

MODEL NO : TM070RDHG70**MODEL VERSION: -00****SPEC VERSION : V1.3****ISSUED DATE: 2017/1/4**

- ☒ Preliminary Specification
☐ Final Product Specification

Customer : _____

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by

This technical specification is subjected to change without notice

Table of Contents

Table of Contents	2
Record of Revision.....	3
1 General Specifications.....	4
2 Input/Output Terminals	5
3 Absolute Maximum Ratings.....	7
4 Electrical Characteristics	8
5 Timing Chart.....	10
6 Optical Characteristics	15
7 Environmental / Reliability Test.....	18
8 Mechanical Drawing	19
9 Packing Drawing	20
10 Precautions for Use of LCD Modules.....	21

Record of Revision

[illegible]

1 General Specifications

Feature		Spec
Display Spec.	Size	7inch
	Resolution	800RGB*480
	Technology Type	SFT
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.1926(H) x 0.179(V)
	Display Mode	TM,NB
	Surface Treatment	AG
	Viewing Direction	All direction
	Gray Scale Inversion Direction	N.A.
Mechanical Characteristics	LCM (W x H x D) (mm)	164.9 x 100 x 5.7
	Active Area(mm)	154.08(W) x 85.92(H)
	With /Without TSP	Without TSP
	Matching Connection Type	HIROSE FH12A-50S-0.5H
	LED Numbers	27 LEDS
	Weight (g)	TBD
Electrical Characteristics	Interface	RGB 24bit
	Color Depth	16M
	Driver IC	HX8282-A02 + HX8664-B

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: $\pm 5\%$

2 Input/Output Terminals

Pin No.	Symbol	I/O	Function	Remark
1	VLED+	P	Led anode	
2	VLED+	P	Led anode	
3	VLED-	P	Led cathode	
4	VLED-	P	Led cathode	
5	GND	P	Ground	
6	NC	NC		
7	VCC	P	Digital power supply	
8	MODE	I	DE/SYNC mode select. H:DE mode, L:SYNC mode	
9	DE	I	Data enable signal, active high to enable data,	
10	VSNC	I	Vertical sync input,	
11	HSNC	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	

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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	Ground	
37	DCLK	I	Clock for input data	
38	GND	P	Ground	
39	LR	I	Source left or right sequence control	
40	UD	I	Gate up or down scan control	
41	VGH	P	Positive power of TFT	
42	VGL	P	Negative power of TFT	
43	AVDD	P	Analog power supply	
44	RESET	I	Global reset pin	
45	NC	NC		
46	NC	NC		
47	DITHB	I	Dithering setting.L: 6bit resolution, H: 8bit resolution	
48	GND	P	Ground	
49	NC	NC		
50	NC	NC		

I---Input, O---Output, P---Power/Ground

Table 2.1 terminal pin assignment

3 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage1	VCC	-0.5	3.96	V	Note1
Power Voltage2	AVDD	-0.5	14.85	V	
Logic output voltage	V _{OUT}	-0.5	5	V	
Input voltage	V _{IN}	-0.5	AVDD+0.5	V	
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tst	-30	80	°C	
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/m ³	Ta>70°C

Table 3 Absolute Maximum Ratings

Note1 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.

4 Electrical Characteristics

TTL mode DC electrical characteristics

(VDD=2.3~3.6V, AVDD=6.5~13.5V, GND=AGND=0V, T_A=-30℃~+85℃)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Power supply voltage	VDD		3.0	3.3	3.6	V
Power supply voltage	AVDD		10.71	11.9	13.09	V
Low level input voltage	V _{IL}	For digital circuit	0	-	0.3VDD	V
High level input voltage	V _{IH}	For digital circuit	0.7VDD	-	VDD	V
Output low voltage	V _{OL}	I _{OL} =400μA	-	-	GND+0.4	V
Output high voltage	V _{OH}	I _{OH} =-400μA	VDD-0.4	-		V
Gate high voltage	V _{GH}		18	20	22	V
Gate low voltage	V _{GL}		-6.3	-7	-7.7	V
Pull low/high resistance	R _I	For the digital input pin @VDD=3.3V	200	250	300	KΩ
Input leakage current	I _I	For digital circuit	-	-	±1	uA
Digital operation current	I _{dd}	Fclk=50MHz, LD=48KHz, VDD=3.3V, No load	-	12	20	mA
Digital stand-by current	I _{st1}	Clock & all functions are stopped	-	10	50	uA
Analog operating current	I _{dda}	No load, Fclk=50MHz, LD=48KHz @ AVDD=10V, V1=8V, V14=0.4V	-	8	10	mA
Analog stand-by current	I _{st2}	No load, clock & all functions are stopped	-	10	50	uA
Input level of V1-V7	V _{ref1}	Gamma correction voltage input	0.4AVDD	-	AVDD-0.1	V
Input level of V8-V14	V _{ref2}	Gamma correction voltage input	0.1	-	0.6AVDD	V
Output voltage deviation	V _{od1}	V _o =AGND+0.1V~AGND+0.5V & V _o =AVDD-0.5V~AVDD-0.1V	-	±20	±35	mA
Output voltage deviation	V _{od2}	V _o =AGND+0.5V~AVDD-0.5V	-	±15	±20	mA
Output voltage offset between chips	V _{oc}	V _o =AGND+0.5V~AVDD-0.5V	-	-	±20	mA
Dynamic range of output	V _{dr}	SO1~SO1200	0.1	-	VADD-0.1	V
Sinking current of outputs	I _{OLy}	SO1~SO1200; V _o =0.1V vs. 1.0V, AVDD=13.5V	80	-	-	uA
Driving current of output	I _{OHy}	SO1~SO1200 ;V _o =0.1V vs. 12.5V, AVDD=13.5V	80	-	-	uA
Resistance of gamma table	R _g	R _n : Internal gamma resistor	0.7xR _n	1.0xR _n	1.3xR _n	Ω

Table 4.1 DC electrical characteristics

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TTL mode AC electrical characteristics

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
VDD Power on alew rate	TPOR	From 0V to 90% VDD	-	-	20	ms
GRB pulse width	TGRB	DCLK=65MHz	50	-	-	μs
DCLK cycle time	Tcph	-	14	-	-	ns
DCLK pulse duty	Tcwh	-	40	50	60	%
VSD setup time	Tvst	-	5	-	-	ns
VSD hold time	Tvhd	-	5	-	-	ns
HSD setup time	Thst	-	5	-	-	ns
HSD hold time	Thhd	-	5	-	-	ns
Data setup time	Tdsu	D0[7:0], D1[7:0], D2[7:0] to DCLK	5	-	-	ns
Data hold time	Tdhd	D0[7:0], D1[7:0], D2[7:0] to DCLK	5	-	-	ns
DE setup time	Tesu	-	5	-	-	ns
DE hold time	Tehd	-	5	-	-	ns
Output stable time	Tsst	10% to 90% target voltage. CL=90pF, R=10K. (Cascade)	-	-	6	μs
		Dual gate	-	-	3	

Table 4.2 AC electrical characteristics
4.2 Backlight Unit Driving Condition

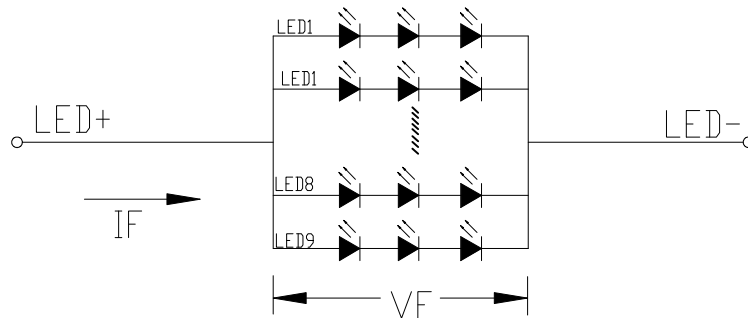
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	180	-	mA	27 LEDs (3 LED Serial,9 LED Parallel)
Forward Current Voltage	V_F	9.0	9.3	9.6	V	
Backlight Power Consumption	W_{BL}	1620	1674	1728	mW	
LED Life Time	--	20000	30000	--	hrs	Note 2, Note 3

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 9LED Parallel).

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: Optical performance should be evaluated at $T_a=25^{\circ}\text{C}$ 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% initial brightness. Typical operating life time is estimated data.

Note4: The LED driving condition is defined for each LED module.



5 Timing Chart

5.1 TTL mode data input format Vertical timing

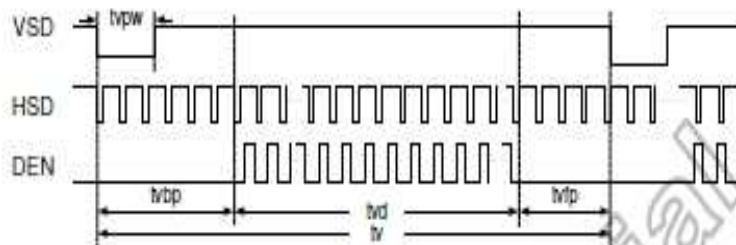


Figure 5.1.1: Vertical input timing diagram

Horizontal timing

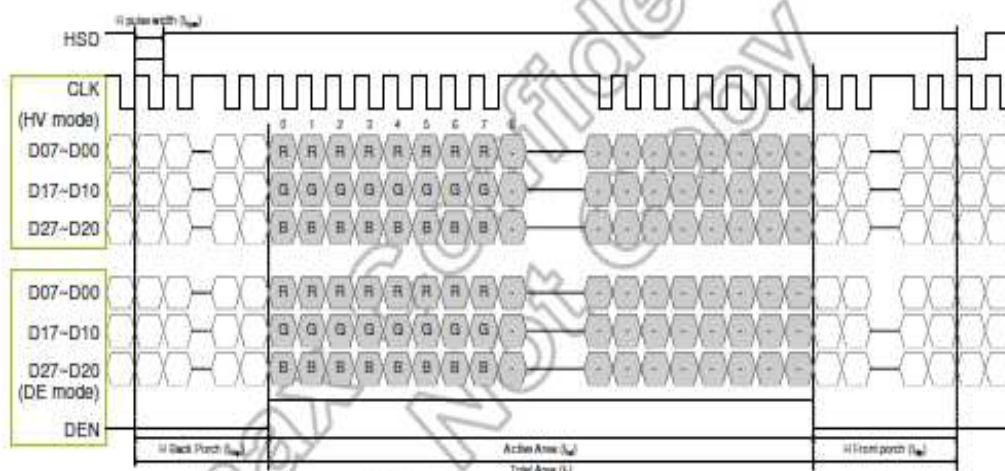


Figure 5.1.2: Horizontal input timing diagram

5.2 parallel RGB input timing table DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	26.2	29.2	54.6	MHz
Horizontal display area	thd		800		DCLK
HSD period	th	890	928	1300	DCLK
HSD blanking	thb+ thpw	90	128	500	DCLK
Vertical display area	tvd		480		T _H
VSD period	tv	490	525	700	T _H
VSD blanking	tvbp+ tv/p	10	45	220	T _H

HV mode

Horizontal timing

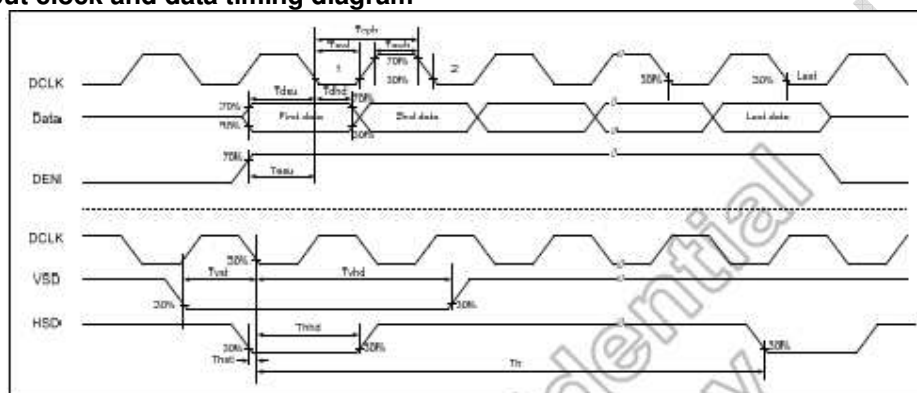
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	27.7	29.2	39.6	MHz
Horizontal display area	thd		800		DCLK
HSD period	th	900	928	1100	DCLK
HSD pulse width	thpw	1	-	40	DCLK
HSD back porch	thbp		88		DCLK
HSD front porch	thfp	12	40	212	DCLK

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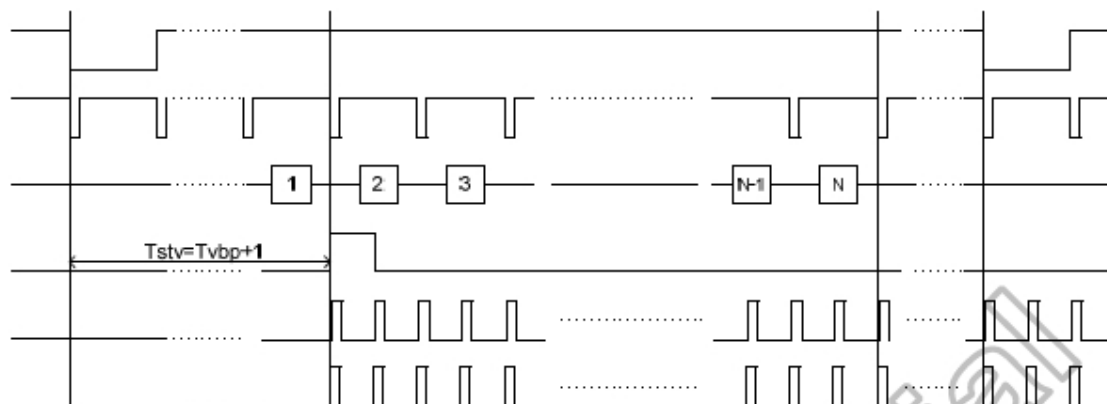
Vertical timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd		480		T _H
VSD period	tv	513	525	600	T _H
VSD pulse width	typw	1	-	3	T _H
VSD back porch	tvbp		32		T _H
VSD front porch	tvfp	1	13	88	T _H

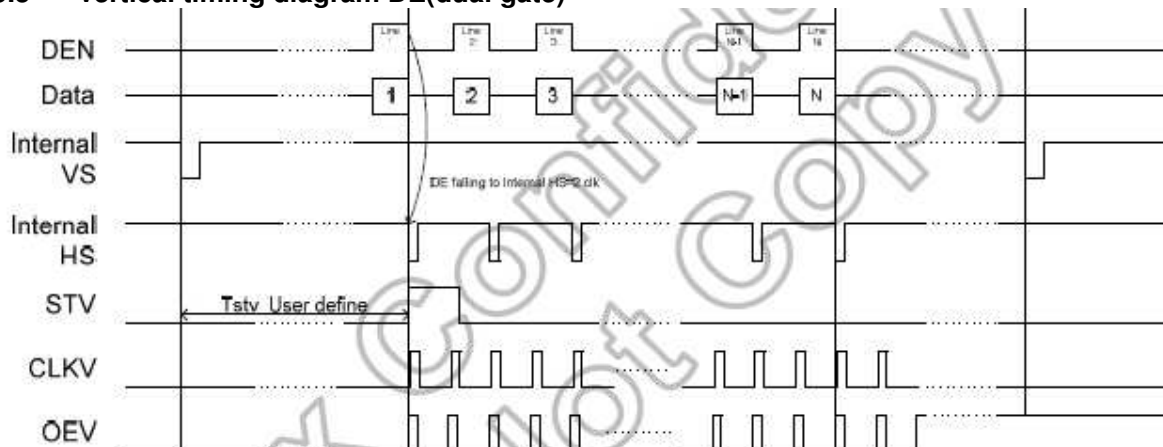
5.3 Input clock and data timing diagram



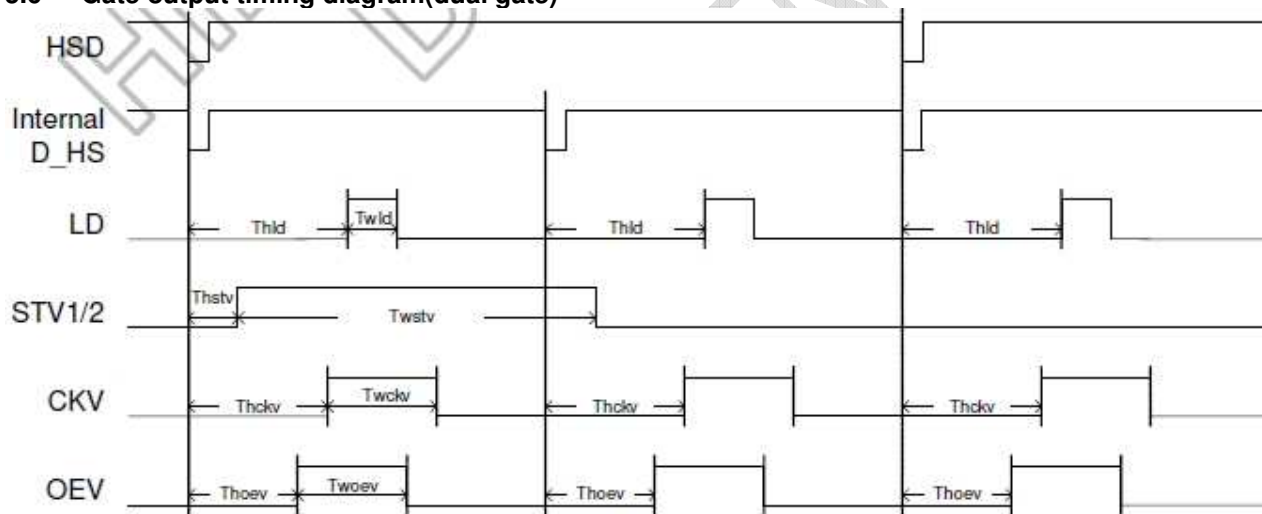
5.4 Vertical timing diagram HV(dual gate)

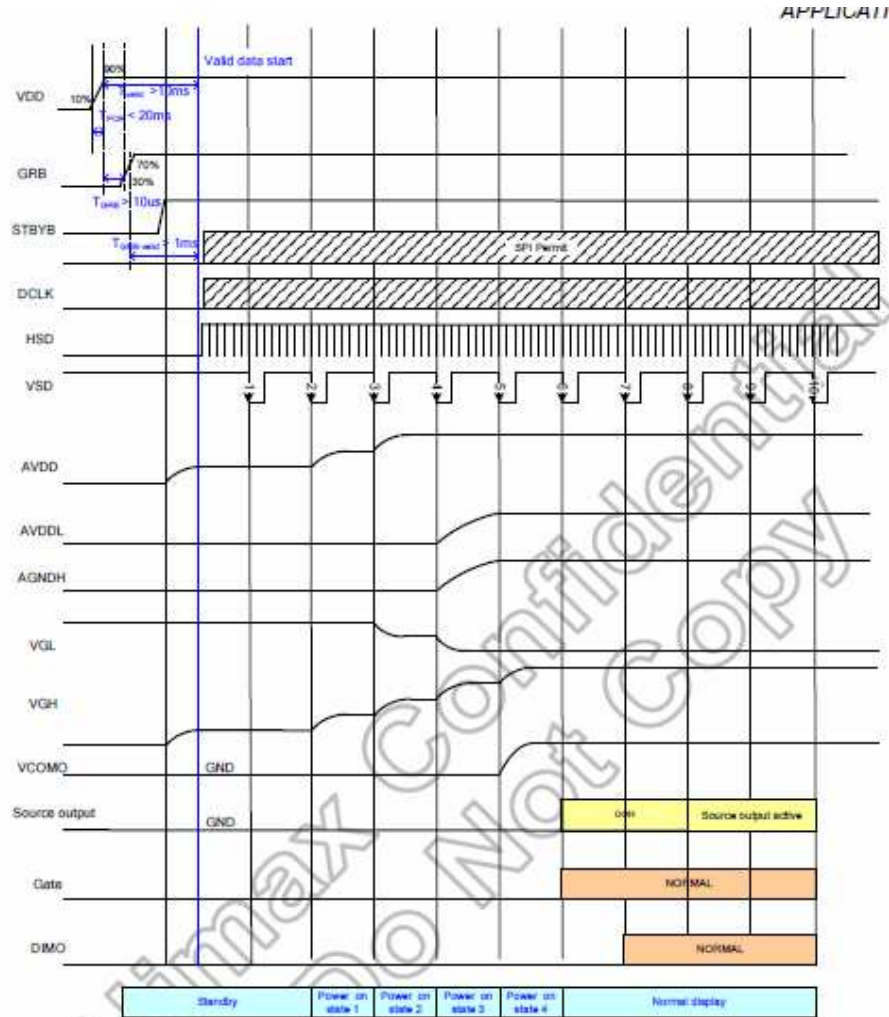


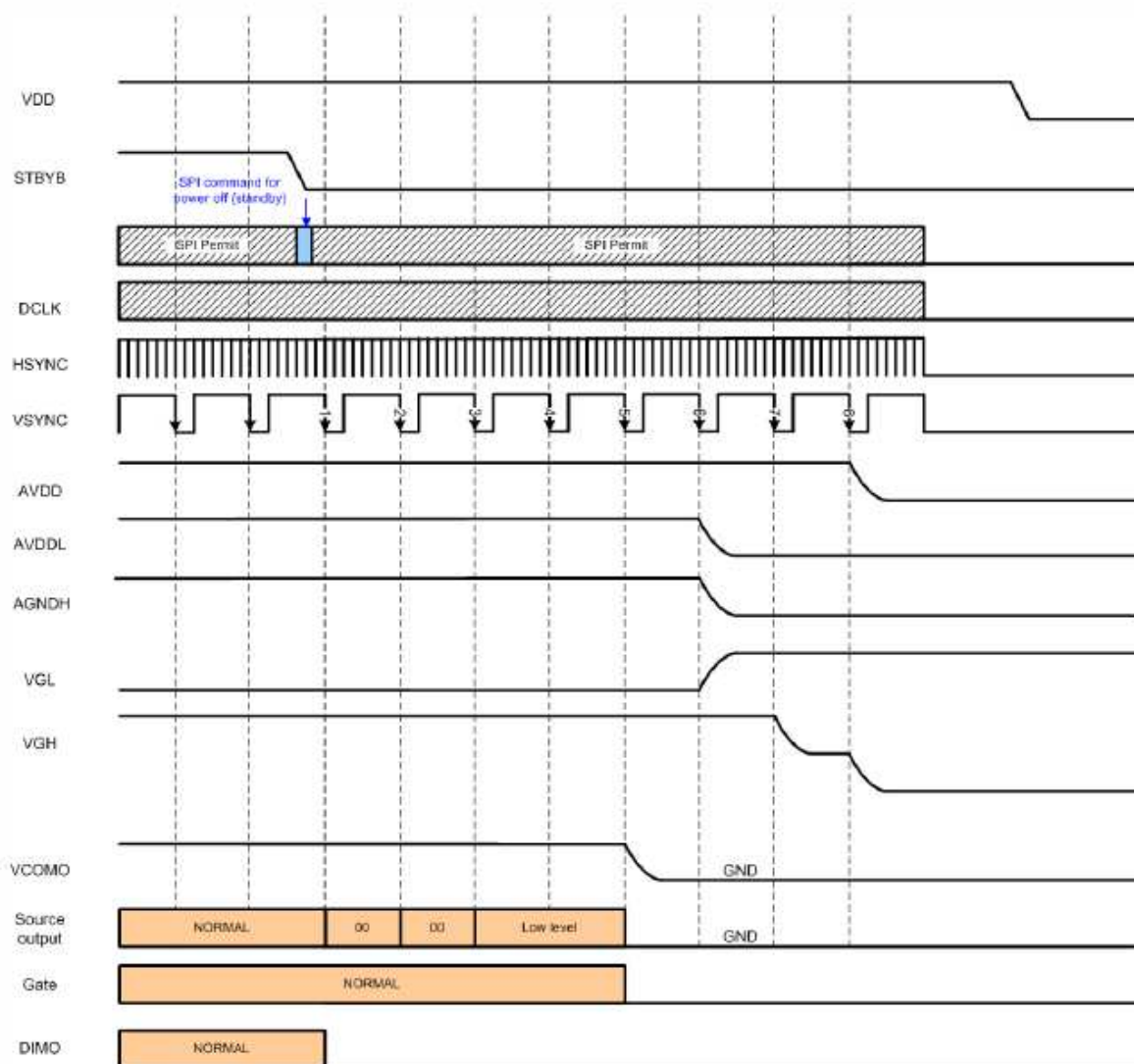
5.5 Vertical timing diagram DE(dual gate)



5.6 Gate output timing diagram(dual gate)



5.7 Power on sequence


5.8 Power off sequence


6 Optical Characteristics

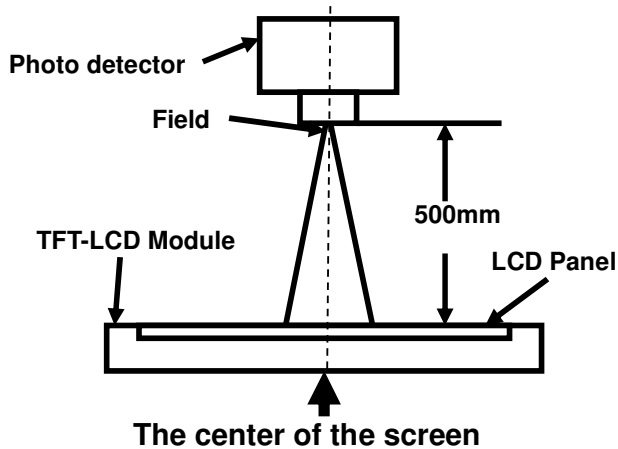
Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles	θT	$CR \geq 10$	80	88		Degree	Note 2,3
	θB		80	88			
	θL		80	88			
	θR		80	88			
Contrast Ratio	CR	$\theta = 0^\circ$	700	900			Note 3
Response Time	T_{ON}	25°C		30	40	ms	Note 4
	T_{OFF}						
Chromaticity	White	x	0.258	0.308	0.358		Note 1,5
		y	0.282	0.332	0.382		
	Red	x	0.583	0.633	0.683		Note 1,5
		y	0.279	0.329	0.379		
	Green	x	0.270	0.320	0.370		Note 1,5
		y	0.563	0.613	0.663		
	Blue	x	0.100	0.150	0.200		Note 1,5
		y	0.003	0.053	0.103		
Uniformity	U		75	80		%	Note 6
NTSC				70		%	Note 5
Luminance	L		455	555		cd/m ²	Note 7

Test Conditions:

1. $I_F = 180$ mA, and the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

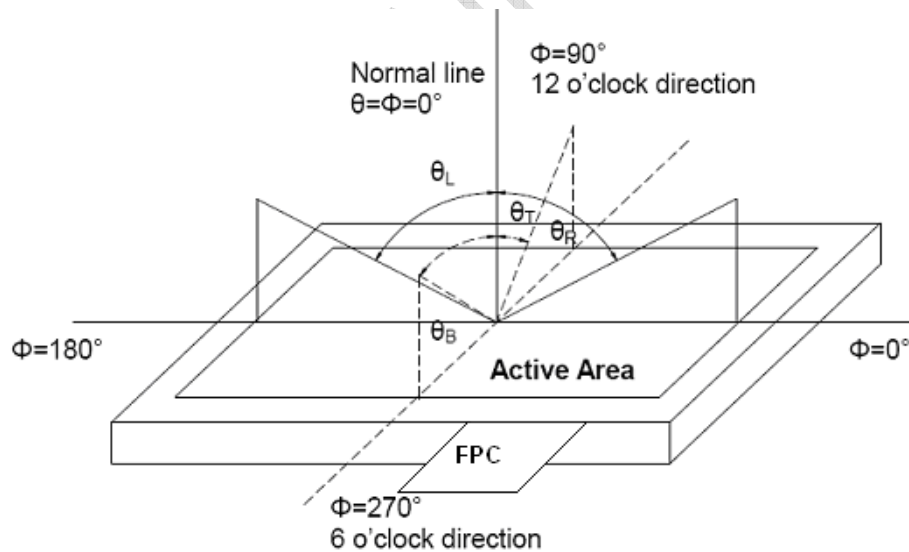
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).



Note 3: Definition of contrast ratio

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

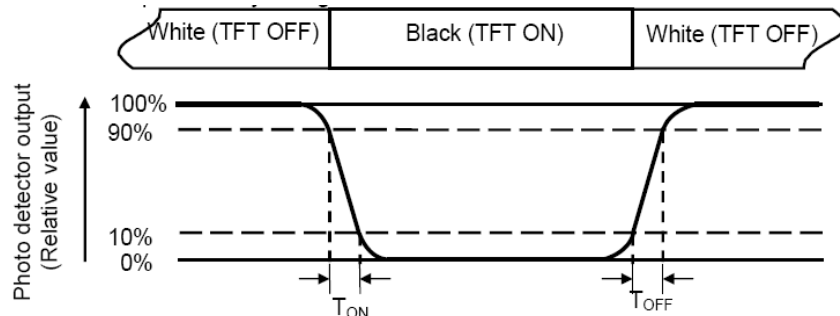
"White state ": The state is that the LCD should drive by Vwhite.

"Black state": The state is that the LCD should drive by Vblack.

V_{white}: To be determined V_{black}: To be determined.

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



Note 5: Definition of color chromaticity (CIE1931)

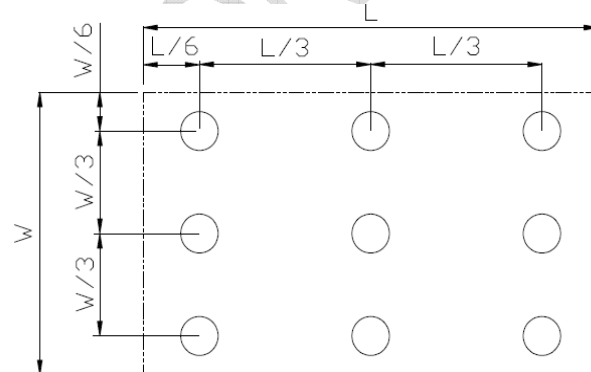
Color coordinates measured at center point of LCD.

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.

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

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



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

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

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

7 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +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	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max,240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 100 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	Half Sine Wave 100G 6ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:60cm, 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

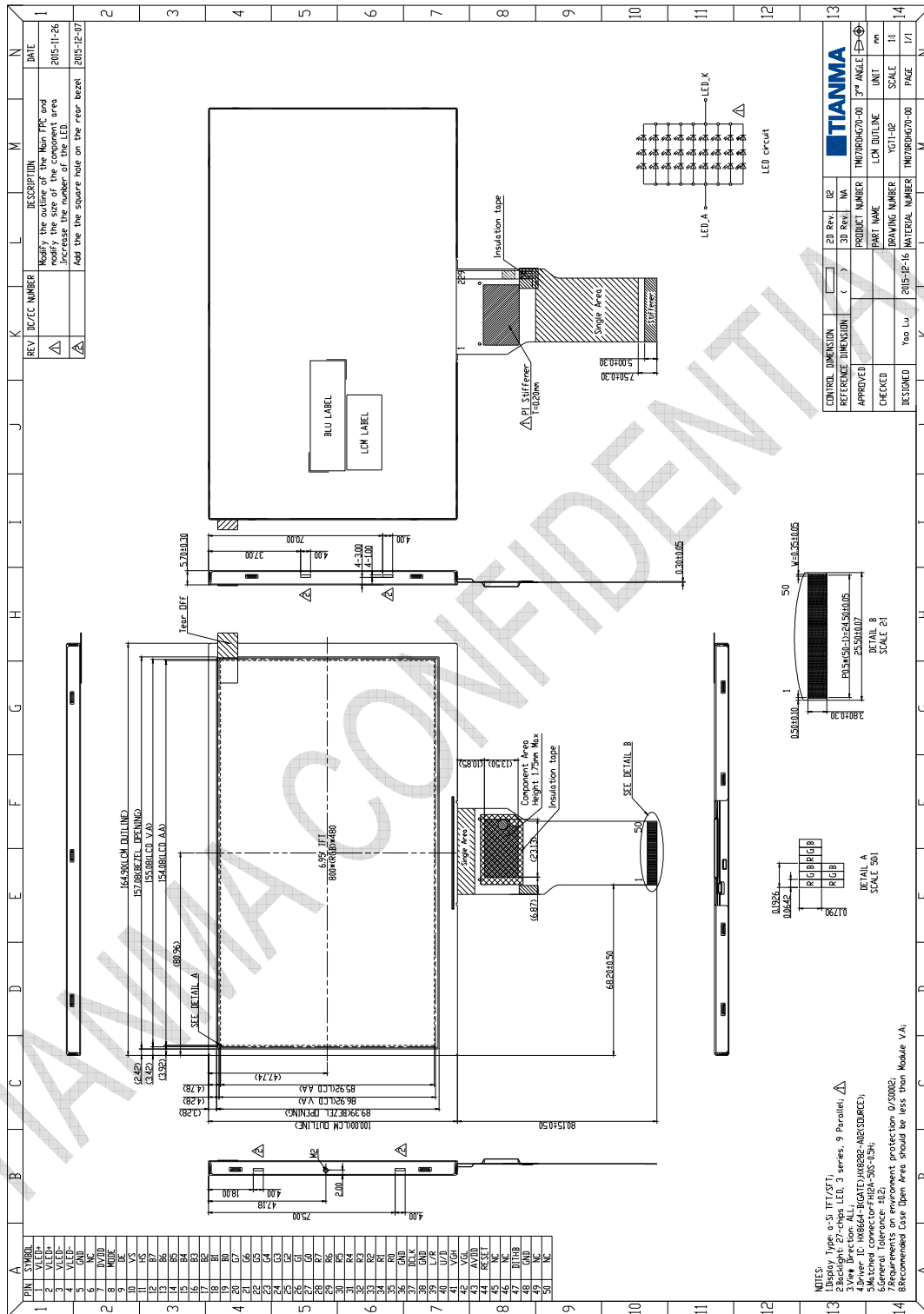
Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of sample.

Note3: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: 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



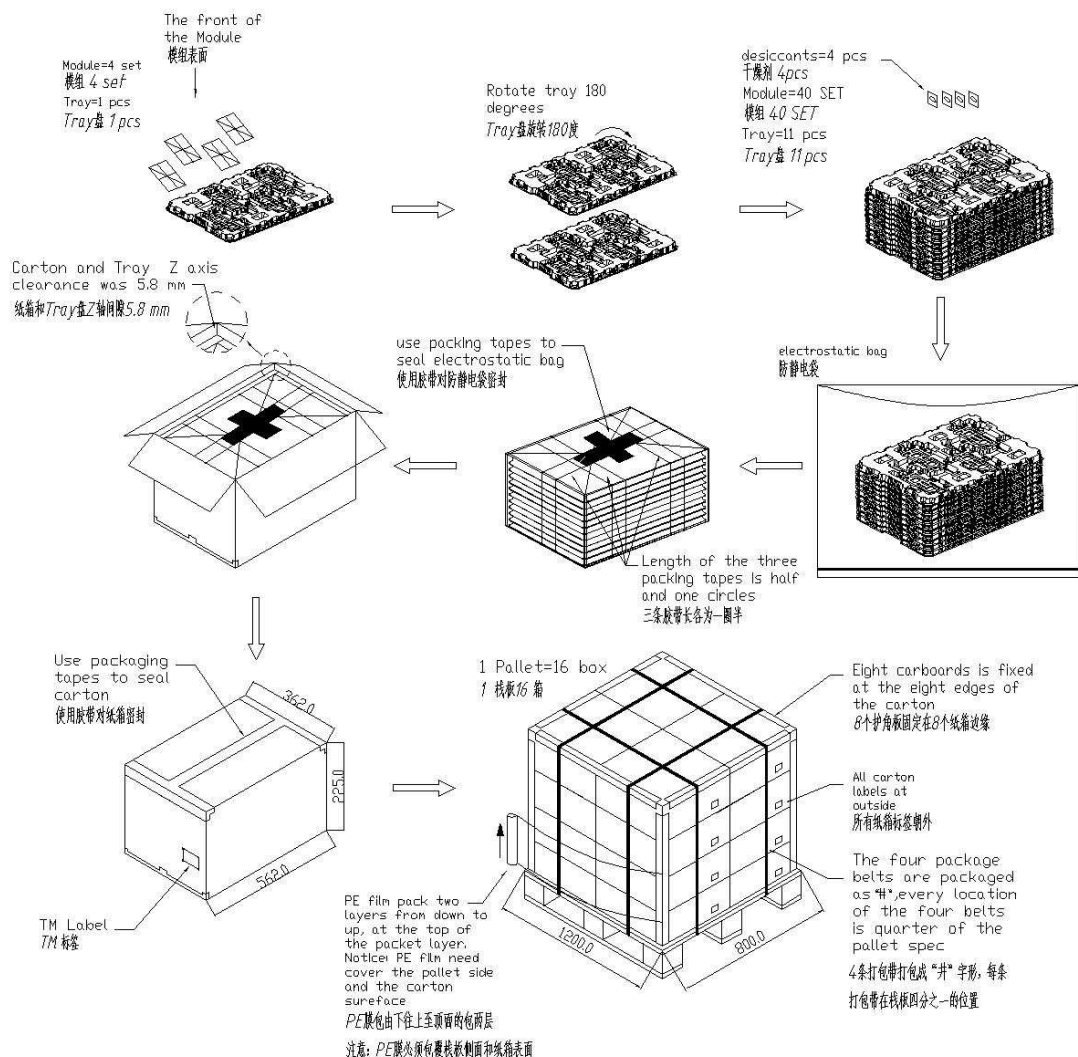
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9 Packing Drawing

(1) LCM quantity per Tray: 1row×4column = **4**

(2) Total LCM quantity in Carton: No. of Tray(11-1)× quantity per Tray **4= 40**

Note: Please refer to the data from “estimated report about the dimension and stack of Carton “ about stacking carton



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.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 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°C ~ 40°C Relatively humidity: ≤80%

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

10.3 Transportation Precautions

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