ORIENT DISPLAY
MAKE THINGS POSSIBLE

Specification for TFT

AFR10801080A0R-5.0INTM-C-I

Revision V1.1

A	Orient Display
FR	TFT Type
10801080	Resolution 1080 x 1080
A0R	Serial A0, Round
5.0	5.0”, Module Dimension 208.00*208.00*4.16 mm
I	IPS Display
N	Top: -20~+60°C; Tstr: -30~+75°C
T	Transmissive
M	Medium Brightness, 270cd/m2
C	Capacitive Touch Panel
I	MIPI Interface
/	HX8399 OR COMPATIBLE

Revision History

Date	Rev. No.	Page	Summary
2020.01.03	V1.0	ALL	FIRST ISSUE
2023.09.20	V1.1	ALL	SECOND ISSUE

Contents

1.Basic Specifications

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit, capacitance touch panel,back-light unit. The resolution of a 5.0 " TFT-LCD contains 1080x1080 pixels, and can display up to 16.7M colors.

1.1 TFT Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	127.008(H)*127.008(V) (5.0inch)	mm	
Driver element	TFT active matrix	-	
Display colors	65K/262K/16.7M	colors	
Number of pixels	1080(RGB)*1080	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.1176(H)*0.1176(V)	mm	
Viewing angle	Free	o'clock	
Controller IC	HX8399	-	
LCM Interface	4 Lane MIPI	-	
Display mode	Transmissive /Normally Black	-	
Operating temperature	-20～+60	℃	
Storage temperature	-30～+75	℃	
Module bonding	Use optical bonding between LCM and	-	

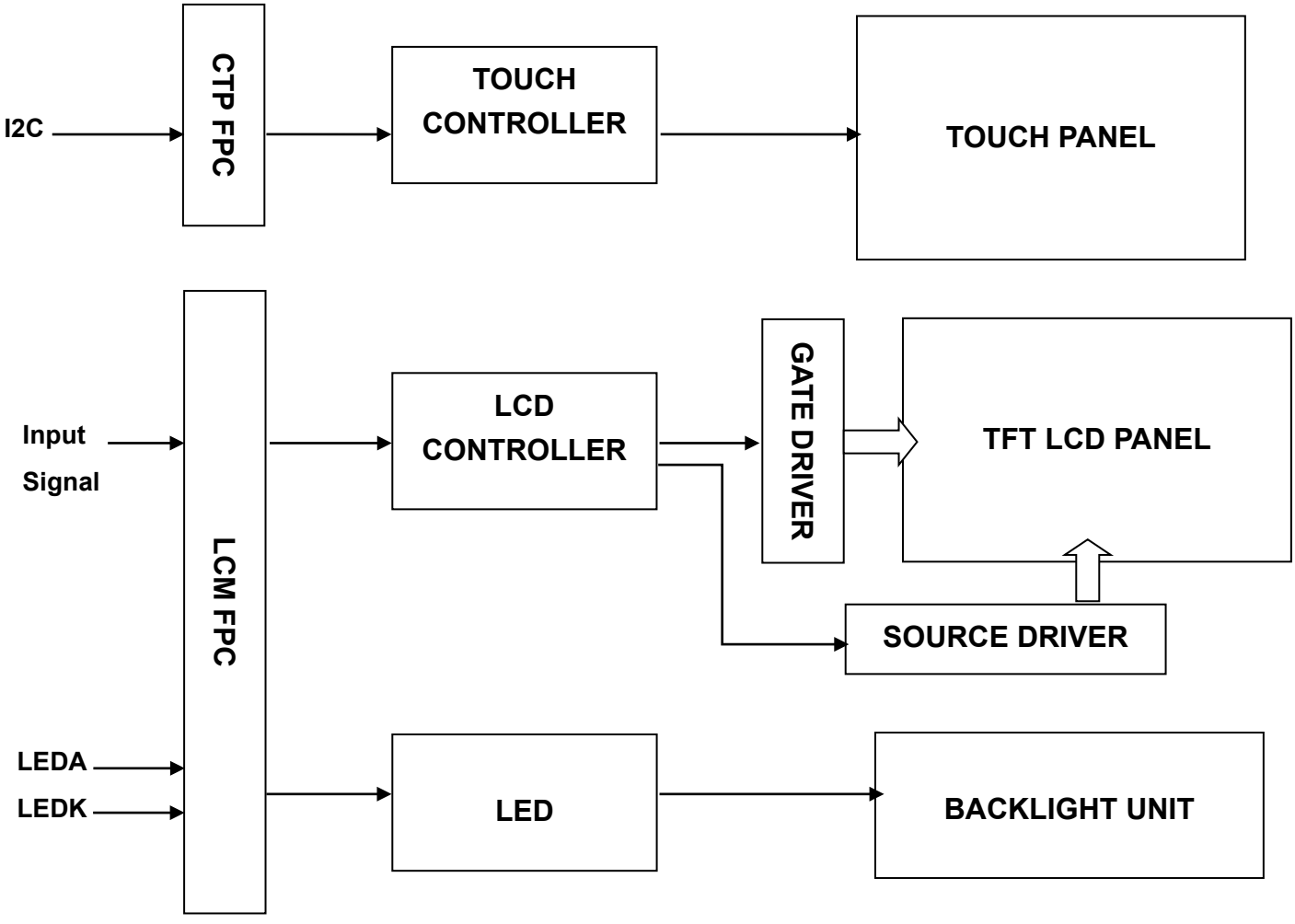
1.2 CTP Features

General Information Items	Specification	Unit	Note
	Main Panel		
Resolution	1080(H)*1080(V)	-	
Structure	G+G	-	
Controller IC	ST1727	-	
Interface	I2C	-	
Slave Adress	0x55(7bit)	-	
Touch mode	Five points	-	-
Logic level	1.8 or 3.3	V	

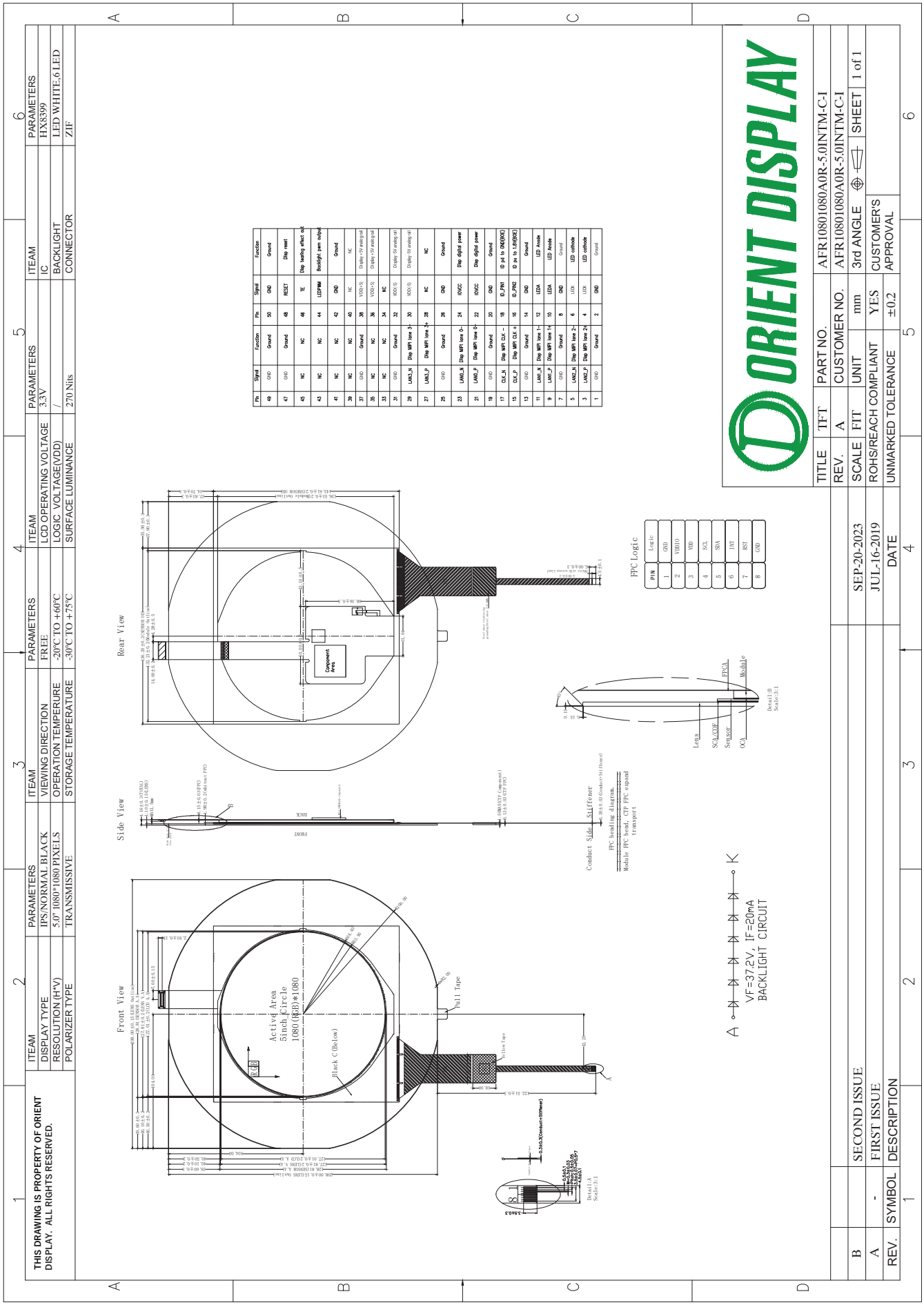
1.3 Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	208	-	mm	
	Vertical(V)	-	208	-	mm	
	Depth(D)	-	4.16	-	mm	
Weight		-	TBD	-	g	

2. Block Diagram



3. Outline dimension



4. Input terminal Pin Assignment

4.1 TFT PIN Define

NOTE: 1. Connector Model Number: DF40C-50DP-0.4V
2.Manufacturer: Hirose

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground.	P
2	GND	Ground.	P
3	LAN2_P	Disp MIPI lane2+.	I
4	LEDK	LED cathode.	P
5	LAN2_N	Disp MIPI lane2-.	I
6	LEDK	LED cathode.	P
7.	GND	Ground.	P
8	GND	Ground.	P
9	LAN1_P	Disp MIPI Blane 1+.	I
10	LEDA	LED Anode.	P
11	LAN1_N	Disp MIPI lane 1-.	I
12	LEDA	LED Anode.	P
13	GND	Ground.	P
14	GND	Ground.	P
15	CLK_P	Disp MIPICLK+.	I
16	ID_PIN2	ID pu to1.8V(LCM). If not used open.	P
17	CLK_N	Disp MIPICLK-.	I
18	ID_PIN1	ID pd to GND(LCM). If not used open.	P
19	GND	Ground.	P
20	GND	Ground.	P
21	LAN0_P	Disp MIPI lane 0+.	I
22	IOVCC	Disp digital power(1.8V).	P
23	LAN0_N	Disp MIPI lane0-.	I
24	IOVCC	Disp digital power(1.8V).	P

25	GND	Ground.	P
26	GND	Ground.	P
27	LAN3_P	Disp MIPI lane 3+.	I
28	NC	NC	
29	LAN3_N	Disp MIPI lane 3-.	I
30	VSN/VDD-	Display -5V analog rail.	P
31	GND	Ground.	P
32	VSN/VDD-	Display -5V analog rail.	P
33	NC	NC	
34	NC	NC	
35	NC	NC	
36	VSP/VDD+	Disp +5V analog rail.	P
37	GND	Ground.	P
38	VSP/VDD+	Disp +5V analog rail .	P
39	NC	NC	
40	NC	NC	
41	NC	NC	
42	GND	Ground.	P
43	NC		
44	LEDPWM	Backlight pwm output, If not used open.	O
45	NC	NC	
46	TE	Disp tearing effect out, If not used open.	O
47	GND	Ground.	P
48	RESET	Disp reset.	I
49	GND	Ground.	P
50	GND	Ground.	P

4.2 CTP PIN Define

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground.	P
2	VDDIO	I/O power supply.	P
3	VDD	Supply voltage.	P
4	SCL	I2C clock input.	I
5	SDA	I2C data input and output.	I
6	INT	External interrupt to the host.	I
7	RST	External Reset, Low is active.	I
8	GND	Ground.	P

5. LCD Optical Characteristics

5.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	Θ=0 Normal viewing angle	800	1200	--		(1)(2)
Response time	Rising	$T_{R+}T_F$		--	--	40	msec	
	Falling							(1)(3)
Color Gamut		S(%)		60	65	--	%	
Color Filter Chromacicity	White	W_X		0.2422	0.2822	0.3222		(1)(4)
		W_Y		0.2597	0.2957	0.3357		
	Red	R_X		0.5938	0.6338	0.6738		
		R_Y		0.3075	0.3475	0.3875		
	Green	G_X		0.2641	0.3041	0.3441		
		G_Y		0.5093	0.5493	0.5893		
	Blue	B_X		0.1064	0.1464	0.1864		
		B_Y		0.0126	0.0526	0.0926		
Viewing angle	Hor.	ΘL	CR>10	--	80	--		(1)(4)
		ΘR		--	80	--		
	Ver.	ΘU		--	80	--		
		ΘD		--	80	--		
Option View Direction		Free						

*The data comes from the LCD specification.

Measuring Condition

Measuring surrounding : dark room

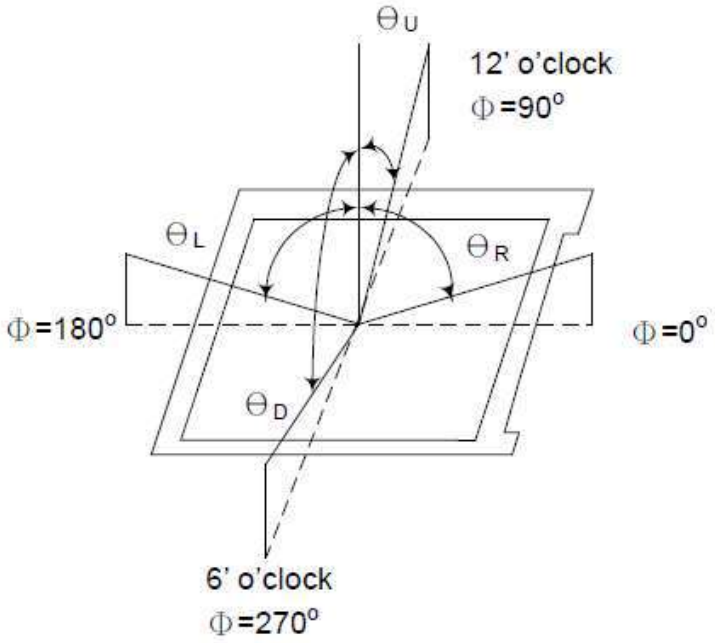
Ambient temperature : 25±2oC

15min. warm-up time.

Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

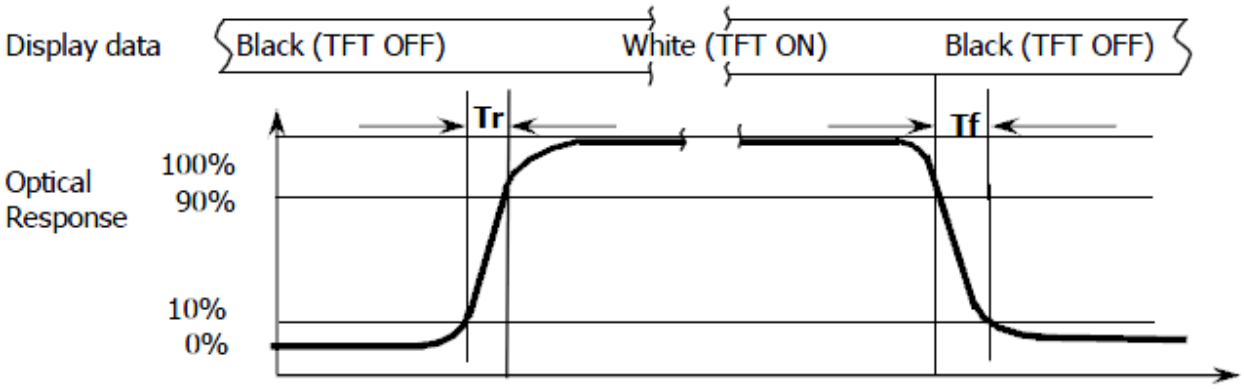
Note (1): Definition of Viewing Angle :



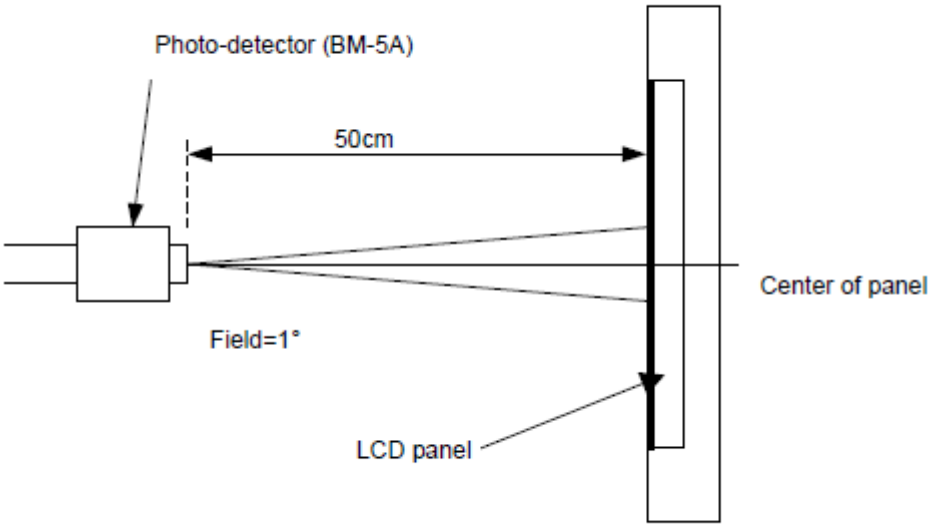
Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

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

Note (3): Response Time



Note (4): Definition of optical measurement setup



6. Electrical Characteristics

6.1 Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit	Note
Logic Power Supply Voltage	IOVCC	-0.3	3.6	V	Note1
Analog Positive Power Supply	VDD+/VSP	-0.3	+6.6	V	
Analog Negative Power Supply	VDD-/VSN	0	-6.6	V	
Operatng temperature	T_{OP}	-20	+60	℃	
Storage temperature	T_{ST}	-30	+75	℃	

NOTE1: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily,

the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values

exceeding which the product may be physically damaged. Be sure to use the product within the range

of the absolute maximum ratings.

6.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Input Voltage	IOVCC	1.65	1.8	3.3	V	
Analog Positive Power Supply	VDD+/VSP	4.8	5.0	6.0	V	
Analog Negative Power Supply	VDD-/VSP	-6.0	-5.0	-4.8	V	--
Normal mode Current	IOIDD	--	17	34	mA	
Low Level Input Voltage	VIL	0	--	0.3*IOVCC	V	
High Level Input Voltage	V_{IH}	0.7*IOVCC	--	IOVCC	V	

6.3 LED Backlight Characteristics

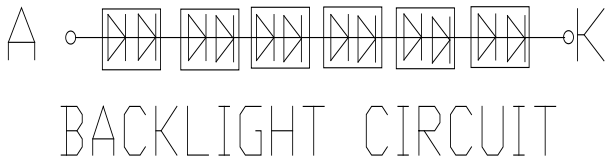
The back-light system is edge-lighting type with 12 chips LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	15	20	--	mA	
Forward Voltage	V_F	--	37.2	38.4	V	
LCM Luminance (I_F =20mA)	LV	220	270	--	cd/m2	Note3
LED life time	Hr	--	30000	--	Hour	Note1,2
Uniformity	Avg	80	--	--	%	Note3

Note1: LED life time (Hr) can be defined as the time in which it continues to operate under the condition:

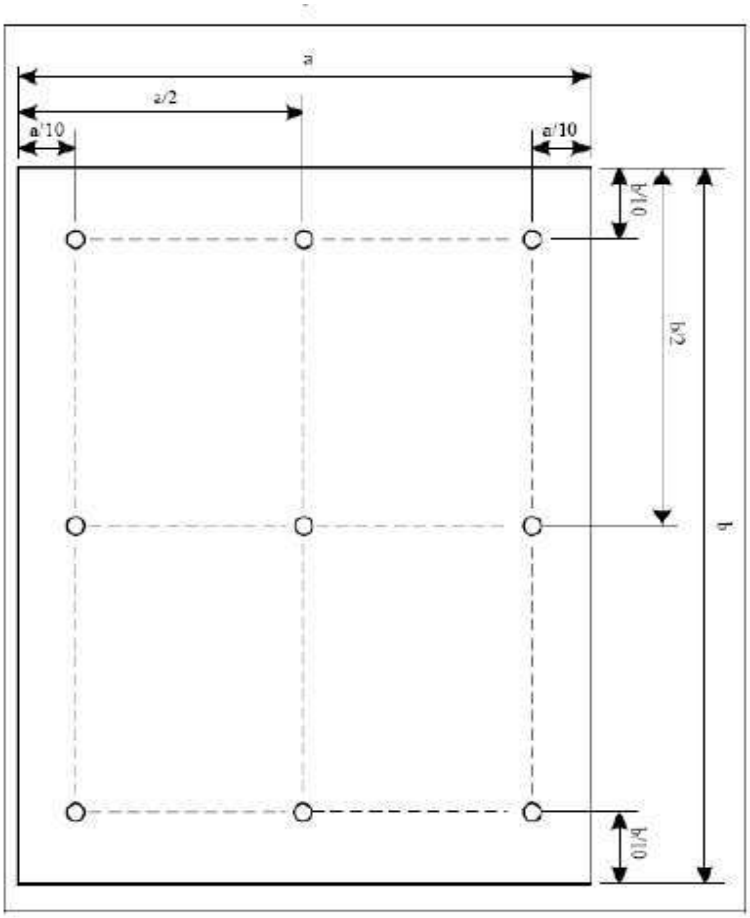
Ta=25±3 ℃, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL=20mA. The LED lifetime could be decreased if operating IL is larger than 20mA. The constant current driving method is suggested.



BACKLIGHT CIRCUIT

Note (3) Luminance Uniformity of these 9 points is defined as below:

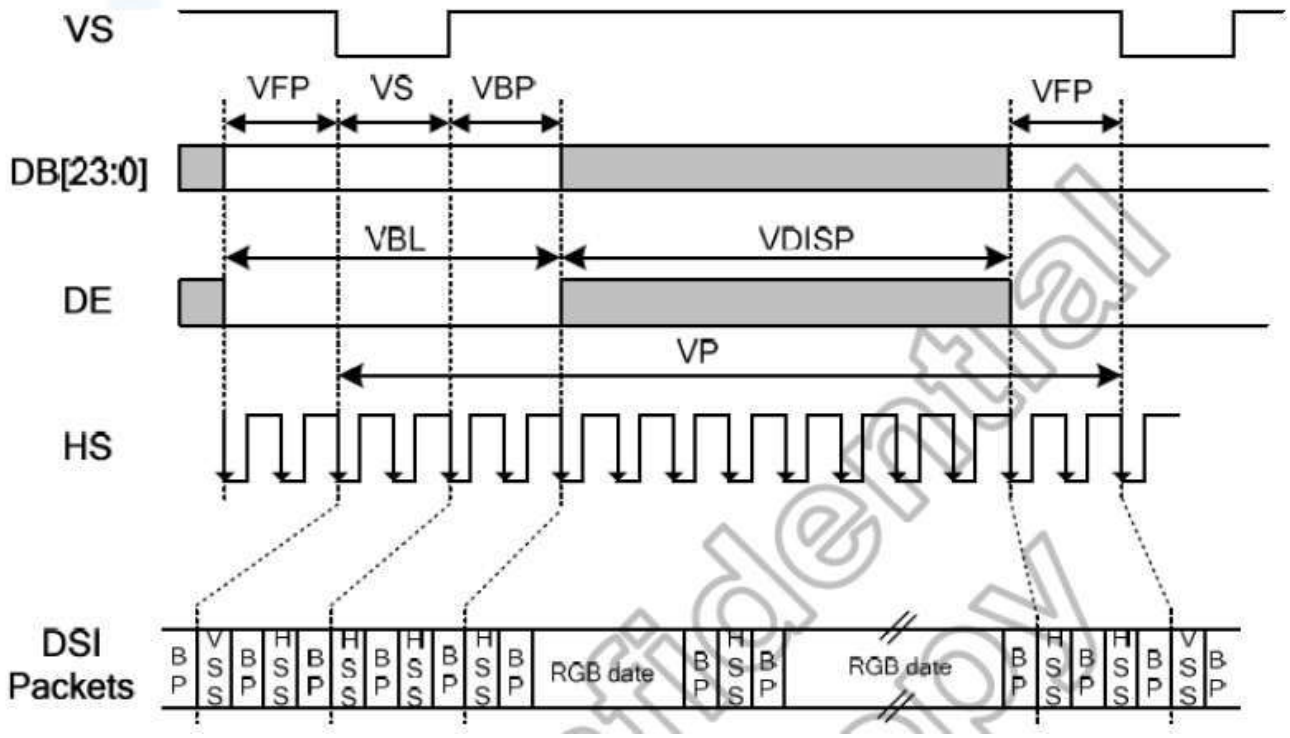


$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

7. TFT AC Characteristics

7.1 Vertical Timing

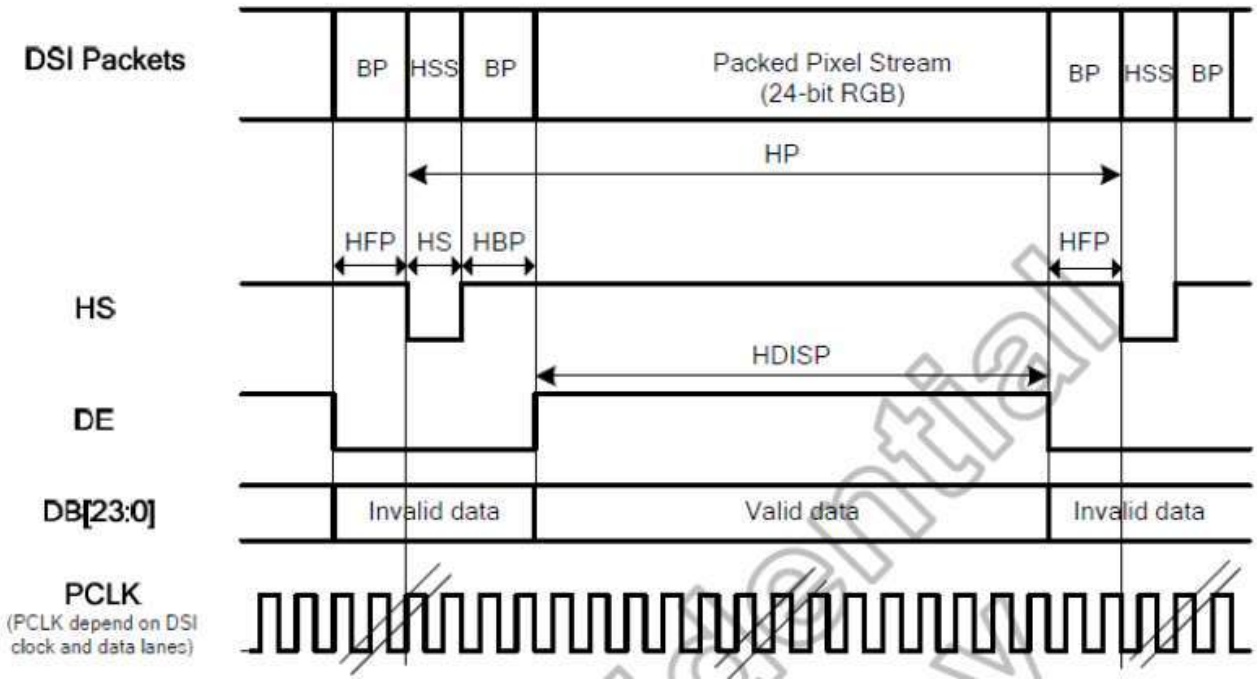


Vertical Resolution=528+8xNL (VSSA=0V, VDD1=1.8V, VDD3=2.8V, T_A=25°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Vertical cycle	VP	-	534+8xNL	-	-	Line
Vertical low pulse width	VS	-	2	-	Note(1)	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note(1)	Line
Vertical data start point	-	VS+VBP	4	-	Note(1)	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	528+8xNL	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

Note: (1) The VS and VBP pulse width are related to GSP and GCK timing. The GSP and GCK must be set at corresponding position for LCD normal display.

7.2 Horizontal Timing



Horizontal Resolution=H_RES(1080/1024/960/900/800/720) (VSSA=0V, VDD1=1.8V, VDD3 = HS_VCC =2.8V, T_A=25°C)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
HS cycle	HP	-	H_RES+66	-	-	DCK
HS low pulse width	HS	-	25	-	-	DCK
Horizontal back porch	HBP	-	25	-	-	DCK
Horizontal front porch	HFP	-	16	-	-	DCK
Horizontal data start point	-	HS+HBP	50 Note(1)	-	-	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	66	-	-	DCK
Horizontal active area	HDISP	-	-	H_RES	-	DCK

Note: (1) HS+HBP must larger than 50 PCLK.

7.3 Reset timing

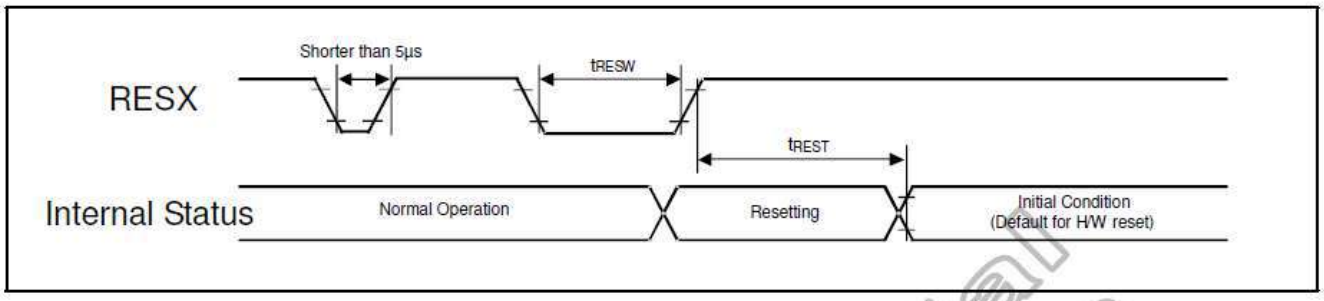


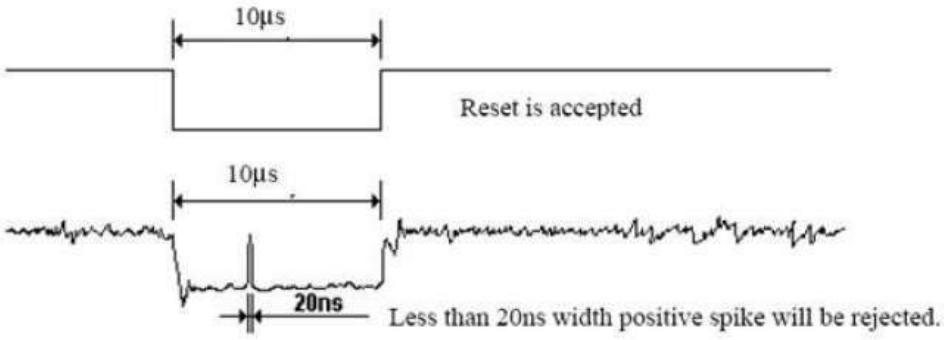
Figure 8.12: Reset input timing

Symbol	Parameter	Related pins	Spec. Min.	Spec. Typ.	Spec. Max.	Unit	Note
t_{RESW}	Reset low pulse width(1)	RESX	10	-	-	µs	-
t_{REST}	Reset complete time(2)	-	-	-	50	ms	-

Note: (1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

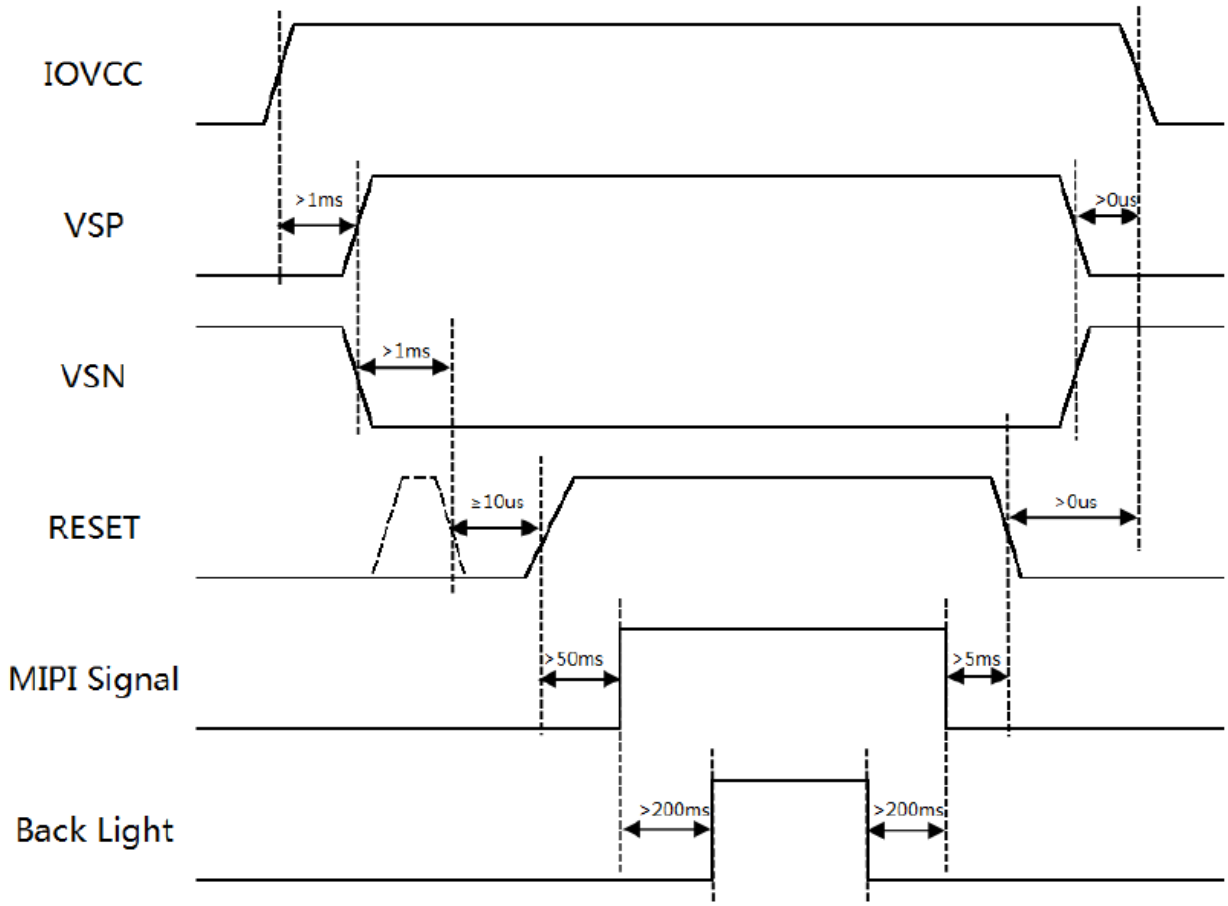
RESX Pulse	Action
Shorter than 5µs	Reset Rejected
Longer than 10µs	Reset
Between 5µs and10µs	Reset Start

(2) During Reset Complete Time, OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (**tREST**) within 5ms after a rising edge of RESX.
(3) Spike Rejection also applies during a valid reset pulse as shown below:



7. POWER ON/OFF SEQUENCE

Power on/off Sequence



8. CTP Specification

8.1 Electrical Characteristics

8.1.1 Absolute Maximum Rating

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	6	V	
I/O power supply	VDDIO	-0.3	6	V	
Operating temperature	T_{OP}	-20	+60	℃	
Storage temperature	T_{ST}	-30	+75	℃	

8.1.2 DC Electrical Characteristics (Ta=25℃)

(Ambient temperature:25℃, VDD=3.3V, VDDIO=1.8V or VDDIO=VDD)

Item	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage/VDD	3.0	3.3	3.6	V	
I/O power supply/VDDIO	1.6	1.8/3.3	3.6	V	
operating current	--	16.1	24	mA	
Idle Current	--	8.1	12.2	mA	
Power Down Current	--	--	20	uA	
Input High Voltage	0.85*VDDIO	--	--	V	
Input Low Voltage	--	--	0.15*VDDIO	V	

Input Pull Up Resistor	50	--	60	KOhm	
Output Driving Current	6	--	--	mA	
Output Sinking Current	10	--	--	mA	
Low Voltage Reset	--	--	2.3	V	

8.2 Default I2C Address

I2C address is default to **0x55** (7-bits address) for Sitronix Touch IC. If the I2C address is conflict with another I2C device's address on same bus, user can change I2C address by TTK PC Utility.

8.3 AC Electrical Characteristics

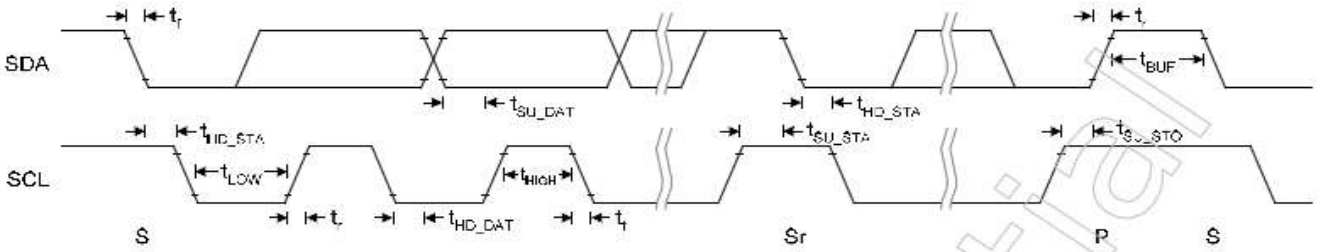


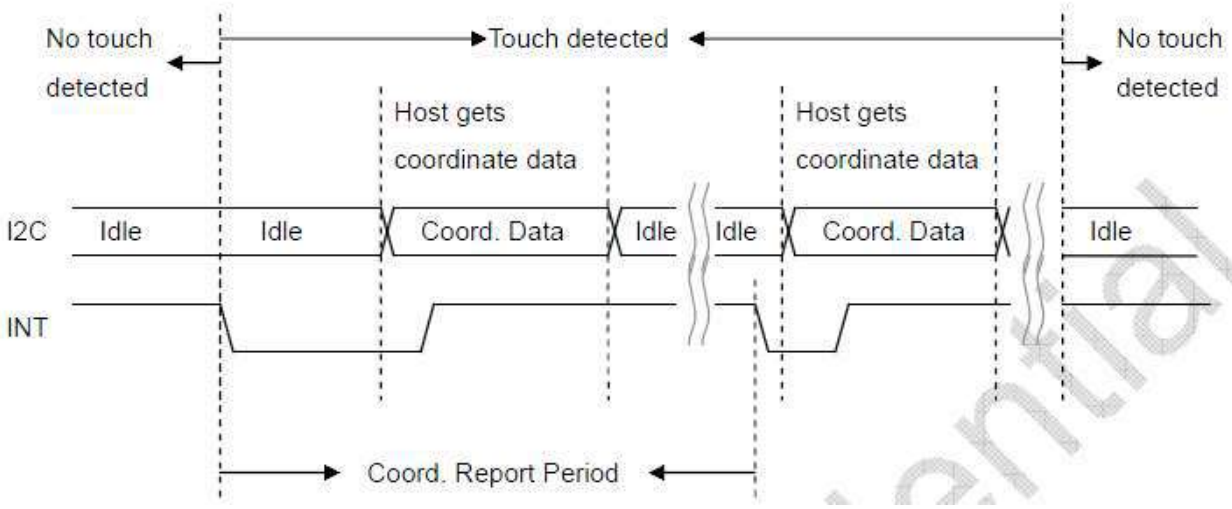
Figure 5-1 I2C Fast Mode Timing

Table 5-3 I2C Fast Mode Timing Characteristic

Conditions: VDD = 3.3V, GND = 0V, T_A = 25°C

Symbol	Parameter	Rating			Unit
		Min.	Typ	Max.	
f_{SCL}	SCL clock frequency	0	-	400	kHz
t_{LOW}	Low period of the SCL clock	1.3	-	-	us
t_{HIGH}	High period of the SCL clock	0.6	-	-	us
t_f	Signal falling time	-	-	300	ns
t_r	Signal rising time	-	-	300	ns
t_{SU_STA}	Set up time for a repeated START condition	0.6	-	-	us
t_{HD_STA}	Hold time (repeated) START condition. After this period, the first clock pulse is generated	0.6	-	-	us
t_{SU_DAT}	Data set up time	100	-	-	ns
t_{HD_DAT}	Data hold time	0	-	0.9	us
t_{SU_STO}	Set up time for STOP condition	0.6	-	-	us
t_{BUF}	Bus free time between a STOP and START condition	1.3	-	-	us
C_b	Capacitive load for each bus line	-	-	400	pF

8.4 I2C Electrical Waveform



8.5 Power On/Off Sequence

RESET pin should be held low before power on and power off. During power on, after both VDD and IOVDD reach normal voltage, RESET pin needs to be held low for 5ms to ensure internal block stable.

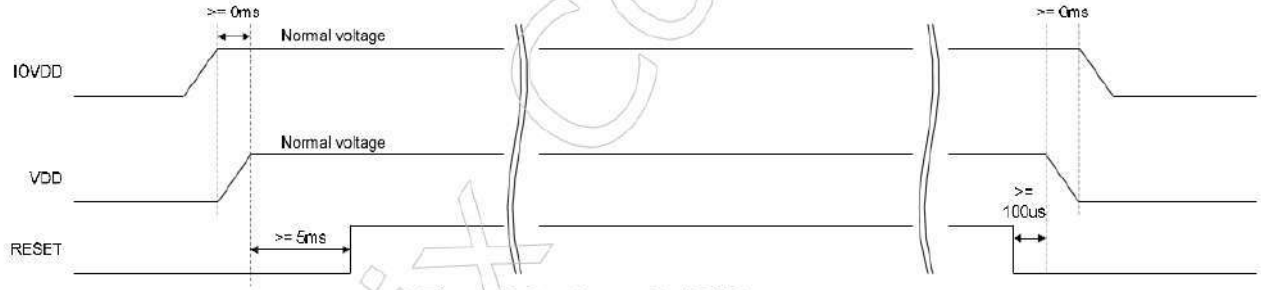


Figure 3-2 Power On/Off Sequence

Master can reset ST1727 through RESET pin. RESET pin is low active and needs hold low for 1us to take effect.

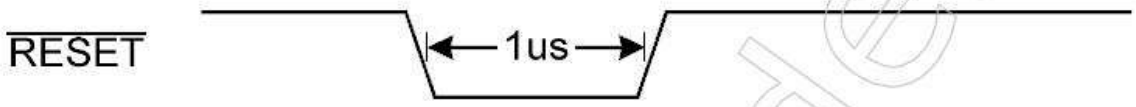


Figure 3-1 $\overline{\text{RESET}}$ Pin Low Pulse Width

9. LCD Module Out-Going Quality Level

9.1 VISUAL & FUNCTION INSPECTION STANDARD

9.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

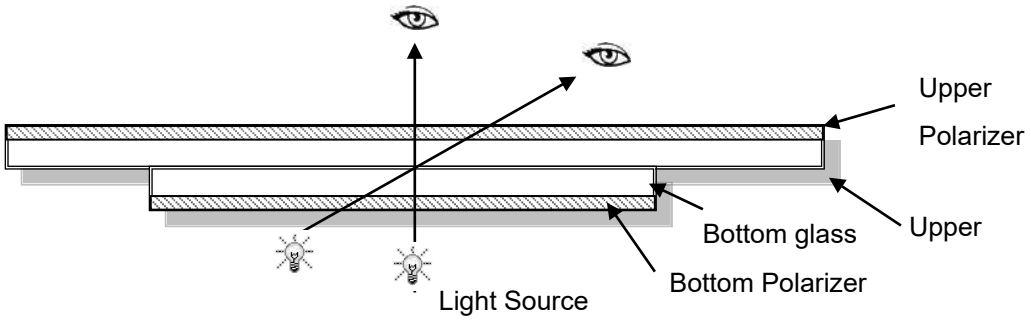
Temperature : 25±5℃

Humidity : 65%±10%RH

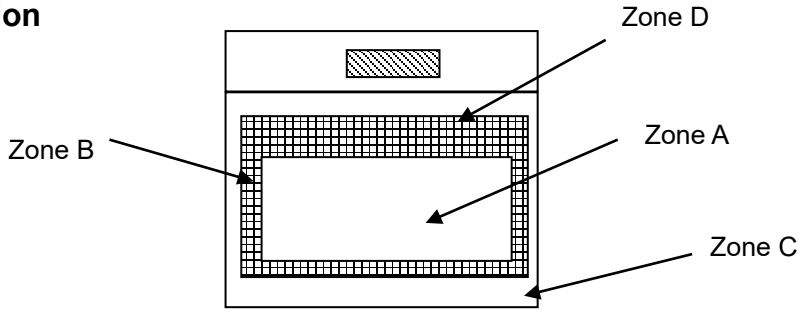
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



9.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C Cover (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

9.1.3 Sampling Plan

According to GB/T 2828.1-2003 ; , normal inspection, Class Ⅱ

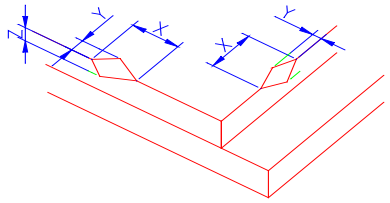
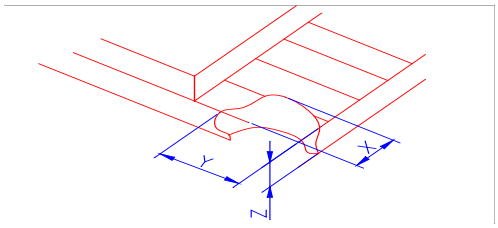
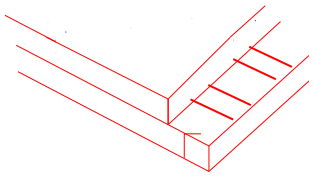
AQL:

Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

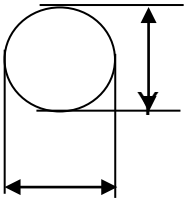
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot Line defect	Light dot， Dim spot , Polarizer Bubble ; Polarizer accidented spot.	
6	Soldering appearance	Good soldering , Peeling off is not allowed.	
7	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

9.1.4 Criteria (Visual)

<table>
<tr><th>Number</th><th>Items</th><th>Criteria(mm)</th></tr>
<tr><td rowspan="3">1.0 LCD Crack/Broken
NOTE:
X: Length
Y: Width
Z: Height
L: Length of ITO,
T: Height of LCD</td><td>(1) The edge of LCD broken</td><td> 
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr>
</table></td></tr>
<tr><td>(2)LCD corner broken</td><td> 
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr>
</table></td></tr>
<tr><td>(3) LCD crack</td><td> 
Crack
Not allowed</td></tr>
</table>

2.0

Spot defect



X

Φ=(X+Y)/2

① light dot（LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain）

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.10	Ignore		Ignore
0.10<Φ≤0.25	4(distance≧10mm)		
0.25<Φ≤0.35	3		
Φ>0.4	0		

②Dim spot（LCD/TP/Polarizer dim dot, light leakage、dark spot）

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.1	Ignore		Ignore
0.10<Φ≤0.25	4(distance≧10mm)		
0.25<Φ≤0.35	3		
Φ>0.4	0		

③ Polarizer accidented spot

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.3<Φ≤0.5	3(distance≧10mm)		
Φ>0.5	0		

④Pixel bad points（light dot，Dim dot, color dot）

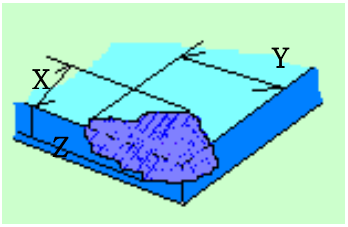
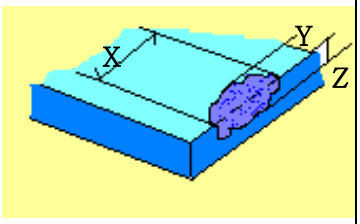
Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore		Ignore
0.2<Φ≤0.3	2(distance≧10mm)		
Φ>0.4	0		

⑤ Polarizer Bubble

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.3<Φ≤0.4	4(distance≧10mm)		
0.4<Φ≤0.5	3		
Φ>0.5	0		

<table>
<tr><td>3.0</td><td>Line defect (LCD/TP /Polarizer backlight black/white line, scratch, stain)</td><td>
<table>
<tr><td rowspan="2">Width(mm)</td><td rowspan="2">Length(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.05</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.05<W≤0.06</td><td>L≤4.0</td><td colspan="2">N≤3</td></tr>
<tr><td>0.07<W≤0.08</td><td>L≤3.0</td><td colspan="2">N≤2</td></tr>
<tr><td>0.08<W</td><td colspan="4">Define as spot defect</td></tr>
</table>
</td></tr>
<tr><td>4.0</td><td>Electronic Components SMT</td><td>Not allow missing parts，solderless connection，cold solder joint，mis match，The positive and negative polarity opposite</td></tr>
<tr><td>5.0</td><td>Display color& Brightness</td><td>1. Color：Measuring the color coordinates, The measurement standard according to the datasheet or samples.
2. Brightness：Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.</td></tr>
<tr><td>6.0</td><td>LCD Mura</td><td>By 5% ND filter invisible.</td></tr>
</table>

<table>
<tr><td rowspan="2">7.0</td><td rowspan="2">CTP Related</td><td>CTP Cover sensor accidented black/white spot</td><td>
<table>
<tr><td rowspan="2">Size Φ(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.15<Φ≤0.25</td><td colspan="2">4（distance≧10mm）</td></tr>
<tr><td>0.25<Φ≤0.35</td><td colspan="2">3</td></tr>
<tr><td>Φ>0.4</td><td colspan="2">0</td><td></td></tr>
</table>
</td></tr>
<tr><td>CTP Cover scratch</td><td>
<table>
<tr><td rowspan="2">Width(mm)</td><td rowspan="2">Ignore(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.05</td><td>Ignore</td><td colspan="3">Ignore</td></tr>
<tr><td>0.05<W≤0.06</td><td>L≤4.0</td><td colspan="3">N≤3</td></tr>
<tr><td>0.07<W≤0.08</td><td>L≤3.0</td><td colspan="3">N≤2</td></tr>
<tr><td>0.08<W</td><td colspan="4">Define as spot defect</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><td></td><td></td><td>CTP Cover Pinhole/ Lack of ink</td><td>
<table>
<tr><th>Zone
Size (mm)</th><th>Acceptable Qty</th></tr>
<tr><td></td><td>C</td></tr>
<tr><td>Φ≤0.2</td><td>Ignore</td></tr>
<tr><td>0.2<Φ≤0.3</td><td>4(distance≧10mm)</td></tr>
<tr><td>0.3<Φ≤0.4</td><td>3</td></tr>
<tr><td>Φ>0.4</td><td>0</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td>CTP Bonding bubble/ accidented spot</td><td>
<table>
<tr><th rowspan="2">Size Φ(mm)</th><th colspan="2">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td></tr>
<tr><td>0.15<Φ≤0.2</td><td colspan="2">3(distance≧10mm)</td></tr>
<tr><td>0.2<Φ≤0.25</td><td colspan="2">2</td></tr>
<tr><td>Φ>0.25</td><td colspan="2">0</td></tr>
</table>
</td></tr>
<tr><td></td><td></td><td>Assembly deflection</td><td>beyond the edge of backlight ≤0.2mm</td></tr>
<tr><td></td><td></td><td>TP cover broken
X：length
Y：width
Z：height</td><td>
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>X≤0.5mm</td><td>Y≤0.5mm</td><td>Z<cover thickness</td></tr>
</table>
*
Circuitry broken is not allowed.
</td><td> 
</td></tr>
<tr><td></td><td></td><td>TP cover broken
X：length
Y：width
Z：height</td><td>
<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>X≤0.3mm</td><td>Y≤0.3mm</td><td>Z<LCD thickness</td></tr>
</table>
* Circuitry broken is not allowed.
</td><td> 
</td></tr>
</table>

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

10. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	60℃,96H	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value.
Low Temperature Operating	-20℃, 96HR	
High Temperature Storage	75℃, 96HR	
Low Temperature Storage	-30℃, 96HR	
High Temperature & High Humidity Operating	+60℃, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-30℃,30 min ↔ 75℃,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15℃~35℃, 30%~60%).	
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package	
Box Drop Test	1 Corner 3 Edges 6 faces,80㎝(MEDIUM BOX)	

Remark:

1.The test samples should be applied to only one test item.
2.Sample size for each test item is 5~10pcs.
3.For Damp Proof Test, Pure water(Resistance＞10MΩ) should be used.
4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11. Cautions and Handling Precautions

11.1 Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.
Do not warp or twist the module during assembly work.
(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
(4) Do not allow drops of water or chemicals to remain on the display surface.
If you have the droplets for a long time, staining and discoloration may occur.
(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.
Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
(8) Protect the module from static; it may cause damage to the CMOS ICs.
(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
(10) Do not disassemble the module.
(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
(12) Pins of I/F connector shall not be touched directly with bare hands.
(13) Do not connect, disconnect the module in the “Power ON” condition.

11.2 Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35 ℃ and relative humidity of less than 70%
(2) Do not store the TFT-LCD module in direct sunlight.
(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.

(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.
In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

12. Packing

----TBD----------