

# PRODUCT SPECIFICATIONS

For Customer: \_\_\_\_\_

: APPROVAL FOR SPECIFICATION

Customer Model No. \_\_\_\_\_

: APPROVAL FOR SAMPLE

Module No.:   XH-T057BGH-01  

  Date : 2019-09-18  

## Table of Contents

No.	Item	Page
1	Cover Sheet(Table of Contents)	P1
2	Revision Record	P2
3	General Specifications	P3
4	Outline Drawing	P4
5	Absolute Maximum Ratings	P5
6	Electrical Specifications	P6-P10
7	Optical Characteristics	P11-P14
8	Reliability Test Items and Criteria	P15
9	Precautions for Use of LCD Modules	P16-P17

## For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT
SSX			

## 2. Revision Record

Date	Rev.No.	Page	Revision Items	Prepared
2019.09.18	V0		The first release	ssx

### 3. General Specifications

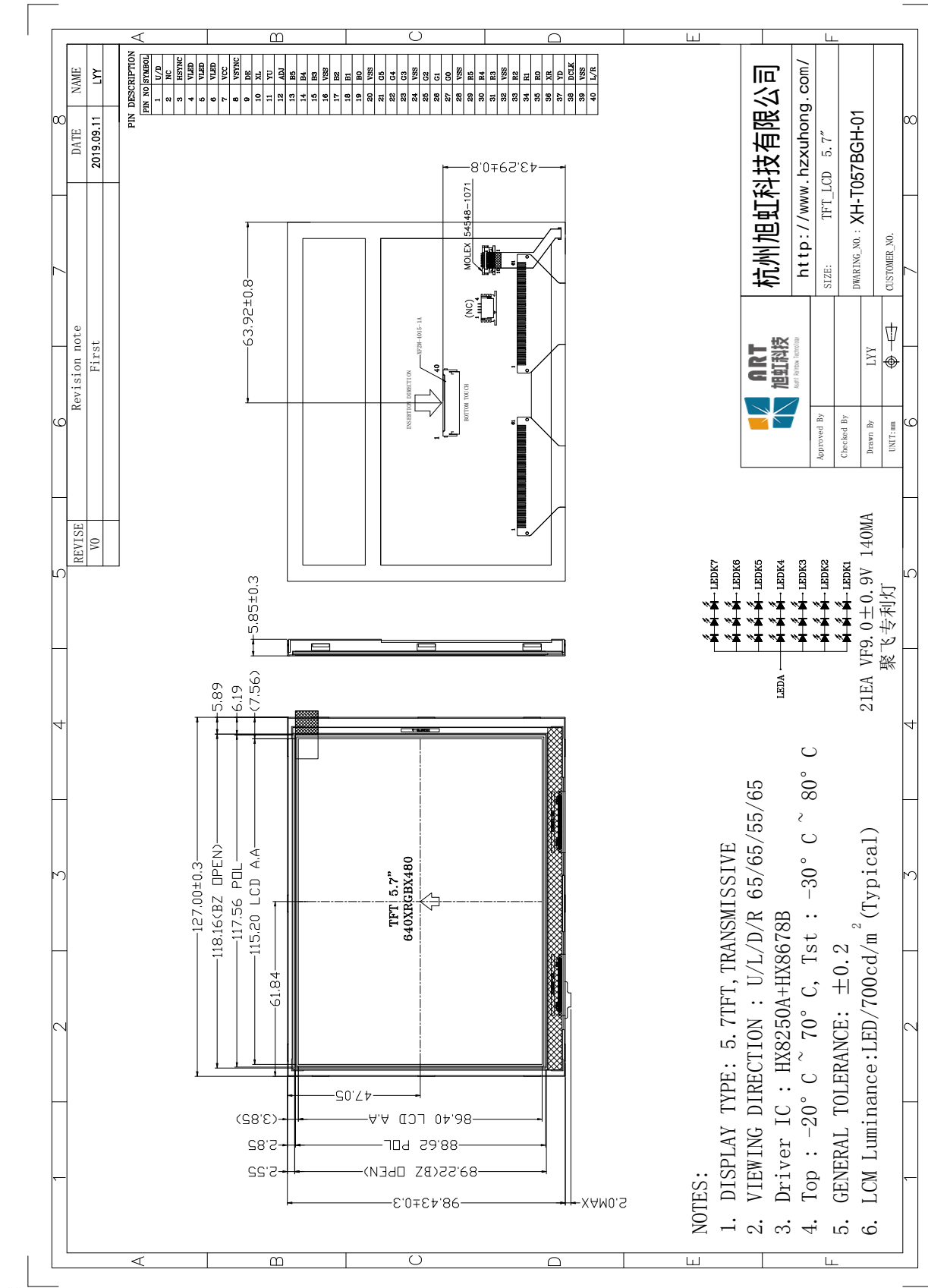
XH-T057BGH-01 is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light unit. The 5.7" display area contains 640X(RGB)x480 pixels and can display up to 262K colors. This product accords with ROHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	262K		1
Viewing Direction	6	O'Clock	
Gray inversion Direction	12	O'Clock	
Operating temperature	-20~+70	℃	
Storage temperature	-30~+80	℃	
Module size	127.00X98.43X5.85	mm	2
Active Area(W×H)	115.20X86.40	mm	
Number of Dots	640×480	dots	
Controller	HX8250-A01*2+HX8678B*1	-	
Power Supply Voltage	3.3	V	
Backlight	3S7P-LEDs (white)	pcs	
Weight	---	g	
Interface	RGB666	-	

Note 1: Color tune is slightly changed by temperature and driving voltage.

Note 2: Without FPC and Solder.

# 4.Outline.Drawing



SS

## 5. Absolute Maximum Ratings(Ta=25°C)

### 5.1 Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25°C)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VCC	-0.5	5.0	V	1, 2

Notes:1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.

2.  $V_{VCC} > V_{SS}$  must be maintained.
3. Please be sure users are grounded when handing LCD Module.

### 5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30°C	80°C	-20°C	70°C	1,2
Humidity	-	-	-	-	3

1. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature.

The phenomenon is reversible.s

3.  $T_a \leq 40^\circ\text{C}$ :85%RH MAX.

$T_a \geq 40^\circ\text{C}$ :Absolute humidity must be lower than the humidity of 85%RH at 40°C.

## 6. Electrical Specifications

### 6.1 Electrical characteristics(Vss=0V ,Ta=25°C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply	VCC	Ta=25°C	2.7	3.3	3.6	V	
Power supply	ICC	White	-	100	-	mA	

Current	ICC	Black	-	120	-	mA	
Input leakage Current	ILKG	-	-1	-	1	uA	
Input voltage	'H'	V <sub>IH</sub>	Ta=25°C	0.8*VCC	-	VCC	V
	'L'	V <sub>IL</sub>	Ta=25°C	-0.3	-	0.2*VCC	V

## 6.2 LED backlight specification(VSS=0V ,Ta=25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V <sub>f</sub>	If=140mA	8.1	9.0	9.9	V	
Uniformity	Δ Bp	If=140mA	75	80	-	%	
Life Time	time	If=140mA	20K	30K	-	hours	1
Power supply Voltage for LED	VLED	-	-	5.0	-	V	
Power supply Current for LED	ILED	-	-	350	400	mA	
Adj frequency	-	-	19K	20K	21K	HZ	
Adj input voltage	-	V <sub>IH</sub>	3.0	-	3.3	V	
Adj input voltage	-	V <sub>IL</sub>	0	-	0.3	V	

Note 1: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25°C

### 6.3 Interface signals

Pin No.	Symbol	I/O	Function
1	U/D	I	Up/down scan setting. When UD=H,reverse scan. When UD=L,normal scan.
2	NC	-	No connection.
3	HSYNC	I	Horizontal SYNC.
4-6	VLED	P	Power supply for LED driver circuit.
7	VCC	P	Power supply for LCD.
8	VSYNC	I	Vertical SYNC.
9	DE	I	Data enable pin.
10	NC(XL)	-	No connection.
11	NC(YU)	-	No connection.
12	ADJ	I	Brightness control for LED B/L.
13-15	B5-B3	I	Blue data bus
16	VSS	P	Power ground.
17-19	B2-B0	I	Blue data bus
20	VSS	P	Power ground.
21-23	G5-G3	I	Green data bus
24	VSS	P	Power ground.
25-27	G2-G0	I	Green data bus
28	VSS	P	Power ground.
29-31	R5-R3	I	Red data bus
32	VSS	P	Power ground.
33-35	R2-R0	I	Red data bus
36	NC(XR)	-	No connection.
37	NC(YD)	-	No connection.
38	DCLK	I	Data clock
39	VSS	P	Power ground.
40	L/R	I	The shift direction of device internal shift register is controlled by this pin as shown below: LR=H: STH→S01→•••→S0960→STH0 LR=L: STH→S0960→•••→S01→STH0

## 6.4 Timing Characteristics

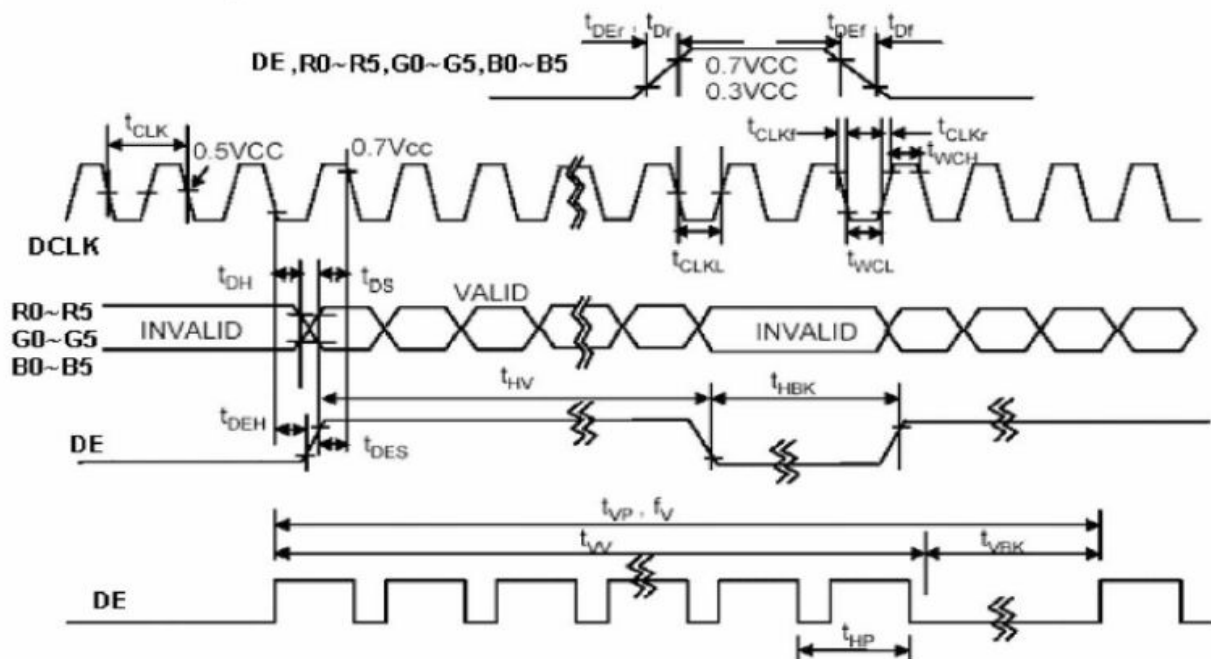
### 6.4.1 Timing conditions

Parallel DE mode input timing table

Signal	Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
DCLK	Period	$t_{CLK}$	33	40	43	ns	
	Frequency	$f_{CLK}$	23	25	30	MHz	
	Low Level Width	$t_{WCL}$	6	-	-	ns	
	High Level Width	$t_{WCH}$	6	-	-	ns	
	Rise, Fall Time	$t_{CLKr}, t_{CLKf}$	-	-	3	ns	
	Duty	-	0.45	0.50	0.55	-	
DE (Data Enable)	Setup Time	$t_{DES}$	5	-	-	ns	
	Hold Time	$t_{DEH}$	10	-	-	ns	
	Rise, Fall Time	$t_{DEr}, t_{DEf}$	-	-	16	ns	
	Horizontal Period	$t_{HP}$	750	800	900	$t_{CLK}$	
	Horizontal Valid	$t_{HV}$	640	640	640	$t_{CLK}$	
	Horizontal Blank	$t_{HBK}$	110	160	260	$t_{CLK}$	
	Vertical Period	$t_{VP}$	515	525	560	$t_{HP}$	
	Vertical Valid	$t_{VW}$	480	480	480	$t_{HP}$	
	Vertical Blank	$t_{VBK}$	35	45	80	$t_{HP}$	
	Vertical Frequency	$f_V$	55	60	65	Hz	
Data R,G,B	Setup Time	$t_{DS}$	5	-	-	ns	
	Hold Time	$t_{DH}$	10	-	-	ns	
	Rise, Fall Time	$t_{Dr}, t_{Df}$	-	-	3	ns	

Note: (1)  $t_{CLKL} / t_{CLK}$ .

### Timing diagram

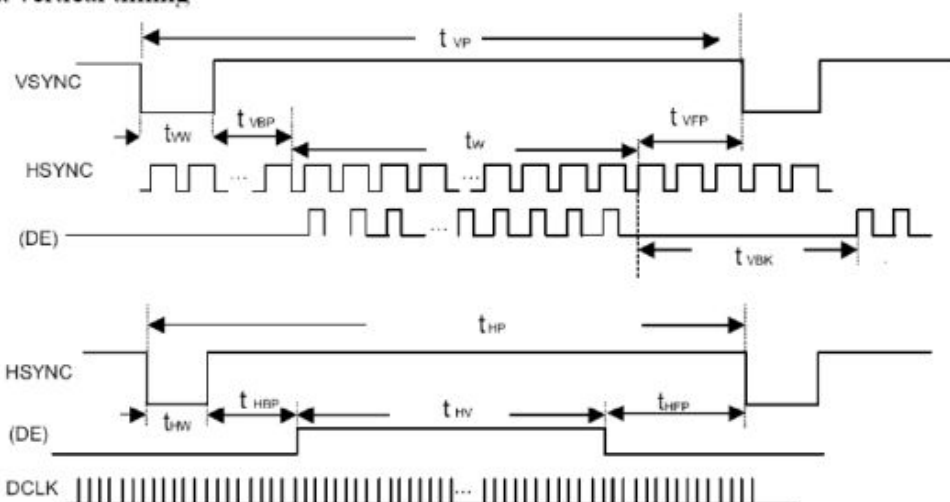


SYNC mode input timing table ①

Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Clock Period	$t_{CLK}$	33	40	43	ns	
Clock Frequency	$f_{CLK}$	23	25	30	MHz	
Clock Low Level Width	$t_{WCL}$	6	-	-	ns	
Clock High Level Width	$t_{WCH}$	6	-	-	ns	
Clock Rise, Fall Time	$t_{CLKr}, t_{CLKf}$	-	-	3	ns	
HSYNC Period	$t_{HP}$	750	800	900	$t_{CLK}$	
HSYNC Pulse Width	$t_{HW}$	5	30	-	$t_{CLK}$	
HSYNC Front Porch	$t_{HFP}$	1	16	116	$t_{CLK}$	
HSYNC Back Porch	$t_{HBP}$	1	114	139	$t_{CLK}$	
HSYNC Width + Back Porch	$t_{HW} + t_{HBP}$	144	144	144	$t_{CLK}$	
Horizontal Blank	$t_{HBK}$	1	160	260	$t_{CLK}$	
Horizontal Valid	$t_{HV}$	640	640	640	$t_{CLK}$	
VSYNC Period	$t_{VP}$	515	525	560	$t_{HP}$	
VSYNC Pulse Width	$t_{VW}$	1	3	5	$t_{HP}$	
VSYNC Front Porch	$t_{VFP}$	1	10	45	$t_{HP}$	
VSYNC Back Porch	$t_{VBP}$	30	32	34	$t_{HP}$	
VSYNC Width + Back Porch	$t_{VW} + t_{VBP}$	35	35	35	$t_{HP}$	
Vertical Blank	$t_{VBK}$	35	45	80	$t_{HP}$	
Valid data Width	$t_W$	480	480	480	$t_{HP}$	
Data Setup Time	$t_{DS}$	5	-	-	ns	
Data Hold Time	$t_{DH}$	10	-	-	ns	

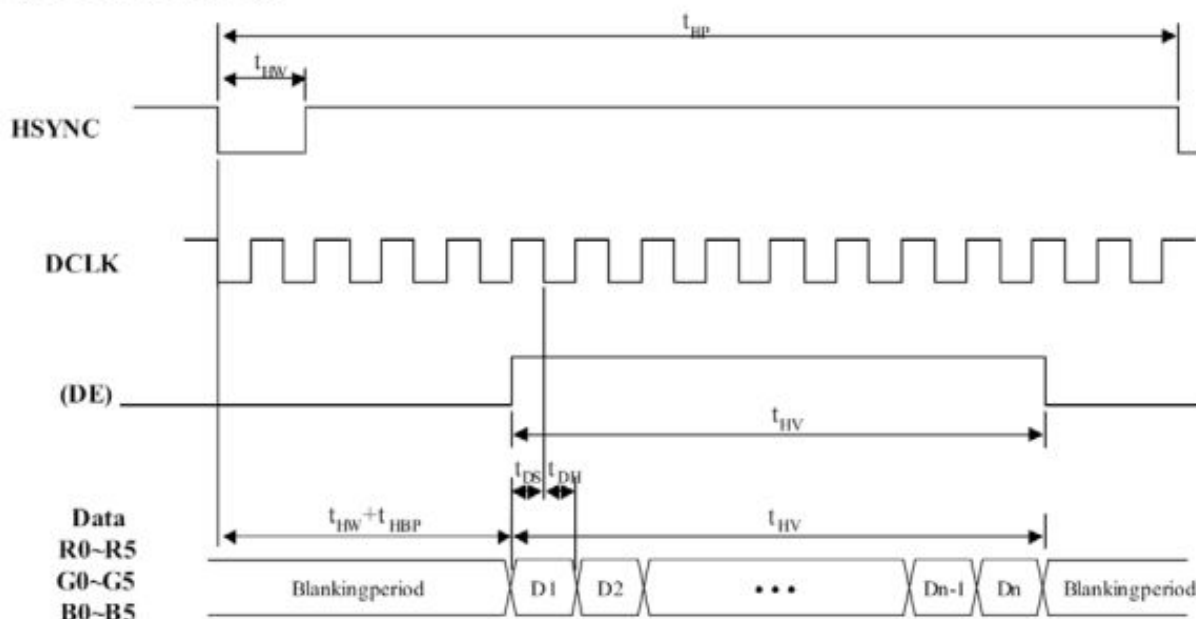
Note: (1)  $t_{HBK} = t_{HFP} + t_{HW} + t_{HBP}$

Timing diagram  
Input vertical timing



Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

### Input horizon timing



Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

## 7. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Brightness	Bp	$\theta=0^\circ$	-	700	-	Cd/m <sup>2</sup>	1	
Uniformity	$\Delta Bp$	$\Phi=0^\circ$	75	80	-	%	1,2	
Viewing Angle	3:00	Cr $\geq$ 10	-	65	-	Deg	3	
	6:00		-	55	-			
	9:00		-	65	-			
	12:00		-	65	-			
Contrast Ratio	Cr	$\theta=0^\circ$	150	250	-	-	4	
Response Time	T <sub>r</sub> +T <sub>f</sub>	$\Phi=0^\circ$	-	45	-	ms		
Color of CIE Coordinate	W	x	$\theta=0^\circ$ $\Phi=0^\circ$	Typ. -0.05	TBD	Typ. +0.05	-	1,6
		y			TBD		-	
	R	x			TBD		-	
		y			TBD		-	
	G	x			TBD		-	
		y			TBD		-	
	B	x			TBD		-	
		y			TBD		-	
NTSC Ratio	S	-	TBD	-	%			

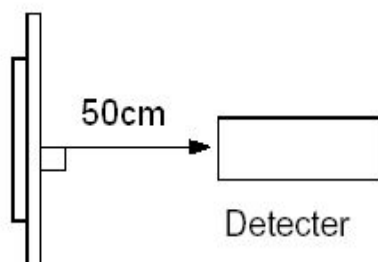
Note: The parameter is slightly changed by temperature, driving voltage and material

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment BM-7 ( $\Phi$ 5mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

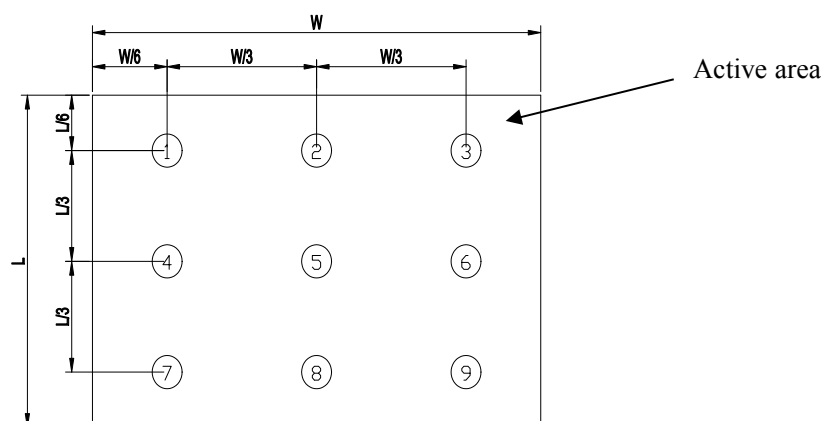


Note 2: The luminance uniformity is calculated by using following formula.

$$\Delta Bp = Bp (\text{Min.}) / Bp (\text{Max.}) \times 100 (\%)$$

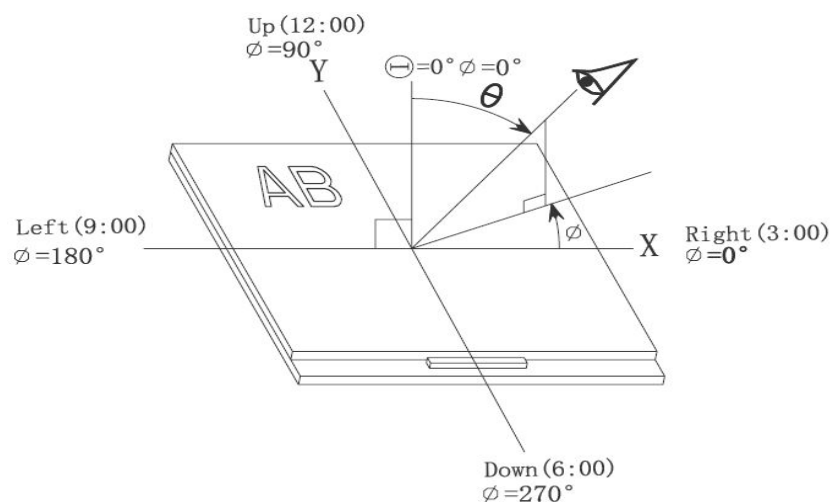
$Bp (\text{Max.})$  = Maximum brightness in 9 measured spots

$Bp (\text{Min.})$  = Minimum brightness in 9 measured spots.

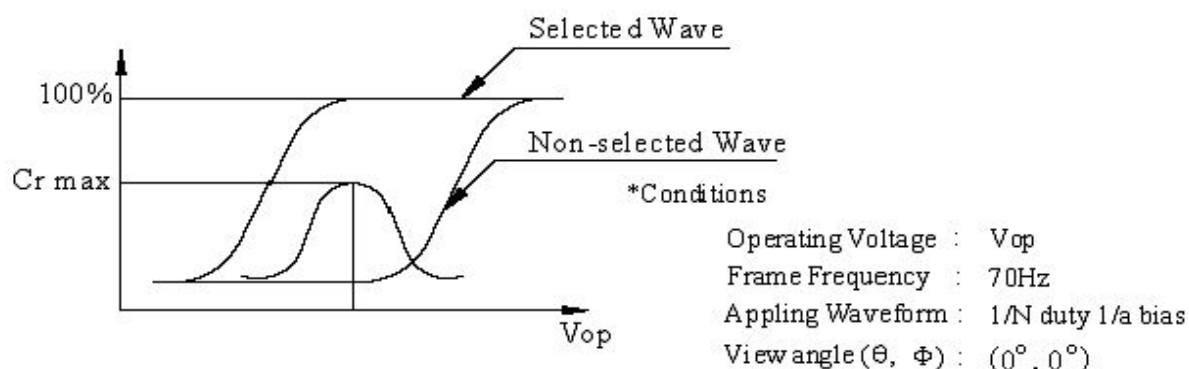


Note 3: The definition of viewing angle:

Refer to the graph below marked by  $\theta$  and  $\phi$



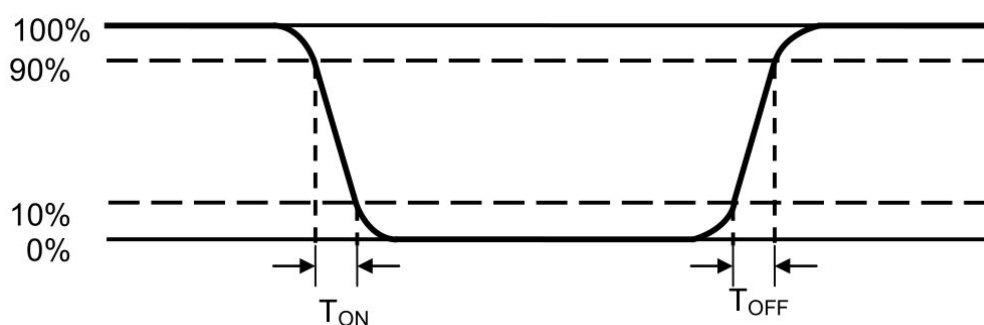
Note 4: Definition of contrast ratio.( Test LCD using DMS501)



$$\text{Contrast ratio}(Cr) = \frac{\text{Brightness of selected dots}}{\text{Brightness of non-selected dots}}$$

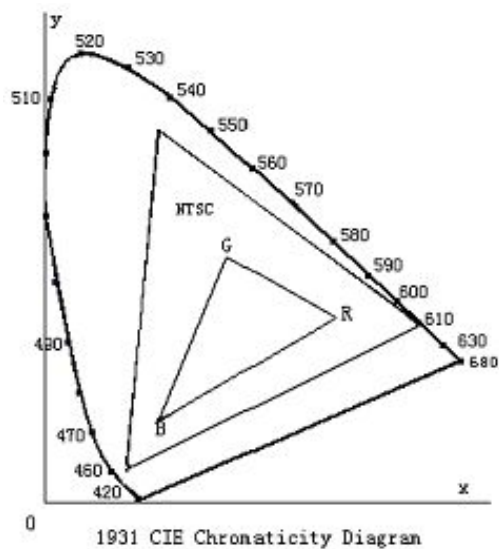
Note 5: Definition of Response time. (Test LCD using DMS501):

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

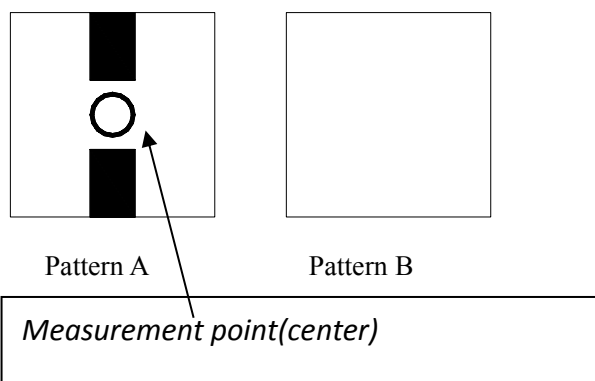


**Color gamut:**

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

Note 7: Definition of cross talk.

Cross talk ratio(%) = |pattern A Brightness - pattern B Brightness| / pattern A Brightness \* 100



Electric volume value = 3F+/-3Hex

## 8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80°C±2°C 96H Restore 2H at 25°C Power off	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value.
2	Low Temperature Storage	-30°C±2°C 96H Restore 2H at 25°C Power off	
3	High Temperature Operation	70°C±2°C 96H Restore 2H at 25°C Power on	
4	Low Temperature Operation	-20°C±2°C 96H Restore 4H at 25°C Power on	
5	High Temperature/Humidity Operation	60°C±2°C 90%RH 96H Power on	
6	Temperature Cycle	$-30^{\circ}\text{C} \xrightarrow{\quad} 80^{\circ}\text{C}$ 30min 5min 30min after 5 cycle, Restore 2H at 25°C Power off	

Note: Operation: Supply 3.3V for logic system.

The inspection terms after reliability test, as below

ITEM	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0,05

## 9. Precautions for Use of LCD Modules

### 9.1 Handling Precautions

9.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

9.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

9.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

9.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

9.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

9.1.6 Do not attempt to disassemble the LCD Module.

9.1.7 If the logic circuit power is off, do not apply the input signals.

9.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- a. Be sure to ground the body when handling the LCD Modules.
- b. Tools required for assembly, such as soldering irons, must be properly ground.
- c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
- d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

## 9.2 Storage precautions

9.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

9.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature :         $0^{\circ}\text{C} \sim 40^{\circ}\text{C}$

Relatively humidity:  $\leq 80\%$

9.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

---

**9.3 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.**

**END**