



ASI-T-500R1010A3MPN/D

Item	Contents	Unit
Size	5.0	inch
Resolution	1080(RGB) x 1080	/
Interface	MIPI	/
Technology type	IPS	/
Pixel pitch	0.1176 x 0.1176	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	136.53 x 132.21 x 1.98	mm
Active Area	127.01 x 127.01	mm
Viewing Direction	ALL	/
Backlight Type	LED	/
Driver IC	HX8399C	/

1. Scope

This data sheet is to introduce the specification of ASI-T-500R1010A3MPN/D active matrix TFT module. It is composed of a color TFT-LCD panel, driver IC, FPC and a backlight unit. The 5.0" display area contains 1080 (RGB) x 1080 pixels.

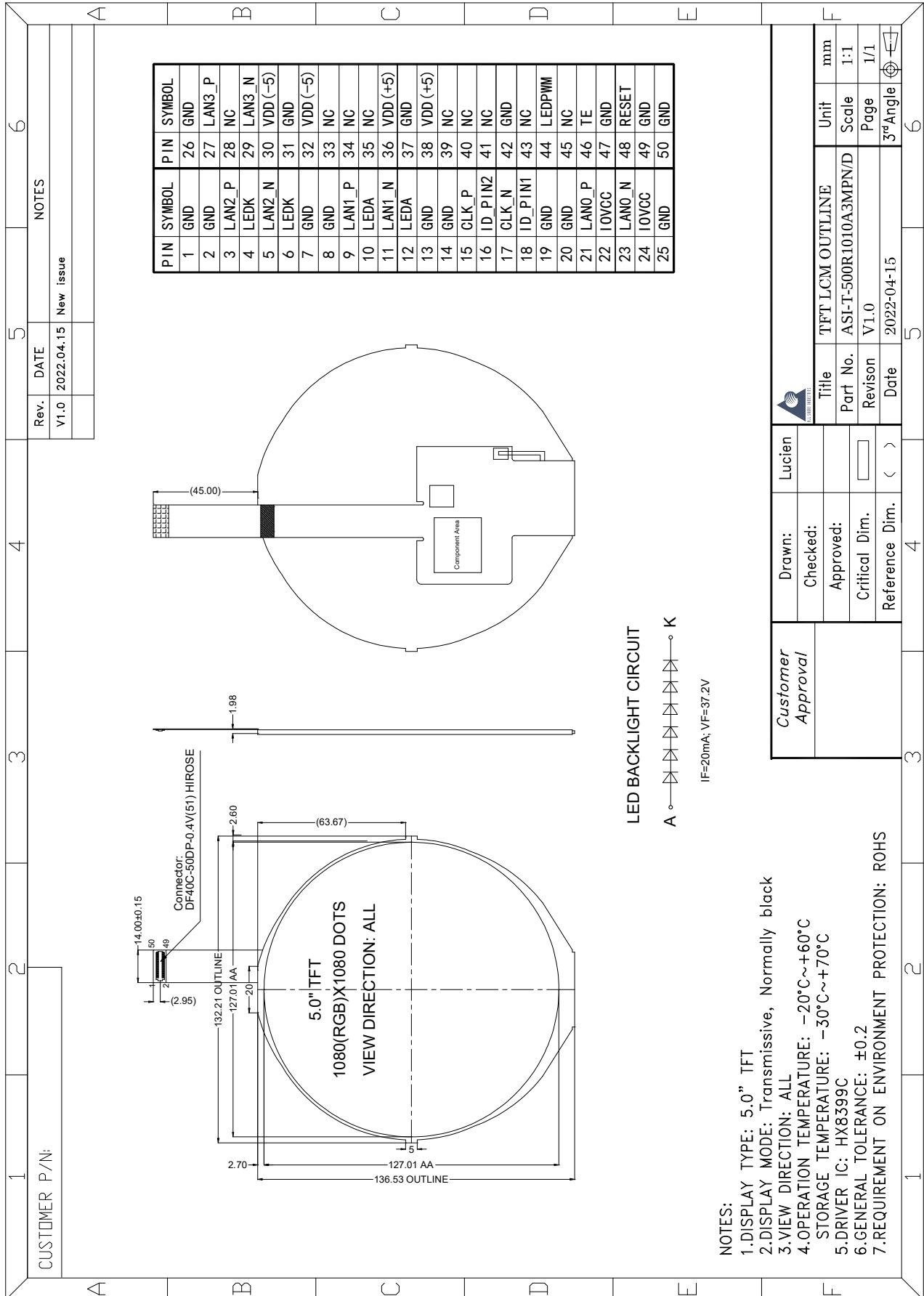
2. Application

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

3. General Information

Item	Contents	Unit
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4. Outline Drawing



5. Interface signals

No	Symbol	Description	Remarks
1~2	GND	Power ground	
3	LAN2_P	DISP MIPI lane 2+	
4	LEDK	LED Cathode	
5	LAN2_N	DISP MIPI lane 2-	
6	LEDK	LED Cathode	
7~8	GND	Power ground	
9	LAN1_P	DISP MIPI lane 1+	
10	LEDA	LED Anode	
11	LAN1_N	DISP MIPI lane 1-	
12	LEDA	LED Anode	
13~14	GND	Power ground	
15	CLK_P	DISP MIPI CLK+	
16	ID_PIN2	ID pu to 1.8V	
17	CLK_N	DISP MIPI CLK-	
18	ID_PIN1	ID pd to GND	
19~20	GND	Power ground	
21	LAN0_P	DISP MIPI lane 0+	
22	IOVCC	DISP digital power	
23	LAN0_N	DISP MIPI lane 0-	
24	IOVCC	DISP digital power	
25~26	GND	Power ground	
27	LAN3_P	DISP MIPI lane 3+	
28	NC	No connection	
29	LAN3_N	DISP MIPI lane 3-	
30	VDD(-5V)	Display -5V analog rail	
31	GND	Power ground	
32	VDD(-5V)	Display -5V analog rail	
33~35	NC	No connection	
36	VDD(+5V)	Display +5V analog rail	
37	GND	Power ground	
38	VDD(+5V)	Display +5V analog rail	
39~41	NC	No connection	
42	GND	Power ground	

43	NC	No connection	
44	LEDPWM	Backlight PWM output	
45	NC	No connection	
46	TE	Tearing effect output	
47	GND	Power ground	
48	RESET	Reset pin	
49~50	GND	Power ground	

Note: Connector: DF40C-50DP-0.4V(51) Hirose.

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Logic power supply voltage	IOVCC	-0.3	+3.6	V	
Analog positive power supply	VSP	-0.3	+6.6	V	
Analog negative power supply	VSN	0	-6.6	V	

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	60	°C	
Storage Temperature	TSTG	-30	70	°C	

7. Electrical Specifications

7.1 Electrical characteristics

GND=0V, Ta=25°C

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply Voltage		IOVCC	1.65	1.8	3.3	V	
		VSP	4.8	5.0	6.0	V	
		VSN	-6.0	-5.0	-4.8	V	
Input signal voltage	Low Level	V _{IL}	0	-	0.3*IOVCC	V	
	High Level	V _{IH}	0.7*IOVCC	-	IOVCC	V	
Power Consumption		PD	-	-	-	W	Note
		PBL	-	0.744	0.768	W	

Note: Frame rate=60HZ, Typ. Pattern white pattern, worst case pattern 1 x 1 checker 25°C.

7.2 LED Backlight

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	--	20	-	mA	
Forward Voltage	VF	--	37.2	38.4	V	
LED Power Consumption	PLED	--	0.93	0.96	W	
LED Life time	--	--	30,000	--	Hrs	Note

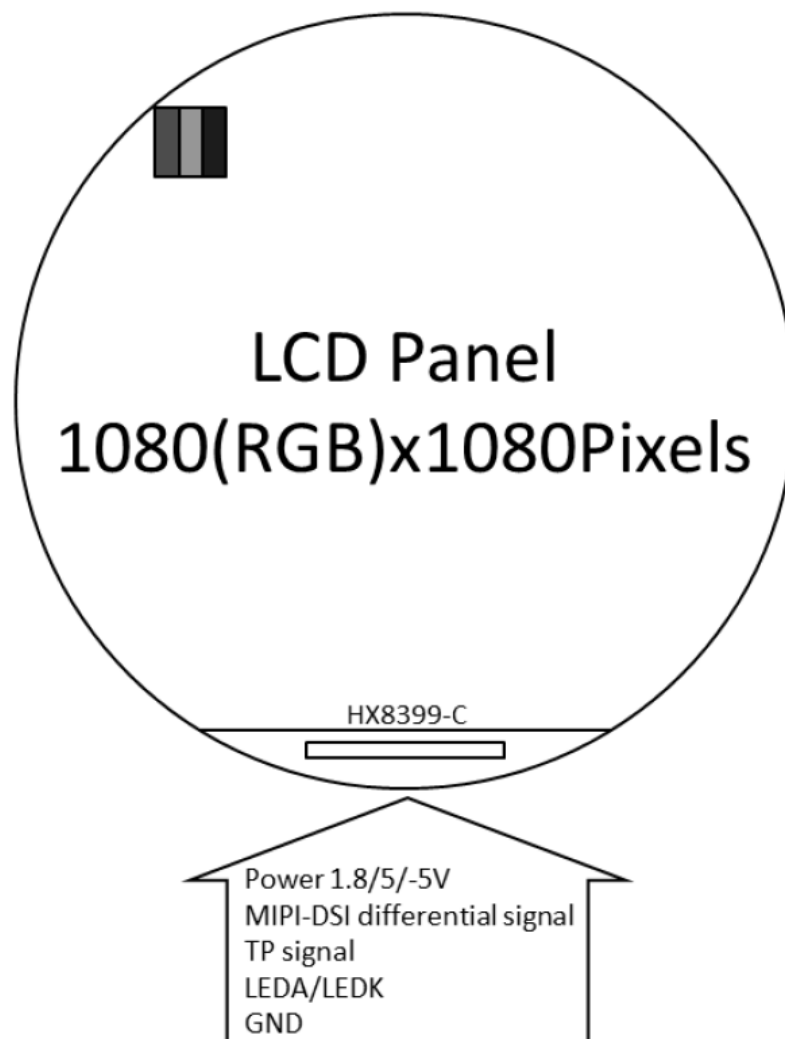
Note: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL =20mA. The LED lifetime could be decreased if operating IL is larger than 20mA.

LED BACKLIGHT CIRCUIT



IF=20mA; VF=37.2V

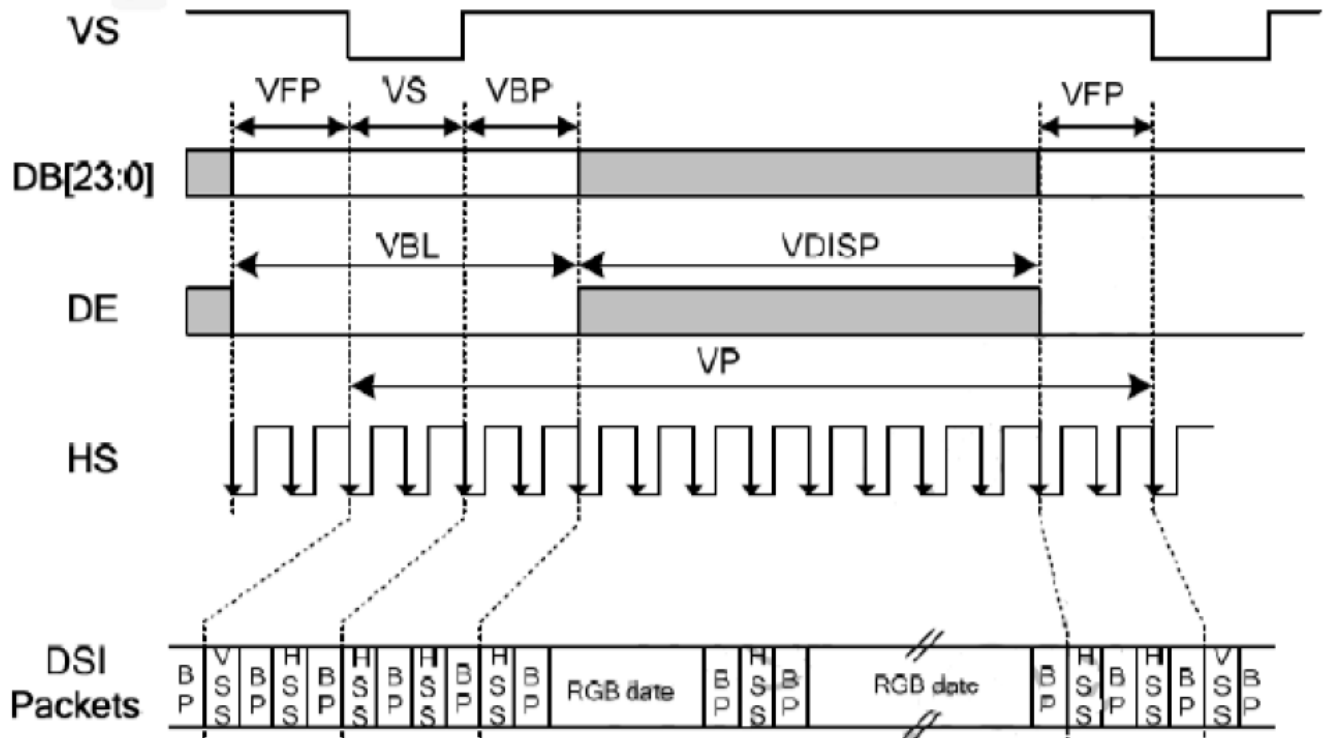
7.3 Block Diagram



8. Command/AC Timing

8.1 Signal Timing Specification

Vertical Timing

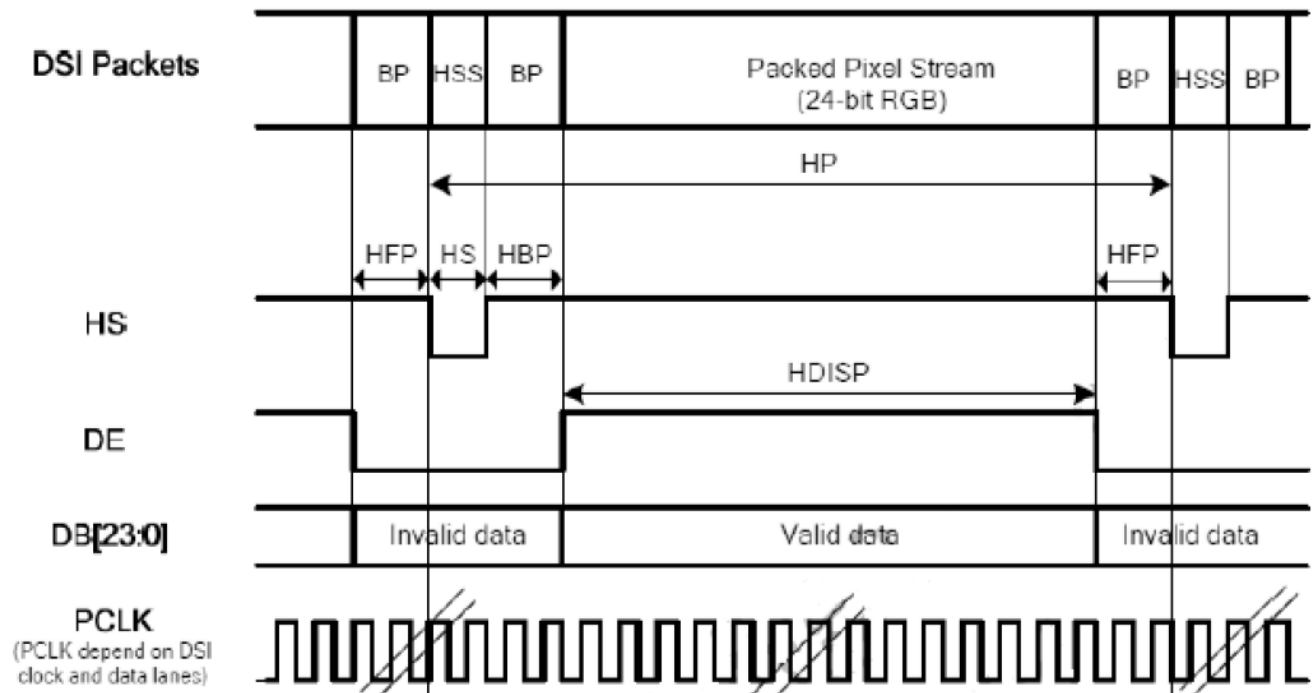


Vertical Resolution=528+8xNL (VSSA=0V, VDD1=1.8V, VDD3=2.8V, Ta=25°C)

Parameter	Symbol	Condition	Min.	Min.	Max.	Unit
Vertical cycle	VP	-	534+8xNL	-	-	Line
Vertical low pulse width	VS	-	2	-	Note1	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note1	Line
Vertical data start point	-	VS+VBP	4	-	Note1	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	528+8xNL	-	Line
Vertical refresh rate	VRR	-	-	60	-	Hz

Note: 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.

Horizontal Timing

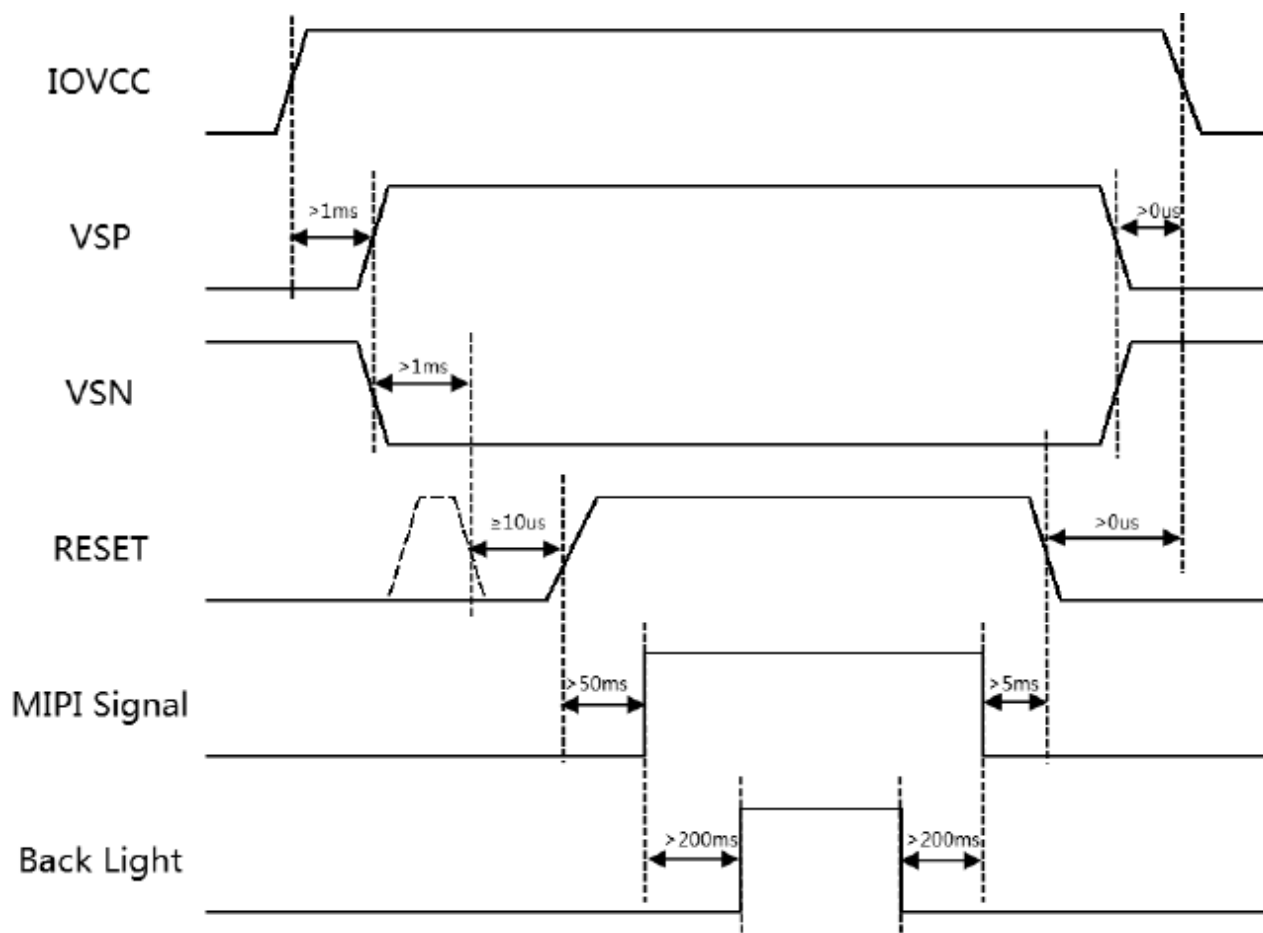


Horizontal Resolution=H_RES(1080/1024/960/900/800/720) (VSSA=0V, VDD1=1.8V, VDD3=HS_VCC=2.8V, Ta=25°C)

Parameter	Symbol	Condition	Min.	Min.	Max.	Unit
HS cycle	HP	-	H_RES+66	-	-	DCK
HS low pulse width	HS	-	25	-	-	DCK
Horizontal front porch	HBP	-	25	-	-	DCK
Horizontal back porch	HFP	-	16	-	-	DCK
Horizontal data start point	-	HS+HBP	50 Note1	-	-	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	66	-	-	DCK
Horizontal active area	HDISP	-	-	H_RES	-	DCK

Note: HS+HBP must larger than 50 PCLK.

8.2 Power ON/OFF Sequence



9. Optical Specification

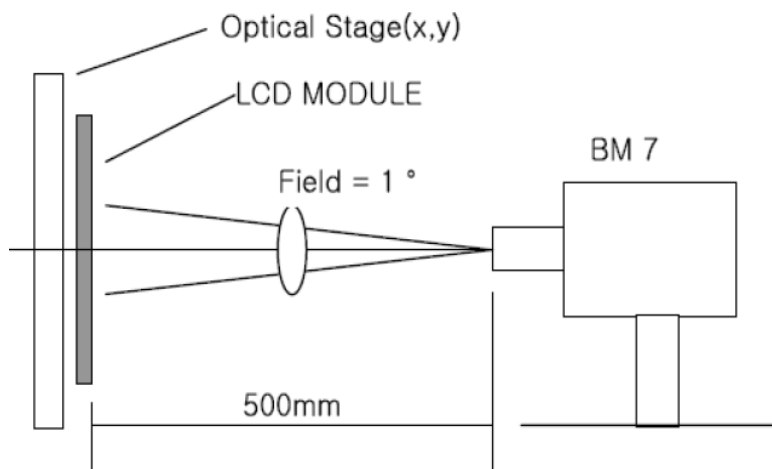
Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	800	1300	--		Note1 Note2
Response Time	TR+TF	25°C	--	-	40	ms	Note1 Note3
View Angles	ΘT	$CR \geq 10$	70	80	-	Degree	Note 4
	ΘB		70	80	-		
	ΘL		70	80	-		
	ΘR		70	80	-		
Chromaticity	White	x	Brightness is on	0.256	0.306	0.356	Note5, Note1
		y		0.268	0.318	0.368	
	Red	x		0.636	0.686	0.736	
		y		0.254	0.304	0.354	
	Green	x		0.214	0.264	0.314	
		y		0.579	0.629	0.679	
	Blue	x		0.097	0.147	0.197	
		y					

		y		0.007	0.047	0.097		
NTSC	--	--		65	70	--	%	
Luminance	L			300	350	--	cd/m ²	Note1 Note6
Uniformity (White)	U			70	--	--	%	Note1 Note7

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

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

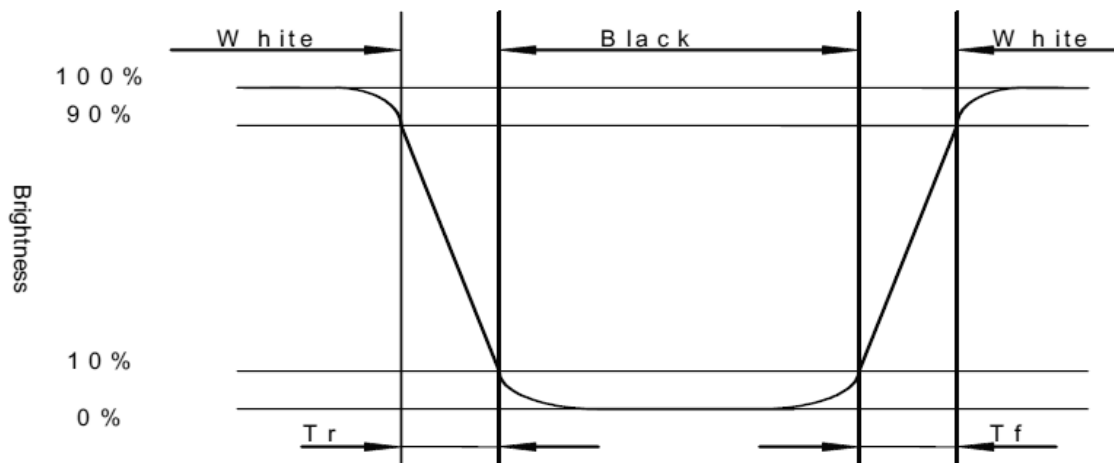


Note 2: Contrast ratio is defined as follow:

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

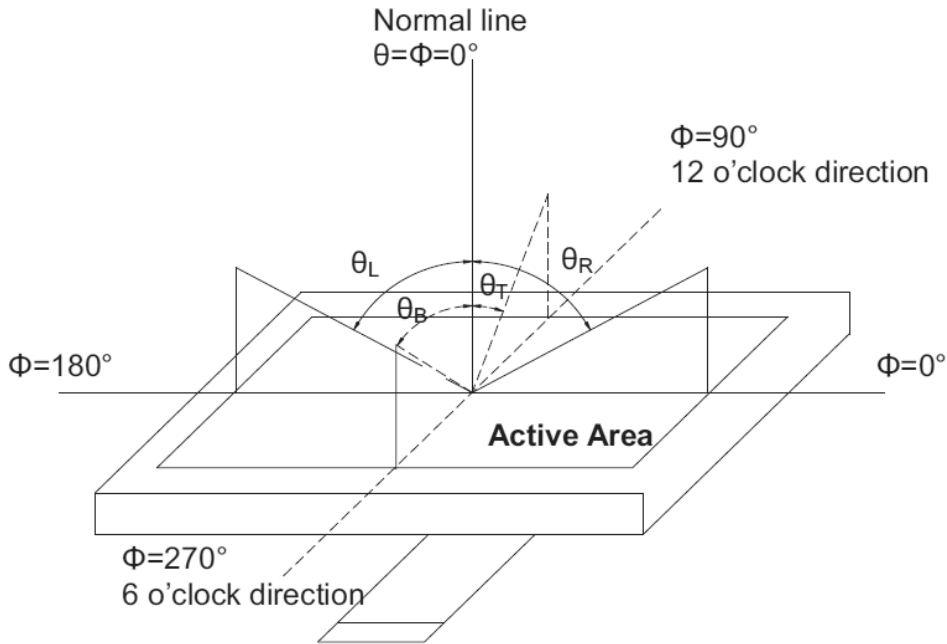
Note 3: Response time is defined as follow:

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



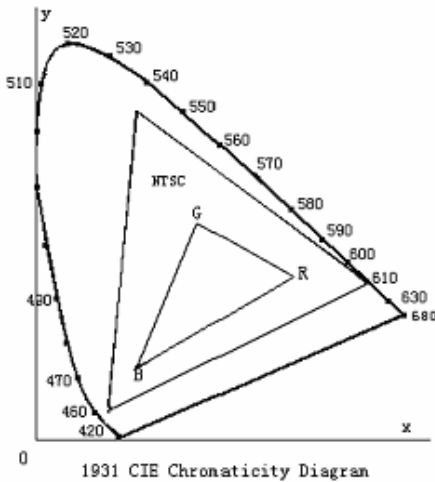
Note 4: Viewing angle range is defined as follow:

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.

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

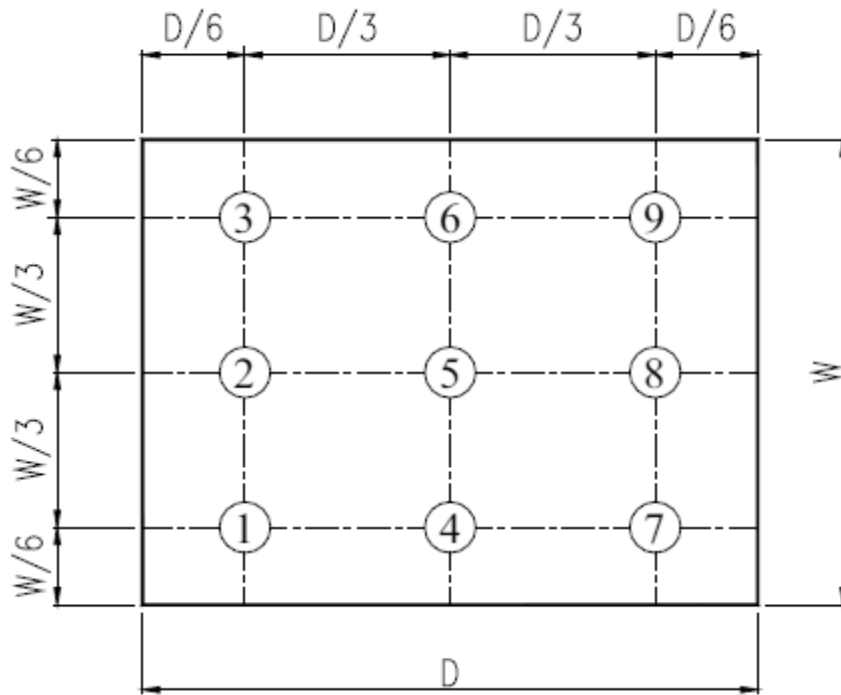


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ta= +60°C, 120hrs	Per table in below
2	Low Temp Operation	Ta= -20°C, 120hrs	Per table in below
3	High Temp Storage	Ta= +70°C, 120hrs	Per table in below
4	Low Temp Storage	Ta= -30°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~+70°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

- A. 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.
- B. 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.
- C. Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.

