



PHOENIX DISPLAY INTERNATIONAL, INC.

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SPECIFICATION FOR LCD MODULE

CUSTOMER	
PART NUMBER	PDI050WVHI-13
DESCRIPTION	5.0" 800 RGB (H) x 480(V)
VERSION	V1.0
ISSUE DATE	19-Sep-17

COMPANY ADDRESS:

Phoenix Display International, Inc.
6150 W. Gila Springs Place Unit 2
Chandler, AZ 85226
USA
www.phoenixdisplay.com
(630) 359-5700 office
(630) 359-5701 fax

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1.0 GENERAL DESCRIPTION

1.1 Introduction

Team Source Display model TST050WVHI-13 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, and a backlight system. 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	120.7x 75.8 x 3.0 (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
LED current	I_L		60	70	mA	(1)(2)(3)

LED voltage	V	18	19.2	20.4	V	(1)(2)(3)
LED Uniformity	ΔI_v	80	85	--	%	
(LED+LCD)Luminance	L_v	900	1000	--	Cd/m ²	

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 IL 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	TR	$\Theta = 0$ Normal viewing angle	—	3	6	msec	(1)(3)	
	Falling	TF		—	7	14			
White luminance(center)		YL			900	1000	-	cd/m ²	I=60mA
Color gamut		S			—	50	—	%	C light
Color chromaticity (CIE1931)		White		W_x	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		
Viewing angle		Hor.	Θ_L	65	75	—			
			Θ_R	65	75	—			
		Ver.	Θ_U	60	70				
			Θ_D	50	60				
Optima View Direction		12 O' clock						(5)	

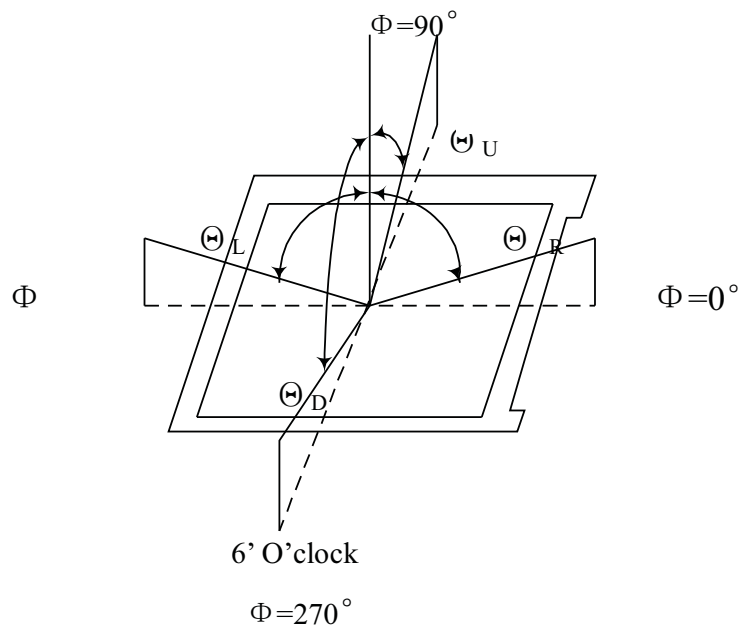
3.2 Measuring Condition

- 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

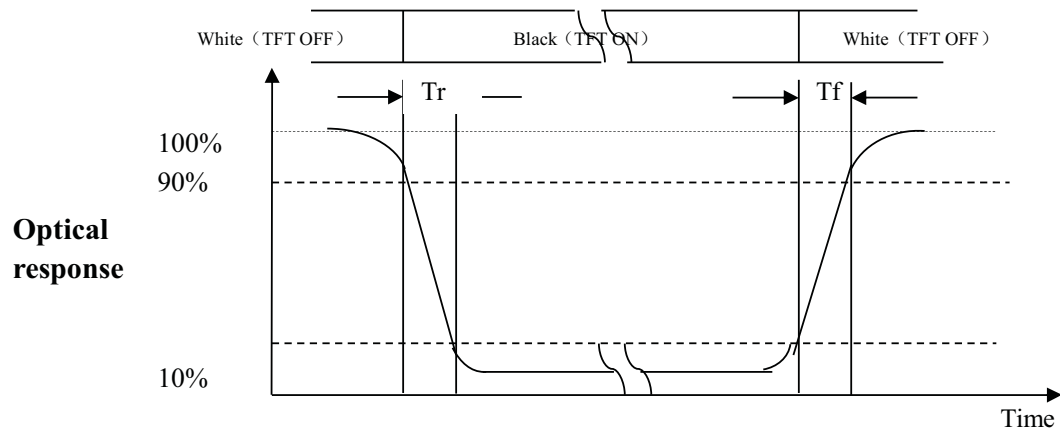
Note (1) Definition of Viewing Angle: 12' O'clock



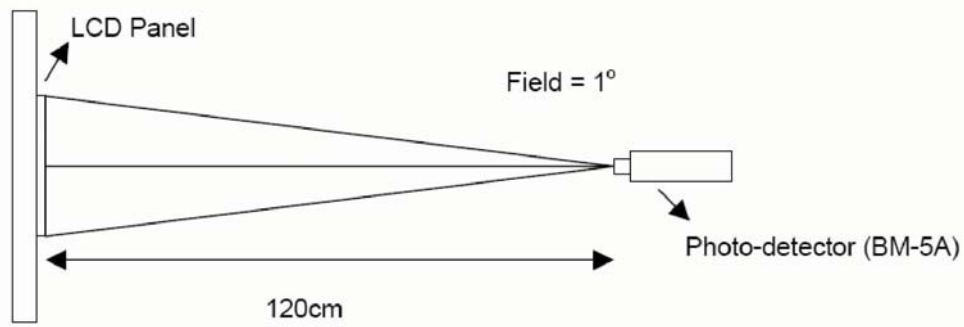
Note (2) Definition of Contrast Ratio (CR):
measured at the center point of pane

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

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

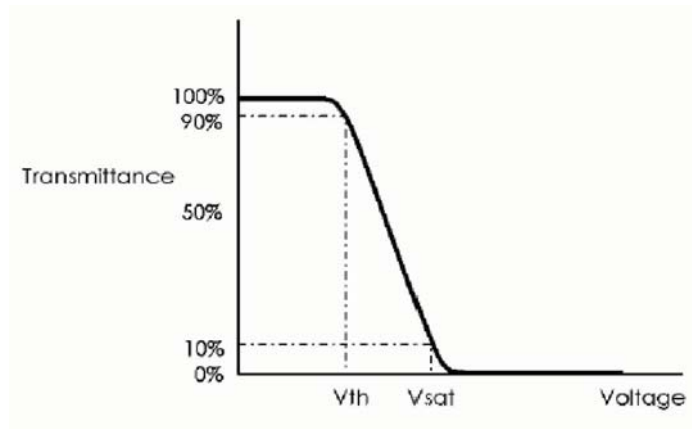


Note (4) Definition of optical measurement setup



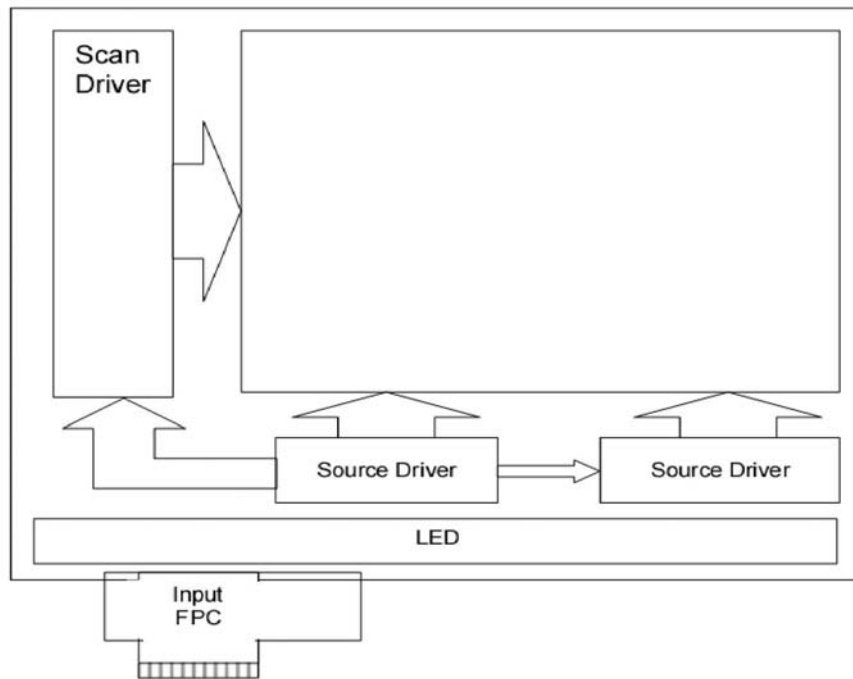
Note (5) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction.)

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

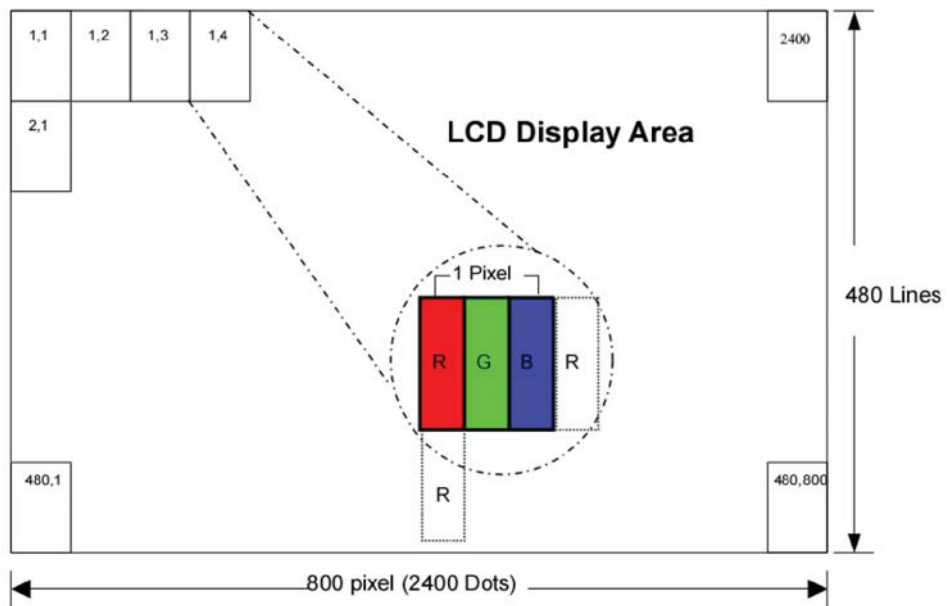


4.0 BLOCK DIAGRAM

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 _{DD}	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	VSYNC	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

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	$V_{DD} = 3.3V$

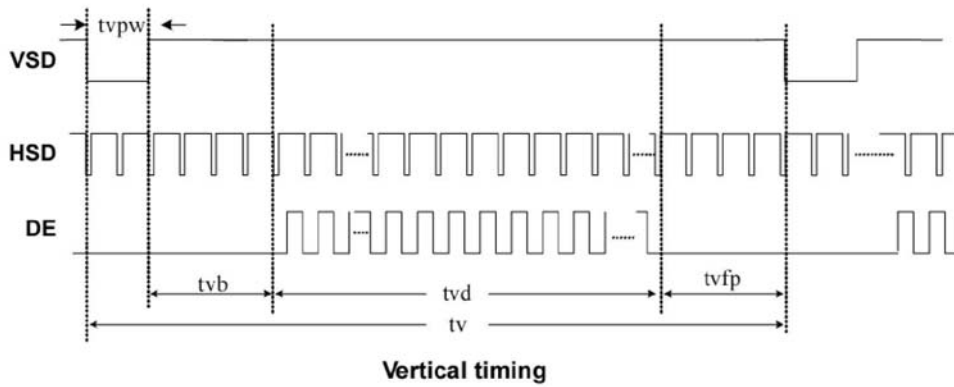
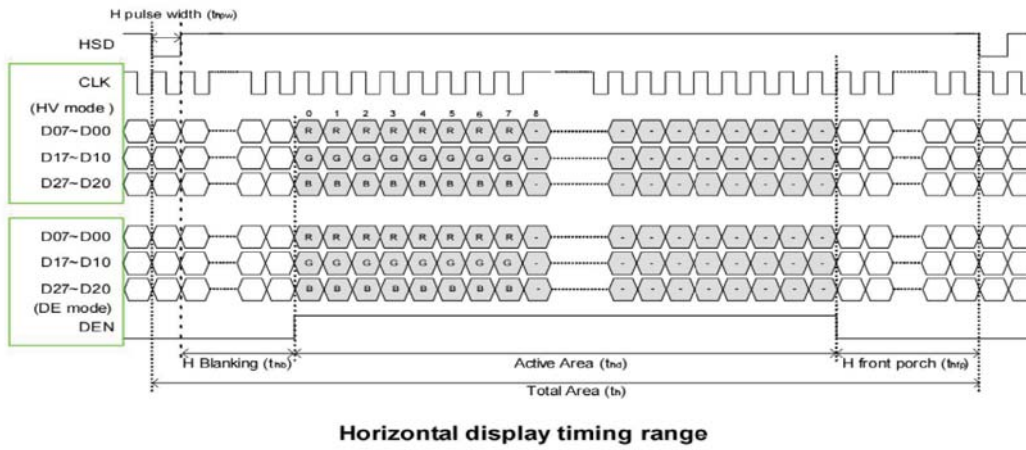
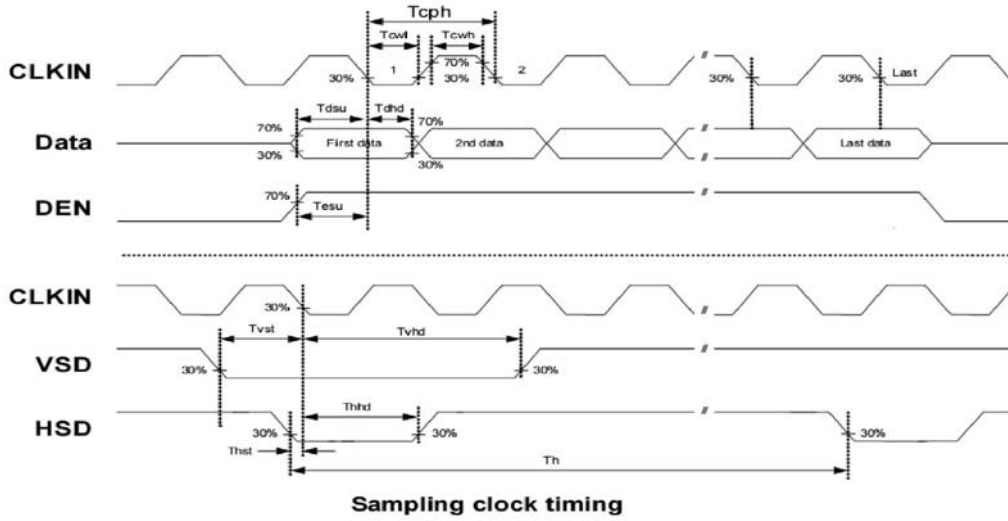
Note (1): HSYNC, VSYNC, DE, R/G/B Data

Note (2): GND=0V

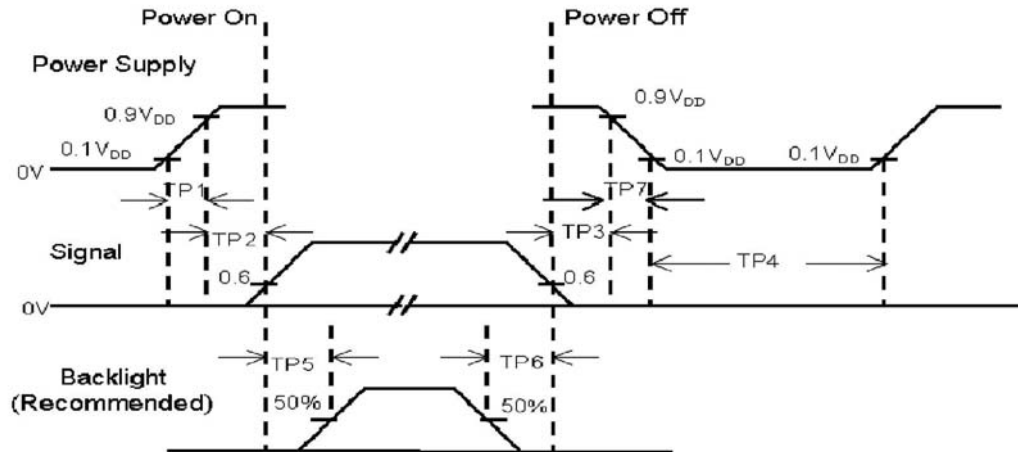
6.2 AC Characteristics

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



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_{DD} .

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turns off, the display may momentarily become white.

(3) In case of V_{DD} = 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.

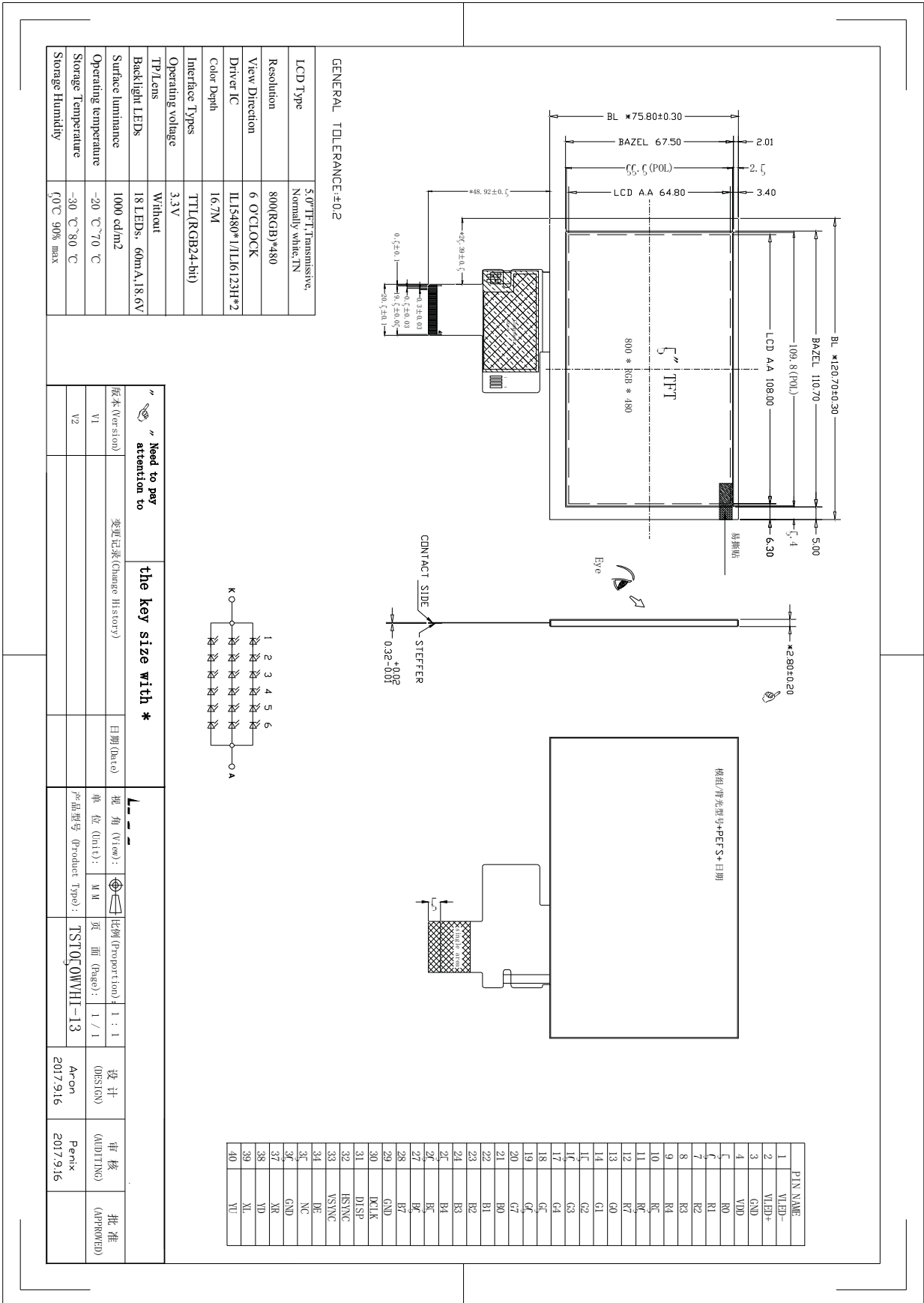
(5) Interface signal shall not be kept at high impedance when the power is on.

7.0 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 ² /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

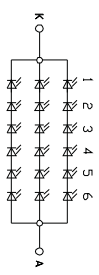
Note: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

8.0 OUTLINE DIMENSION



Need to pay attention to

the key size with *



版本 (Version)	变更记录 (Change History)	日期 (Date)	视角 (View):	比例 (Proportion)	设计 (DESIGN)	审核 (AUDITING)	批准 (APPROVED)
V1			单位 (Unit): M M	页 面 (Page): 1 / 1	A-on 2017.9.16	Perix 2017.9.16	
V2			产品型号 (Product Type):	TSTOQWVH1-13			

9.0 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

10.0 GENERAL PRECAUTION

10.1 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.

10.2 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.

10.3 Breakage of LCD Panel

10.3.1 .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.

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

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

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

10.4 Electric Shock

10.4.1. Disconnect power supply before handling LCD module.

10.4.2. Do not pull or fold the LED cable.

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

10.5 Absolute Maximum Ratings and Power Protection Circuit

10.5.1. 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.

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

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

10.6 Operation

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

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

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