

PRODUCT SPECIFICATIONS

For Customer: _____

 : APPROVAL FOR SPECIFICATION

Customer Model No. _____

 : APPROVAL FOR SAMPLE

Module No.: XH-T070QAH-09

Date : 2016-04-25

Table of Contents

No.	Item	Page
1	Cover Sheet(Table of Contents)	
2	Revision Record	
3	General Specifications	
4	Outline Drawing	
5	Absolute Maximum Ratings	
6	Electrical Specifications and Instruction Code	
7	Optical Characteristics	
8	Reliability Test Items and Criteria	
9	Packing Reliability	

For Customer's Acceptance:

Approved By	Comment

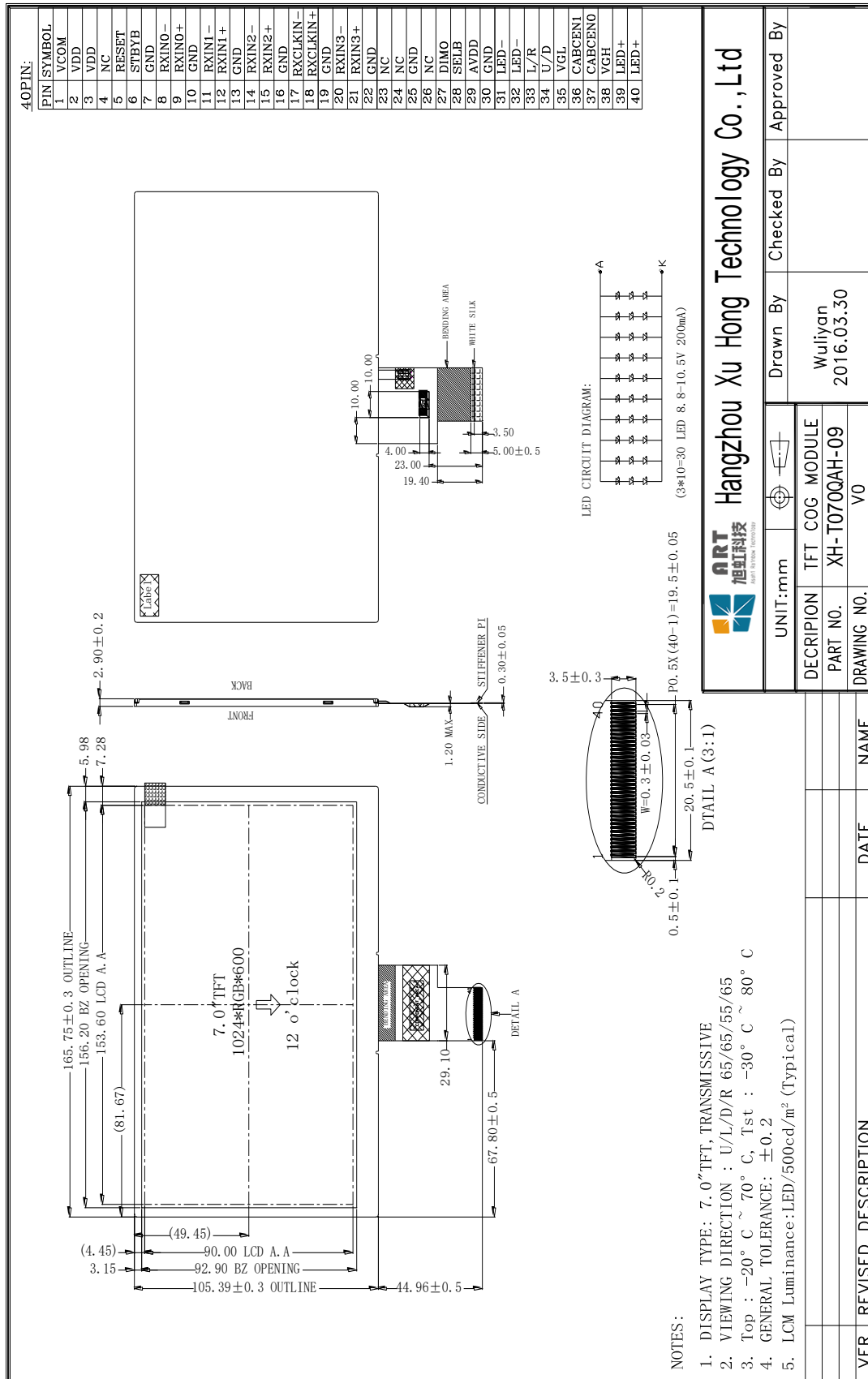
PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT

3. General Specifications

XH-T070QAH-09 is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light unit. The 7.0" display area contains 1024 x 600 pixels and can display up to 16.7M colors. This product accords with RoHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	16.7M		
Viewing Direction	12	O'Clock	
Gray scale inversion direction	6	O'Clock	
Operating temperature	-20~+70	°C	
Storage temperature	-30~+80	°C	
Module size	Refer to outline drawing	mm	
Active Area(W×H)	153.60X90.00	mm	
Pixel size	0.15*0.15mm		
Number of Dots	1024x600	dots	
Power Supply Voltage	3.3	V	
Outline Dimensions	Refer to outline drawing	-	
Backlight	3X10-LEDS (white)	pcs	
Weight	---	g	
Interface	LVDS	-	

4. Outline Drawing



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	V _{DD}	-0.3	5.0	V	1, 2
	AV _{DD}	6.5	13.5	V	
	V _{GH}	-0.3	42.0	V	
	V _{GL}	-20	0.3	V	
	V _{GH} -V _{GL}	-	40.0	V	

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_{DD} > V_{SS} must be maintained.

5.2 Typical operation conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	V _{DD}	3.0	3.3	3.6	V	
	AV _{DD}	10.8	11.0	11.2	V	
	V _{GH}	16	20	24	V	
	V _{GL}	-10	-7.0	-4.0	V	
Input signal voltage	V _{COM}	3.56	3.76	3.96	V	
Input logic high voltage	V _{IH}	0.7 V _{DD}	-	V _{DD}	V	
Input logic low voltage	V _{IL}	0	-	0.3V _{DD}	V	

5.3 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.

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

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

6. Electrical Specifications and Instruction Code

6.1 Electrical characteristics(V_{SS}=0V ,Ta=25°C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note	
Power supply	VDD	Ta=25°C	3.0	3.3	3.6	V		
Input voltage	'H'	V _{IH}	V _{CC} =3.3V	0.8V _{CC}	-	V _{CC}	V	
	'L'	V _{IL}	V _{CC} =3.3V	0	-	0.2V _{CC}	V	
Current Consumption	I _{DD1}	Normal mode	-	135	-	mA	1	
	I _{DD2}	Sleep mode	-	0.05	0.1	mA	1	
Clock Frequency	f _{CLK}	-	-	50	70	MHz		

Note:

1: Tested in 1×1 chessboard pattern.

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

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	Vf	-	-	9.0	-	V	
LED Forward Current	I	-	-	200	-	mA	
Life Time	time	If=200mA	18000	20000		hours	Note1

Note:

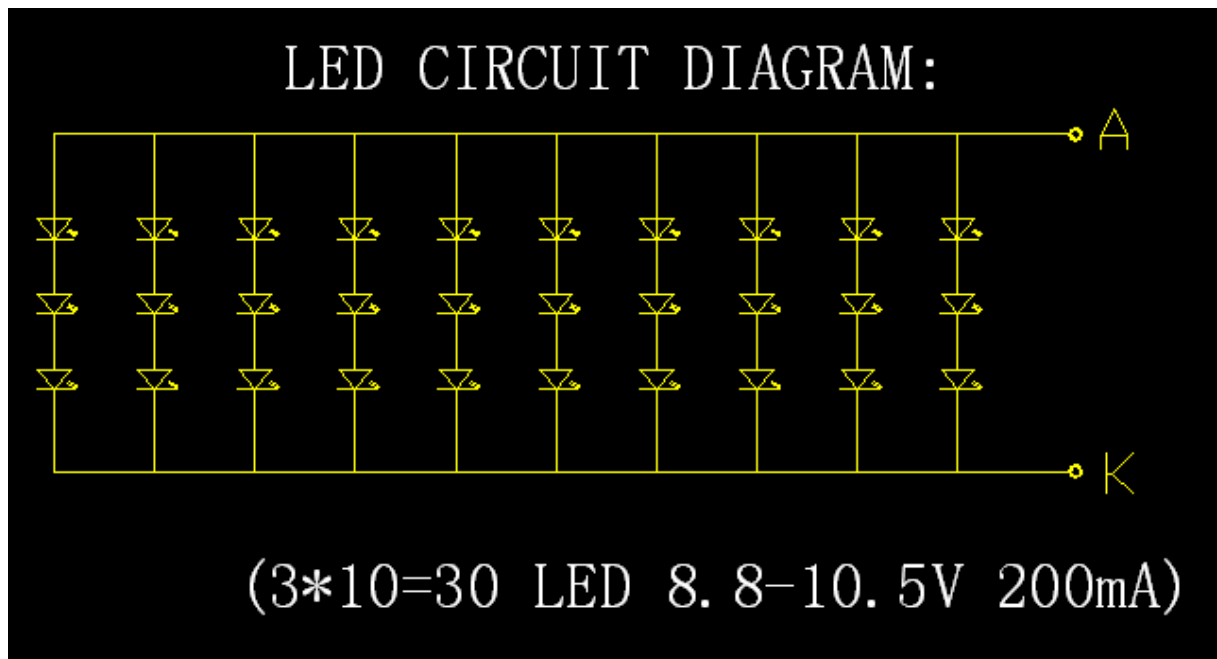
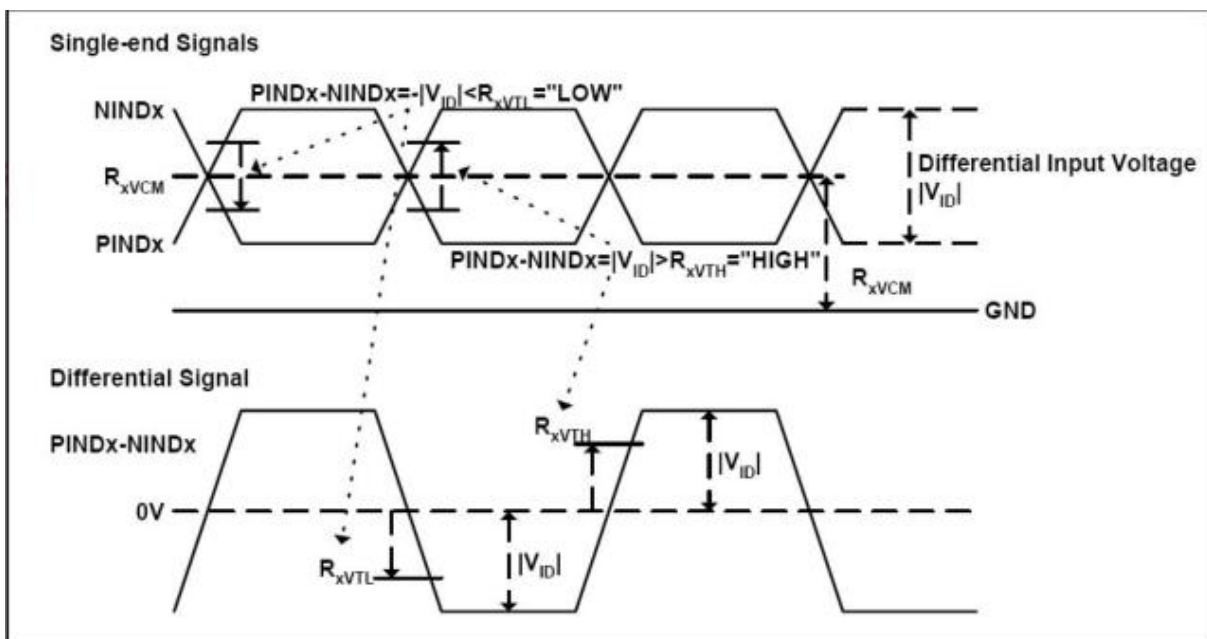
 Fig. 6.2.1 shows the LED backlight circuit. The circuit has $3 \times 10 = 30$ LEDs


Fig 6.2.1

6.3 Timing characteristics

6.3.1 DC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R_{xVTH}	-	-	+0.1	V	$R_{xVCM}=1.2V$
Differential input low Threshold voltage	R_{xVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{xVIN}	0	-	2.4	V	
Differential input common mode voltage	R_{xVCM}	$ V_{ID} /2$	-	$2.4- V_{ID} /2$	V	
Differential voltage	$ V_{ID} $	0.2	-	0.6	V	
Differential input leakage current	RV_{xliz}	-10	-	+10	uA	

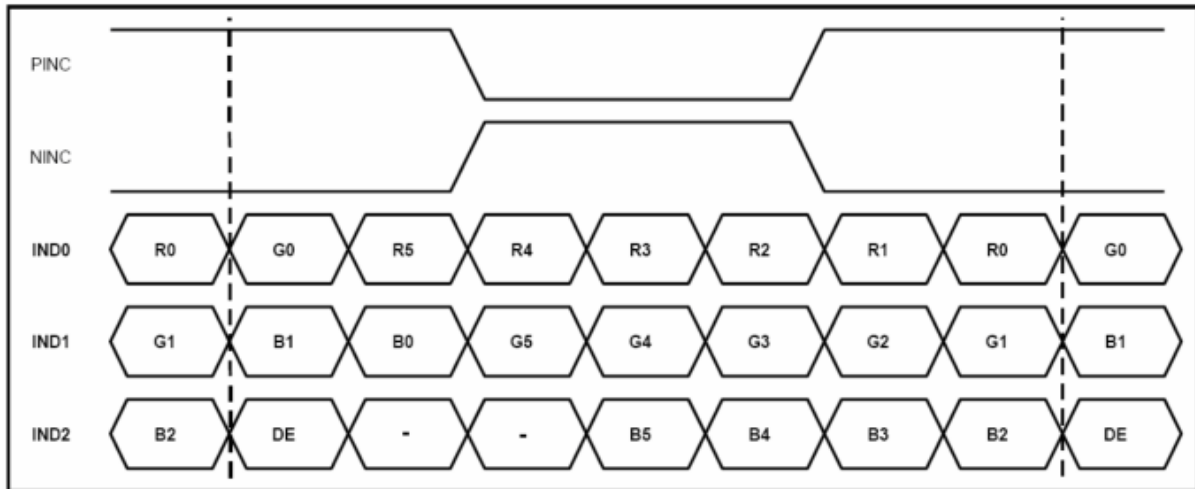


6.3.2 Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	fclk	40.8	51.2	67.2	MHz	Frame rate =60Hz
Horizontal display area	thd	1024			DCLK	
HS period time	th	1114	1344	1400	DCLK	
HS Blanking	thb	90	320	376	DCLK	
Vertical display area	tvd	600			H	
VS period time	tv	610	635	800	H	
VS Blanking	thb	10	35	200	H	

6.3.3 Data Input Format

6bit LVDS input



Note: Support DE timing mode only, SYNC mode not supported

6.3 Interface signals

Pin No.	Symbol	I/O	Function
1	VCOM	P	Common voltage
2-3	VDD	P	Power for digital circuit
4	NC	-	No connect
5	REST	I	Global reset pin
6	SBYB	I	Stand mode: SBYB=1,normal operation SBYB=0,timing control,source driver will turn off,all output are hight-Z
7	GND	P	Ground
8	RXIN0-	I	-LVDS differential data input
9	RXIN0+	I	+LVDS differential data input
10	GND	P	Ground
11	RXIN1-	I	-LVDS differential data input
12	RXIN1+	I	+LVDS differential data input
13	GND	P	Ground
14	RXIN2-	I	-LVDS differential data input
15	RXIN2+	I	+LVDS differential data input
16	GND	P	Ground
17	RXCLKIN-	I	-LVDS differential clock input
18	RXCLKIN+	I	+LVDS differential clock input
19	GND	P	Ground
20	RXIN3-	I	-LVDS differential data input
21	RXIN3+	I	+LVDS differential data input
22	GND	P	Ground
23-24	NC	-	No connection
25	GND	P	Ground
26	NC	-	No connection
27	DIMO	I	Backlight CABC controller signal output
28	SELB	I	6bit/8bit select H:6bit, L:8bit
29	AVDD	P	Power for analog circuit
30	GND	P	Ground
31-32	LED-	P	LED Cathode
33	L/R	I	Horizonal inversion
34	U/D	I	Vertical inversion
35	VGL	P	Negative power for TFT
36	CABCEN1	I	CABC H/W enable

37	CABCEN0	I	CABC H/W enable
38	VGH	P	Positive power for TFT
39-40	LED+	P	LED Anode

NOTE:

Note1:If LVDS inout data is 6 bit,SELB must be set high
If LVDS inout data is 8 bit,SELB must be set low.

Note2:

When L/R=" 0" , set right to left scan direction.

When L/R=" 1" , set left to right scan direction.

When U/D=" 0" , set top to bottom scan direction.

When U/D=" 1" , set bottom to top scan direction

7. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp	$\theta=0^\circ$	-	500	-	Cd/m ²	1
Uniformity	ΔBp	$\Phi=0^\circ$	70	-	-	%	1,2
Viewing Angle	3:00	$Cr \geq 10$	-	65	-	Deg	3
	6:00		-	55	-		
	9:00		-	65	-		
	12:00		-	65	-		
Contrast Ratio	Cr	$\theta=0^\circ$ $\Phi=0^\circ$	300	500	-	-	4
Response Time	T _r		-	10	-	ms	5
	T _f	-	10	-	ms		
Color of CIE Coordinate	W	x	$\theta=0^\circ$ $\Phi=0^\circ$	0.28	-	-	1,6
		y		0.33	-	-	
	R	x		0.51	-	-	
		y		0.34	-	-	
	G	x		0.31	-	-	
		y		0.56	-	-	
	B	x		0.15	-	-	
		y		0.14	-	-	
NTSC Ratio	S	50	60	-	%		

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.

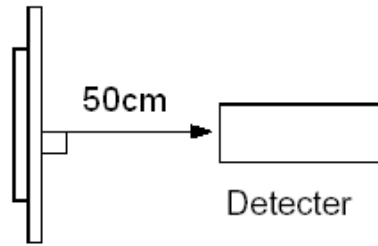
The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

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.

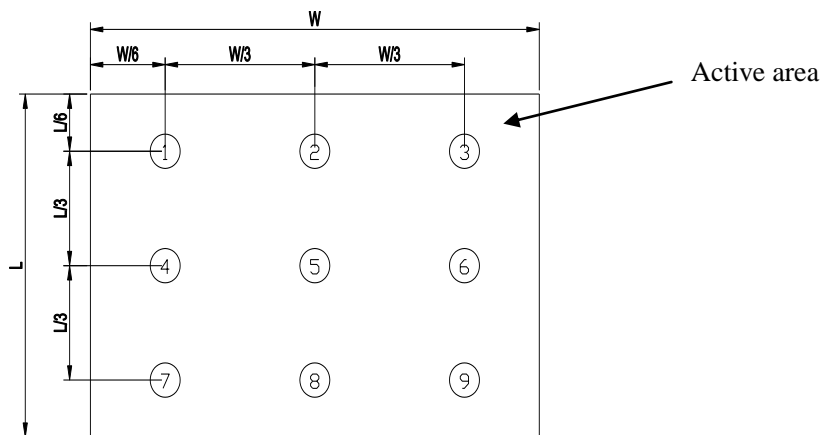


Note 2: The luminance uniformity is calculated by using following formula.

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

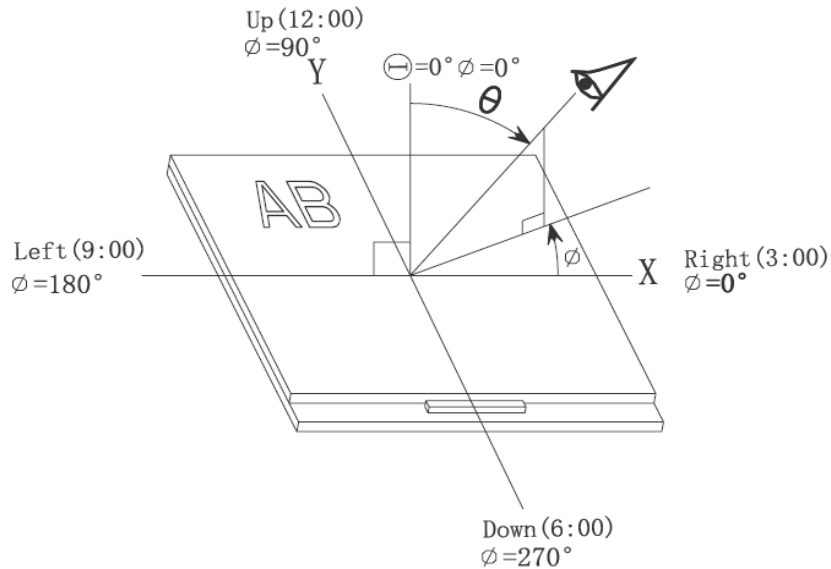
$Bp (\text{Max.})$ = Maximum brightness in 9 measured spots

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

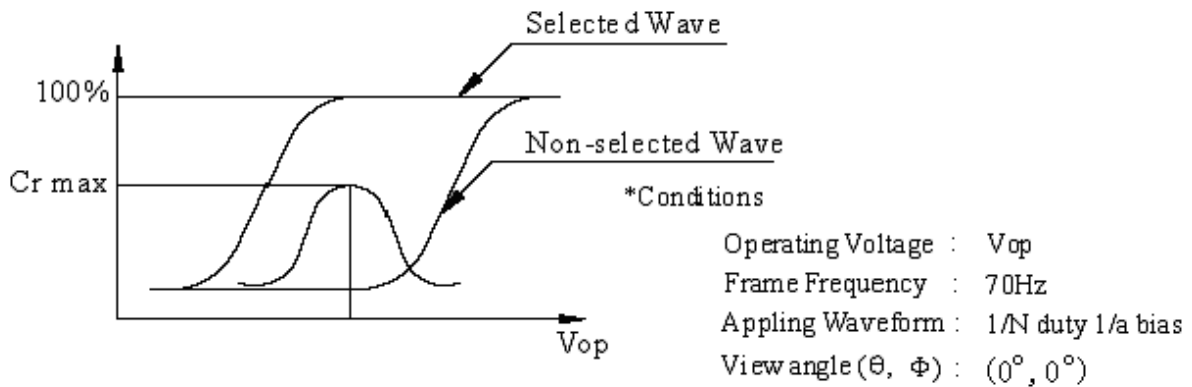


Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and ϕ



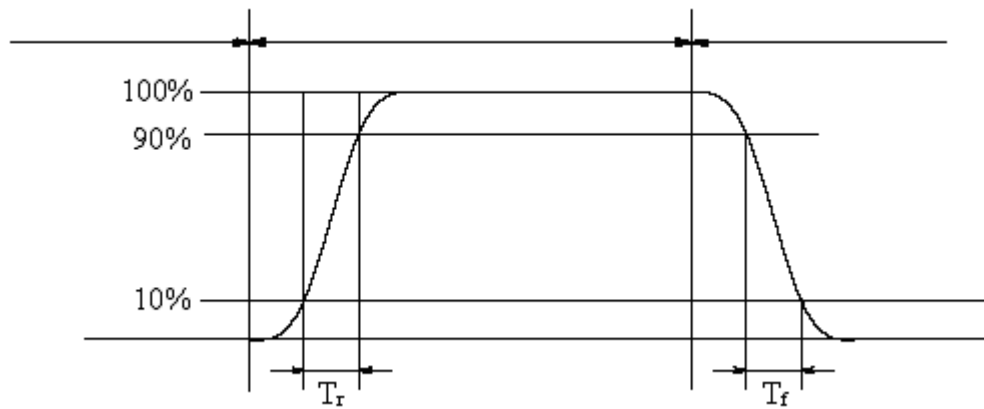
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



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

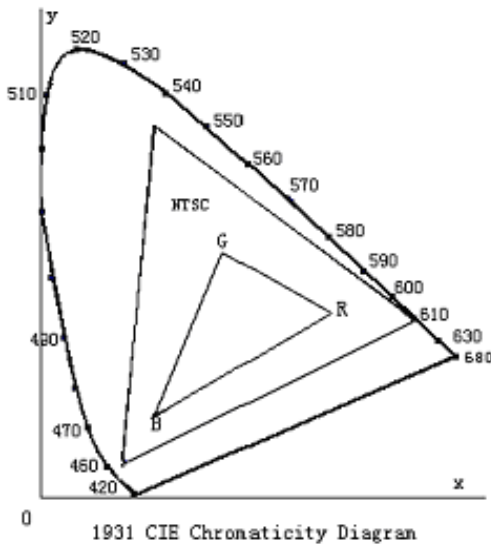
Note 5: Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes.Refer to figure as below.



The definition of response time

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

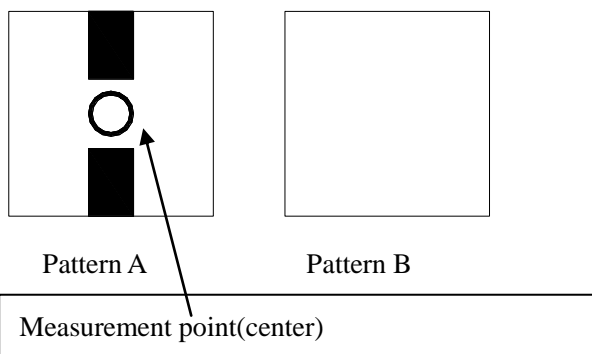


Color gamut:

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

Note 7: Definition of cross talk.

$$\text{Cross talk ratio}(\%) = \frac{|\text{pattern A Brightness} - \text{pattern B Brightness}|}{\text{pattern A Brightness}} \times 100$$



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	40°C±2°C 90%RH 96H Power on	
6	Temperature Cycle	-30°C ←————→ 80°C 30min 5min 30min after 5 cycle, Restore 2H at 25°C Power off	
7	Vibration Test	10Hz~150Hz, 100m/s ² , 120min	Not allowed cosmetic and electrical defects.
8	Shock Test	Half- sine wave, 300m/s ² , 11ms	

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°C ~ 40°C

Relatively humidity: ≤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.