

SPECIFICATION

[☒] Preliminary Specification
[] Final Specification

Description 10.1” 1024xRGBx600 TFT-LCD Module
Part Number P1010WSF1MB00

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* This cover page is for your Comments and Signatures back to TIANMA.

REVISION HISTORY

Rev	Date	Page	Revision Items	Editor
1.0	2024/08/27	-	Preliminary SPEC released.	Tingting Hou
1.1	2025/01/06		Update LED lifetime in page 7 Update “Data input timing table” in page 10 Update “Optical Characteristics” in page 11	Tingting Hou
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1. Summary

1.1 General Description

This is a 10.1 inch a-Si TFT-LCD module with Normal- black technology. It is composed of a TFT-LCD panel, a driver circuit, and a LED backlight unit

1.2 Features

- Interface: RGB
- Surface treatment AG
- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03 (File number: TBD)
- This product will comply with the European RoHS directive (2011/65/EU) and Delegated Directive (2015/863/EU,Amending Annex II of 2011/65/EU)

2. General Specification

Feature		Spec	Unit
Display Spec.	Size	10.1 inch	
	Resolution	1024(RGB)x600	
	Pixel Pitch (mm)	0.2175x0.2088	mm
	TFT Active Area	222.72 x 125.28	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	SFT, Normally Black	
	Surface Treatment	Anti-Glare	
	Viewing Direction	All viewing angle	
	Gray Scale Inversion Direction	No gray scale inversion	
Mechanical Characteristics	LCM (W x H x D)	235.00 x 143.00 x 4.9	mm
	Weight	TBD	g
Optical Characteristics	Luminance	Typ 700	cd/m ²
	Contrast ratio	Typ1000	
	NTSC	Typ 50	%
	Viewing angle(R/L/U/D)	Typ 85/85/85/85	degree
Electrical Characteristics	Interface	RGB interface	
	Color Depth	262K/16.7M	color
	Power consumption	LCD:TBD(white pattern) Backlight: TBD	mW

Table 2.1 General TFT Specifications

Note 1: LCM weight tolerance: $\pm 5\%$

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD matching connector	089H50-000100-G2-R

Table 3.1.1 Connector information

No	Symbol	I/O	Description	Comment
1	NC	N	No connection	
2	NC	N	No connection	
3	NC	N	No connection	
4	NC	N	No connection	
5	GND	p	Power GND	
6	NC(CS)	N	It is used only by internal OTP and must be disconnected	Note 3
7	DVDD	P	LCD power supply	
8	MODE	I	SYNC and DE selection pin(H DE,L SYNC)	
9	DE	I	Data input enable	
10	VS	I	Vertical sync input	
11	HS	I	Horizontal sync input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	
19	B0	I	Blue data(LSB)	
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	
26	G1	I	Green data	
27	G0	I	Green data(LSB)	

28	R7	I	Red data(MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	
35	R0	I	Red data(LSB)	
36	GND	P	Power GND	
37	DCLK	I	TTL clock input pin	
38	GND	P	Power GND	
39	SHLR	I	Horizontal scan direction(H Right-->Left,L Right<--Left)	Note 2
40	UPDN	I	Vertical scan direction(H Bottom-->Top,L Bottom<--Top)	Note 2
41	VGH	P	Positive power for TFT	
42	VGL	P	Negative power for TFT	
43	AVDD	P	Analog power	
44	RESET	I	Global reset pin	
45	NC(SDIO)	N	It is used only by internal OTP and must be disconnected	Note 3
46	NC(SCL)	N	It is used only by internal OTP and must be disconnected	Note 3
47	GND	P	Power GND	
48	GND	P	Power GND	
49	NC	N	No connection	
50	NC	N	No connection	

Table 3.1.2 Pin Assignment for LCD Interface

Note1: I/O definition: I---Input, O---Output, P---Power/Ground, N---No connection

Note2: Scan direction is shown as below (PCB at down side):



SHLR=L AND UPDN L



SHLR=H AND UPDN H

Note3: For internal OTP use only, the client must be disconnected.

3.2 CN2 Pin assignment (Backlight Interface)

Connector Information	
Backlight matching connector	FH64MA-7S-0.25SHW

Table 3.2.1 Connector information

No	Symbol	I/O	Description	Comment
1	LEDA	P	LED driving anode (high voltage)	
2	LEDA	P	LED driving anode (high voltage)	
3	LEDA	P	LED driving anode (high voltage)	
4	NC	N	No connection	
5	NC	N	No connection	
6	LEDK	P	LED driving cathode (low voltage)	
7	LEDK	P	LED driving cathode (low voltage)	

Table 3.2.2 Pin Assignment for backlight Interface

4. Absolute Maximum Ratings

GND=0V

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VCC	-0.3	3.96	V	
Input voltage	V _{IN}	-0.3	3.96	V	Note 1
LED power supply Voltage	BLK	/	/	V	
Operating Temperature	TOPR	-20	70	°C	Note2、 Note3
Storage Temperature	TSTG	-30	80	°C	
Relative Humidity Note1	RH	--	≤95	%	Ta≤40°C
		--	≤85	%	40°C < Ta≤50°C
		--	≤55	%	50°C < Ta≤60°C
		--	≤36	%	60°C < Ta≤70°C
Absolute Humidity	AH	--	≤70	g/m ³	Ta>70°C

Table 4.1 Absolute Maximum Ratings

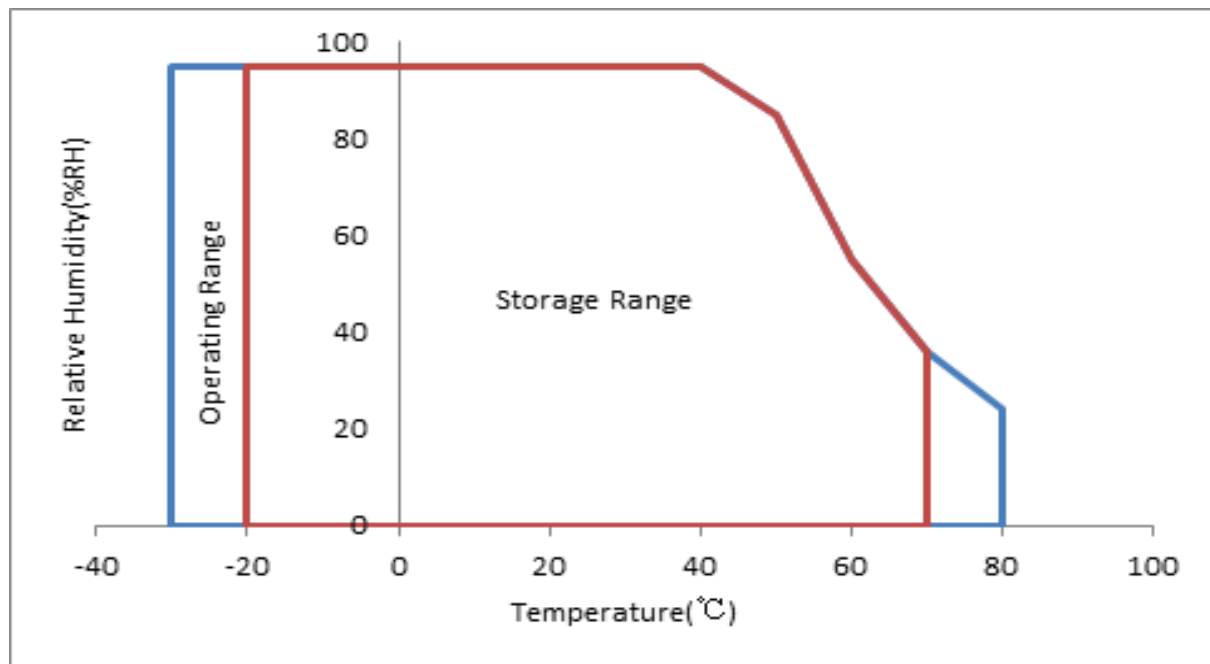


Table 4.2 Absolute Maximum Ratings chart

Note1: Input voltage include REVERSE、SEL6/8

Note2: Ta means the ambient temperature.

It is necessary to limit the relative humidity to the specified temperature range.
Condensation on the module is not allowed.

Note3: The absolute maximum rating values of this product are not allowed to be exceeded at any times.
When exceeded the maximum ratings, the characteristics of the module may not be recovered, or in an extreme condition, the module may be permanently destroyed.

5. Electrical Characteristics

5.1 DC Characteristics for Panel Driving

GND=0V, Ta = 25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage	VCC	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	VIL	--	0.2×VDD	V	
	High Level	VIH	--	VDD	V	
Power Consumption	60Hz	P	--	TBD	mW	White pattern

Note 1: Input Signal Voltage include MODE,SHLR,UPDN,RES

Table 5.1.1 Operating Voltages

5.2 DC Characteristics for Backlight Driving

GND=0V, Ta = 25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	-	140	TBD	mA	16 LEDs (2 LED Parallel,8 LED Serial)
Forward Current Voltage	VF	21	25.6	27.2	V	
Backlight Power Consumption	WBL	--	3584		mW	
LED life time	--	30000	50000	-	Hrs	

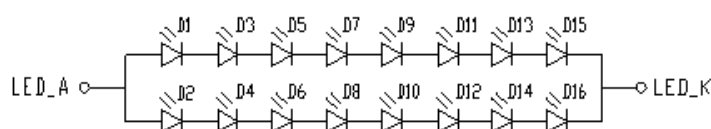
Table 5.2.1 LED Backlight Characteristics

Note1: I_F is defined for total current

Note2: Optical performance should be evaluated at Ta=25°C only.

Note3: If LED is driven by high current, high ambient temperature & humidity condition, The life time of LED will be reduced.

Note4: Operating life means brightness goes down to 50% of initial brightness. Typical operating life time is estimated data.



Backlight Circuit Diagram

5.3 Recommended Power ON/OFF Sequence

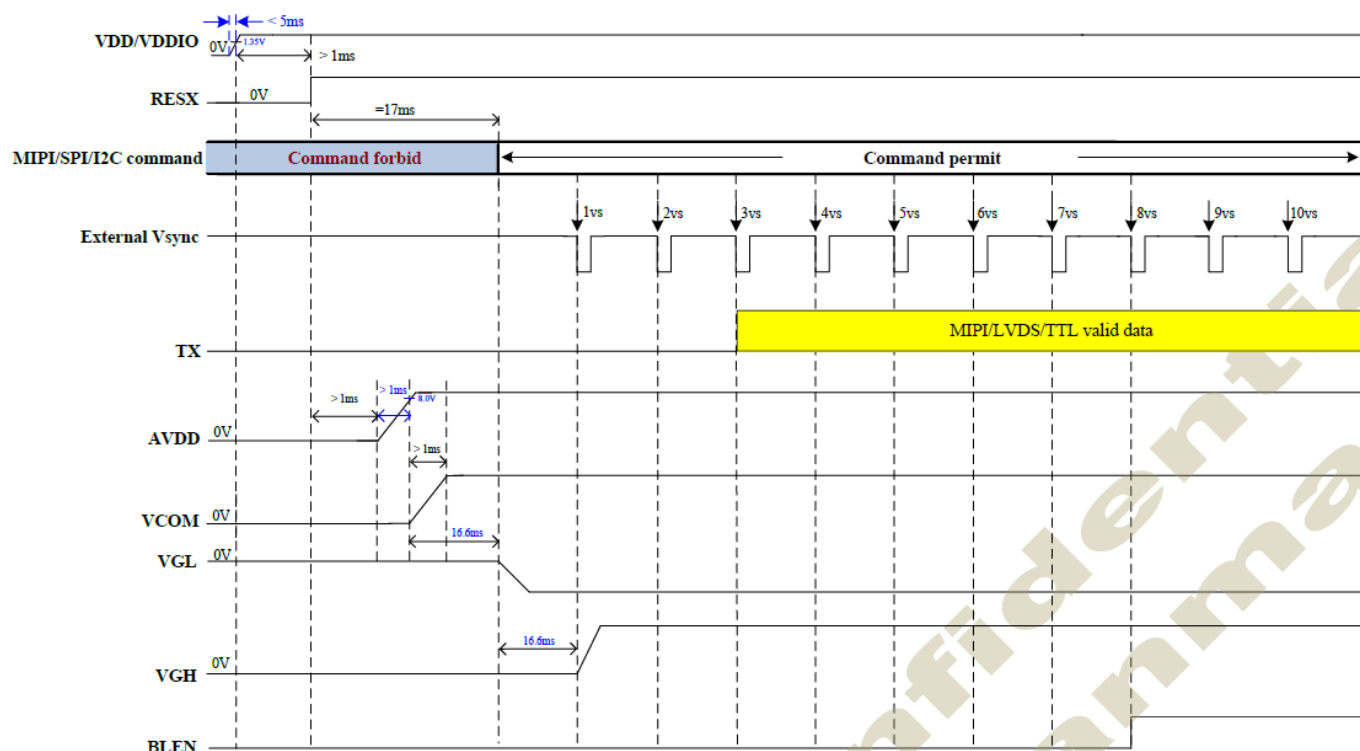


Table 5.3.1 Power ON Sequence

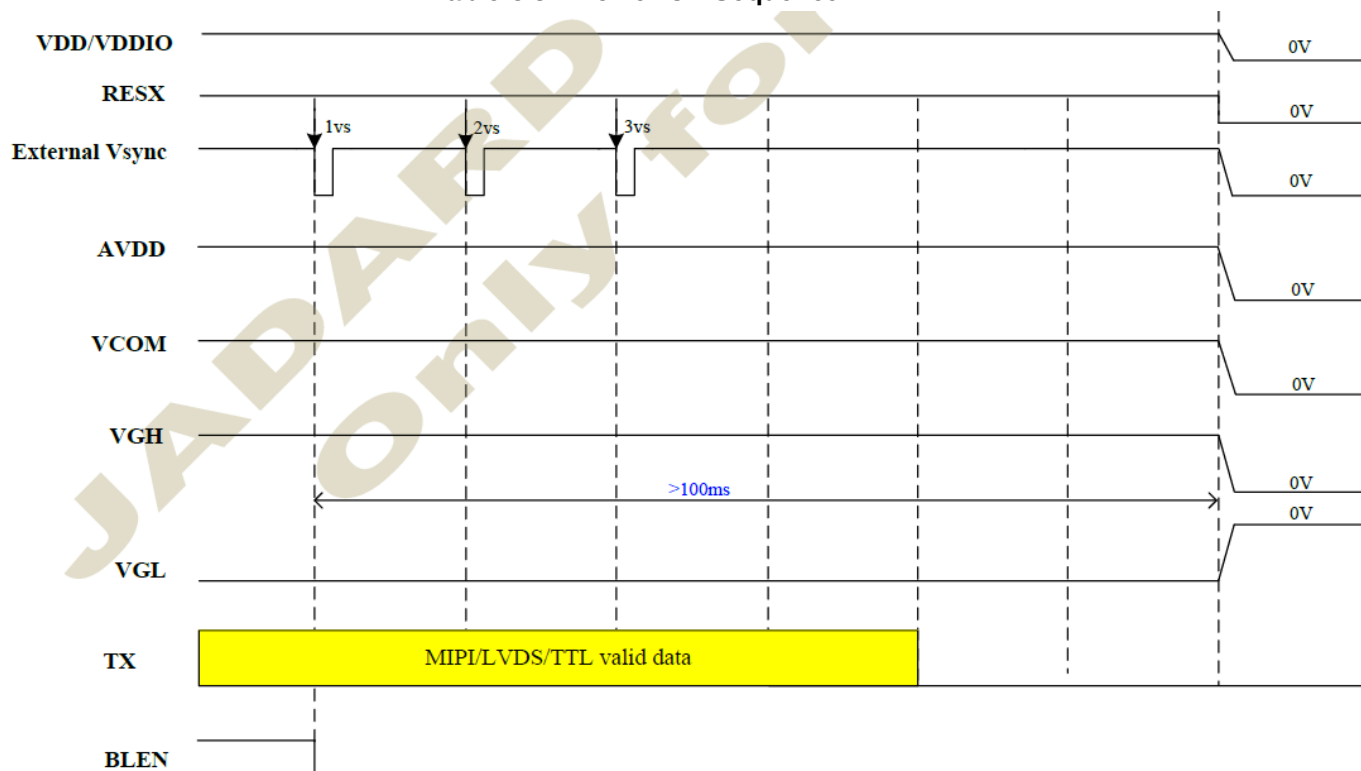


Figure 5.3.2 Power OFF Sequence

Note1: The low level of these signals and analog powers are GND level.

Note2: All of the power and signals should be kept at GND level before power on. If there are residual voltages on them, the LCD might not work properly.

Note3: Keep backlight turned off until the display has stabilized.

5.4 LCD Module Block Diagram

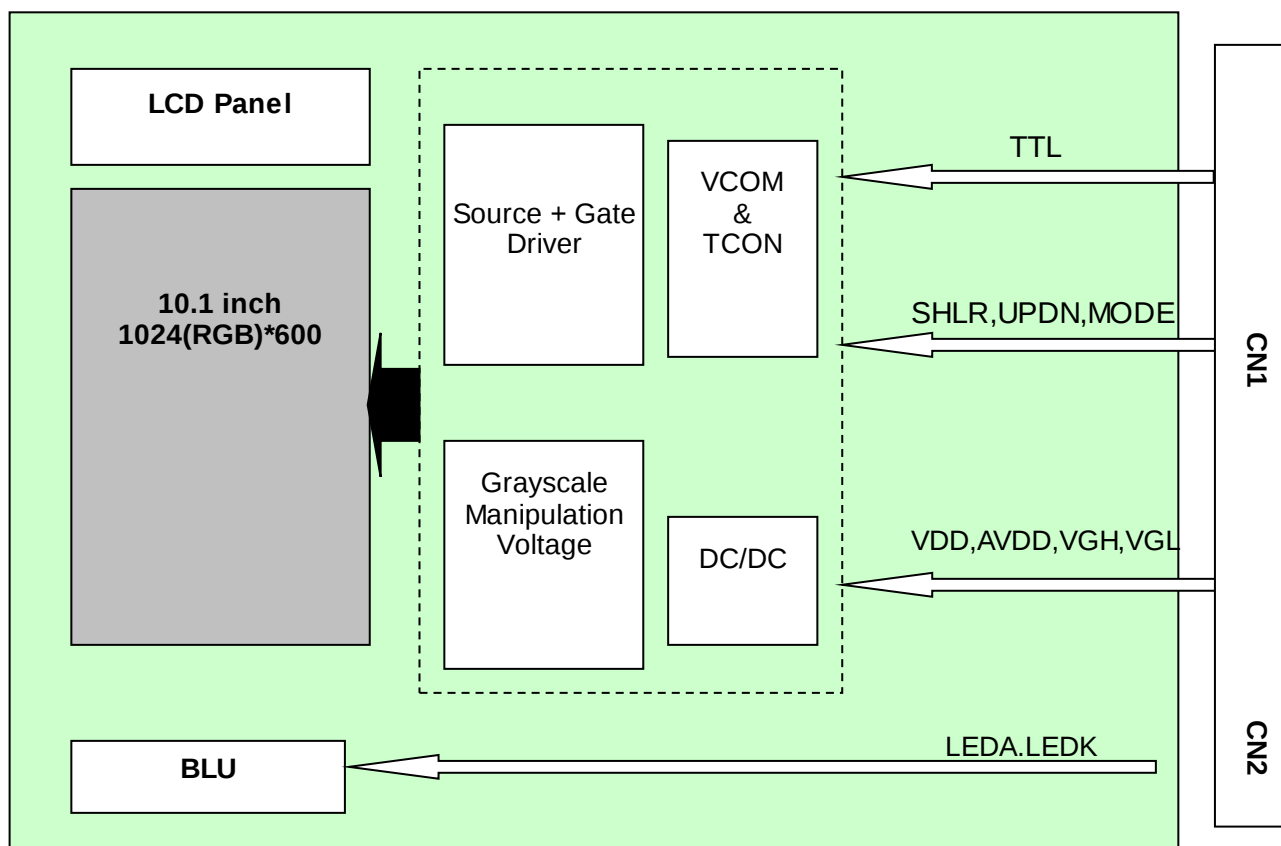


Figure 5.4.1 LCD Module Block Diagram

6. Timing Characteristics

6.1 Data input timing table

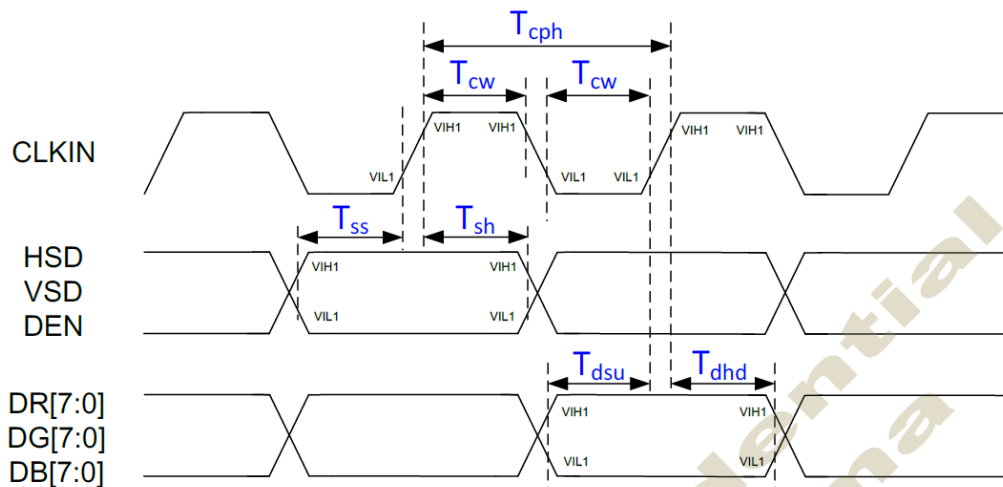
VCC=3.3V, GND=0V, Ta=25°C

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
	Dclk frequency	Fclk	46.4	51.2	59.1	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	th	1230	1344	1372	Tclk	
	Horizontal blanking	thb	103	160	174	Tclk	
	Valid Data Width	thd	1024			Tclk	
Vertical section	Vertical total	tv	630	635	718	TH	
	Vertical blanking	tvb	20	23	68	TH	
	Valid Data Width	tvd	600			TH	
	Frame rate		60			Hz	

Table 6.1.1 Input timing

6.2 TTL AC characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
CLKIN period	T _{cph}	14	-	-	ns
CLKIN duty ratio	T _{cw}	40	50	60	%
Data setup time	T _{dsu}	5	-	-	ns
Data hold time	T _{dhd}	5	-	-	ns
VSD setup time	T _{ss}	5	-	-	ns
VSD hold time	T _{sh}	5	-	-	ns
HSD setup time	T _{ss}	5	-	-	ns
HSD hold time	T _{sh}	5	-	-	ns
DEN setup time	T _{ss}	5	-	-	ns
DEN hold time	T _{sh}	5	-	-	ns



7. Optical Characteristics

Ta=25°C

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≧ 10	75	85	-	Degree	Note2,3
		θB		75	85	-		
		θL		75	85	-		
		θR		75	85	-		
Contrast Ratio		CR	θ=0°	800	1000			Note 3
Response Time		T _{ON}	25℃	-	30	40	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.269	0.319	0.369		Note 1,5
		y		0.287	0.337	0.387		
	Red	x		0.561	0.611	0.661		Note 1,5
		y		0.313	0.363	0.413		
	Green	x		0.282	0.332	0.382		Note 1,5
		y		0.506	0.556	0.606		
	Blue	x		0.104	0.154	0.204		Note 1,5
		y		0.040	0.090	0.140		
Uniformity		U		75			%	Note 6
NTSC		-		45	50	-	%	Note 5
Luminance		L		600	700		cd/m ²	Note 7

Table 7.1 Optical characteristics

Test Conditions:

1. Ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical characteristics are measured at the center point of the LCD screen.

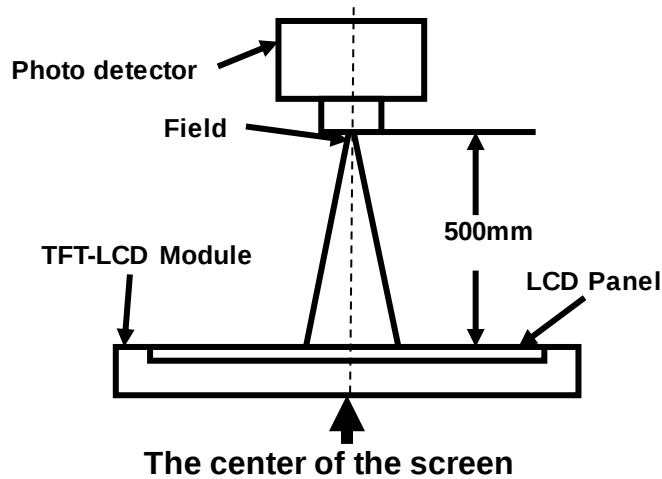


Fig1. Measurement Set Up

Note 2: Definition of viewing angle range and measurement system. viewing angle is measured at the center point of the LCD .

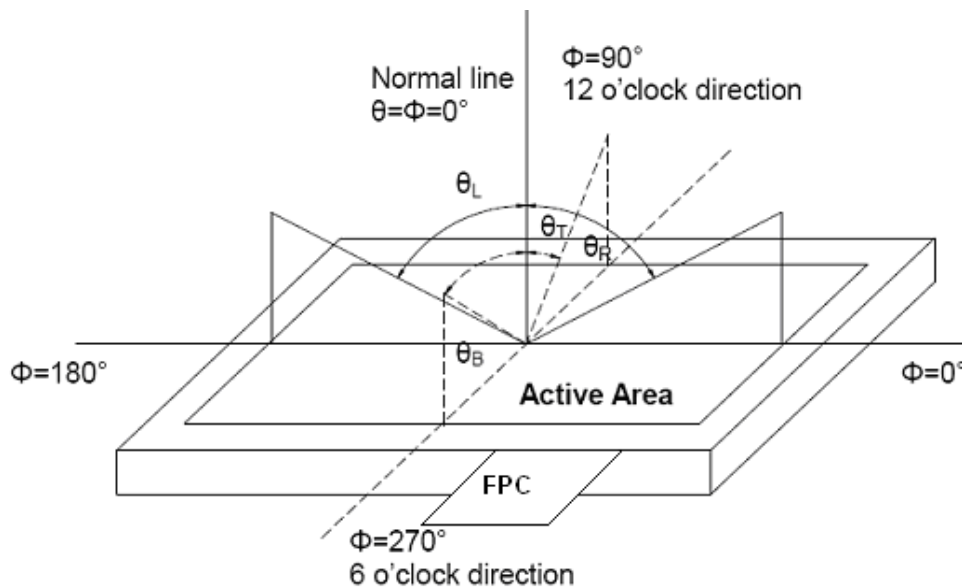


Fig2. Measurement viewing angle

Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

Note4: Definition of Response time

For SFT LCM, the response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_r) is the time between photo detector output intensity changed from 10% to 90%. And fall time (T_f) is the time between photo detector output intensity changed from 90% to 10%.

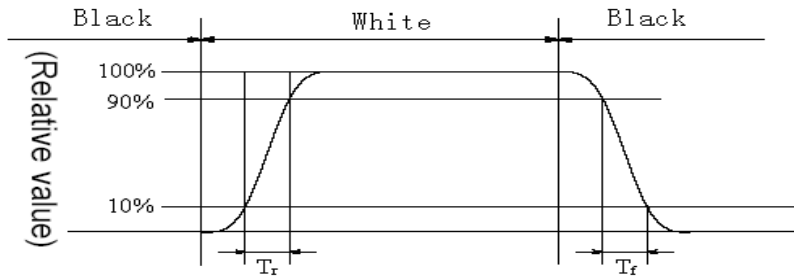


Fig4. Response Time Testing(SFT)

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig.5). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = L_{min} / L_{max}

L_{max} : The measured Maximum luminance of all measurement position.

L_{min} : The measured Minimum luminance of all measurement position.

L-----Active area length; W-----Active area width

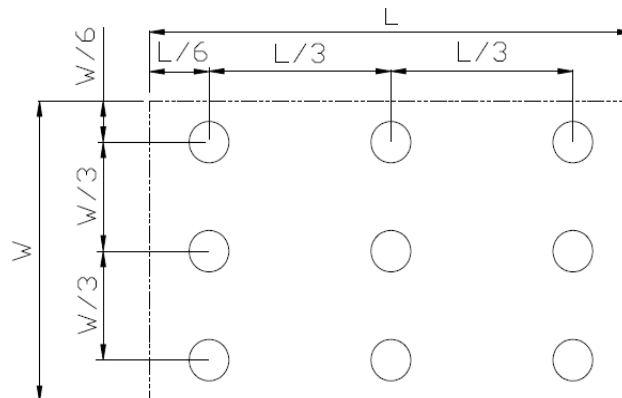


Fig5. Luminance Uniformity Measurement Locations(9 points)

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

8. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	+70°C, 240 hrs	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	-20°C, 240 hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	+80°C, 240 hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	-30°C, 240 hrs	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	+60°C, 90% RH 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30°C 30 min~+80°C 30 min, Change time:5min,100 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF, R=330Ω,5points/panel Air:± 8KV, 5times Contact:± 4KV, 5 times	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	10~55HZ Stroke:1.5mm Sweep:10HZ~55HZ~10HZ 2H For X\Y\Z	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (non-operation)	Half sine Wave 60G , 6ms 3times ±X、±Y、±Z	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Vibration Test	5-20-200HZ PSD:0.01-0.01-0.001 Total:0.781g2/HZ, x/y/z 30min	GB/T 4857.23-2012
11	Package Drop Test	Height: X cm,1 corner, 3edges, 6 surfaces Note : X > 10Kg:60cm ; ≤10Kg:80cm	IEC60068-2-32:1990 GB/T2423.8—1995

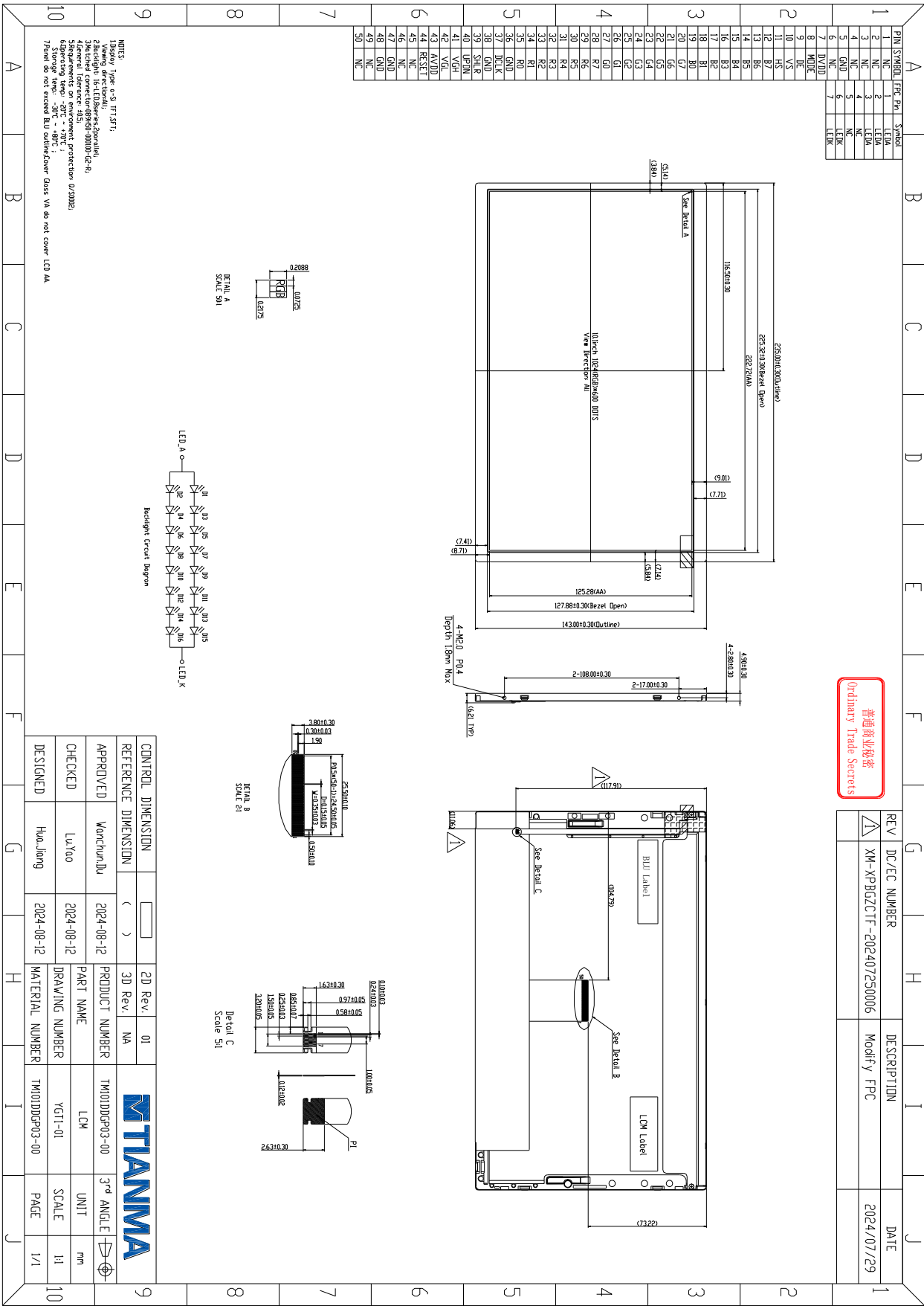
Table 8.1 RA test condition

Note1: Temperature is the ambient temperature of sample

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

Note3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product's function only be guaranteed, but not for all of the cosmetic specification.

9. Mechanical Drawing



10.Packing Instruction

TBD

11. Precautions for Use of LCD Modules

11.1 Handling Precautions

- (1) The display panel is made of glass. Do not subject it to mechanical shock by dropping it, etc.
- (2) If the display panel is damaged and the liquid crystal fluid inside it leaks out be sure not to get any in your mouth. If the fluid comes into contact with your skin or clothes promptly wash it off using soap and water.
- (3) Do not apply excessive force to the display surface or the bezel since this may cause the color tone to vary.
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle the polarizer carefully.
- (5) If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is still not completely clear use a moist cloth with one of the following solvents:
 - Isopropyl alcohol
 - Ethyl alcohol
 Solvents other than those mentioned above may damage the polarizer. Specifically, do not use the following:
 - Water
 - Ketone
 - Aromatic solvents
- (6) Do not disassemble the LCD Module.
- (7) If powered off, do not apply the input signals.
- (8) To prevent destruction of the module by static electricity, be careful to maintain an optimum work environment.
- (9) Be sure to ground your body when handling the LCD Modules.
- (10) Tools used for assembly, must be properly grounded.
- (11) To reduce the amount of static electricity generated, do not conduct assembly or other work under very low humidity conditions.
- (12) The LCD Module is covered with a film to protect the display surface, remove film slowly under the ionizer.

11.2 Storage precautions

- (1) When storing the LCD modules avoid exposure to direct sunlight or to the light of fluorescent lamps.
- (2) The LCD modules should be stored within the rated storage temperature range. The recommend condition is: Temperature: 0 ~ 35 °C at normal humidity.
- (3) The LCD modules should be stored in a room without acid, alkali or other harmful gas.

11.3 Transportation Precautions

The LCD modules should not be dropped or subject to violent mechanical shock during transportation. Also they should avoid excessive pressure, water, high humidity and direct sunlight.

11.4 Screen saver Precautions

Not display the fixed pattern for a long time. Use a screen saver, if the fixed pattern is displayed on the screen

11.5 Safety Precautions

- (1) When you waste damaged or unnecessary LCDs, it is recommended to crush LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned
- (2) Be sure to turn off the power supply when inserting or disconnecting the LED backlight cable.
- (3) LED driver should be designed to limit or stop its function when over current is detected on the LED.