MODEL NO.   :   TM050RDH03

ISSUED DATE: 2010-08-03

VERSION   :   Ver 1.0

■Preliminary Specification
□Final Product Specification

Customer :

Approved by	Notes

SHANGHAI TIANMA Confirmed :

Prepared by	Checked by	Approved by

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2010-08-03	Preliminary release.	Haitao Chen

1. General Specifications

Feature		Spec
Display Spec.	Size	5.0 inch
	Resolution	800(RGB) x 480
	Interface	RGB 24 bits
	Color Depth	16.7M
	Technology Type	a-Si
	Pixel Pitch (mm)	0.360x0.360
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Anti-Glare(3H)
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
	LCM (W x H x D) (mm)	120.70x75.80x3.10
Mechanical Characteristics	Active Area(mm)	108.00x64.80
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	14 LEDs

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 CN1 pin assignment (Signal interface)

No	Symbol	I/O	Description	Comment
1	VLED-	P	Back light cathode	
2	VLED+	P	Back light anode	
3	GND	P	Ground	
4	VDD	P	Power supply	
5	R0	I	Data input	
6	R1	I	Data input	
7	R2	I	Data input	
8	R3	I	Data input	
9	R4	I	Data input	
10	R5	I	Data input	
11	R6	I	Data input	
12	R7	I	Data input	
13	G0	I	Data input	
14	G1	I	Data input	
15	G2	I	Data input	
16	G3	I	Data input	
17	G4	I	Data input	
18	G5	I	Data input	
19	G6	I	Data input	
20	G7	I	Data input	
21	B0	I	Data input	
22	B1	I	Data input	
23	B2	I	Data input	
24	B3	I	Data input	
25	B4	I	Data input	
26	B5	I	Data input	
27	B6	I	Data input	
28	B7	I	Data input	
29	GND	P	Ground	
30	CLKIN	I	Clock for input data. Data latched at falling edge of this signal.	
31	STBYB	I	Standby mode. STBYB="1": Normally operation. STBYB="0": Standby mode .Timing controller, source driver will turn off, all output are High-Z.	
32	HSD	I	Horizontal sync input.	
33	VSD	I	Vertical sync input	
34	DEN	I	Data input enable. Active high to enable the data input bus under "DE Mode ".	
35	NC	--	No connection	
36	GND	P	Ground	
37	XR	--	NC	
38	YD	--	NC	
39	XL	--	NC	
40	YU	--	NC	

Note1:   I/O definition: I----Input   O----Output   P----Power/Ground

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

GND=0V,Ta=25℃

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

Note1: The parameter is for driver IC (gate driver, source driver) only.
Note2: Signals include R0~R7, G0~G7, B0~B7, CLKIN, STBYB, HSD, VSD, DEN

Table 3.1 absolute maximum rating

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage		VDD	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	V_{IL}	0	--	0.3xVDD	V	
	High Level	V_{IH}	0.7xVDD	--	VDD	V	
Output Signal Voltage	Low Level	V_{OL}	--	--	GND+0.4	V	
	High Level	V_{OH}	VDD-0.4	--	--	V	
(Panel+LSI) Power Consumption	Black Mode (60Hz)			TBD		mW	
	Standby Mode			TBD		mW	

Note1: For different LCM, the value may have a bit of difference.
Note2: To test the current dissipation, use "all Black Pattern".

Table 4.1 LCD module electrical characteristics

4.2 Driving Backlight

Item	Symbol	Min	Typ	Max	Unit	Remark
Channel1	I_F	-	20	-	mA	Note 1
Forward Voltage	V_F	-	21.7	-	V	
Backlight Power Consumption	W_{BL}	-	868	-	mW	
Life Time	-	10,000	(20,000)		Hrs	Note 3

Note 1: I_F is defined for one channel LED. There are total two LED channels in back light unit
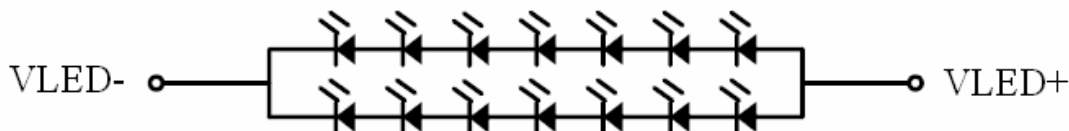
Note 2: Optical performance should be evaluated at Ta=25℃ only.

Note 3: 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.

Table 4.2 LED backlight characteristics
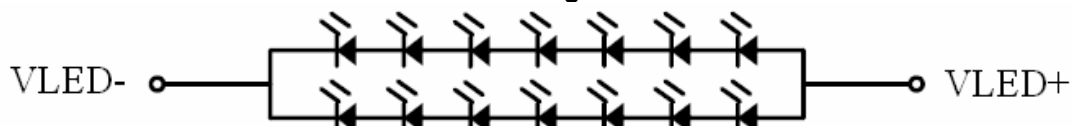
Figure 4.2 LED connection of backlight

4.3 Block Diagram
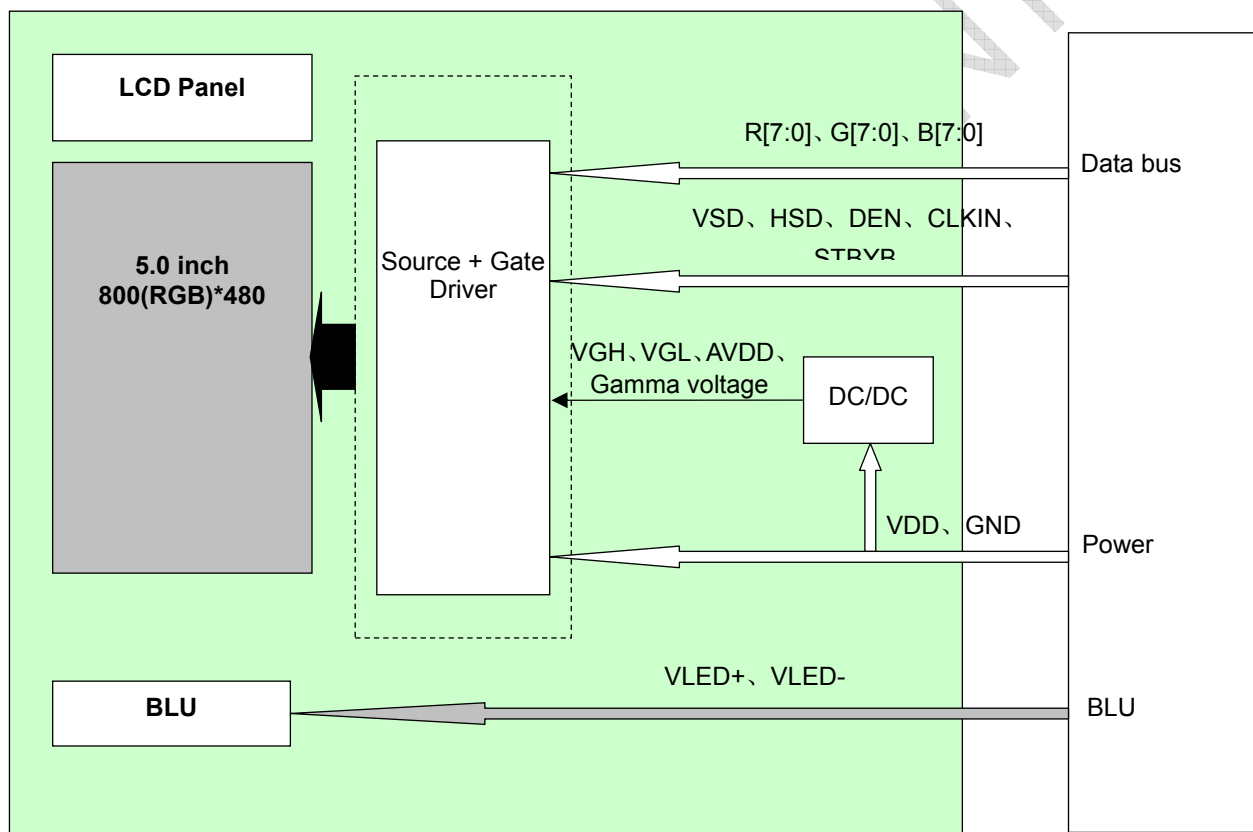
5. Interface timing

5.1 Input Clock and Data Timing

Parameter	Symbol	Min	Typ	Max	Unit	Remark
HSD Setup Time	T_{hst}	8			ns	
HSD Hold Time	T_{hhd}	8	-	-	ns	
VSD Setup Time	T_{vst}	8			ns	
VSD Hold Time	T_{vhd}	8	-	-	ns	
Data Setup Time	T_{dsu}	8			ns	
Data Hold Time	T_{dhd}	8	-	-	ns	
DE Setup Time	T_{esu}	8			ns	
DE Hold Time	T_{ehd}	8	-	-	ns	
CLKIN Cycle Time	T_{cph}	20	-	-	ns	
CLKIN Pulse Width	T_{cwh}	40	50	60	%	
Output stable time	Tsst	-	-	6	us	
VDD Power ON Slew rate	Tpor			20	ms	
RSTB pulse width	TRst	10	-	-	us	

Table 5.1 Input Clock and Data Timing
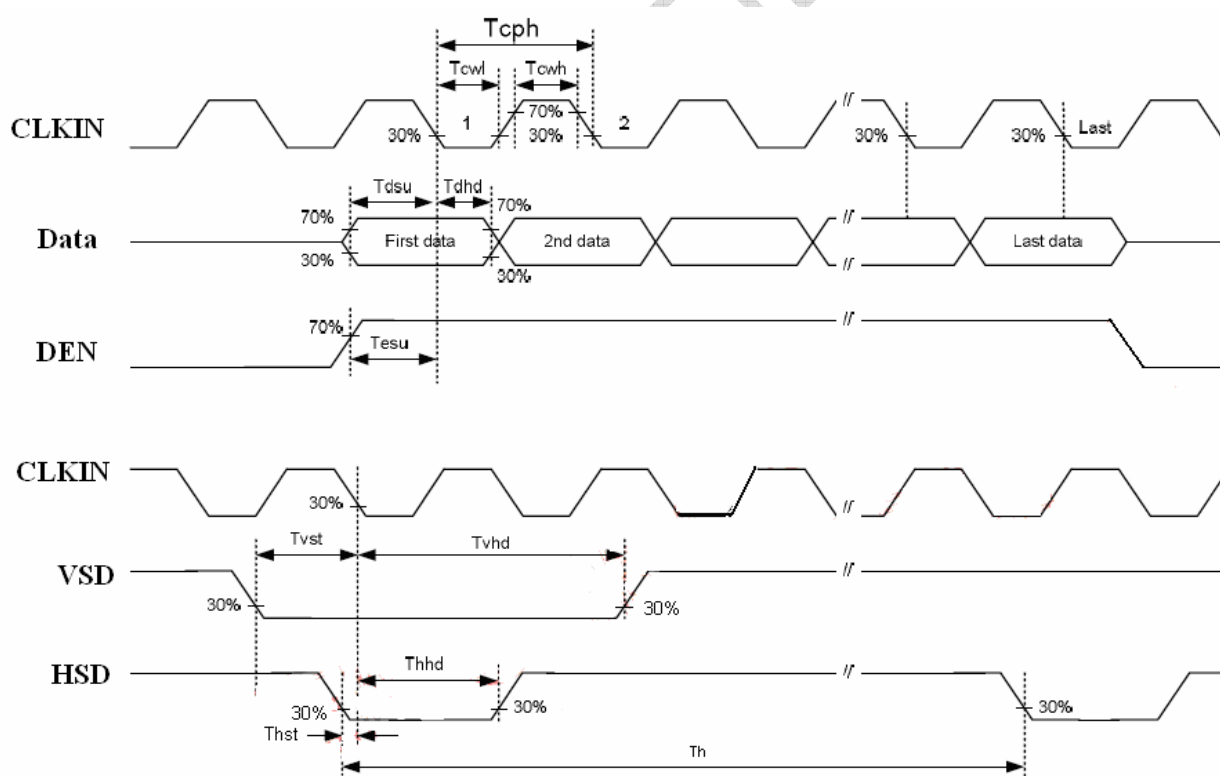
Figure 5.1 Input Clock and Data Timing Diagram

5.2 Data Input format

5.2.1 Parameter Setting Of Timing

Parameter	Symbol	Spec			Unit
		Min	Typ	Max	
Horizontal display area	t_{hd}		800		CLKIN
CLKIN frequency (60Hz)	f_{clk}	-	30	50	MHZ
One Horizontal Line	t_h	889	928	1143	CLKIN
HSD pulse width	t_{hpw}	1	48	255	CLKIN
HSD blanking	t_{hb}		88		CLKIN
HSD front porch	t_{hfp}	1	40	255	CLKIN
Vertical display area	t_{vd}		480		T_H
VSD period time	t_v	513	525	767	T_H
VSD pulse width	t_{vpw}	3	3	255	T_H
VSD Blanking(tvb)	t_{vb}		32		T_H
VSD Front porch (tvfp)	t_{vfp}	1	13	255	T_H

Table 5.2 Parameter Setting Of Timing

5.2.2 Horizontal Input Timing Diagram
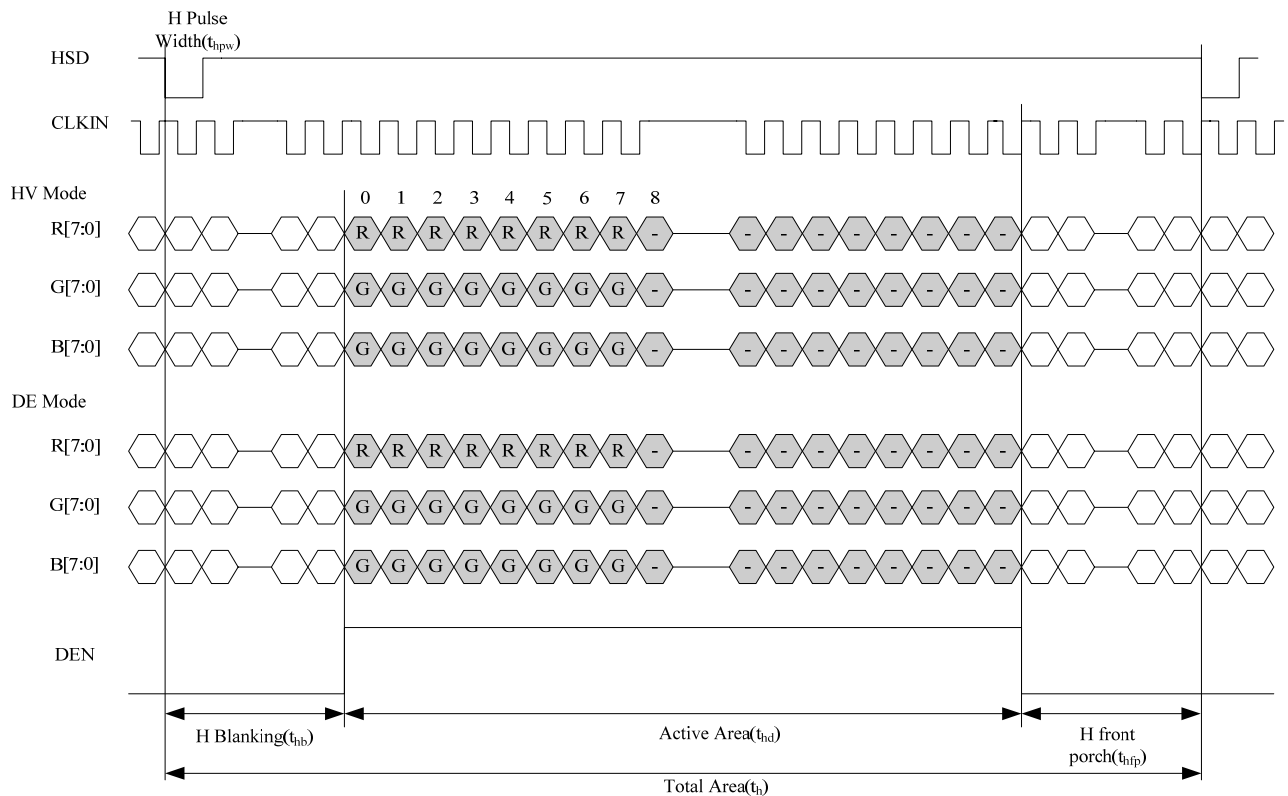
Figure 5.2 Horizontal Input Timing Diagram

5.2.3 Vertical Input Timing Diagram
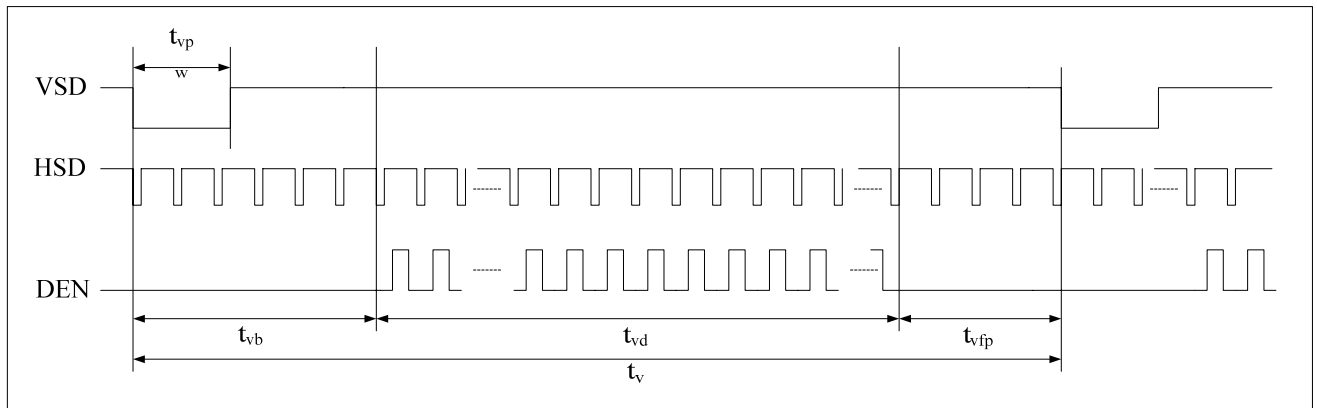
Figure 5.2.3 Vertical Input Timing Diagram

5.3 Power ON/OFF Sequence
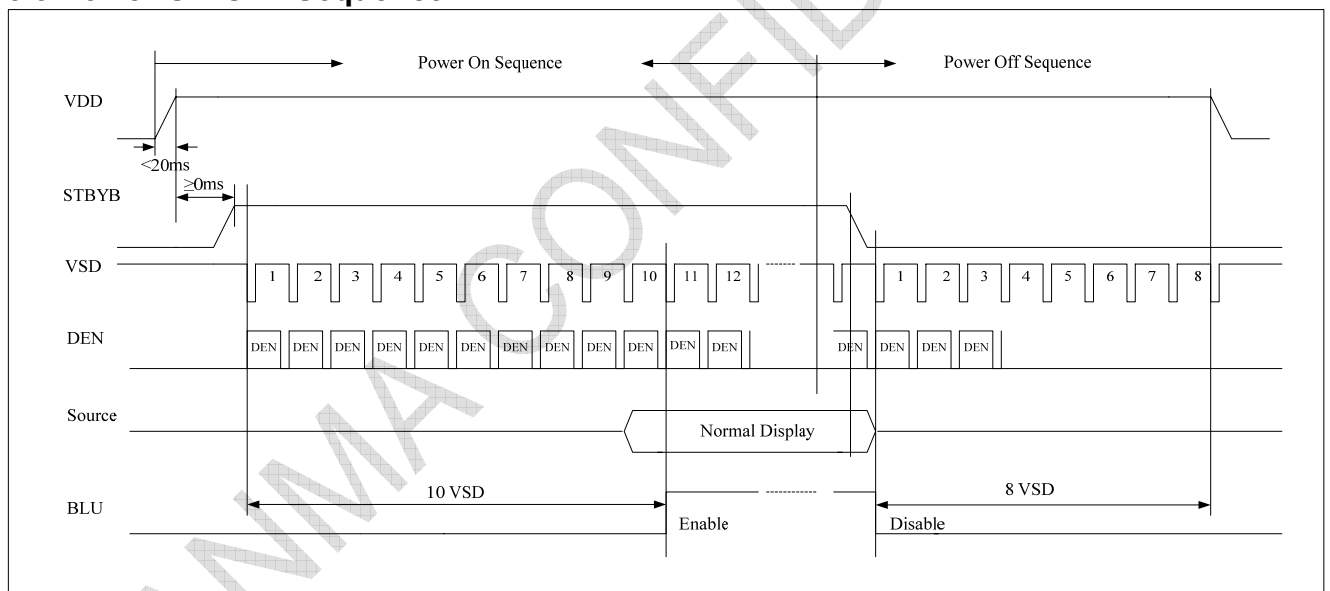
Figure 5.3 Power On/Off Sequence

BLU

VDD

STBYB

Source

T=0   T

VDD → Display on → Source → BLU
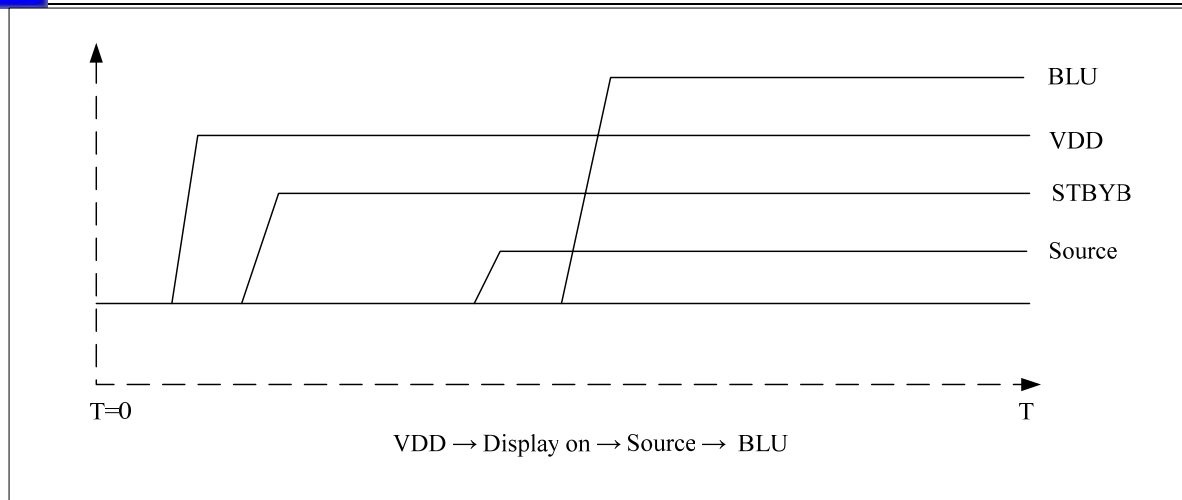
Figure 5.3 Power On Sequence

BLU

VDD

Source

STBYB

T=0   T

Display off → BLU → Source → VDD
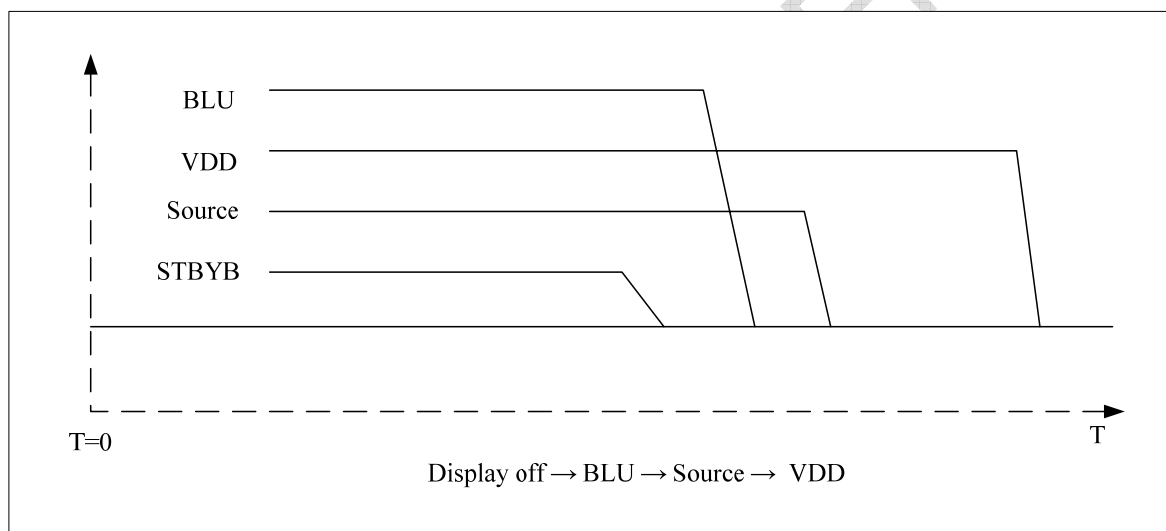
Figure 5.3 Power Off Sequence

6. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≧ 10	40	50	--	Degree	Note 2
		θB		60	70	--		
		θL		60	70	--		
		θR		60	70	--		
Contrast Ratio		CR	θ=0°	500	600	--		Note1、Note3
Response Time		T_{ON}	25℃	--	20	30	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.260	0.310	0.360		Note5 Note1
		y		0.280	0.330	0.380		
	Red	x		0.540	0.590	0.640		
		y		0.300	0.350	0.400		
	Green	x		0.298	0.348	0.398		
		y		0.520	0.570	0.620		
	Blue	x		0.095	0.145	0.195		
		y		0.060	0.110	0.160		
Uniformity		U		75	80	--	%	Note1、Note6
NTSC				--	50	--	%	Note 5
Luminance		L		200	250	--	cd/m²	Note1、Note7

Test Conditions:
1. I_F= 20mA(one channel), V_F=23.1V,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 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.

Photo detector

Field

500mm

TFT-LCD Module

LCD Panel

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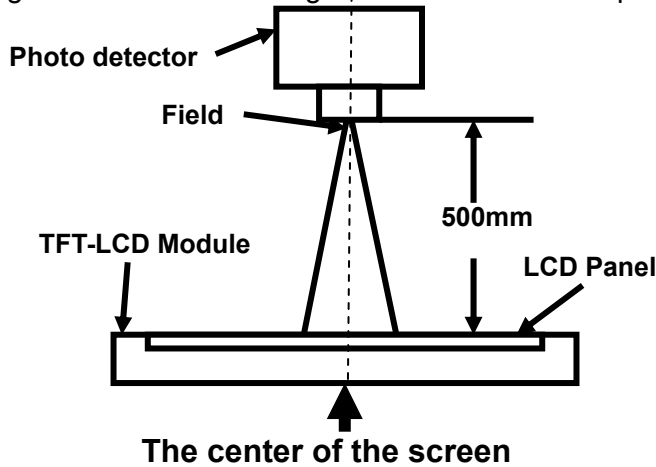
Item	Photo detector	Field
Contrast Ratio		
Luminance	SR-3A	1°
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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)。

Φ=90°
12 o'clock direction

Normal line
θ=Φ=0°

θ_L

θ_T θ_R

Φ=180°

θ_B

Active Area

Φ=0°

FPC

Φ=270°
6 o'clock direction
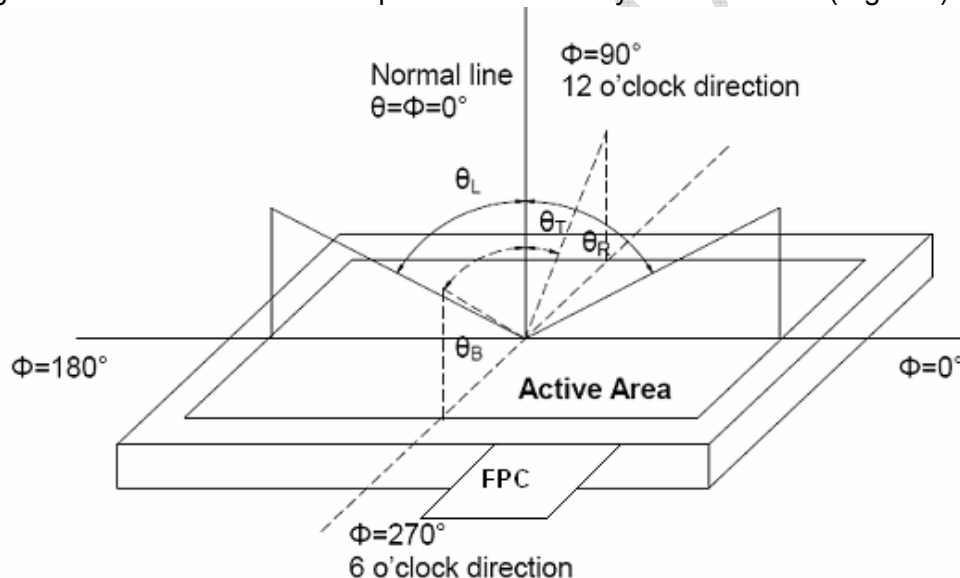
Note 3: Definition of contrast ratio

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

"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 "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%.

White (TFT OFF)	Black (TFT ON)	White (TFT OFF)
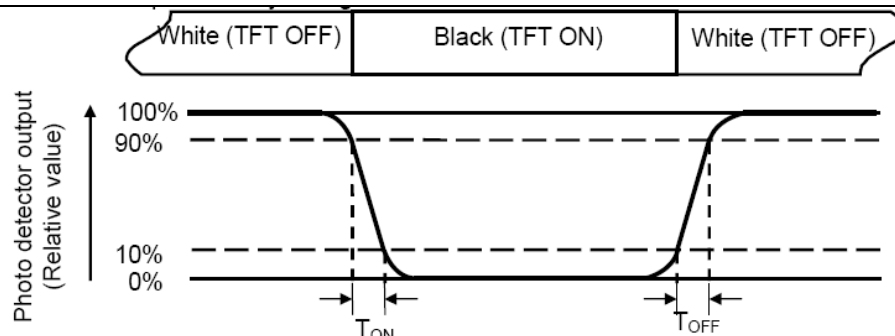
Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.
Note 6: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

   Luminance Uniformity (U) = Lmin/ Lmax
   L-------Active area length W----- Active area width
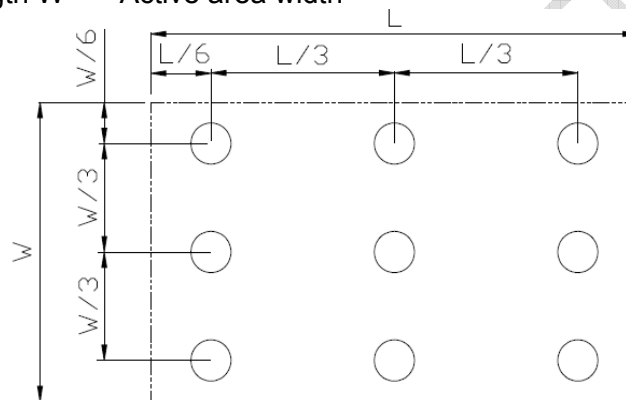
   Lmax: The measured Maximum luminance of all measurement position.
   Lmin: The measured Minimum luminance of all measurement position.
Note 7: Definition of Luminance:
Measure the luminance of white state at center point.

7. Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	Note1 IEC60068-2-1,GB2423.2
2	Low Temperature Operation	Ta = -20℃, 240 hours	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1 GB2423.1
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max,240hours	Note2 IEC60068-2-78 GB/T2423.3
6	Thermal Shock (non-operation)	-20℃ 30 min~+60℃ 30 min, Change time:5min, 100 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
8	Vibration Test	Frequency range:10~200Hz Stroke:1.5mm Sweep:10Hz~200Hz~10Hz 30 minutes for each direction of X.Y.Z. (1.5 hours for total)	IEC60068-2-6 GB/T2423.10
9	Mechanical Shock (Non Op)	Half Sine Wave 60G 20ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27 GB/T2423.5
10	Package Drop Test	Height:60cm, 1corner,3edges,6surfaces	IEC60068-2-32 GB/T2423.8
11	Package Vibration Test	Random Vibration: 0.015G*G/Hz for 5-200Hz, -6dB/Octave from 200-500Hz 2 hours for each direction of X,Y,Z (6 hours for total)	IEC60068-2-34 GB/T2423.11

Note1:   Ts is the temperature of panel's surface.
Note2:   Ta is the ambient temperature of samples.

SHANGHAI TIANMA MICRO-ELECTRONICS

TM050RDH03 V1.0

SHANGHAI TIANMA MICRO-ELECTRONICS

8. Mechanical Drawing

NO.	PIN NAME
1	VLED-
2	VLED+
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	CLKIN
31	STBYB
32	HSD
33	VSD
34	DEN
35	NC
36	GND
37	XR
38	YD
39	XL
40	YU

120.70±0.20 (Module Outline)
111.10±0.20 (Bezel Opening)
109.00 (Module V/A)
108.00 (LCD A/A)
(60.35)
(4.80)
(5.85)
(6.35)
(1.82)
(2.87)
(3.37)
(35.77)

76.80±0.20 (Module Outline)
67.90±0.20 (Bezel Opening)
65.80 (Module V/A)
64.80 (LCD A/A)

3.10 Max

Component Araea
(11.90)
(16.85)
23.00
43.00
46.00±0.50
(17.00)
See Detail "B"

Thickness 1.3max
Thickness 1.0max

1.30mm Max
0.30±0.03

26.15±0.50

See Detail "A"

Single Layer
20.00
0.00±0.50
60.00
70.00

NOTES:
1.Display:TFT;
2.Viewing Direction:12:00;
3.General Tolerance:±0.20;
4.Requirements on Environment Protection: Q/S0002
5.Recommended Case Open Area should be less than Module V. A
6. Connector size: FH19SC-40S-0.5SH (HRS)

3.50±0.30
w=0.35±0.03
1
40
0.50±0.10
P0.5x(40-1)=19.50±0.05
20.50±0.07
p=0.50±0.03

DETAIL: A
SCALE: 4:1

p1.0x(4-1)=3.00±0.05
w=0.50±0.05
YU YD
XL - XR
3.20±0.30

DETAIL: B
SCALE: 4:1

LED K
LED A
BLU circuit

CONTROL DIMENTION:			Shanghai Tianma Micro-Electronics Co.,Ltd.		
REFERENCE DIMENTION:	( )		No.889,Huiqing Rd.,Pudong New District,Shanghai,China		
APPROVED:	Wei Shu	2010-08-03	PRODUCT NUMBER	TM050RDH03-00	3rd ANGLE
CHECKED:	Wei Fang	2010-08-03	PART NAME	LCM	UNIT mm
DESIGNED:	Wei Zhou	2010-08-03	DRAWING NUMBER	YGT 1-00	SCALE 1:1
			METERIAL NUMBER	TM050RDH03-00	PAGE 1/1

| REV	EC NUMBER	DESCRIPTION	DATE

9. Packing Drawing

9.1 Packaging Material

No	Item	Model(Material)	Dimensions (mm)	Unit Weigt (Kg)	Quantity	Remark
1	LCM module	TM050RDH03-00	120.7x75.8x3.1	TBD	112	
2	Partition_1	Corrugated paper	513X333X106	0.7	2	
3	Anti-static Bag	PE	136X140X0.05	0.0007	112	Anti-static
4	Dust-Proof Bag	PE	-	0.06	1	
5	Partition_2	Corrugated Paper	505X332X4.0	0.09	3	
6	Corrugated Bar	Corrugated paper	513X110×31	0.048	4	
7	Beauty-grain	Beauty-grain	30x10	--	112	
8	Desiccant	Desiccant	45x35	0.002	24	
9	Carton	Corrugated paper	530X350X250	1.10	1	
10	Total weight	TBD				

Note: Packaging Specification and Quantity

Module quantity in a carton：28pcs(per row)x2(per column)x2= 112pcs

9.2 Packing Instruaction

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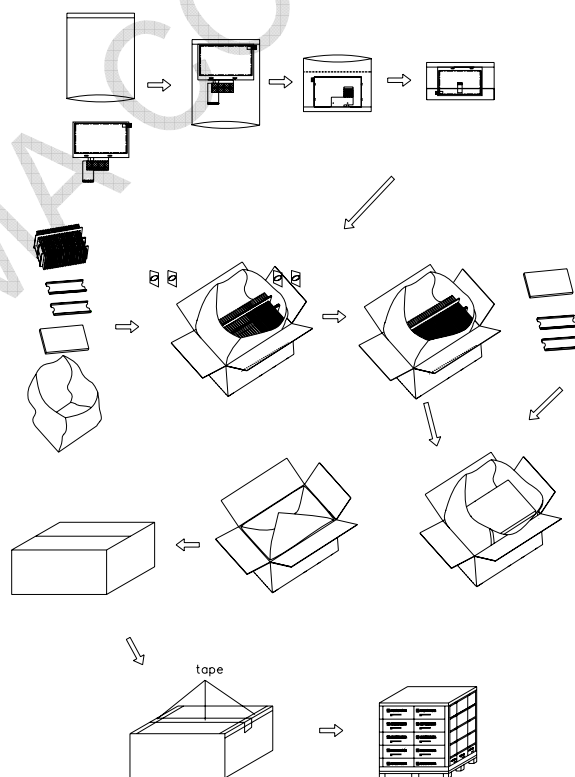
10. Precautions for Use of LCD Modules

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℃ ～ 40℃   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.