



ASI-T-351RA1AN/D

Item	Contents	Unit
Size	3.51	inch
Resolution	480(RGB) x 640	/
Interface	RGB	/
Technology type	a-Si TFT	/
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	63.50 x 85.50 x 3.23	mm
Active Area	53.57 x 71.42	mm
Display Mode	Transflective, Normally white	/
View Direction	12	O'clock
Backlight Type	LED	/
Driver IC	HX8363	/
Weight	TBD	g



Record of Revision

Date	Revision No.	Summary
2017-11-24	1.0	Rev 1.0 was issued



1. Scope

This data sheet is to introduce the specification of ASI-T-351RA1AN/D active matrix TFT module. It is composed of a color TFT-LCD panel, driver IC, FPC and a backlight unit. The 3.51" display area contains 480(RGB) x 640 pixels.

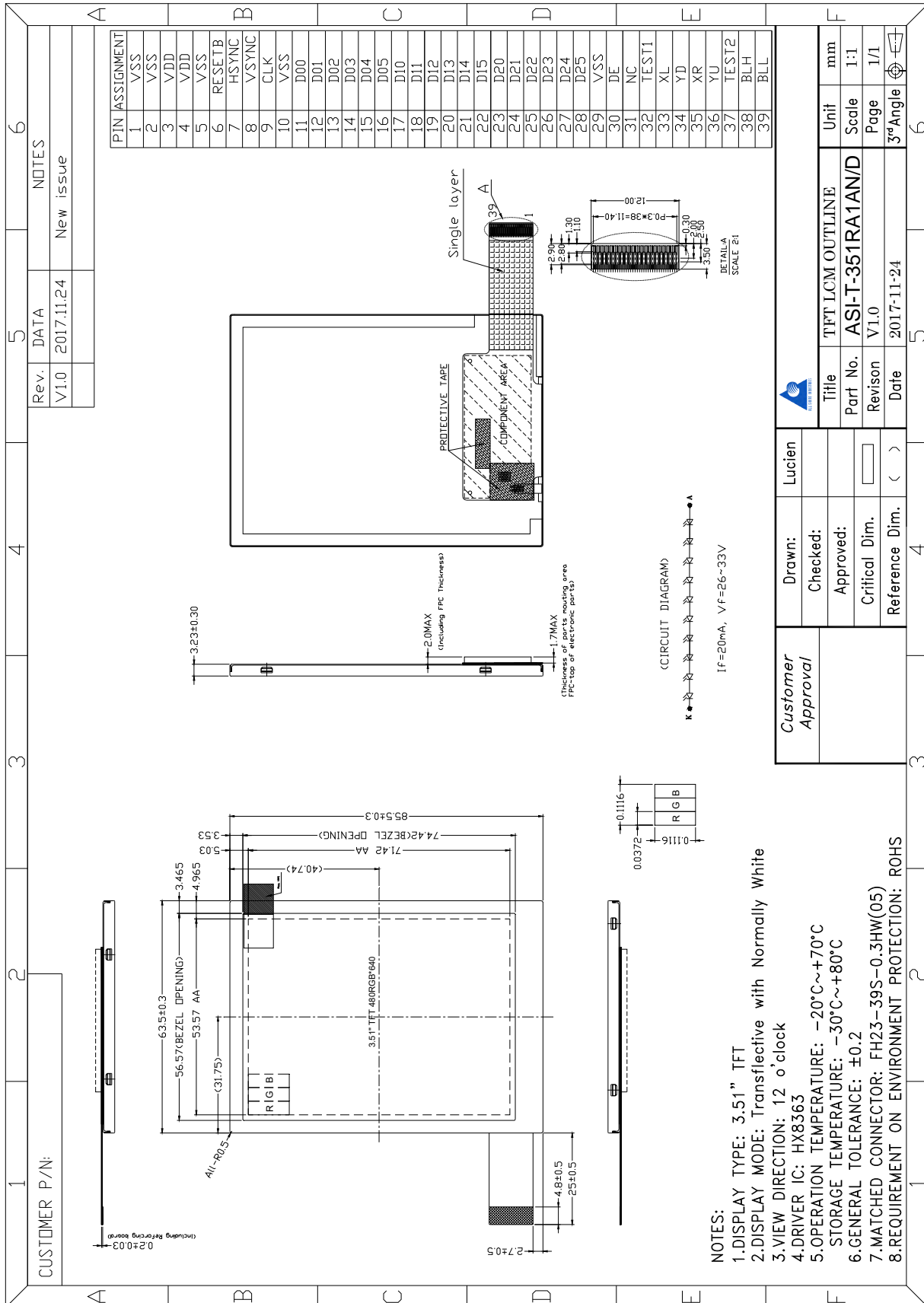
2. Application

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

3. General Information

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4. Outline Drawing



5. Interface signals

Connector: FH23-39S-0.3HW(05)

Pin No.	Symbol	Function
1	VSS	Ground.
2	VSS	Ground.
3	VDD	Power supply
4	VDD	Power supply
5	VSS	Ground
6	RESETB	Reset signal
7	HSYNC	Line synchronizing signal
8	VSYNC	Frame synchronizing signal
9	CLK	Dot clock signal
10	VSS	Ground
11	D00	Display data (B)
12	D01	
13	D02	
14	D03	
15	D04	
16	D05	
17	D10	Display data(G)
18	D11	
19	D12	
20	D13	
21	D14	
22	D15	
23	D20	Display data(R)
24	D21	
25	D22	
26	D23	
27	D24	
28	D25	
29	VSS	Ground

30	DE	A data enable signal in RGB I/F mode
31	NC	No connection
32	TEST1	Connect to ground
33	XL	X-axis left terminal, No connection
34	YD	Y-axis downside terminal, No connection
35	XR	X-axis right terminal, No connection
36	YU	Y-axis upside terminal, No connection
37	TEST2	Connect to ground
38	BLH	LED Anode
39	BLL	LED Cathode

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Item	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VDD	-0.3	4.6	V	
Logic Signal Input /Output Voltage	VIN	-0.3	VDD+0.3	V	

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	70	°C	
Storage Temperature	TSTG	-30	80	°C	

Note: Absolute maximum ratings means the product can withstand short-term, NOT more than 120 hours. If the product is a long time to withstand these conditions, the life time would be shorter.

7. Electrical Specifications

7.1 Electrical characteristics

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		VDD	Ta=25°C	2.5	3.3	3.3	V	
Input Current		IDD	Ta=25°C	-	33	40	mA	
Input voltage	'H'	V _{IH}		0.7V _{DD}	-	V _{DD}	V	
	'L'	V _{IL}		0	-	0.3V _{DD}	V	
output voltage	'H'	V _{OH}		0.8V _{DD}	-	V _{DD}	V	
	'L'	V _{OL}		0	-	0.2V _{DD}	V	

Note: Tested in 1x1 chessboard pattern.

7.2 LED Backlight

Item	Symbol	Min	Typ	Max	Unit	Note
Supply voltage	V _f	26.0	29.5	33.0	V	I _f =20mA
Supply current	I _f	-	20	-	mA	
Number of LED	-	-	10	-	Piece	

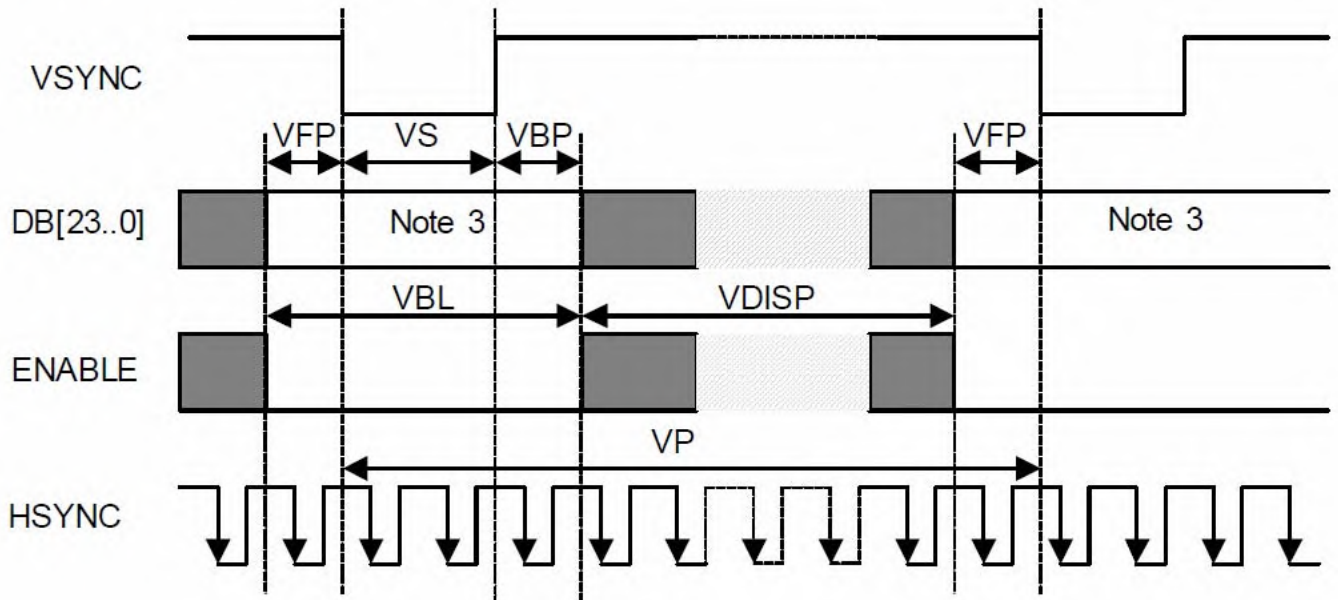
(CIRCUIT DIAGRAM)



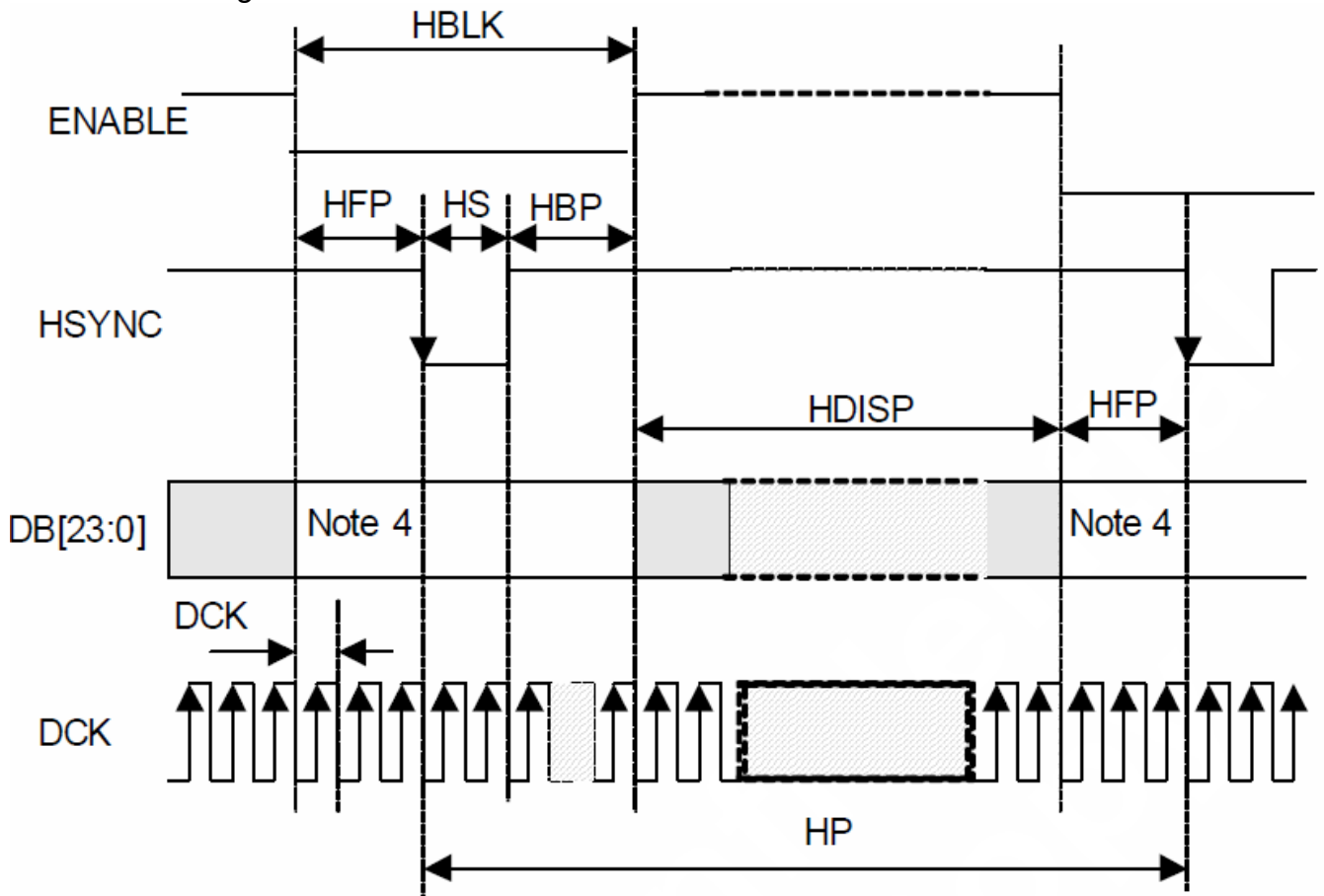
8. Command/AC Timing

8.1 RGB Interface Characteristics

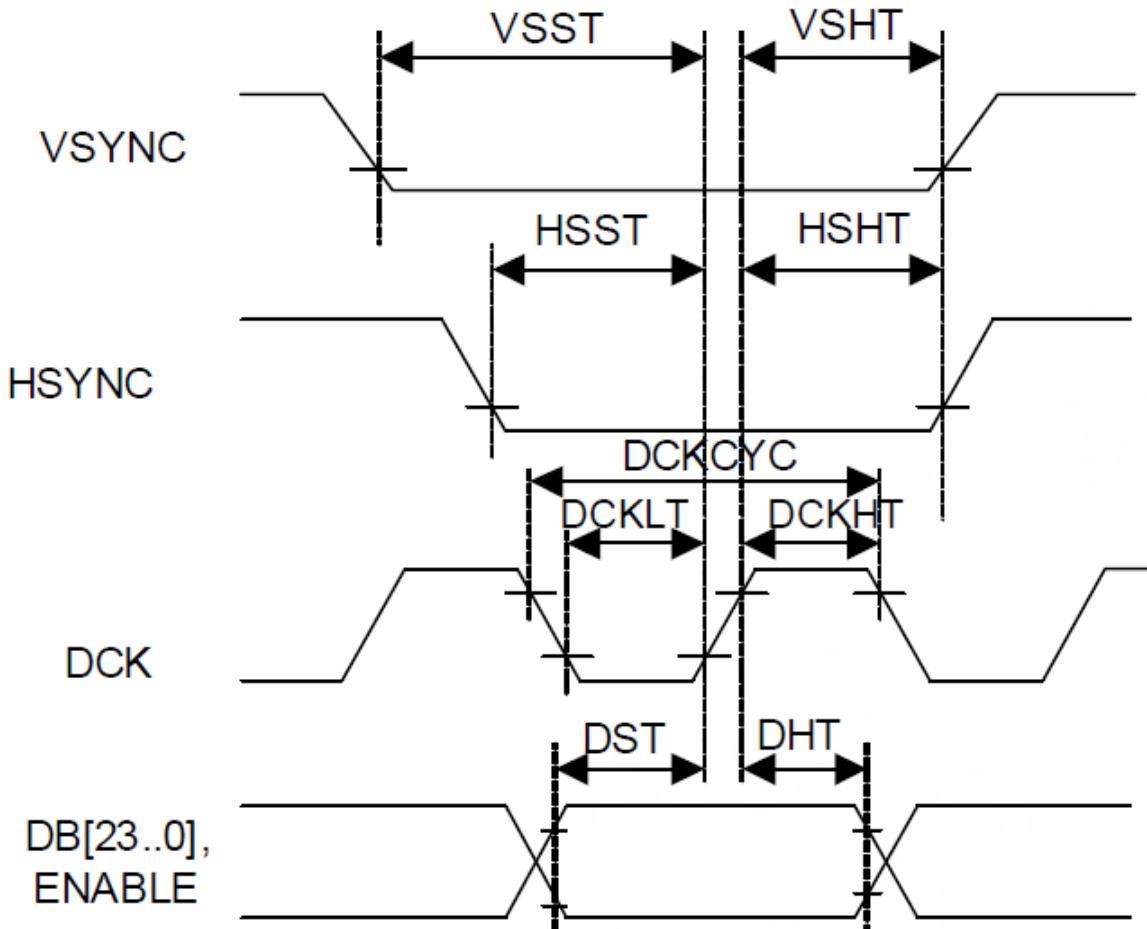
Vertical Timings for RGB I/F



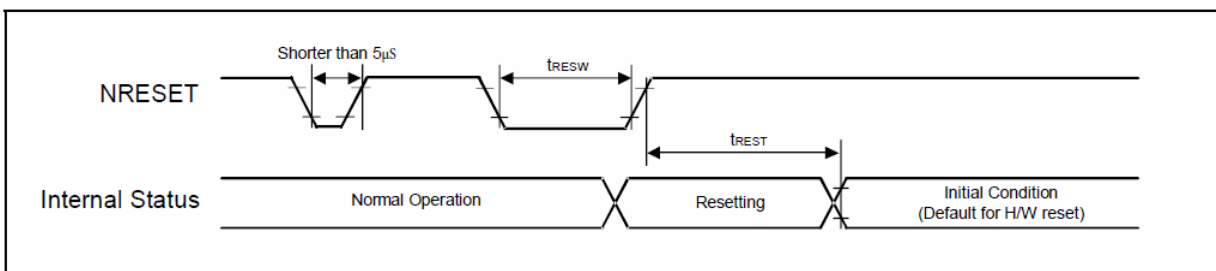
Horizontal Timing for RGB I/F



General Timings for RGB I/F



8.2.Reset Input Timing



Symbol	Parameter	Related Pins	Min	Typ	Max	Note	Unit
tRESW	1) Reset low pulse width	NRESET	10	-	-	-	µs
tREST	2) Reset complete time	-	-	-	5	When reset is applied during Sleep In mode	ms
		-	-	-	120	When reset is applied during Sleep Out mode	ms

Notes:

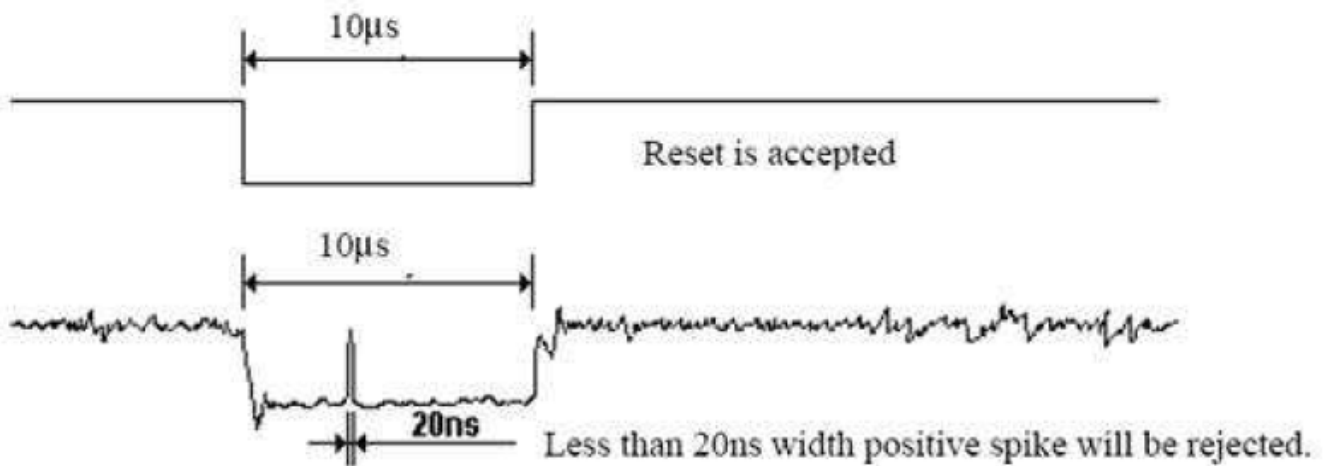
1. Spike due to an electrostatic discharge on NRESET line does not cause irregular system reset according to the table below.

NRESET Pulse	Action
Shorter than 5 μ s	Reset Rejected
Longer than 10 μ s	Reset
Between 5 μ s and 10 μ s	Reset Start

2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then returns to Default condition for H/W reset.

3. During Reset Complete Time, ID2 value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (t_{REST}) within 5ms after a rising edge of NRESET.

4. Spike Rejection also applies during a valid reset pulse as shown below:



5. When Reset is applied during Sleep In Mode.

6. When Reset is applied during Sleep Out Mode.

7. It is necessary to wait 5msec after releasing NRESET before sending commands. Also Sleep Out command cannot be sent for 120msec.

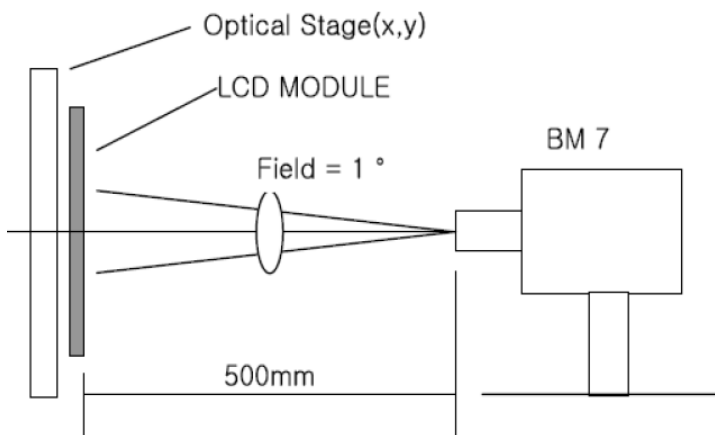
9. Optical Specification

Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	22	44	-		Note1 Note2
Response Time	Tr+Tf	25°C	-	30	45	ms	Note1 Note3
View Angles	θT	CR ≥ 10	70	80	-	Degree	Note 4
	θB		20	30	-		
	θL		30	40	-		
	θR		10	20	-		
Chromaticity	White	Brightness is on	x	0.2233	0.2833	0.3433	Note5, Note1
			y	0.2359	0.2959	0.3559	
	Red		x	0.5117	0.5617	0.6117	
			y	0.3030	0.353	0.4030	
	Green		x	0.2790	0.3290	0.3790	
			y	0.5171	0.5671	0.6171	
	Blue		x	0.1108	0.1608	0.2108	
			y	0.0657	0.1157	0.1657	
NTSC	S		-	44	--	%	Note5
Luminance	L		120	150	--	cd/m ²	Note1 Note6
Uniformity	U		70	--	--	%	Note1 Note7

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C); LED back-light: ON, Environment brightness < 150 lx

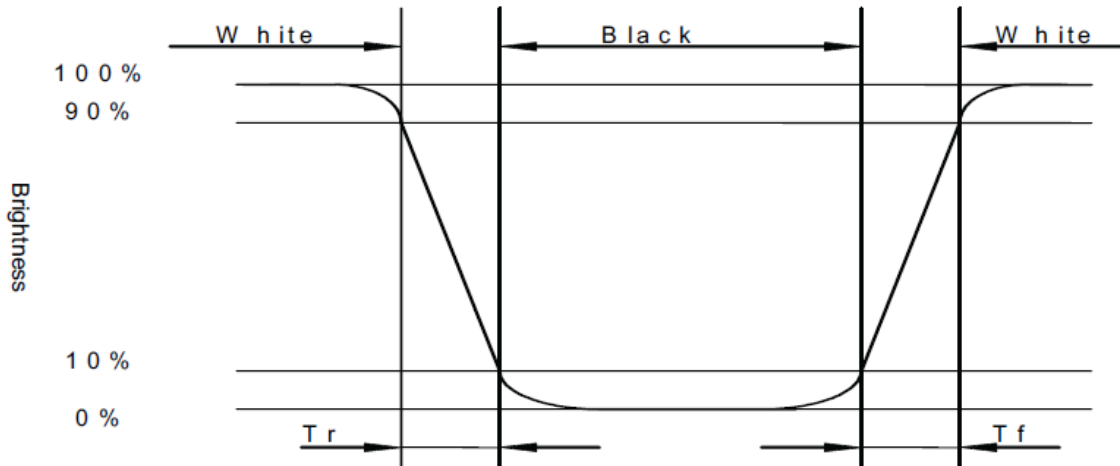


Note 2: Contrast ratio is defined as follow:

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

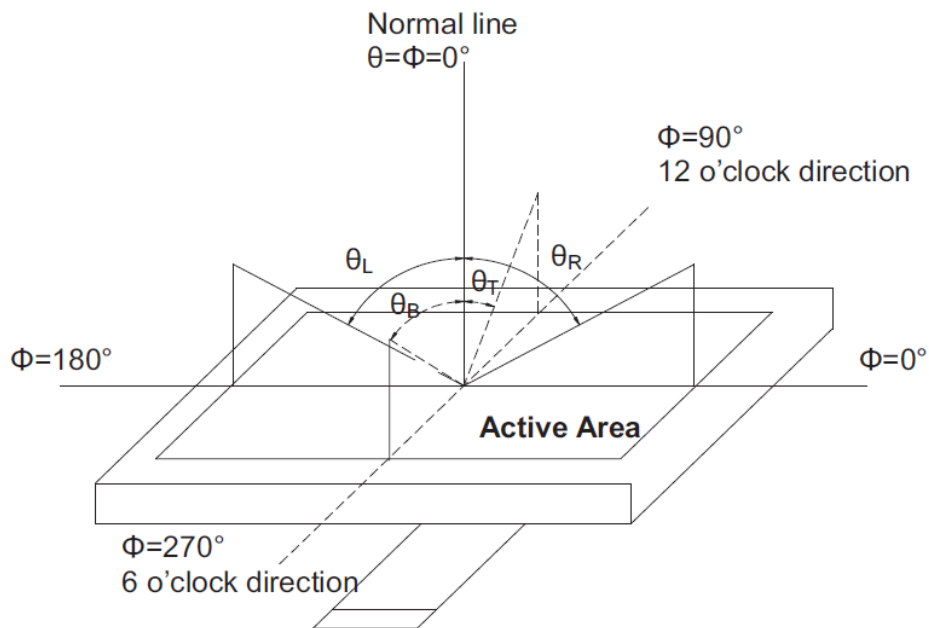
Note 3: Response time is defined as follow:

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



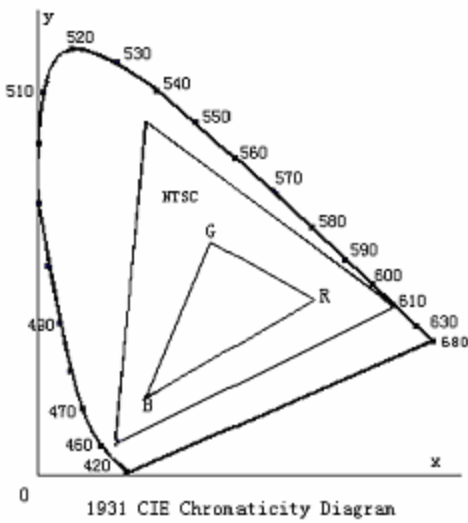
Note 4: Viewing angle range is defined as follow:

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.

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

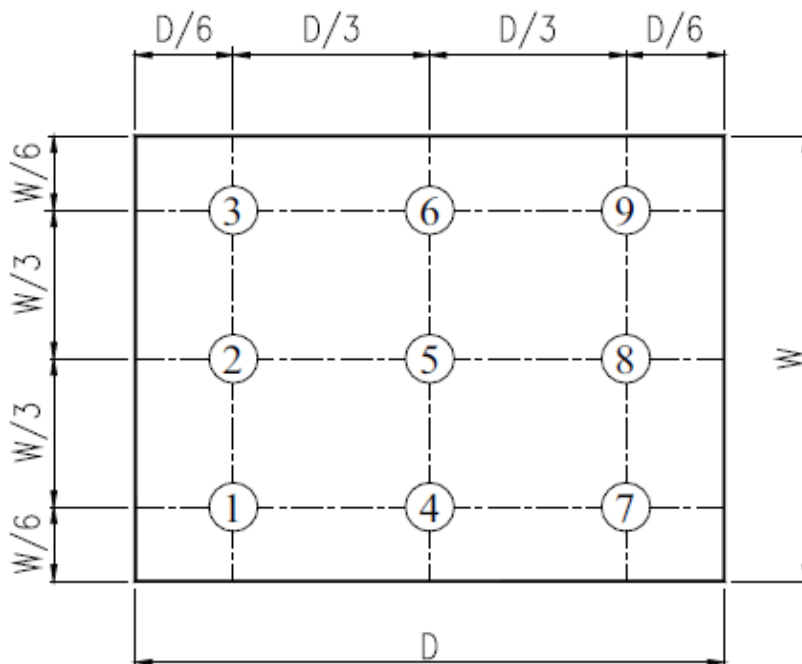


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70°C, 96hrs	Per table in below
2	Low Temp Operation	Ta=-20°C, 96hrs	Per table in below
3	High Temp Storage	Ta=+80°C, 96hrs	Per table in below
4	Low Temp Storage	Ta=-30°C, 96hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH 96 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, 5 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)	10Hz~150Hz, 100m/s ² , 120min	Per table in below
9	Shock (Non-operation)	Half- sine wave,300m/s ² ,11ms	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.

In order to make the display assembly stable and firm, ASI recommends to design some supporting at the display backside, especially for the display with tape-attached touch panel, such supporting is important and essential, or else, the display may drop-off from front after some period of time.

