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SPECIFICATION

- [] Preliminary Specification
- [] Final Specification

Description	10.4" 800xRGBx600 TFT-LCD Module
Part Number	P1040SVN1ME10

Customer		Industrial Product Dept, PDBU Tianma Microelectronics Co., Ltd.	
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REVISION HISTORY

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1. Summary

1.1 General Description

This is a 10.4 a-Si TFT-LCD module with Normally White technology. It is composed of a TFT-LCD panel, a driver circuit, FPC, Bezel, and a LED backlight unit.

1.2 Features

- Interface: RGB
- Acquisition product for UL62368-1/CSA C22.2 No.62368-1-03.
- Compliant 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	10.4 inch	
	Resolution	800(RGB)x600	
	Pixel Pitch	0.264x0.264	mm
	TFT Active Area	211.20x158.40	mm
	Technology Type	a-Si	
	Pixel Configuration	R.G.B Vertical Stripe	
	Display Mode	TN, Normally White	
	Surface Treatment	Anti-Glare	
	Viewing Direction	12 o'clock	
	Gray Scale Inversion Direction	6 o'clock	
Mechanical Characteristics	LCM (W x H x D)	228.40x175.40x6.20	mm
	Weight	350±5%	g
Optical Characteristics	Luminance	TYP:350	cd/m ²
	Contrast Ratio	TYP:500	
	NTSC	TYP:50%	%
	Viewing Angle	60/70/70/70	degree
Electrical Characteristics	Interface	RGB 24 bits	
	Color Depth	262K/16.2M	color
	Power Consumption	LCD:435mW(Black pattern) Backlight:2304mW	mW

Table 2.1 General TFT Specifications

Note 1: For TN LCM: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: LCM weight tolerance: ± 5%

3. Input / Output Terminals

3.1 CN1 Pin assignment (LCD Interface)

Connector Information	
LCD Module connector	XXXX or equivalent
Matching connector	FH28-60S-0.5SH(Hirose) or equivalent

Pin	Symbol	I/O	Description	Remark
1	GND	P	Power Ground	
2	AVDD	P	Power Supply	
3	VCC	P	Power Supply	
4	R0	I	Red data Input(LSB)	
5	R1	I	Red data Input	
6	R2	I	Red data Input	
7	R3	I	Red data Input	
8	R4	I	Red data Input	
9	R5	I	Red data Input	
10	R6	I	Red data Input	
11	R7	I	Red data Input(MSB)	
12	G0	I	Green data Input(LSB)	
13	G1	I	Green data Input	
14	G2	I	Green data Input	
15	G3	I	Green data Input	
16	G4	I	Green data Input	
17	G5	I	Green data Input	
18	G6	I	Green data Input	
19	G7	I	Green data Input(MSB)	
20	B0	I	Blue data Input(LSB)	
21	B1	I	Blue data Input	
22	B2	I	Blue data Input	
23	B3	I	Blue data Input	
24	B4	I	Blue data Input	
25	B5	I	Blue data Input	
26	B6	I	Blue data Input	
27	B7	I	Blue data Input(MSB)	
28	DCLK	I	Clock input(Latch data at falling edge)	
29	DE	I	Data enable	
30	HSYNC	I	Horizontal sync input. Negative polarity	
31	VSNC	I	Vertical sync input. Negative polarity	
32	MODE	I	DE/SYNC mode select .normally pull high H:DE mode .L:HV sync mode	
33	NC	N	No connection	
34	NC	N	No connection	
35	NC	N	No connection	
36	VCC	P	Power Supply	
37	NC	-	No connection	
38	GND	P	Power Ground	
39	GND	P	Power Ground	
40	AVDD	P	Power Supply	
41	VCOM	P	VCOM DC input	

42	DITH	I	Dithering setting DITH="H" 6bit resolution; DITH="L" 8bit resolution	
43	NC	N	No connection	
44	NC	N	No connection	
45	NC	N	No connection	
46	NC	N	No connection	
47	NC	N	No connection	
48	NC	N	No connection	
49	NC	N	No connection	
50	NC	N	No connection	
51	NC	N	No connection	
52	NC	N	No connection	
53	NC	N	No connection	
54	NC	N	No connection	
55	NC	N	No connection	
56	VGH	P	TFT turn on voltage	
57	VCC	P	Power Supply	
58	VGL	P	TFT turn off voltage	
59	GND	P	Power Ground	
60	NC	N	No connection	

Table 3.1 Pin Assignment for LCD Interface

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

Note1: All of the GND pins should be connected to the system ground.

Note 2: This LCD module supports SYNC & SYNC-DE & DE mode, the pin setting is different from each other.
Please refer to the descriptions.

3.2 CN2 Pin assignment (BL Interface)

Matching connector type: BHSR-02VS-1

No	Symbol	I/O	Description	Wire Color
1	LEDA	P	LED driving anode (high voltage)	Red
2	LEDK	P	LED driving cathode (low voltage)	White

Table 3.2 Pin Assignment for BL Interface

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

4. Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.3	5.0	V	Maximum value due to MOS characteristics, user should set on advised value.
	AVDD	-0.3	15.0	V	
	VGH	-0.3	42.0	V	
	VGL	-20.0	0.3	V	
	VGH-VGL	-0.3	40.0	V	
Signal Input	Vin	-0.3	5.0	V	Note1
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tst	-30	80	°C	
Operating and Storage Humidity	HSTG	-	90	% (RH)	Exceed 90%RH may cause abnormal display
Relative Humidity (Note2)	RH	--	≤95	%	Ta≤40°C
		--	≤85	%	40°C < Ta≤50°C
		--	≤55	%	50°C < Ta≤60°C
		--	≤36	%	60°C < Ta≤70°C
		--	≤24	%	70°C < Ta≤80°C
Absolute Humidity	AH	--	≤70	g/m³	Ta > 70°C

Table 4.1 Absolute Maximum Ratings

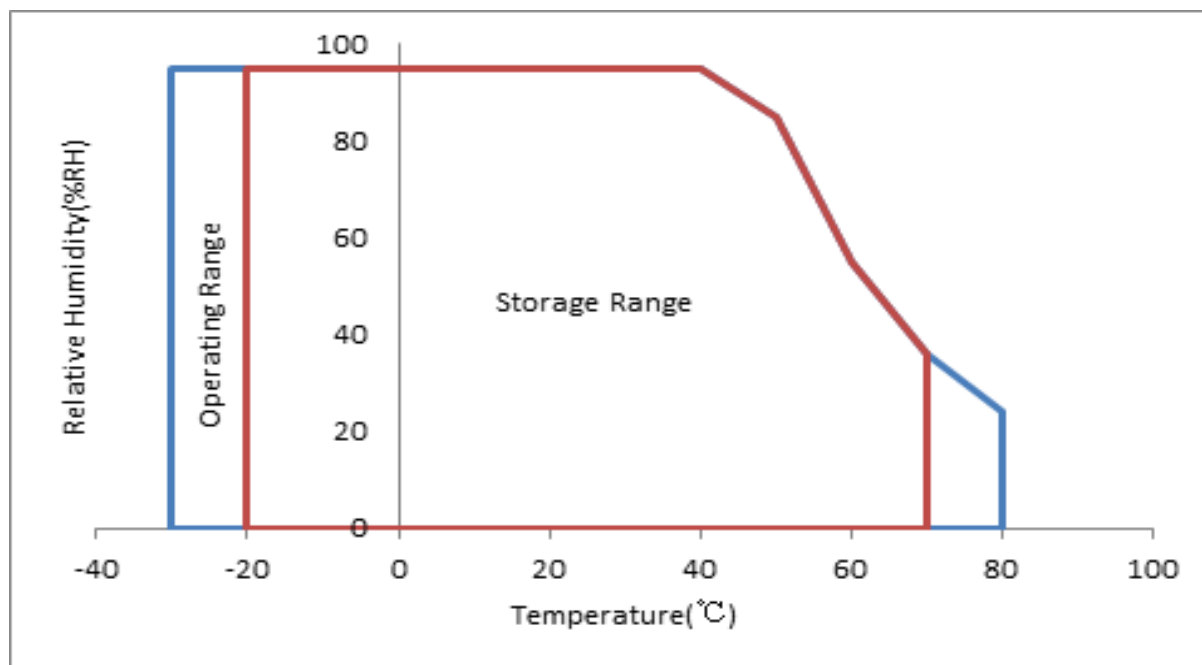


Table 4.2 Absolute Maximum Ratings chart

Note1: Input voltage include all in put data.

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. A module should be used with any of the absolute maximum ratings exceeded, 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
Digital supply Voltage		VCC	3.00	3.30	3.60	V	
Analog supply Voltage		AVDD	10.8	11	11.2	V	Very important voltage, exceed this value may cause abnormal display
Gate on voltage		VGH	24	25	26	V	
Gate off voltage		VGL	-7.5	-7.0	-6.5	V	
Common Electrode Driving Signal		VCOM	4.05	4.10	4.15	V	Very important voltage, exceed this value may cause abnormal display
Input Signal Voltage	Low Level	V _{IL}	0	-	0.3xVCC	V	R0~R7,G0~G7,0~B7,DE, DCLK,HSYNC,VSYNC,MODE, RESET, DITH
	High Level	V _{IH}	0.7xVCC	-	VCC	V	
Current of digital supply voltage		I _{VCC}	-	10.20	-	mA	VCC=3.3V,all white pattern
Current of analog supply voltage		I _{AVDD}	-	34.30	-	mA	AVDD=11V
Current of Gate on voltage		I _{VGH}	-	0.70	-	mA	VGH=25V
Current of Gate off voltage		I _{VGL}	-	0.70	-	mA	VGL=-7.0V
Current of Vcom		I _{vcom}		0.002	-	mA	VCOM=4.10V
Power consumption		P	-	435	-	mW	This value may vary with different patterns.

Table 5.1 DC Characteristics

Note1:To test the current dissipation, use "all Black Pattern".

5.2 DC Characteristics for Backlight Driving

GND=0V, Ta = 25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	-	240	360	mA	Note 1
Forward Current Voltage	V_F	9.0	9.6	9.9	V	Note 1
Backlight Power Consumption	WBL	-	2304	-	mW	Note 1
Operating Life Time	--	-	30000	-	hrs	Note 2

Table 5.2 LED Backlight Characteristics

Note1: I_F is defined for each channel.

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.

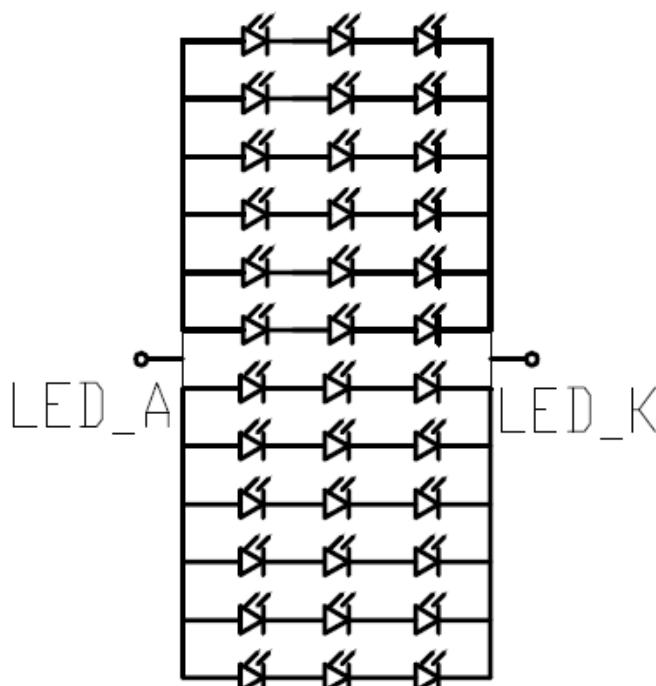


Figure 5.2 LED Backlight Characteristics

5.3 Recommended Power ON/OFF Sequence

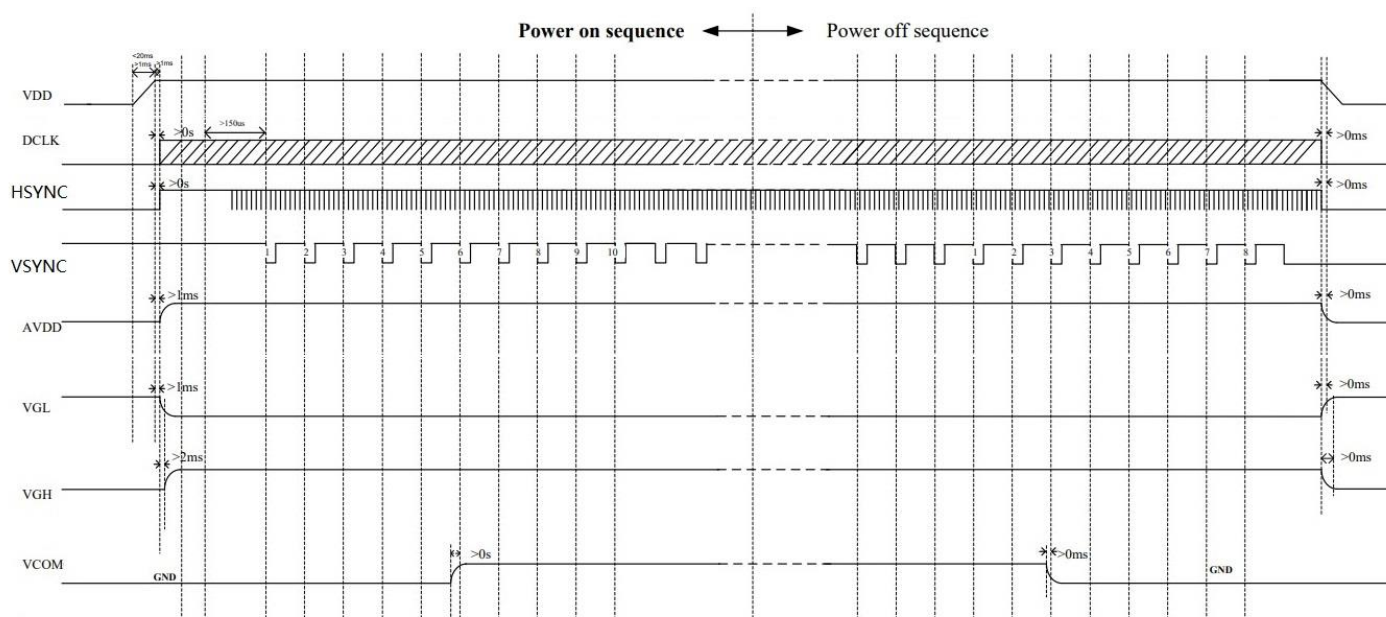


Table 5.3 Power ON/OFF Sequence

- Note:1. When VCC turned on, the rising time $T1$ should less than 20ms.
 2. AVDD stable to VCC stable time $T2$ should better longer than 1ms.
 3. The power off sequence can be set according to power on settings.
 4. It is advised that LCD power turned on much later than system when RGB pin is multiple used for system initial.

5.4 LCD Module Block Diagram

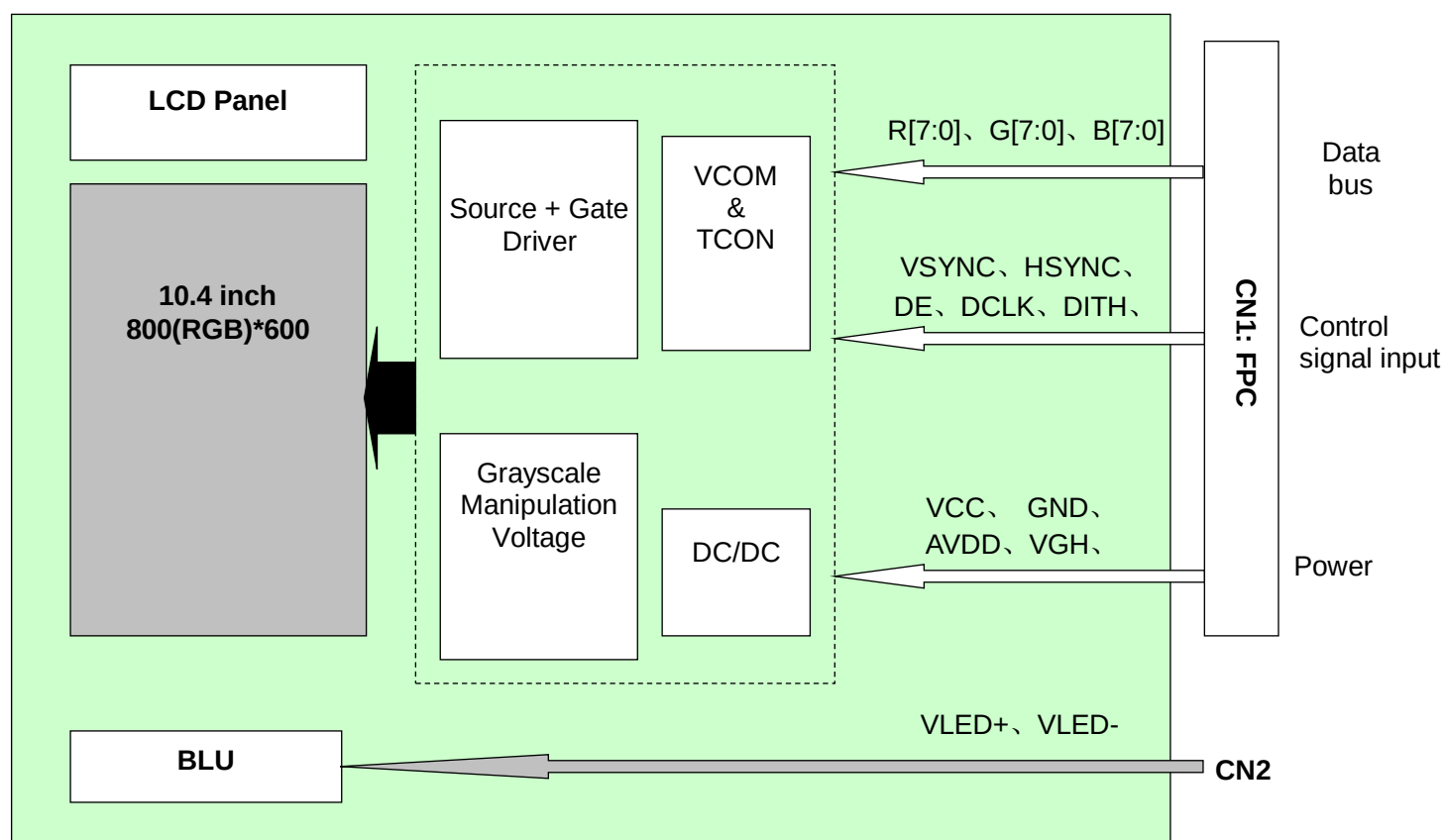


Figure 5.4 LCD Module Block Diagram

6. Interface Timing Characteristics

6.1 AC characteristics

VCC=3.3V, GND=0V, Ta=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Remark
HSYNC Setup Time	$T_{B_{hstB}}$	5	-	-	ns	
HSYNC Hold Time	$T_{B_{hhdB}}$	5	-	-	ns	
VSYNC Setup Time	$T_{B_{vstB}}$	5	-	-	ns	
VSYNC Hold Time	$T_{B_{vhdB}}$	5	-	-	ns	
Data Setup Time	$T_{B_{dsuB}}$	5	-	-	ns	
Data Hold Time	$T_{B_{dhdB}}$	5	-	-	ns	
DE Setup Time	$T_{B_{esuB}}$	5	-	-	ns	
DE Hold Time	$T_{B_{ehdB}}$	5	-	-	ns	
CLKIN Cycle Time	$T_{B_{cphB}}$	14	-	-	ns	
CLKIN Pulse Width	$T_{B_{cwhB}}$	40	50	60	%	
Output stable time	T_{sst}	-	-	6	us	
VCC Power ON Slew rate	T_{por}	-	-	20	ms	From 0V to 90% VCC
RSTB pulse width	T_{Rst}	50	-	-	us	

Table 6.1 AC characteristics

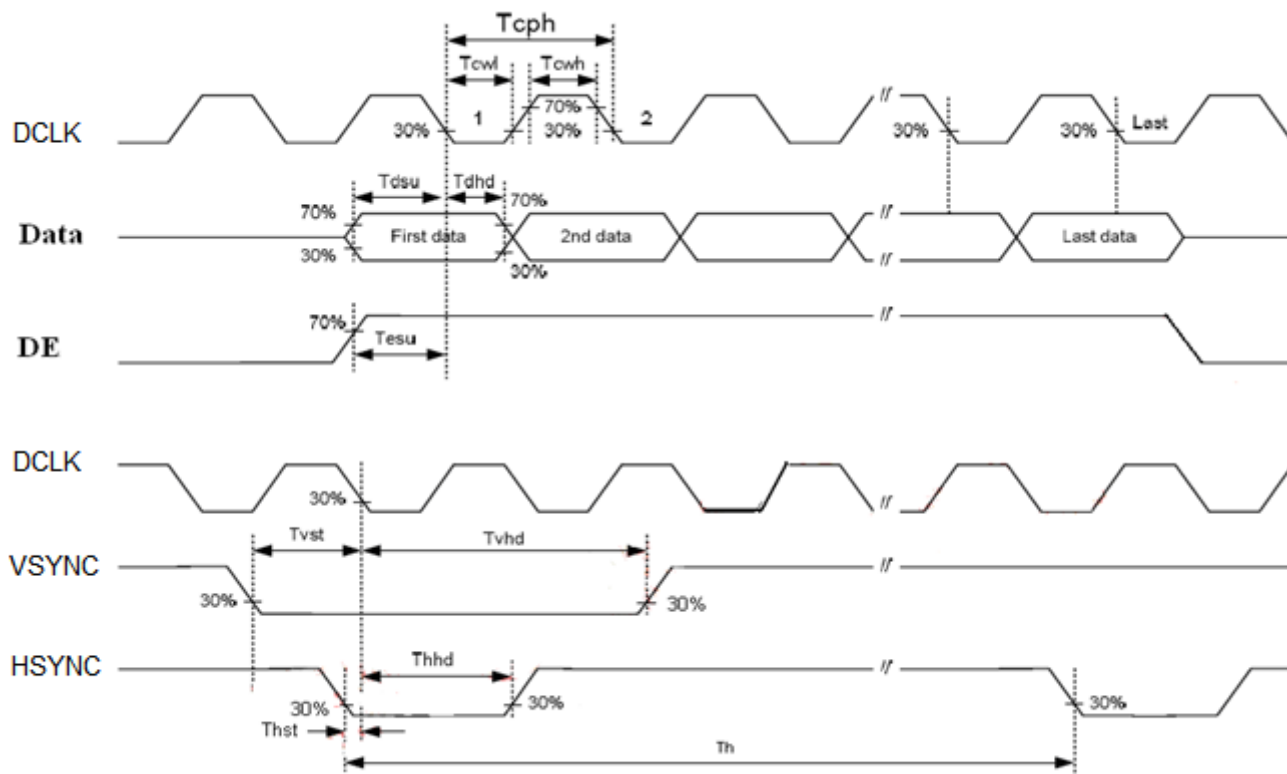


Figure 6.1 AC characteristics

6.2 Data input timing table

i. Input timing at DE mode

VCC=3.3V, GND=0V, Ta=25℃

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
	Dclk frequency(Frame rate=60HZ)	Fclk	36.4	39.6	50.4	MHz	Tclk=1/Fclk
Horizontal section	Horizontal total	TH	955	1000	1150	Tclk	
	Horizontal blanking	THC	155	200	350	Tclk	Note1
	Valid Data Width	THD	-	800	-	Tclk	
Vertical section	Vertical total	TV	635	660	730	TH	
	Vertical blanking	TVC	35	60	130	TH	Note1
	Valid Data Width	TVD	-	600	-	TH	

Table 6.2.1 input timing (DE mode)

ii. Input timing at HV mode

VCC=3.3V, GND=0V, Ta=25℃

	Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
	Dclk frequency(Frame rate=60HZ)	Fclk	37.1	39.6	44.9	MHz	Tclk=1/Fclk
Horizontal section	Horizontal pulse width	THPW	1	-	40	Tclk	
	Horizontal total	TH	950	1000	1100	Tclk	
	Horizontal back porch	THB	88	88	88	Tclk	
	Horizontal front porch	THFP	62	112	212	Tclk	
	Valid Data Width	THD	-	800	-	Tclk	
Vertical section	Vertical pulse width	TVPW	1	-	20	TH	
	Vertical total	TV	650	660	680	TH	
	Vertical back porch	TVB	39	39	39	TH	
	Vertical front porch	TVFP	11	21	41	TH	
	Valid Data Width	TVD	-	600	-	TH	

Table 6.2.2 input timing (HV mode)

Note1: In HV mode, it is necessary to keep it on typical value.

6.3 Data input timing diagram

i. Vertical Input Timing Diagram

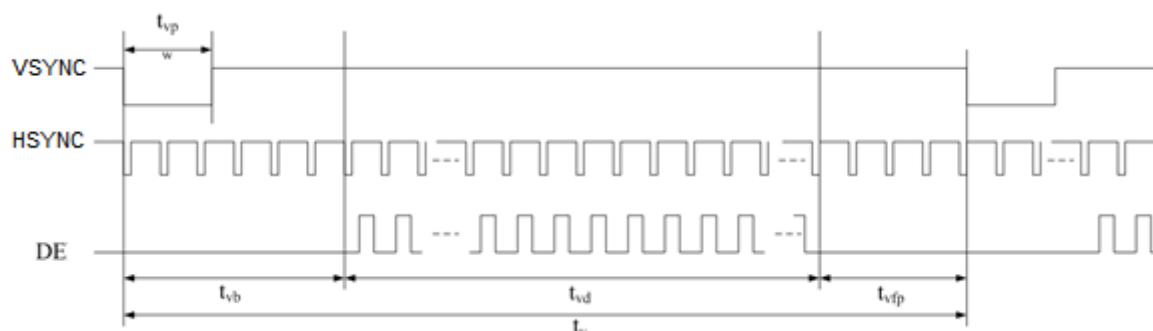


Figure 6.3.1 Vertical Input Timing Diagram

ii. Horizontal Input Timing Diagram

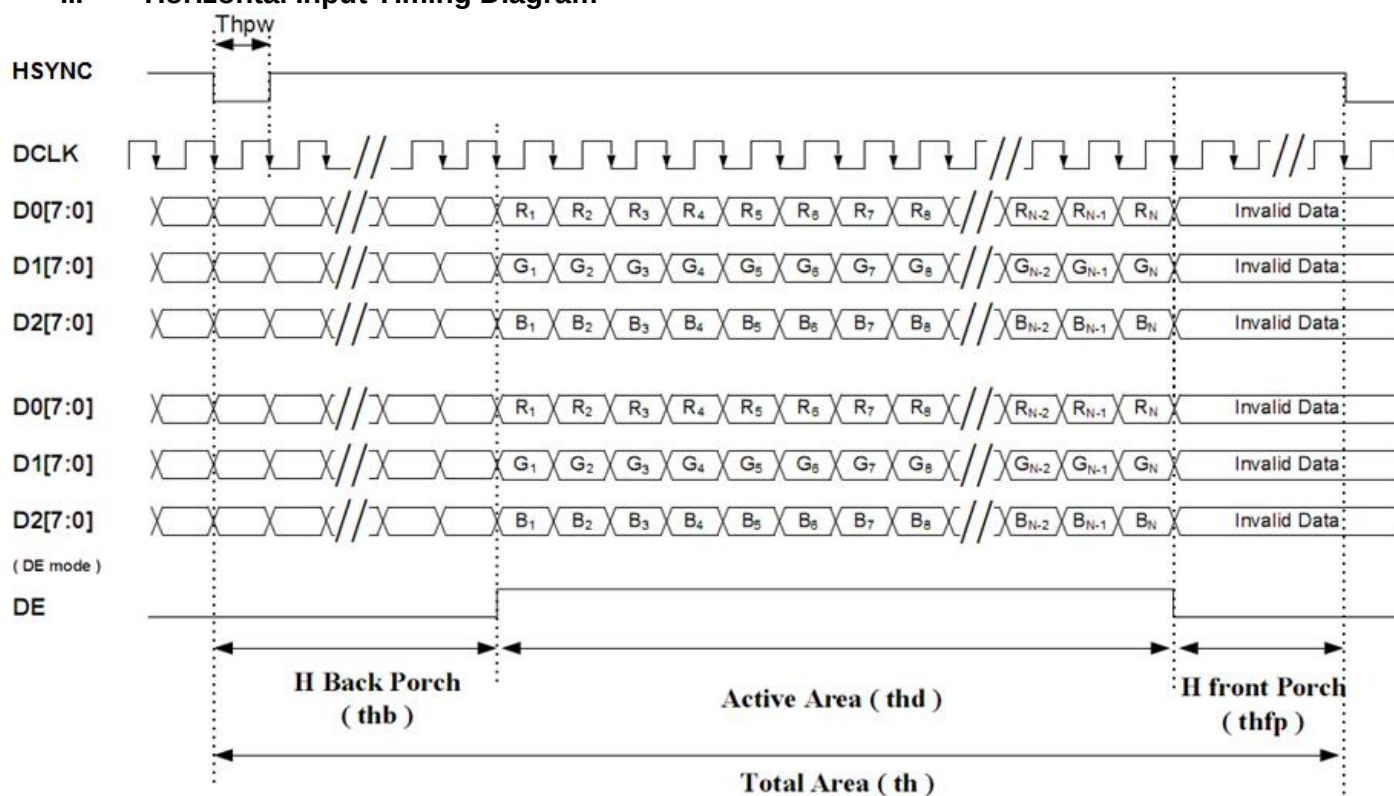


Figure 6.3.2 Vertical Input Timing Diagram

7. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≥ 10	50	60	-	Degree	Note2,3
		θB		60	70	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	500			Note 3
Response Time		T _{ON}	25℃	-	25	40	ms	Note 4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	0.252	0.302	0.352		Note 1,5
		y		0.269	0.319	0.369		
	Red	x		0.549	0.599	0.649		Note 1,5
		y		0.295	0.345	0.395		
	Green	x		0.278	0.328	0.378		Note 1,5
		y		0.498	0.548	0.598		
	Blue	x		0.102	0.152	0.202		Note 1,5
		y		0.047	0.097	0.147		
Uniformity		U		70	75	-	%	Note 6
NTSC				45	50	-	%	Note 5
Luminance		L		300	350	-	cd/m²	Note 7

Table 7.1 Optical characteristics

Test Conditions:

1. $I_F = 240$ mA, and the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

Note1: 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.

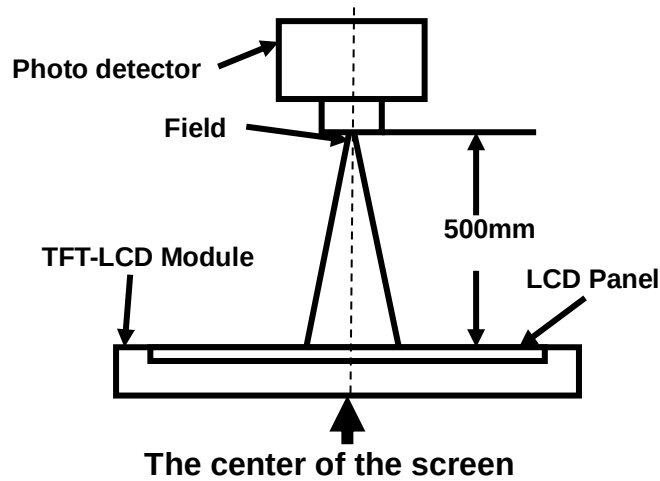


Fig1. Measurement Set Up

Note2: Definition of viewing angle range and measurement system. Viewing angle is measured at the center point of the LCD

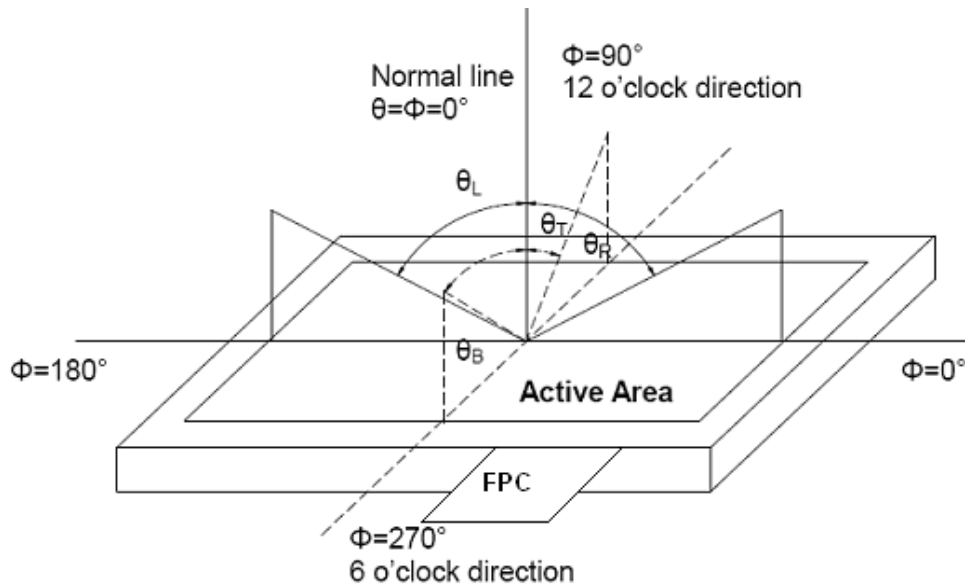


Fig2. Measurement viewing angle

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 TN 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 90% to 10%. And fall time (T_f) is the time between photo detector output intensity changed from 10% to 90%.

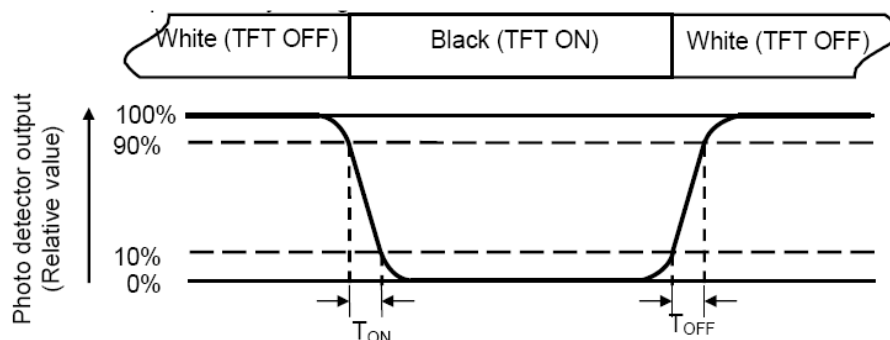


Fig3. Response Time Testing(TN)

Note 5: Definition of color chromaticity (CIE1931).Color coordinates measured at center point of LCD.

Note6: 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

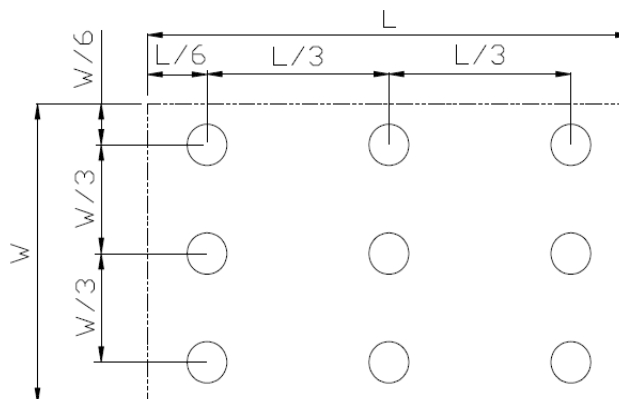


Fig4. Luminance Uniformity Measurement Locations(9 points)

Note 7: Definition of Luminance: Measure the luminance of white state at center point.

8. Reliability Test

No	Test Item	Condition	Remark
1	High Temperature Operation	+70℃, 240hrs	Note1 IEC60068-2-1:2007,GB2423.2-2008
2	Low Temperature Operation	-20℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage (non-operation)	+80℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage (non-operation)	-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & High Humidity Operation	+60℃, 90% RH max, 240 hours	Note2 IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃, 30 min~+80℃, 30 min, Change time:5min, 100 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	Electro Static Discharge (operation)	C=150pF,R=330Ω, 5point/panel Air:±8Kv,5times Contact:±4Kv, 5times	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration (non-operation)	Frequency range:10 ~ 55Hz, Stroke:1.5mm Sweep:10Hz ~ 55Hz ~ 10Hz 2hours for each direction of X.Y.Z (6 hours total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Shock (non-operation)	60G 6ms, ±X,±Y,±Z 3 times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:80 cm,1 corner, 3 edges, 6 surfaces	IEC60068-2-32:1990 GB/T2423.8—1995
11	Package Vibration Test	Frequency: 5-20-200HZ, PSD : 0.01-0.01-0.001 Total:0.781g ² /HZ, x/y/z each direction 30min)	IEC60068-2-34 GB/T2423.11

Table 8.1 Reliability 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.



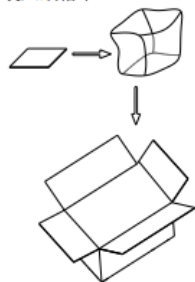
10. Packing Instruction

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM	TM104SDHG31-71	228.40×175.40×6.20	0.35	22	
2	Carton	Corrugated paper	544×365×250	1.01	1	
3	Anti-Static Bag	PE	250×250	0.0054	22	
4	Dust-Proof Bag	PE	700×545	0.06	1	
5	Beauty-grain	Tape	30×10	0.0005	44	
6	Partition_1	Corrugated paper	527.00×348.00×185.00	0.001	1	
7	EPE	EPE	525.00×345.00×20.00	0.072	2	
8	Label	Paper	100×52	0.001	1	
9	Total weight	9.056 ±5% Kg				

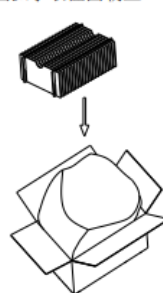
Table10.1 Packing instruction

The detail of packing method is shown as below:

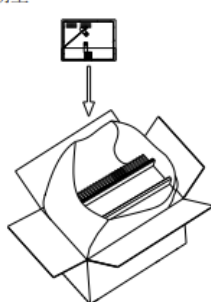
1. 将 EPE 防静电珍珠棉先放入防尘袋中，
然后整体装入纸箱中



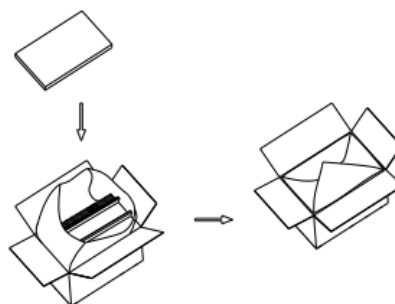
2. 将压线卡放入 A 步骤组装完成后的纸箱
内，左右圆弧拿取位面朝上



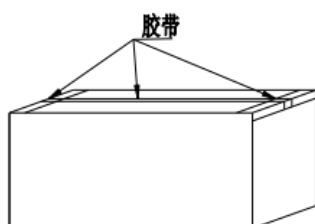
3. 将包装好的单片模组依次放入 B 步骤中
组装好的纸箱内，防静电袋口折弯部分朝
下，显示面 朝内放置，每排最后一片模组
显示面朝里



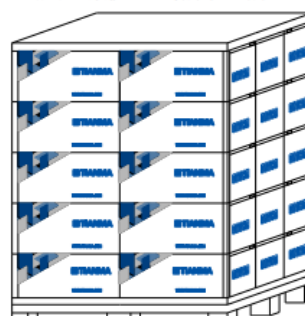
4. 将另一块 EPE 防静电珍珠棉放置在压线
卡上，封好防尘袋



5. 使用胶带封好纸箱



6. 纸箱堆叠数按 2*3 每层*共 5 层



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.