

SPECIFICATION FOR LCD MODULE

Part No.:	MLT070W50-CT22
Customer No.:	
Spec Version:	03
Issued Date:	2016.11.23
Customer approval:	

Designed 设计者	Checked 审核者	Approved 核准者

※Please pay more attention for the “inspection standard”, we assume you already agree this standard when place an order with us.

※The specification of “TBD” should refer to the measured value of sample .

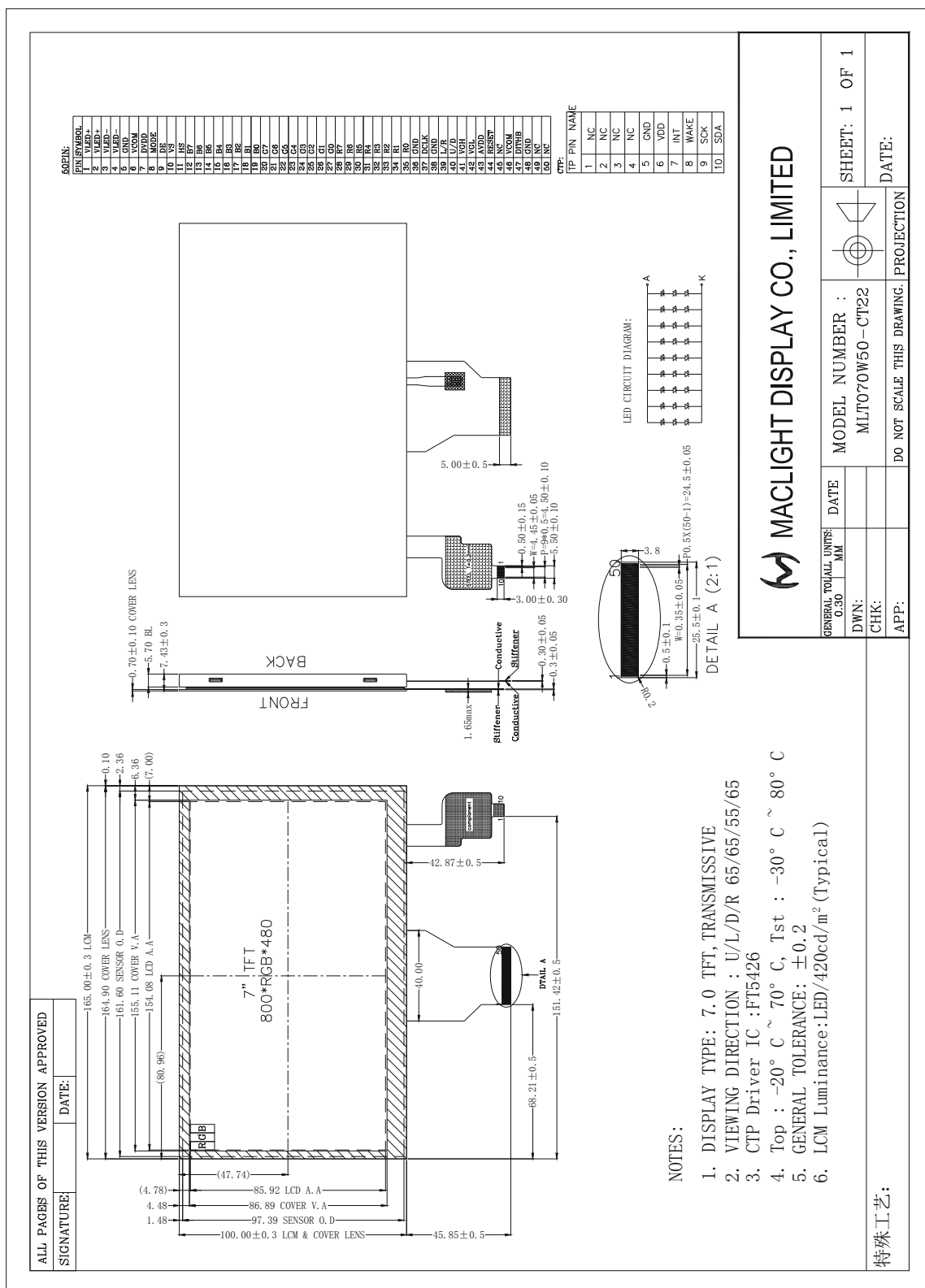
[illegible]

3. General Specifications

MLT070W50-CT22 is a TFT-LCD module. It is composed of a TFT-LCD panel, driver IC, CTP,FPC,a back light unit. The 7.0" display area contains 800 x 480pixels 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	℃	
Storage temperature	-30~+80	℃	
Module size	Refer to outline drawing	mm	
Active Area(W×H)	154.08X85.92	mm	
Number of Dots	800×480	dots	
Pixel Pitch (mm)	0.1926(W) X 0.1790(H)		
Controller	Equivalent to OTA7001A Or HX8264+HX8664	-	
CTP Controller	FT5426		
Power Supply Voltage	3.3	V	
Outline Dimensions	Refer to outline drawing	-	
Backlight	3X9-LEDs (white)	pcs	
Weight	---	g	
Interface	RGB-24bit	-	

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 _{DVDD}	-0.3	3.6	V	1, 2
	V _{AVDD}	6.5	13.5	V	1, 2
	V _{GH}	-0.3	40.0	V	1
	V _{GL}	-20.0	0.3	V	1
	V _{GH} -V _{GL}	-	40.0	V	1

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 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. Ta<=40°C:85%RH MAX.

Ta>=40°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 ,T_a=25°C)

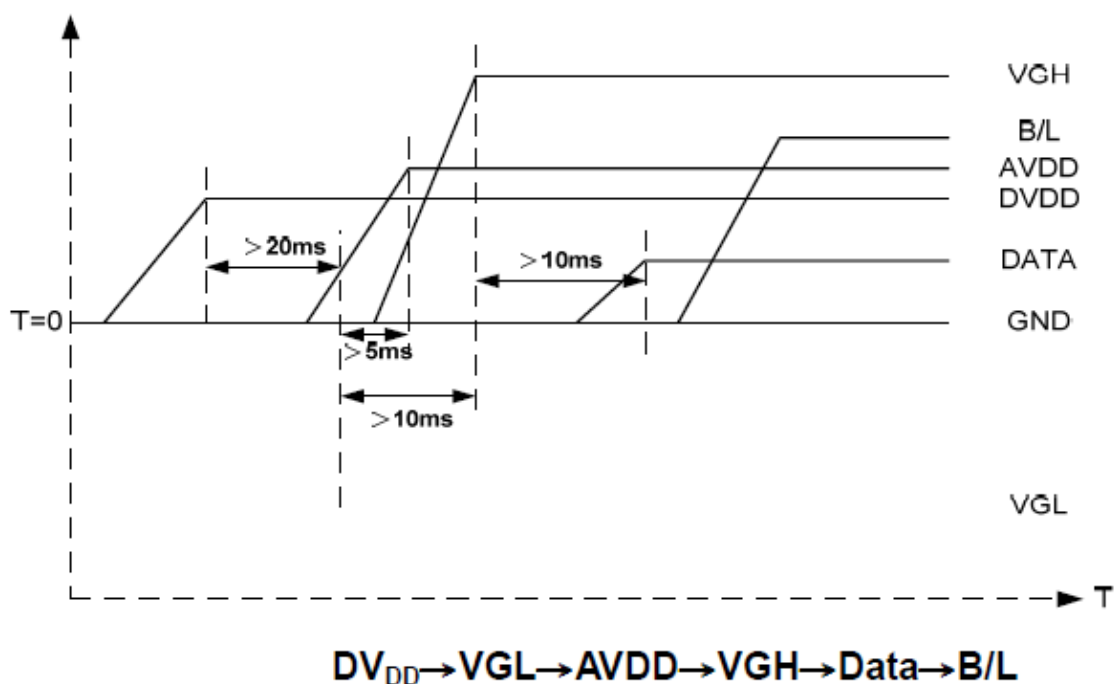
Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		DVDD	T _a =25°C	3.0	3.3	3.6	V	
		AVDD	T _a =25°C	10.2	10.4	10.6	V	
		VGH	T _a =25°C	15.3	16.0	16.7	V	
		VGL	T _a =25°C	-7.7	-7.0	-6.3	V	
		VCOM	T _a =25°C	3.6	3.8	4.0	V	
Input voltage	'H'	V _{IH}	V _{DVDD} =3.3V	0.8V _{DVDD}	-	V _{DVDD}	V	
	'L'	V _{IL}	V _{DVDD} =3.3V	0	-	0.2V _{DVDD}	V	
Current Consumption		I _{DD1}	Normal mode	-	35	50	mA	1
		I _{DD2}	Sleep mode	-	0.05	0.1	mA	1
		I _{GH}	VGH=16.0V	-	0.2	1.0	mA	
		I _{GL}	VGL=-7.0V	-	0.2	1.0	mA	
		I _{DVDD}	DVDD=3.3V	-	4.0	10	mA	
		I _{AVDD}	AVDD=10.4V	-	20	50	mA	
Clock Frequency		f _{CLK}	-	-	30	50	MHz	

Note:

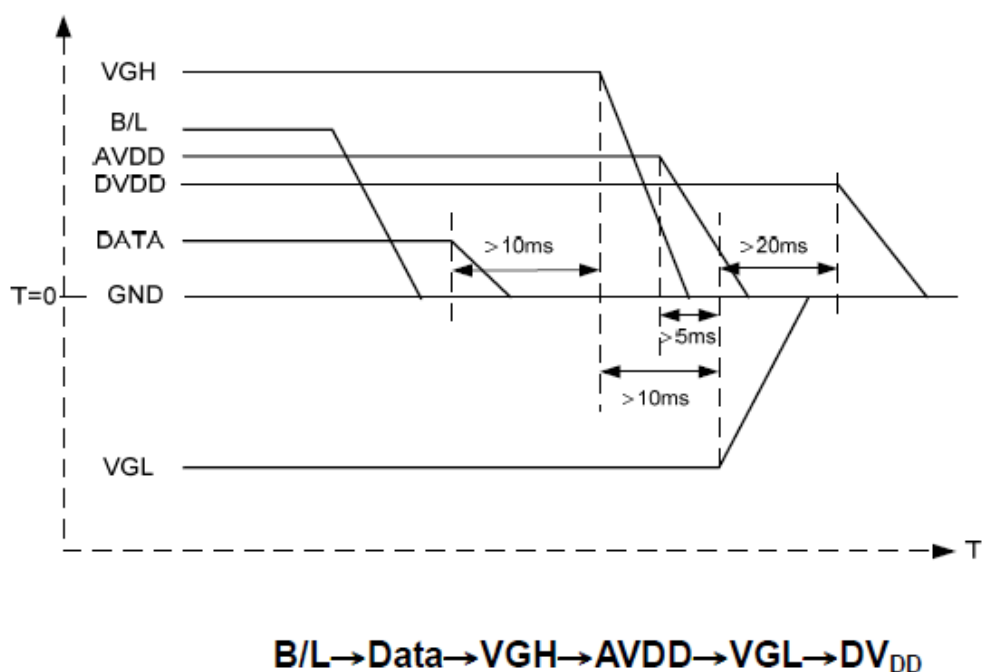
1: Tested in 1×1 chessboard pattern.

6.2 Power Sequence

a. Power on:



b. Power off



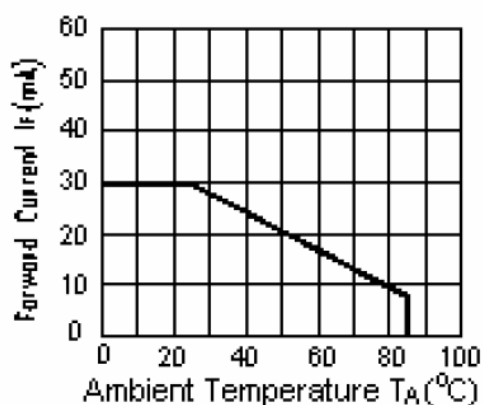
Note: Data include R0~R7, B0~B7, GO~G7, U/D, L/R, DCLK, HS, VS, DE.

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

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	Vf	If=20X9mA	-	9.0	-	V	
Uniformity	ΔBp	If=20X9mA	75			%	
Luminance for LCD (W/O CTP)	Lv	If=20X9mA	-	500		Cd/m2	
LED Life Time	-	If=20X9mA	-	50000	-	Hours	

Note:

1)



I_{LED} VS TEMP

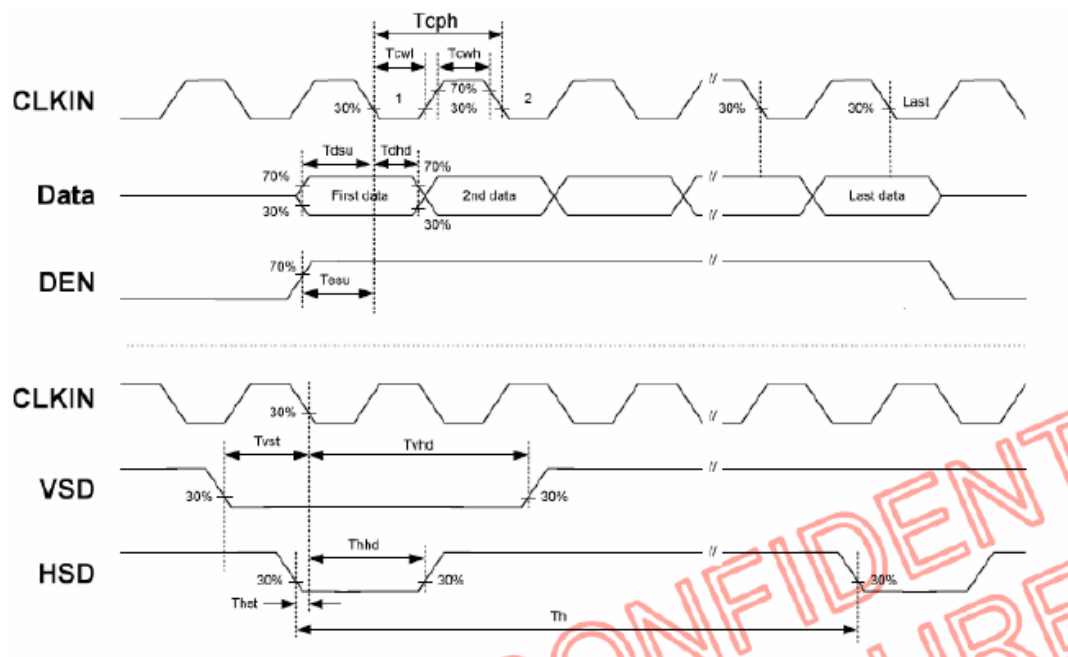
2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^\circ\text{C}$ and $I_L=180\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 180mA.

6.4 Timing characteristics

AC Electrical Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	T_{hst}	8	-	-	ns	
HS hold time	T_{hhd}	8	-	-	ns	
VS setup time	T_{vst}	8	-	-	ns	
VS hold time	T_{vhd}	8	-	-	ns	
Data setup time	T_{dsu}	8	-	-	ns	
Data hole time	T_{dhd}	8	-	-	ns	
DE setup time	T_{esu}	8	-	-	ns	
DE hole time	T_{ehd}	8	-	-	ns	
DV _{DD} Power On Slew rate	T_{POR}	-	-	20	ms	From 0 to 90% DV _{DD}
RESET pulse width	T_{Rst}	1	-	-	ms	
DCLK cycle time	T_{coh}	20	-	-	ns	
DCLK pulse duty	T_{cwh}	40	50	60	%	

Input Clock and data timing diagram:



Timing:

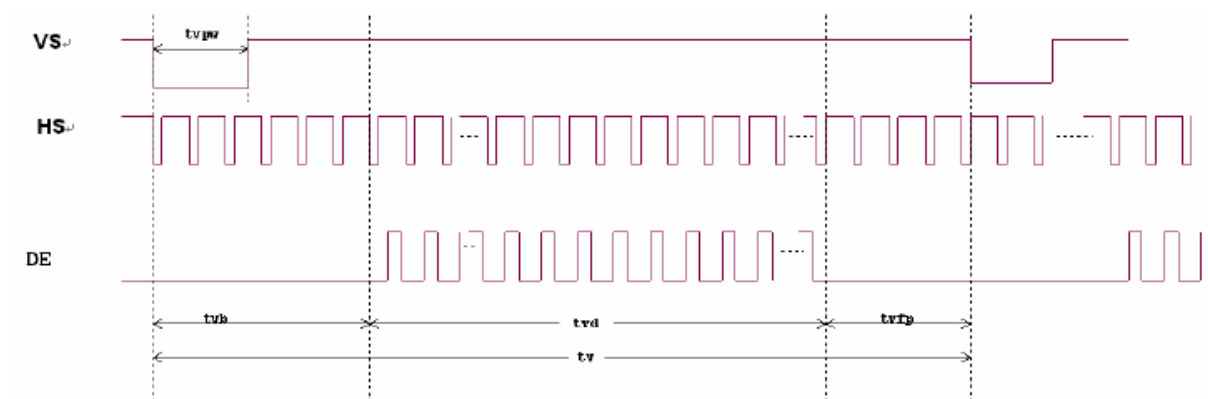
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

6.5 Data input format:



Horizontal input timing diagram



Vertical input timing diagram

6.4 Interface signals

Pin No.	Symbol	I/O	Function
1-2	VLED+	P	LED back light(Anode)
3-4	VLED-	P	LED back light(Cathode)
5	GND	P	Ground.
6	VCOM	P	Common voltage
7	DVDD	P	Power supply
8	MODE	I	DE/YSNC mode select
9	DE	I	Data enable pin
10	VSYNC	I	Frame sync signal
11	HSYNC	I	Line sync signal
12-19	B7~B0	I	Blue data bus
20-27	G7~G0	I	Green data bus
28-35	R7~R0	I	Red data bus
36	GND	P	Ground.
37	DCLK	I	Data clock
38	GND	P	Ground.
39	L/R	I	Right/Left sequence control of source driver
40	U/D	I	Gate driver Up/Down scan control of gate driver
41	VGH	I	Gate on voltage
42	VGL	P	Gate off voltage
43	AVDD	P	power for analog circuit
44	RESET	I	Chip reset pin
45	NC	-	No connection.
46	VCOM	P	Common voltage
47	DITHB	I	Dithering function
48	GND	P	Ground
49-50	NC	-	No connection.

CTP interface

Pin No	Symbol	I/O	Function
1-4	NC	-	No connection.
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	SCL	I	Serial clock
10	SDA	I	Serial Input/output data bus

7. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness (With CTP)	Bp	$\theta=0^\circ$	350	420	-	Cd/m ²	1
Uniformity	Δ Bp	$\Phi=0^\circ$	75	-	-	%	1,2
Viewing Angle	3:00	$Cr \geq 10$	55	65	-	Deg	3
	6:00		55	65	-		
	9:00		45	55	-		
	12:00		55	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	0.23	0.28	0.33	-	1,6
		y	0.28	0.33	0.38	-	
	R	x	0.46	0.51	0.56	-	
		y	0.29	0.34	0.39	-	
	G	x	0.26	0.31	0.36	-	
		y	0.51	0.56	0.61	-	
	B	x	0.14	0.15	0.2	-	
		y	0.09	0.14	0.19	-	
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.

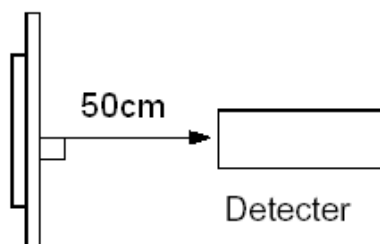
The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

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.

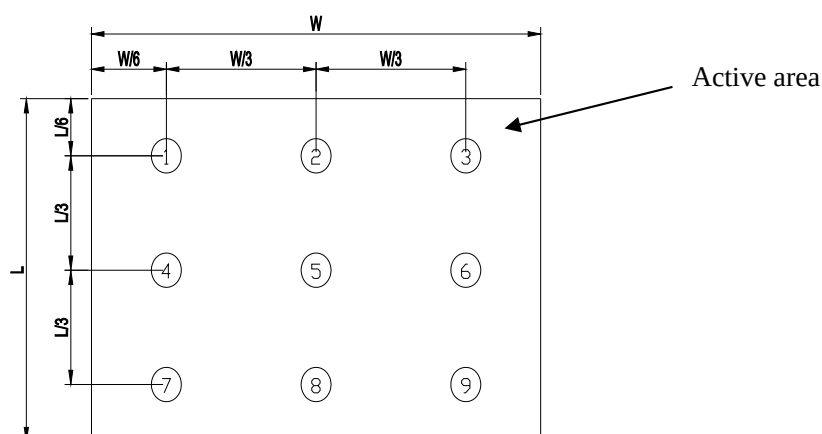


Note 2: The luminance uniformity is calculated by using following formula.

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

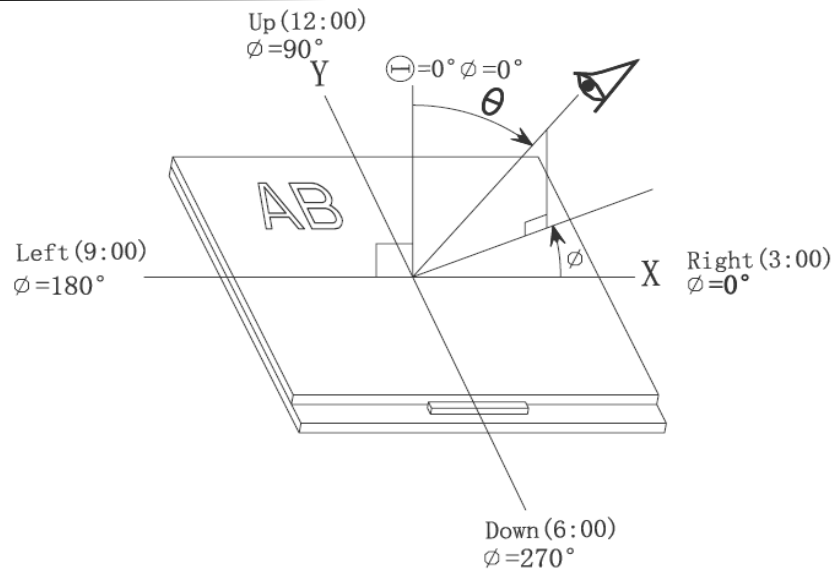
Bp (Max.) = Maximum brightness in 9 measured spots

Bp (Min.) = Minimum brightness in 9 measured spots.

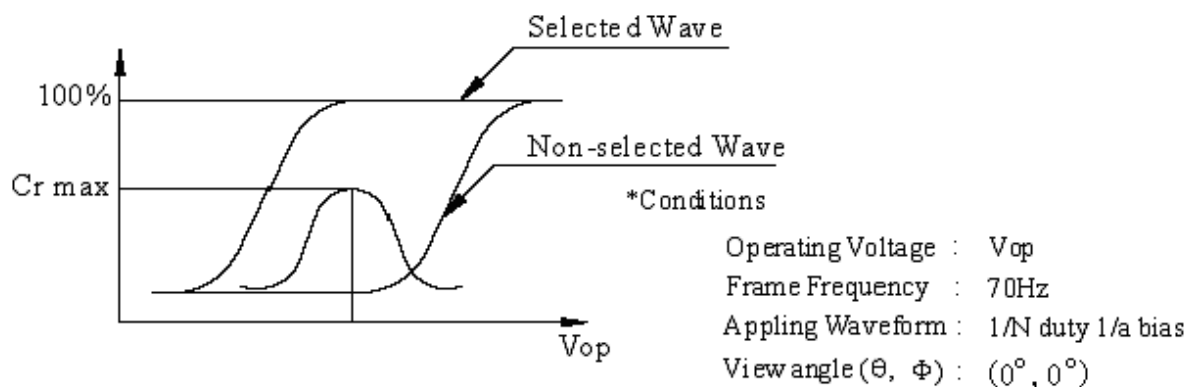


Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and ϕ



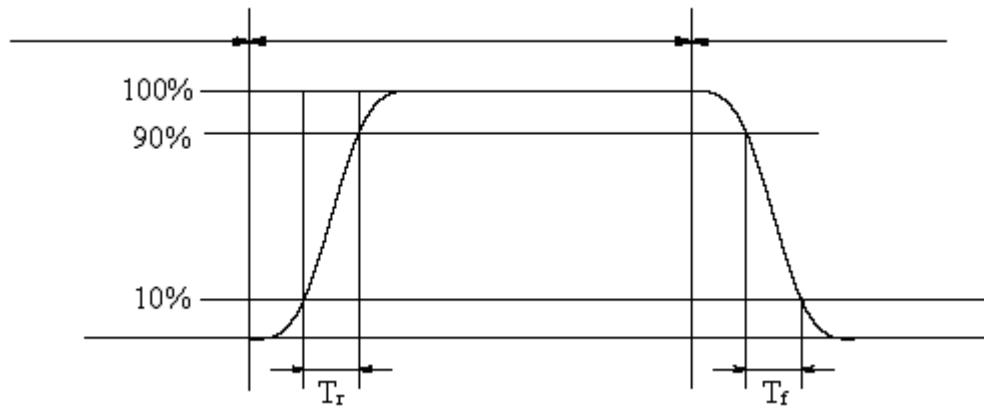
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



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

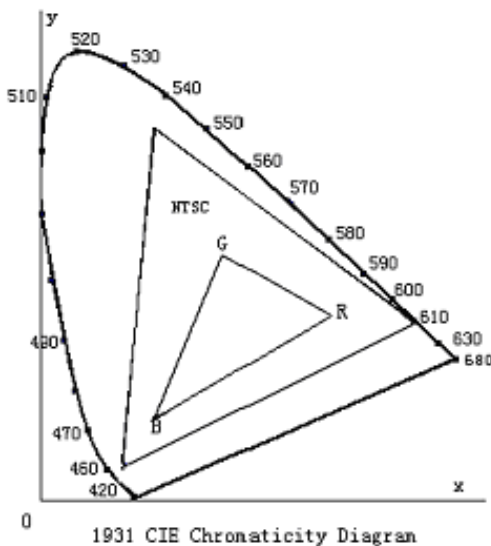
Note 5: Definition of Response time. (Test LCD using DMS501):

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.

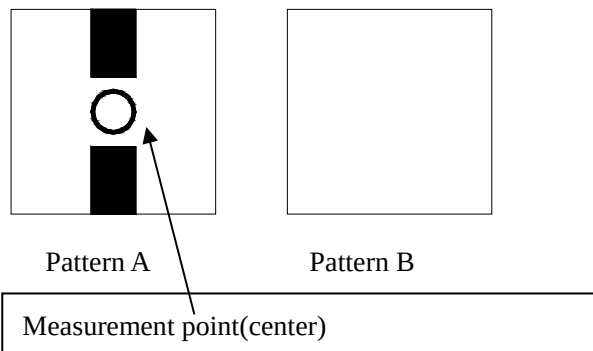


Color gamut:

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

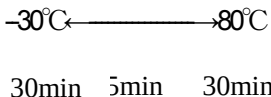
Note 7: Definition of cross talk.

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	 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 2.8V 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.