▼ TIANMA

MODEL NO :   **TM070JVHG33**

MODEL VERSION: **01**

SPEC VERSION :   **2.0**

ISSUED DATE: **2018-5-23**

□**Preliminary Specification**
■**Final Product Specification**

Customer : _____

Approved by	Note

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Dongliang Xie	**Feng Tan**	**Kevin Kim**

This technical specification is subjected to change without notice.

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2018-01-22	First release	Dongliang Xie
2.0	2018-05-23	Final Specification Release	Dongliang Xie

1 General Specification

Feature		Spec
Display Spec.	Size	7.0inch
	Resolution	1280(RGB) x 800
	Technology Type	a-Si
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel Pitch (mm)	0.117(H)x 0.117(V)
	Display Mode	SFT with Normally Black
	Surface Treatment(Up Polarizer)	HC
	Viewing Direction	All direction
Mechanical Characteristics	LCM (W x H x D) (mm)	LCM: 161.00 x107.00
		CTP+LCM:181.76x125.60x6.35
	Active Area(mm)	TFT LCD:149.76 x 93.60
		CTP:152.16x96
	CTP Structure	G+G
	CTP Touch Method	Bare finger
	Number of simultaneous touches	≤5 points
	Minimum Touch Area	Φ7
	Finger Touch Pitch	≥14mm
	With /Without TSP	With TSP
	Matching Connection Type	CN1:F1-SE20P-HFE-E3000 CN2:F1-S6P-HFE-E1500 CN3: Molex 53261-0871
	Weight (g)	228.5
Electrical Characteristics	Interface	LCD: LVDS 6/8bits
		CTP: USB
	Color Depth	262K/16.7M
	Driver IC	LCD: 3*ST5821C and 1*ST5084C
		CTP: ILI2511

Note 1: Viewing direction for best image quality is different from TFT definition; there is a 180 degree shift.
Note 2: Requirements on Environmental Protection: Q/S0002
Note 3: LCM weight tolerance: +/- 5%

2. Input/output Terminals

2.1 TFT CN pin assignment

Connector type: **CN1:JAE F1-SE20P-HFE-E3000   CN2:JAE F1-S6P-HFE -E1500**
CN3:MOLEX 53261-0871

No	Symbol	I/O	Description	Comment
			CN1	
1	IND3+	I	Positive LVDS Differential data input(3)	
2	IND3-	I	Negative LVDS Differential data input(3)	
3	NC	-	No Connection	
4	SEL6/8	I	6bit/8bit mode select H : 6-bit mode L : 8-bit mode	
5	VSS	P	Power Ground	
6	PINC	I	Positive LVDS Differential clock input	
7	NINC-	I	Negative LVDS Differential clock input	
8	VSS	P	Power Ground	
9	IND2+	I	Positive LVDS Differential data input(2)	
10	IND2-	I	Negative LVDS Differential data input(2)	
11	VSS	P	Power Ground	
12	IND1+	I	Positive LVDS Differential data input(1)	
13	IND1-	I	Negative LVDS Differential data input(1)	
14	VSS	P	Power Ground	
15	IND0+	I	Positive LVDS Differential data input(0)	
16	IND0-	I	Negative LVDS Differential data input(0)	
17	VSS	P	Power Ground	
18	NC	-	No Connection	
19	VDD	P	Power Supply	
20	VDD	P	Power Supply	
			CN2	
1	VLED	P	Backlight power supply	
2	VLED	P	Backlight power supply	
3	VLSS	P	VLED Ground	
4	VLSS	P	VLED Ground	
5	LED_EN	I	Backlight on/off control	
6	LED_PWM	I	Backlight dimming control	
			CN3	
1	VDD1	P	Power supply for CTP	
2	D-	I/O	USB data- pin	
3	D+	I/O	USB data+ pin	
4	VSS1	P	Power Ground	
5	NC	-	No Connection	
6	NC	-	No Connection	
7	NC	-	No Connection	
8	NC	-	No Connection	

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

3. Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V, Ta = 25℃

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	-0.5	5.0	V	
Backlight Forward Current	I_{LED}	–	25	mA	For each LED
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

Table 3.1 absolute maximum rating

3.2 CTP absolute Maximum Ratings

Item	Symbol	Min.	Max	Unit	Remark
Input Voltage	VDD1	-0.3	5.5	V	
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

Table 3.2 CTP absolute Maximum Ratings

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

Ta = 25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Power consumption	P_{TFT}	-	825	-	mW	

Table 4.1 LCD module electrical characteristics

4.2 CTP recommended Operating Condition

(T_A= 25℃,VDD1=5.0V)

Item	Symbol	Min	Typ	Max	Unit	Note
Power supply voltage	VDD1	4.7	5.0	5.3	V	
Operation current	I_{op}	-	100	-	mA	

4.3 TFT Driving Backlight

Item		Symbol	Min	Typ	Max	Unit	Remark
Backlight power supply voltage		VLED	5.5	12	12.5	V	
Backlight power supply current		I_Total	-	185	-	mA	Note1
Backlight power consumption		P_Total	-	2220	-	mW	
Input voltage for VLED_PWM signal	High level	-	2.0	-	5.0	V	
	Low level	-	0	-	0.4	V	
Input voltage for VLED_EN	High level	-	2.0	-	5.0	V	
	Low level	-	0	-	0.4	V	
VLED_PWM frequency		Fpwm	200	-	20k	HZ	
VLED_PWM duty		D	5		100	%	Note2
Operating Life Time		--	--	50000	--	hrs	Note3

Note 1: I_Total is the power supply current of LED driver, P_Total is the power consumption of LED driver and backlight.

Note 2: According to LED driver IC characteristics, the minimum value of VELD_PWM duty may vary with VLED_PWM frequency, higher the frequency, bigger the duty.

Note 3: Optical performance should be evaluated at Ta=25℃ only.
  If LED is driven by high current, high ambient temperature & humidity condition.The life time of LED will be reduced.
  Operating life means brightness goes down to 50% of initial brightness.
  Typical operating life time is estimated data.

4.3 TFT Block Diagram
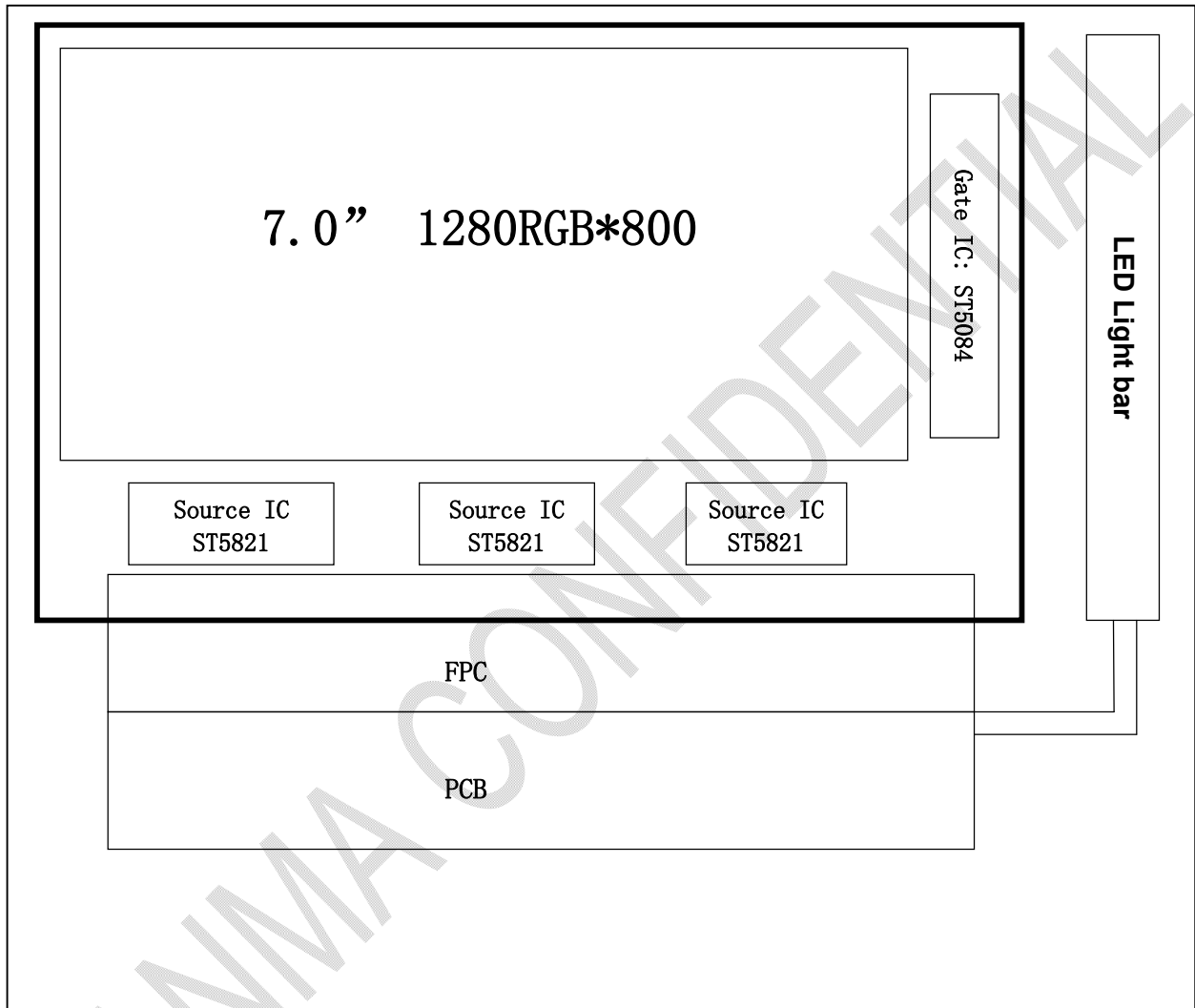
Figure 4.3 TFT Block Diagram

5. Timing Chart

5.1 AC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
Clock Frequency	R_{xFCLK}	20	-	80	MHz	
Input data skew margin	T_{RSKM}	500	–	–	ps	$|V_{ID}|$= 400mV, R_{xVCM}=1.2V R_{xFCLK}=80MHz
Clock high time	T_{LVCH}	–	$4/(7\ R_{xFCLK})$	–	ns	
Clock low time	T_{LVCL}	–	$3/(7\ R_{xFCLK})$	–	ns	
PLL wake-up time	T_{enPLL}	–	–	150	us	
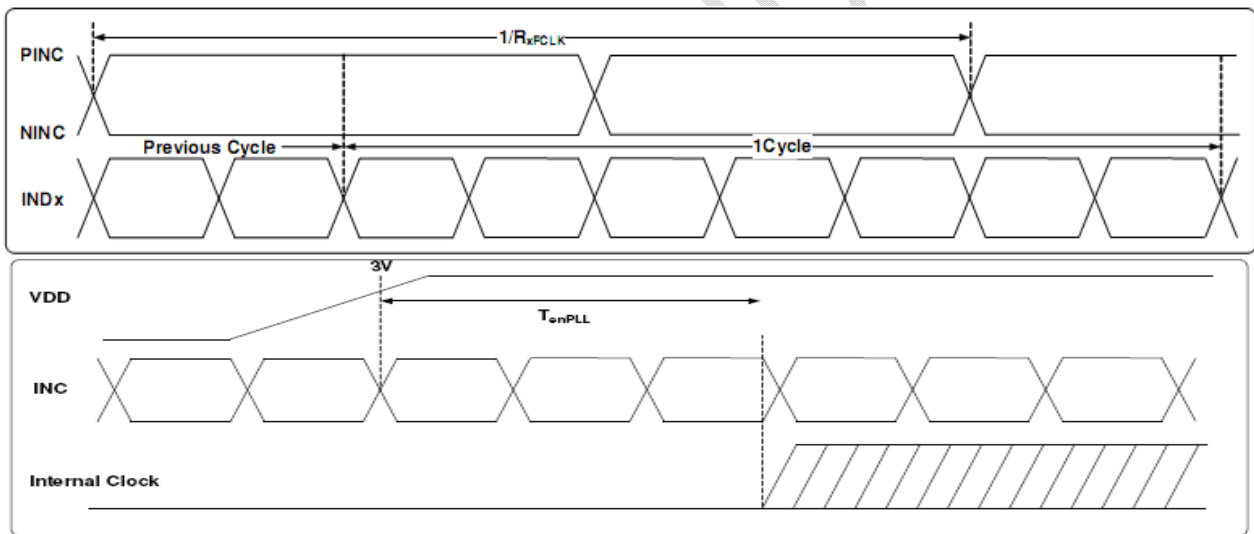
5.2 DC Electrical Characteristics

VDD=3.3V, AGND=GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
Differential input high Threshold voltage	R_{XVTH}	–	–	+0.1	V	
Differential input Low Threshold voltage	R_{XVTL}	-0.1	–	–	V	
Input voltage range	R_{XVIN}	0	–	VDD-1.0	V	
Differential input common Mode voltage	R_{XVCM}	$|V_{ID}|/2$	–	$2.4\text{-}|V_{ID}|/2$	V	
Differential input voltage	$|V_{ID}|$	0.2	--	0.6	V	
Differential input leakage Current	RV_{Xliz}	-10	--	+10	uA	

LVDS Digital Operating Current	Iddlvds	–	40	50	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	Istlvds	–	10	50	uA	Clock & all functions are stopped

Single-end Signals

NINDx

$PINDx-NINDx=-|V_{ID}|<R_{xVTL}="LOW"$

R_{xVCM}

PINDx

$PINDx-NINDx=|V_{ID}|>R_{xVTH}="HIGH"$

Differential Input Voltage $|V_{ID}|$

R_{xVCM}

GND

Differential Singals

PINDx-NINDx

R_{xVTH}

$|V_{ID}|$

0V

R_{xVTL}

$|V_{ID}|$
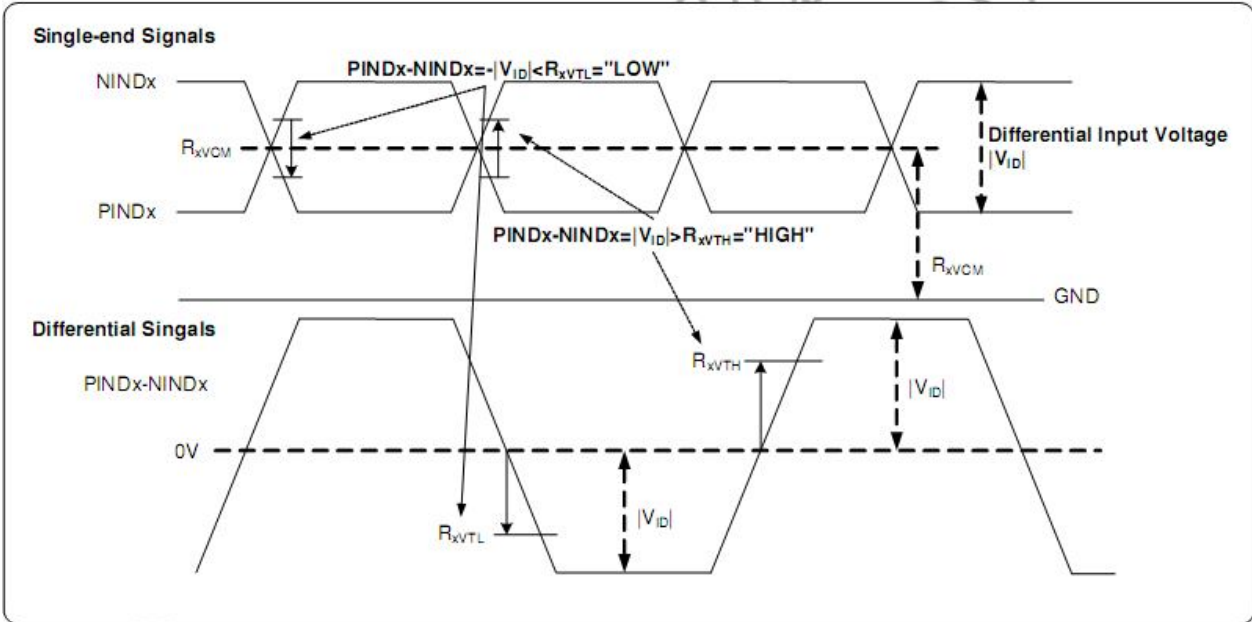
5.3 Input timing

1280x800 (RES[3:0] = 0010)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
CLK frequency	t_{CLK}	62.6	68.2	78.1	Mhz	
Horizontal blanking time	t_{HBT}	20	69	164	t_{CLK}	$t_{HBP} + t_{HFP}$
Horizontal back porch	t_{HBP}	5	5	164- t_{HFP}	t_{CLK}	
Horizontal display area	t_{HD}	1280	1280	1280	t_{CLK}	
Horizontal front porch	t_{HFP}	15	64	159	t_{CLK}	
Horizontal period	t_H	1300	1349	1444	t_{CLK}	
Horizontal pulse width	t_{HPW}	1	1	256	t_{CLK}	
Vertical blanking time	t_{VBT}	5	42	101	t_H	$t_{VBP} + t_{VFP}$
Vertical back porch	t_{VBP}	2	2	101- t_{VFP}	t_H	
Vertical display area	t_{VD}	800	800	800	t_H	
Vertical front porch	t_{VFP}	3	40	99	t_H	
Vertical period	t_V	803	842	901	t_H	
Vertical pulse width	t_{VPW}	1	1	128	t_H	

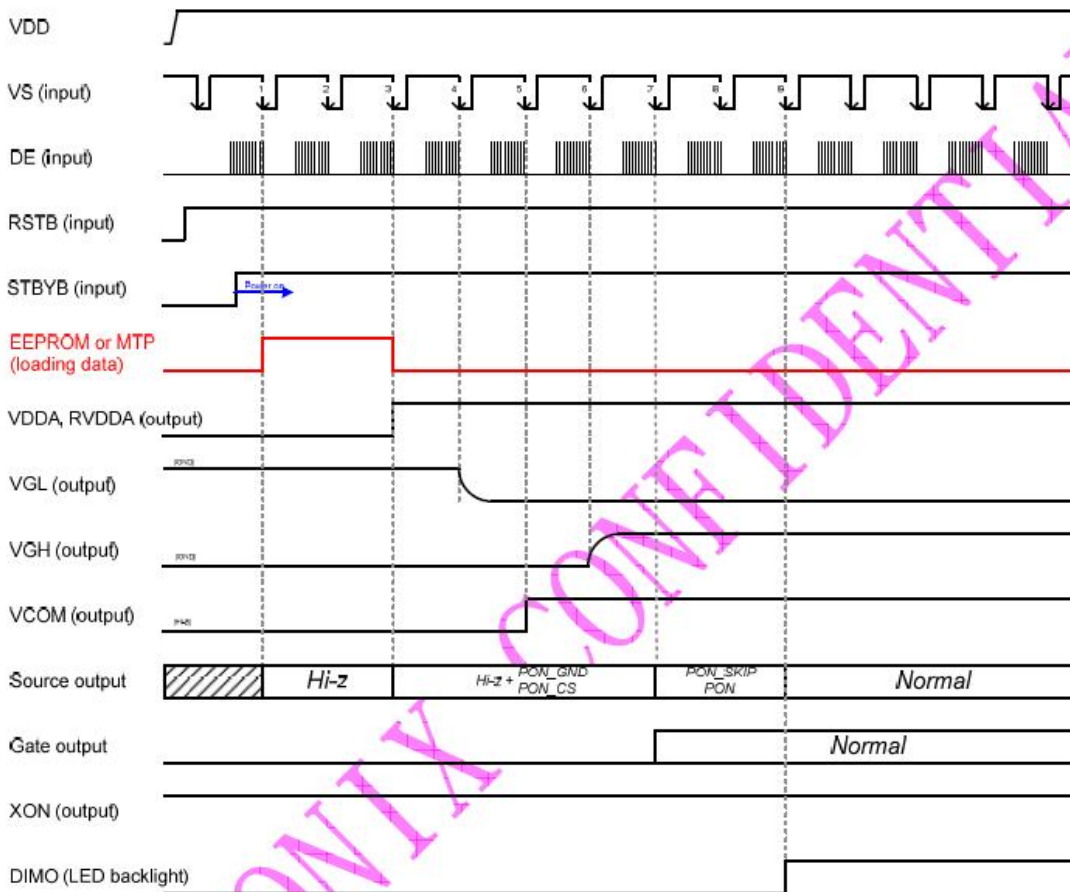## 5.4 Data Input Format

VESA data mapping
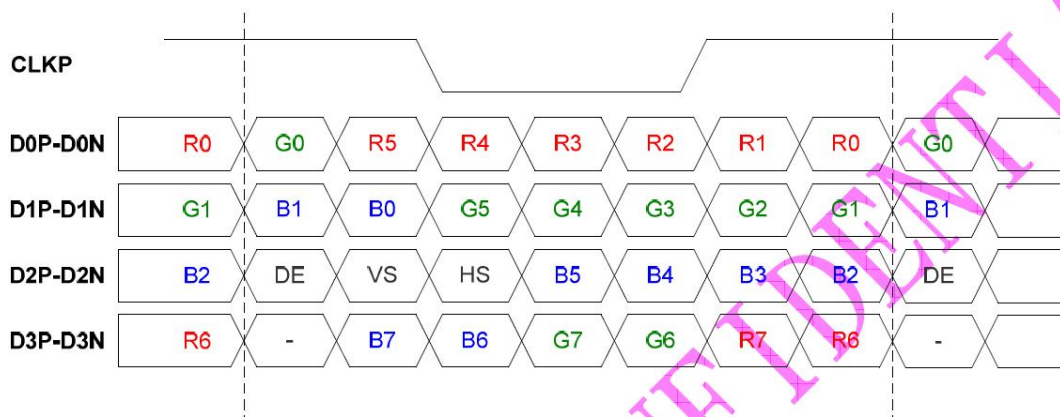
Note 1 : for 6 bit mode, MSB are R/G/B[5] and R/G/B[0] are LSB
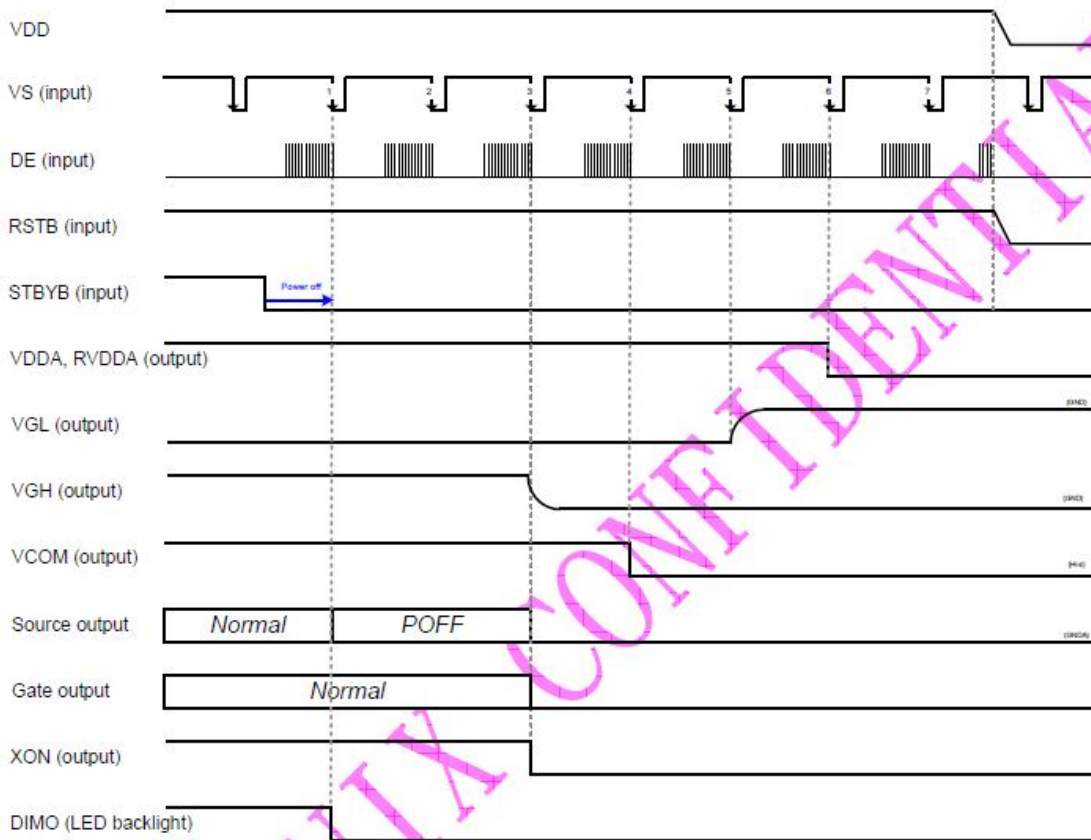Note 2 : for 8 bit mode, MSB are R/G/B[7] and R/G/B[0] are LSB

...

5.5 Power On/Off Timing

To prevent the device damage from latch up, the power on/off sequence shown below must be followed.

Power ON:

Power Off:

	Normal	POFF	

VDD

VS (input)

DE (input)

RSTB (input)

STBYB (input)   Power off

VDDA, RVDDA (output)

VGL (output)

VGH (output)

VCOM (output)

Source output — Normal / POFF

Gate output — Normal

XON (output)

DIMO (LED backlight)

6. Optical Characteristics

| Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≥10	75	85	-	Degree	Note 2
		θB		75	85	-		
		θL		75	85	-		
		θR		75	85	-		
Contrast Ratio		CR	θ=0°	600	800	-		
Response Time		T_{ON}	25℃	-	35	40	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x		0.265	0.315	0.365		Note5 Note1
		y		0.291	0.341	0.391		
	Red	x		0.526	0.576	0.626		
		y		0.291	0.341	0.391		
	Green	x		0.297	0.347	0.397		
		y		0.547	0.597	0.647		
	Blue	x		0.103	0.153	0.203		
		y		0.050	0.100	0.150		
Uniformity		U		70	75	-	%	Note1、Note6
NTSC				45	50	-	%	
Luminance		L		320	500	-	cd/m^2	Note7

Test Conditions:
1. I_F= 20mA(one channel), the ambient temperature is 25℃.
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 10 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.
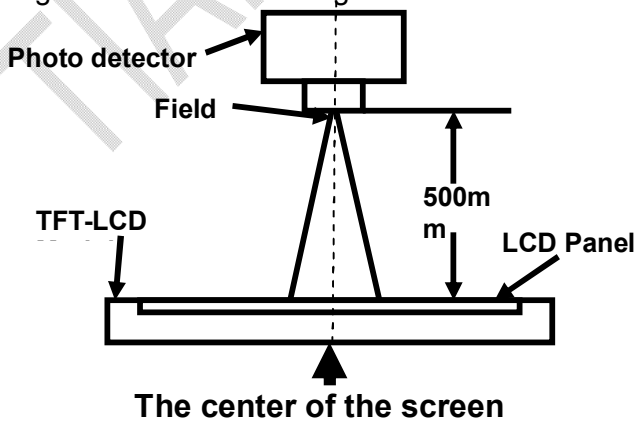
Note 2: Definition of viewing angle range and measurement system.
viewing angle is measured at the center point of the LCD.
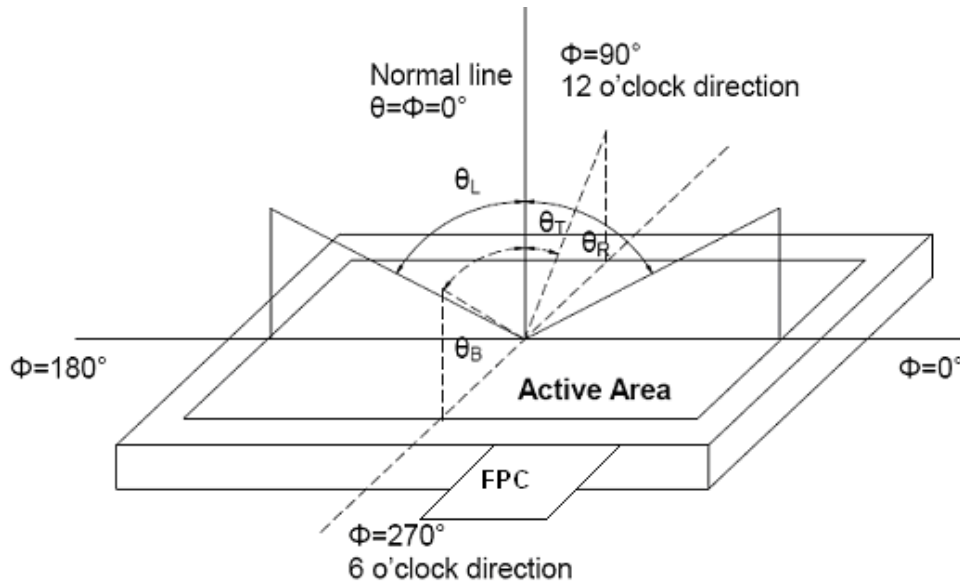
Note 3: Definition of contrast ratio

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

"White state ": The state is that the LCD should drive by Vwhite.
"Black state": The state is that the LCD should drive by Vblack.
Vwhite: To be determined   Vblack: To be determined.

Note 4: Definition of Response time
The response time is defined as the LCD optical switching time interval between "Black" state and "White" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 10% to 90%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 90% to 10%.
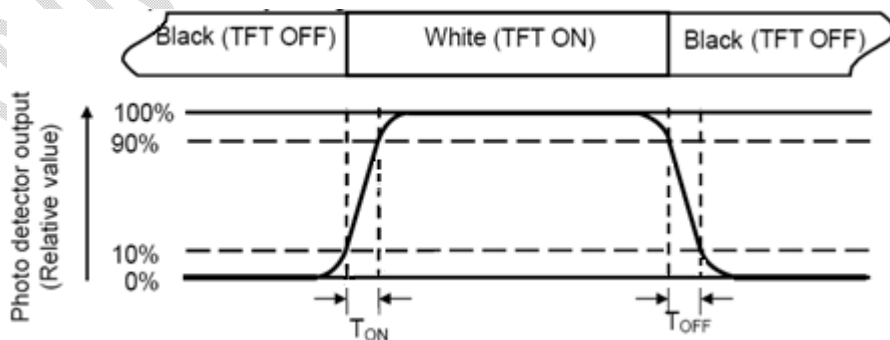
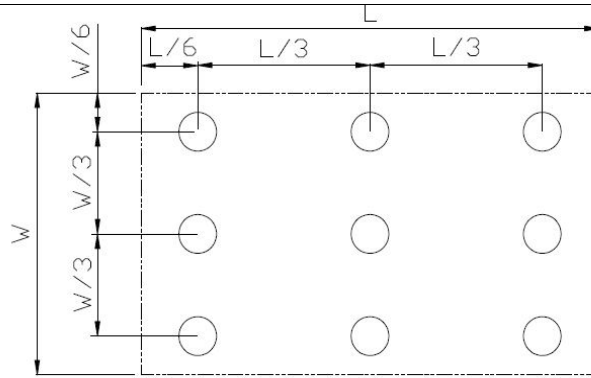Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.
Note 6: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.
    Luminance Uniformity (U) = Lmin/ Lmax
    L-------Active area length W----- Active area width

Lmax: The measured Maximum luminance of all measurement position.
Lmin: The measured Minimum luminance of all measurement position.
Note 7: Definition of Luminance:
Measure the luminance of white state at center point.

7. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta = +70℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
5	Operate at High Temperature and Humidity	Ta=+60℃、RH=90％, 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃（30min）⇔80℃（30min）,Change Time:5min,20cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
7	ESD	C=150pF、R=330Ω Air: ±8KV　Contact:±4KV 5point/panel, 5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Package Drop Test	Height: 60 cm, 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

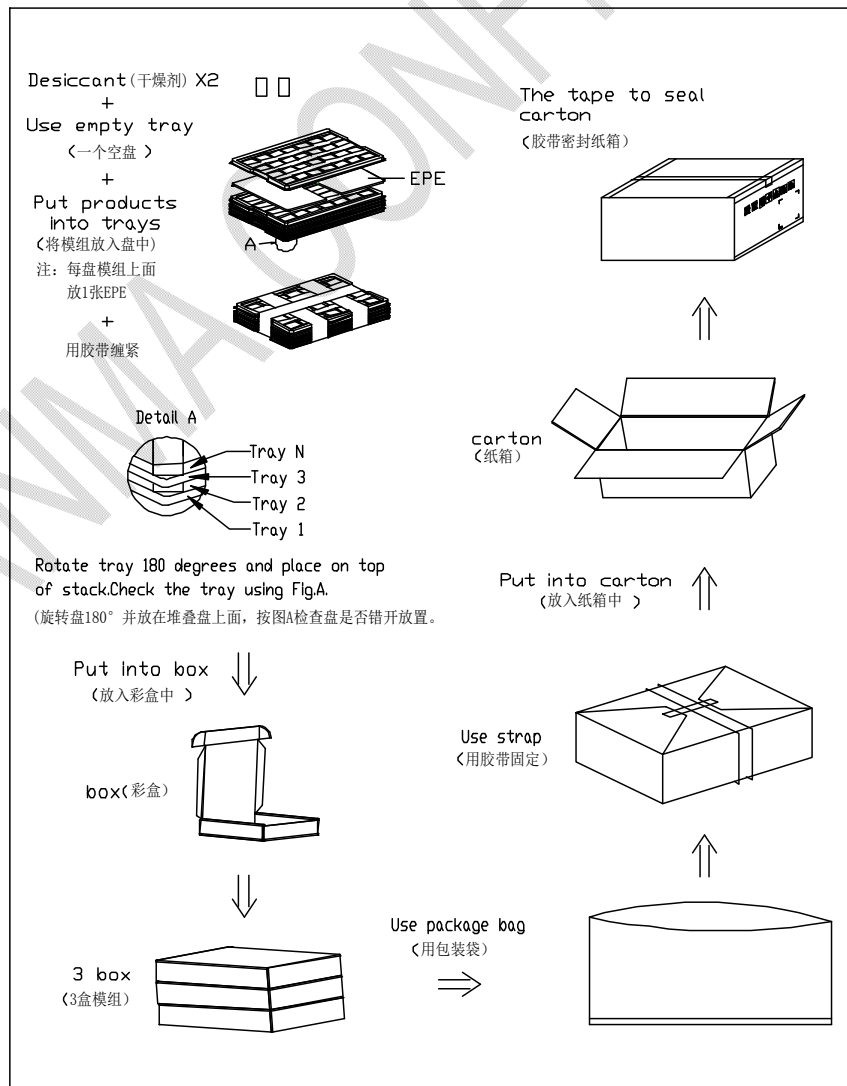Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

Note4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

8. Mechanical Drawing

Note 1: Cross section of EMI film on FPC has conductivity.

9. Packing Drawing

No	Item	Model (Materiel)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM070JVHG33-01	181.76×125.60×6.35	0.2285	36	
2	Tray	PET（Transmit）	485×330×23	0.202	12	
3	Dust-proof Bag	PE	700×545×0.05	0.045	1	
4	BOX	CORRUGATED PAPER	520×345×74	0.373	3	
5	Desiccant	Desiccant	45×35	0.002	6	
6	EPE	EPE	384.32x266.0x1.0	0.0019	9	
7	Label	Label	100X52	0.0004	1	
8	Carton	CORRUGATED PAPER	544×365×250	0.94	1	
9	Total weight(Kg)	12.78±5%				

Desiccant（干燥剂）X2
+
Use empty tray
（一个空盘）
+
Put products into trays
（将模组放入盘中）
注：每盘模组上面
放1张EPE
+
用胶带缠紧

EPE

A

Detail A

Tray N
Tray 3
Tray 2
Tray 1

Rotate tray 180 degrees and place on top of stack.Check the tray using Fig.A.
（旋转盘180°并放在堆叠盘上面，按图A检查盘是否错开放置。）

Put into box
（放入彩盒中）

box（彩盒）

3 box
（3盒模组）

The tape to seal carton
（胶带密封纸箱）

carton
（纸箱）

Put into carton
（放入纸箱中）

Use strap
（用胶带固定）

Use package bag
（用包装袋）

10. Precautions for Use of LCD Modules

10.1 Handling Precautions

   10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

   10.1.2 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.

   10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

   10.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

   10.1.5 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

   10.1.6 Do not attempt to disassemble the LCD Module.

   10.1.7 If the logic circuit power is off, do not apply the input signals.

   10.1.8 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.

10.2 Storage precautions

   10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

   10.2.2 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℃ ～ 40℃
     Relatively humidity: ≤80%

   10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

10.3 The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.