Customer	
Customer NO.	
Approve By	

For Solution ---10.1 inch ;1920(W)×RGB×1200(H)

Owner:

Version: V02

Approved by

Record of Revisions

Rev	Date	Sub-Model	Description of change
V01	**May 14th 2020**		**Preliminary Product Specification was first issued.**
V02	**June 11th 2022**		**Correct the AC/DC SPEC and Timing**

Table of contents

1. General description

1.1 Introduction

This 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 back light system. This TFT LCD has a 10.1 (16:10) inch diagonally measured active display area with WUGA (1920horizontal by 1200 vertical pixel) resolution.

1.2 Features

10.1 (16:10 diagonal) inch configuration

16.7M color 8bit LVDS interface

RoHS Compliance

1.3 Applications

Mobile NB, Machine

Automotive

Multimedia applications and Other AV system

1.4 General information

Item		Specification	Unit
Outline Dimension		234.38x151.29x8.5 [module:229.46x 149.10 x 4.8(typ)]	mm
Display area		216.8(W) x 135.50(H)	mm
Number of Pixel		1920 x RGB(H) x 1200(V)	pixels
Dot pitch		0.03764(W) x 0.11292(H)	mm
Pixel arrangement		RGB Vertical stripe	
Display mode		Normally Black	
Surface treatment		HC	
Weight		TBD	g
Back-light		Single LED (Side-Light type)	
Power Consumption	B/L System	TBD	w

1.5 Mechanical Information

item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	234.18	234.38	234.58	mm
	Vertical(V)	151.06	151.26	151.46	mm
	Depth(D)	8.2	8.5	8.8	mm

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	VDDIN	-0.3	3.6	V	GND=0
	VGH	-0.3	42	V	
	VGL	-19	0.3	V	
	VGH-VGL	12	32	V	

2.1.2 Back-Light Unit

Item	Symbol	MIN.	TYP.	MAX.	Unit	Note
Forward voltage	Vf	14	14.3	14.5	V	(1)(2)
Forward current	If	--	600		mA	(1)(2) (3)
Power Consumption	PBL	--	8.58		W	

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) Ta =25±2℃

(3) Test Condition: NA

2.2 Environment Absolute Rating

Item	**Symbol**	**Min.**	**Max.**	**Unit**	**Remarks**
Operating Temperature	**Topa**	**-20**	**+70**	℃	
Storage Temperature	**Tstg**	**-30**	**+80**	℃	

3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification:

Item	Symbol	Temp.	Min.	Typ.	Max.	Unit	Condition
Response Time(Tr+Tf)	Tr	25℃		25	--	msec	θ =0 °,φ=0 ° (Note 1,3)
	Tf	25℃			--		
Contrast Rate	Cr	25℃	700	900	--	--	θ =0 °, φ=0 ° LED:ON, LIGHT:OFF(Note1,2)
Brightness	YL	25℃	1000	1250	--	Cd/m2	I=600mA(Note1,4)
Visual angle range front and rear	Θ U	25℃	80	85		De-gree	ϕ =90°,(12'clock) CR≧10 (Note 1,4)
	Θ D		80	85			ϕ =270°,(6'clock) CR≧10 (Note 1,4)
Visual angle range left and right	Θ L	25℃	80	85		De-gree	ϕ = 180°, (9 o'clock)CR≧ 10 (Note 1,4)
	Θ R		80	85			ϕ = 0°, (3 o'clock)CR≧10, (Note 1,4)
Brightness uniformity	BUNI		75			%	Θ =0(Note5,7)
Visual angle			--				(Note 6)

Item	Symbol	Transmissive			Conditions
		Min.	Typ.	Max.	
Red	XR	0.594	0.644	0.694	Reference: LCD Panel, CIE (x, y) chromaticity (Note 1,4)
	YR	0.294	0.344	0.394	
Green	XG	0.265	0.315	0.365	
	YG	0.582	0.632	0.692	
Blue	XB	0.107	0.157	0.207	
	YB	0.014	0.054	0.104	
White	XW	0.235	0.285	0.335	
	YW	0.287	0.327	0.377	

3.2 Measuring Condition

Measuring surrounding: dark room ,LED current IL

Ambient temperature: 25±2oC

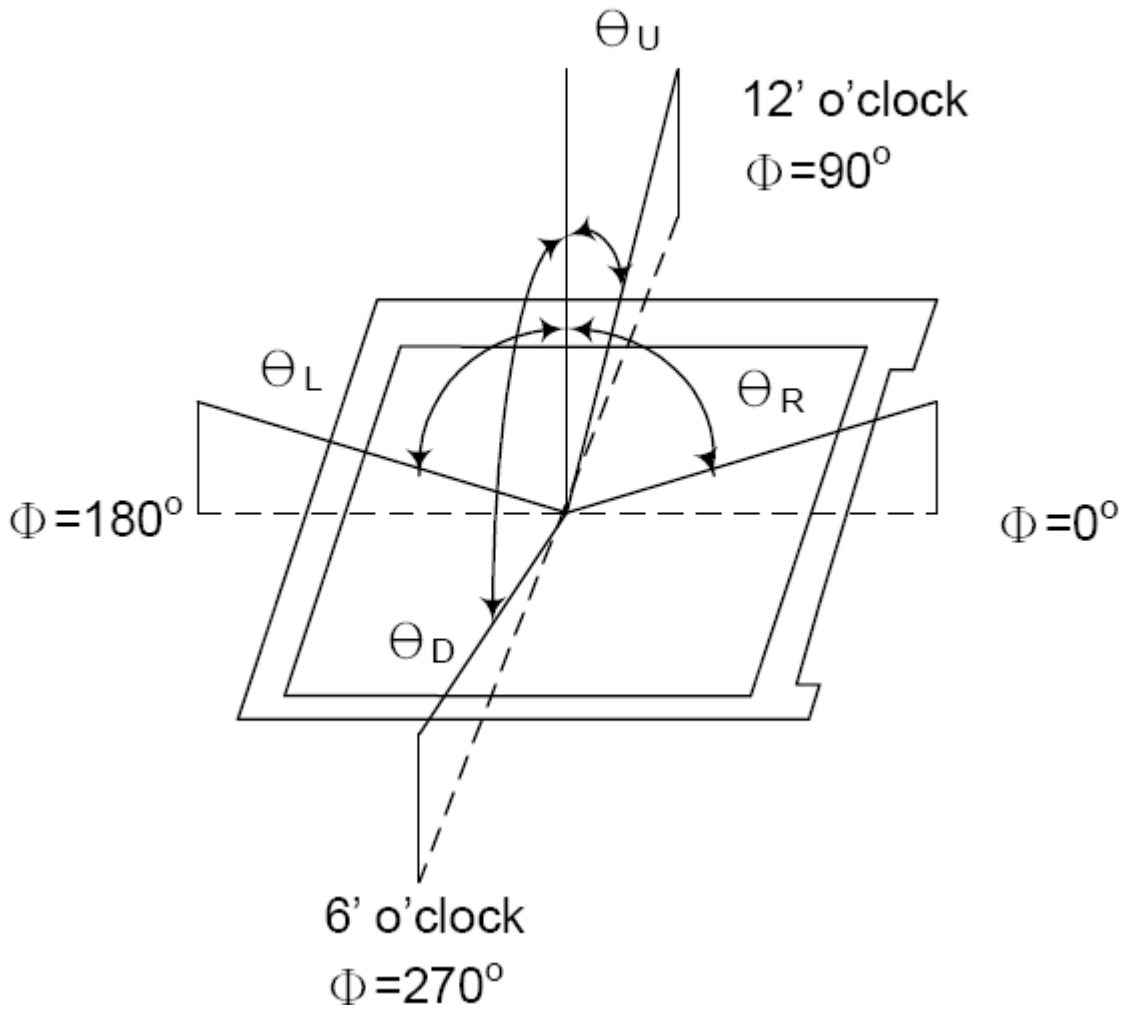
15min. warm-up time.

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: CONFIDENTIAL

20 ~ 21 mm

Note (1) Definition of Viewing Angle :

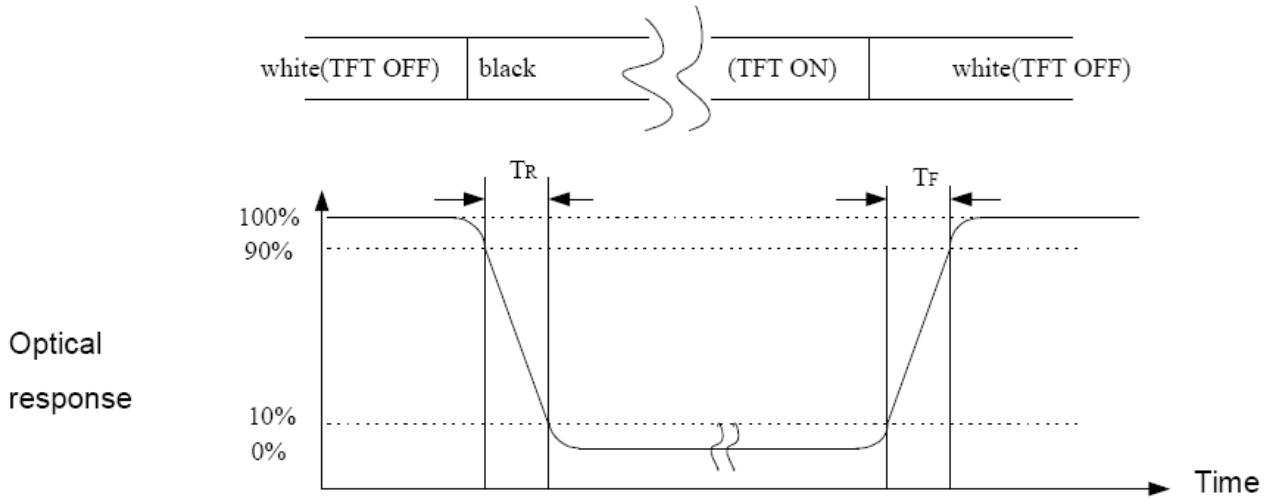


Note (2) Definition of Contrast Ratio (CR):

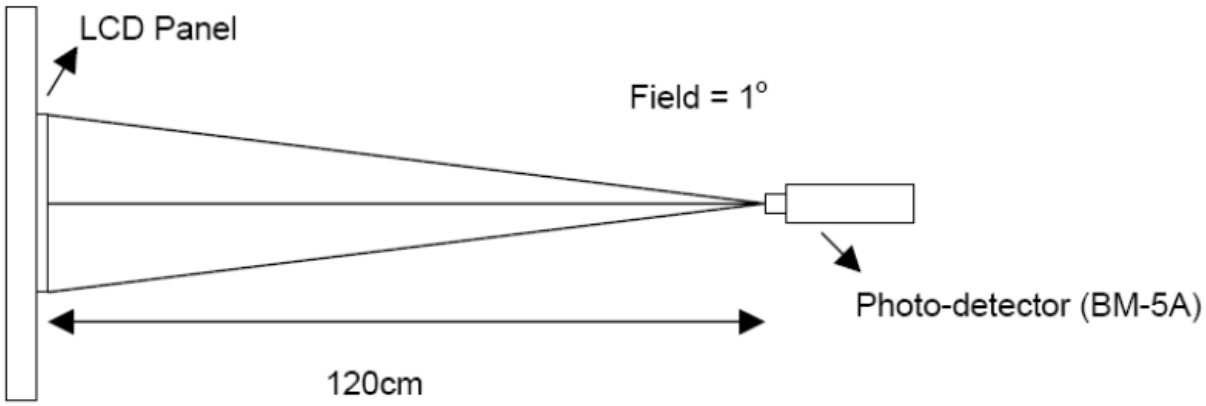
Measured at the center point of panel

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

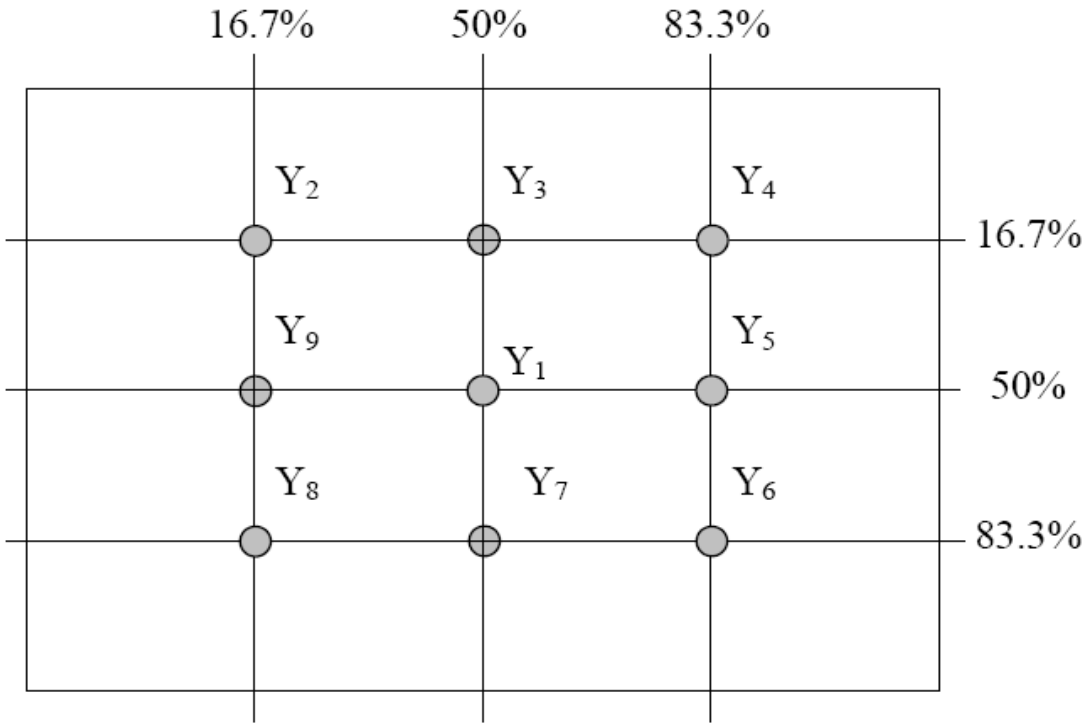
Note (3) Definition of Response Time: Sum of TR and TF



Note (4) Definition of optical measurement setup



Note (5) Definition of brightness uniformity



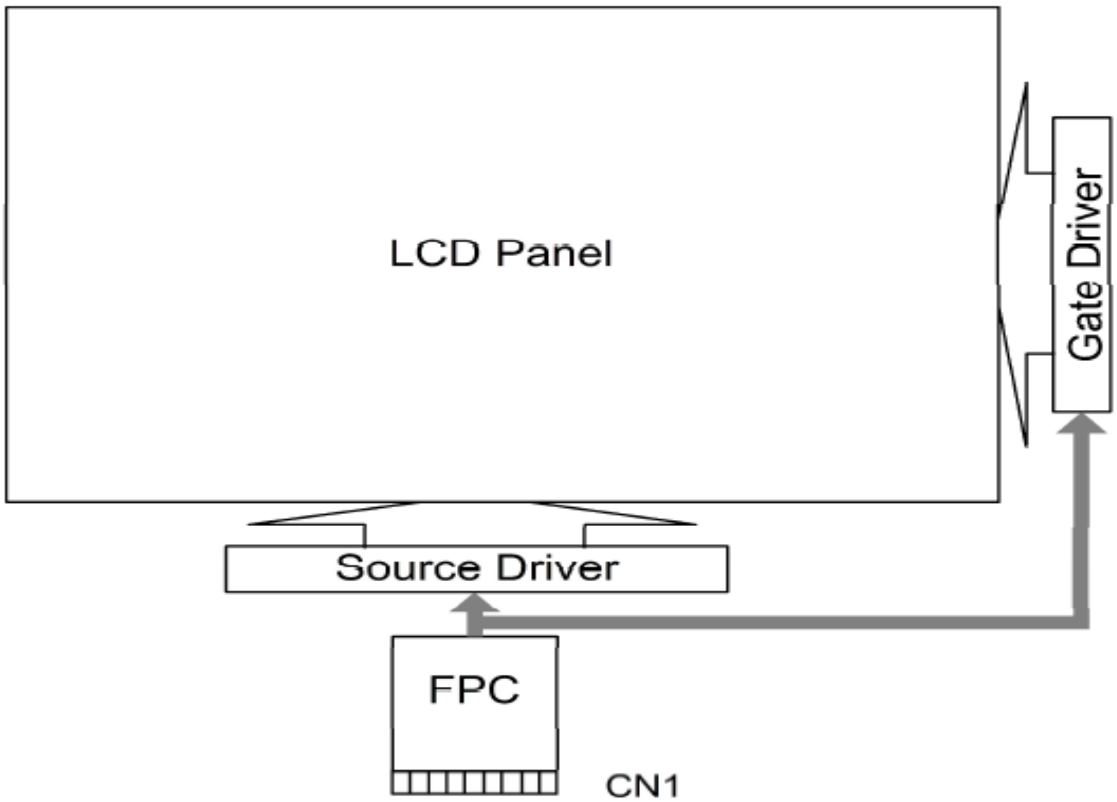
$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction).

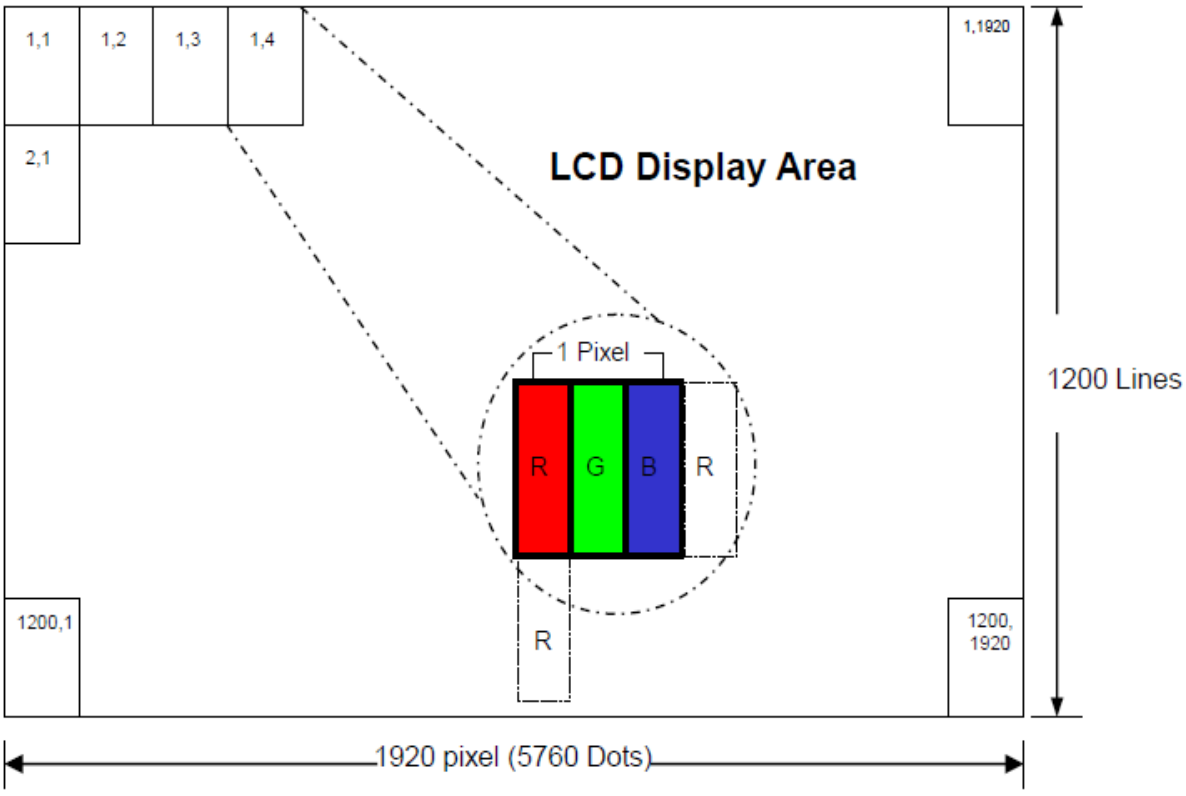
Note (7) Measured at the brightness of the panel when all terminals of LCD panel are electrically open.

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel format



5.0 INTERFACE PIN CONNECTION

5.1 45PIN connector is used for the module electronics interface the recommended model is FH34SRJ-45S-0.5SH(45)(HRS) or equivalent

Pin No.	Symbol	I/O	Function	Remark
1	VDDIN	P	Power for Analog Circuit(3.3V)	
2	VDDIN	P	Power for Analog Circuit(3.3V)	
3	VDDIN	P	Power for Analog Circuit(3.3V)	
4	VDDIN	P	Power for Analog Circuit(3.3V)	
5	VDDIN	P	Power for Analog Circuit(3.3V)	
6	**GND**	**P**	**Ground**	
7	VDD_OTP	P	OTP Power Supply VDD_OTP:8.6V	
8	I2C_SCL	I	OTP_SCL	
9	I2C_SDA	I	OTP_SDA	
10	GND	P	Ground	
11	OLV0N	I	- LVDS differential data input	
12	OLV0P	I	+ LVDS differential data input	
13	GND	P	Ground	
14	OLV1N	I	- LVDS differential data input	
15	OLV1P	I	+ LVDS differential data input	
16	GND	P	Ground	
17	OLV CLKN	I	- LVDS differential clock input	
18	OLV CLKP	I	+ LVDS differential clock input	
19	GND	P	Ground	
20	OLV2N	I	- LVDS differential data input	
21	OLV2P	I	+ LVDS differential data input	
22	GND	P	Ground	
23	OLV3N	I	- LVDS differential data input	
24	OLV3P	I	+ LVDS differential data input	
25	GND	P	Ground	

26	ELV0N	I	- LVDS differential data input	
27	ELV0P	I	+ LVDS differential data input	
28	GND	P	Ground	
29	ELV1N	I	- LVDS differential data input	
30	ELV1P	I	+ LVDS differential data input	
31	GND	P	Ground	
32	ELV CLKN	I	- LVDS differential clock input	
33	ELV CLKP	I	+ LVDS differential clock input	
34	GND	P	Ground	
35	ELV2N	I	- LVDS differential data input	
36	ELV2P	I	+ LVDS differential data input	
37	GND	P	Ground	
38	ELV3N	I	- LVDS differential data input	
39	ELV3P	I	+ LVDS differential data input	
40	GND	P	Ground	
41	NC	--	Not connected	
42	VLED+(NC)	P	BL Power Input Anode(Same to Not Connected, If Not Use)	
43	VLED+(NC)	P	BL Power Input Anode(Same to Not Connected, If Not Use)	
44	VLED-(NC)	P	BL Power Input Cathode(Same to Not Connected, If Not Use)	
45	VLED-(NC)	P	BL Power Input Cathode (Same to Not Connected, If Not Use)	

I: input O: output ,P: power

6.0 ELECTRICAL CHARACTERISTICS

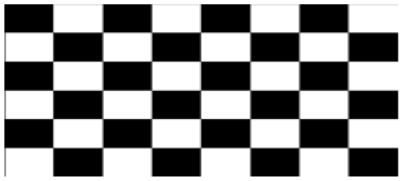
6.1 TFT LCD Module

Item	Symbol	Min.	Type	Max.	Unit.	Note
Power supply voltage	VDD	3.0	3.3	3.6	V	GND=0
	VRP			300	mV	Ripple
Power Supply Current	IVDD		300	360	mA	Note 1
Power consumption	PLCD		1	1.2	W	
Rush Current	Iruch			3.0	A	Note 2
Input logic high voltage	VIH	0.7VDD		VDD	V	
Input logic low voltage	VIL	0	--	0.3VDD	V	
LED Reverse Voltage	Vr	-	--	5.0	V	Each LED
LED Forward Current	If	-	--	35	mA	Each LED

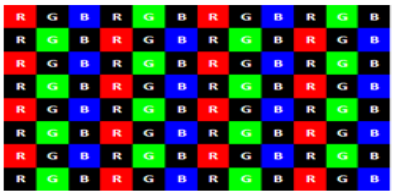
Note 1

The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=3.3V, Frame rate f_V=60Hz and Clock frequency = 80MHz. Test Pattern of power supply current

a) Typ : Mosaic 8 x 6 Pattern(L0/L255)



b) Max : skip subPixel(L255)



Note 2

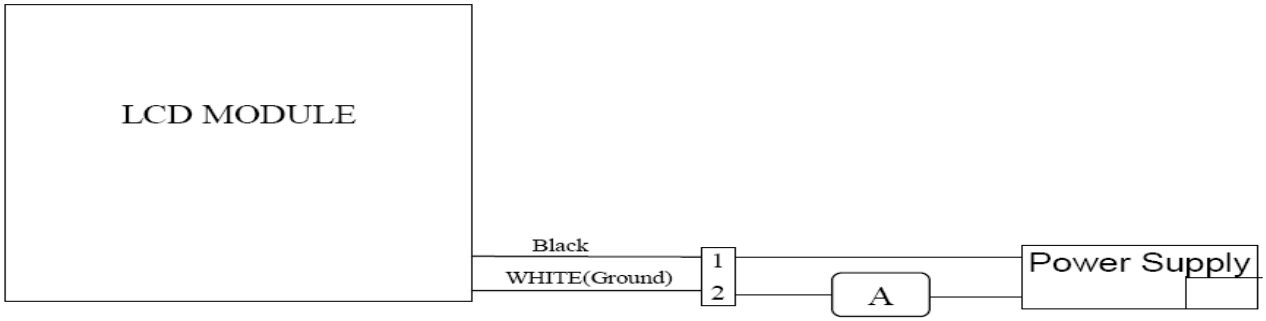
The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

6.2 Back-Light Unit

The backlight system is an edge-lighting type with 40 LED.

The characteristics of the LED are shown in the following tables.

Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED current	**VL**	**14**	**14.3**	**14.5**	**V**	**(2)**
LED Voltage	**IL**		**600**		**mA**	
Operating LED life time	**Hr**	**50000**	**-**	**-**	**Hour**	**(1)(2)**



Note (1) 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%.

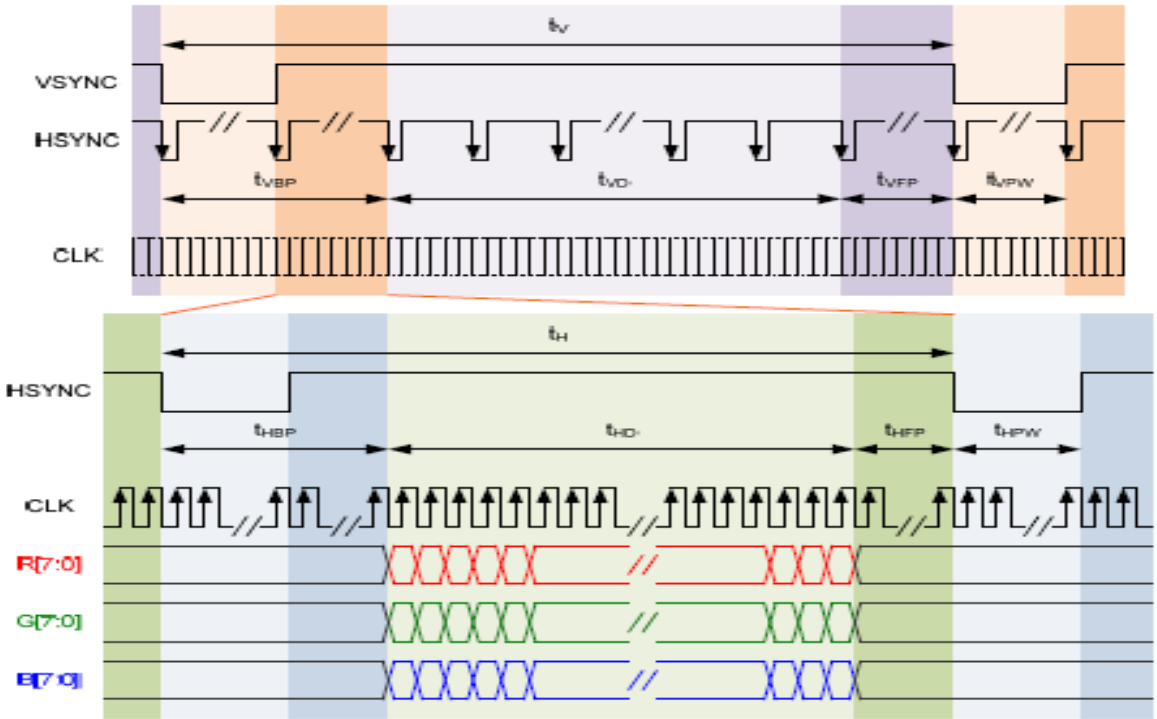
Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃. The LED lifetime could be decreased if operating IL is larger. The constant current driving method is suggested.

6.3 LVDS/Parallel RGB

6.3.1LVDS Signal Timing Diagram of Interface Signal(SYNC Mode)

1080RGB x 1920 (2-Port LVDS)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
CLK frequency	tCLK	73.7	75.7	78	Mhz	
Horizontal blanking time	tHBT	48	50	54	tCLK	tHBP + tHFP
Horizontal back porch	tHBP	24	26	28	tCLK	Include tHPW
Horizontal display area	tHD		960		tCLK	
Horizontal front porch	tHFP	24	24	26	tCLK	
Horizontal period	tH	1008	1010	1014	tCLK	
Horizontal pulse width	tHPW	2	2	2	tCLK	
Vertical blanking time	tVBT	40	50	60	tH	tVBP + tVFP
Vertical back porch	tVBP	20	26	30	tH	Include tVPW
Vertical display area	tVD		1200		tH	
Vertical front porch	tVFP	20	24	30	tH	
Vertical period	tV	1240	1250	1260	tH	
Vertical pulse width	tVPW	2	2	2	tH	
Frame rate	FR	59	60	61	Hz	

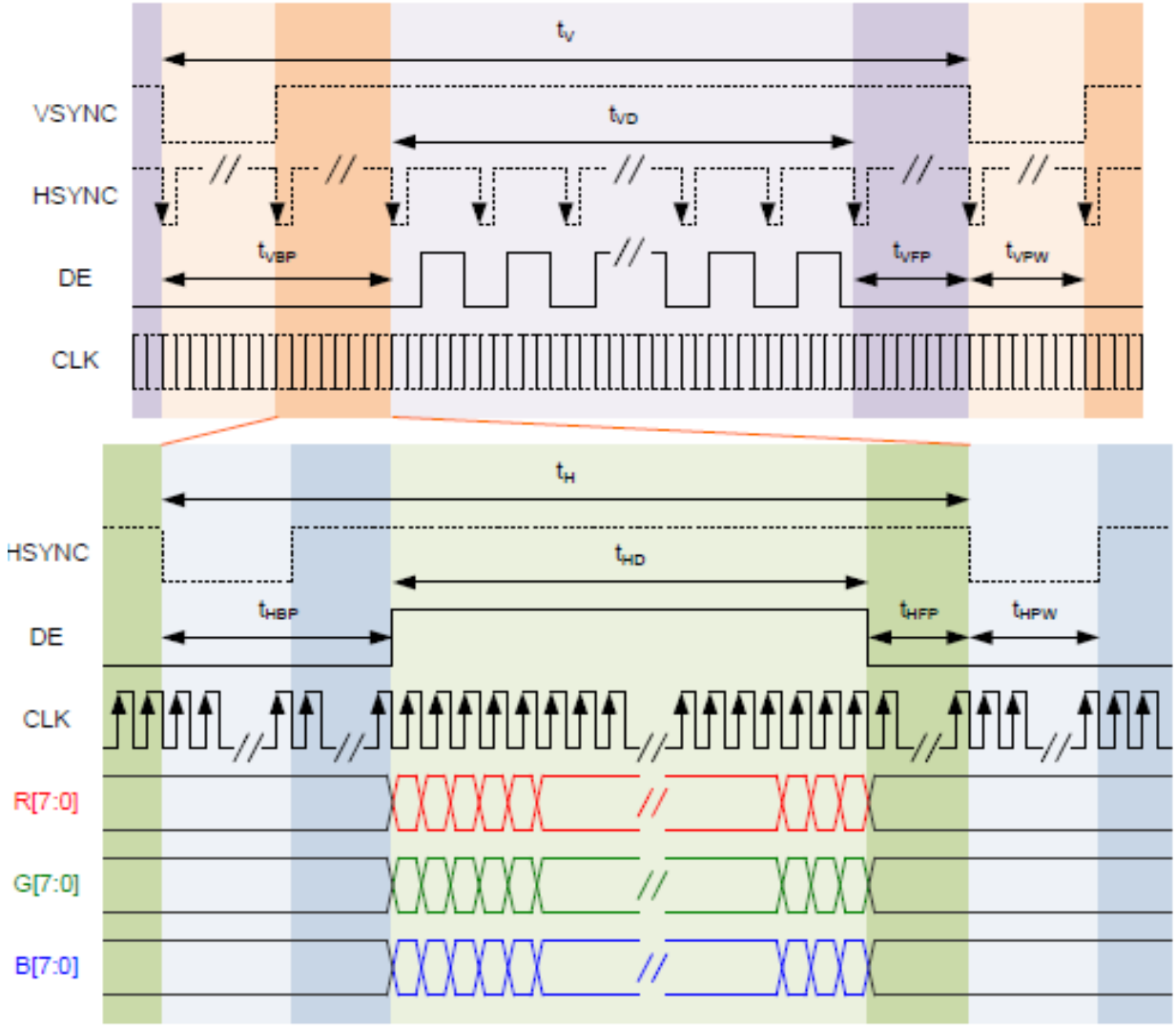


6.3.2LVDS Signal Timing Diagram of Interface Signal(DE Mode)

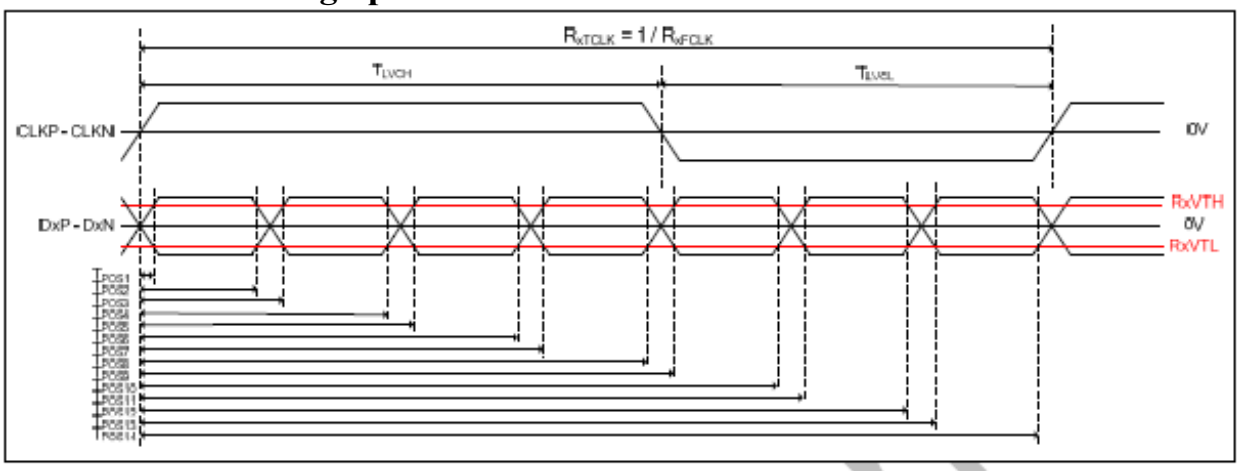
1080RGB x 1920 (2-Port LVDS)

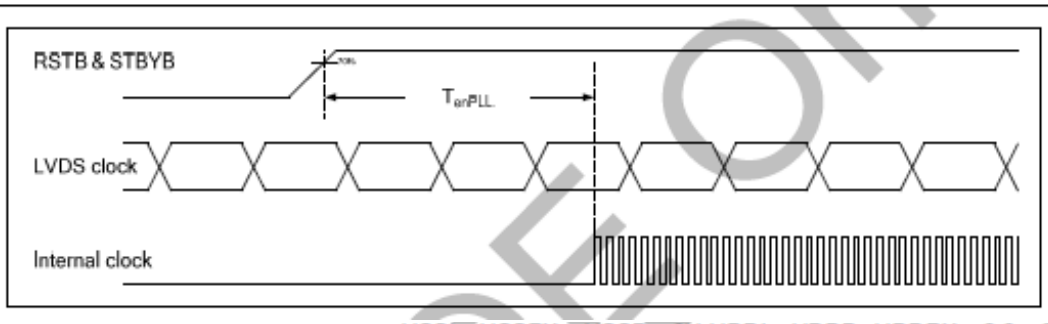
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
CLK frequency	tCLK	73.7	75.7	78	Mhz	
Horizontal blanking time	tHBT	48	50	54	tCLK	tHBP + tHFP
Horizontal display area	tHD		960		tCLK	
Horizontal period	tH	1008	1010	1014	tCLK	
Horizontal pulse width	tHPW	2	2	2	tCLK	
Vertical blanking time	tVBT	40	50	60	tH	tVBP + tVFP
Vertical display area	tVD		1200		tH	
Vertical period	tV	1240	1250	1260	tH	
Vertical pulse width	tVPW	2	2	2	tH	
Frame rate	FR	59	60	61	Hz	

Note: ST5892B can't accept the tolerance of tVBT =+/- 1 in DE mode.



6.4 LVDS AC Timing Specification



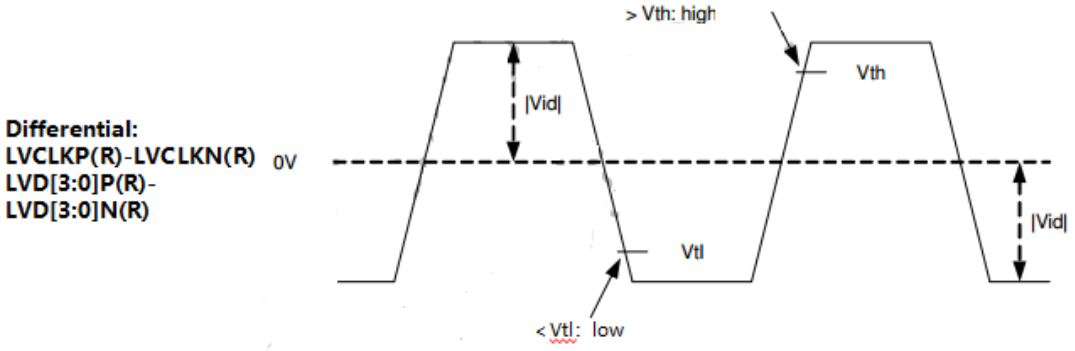


VSSI = VSSRX = VSSP = 0V, VDDI = VDDP= VDDRX = 3.0 ~ 3.3V, -40 ~ 85°C

Item	Signal	Symbol	Rating			Unit
			Min.	Typ.	Max.	
Clock Frequency	CLK	R_{xFCLK}	20	-	100	MHz
Clock Period		R_{xTCLK}	10	-	50	ns
1 data bit time		UI	-	1/7	-	R_{xTCLK}
Clock high time	CLK	T_{LVCH}		4		UI
Clock low time		T_{LVCL}		3		UI
Position 1	DATA	T_{POS1}	-0.25	0	0.25	UI
Position 2		T_{POS2}	0.75	-	1.25	
Position 3		T_{POS3}	0.75	1	1.25	
Position 4		T_{POS4}	1.75	-	2.25	
Position 5		T_{POS5}	1.75	2	2.25	
Position 6		T_{POS6}	2.75	-	3.25	
Position 7		T_{POS7}	2.75	3	3.25	
Position 8		T_{POS8}	3.75	-	4.25	
Position 9		T_{POS9}	3.75	4	4.25	
Position 10		T_{POS10}	4.75	-	5.25	
Position 11		T_{POS11}	4.75	5	5.25	
Position 12		T_{POS12}	5.75	-	6.25	
Position 13		T_{POS13}	5.75	6	6.25	
Position 14		T_{POS14}	6.75	-	7.25	
PLL wake-up time		TenPLL	-		150	us

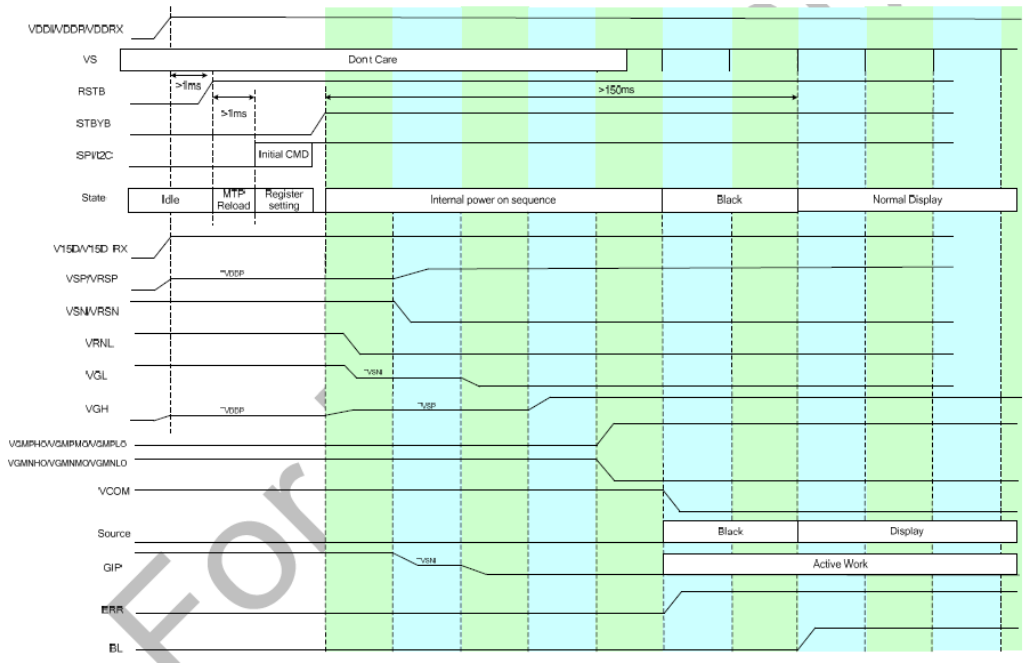
6.4.1 LVDS DC Timing Specification

Item	Symbol	Condition	MIN	TYP	MAX	Unit
Differential input high Threshold voltage	Vth	Vcm=1.2V	-	-	+0.1	V
Differential input low Threshold voltage	Vtl	-	-0.1	-	-	V
Differential input common Threshold voltage	Vcm	-	1	1.2	1.7-|Vid|/2	V
LVDS input voltage	Vinlv	-	0.7	-	1.7	V
Differential input voltage	|Vid|	-	0.35	-	0.6	V
Differential input leakage voltage	Ilvleak	-	-10	-	+10	uA

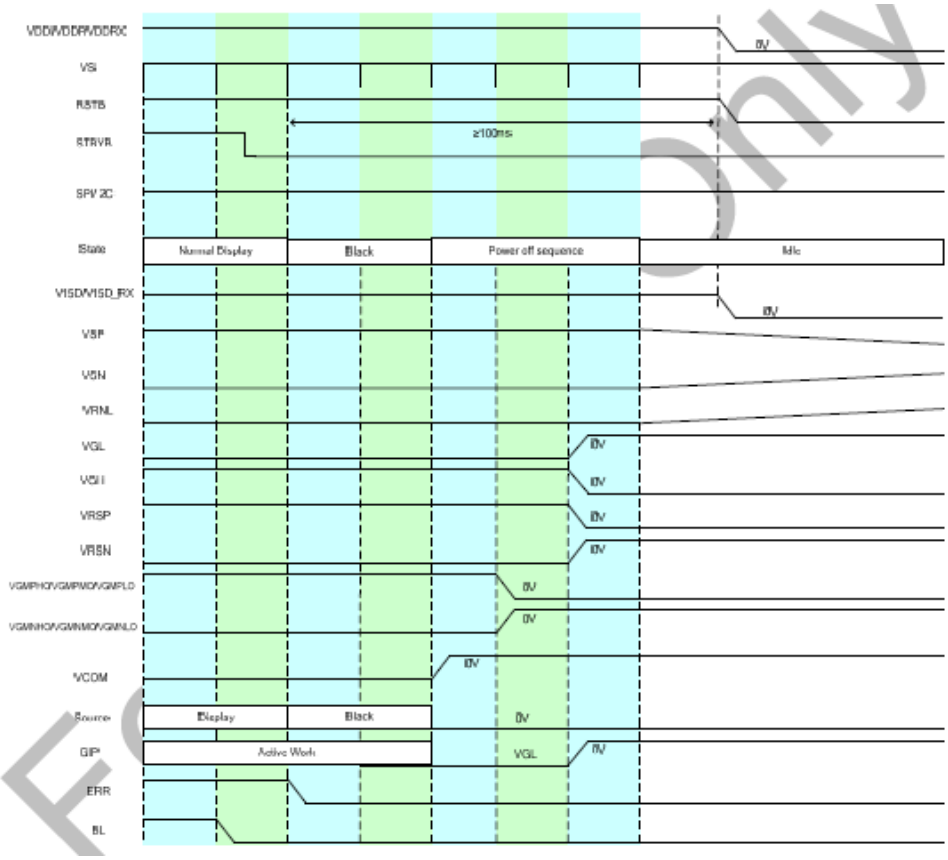


6.5 Power Sequence Specifications

Power ON



Power standby and Power Off



7.0 Reliability test items

NO.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+80℃,240hrs	Inspection after2～4 hours storage at room temperature, the sample shall be free from defects 1. Air bubble in the LCD 2. Sealleak 3. non-display 4. missing segmnents 5. glass crack 6. current idd is twice higher than initial value.
2	Low Temperature Storage	Ta=-30℃,240hrs	
3	High Temperature Operation	Ta=+70℃,240hrs	
4	Low Temperature Operation	Ta=-20℃,240hrs	
5	High Temperature and High Humidity(Operation)	Ta=+60℃, 90%RH, 240hrs	
6	Thermal cycling Test (non operation)	-20℃(30min)→+70℃(30min),100cycles	
7	Electrostatic discharge	Air 150PF 330 12KV Contact 150PF 330 8KV	
8	Vibration	1. Random: 1.04 Grms,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 times for each direction	JIS C7021,A-10 (Condition)
10	Vibration(with carton)	Random:0.015G∧2/HZ, 5～200HZ -6dB/octave,200～400HZ XYZ each dirction:2hr	
11	Drop (with carton)	Height:60cm 1corner,3edges,6surfaces	JIS Z0202

Note:

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

2.the test samples should be applied to only one test item

3.for damp proof test, Pure water(resistance>10M ohm)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 Charateristic,Optical Characteristic

7.1 Capacitance Touch Panel Specification

7.1.1 PIN assignment for I2C

Terminal No.	Symbol	IO	Functions
1	VCC	I	Power supply [2.8V]
2	RST	I	External restart Low is active (1.8V)
3	INT	I	External interrupt to the host (1.8V)
4	SCL	I	I2C clock input (1.8V)
5	SDA	I/O	I2C data input and output (1.8V)
6	GND	P	Power ground

7.1.2 PIN assignment for USB

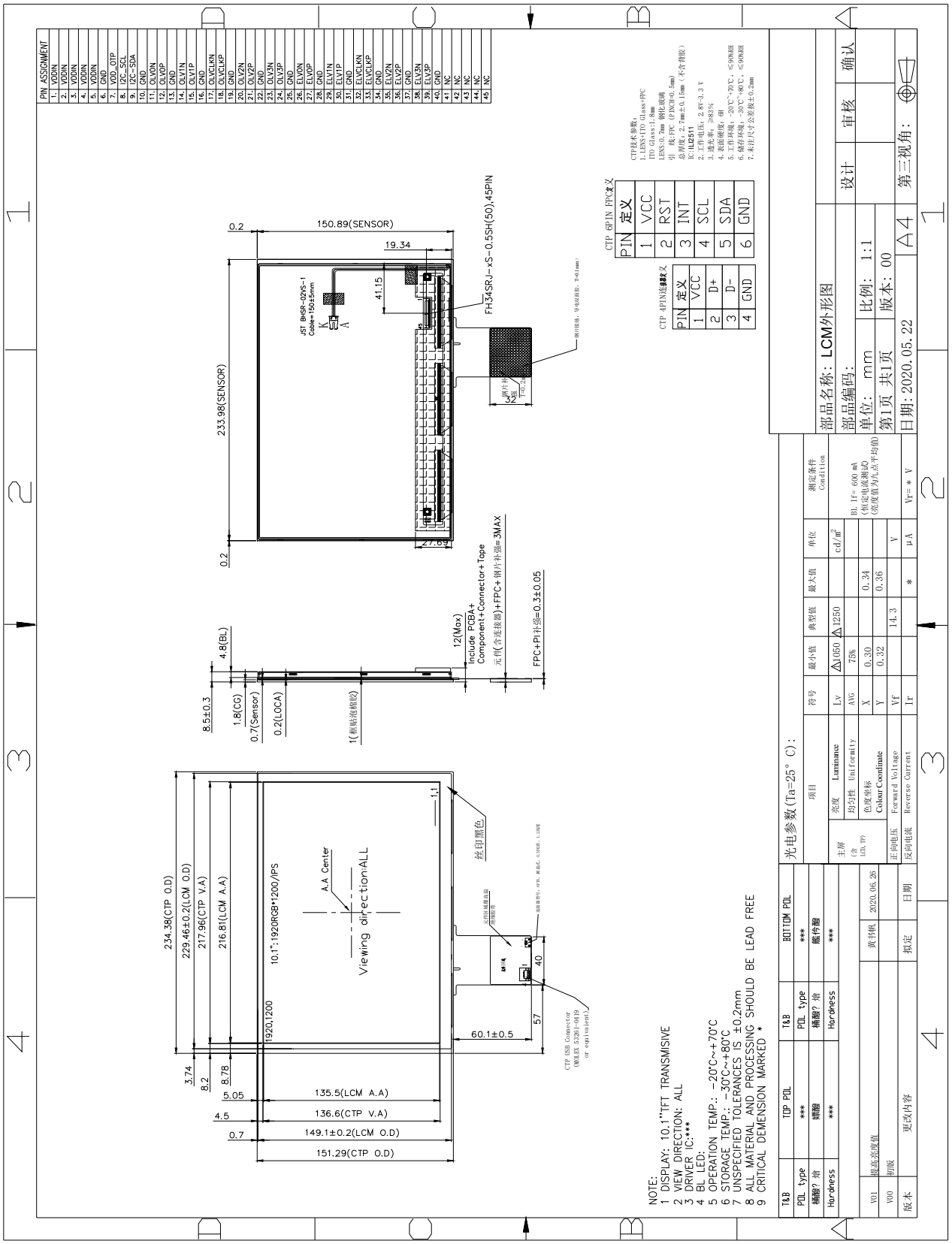
Terminal No.	Symbol	IO	Functions
1	VCC	I	Power supply [5.0V]
2	D+	I	USB Data input
3	D-	I	USB Data input
4	GND	P	Power ground

7.1.2 general features

General information Items	Specification	Unit	Note
Transmissivity	>86%		
Haze	<3%		
Screen	TX25*RX14		
Hardness	>6H		
Driver IC	ILI2511		
Interface	I2C&USB		
Touch type	Projective capacitive		
Simultaneous touch points	5 points		
Structure	G+G(cover glass +ITO glass)		

8.0 OUTLINE DIMENSION

Outline Dimension:



9.0 GENERAL PRECAUTION

9.1 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.

9.2 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. The supplier does not warrant the module, if customers disassemble or modify the module.

9.3 Breakage of LCD Panel

9.3.1.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.

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

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

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

9.4 Electric Shock

9.4.1. Disconnect power supply before handling LCD module.

9.4.2. Do not pull or fold the LED cable.

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

9.5 Absolute Maximum Ratings and Power Protection Circuit

9.5.1. 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. 9.5.2. 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.

9.6 Operation

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

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

9.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
9.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
9.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

9.7 Mechanism

Please mount LCD module by using mouting holes arranged in four corners tightly.

9.8 Static Electricity

9.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
9.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

9.9 Strong Light Exposure

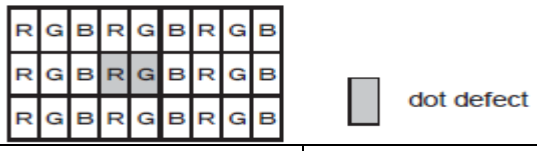
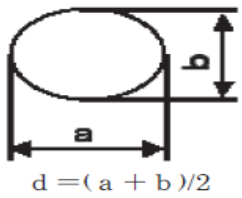
The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

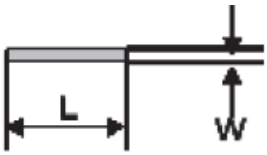
9.10 Disposal

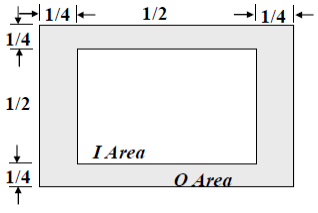
When disposing LCD module, obey the local environmental regulations.

10. Package Specification

11.Visuals Specification: 1)Note

<table>
<tr><td>General</td><td colspan="3">3. Inspection conditions
Luminance : 500 Lux min.
Inspection distance : 300 mm.
Temperature : 25±5°C
Direction : Directly above</td></tr>
<tr><td rowspan="6">Definition of inspection item</td><td rowspan="3">Dot defect</td><td>Bright dot defect</td><td>The dot is constantly “on” when power applied to the LCD, even when all “Black” data sent to the screen. Inspection tool: 5% Transparency neutral density filter.Count dot: If the dot is visible through the filter. Don’t count dot: If the dot is not visible through the filter.
 
</td></tr>
<tr><td>Black dot defect</td><td>The dot is constantly “off” when power applied to the LCD, even when all “White” data sent to the screen.</td></tr>
<tr><td>Adjacent dot</td><td>Adjacent dot defect is defined as two or more bright dot defects or black dot defects.
 
</td></tr>
<tr><td>External inspection</td><td>Bubble ,scratch(foreign Particle polarizer, Cell, Backlight)</td><td>Visible operating (all pixels “Black” or “White”) and non operating.</td></tr>
<tr><td>Appearance inspection</td><td colspan="2">Does not satisfy the value at the spec.</td></tr>
<tr><td>Others</td><td>LED wires</td><td>Damaged to the LED wires, connector, pin, functional failure or appearance failure.</td></tr>
<tr><td>Definition of Size</td><td colspan="2">Definition of circle : definition of linear size definition Area I/O
 

 
</td></tr>
</table>

2) Standard

Classification		Inspection item			Judgment Standard	
Defect (in LCD glass)	Dot defect	Area			I	O
		Bright dots(Note: Visible under:ND5%) 1:D≤0.15mm:No count); D>0.15mm acceptable: 2			N≤2	
		Dark dots (0.15mm<D≤0.3mm), D>0.3mm Not allowable			N≤4	
		Bright dot-2Adjacent			N≤0	
		Dark dot-2Adjacent			N≤0	
		Dark or bright dots-3 and more adjacent(note6)			N≤0	
		Total bright and dark dots			N≤4	
		Minimum distance between bright dots			15mm	
		Minimum distance between dark dots			5mm	
		Minimum distance between bright and bright dots			5mm	
	Other	White dot ,dark dot (circle)	Size (mm)	Acceptable number		
			d≤0.2	Neglected		
			0.2mm<D≤0.3mm	N≤4		
			0.3mm<D≤0.4mm	N≤2		
			D>0.4mm	Not allowable		
Visual defect		Foreign partial	Circular foreign material: dark/bright sport	Visible under:ND5% 1:D≤0.15mm:No count 2:0.15mm<D≤0.3mm,N≤4 3:D>0.3mm:Not allowable		
			Linear foreign material: bright or dark line	Invisible under ND5% 0.1mm<W≤0.3mm, 0.3mm<L≤1.5mm,N≤2 Visible under ND5% 0.05mm≤w≤0.1mm, 0.3mm≤L≤0.7mm,N≤1		
		Polarizer	Linear scratch	1:BM:No Count 2:Pixel area 0.05mm≤w≤0.2mm, 1.0mm≤L≤5.0mm,N≤2		
			Bubble peeling	1:BM:No Count 2:Pixel area 0.15mm≤D<0.3mm,N≤4		
		Mura & leak		ND5%		