



## ASI-T-200CA2IN/D

Item	Contents	Unit
Size	2.0	inch
Resolution	176(RGB) x 220	/
Interface	CPU 8/16 bits	
Color Depth	262K	
Technology type	a-si TFT	/
Pixel pitch	0.180 x 0.180	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	38.03 x 51.65 x 2.50	mm
Active Area(W x H)	31.68 x 39.60	mm
Display Mode	Transmissive, Normally white	/
Viewing Direction	6 O'clock	/
Backlight Type	LED	/
Driver IC	HX8340-B	



## Record of Revision

Date	Revision No.	Summary
2016-05-13	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of ASI-T-200CA2IN/D active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 2.0" display area contains 176(RGB) x 220 pixels.

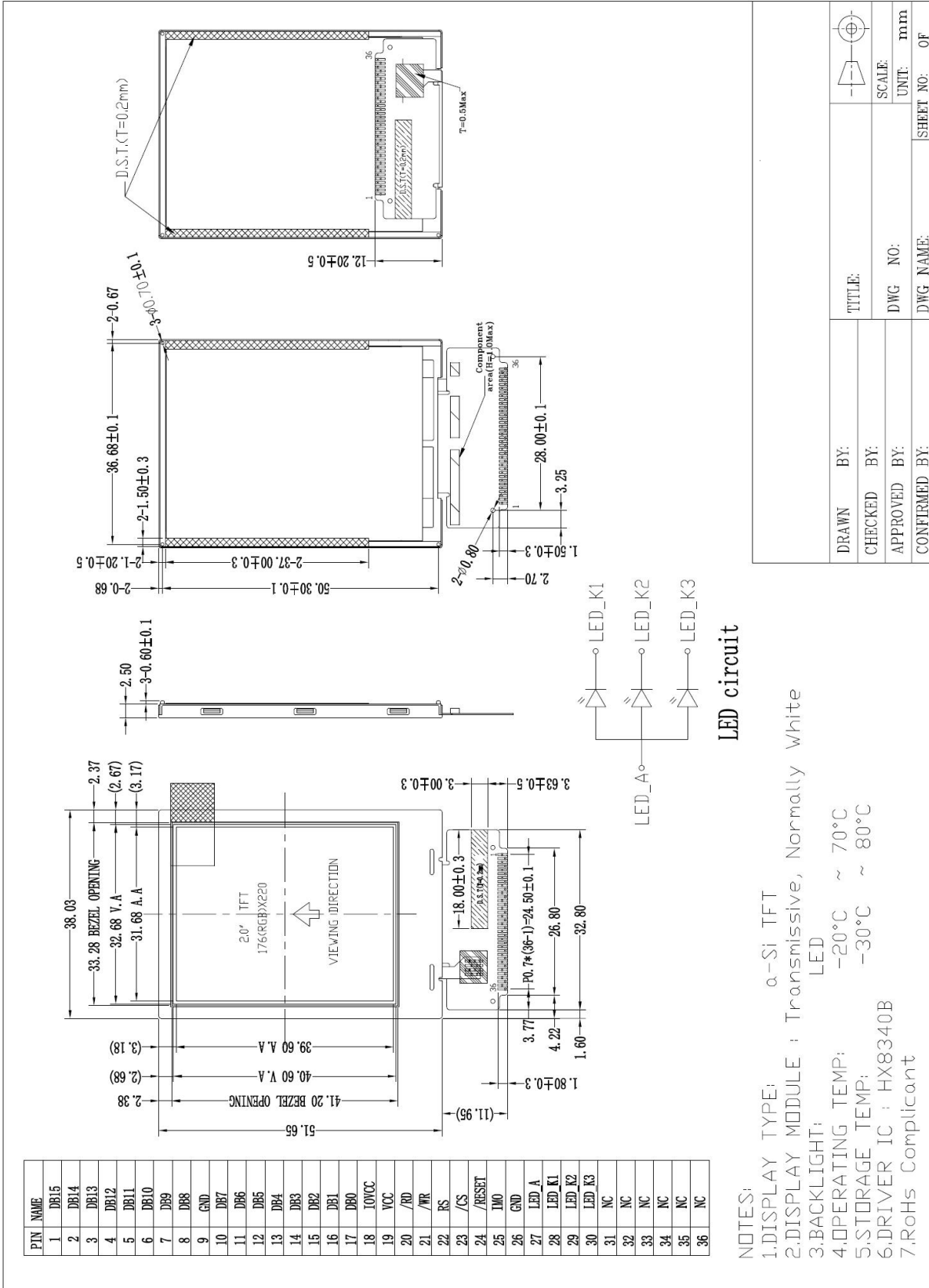
2. Application

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

No	Symbol	I/O	Description	Remarks
1	DB15	I/O	Data Bus	
2	DB14	I/O	Data Bus	
3	DB13	I/O	Data Bus	
4	DB12	I/O	Data Bus	
5	DB11	I/O	Data Bus	
6	DB10	I/O	Data Bus	
7	DB9	I/O	Data Bus	
8	DB8	I/O	Data Bus	
9	GND	P	Ground	
10	DB7	I/O	Data Bus	
11	DB6	I/O	Data Bus	
12	DB5	I/O	Data Bus	
13	DB4	I/O	Data Bus	
14	DB3	I/O	Data Bus	
15	DB2	I/O	Data Bus	
16	DB1	I/O	Data Bus	
17	DB0	I/O	Data Bus	
18	IOVCC	P	Logic IO power supply	
19	VCC	P	Driver power supply	
20	/RD	I	Read signal, Active low	
21	/WR	I	Write signal, Active low	
22	RS	I	Register select low: Index high: register	
23	/CS	I	Chip selection, Active low	
24	/RESET	I	Reset signal, Active low	
25	IM0	I	Mode select, low:16bit; high:8bit	
26	GND	P	Ground	
27	LED_A	I	Anode of LED	
28	LED_K1	I	Cathode of LED	
29	LED_K2	I	Cathode of LED	
30	LED_K3	I	Cathode of LED	
31	NC	-	No connection	
32	NC	-	No connection	
33	NC	-	No connection	
34	NC	-	No connection	
35	NC	-	No connection	
36	NC	-	No connection	

## 6. Absolute maximum Ratings

### 6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Logic Supply Voltage	IOVCC	-0.3	3.6	V	
Power Supply Voltage	VCC	-0.3	4.2	V	
Logic Input voltage	/CS,RS,/WR,/RD,/RESET,DB[0:15]	-0.3	IOVCC+0.5		

### 6.2. Environment Conditions

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

### 6.3 Backlight unit

Item	Symbol	MIN	MAX	Unit	Remark
Forward Current	I <sub>LED</sub>	-	90	mA	3pcs LED

## 7. Electrical Specifications

### 7.1 Electrical characteristics

GND=0V, Ta=25°C

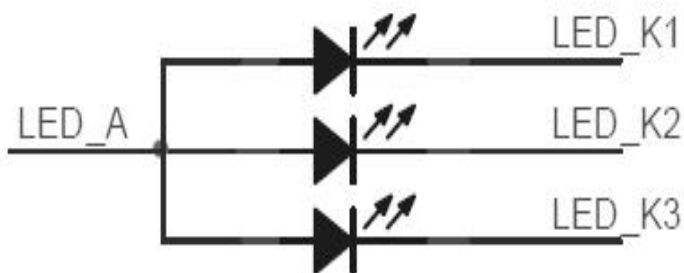
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage	IOVCC	1.65	1.8/2.8	3.3	V	
Power Supply Voltage	VCC	2.5	2.8	3.3	V	
Input Signal Voltage	VIL	GND	-	0.3*IOVCC	V	
	VIH	0.7*IOVCC	-	IOVCC	V	
Power Consumption (Panel+IC)	Black Mode	-	7.85	13.5	mW	
	Sleeping Mode	-	10	26	uW	

### 7.2 LED Backlight

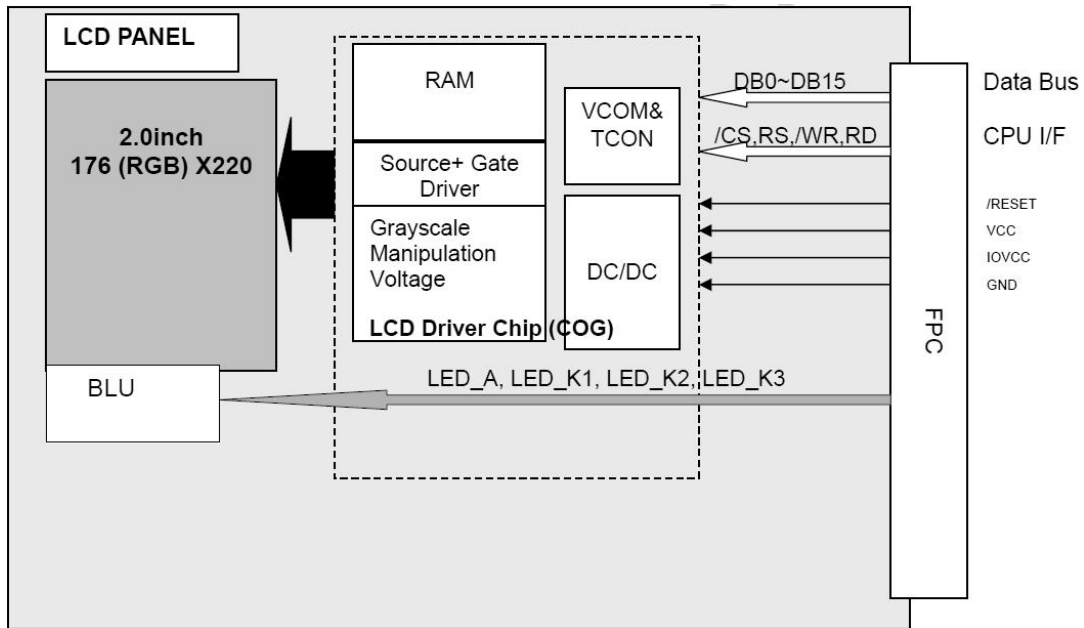
Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I <sub>F</sub>	-	15	-	mA	For each LED
Forward Voltage	V <sub>F</sub>	-	3.2	-	V	For Each LED
Power Consumption	W <sub>BL</sub>	-	144	-	mW	Total LED

Note: Figure below shows the connection of backlight LED.



### 7.3 Block Diagram of LCD module system

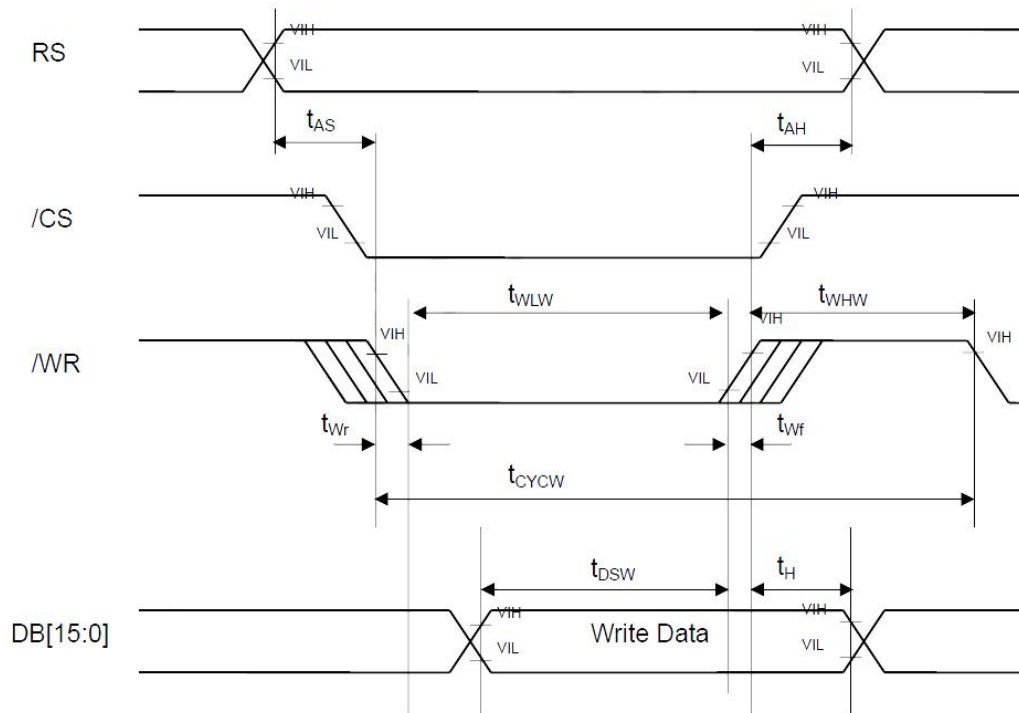




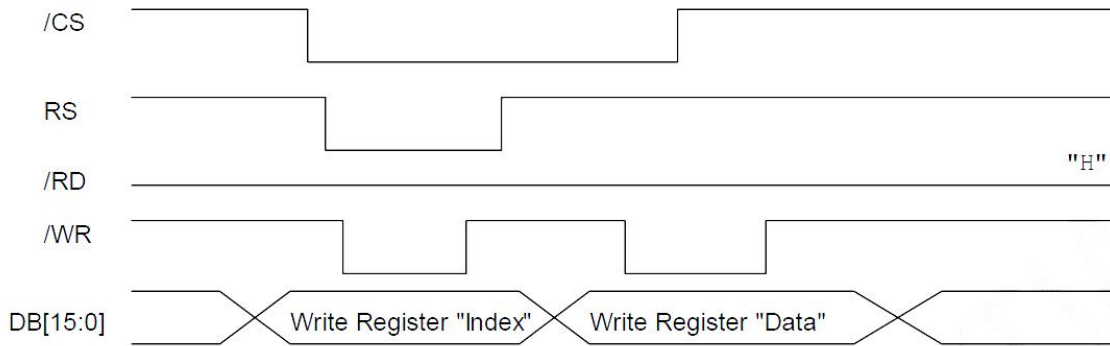
## 8. Command/AC Timing

### 8.1 Timing Parameter

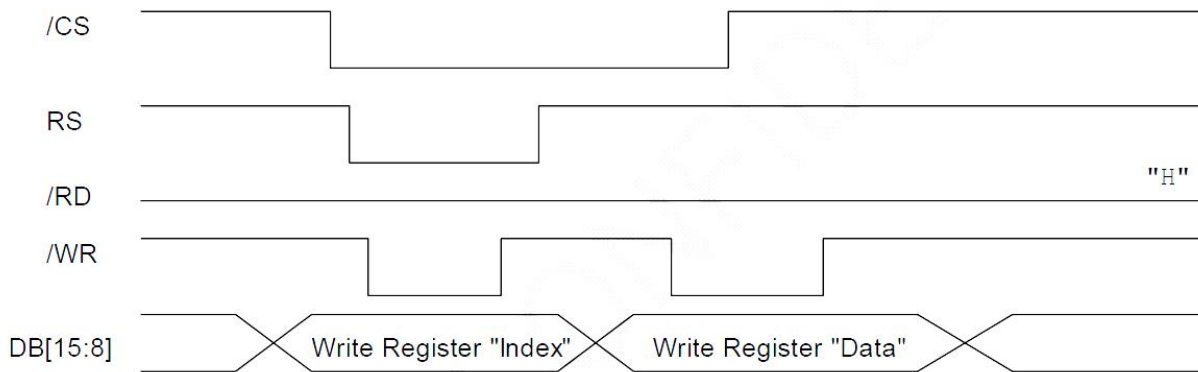
Item	Symbol	Min	TYP	Max	Unit
Bus cycle time	$t_{CYCW}$	66	-	-	ns
Write low-level pulse width	$t_{WLLW}$	15	-	-	ns
Write high-level pulse width	$t_{WHW}$	15	-	-	ns
Write rise/fall time	$t_{Wr,Wf}$	-	-	15	ns
Address setup time	$t_{AS}$	0	-	-	ns
Address hold time	$t_{AH}$	10	-	-	ns
Write data setup time	$t_{DSW}$	10	-	-	ns
Write data hold time	$t_H$	10	-	-	ns



## 8.2 Register Write Timing

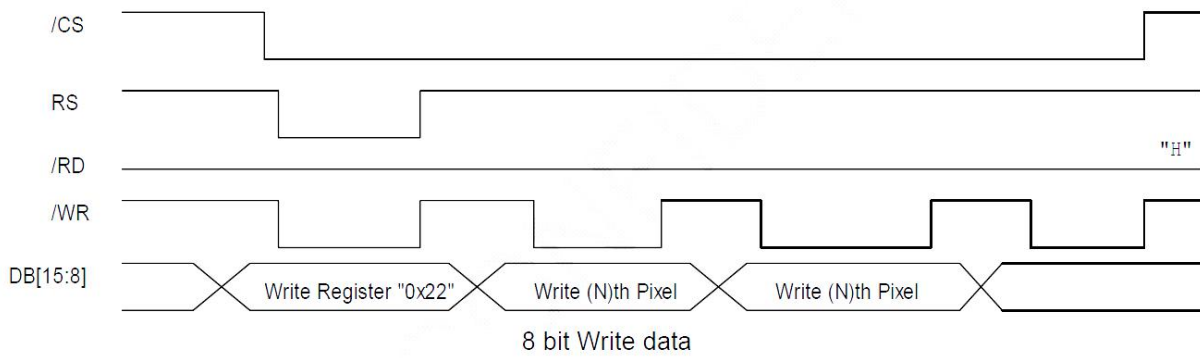
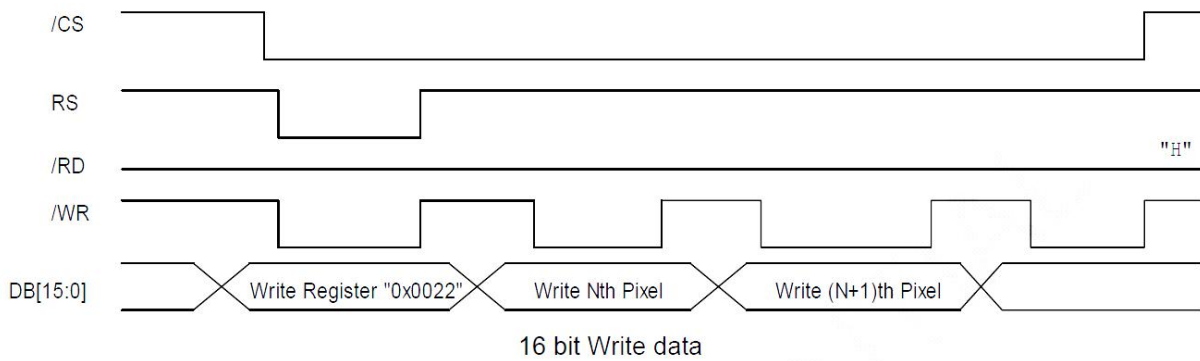


16-bit System Bus Interface Timing (Register Write Timing)

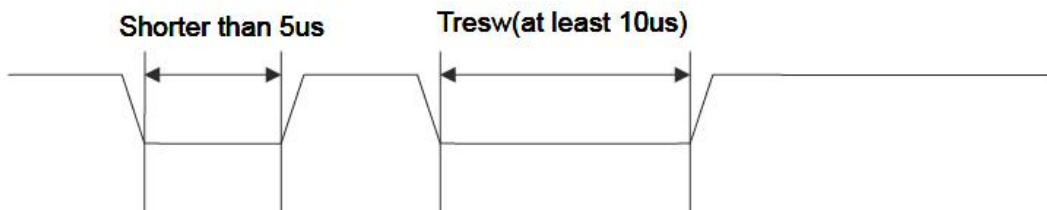


16-bit System Bus Interface Timing (Register Write Timing)

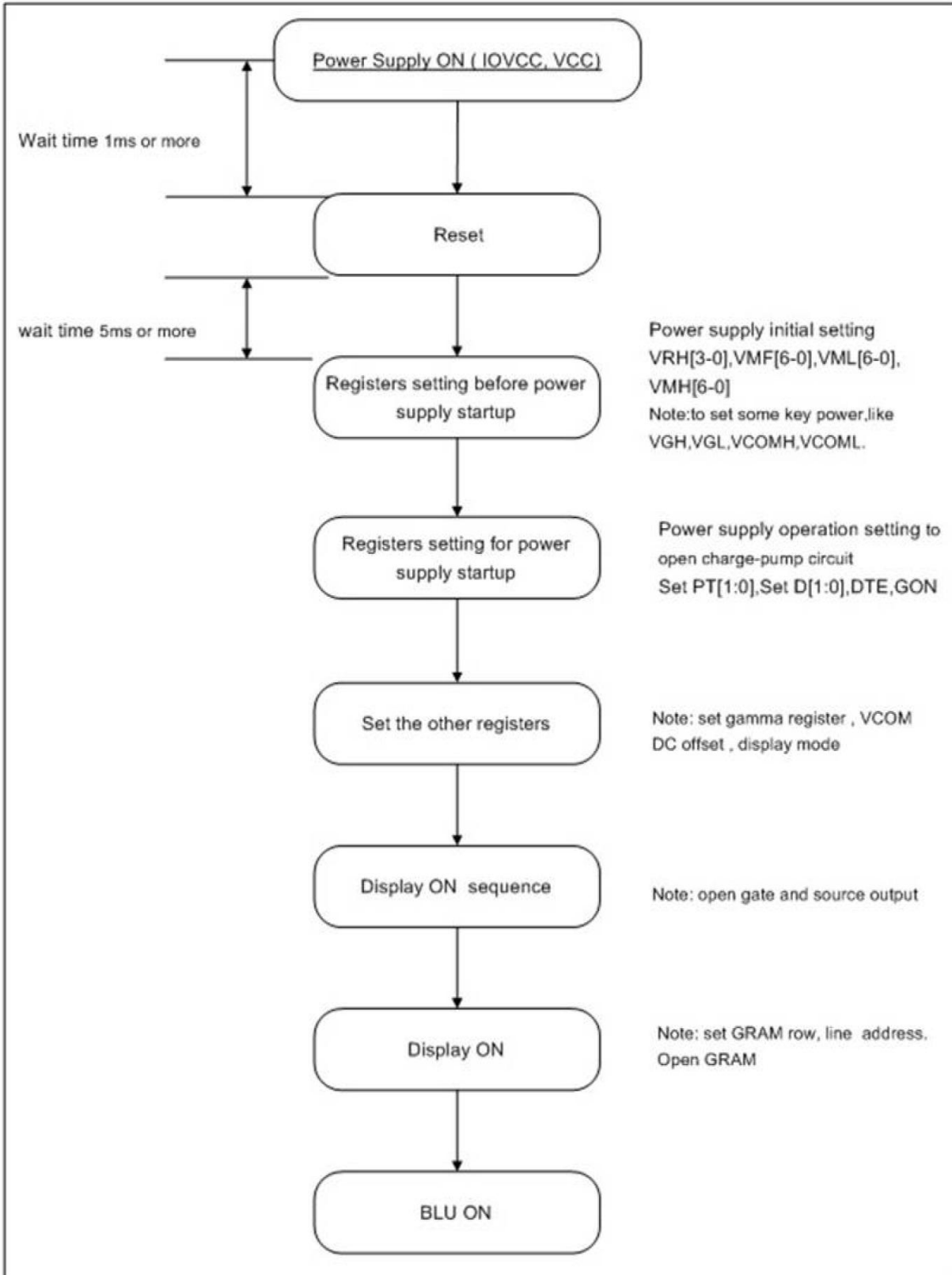
### 8.3 GRAM Write/Read Timing



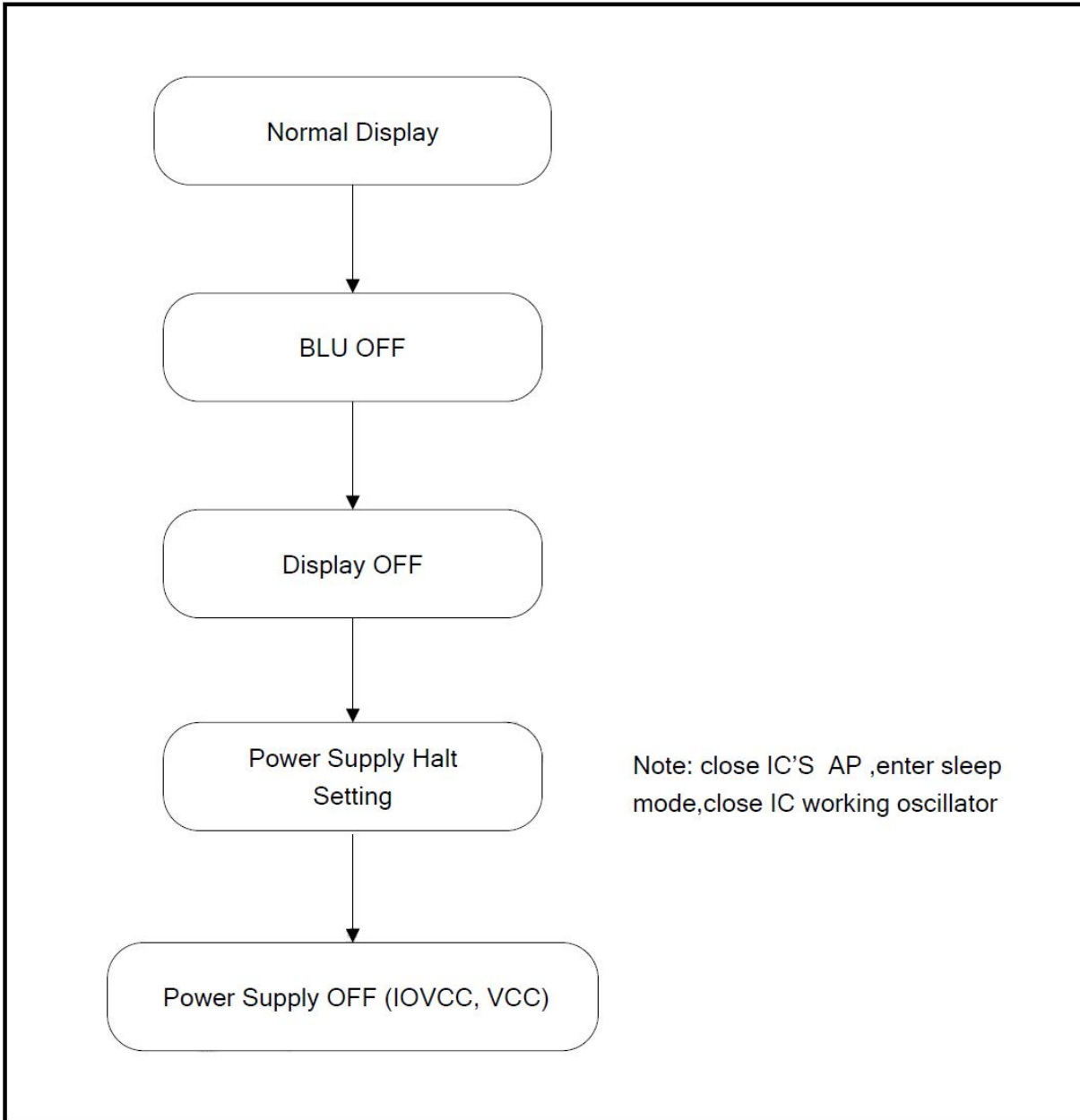
### 8.4 Reset Timing



8.5 Power On/Off Sequence  
 8.5.1 Power on Sequence



### 8.5.2 Power off Sequence



## 9. Optical Specification

Ta=25°C

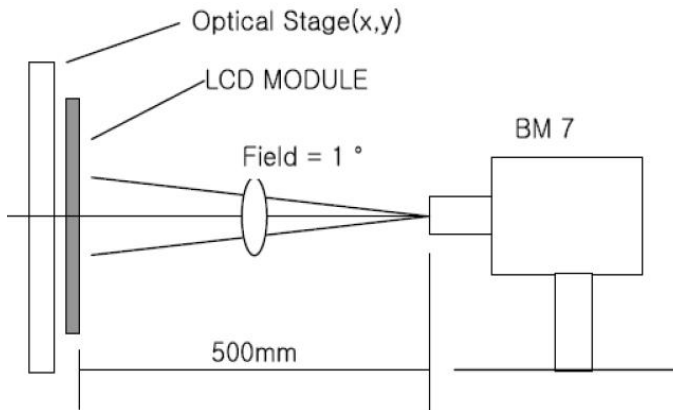
Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	400	500	-		Note1 Note2
Response Time	Ton/ Toff	25°C	-	20	30	ms	Note1 Note3
View Angles	$\theta T$	$CR \geq 10$	60	70	-	Degree	Note 4
	$\theta B$		50	60	-		
	$\theta L$		60	70	-		
	$\theta R$		60	70	-		
Chromaticity	White	x	Brightness is on	Typ-0.05	0.284	Typ+0.05	Note5, Note1
		y			0.312		
	Red	x			0.611		
		y			0.338		
	Green	x			0.324		
		y			0.612		
	Blue	x			0.145		
		y			0.091		
NTSC	S		55	60		%	Note5
Luminance	L		200	220	-	cd/m <sup>2</sup>	Note1 Note6
Uniformity	U		75	80	-	%	Note1 Note7

Test Conditions: 1.  $V_F=3.2V$ ,  $I_F=45mA$ (Backlight current), the ambient temperature is 25°C.

**Note 1: Definition of optical measurement system.**

Temperature = 25°C(±3°C)

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

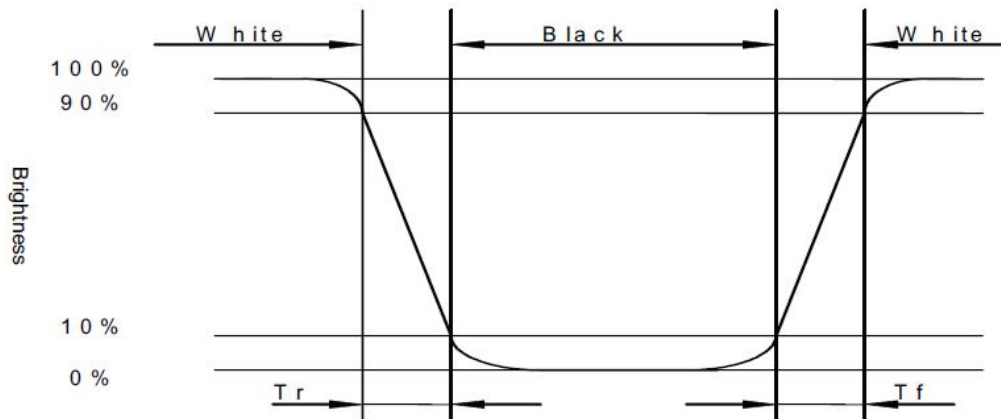


**Note 2: Contrast ratio is defined as follow:**

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

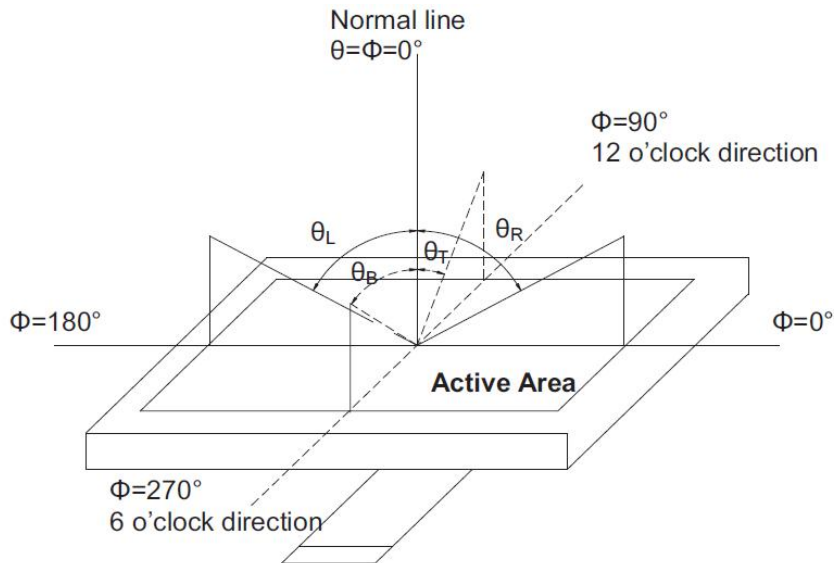
**Note 3: Response time is defined as follow:**

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,  $T_f$ ).



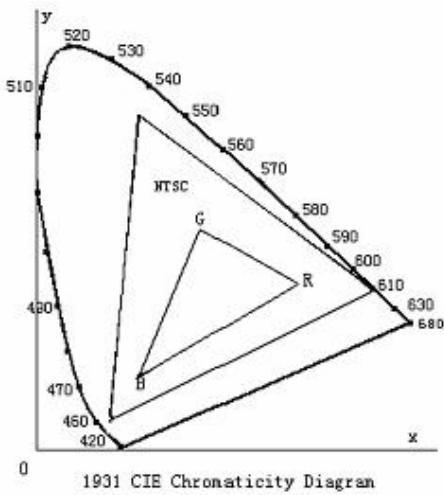
Note 4: Viewing angle range is defined as follow:

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.

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

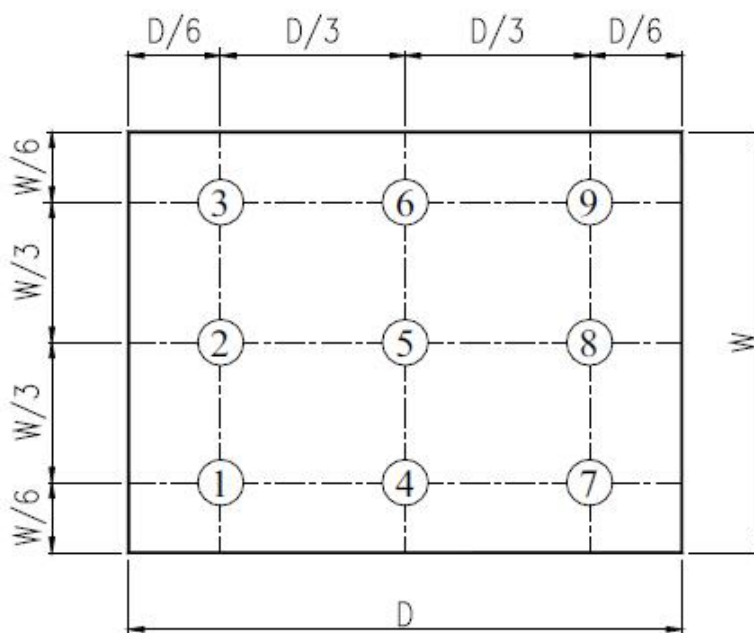


Fig. 2 Definition of uniformity

## 10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70°C, 120hrs	Per table in below
2	Low Temp Operation	Ta=-20°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+80°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=+40°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.

