp		376		
Horizontal Front Porch	hfp	-	30	-	

Vertical input timing

Item	Symbol	Values			Unit
		Min	Typ.	Max.	
Vertical Total	VP	-	1016	-	THT
Vsync Pulse Width	vs	-	10	-	THT
Vertical Back Porch	vbp	-	16	-	THT
Vertical Valid Data	vdisp		960		THT
Vertical Front Porch	vfp	-	30	-	THT

Note:
1. Typical value are related to the setting frame rate is 60Hz.
2. VS+VBP<=254, HPW+HBP<=255

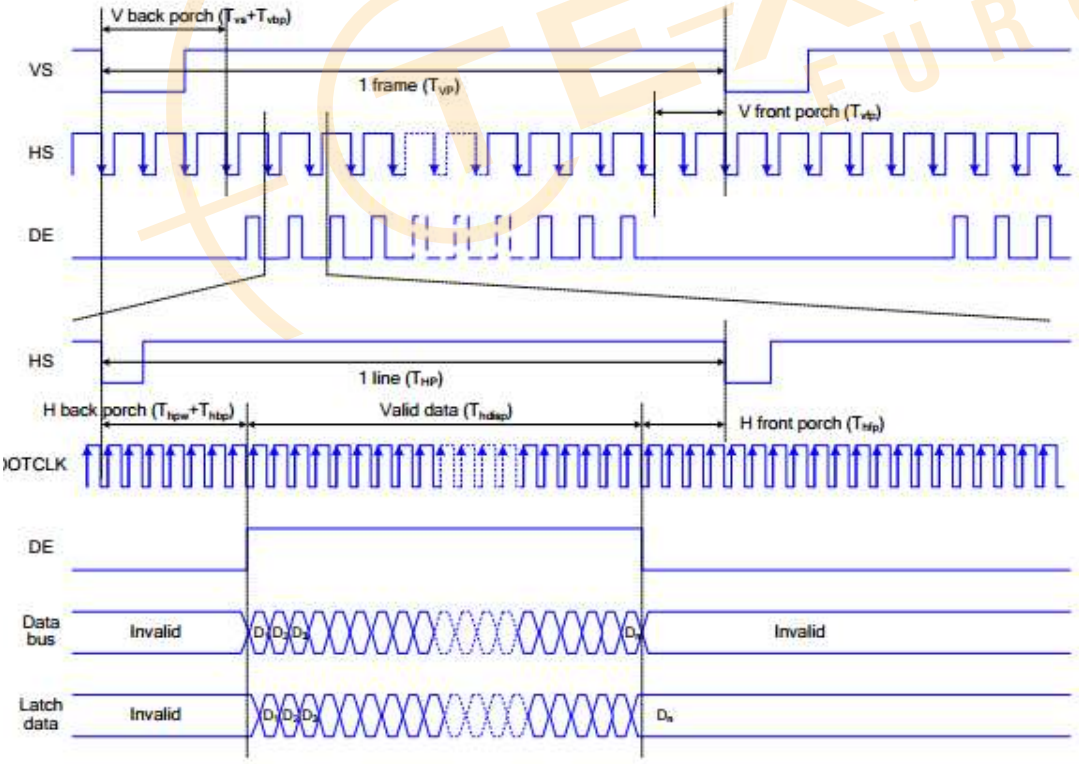
3. RGB Interface Mode Selection

ST7701P supports two kinds of RGB interface, DE mode and HV mode. The table shown below uses command C3h to select RGB interface mode.

DE/Sync	RGB Mode
0	DE mode
1	HV mode

4. RGB Interface Timing

The timing chart of RGB interface DE mode is shown as follows.



Note: The setting of front porch and back porch in host must match that in IC as this mode.

Figure 5 Timing Chart of Signals in RGB Interface DE Mod

The timing chart of RGB interface HV mode is shown as follows.

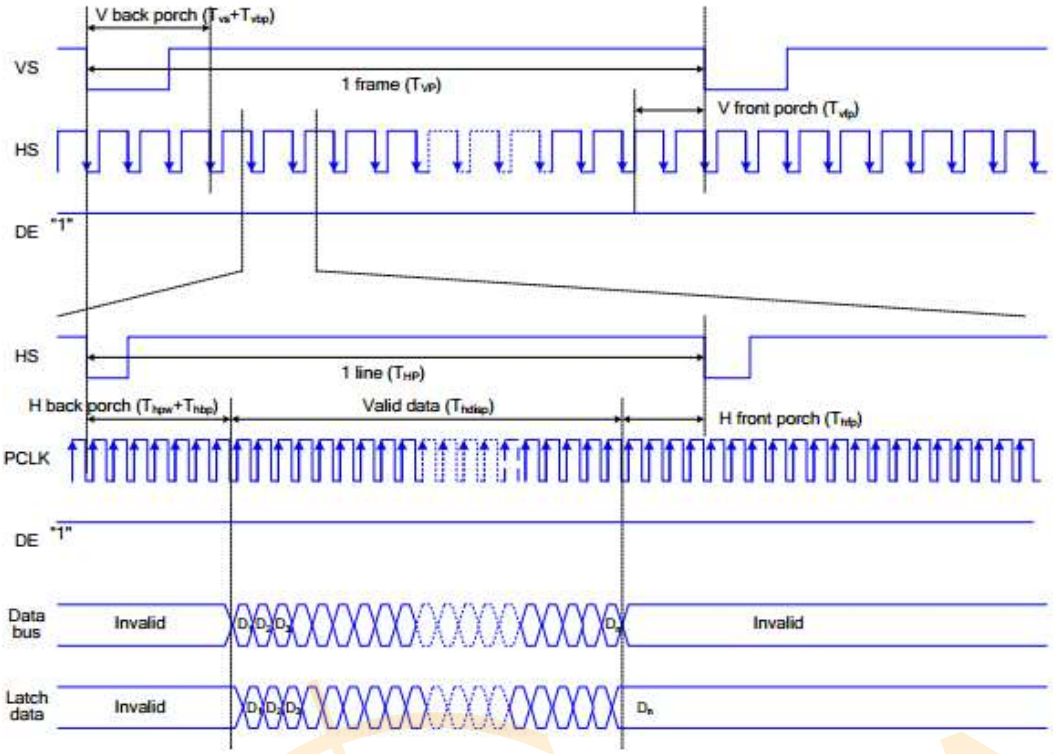
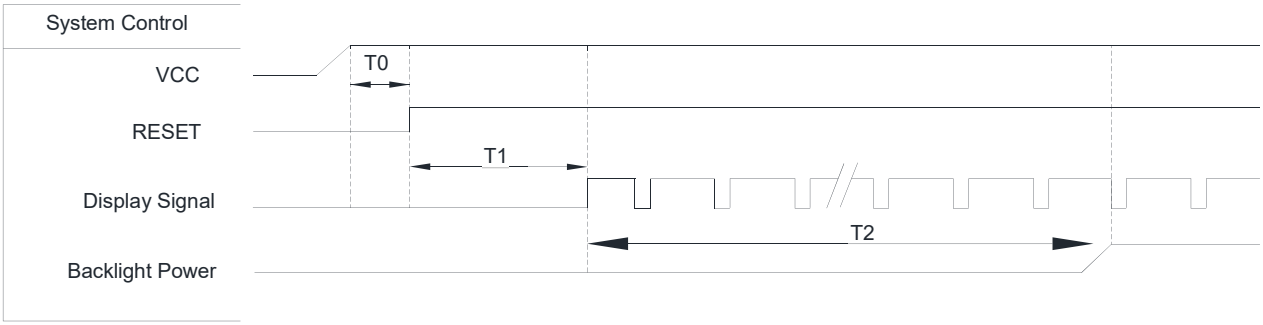


Figure 6 Timing chart of RGB interface HV mode

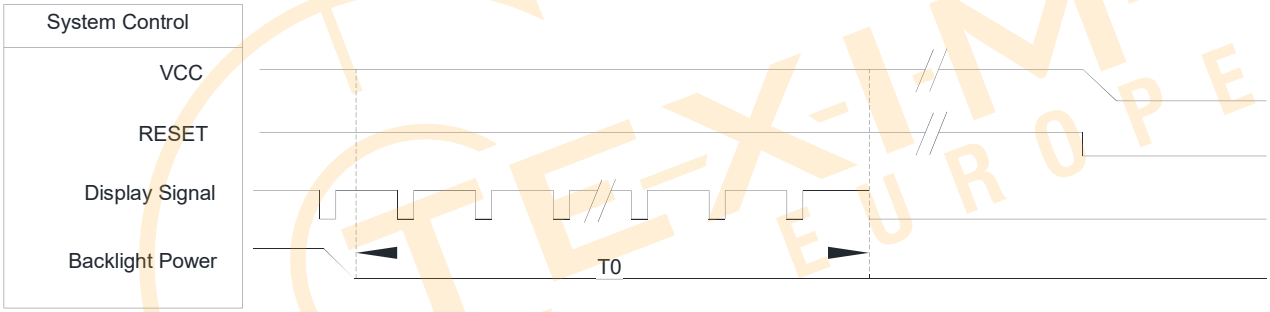
8.3. Power ON/OFF Sequence

1.Power - On Timing Sequence



Symbol	Description	Min. Time	Unit
T0	System power stability to RESET signal	0	ms
T1	GRB RESET=”High to Display Signal output	10	ms
T2	Display signal output to Backlight Power on	250	ms

2.Power - off Timing Sequence



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to IC internal voltage discharge complete	85	ms

9.Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr+ Tf	θ=0°、Φ=0°	-	30	35	ms	Note 3
Contrast ratio		CR	At optimized viewing angle	1000	1200	-	-	Note 4
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.258	0.308	0.358		Note 2,6,7
		Wy		0.295	0.345	0.395		
Viewing angle	Hor.	ΘR	CR≧10	75	85	-	Deg.	Note 1
		ΘL		75	85	-		
	Ver.	ΦT		75	85	-		
		ΦB		75	85	-		
Brightness		-	-	500	600	-	cd/m²	Center of display
Uniformity		(U)	-	70	-	-	%	Note5

Ta=25±2℃

Note 1: Definition of viewing angle range

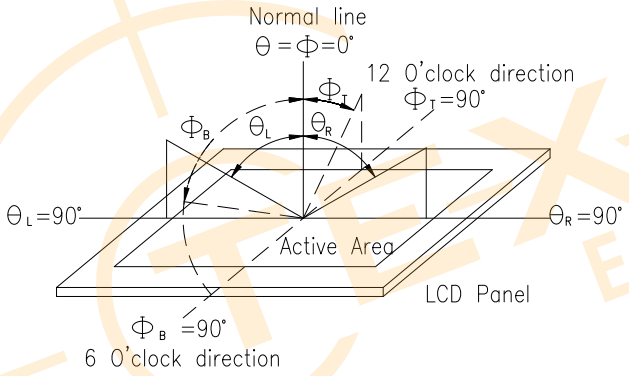


Fig. 9.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

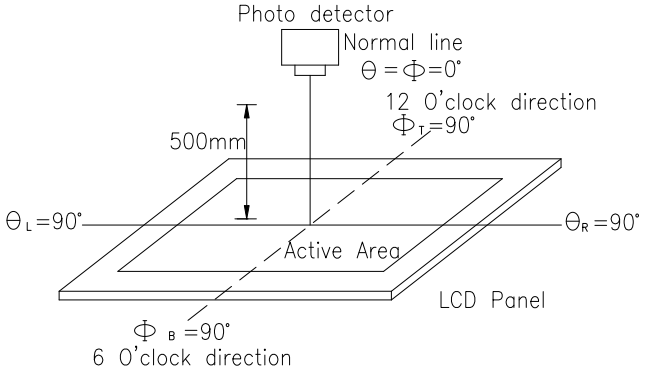
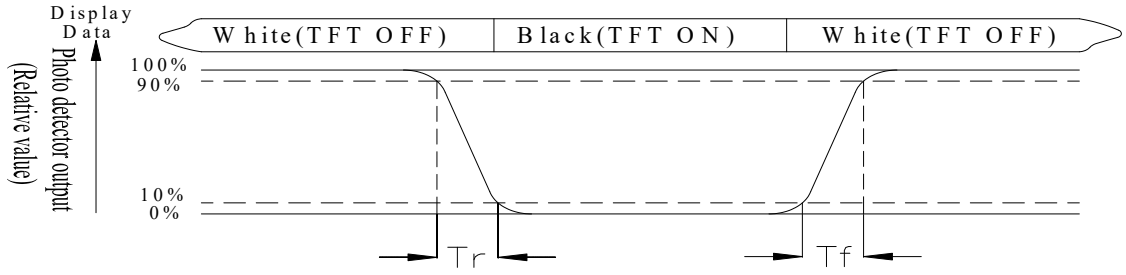


Fig. 9.2. Optical measurement system setup

Note 3: Definition of Response time:
The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, is the time between photo detector output intensity changed from 10%to 90%



Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of Luminance Uniformity
Active area is divided into 5 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.
Luminance Uniformity (U) = Lmin/Lmax x100%
L = Active area length
W = Active area width

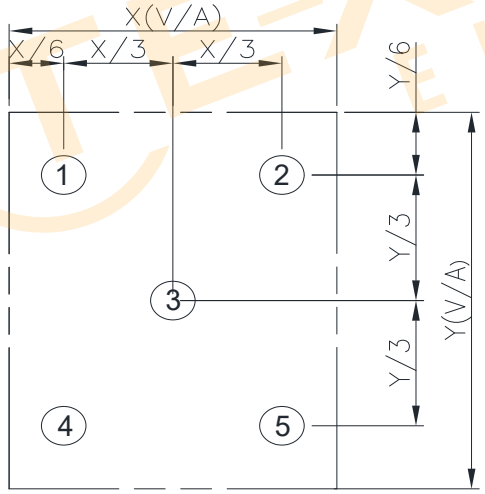


Fig9.3. Definition of uniformity

Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

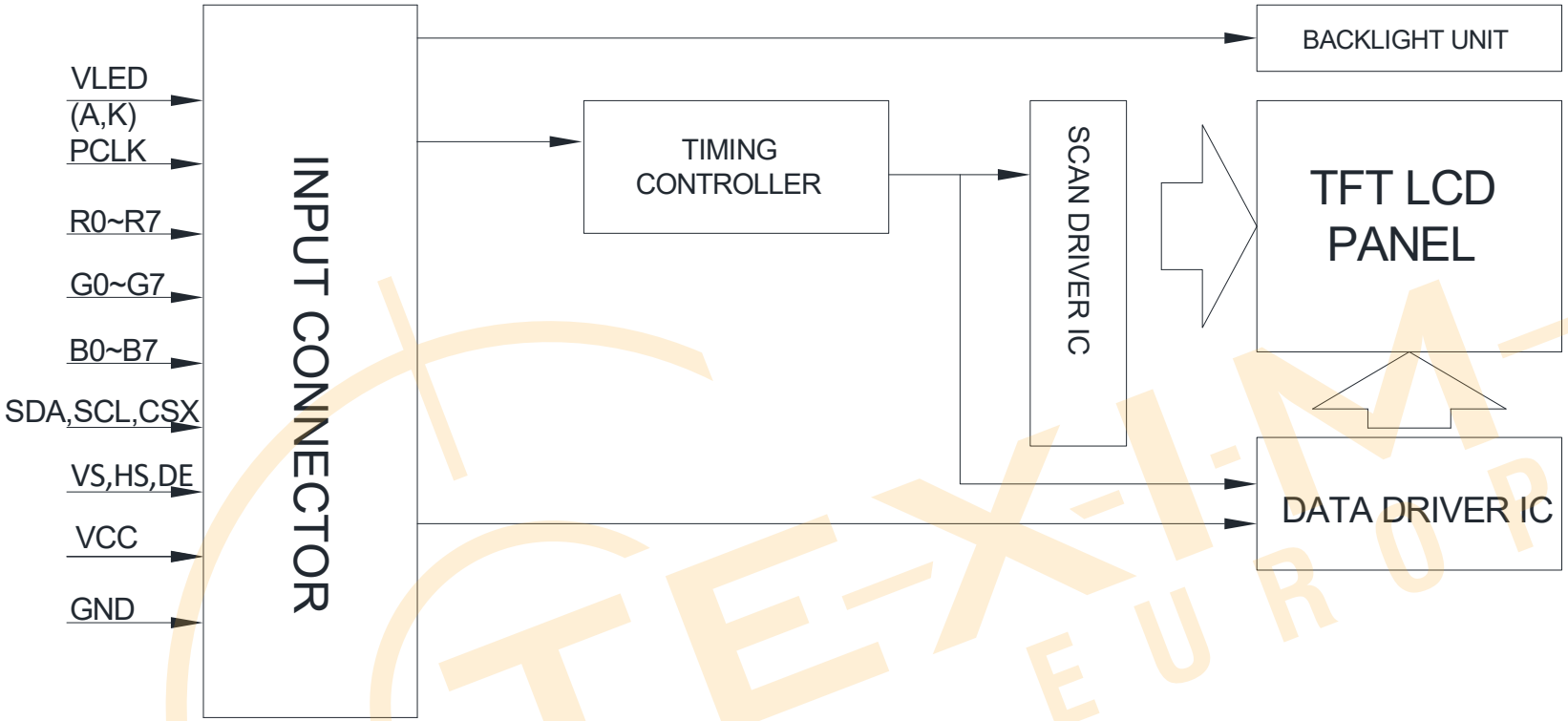
10.Interface

10.1. LCM PIN Definition

Match connector: Molex 5025984593 or equivalent.

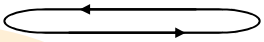
Pin No.	Symbol	Description
1	VLED-	LED backlight cathode
2	VLED+	LED backlight anode
3	GND	Power ground
4	VCC	Power Supply for Digital Circuit
5	SDA	SDA: Serial data input/output bidirectional pin for SPI Interface.
6	SCL	SCL: Serial clock input for SPI interface.
7	CSX	- A chip select signal Low: the chip is selected and accessible High: the chip is not selected and not accessible
8	RESET	Reset signal(low active)
9	GND	Power ground
10~17	R7~R0	Red Data 7~0
18	GND	Power ground
19~26	G7~G0	Green Data 7~0
27	GND	Power ground
28~35	B7~B0	Blue Data 7~0
36	DE	Data Enable (ENABLE)
37	PCLK	Clock Signals ; Latch Data at the Falling Edge (DOTCLK)
38	HS	Line synchronizing signal for RGB interface operation (HSYNC)
39	VS	Frame synchronizing signal for RGB interface operation (VSYNC)
40	NC(TP_RST)	No connection (CTP External Reset, Low is active)
41	NC(TP_INT)	No connection (CTP External interrupt to the host)
42	NC(TP_SDA)	No connection (CTP I2C data input and output)
43	NC(TP_SCL)	No connection (CTP I2C clock input)
44	NC(TP_VDDT)	No connection (CTP Power supply: +3.3V)
45	NC(TP_VSS)	No connection (CTP Ground for analog circuit)

11.Block Diagram



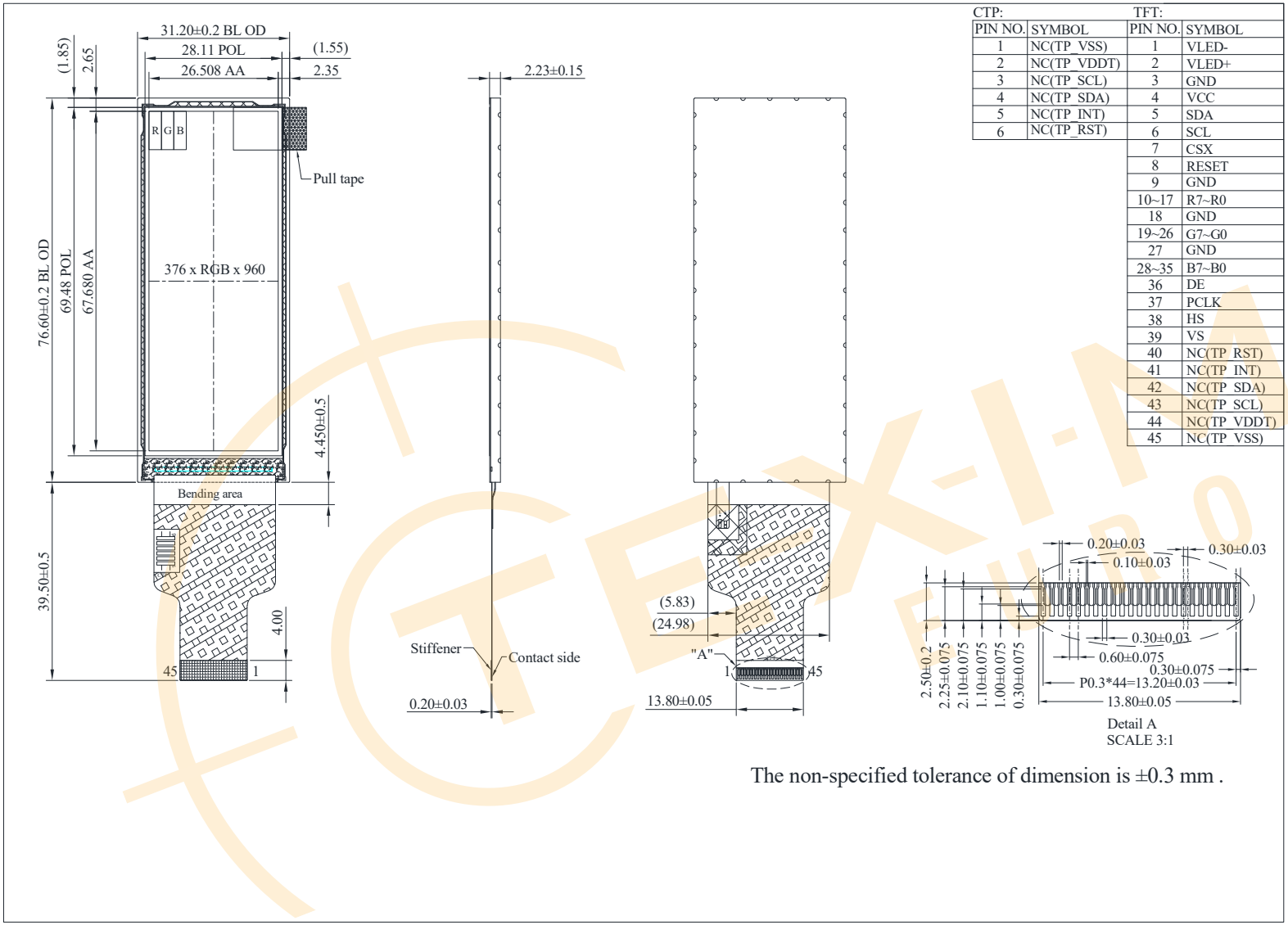
12.Reliability

Content of Reliability Test (Wide temperature, -30℃~85℃)

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	85℃ 240hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 240hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	85℃ 240hrs	2
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30℃ 240hrs	1,2
High Temperature/ Humidity storage	The module should be allowed to stand at 60℃,90%RH max	60℃,90%RH 240hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of storage -30℃ 25℃ 85℃  30min 5min 30min 1 cycle	-30℃/85℃ 10 cycles	2
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=±TBD(contact), ±TBD(air), RS=330Ω CS=150pF 5 times	4

Note1: No dew condensation to be observed.
Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.
Note3: The packing have to including into the vibration testing.
Note4: Endurance test applying the electric stress to the finished product housing

13.Contour Drawing



CTP:		TFT:	
PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	NC(TP_VSS)	1	VLED-
2	NC(TP_VDDT)	2	VLED+
3	NC(TP_SCL)	3	GND
4	NC(TP_SDA)	4	VCC
5	NC(TP_INT)	5	SDA
6	NC(TP_RST)	6	SCL
		7	CSX
		8	RESET
		9	GND
		10~17	R7~R0
		18	GND
		19~26	G7~G0
		27	GND
		28~35	B7~B0
		36	DE
		37	PCLK
		38	HS
		39	VS
		40	NC(TP_RST)
		41	NC(TP_INT)
		42	NC(TP_SDA)
		43	NC(TP_SCL)
		44	NC(TP_VDDT)
		45	NC(TP_VSS)

The non-specified tolerance of dimension is ±0.3 mm .

14.Initial Code for Reference

```
void ST7701P_SPI+RGB_0286A2(void)
{
    GATE = 960;
    SOURCE = 376;

    IC_RST = 1;
    asm("nop");
    asm("nop");
    asm("nop");
    delay(100);
    IC_RST = 0;
    delay(200);
    asm("nop");
    asm("nop");
    asm("nop");
    IC_RST = 1;
    asm("nop");
    asm("nop");
    asm("nop");
    delay(100);

    //------------------ST7701P initial------------------

    Write_Command(0x11);
     Write_Data(0x00);

     Write_Command(0xFF);
     Write_Data(0x77);
     Write_Data(0x01);
     Write_Data(0x00);
     Write_Data(0x00);
     Write_Data(0x13);

     Write_Command(0xEF);
     Write_Data(0x08);

     Write_Command(0xFF);
     Write_Data(0x77);
     Write_Data(0x01);
     Write_Data(0x00);
     Write_Data(0x00);
     Write_Data(0x10);

     Write_Command(0xC0);
     Write_Data(0x77);
     Write_Data(0x00);
```

```
Write_Command(0xC1);
Write_Data(0x0C);
Write_Data(0x0C);

Write_Command(0xC2);
Write_Data(0x07);
Write_Data(0x02);

Write_Command(0xCC);
Write_Data(0x10);

Write_Command(0xB0);
Write_Data(0x00);
Write_Data(0x0C);
Write_Data(0x19);
Write_Data(0x0B);
Write_Data(0x0F);
Write_Data(0x06);
Write_Data(0x05);
Write_Data(0x08);
Write_Data(0x08);
Write_Data(0x1F);
Write_Data(0x04);
Write_Data(0x11);
Write_Data(0x0F);
Write_Data(0x26);
Write_Data(0x2F);
Write_Data(0x1D);

Write_Command(0xB1);
Write_Data(0x00);
Write_Data(0x17);
Write_Data(0x19);
Write_Data(0x0F);
Write_Data(0x12);
Write_Data(0x05);
Write_Data(0x05);
Write_Data(0x08);
Write_Data(0x07);
Write_Data(0x1F);
Write_Data(0x03);
Write_Data(0x10);
Write_Data(0x10);
Write_Data(0x27);
Write_Data(0x2F);
Write_Data(0x1D);


Write_Command(0xFF);
Write_Data(0x77);
Write_Data(0x01);
```

```
Write_Data(0x00);
Write_Data(0x00);
Write_Data(0x11);

Write_Command(0xB0);
Write_Data(0x25);

Write_Command(0xB1);
Write_Data(0x76);

Write_Command(0xB2);
Write_Data(0x81);

Write_Command(0xB3);
Write_Data(0x80);

Write_Command(0xB5);
Write_Data(0x4E);

Write_Command(0xB7);
Write_Data(0x85);

Write_Command(0xB8);
Write_Data(0x20);

Write_Command(0xC1);
Write_Data(0x78);

Write_Command(0xC2);
Write_Data(0x78);

Write_Command(0xD0);
Write_Data(0x88);

Write_Command(0xE0);
Write_Data(0x00);
Write_Data(0x00);
Write_Data(0x02);
Write_Data(0x00);
Write_Data(0x00);
Write_Data(0x0C);

Write_Command(0xE1);
Write_Data(0x02);
Write_Data(0x8C);
Write_Data(0x04);
Write_Data(0x8C);
Write_Data(0x01);
Write_Data(0x8C);
Write_Data(0x03);
Write_Data(0x8C);
```

```
Write_Data(0x00);
Write_Data(0x44);
Write_Data(0x44);

Write_Command(0xE2);
Write_Data(0x03);
Write_Data(0x03);
Write_Data(0x03);
Write_Data(0x03);
Write_Data(0x00);
Write_Data(0x00);
Write_Data(0xD4);
Write_Data(0x00);
Write_Data(0x00);
Write_Data(0x00);
Write_Data(0xD4);
Write_Data(0x00);

Write_Command(0xE3);
Write_Data(0x00);
Write_Data(0x00);
Write_Data(0x33);
Write_Data(0x33);

Write_Command(0xE4);
Write_Data(0x44);
Write_Data(0x44);

Write_Command(0xE5);
Write_Data(0x09);
Write_Data(0xD2);
Write_Data(0x35);
Write_Data(0x8C);
Write_Data(0x0B);
Write_Data(0xD4);
Write_Data(0x35);
Write_Data(0x8C);
Write_Data(0x05);
Write_Data(0xCE);
Write_Data(0x35);
Write_Data(0x8C);
Write_Data(0x07);
Write_Data(0xD0);
Write_Data(0x35);
Write_Data(0x8C);

Write_Command(0xE6);
Write_Data(0x00);
Write_Data(0x00);
Write_Data(0x33);
Write_Data(0x33);
```

```
Write_Command(0xE7);
Write_Data(0x44);
Write_Data(0x44);

Write_Command(0xE8);
Write_Data(0x08);
Write_Data(0xD1);
Write_Data(0x35);
Write_Data(0x8C);
Write_Data(0x0A);
Write_Data(0xD3);
Write_Data(0x35);
Write_Data(0x8C);
Write_Data(0x04);
Write_Data(0xCD);
Write_Data(0x35);
Write_Data(0x8C);
Write_Data(0x06);
Write_Data(0xCF);
Write_Data(0x35);
Write_Data(0x8C);

Write_Command(0xEB);
Write_Data(0x00);
Write_Data(0x01);
Write_Data(0xE4);
Write_Data(0xE4);
Write_Data(0x44);
Write_Data(0x33);

Write_Command(0xED);
Write_Data(0x77);
Write_Data(0x66);
Write_Data(0x55);
Write_Data(0x44);
Write_Data(0xCA);
Write_Data(0xF1);
Write_Data(0x03);
Write_Data(0xBF);
Write_Data(0xFB);
Write_Data(0x30);
Write_Data(0x1F);
Write_Data(0xAC);
Write_Data(0x44);
Write_Data(0x55);
Write_Data(0x66);
Write_Data(0x77);

Write_Command(0xEF);
Write_Data(0x10);
```

```
    Write_Data(0x0D);
    Write_Data(0x04);
    Write_Data(0x08);
    Write_Data(0x3F);
    Write_Data(0x1F);

    Write_Command(0xFF);
    Write_Data(0x77);
    Write_Data(0x01);
    Write_Data(0x00);
    Write_Data(0x00);
    Write_Data(0x13);

    Write_Command(0xE8);
    Write_Data(0x00);
    Write_Data(0x0E);

    Write_Command(0x11);
    Write_Data(0x00);
    delay(120);

    Write_Command(0xE8);
    Write_Data(0x00);
    Write_Data(0x0C);
    delay(20);

    Write_Command(0xE8);
    Write_Data(0x00);
    Write_Data(0x00);

    Write_Command(0xFF);
    Write_Data(0x77);
    Write_Data(0x01);
    Write_Data(0x00);
    Write_Data(0x00);
    Write_Data(0x00);

    Write_Command(0x29);
    Write_Data(0x00);

    Write_Command(0x35);
    Write_Data(0x00);

    Write_Command(0x36);
    Write_Data(0x00);

}
```

winstar

LCM Sample Estimate Feedback Sheet

Module Number： _____

1、Panel Specification：

1.	Panel Type：	□ Pass	□ NG , _____
2.	View Direction：	□ Pass	□ NG , _____
3.	Numbers of Dots：	□ Pass	□ NG , _____
4.	View Area：	□ Pass	□ NG , _____
5.	Active Area：	□ Pass	□ NG , _____
6.	Operating Temperature：	□ Pass	□ NG , _____
7.	Storage Temperature：	□ Pass	□ NG , _____
8.	Others： _____		

2、Mechanical

1.	PCB Size：	□ Pass	□ NG , _____
2.	Frame Size：	□ Pass	□ NG , _____
3.	Material of Frame：	□ Pass	□ NG , _____
4.	Connector Position：	□ Pass	□ NG , _____
5.	Fix Hole Position：	□ Pass	□ NG , _____
6.	Backlight Position：	□ Pass	□ NG , _____
7.	Thickness of PCB：	□ Pass	□ NG , _____
8.	Height of Frame to PCB：	□ Pass	□ NG , _____
9.	Height of Module：	□ Pass	□ NG , _____
10.	Others：	□ Pass	□ NG , _____

3、Relative Hole Size：

1.	Pitch of Connector：	□ Pass	□ NG , _____
2.	Hole size of Connector：	□ Pass	□ NG , _____
3.	Mounting Hole size：	□ Pass	□ NG , _____
4.	Mounting Hole Type：	□ Pass	□ NG , _____
5.	Others：	□ Pass	□ NG , _____

4、Backlight Specification：

1.	B/L Type：	□ Pass	□ NG , _____
2.	B/L Color：	□ Pass	□ NG , _____
3.	B/L Driving Voltage (Reference for LED Type)：	□ Pass	□ NG , _____
4.	B/L Driving Current：	□ Pass	□ NG , _____
5.	Brightness of B/L：	□ Pass	□ NG , _____
6.	B/L Solder Method：	□ Pass	□ NG , _____
7.	Others：	□ Pass	□ NG , _____

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5、**Electronic Characteristics of Module**：

1.	Input Voltage：	□ Pass	□ NG ,_____
2.	Supply Current：	□ Pass	□ NG ,_____
3.	Driving Voltage for LCD：	□ Pass	□ NG ,_____
4.	Contrast for LCD：	□ Pass	□ NG ,_____
5.	B/L Driving Method：	□ Pass	□ NG ,_____
6.	Negative Voltage Output：	□ Pass	□ NG ,_____
7.	Interface Function：	□ Pass	□ NG ,_____
8.	LCD Uniformity：	□ Pass	□ NG ,_____
9.	ESD test：	□ Pass	□ NG ,_____
10.	Others：	□ Pass	□ NG ,_____

6、**Summary**：

Sales signature：_____

Customer Signature：_____ **Date**：____/____/____

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All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts.

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