

PRODUCT SPECIFICATIONS

For Customer: _____ ☐ : APPROVAL FOR SPECIFICATION

Customer Model No. _____ ☐ : APPROVAL FOR SAMPLE

Module No.: AT-T062HWH-01CP

Date : 2017-6-23

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For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT
John	Techshu		Dmjiaang



Date	Rev.No.	Page	Revision Items	Prepared
2017-06-23	V0		The first release	JOHN

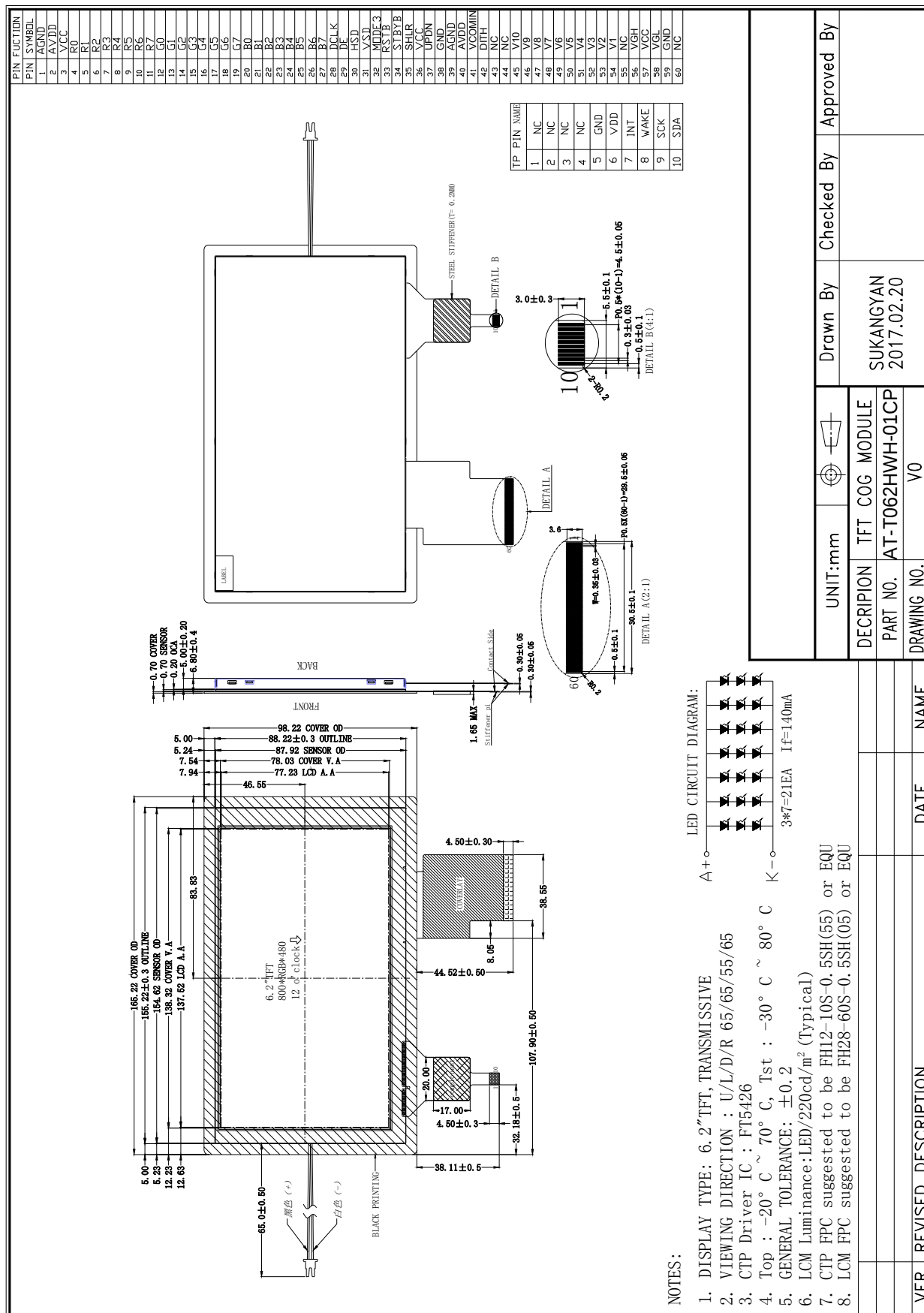


3. General Specifications

AT-T062HWH-01CP is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, FPC, a back light unit. The 6.2" display area contains 800 x 480 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)	137.52X77.23	mm	
Number of Dots	800×480	dots	
Controller	-	-	
Power Supply Voltage	3.3	V	
Outline Dimensions	Refer to outline drawing	-	
Backlight	3X7-LEDs (white)	pcs	
Weight	---	g	
Interface	RGB888	-	

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 _{CC}	-0.5	5.0	V	1, 2
	AV _{DD}	-0.5	15.0	V	
	V _{GH}	-0.3	40.0	V	
	V _{GL}	-20	0.3	V	
	V _{com}	0	6.0	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_{CC} > V_{SS} must be maintained.

5.2 Typical operation conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VCC	2.8	3.3	3.6	V	
	AVDD	9.9	10.0	10.1	V	
	VGH	12.0	15.0	23.0	V	
	VGL	-12.0	-7.0	-5.0	V	
Input signal voltage	VCOMIN	-	3.4	-	V	
Input logic high voltage	VIH	0.7 VCC	-	VCC	V	
Input logic low voltage	VIL	0	-	0.3VCC	V	



5.3 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30℃	80℃	-20℃	70℃	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. Ta≤40℃:85%RH MAX.

Ta>40℃:Absolute humidity must be lower than the humidity of 85%RH at 40℃.



6. Electrical Specifications and Instruction Code

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

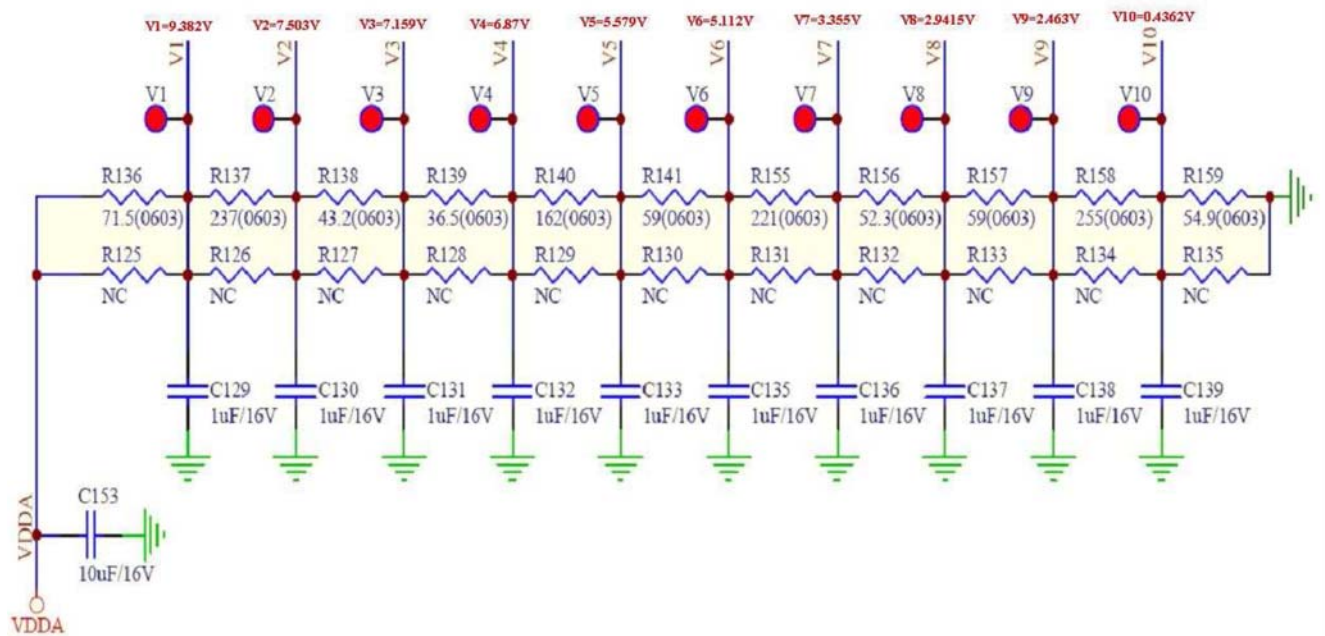
Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply	VCC	Ta=25°C	3.0	3.3	3.6	V	
Current Consumption	I _{DD}	VCC=3.3V	-	12.37	-	mA	1
	I _{ADD}	AVDD=10 V(Black)	-	13.599	-	mA	1
	I _{GH}	VGH=15V	-	0.099	-	mA	1
	I _{GL}	VGL=-7V	-	0.371	-	mA	1
Clock Frequency	f _{CLK}	-	-	30	40	MHz	

Note:

1: Tested in 1×1 chessboard pattern.

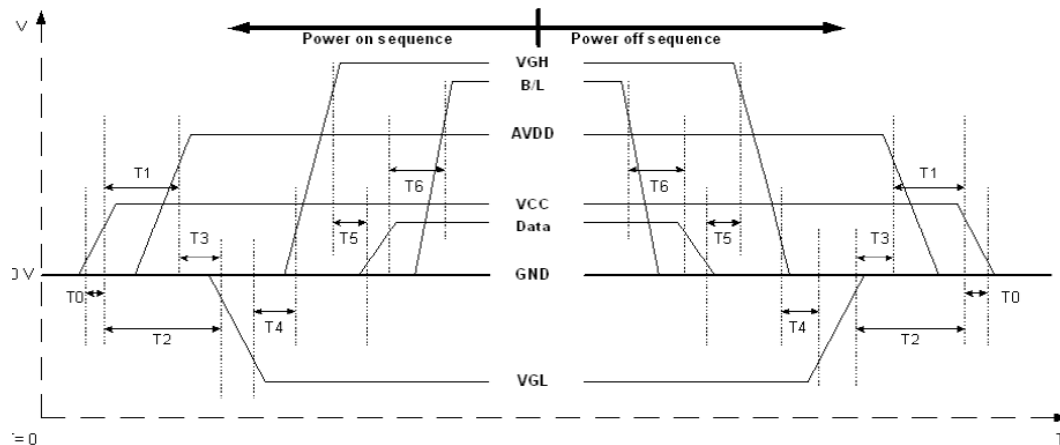


6.2 Gamma Correction Reference Voltage Setting

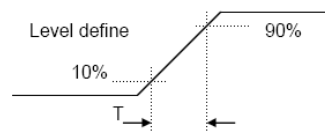




6.3 Power Sequence



Item	Min.	Typ.	Max.	Unit
T0	0.5	--	20	msec
T1	16			msec
T2	20			msec
T3	0			msec
T4	20		--	msec
T5	20			msec
T6	50			msec



Power On Sequence: VCC-> AVDD -> VGL -> VGH -> Data -> B/L

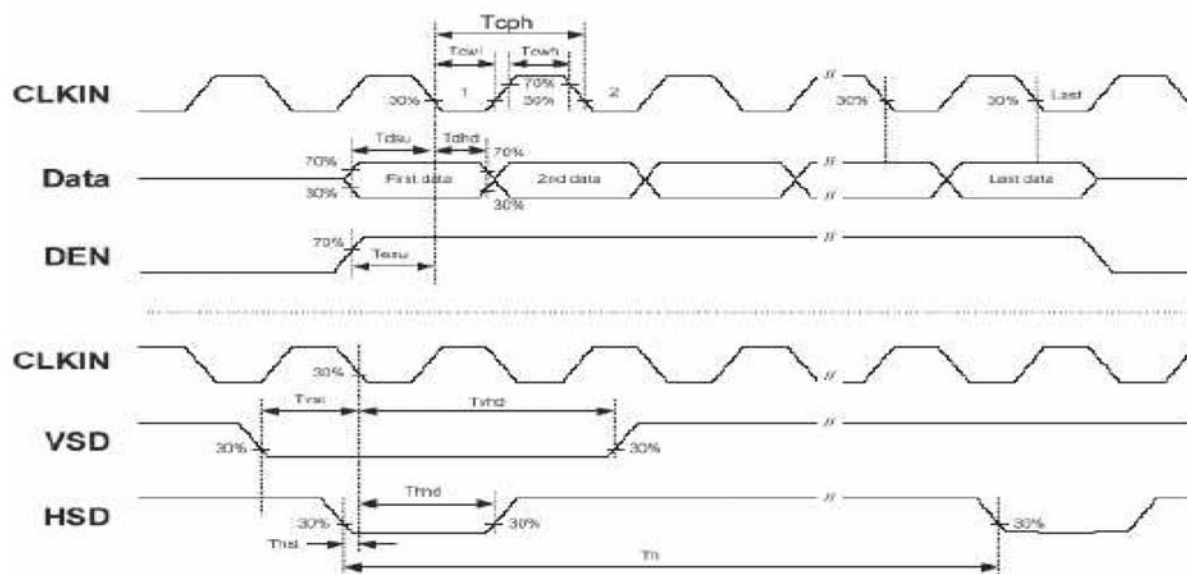
Power Off Sequence: B/L-> Data -> VGH -> VGL -> AVDD -> VCC

Notes: Data include R0~R7, G0~G7, B0~B7, HSD, VSD, DCLK, SHLR, UPDN, DE MODE, RSTB, STBYB, SHLR, UPDN, DITH



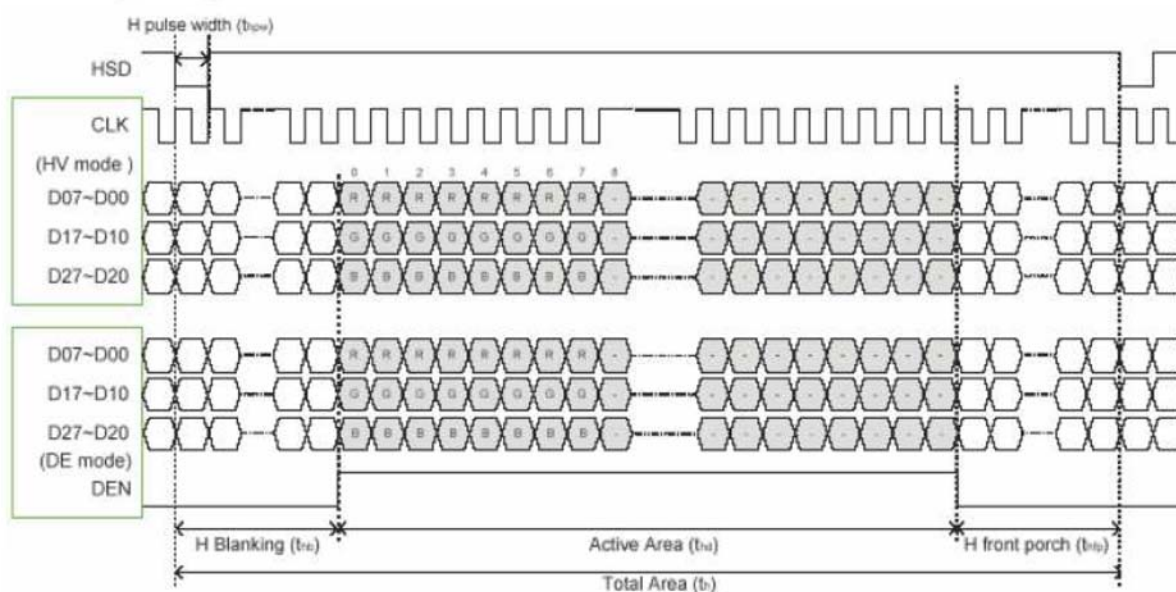
6.4 Timing Chart

Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK cycle time	Tcph	25			ns	
DCLK frequency	fclk		30	40	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSD setup time	Tvst	8			ns	
VSD hold time	Tvhd	8			ns	
HSD setup time	Thst	8			ns	
HSD hold time	Thhd	8			ns	
Data setup time	Tdsu	8			ns	
Data hold time	Tdhd	8			ns	
DE setup time	Tesu	8			ns	
DE hold time	Tehd	8			ns	
Horizontal display area	thd		800		Tcph	
HSD period time	th		928		Tcph	
HSD pulse width	thpw	1	48		Tcph	
HSD back porch	thb		88		Tcph	
HSD front porch	thfp		40		Tcph	
Vertical display area	tvd		480		th	
VSD period time	tv		525		th	
VSD pulse width	tvpw		3		th	
VSD back porch	tvb		32		th	
VSD front porch	tvfp		13		th	



Sampling clock timing

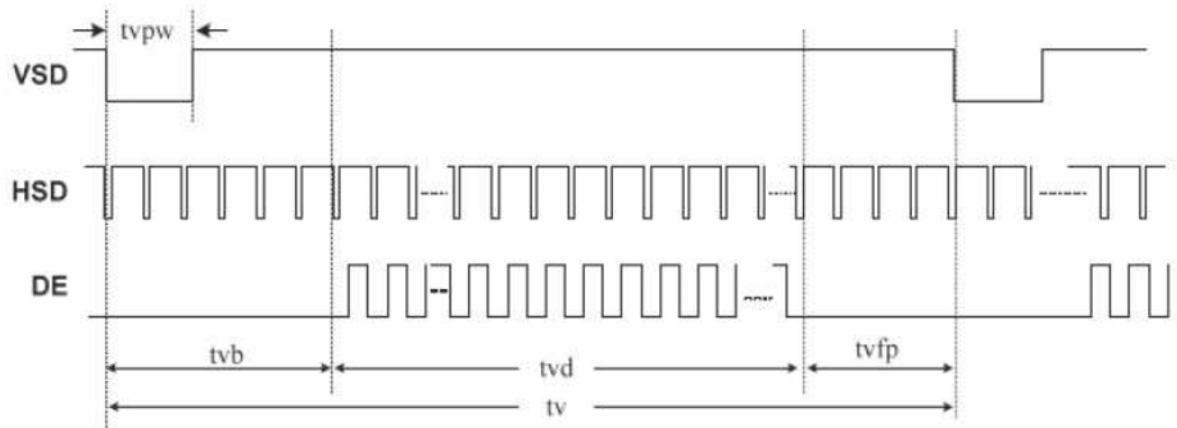
Horizontal input timing



Horizontal display timing range



Vertical input timing

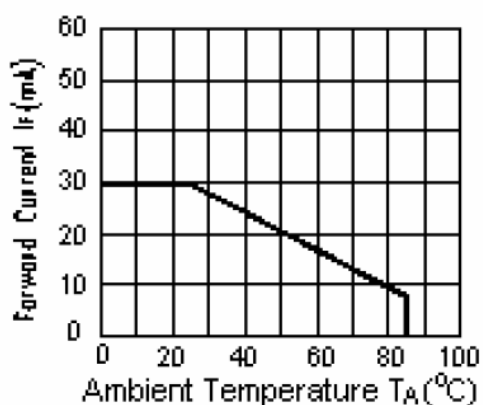


Vertical timing



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

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	Vf	If=20X7mA	-	9.0	-	V	
Uniformity	ΔBp	If=20X7mA	75			%	
Luminance for LCD	Lv	If=20X7mA	-	220		Cd/m2	
Life Time	T	If=20X7mA	-	30000		Hours	



6.6 CTP interface

Pin No	Symbol	I/O	Function
1-4	NC	-	No connect
5	GND	P	Ground
6	VDD	P	CTP Power supply
7	INT	I	External Interrupt to the IC of CTP
8	WAKE	I	Reset the display
9	SCK	I	Serial clock
10	SDA	I	Serial Input/output data bus



6.7 Interface signals

Pin No.	Symbol	I/O	Function
1	AGND	P	Ground.
2	AVDD	P	Power for Analog Circuit
3	VCC	P	Power for Digital Circuit
4-11	R0-R7	I	Red data input
12-19	G0-G7	I	Green data input
20-27	B0-B7	I	Blue data input
28	DCLK	I	Clock input
29	DE	I	Data Enable
30	HSD	I	Hsync signal input
31	VSD	I	Vsync signal input
32	MODE3	I	DE/SYNC mode select .normally pull high H:DE mode.L:HSD/VSD mode
33	RSTB	I	Reset
34	STBYB	I	Standby Mode Select;H:normal operation, L:standby mode
35	SHLR	I	Source right or left sequence control.SHLR="L",shift left:last data=S1<-S2...S1200=first data SHLR="H",shift right:first data=S1->SS2...S1200=last data
36	VCC	P	Power for Digital Circuit
37	UPDN	I	gate up or down scan control. UPDN="L" , DOWN shift : G1->G2...>G480 ; UPDN="H", up shift: G1<-G2...<-G480
38-39	GND	P	Power ground
40	AVDD	P	Power for Analog Circuit
41	VCOMIN	I	VCOM input
42	DITH	I	Dithering Setting. H:6bit Resolution,L:8bit Resolution
43-44	NC	-	No connection
45-54	V10-V1	I	Gamma Voltage 10-1
55	NC	-	No connection
56	VGH	I	Positive power for scan driver
57	VCC	P	Power for Digital Circuit
58	VGL	I	Negative power for scan driver
59	GND	P	Power ground
60	NC	-	No connection



7. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp	$\theta=0^\circ$ $\Phi=0^\circ$	-	220	-	Cd/m ²	1
Uniformity	Δ Bp		75	-	-	%	1,2
Viewing Angle	3:00	Cr $\geq$ 10	-	75	-	Deg	3
	6:00		-	70	-		
	9:00		-	75	-		
	12:00		-	70	-		
Contrast Ratio	Cr	$\theta=0^\circ$ $\Phi=0^\circ$	480	600		-	4
Response Time	T _r		-	2	4	ms	5
	T _f		-	6	12	ms	
Color of CIE Coordinate	W	x	0.253	0.303	0.353	-	1,6
		y	0.274	0.324	0.374	-	
	R	x	0.579	0.609	0.639	-	
		y	0.300	0.330	0.360	-	
	G	x	0.257	0.287	0.317	-	
		y	0.497	0.527	0.557	-	
	B	x	0.117	0.147	0.177	-	
		y	0.108	0.138	0.168	-	
NTSC Ratio	S		50	60	-	%	

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

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white.

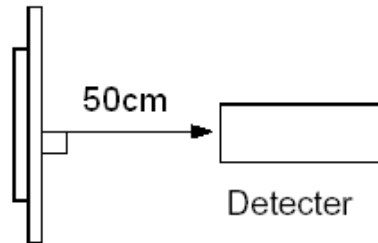
The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

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.

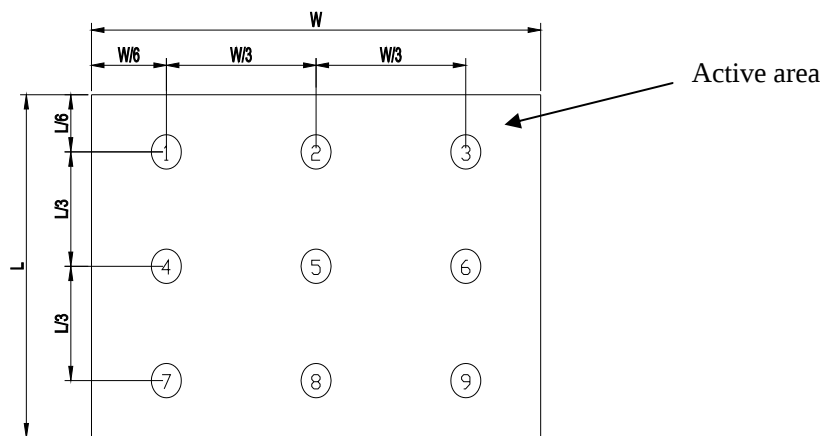


Note 2: The luminance uniformity is calculated by using following formula.

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

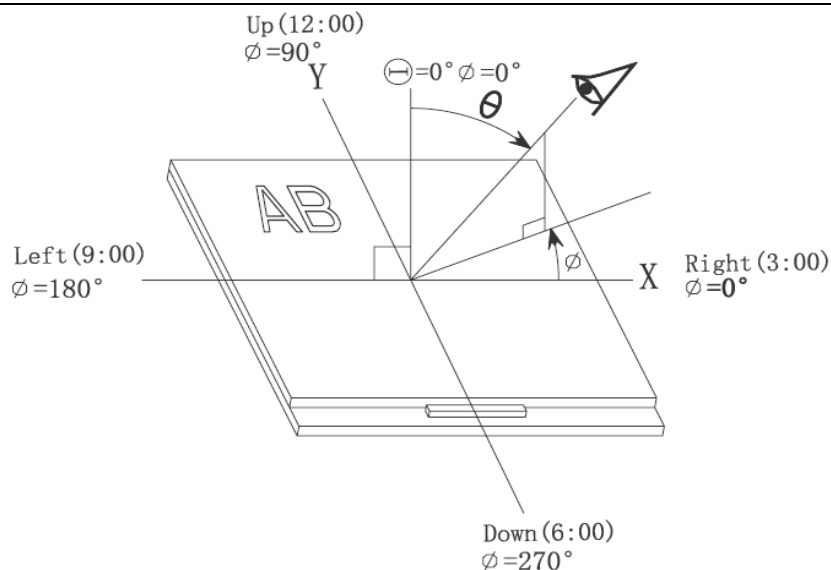
$Bp (\text{Max.})$ = Maximum brightness in 9 measured spots

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

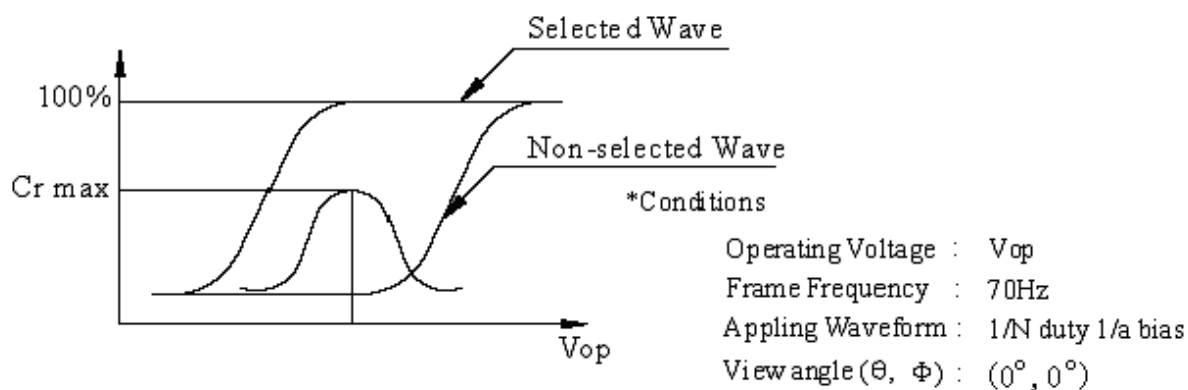


Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and ϕ



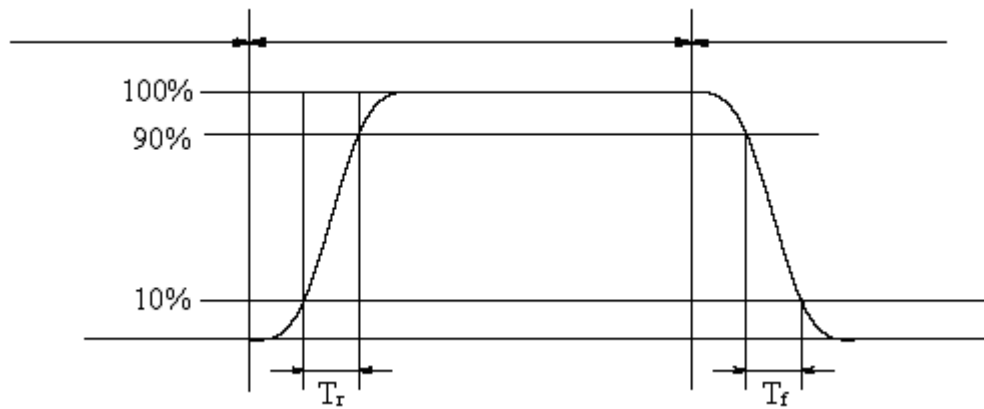
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



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

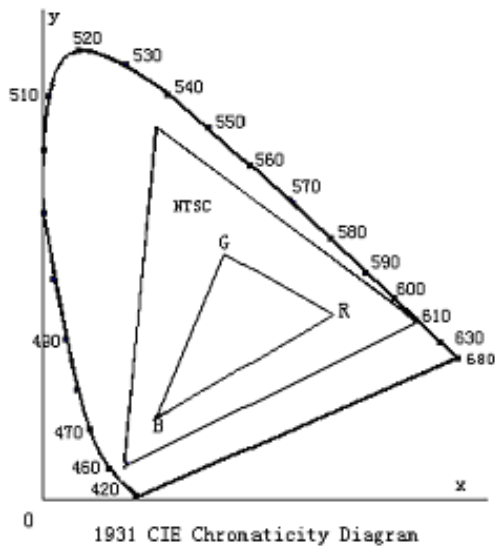
Note 5: Definition of Response time. (Test LCD using DMS501):

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.

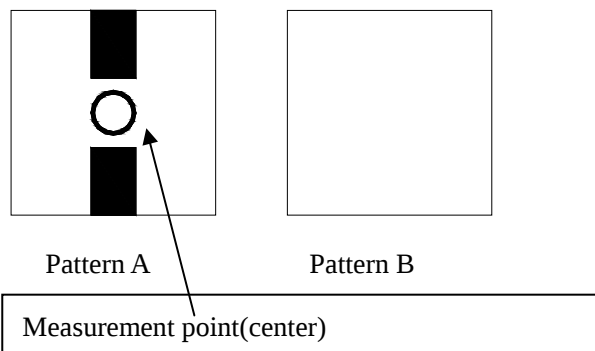


Color gamut:

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

Note 7: Definition of cross talk.

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

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.