



深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, TD.

# TFT-LCD Module Specification

**Module NO.:** TST050WVHI-13C

**Version:** V1.0

APPROVAL FOR SPECIFICATION

APPROVAL FOR SAMPLE

For Customer' s Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Organized by

Version No.	Date	Content	Remark
V1.0	2018-3-15	Initial Release	

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## 1.0 GENERAL DESCRIPTION

### 1.1 Introduction

Team Source Display model TST050WVHI-13C is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit, a backlight system and a touch panel. This TFT LCD has a 5.0 (16:9) inch diagonally measured active display area with WVGA (800 horizontal by 480 vertical pixel) resolution.

### 1.2 Features

- 5.0 (16:9 diagonal) inch configuration
- 6 bits +FRC driver with 1 channel TTL interface
- ROHS and Halogen-Free Compliance

### 1.3 Applications

- Personal Navigation Device
- Multimedia applications and Others AV system

### 1.4 General information

Item	Specification	Unit	Note
Outline Dimension	140.7x 93.83 x 4.4 (Typ.)	mm	
Display area	108.0(H) x 64.8(V)	mm	
Number of Pixel	800 RGB (H) x 480(V)	pixels	16:9WVGA
Pixel pitch	0.135(H) x 0.135(V)	mm	
Pixel arrangement	RGB Vertical stripe	--	
Display mode	Normally white	--	TN Model
Surface Treatment	Antiglare	--	
Dirver Element	a-Si TFT	--	
LED	18	PCS	Establish

## 2.0 ABSOLUTE MAXIMUM RATINGS

### 2.1 Electrical Absolute Rating

#### 2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	$V_{DD}$	-0.5	5.0	V	GND=0
Logic Signal Input Level	$V_i$	-0.3	$V_{DD} + 0.3$	V	

#### 2.1.2 Back-Light Unit

Item	Symbol	MIN	TYP.	Max.	U	Note
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LED current	$I_L$		60	70	mA	(1)(2)(3)
LED voltage	V	18	19.2	20.4	V	(1)(2)(3)
LED Uniformity	$\Delta I_v$	80	85	--	%	
(LED+LCD)Luminance	$L_v$	850	900	--	Cd/m <sup>2</sup>	

### Note

- (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.
- (2)  $T_a = 25 \pm 2^\circ\text{C}$
- (3) Test Condition: LED current 60 mA. The LED lifetime could be decreased if operating  $I_L$  is larger than 70 mA.

## 2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	$T_{opa}$	-20	60	°C	
Storage Temperature	$T_{stg}$	-30	70	°C	

## 3.0 OPTICAL CHARACTERISTICS

### 3.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Threshold voltage	$V_{sat}$		—	2.4	—		(6)
	$V_{th}$		—	1.4	—		(6)
Transmittance (With PZ)	T		—	6.78	—		
Contrast	CR		480	600	—		(1)(2)
Response time	Rising	$T_R$	—	3	6	msec	(1)(3)
	Falling	$T_F$	—	7	14		
White luminance(center)	YL		850	900	-	cd/m <sup>2</sup>	I=60mA
Color gamut	S		—	50	—	%	C light
Color chromaticity (CIE1931)	White	$W_x$	$\Theta = 0$ Normal viewing angle	0.292	0.307	0.322	(1)(4) CF Glass C light
		$W_y$		0.333	0.348	0.363	
	Red	$R_x$		0.611	0.626	0.657	
		$R_y$		0.327	0.342	0.361	
	Green	$G_x$		0.306	0.321	0.336	
		$G_y$		0.538	0.553	0.568	
	Blue	$B_x$		0.134	0.149	0.164	
		$B_y$		0.168	0.183	0.198	
Viewing angle	Hor.	$\Theta_L$	CR>10	65	75	—	
		$\Theta_R$		65	75	—	
	Ver.	$\Theta_U$		60	70		
		$\Theta_D$		50	60		

Optima View Direction	12 O' clock	(5)
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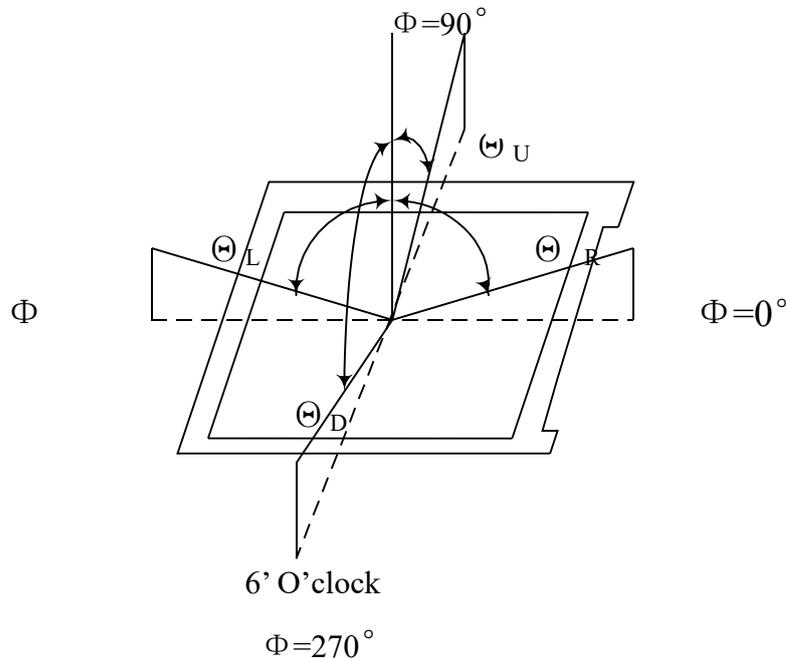
**3.2 Measuring Condition**

- Measuring surrounding: dark room
- LED current  $I_L$ : 60mA
- Ambient temperature:  $25 \pm 2^\circ\text{C}$
- 15min. warm-up time.

**3.3 Measuring Equipment**

- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size: 20 ~ 21m

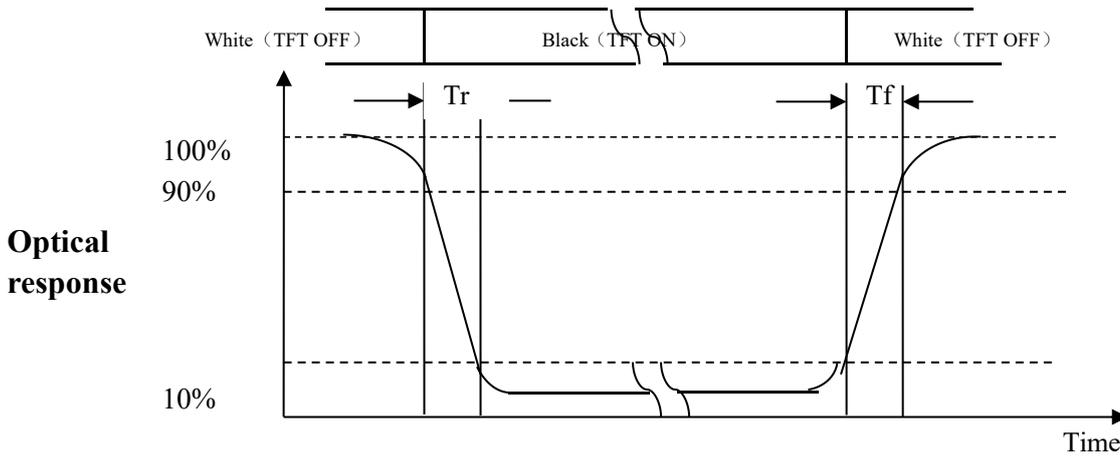
Note (1) Definition of Viewing Angle: 12' O'clock



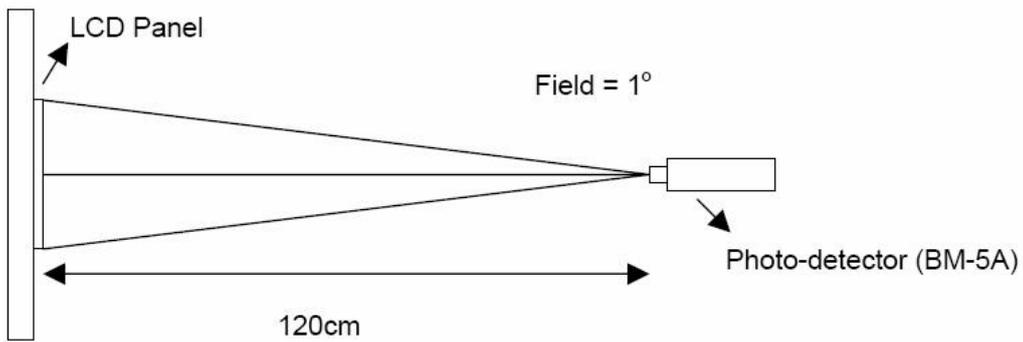
Note (2) Definition of Contrast Ratio (CR):  
measured at the center point of pane

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3) Definition of Response Time: Sum of  $T_R$  and  $T_F$

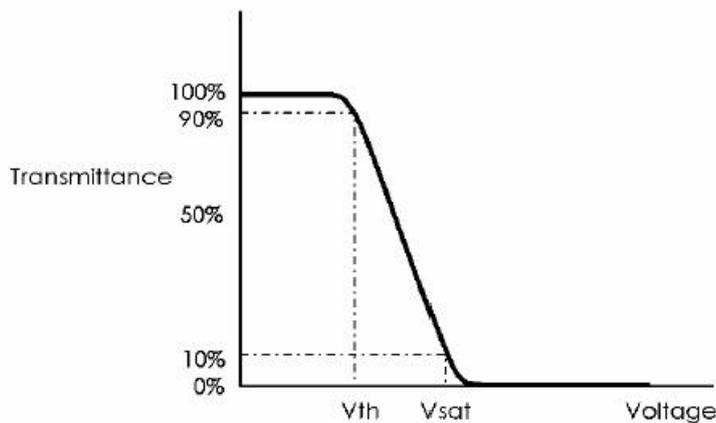


Note (4) Definition of optical measurement setup



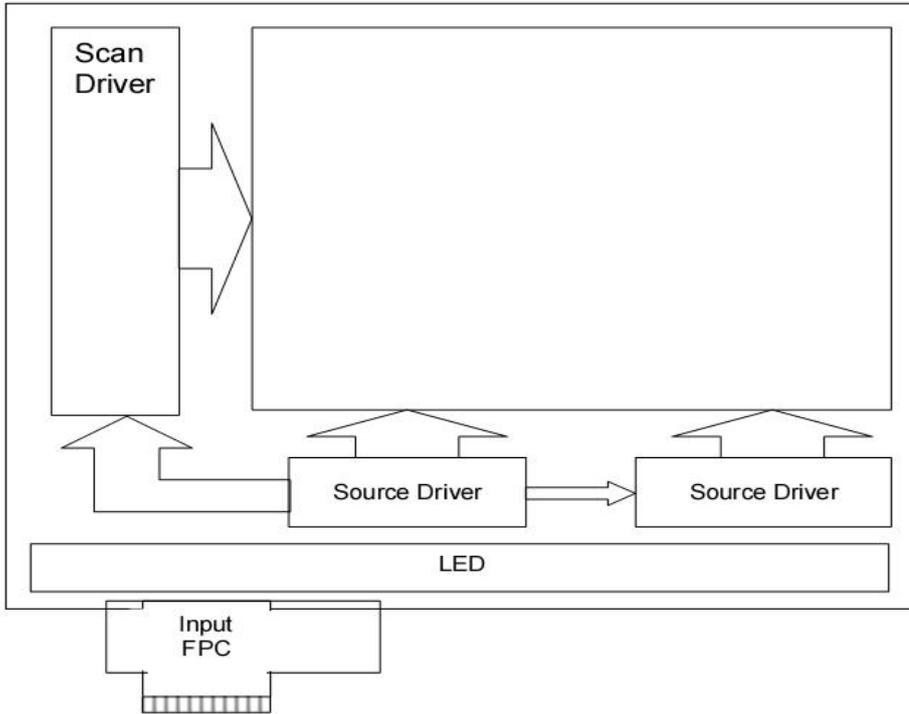
Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction.)

Note (6) Definition of  $V_{sat}$  and  $V_{th}$  (at 20°C)

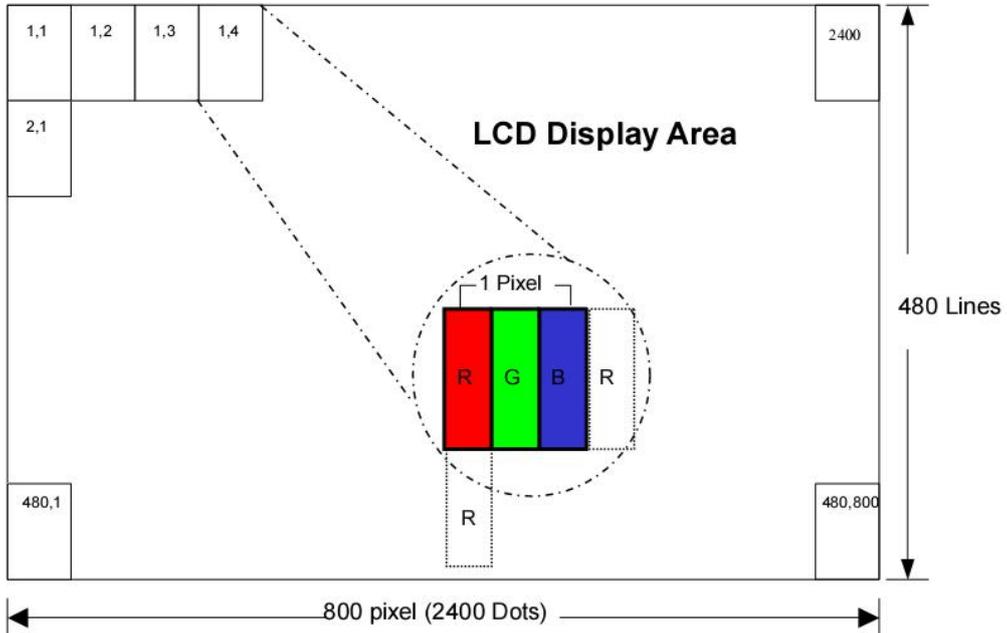


## 4.0 BLOCK DIAGRAM

### 4.1 TFT LCD Module



### 4.2 Pixel Format



## 5.0 INPUT INTERFACE PIN ASSIGNMENT

FPC connector is used for electronics interface.

The recommended model is FH19SC-40S-0.5SH (51) manufactured by HIROSE.

Pin No.	Symbol	I/O	Function
1	LED-	P	Power for LED backlight cathode
2	LED+	P	Power for LED backlight anode
3	GND	P	Power ground
4	V <sub>DD</sub>	P	Power voltage
5	R0	I	Red data (LSB)
6	R1	I	Red data
7	R2	I	Red data
8	R3	I	Red data
9	R4	I	Red data
10	R5	I	Red data
11	R6	I	Red data
12	R7	I	Red data (MSB)
13	G0	I	Green data (LSB)
14	G1	I	Green data
15	G2	I	Green data
16	G3	I	Green data
17	G4	I	Green data
18	G5	I	Green data
19	G6	I	Green data
20	G7	I	Green data (MSB)
21	B0	I	Blue data (LSB)
22	B1	I	Blue data
23	B2	I	Blue data
24	B3	I	Blue data
25	B4	I	Blue data
26	B5	I	Blue data
27	B6	I	Blue data
28	B7	I	Blue data (MSB)
29	DGND	I	Digital ground
30	DCLK	I	Pixel clock
31	DISP	I	Display on/ off
32	HSYNC	I	Horizontal sync signal
33	VSNC	I	Vertical sync signal
34	DE	I	Data enable
35	NC	-	No Connect
36	GND	P	Power ground
37	X R	I/O	Right electrode - differential analog
38	Y B	I/O	Bottom electrode - differential analog
39	X L	I/O	Left electrode - differential analog
40	Y T	I/O	Top electrode - differential analog

I/O: I: input, O: output, P: power

## CTP interface description

PIN NO.	Symbol	description
1	NC	No Connect
2	NC	No Connect
3	RST	External Reset, Low is active
4	GND	System Ground. (0V)
5	INT	Interrupt request to the host
6	SDA	I2C data input and output
7	SCL	I2C clock input
8	GND	System Ground. (0V)
9	GND	System Ground. (0V)
10	VDD	Power supply +3.3V

## 6.0 ELECTRICAL CHARACTERISTICS

### 6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply voltage	$V_{DD}$	3.0	3.3	3.6	V	
Input signal voltage	$V_{iH}$	$0.7 V_{DD}$	-	$V_{DD}$	V	Note (1)
	$V_{iL}$	GND	-	$0.3 V_{DD}$	V	Note (1)
Current of power supply	$I_{DD}$	-	-	220	mA	$V_{DD} = 3.3V$

Note (1): HSYNC, VSYNC, DE, R/G/B Data

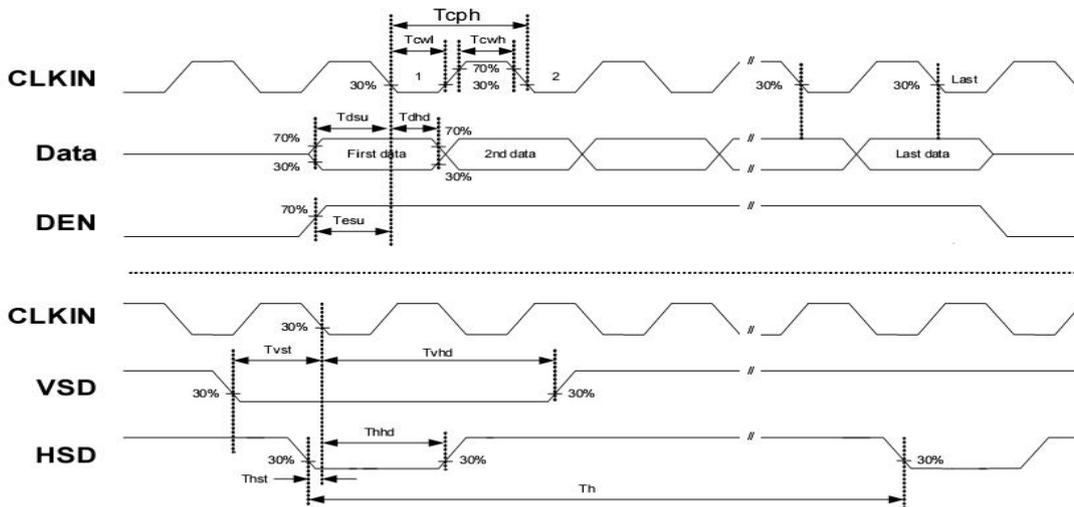
Note (2): GND=0V

### 6.2 AC Characteristics

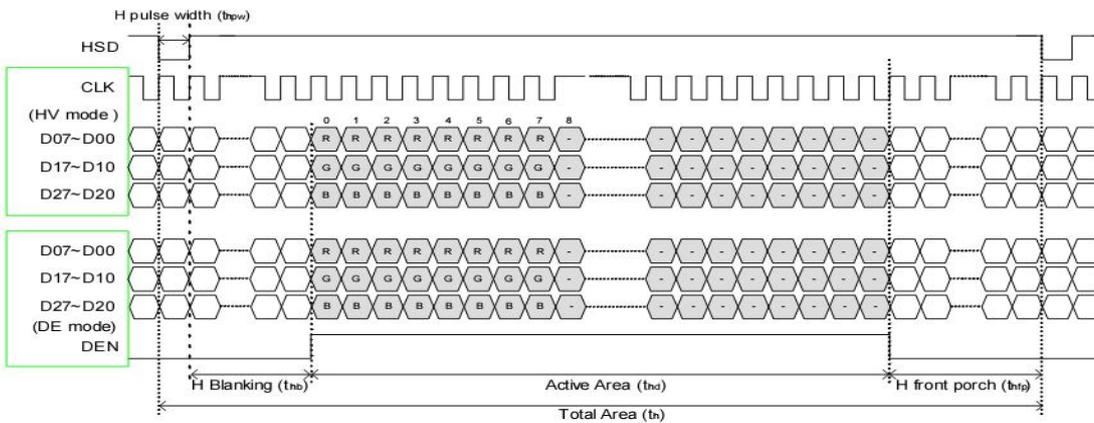
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tclk	25			ns	
DCLK frequency	fclk		33	40	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSYNC setup time	Tvst	8			ns	
VSYNC hold time	Tvhd	8			ns	
HSYNC setup time	Thst	8			ns	
HSYNC hold time	Thhd	8			ns	
Data setup time	Tdasu	8			ns	
Data hold time	Tdahd	8			ns	
DE setup time	Tdesu	8			ns	
DE hold time	Tdehd	8			ns	
Horizontal display area	Thd		800		Tcph	

HSYNC period time	Th		928		Tcph	
HSYNC width	Thwh	1	48		Tcph	
HSYNC back porch	Thbp		40		Tcph	
HSYNC front porch	Thfp		40		Tcph	
Vertical display area	Tvd		480		th	
VSYNC period time	Tv		525		th	
VSYNC width	Tvwh		3		th	
VSYNC back porch	Tvbp		29		th	
VSYNC front porch	Tvfp		13		th	

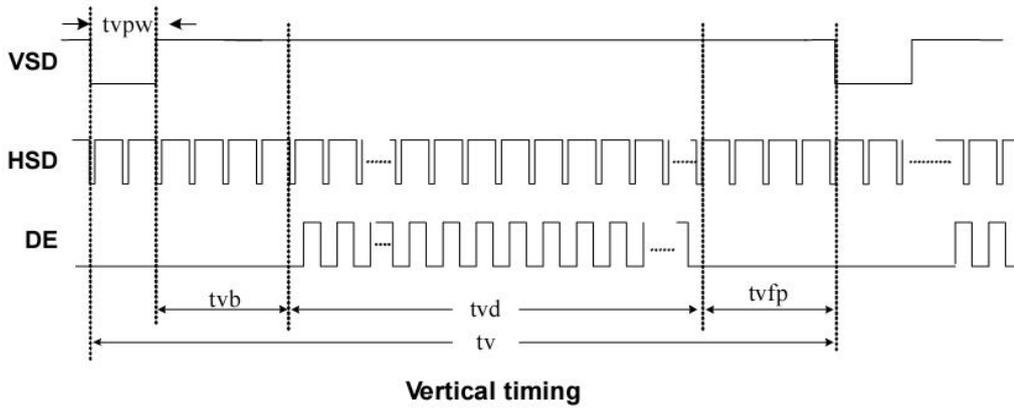
### 6.3 Timing Diagram of interface Signal



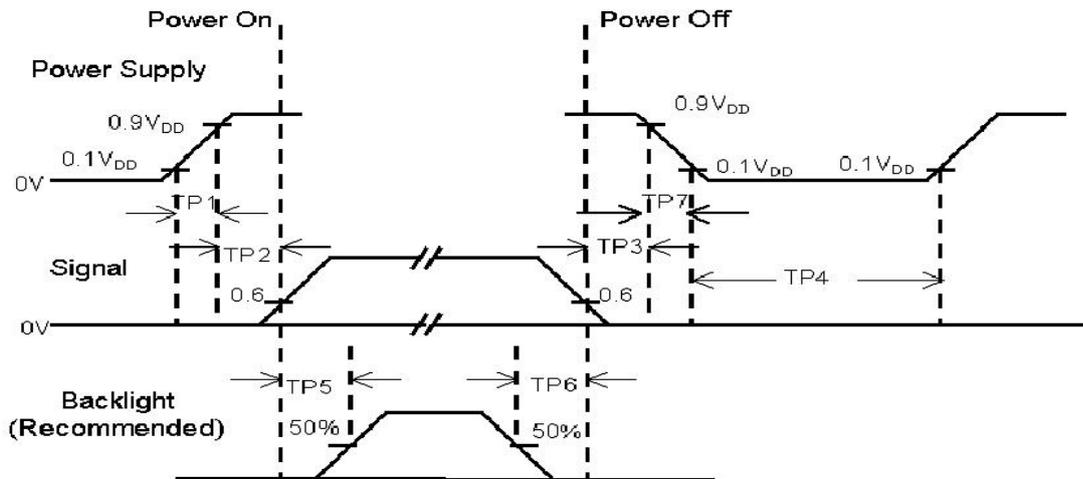
Sampling clock timing



Horizontal display timing range



### 6.4 Power Sequence



Item	Min.	Typ.	Max.	Unit	Remark
TP1	0.5	--	10	msec	
TP2	0	--	50	msec	
TP3	0	--	50	msec	
TP4	1000	--	--	msec	
TP5	200	--	--	msec	
TP6	200	--	--	msec	
TP7	0.5	--	10	msec	

**Note: (1)** The supply voltage of the external system for the module input should be the same as the definition of V<sub>DD</sub>.

- (2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD tns off before the back-light turns off, the display may momentarily become white.
- (3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.
- (4) TP4 should be measured after the module has been fully discharged between power off and on period.
- (5) Interface signal shall not be kept at high impedance when the power is on.

## 7.0 Capacitive Touch Panel specifications

### Mechanical characteristics

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	5.0	
Outline Dimension (OD)	140.7(H) x 93.83(V)mm	Cover Lens Outline
Product Thickness	1.68mm(max)	With FPC and frame D.S.T
Glass Thickness	0.7mm	
Ink View Area	109.04x65.55mm	
Input Method	5 Fingers	
Activation Force	Touch	
Surface Hardness	≥6H	

### Electrical characteristics

DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.3V
Power Consumption (IDD)	Active Mode	12~4.5mA
	Sleep Mode	TBD
Interface		I <sup>2</sup> C
Controller IC		FT5336
I <sup>2</sup> C address		0x70
Resolution		800*480

### Interface timing characteristics

PARAMETER	MIN	MAX	UNIT
SCL Frequency	-	400K	Hz
Bus Free Time Between a STOP and START Condition	1.3	-	uS
Hold Time (repeated) START Condition	0.6	-	uS
Data Setup Time	100	-	nS
Setup Time for Repeated START Condition	0.6	-	uS
Setup Time for STOP Condition	0.6	-	uS

## 8.0 RELIABILITY TEST ITEMS

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+70oC, 240hrs	
2	Low Temperature Storage	Ta=-30oC, 240hrs	
3	High Temperature Operation	Ta=+60oC, 240hrs	
4	Low Temperature Operation	Ta=-20oC, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60oC, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30oC(30min) → +70oC(30min), 200cycles	
7	Electrostatic Discharge	±200V,200pF(0Ω) 1 time/each terminal	
8	Vibration	1.Random: 1.04Grms, 5~500Hz, X/Y/Z, 30min/each direction 2. Sine: Freq. Range: 8~33.3Hz Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hr, Y: 4hr, cyc: 15min	
9	Shock	100G, 6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
10	Vibration (with carton)	Random: 0.015G <sup>2</sup> /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ each direction: 2hr	
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

Note: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.



## 10.0 PACKAGE SPECIFICATION

PARAMETER	Specification	Unit
Outside box	390(L) x 350(W) x 480(H)	mm
Inside box	375(L) x 340(W) x 10(H)	mm
Product quantity of Inside box	36	pcs
Total product quantity	36*4=144	pcs
Total weight	11 ± 0.5	KG

## 11.0 GENERAL PRECAUTION

### 11.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

### 11.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. XUTONG does not warrant the module, if customers disassemble or modify the module.

### 11.3 Breakage of LCD Panel

**11.3.1** .If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

**11.3.2** .If liquid crystal contacts mouth or eyes, rinse out with water immediately.

**11.3.3** .If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

**11.3.4** .Handle carefully with chips of glass that may cause injury, when the glass is broken.

### 11.4 Electric Shock

**11.4.1** .Disconnect power supply before handling LCD module.

**11.4.2** .Do not pull or fold the LED cable.

**11.4.3** .Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

### 11.5 Absolute Maximum Ratings and Power Protection Circuit

**11.5.1** .Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

**11.5.2** .Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

**11.5.3** .It's recommended to employ protection circuit for power supply.

### 11.6 Operation

**11.6.1** Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

**11.6.2** Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

**11.6.3** When the surface is dusty, please wipe gently with absorbent cotton or other soft material.