



ASI-T-9201948A5LN/D

Item	Contents	Unit
Size	9.2	inch
Resolution	1920(RGB) x 480	/
Interface	LVDS(24BIT)+SPI(3-wire)	/
Technology type	a-Si TFT	/
Pixel pitch	0.1182 x 0.1182	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	237.0 x 72.3 x 5.8	mm
Active Area	226.94 x 56.74	mm
Display Mode	Transmissive, Normally White	/
Backlight Type	LED	/
Driver IC	HX8298-A-LT, HX8660-B	



Record of Revision

Date	Revision No.	Summary
2016-08-10	1.0	Rev 1.0 was issued



1. Scope

This data sheet is to introduce the specification of ASI-T-9201948A5LN/D active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 9.2" display area contains 1920(RGB) x 480 pixels.

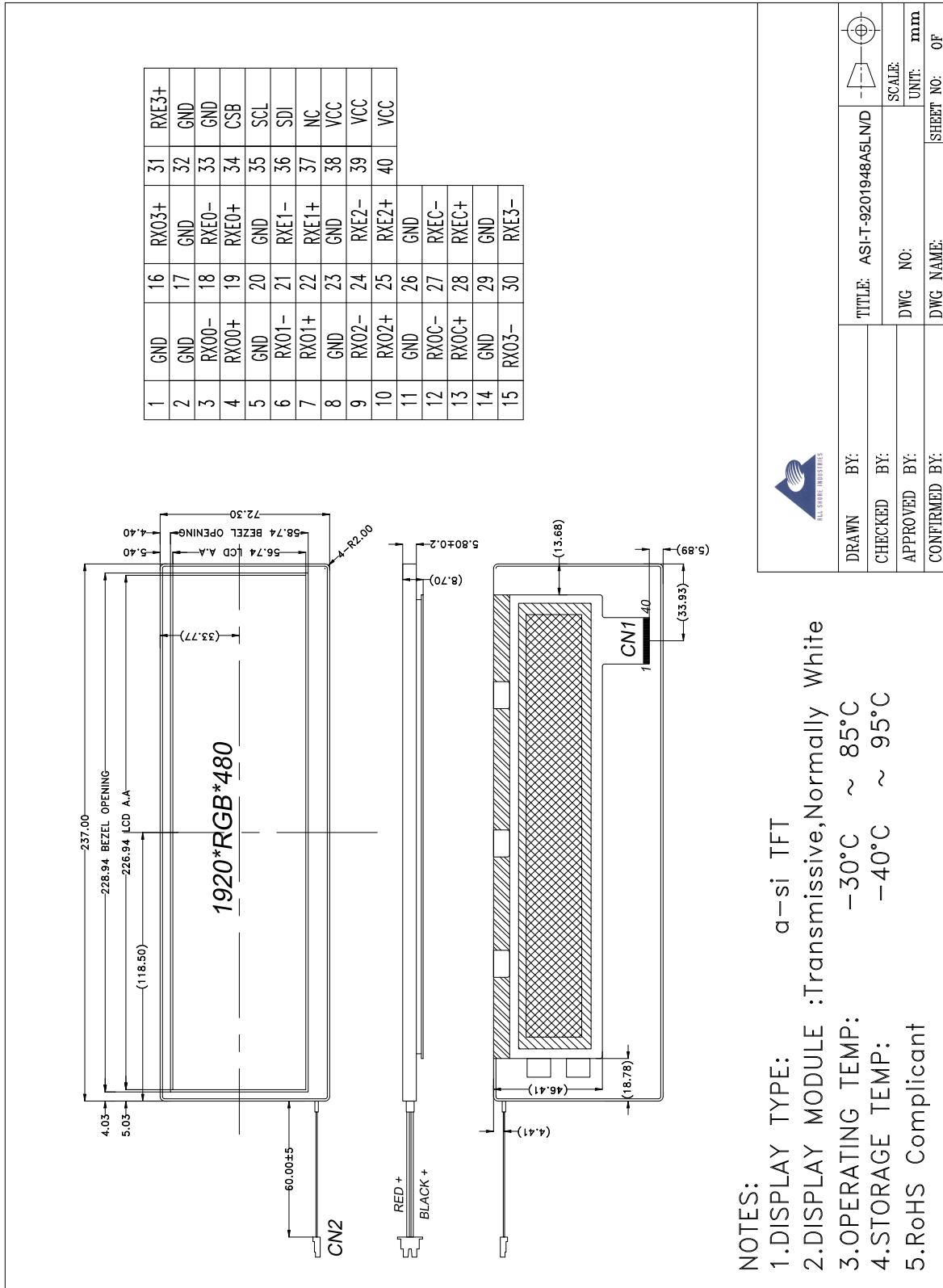
2. Application

Digital equipments which need color display, MID, mobile navigator/video systems.

3. General Information

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4. Outline Drawing



5. Interface signals

5.1 CN1 pin assignment (LVDS interface)

FPC down Connector type: FH52E-40S-0.5SH

Pin No.	Symbol	I/O	Description	Remarks
1	GND	P	Ground	
2	GND	P	Ground	
3	RX00-	I	Negative LVDS differential data input. Channel O0 (odd)	
4	RX00+	I	Positive LVDS differential data input. Channel O0 (odd)	
5	GND	P	Ground	
6	RX01-	I	Negative LVDS differential data input. Channel O1 (odd)	
7	RX01+	I	Positive LVDS differential data input. Channel O1 (odd)	
8	GND	P	Ground	
9	RX02-	I	Negative LVDS differential data input. Channel O2 (odd)	
10	RX02+	I	Positive LVDS differential data input. Channel O2 (odd)	
11	GND	P	Ground	
12	RXOC-	I	Negative LVDS differential clock input. (odd)	
13	RXOC+	I	Positive LVDS differential clock input. (odd)	
14	GND	P	Ground	
15	RX03-	I	Negative LVDS differential data input. Channel O3 (odd)	
16	RX03+	I	Positive LVDS differential data input. Channel O3 (odd)	
17	GND	P	Ground	
18	RXE0-	I	Negative LVDS differential data input. Channel E0 (even)	
19	RXE0+	I	Positive LVDS differential data input. Channel E0 (even)	
20	GND	P	Ground	
21	RXE1-	I	Negative LVDS differential data input. Channel E1 (even)	
22	RXE1+	I	Positive LVDS differential data input. Channel E1 (even)	
23	GND	P	Ground	
24	RXE2-	I	Negative LVDS differential data input. Channel E2 (even)	
25	RXE2+	I	Positive LVDS differential data input. Channel E2 (even)	
26	GND	P	Ground	
27	RXEC-	I	Negative LVDS differential clock input. (even)	



28	RXEC+	I	Positive LVDS differential clock input. (even)	
29	GND	P	Ground	
30	RXE3-	I	Negative LVDS differential data input. Channel E3 (even)	
31	RXE3+	I	Positive LVDS differential data input. Channel E3 (even)	
32	GND	P	Ground	
33	GND	P	Ground	
34	CSB	I	Chip select, Serial interface chip enable signal. CSB=0:Selected. CSB=1: Not selected.	
35	SCL	I	SPI clock	
36	SDA	I/O	Serial interface address and data input/output.	
37	NC	-	No connection	
38	VCC	P	Power Input	
39	VCC	P	Power Input	
40	VCC	P	Power Input	

I---Input, O---Output, P--- Power/Ground, “-”---No connection

5.2 CN2 Backlight interface

Connector type: BHSR-02VS-1
Mating Connector: SBHT-002T-P0.5 or equivalent

Pin No.	Symbol	I/O	Description	Remarks
1	LED+(Anode)	P	LED power supply (high voltage)	
2	LED-(Cathode)	P	LED power supply (low voltage)	



6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

GND=0V, Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VCC	-0.5	5.0	V	
Data Input voltage	V _{IN}	-0.5	5.0	V	Note

Note: Signals include RXOn-/+ , RXEn-/+

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-30	85	°C	
Storage Temperature	TSTG	-40	95	°C	

6.3. LED Backlight Absolute max. ratings

Item	Symbol	MIN	MAX	Unit	Remark
LED Forward Current	I _{LED}	--	100	mA	For each LED

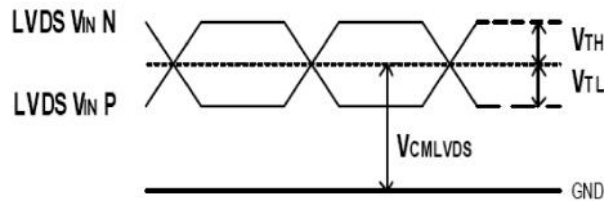
7. Electrical Specifications

7.1 Electrical characteristics

VCC=3.3V, GND=0V, Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage	VCC	3.0	3.3	3.6	V	
Power supply ripple	Vp-p	-	-	200	mV	
Power supply current	Icc	-	TBD	TBD	mA	Note
Differential input voltage	Vid	250	350	450	mV	
Differential Input threshold voltage for LVDS receiver	Low	Vtl	-100	-	mV	Vcm=1.25V
	High	Vth	-	-	+100	
Common Voltage	Vcm	1.0	1.25	1.4	V	
LVDS terminal Resistance	R	-	100	-	Ω	

Note1: To test the current dissipation, use "all Black Pattern".

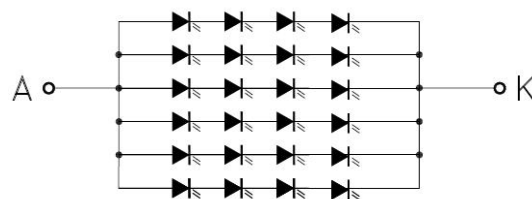


7.2 LED Backlight

LED_GND=GND=0V Ta=25°C

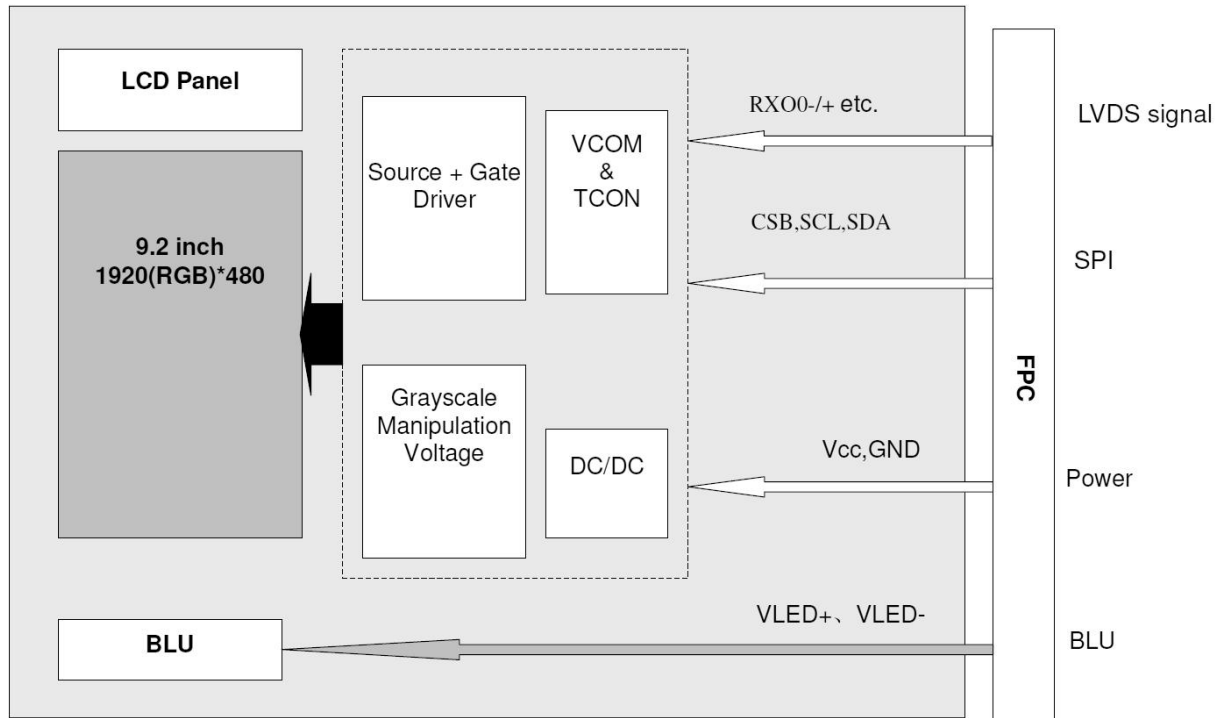
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Channel1	I _F	-	360	-	mA	
Forward Voltage	V _F	-	12	-	V	
Backlight Power Consumption	W _{BL}	-	4320	-	mW	
Life Time	-		50,000		Hrs	Note

Note : If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is an estimated data.



4*6=24 LED

7.3 BLOCK DIAGRAM



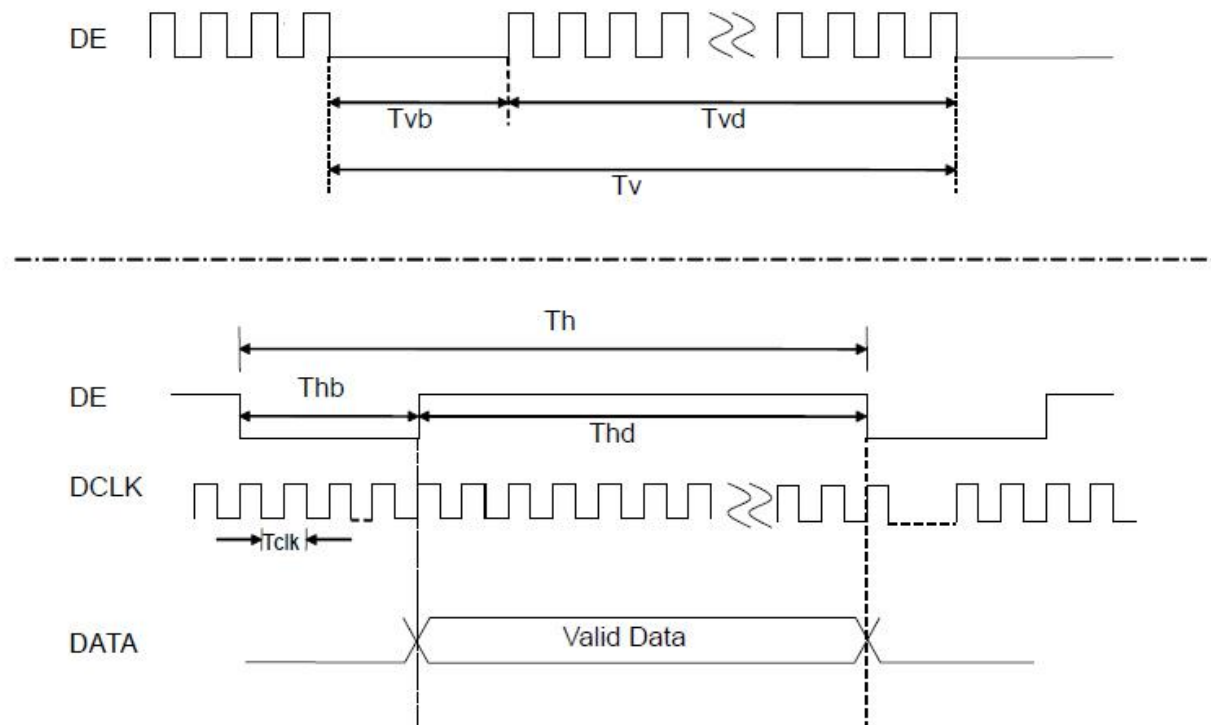
8. Command/AC Timing

8.1 Input Timing characteristics

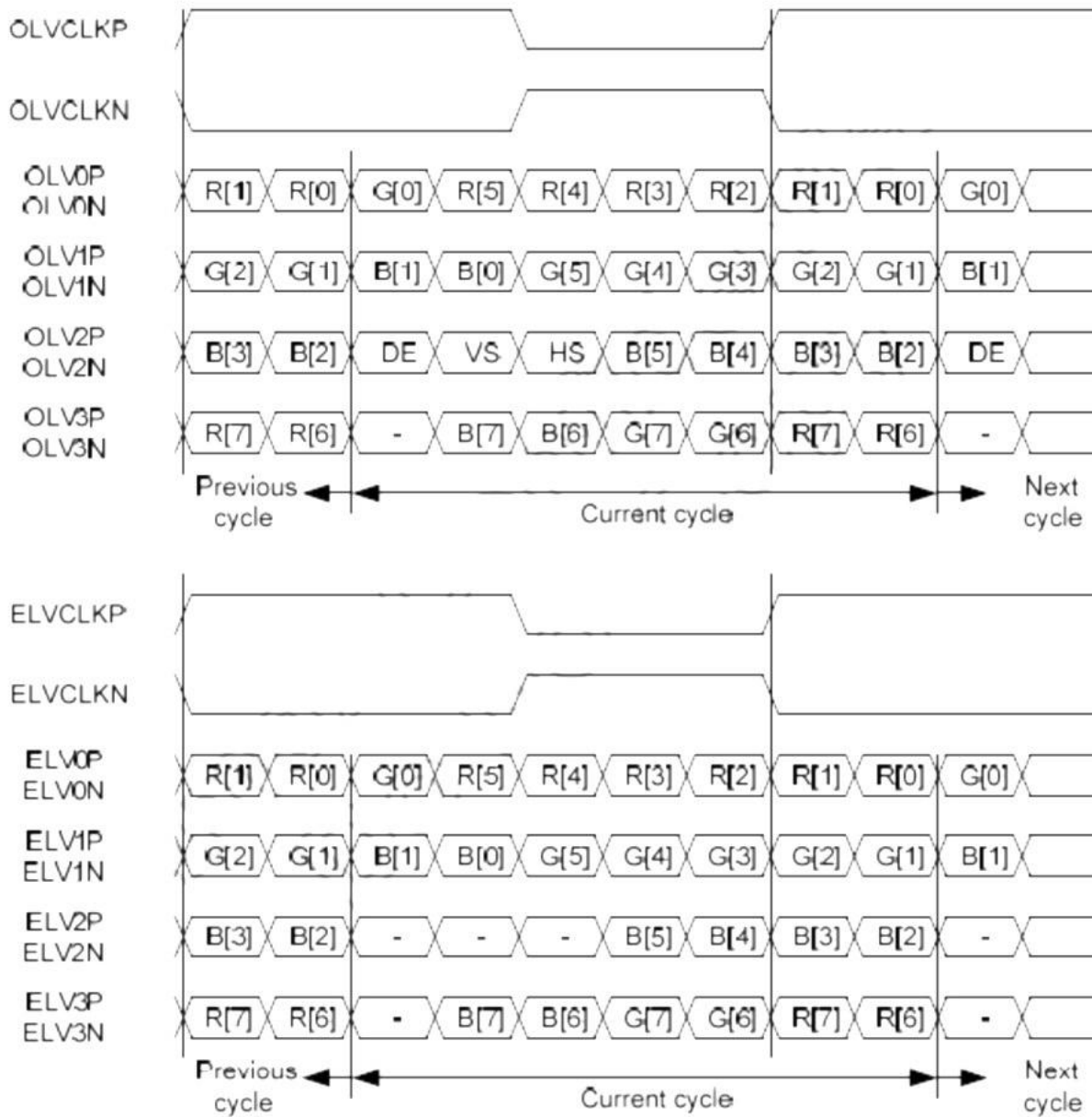
VCC=3.3V,GND=0V,Ta=25°C

Parameter		Symbol	Min	Typ	Max	Unit	Remark
DCLK(Frame rate=60HZ)		Fclk		35.11		MHz	Tclk=1/Fclk
		Tclk		28.5		ns	
Horizontal section	Horizontal total	Th	-	992	-	Tclk	
	Valid Data Width	Thd	-	960	-	Tclk	
	Horizontal blanking	Thb	-	32	-	Tclk	
Vertical section	Vertical total	Tv	-	590	-	TH	
	Valid Data Width	Tvd	-	480	-	TH	
	Vertical blanking	Tvb	-	110	-	TH	

Input Clock and Data timing Diagram:

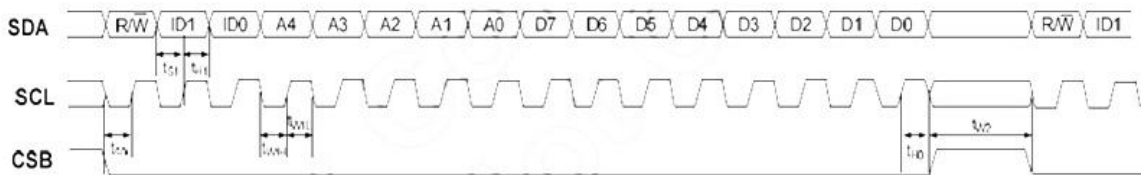


8.2 LVDS input data format



8.3 SPI interface characteristics(3-WIRE)

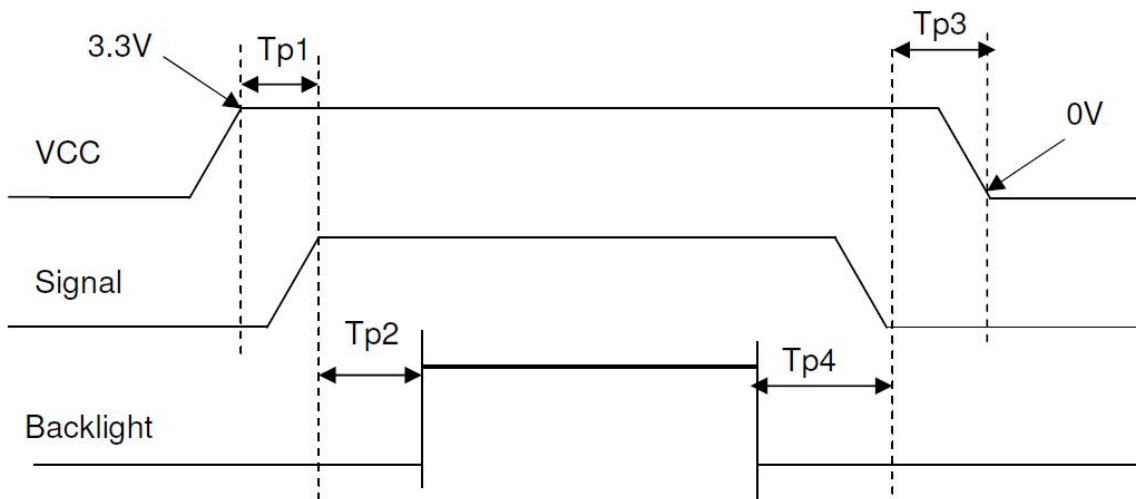
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
SDA Setup Time	Ts0	CSB to SCL	60	-	-	ns
	Ts1	SDA to SCL	60	-	-	ns
SDA Hold Time	Th0	CSB to SCL	60	-	-	ns
	Th1	SDA to SCL	60	-	-	ns
Pulse Width	Tw1L	SCL pulse width	75	-	-	ns
	Tw1H	SCL pulse width	75	-	-	ns
	Tw2	CSB pulse width	1	-	-	ns
Clock duty	-	-	40	50	60	%



8.4 POWER ON/OFF SEQUENCE

Item	Symbol	Min	Typ	Max	Unit	Remark
VCC 3.3V to signal starting	Tp1	5	-	50	ms	
VCC rising time	Tr	0.1	-	5	ms	Note1
Signal starting to backlight on	Tp2	150	-	-	ms	
Signal off to VCC 0V	Tp3	5	-	50	ms	
Backlight off to signal off	Tp4	150	-	-	ms	

Note1: Tr means the time of input voltage rise from 10% to 90%.



9. Optical Specification

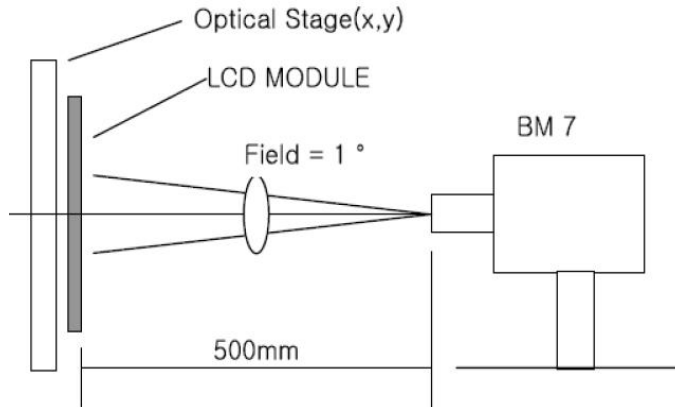
Ta=25°C

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	$\theta=0^\circ$	400	600	-		Note1 Note2
Response Time		T _{ON}	25°C	-	20	30	ms	Note1 Note3
		T _{OFF}						
View Angles		θ_T	CR \cong 10	60	70	-	Degree	Note 4
		θ_B		50	60	-		
		θ_L		70	80	-		
		θ_R		70	80	-		
Chromaticity	White	x	Brightness is on	TBD	TBD	TBD		Note5, Note1
		y		TBD	TBD	TBD		
NTSC		S		60	75	-	%	Note5
Luminance		L		450	500	-	cd/m ²	Note1 Note6
Uniformity		U		75	80	-	%	Note1 Note7

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

LED back-light: ON, Environment brightness < 150 lx

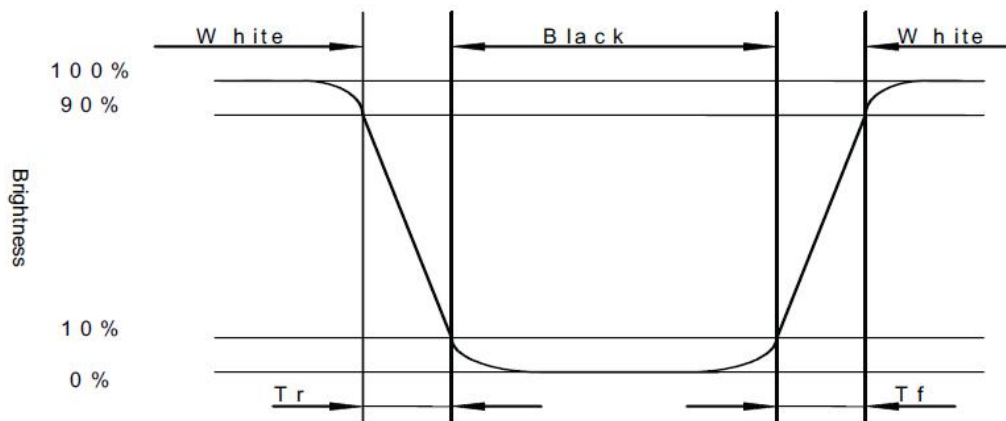


Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

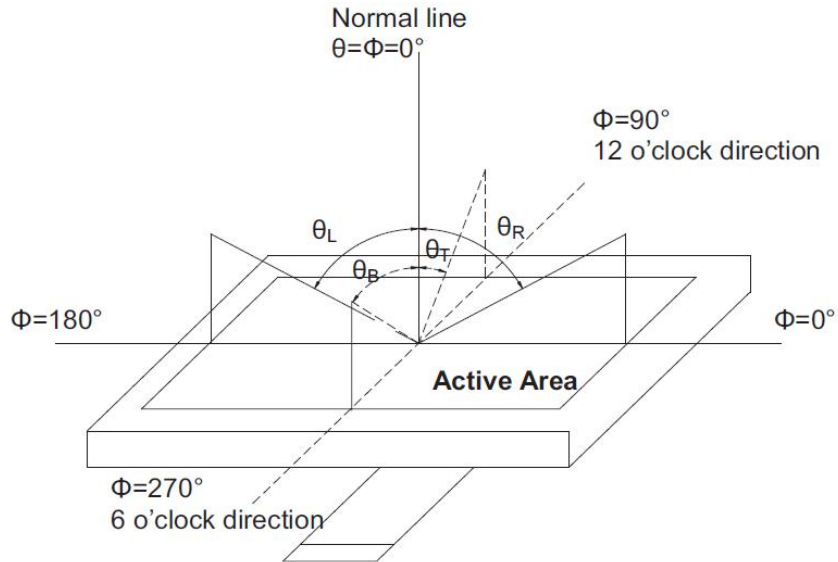
Note 3: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise Time, Tr) and from white to black(Decay Time, Tf).



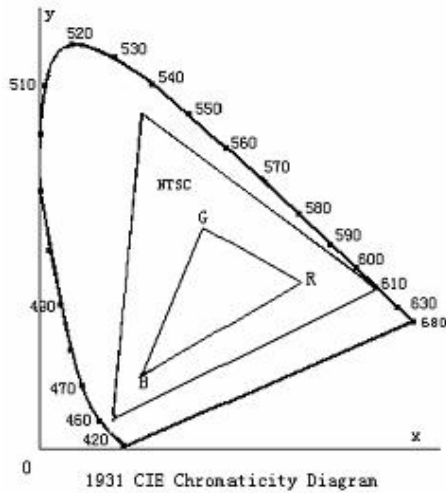
Note 4: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 5: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.



$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 6: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels “White” at the center of display area on optimum contrast.

Note 7: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity (U)} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

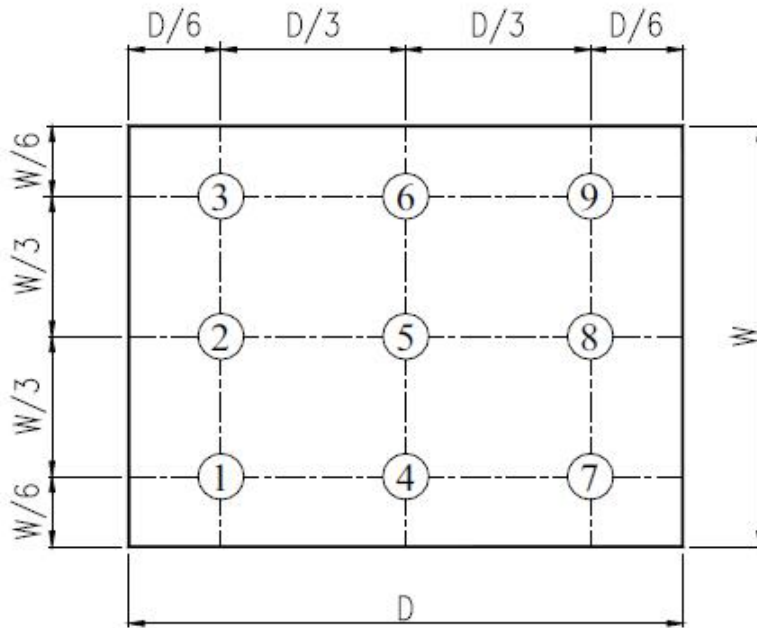


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+85°C, 120hrs	Per table in below
2	Low Temp Operation	Ta=-30°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+95°C, 120hrs	Per table in below
4	Low Temp Storage	Ta=-40°C, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min~+80°C 30 min, Change time:5min, 10 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω, 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times;	Per table in below
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.	Per table in below
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	Per table in below
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

11. Precautions for Use of LCD Modules

11.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

11.2 Handling

A. The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.

B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability

C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.

D. Provide a space so that the panel does not come into contact with other components.

E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.

F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.

G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.

H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

11.3 Static Electricity

A. Ground soldering iron tips, tools and testers when they are in operation.

B. Ground your body when handling the products.

C. Power on the LCD module before applying the voltage to the input terminals.

D. Do not apply voltage which exceeds the absolute maximum rating.

E. Store the products in an anti-electrostatic bag or container.

11.4 Storage

A. Store the products in a dark place at $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.

B. Storage in a clean environment, free from dust, active gas, and solvent.

11.5 Cleaning

A. Do not wipe the touch panel with dry cloth, as it may cause scratch.

B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

11.6 Cautions for installing and assembling

Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area.

A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.

