MODEL NO. : TM040YDHP06

ISSUED DATE: 2011-11-28

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	2011-11-28	Preliminary Specification Release	Oliver Yang

1 General Specifications

Feature		Spec
Display Spec.	Size	3.97 inch
	Resolution	480(RGB) X800
	Interface	RGB
	Color Depth	262K/16.7M
	Technology Type	a-si TFT
	Pixel Pitch (mm)	0.108x0.108
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	IPS NB
	Surface Treatment(Up Polarizer)	AG
	Viewing Direction	--
	Gray Scale Inversion Direction	--
Mechanical Characteristics	LCM (W x H x D) (mm)	56.34*95.70*1.80
	Active Area(mm)	51.84*86.40
	With/Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	8 LED
Electronic	Driver IC	HX8369-A01

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 LCD Panel

No	Symbol	I/O	Description	Comment
1	GND	P	LCM ground	
2	LEDA	P	Backlight anode	
3	LEDK	P	Backlight cathode	
4	VCC	P	Analog power supply	
5	IOVCC	P	Digital Interface power supply	
6	SDO	O	3-Wire Serial interface output	
7	SDI	I	3-Wire Serial interface Input	
8	GND	P	LCM ground	
9	SCL_WR	I	3-Wire Serial interface Clock Input	
10	CS	P	Chip select	
11	IM3(NC)	O	LCM interface select (reserved).	
12	RESET	O	Reset signal	
13	R0	I/O	Data Bus	
14	R1	I/O	Data Bus	
15	R2	I/O	Data Bus	
16	R3	I/O	Data Bus	
17	R4	I/O	Data Bus	
18	R5	I/O	Data Bus	
19	R6	I/O	Data Bus	
20	R7	I/O	Data Bus	
21	G0	I/O	Data Bus	
22	G1	I/O	Data Bus	
23	G2	I/O	Data Bus	
24	G3	I/O	Data Bus	
25	G4	I/O	Data Bus	

26	G5	I/O	Data Bus	
27	G6	I/O	Data Bus	
28	G7	I/O	Data Bus	
29	B0	I/O	Data Bus	
30	B1	I/O	Data Bus	
31	B2	I/O	Data Bus	
32	B3	I/O	Data Bus	
33	B4	I/O	Data Bus	
34	B5	I/O	Data Bus	
35	B6	I/O	Data Bus	
36	B7	I/O	Data Bus	
37	DE	I	DPI interface enable input	
38	GND	P	LCM ground	
39	PLK	I	DPI interface dot clock input	
40	GND	P	LCM ground	
41	HS	I	DPI interface Line synchronizing signal	
42	VS	I	DPI interface Column synchronizing signal	
43	IC_ID(IOVCC)	O	LCM ID pin(Link with IOVCC in LCM)	
44	LEN_PWM	O	LCM Backlight PWM control pin	
45	GND	P	LCM ground	

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
Logic Supply Voltage	IOVCC	-0.3	4.6	V	
Analog Supply Voltage	VCC	-0.3	5.5	V	
Input voltage	I/O PINS	-0.3	IOVCC+0.5	V	
Back Light Forward Current	I_{LED}	-	25	mA	For each LED
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage		IOVCC	1.65	1.8/2.8	3.3	V	
Analog Supply Voltage		VCI	2.3	2.8	4.3	V	
Input Signal Voltage	Low Level	V_{IL}	GND	--	0.3*IOVCC	V	CS,SCL_WR,RESET, SDI,DE,PLK,HS,VS, R[7:0],G[7:0],B[7:0]
	High Level	V_{IH}	0.7*IOVCC	--	IOVCC	V	
Output Signal Voltage	Low Level	V_{OL}	0	--	0.2*IOVCC	V	SDO,LEN_PWN
	High Level	V_{OH}	0.8*IOVCC	--	IOVCC	V	
(Panel+ LSI) Power Consumption		Sleeping Mode	--	TBD	--	mW	

4.2 Driving Backlight

Ta=25℃

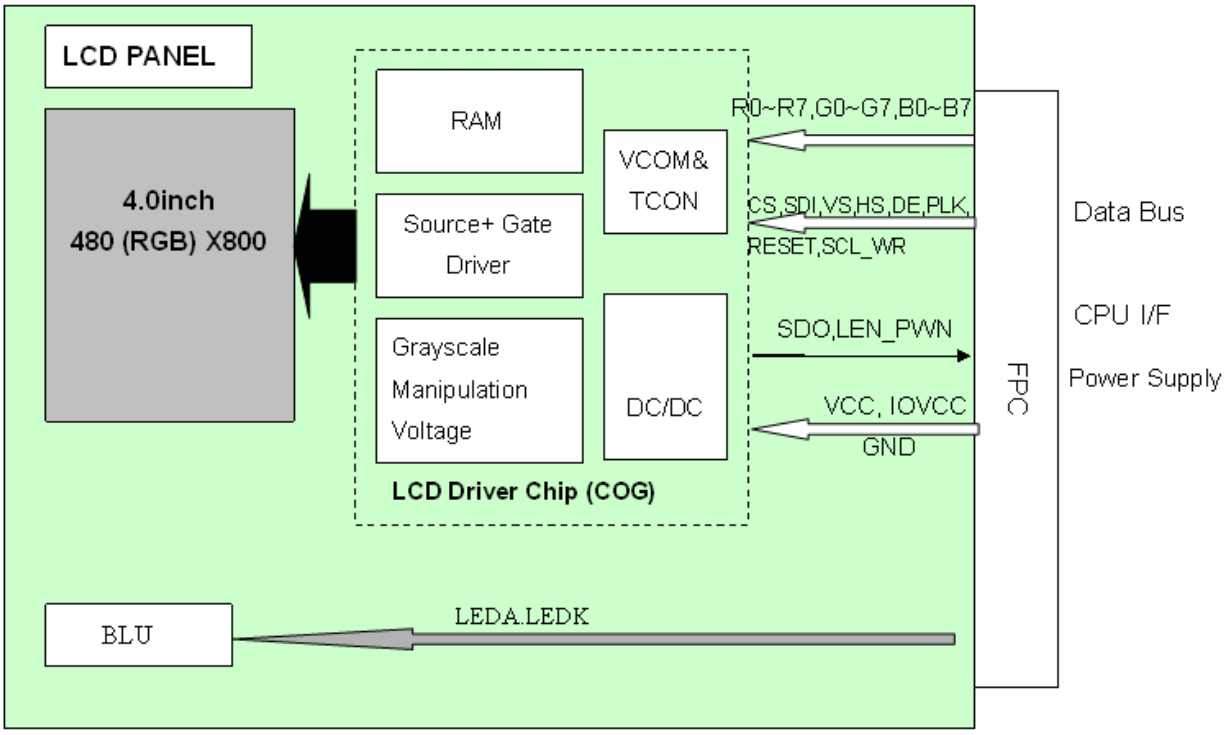
Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	--	20	--	mA	1 LED
Forward Current Voltage	V_F	--	3.2	--	V	
Backlight Power Consumption	W_{BL}	--	512	--	mW	8 LEDS

Note 1: The figure below shows the connection of backlight LED.

Note 2: One LED : I_F =20 mA, V_F =3.2V

4.3 Block Diagram

LCD module diagram



5 INTERFACE TIMING

5.1 3-Wire serial SPI interface

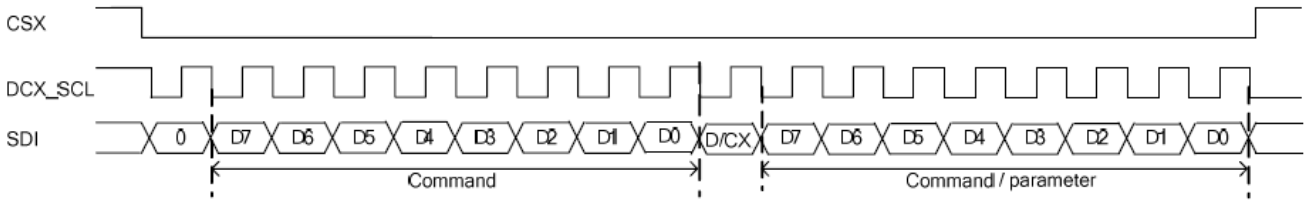


Figure 5.1.1 3-wire Serial data write mode

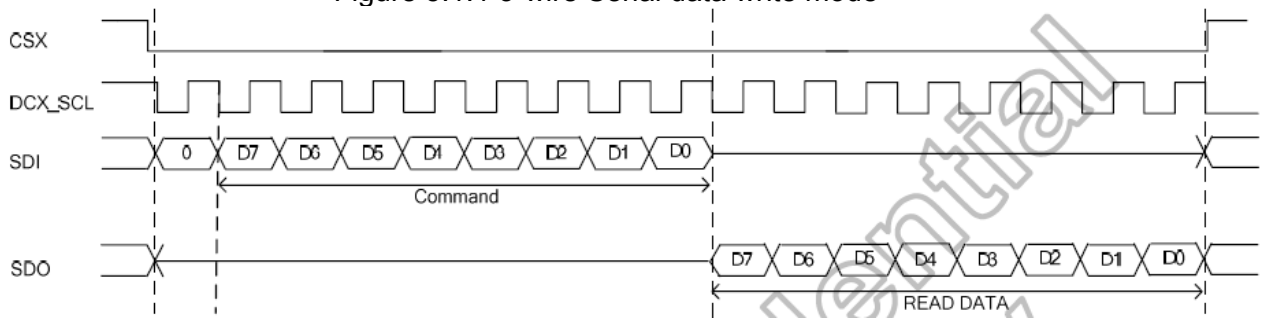
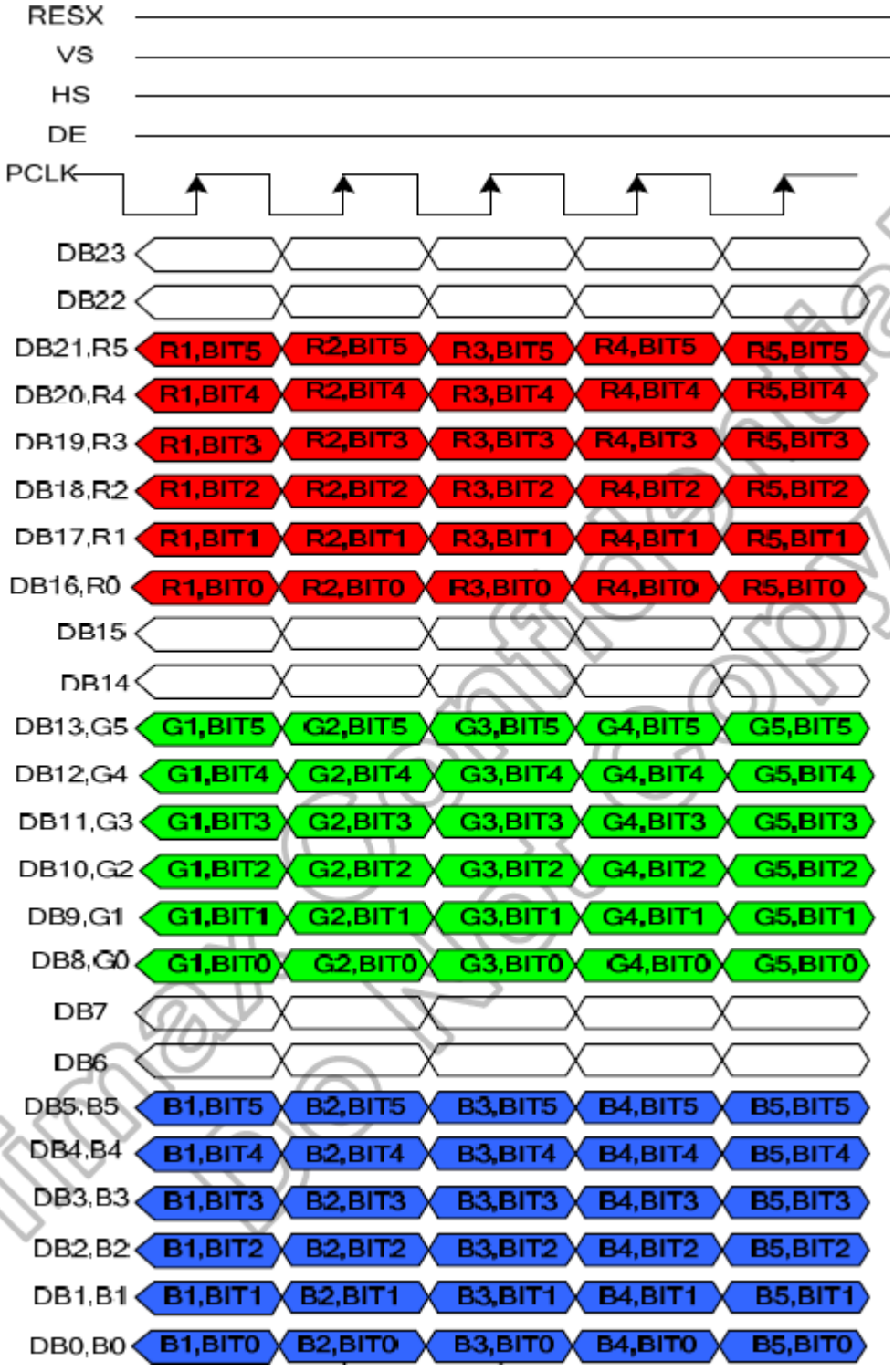


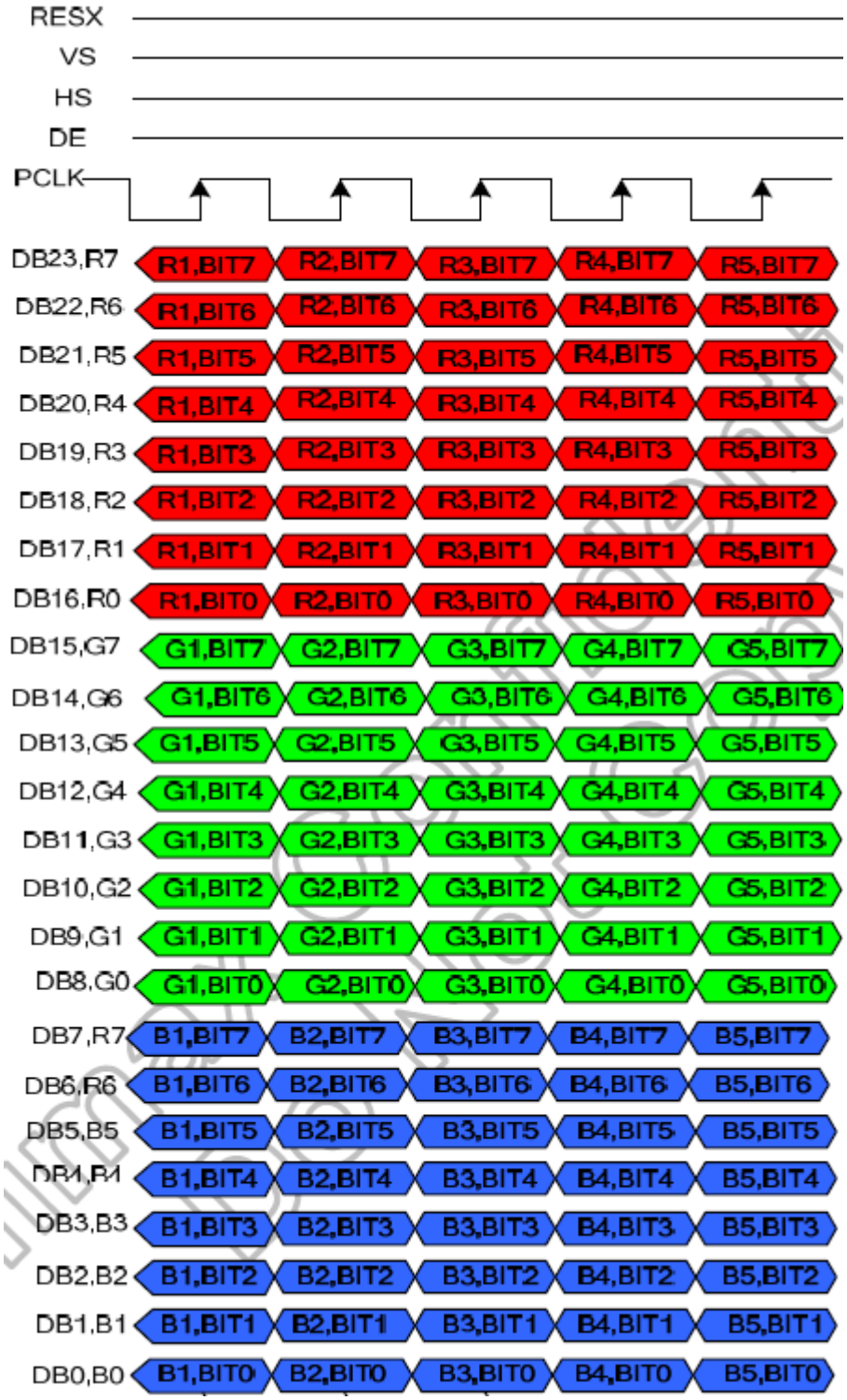
Figure 5.1.2 3-wire Serial data read mode

5.2 DPI Interface

5.2.1 RGB 18bit interface



5.2.2 RGB 24bit interface



5.3 3-wire Interface characteristics

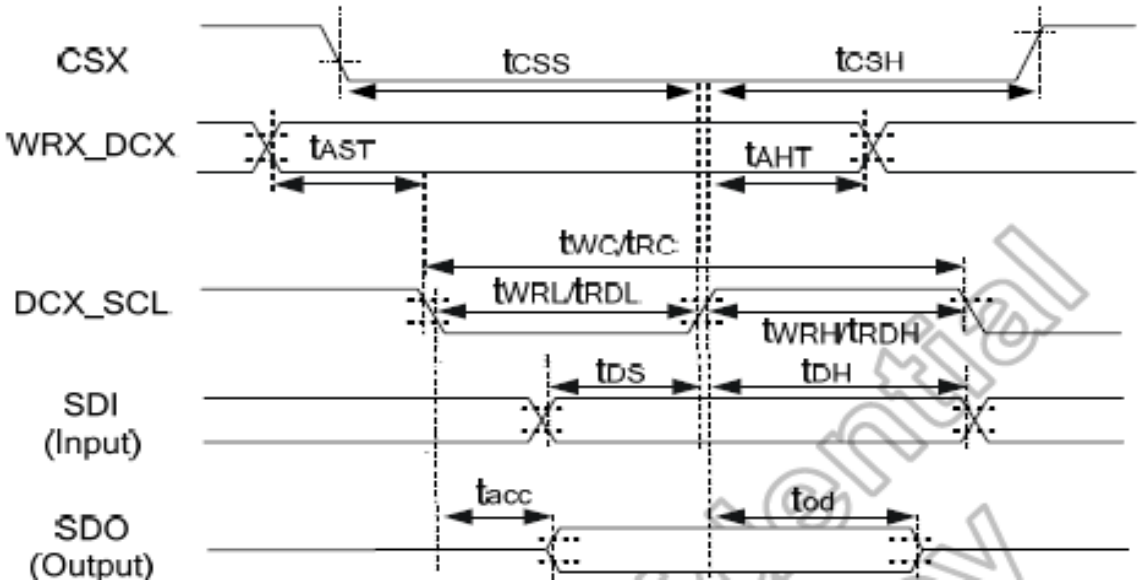


Figure5.3.1 3-wire SPI Interface Timing

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
CSX	tCSS tCSH	Chip select setup time (Write) Chip select setup time (Read)	40 40	- -	ns	-
WRX_DCX	tAST tAHT	Address setup time Address hold time (Write/Read)	10 10	- -	ns	-
DCX_SCL (Write)	tWC tWRH tWRL	Write cycle Control pulse "H" duration Control pulse "L" duration	100 40 40	- - -	ns	-
DCX_SCL (Read)	tRC tRDH tRDL	Read cycle Control pulse "H" duration Control pulse "L" duration	150 60 60	- - -	ns	-
SDI/SDO (Input)	tDS tDT	Data setup time Data hold time	30 30	- -	ns	For maximum CL=30pF For minimum CL=8pF
SDI/SDO (Output)	tRACC tOD	Read access time Output disable time	10 10	- 50	ns	

Figure5.3.1 Timing Parameters

5.4 RGB interface characteristics

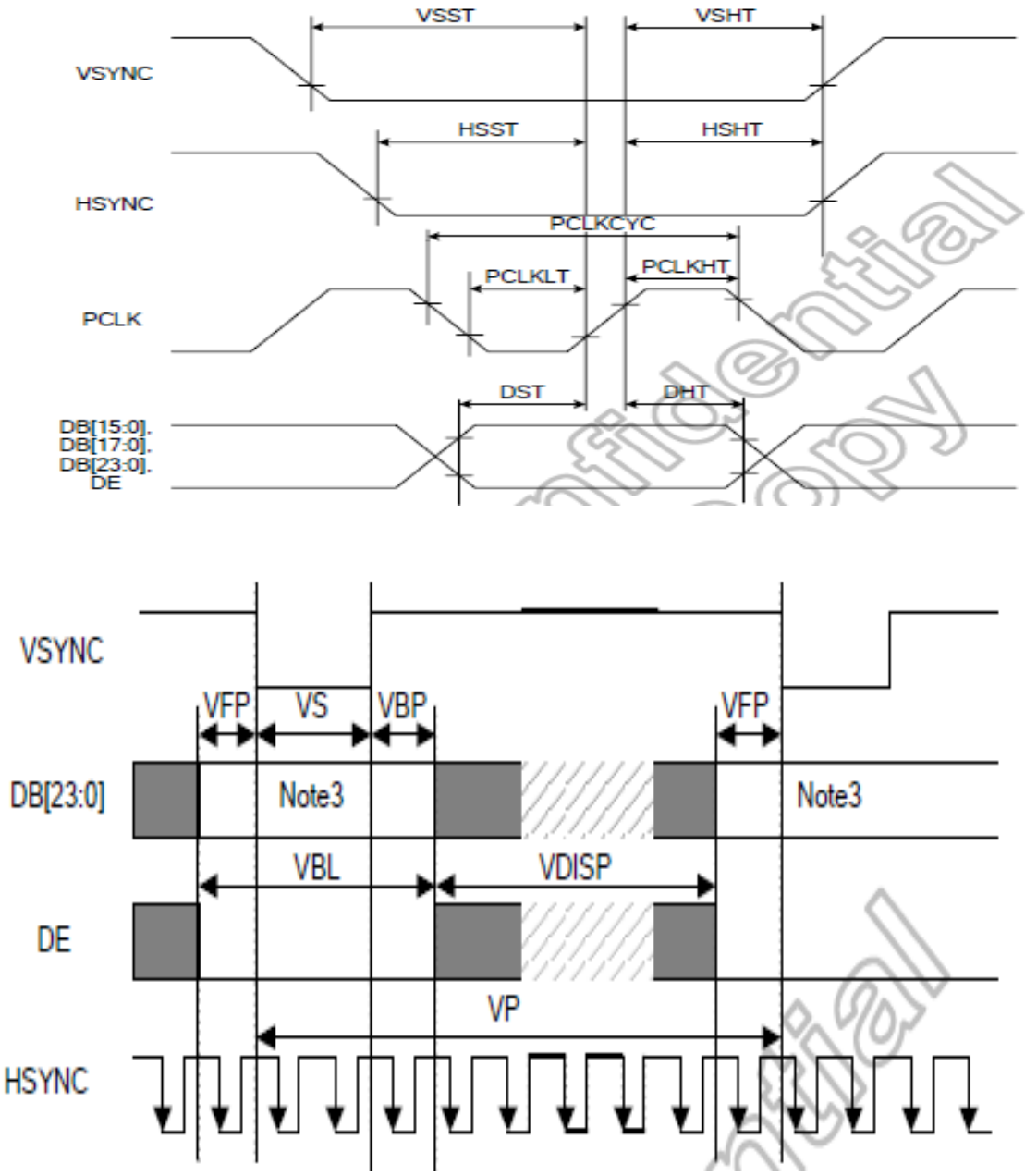


Figure5.4.1RGB Interface Timing

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical sync. setup time	VSST	-	5	-	-	ns
Vertical sync. hold time	VSHT	-	5	-	-	ns
Horizontal sync. setup time	HSST	-	5	-	-	ns
Horizontal sync. hold time	HSHT	-	5	-	-	ns
Pixel clock cycle when RGB I/F is running	PCLKCYC (480x854)	VRR[3] = Min . 50 Hz Max. 70 Hz	21.6	-	34.3	MHz
			29.1	-	46.2	ns
	PCLKCYC (480x800)	VRR[3] = Min . 50 Hz Max. 70 Hz	20.3	-	32.2	MHz
			31	-	49.2	ns
	PCLKCYC (360x640)	VRR[3] = Min . 50 Hz Max. 70 Hz	12.4	-	20.3	MHz
			49.2		80.6	ns
Pixel clock low time	PCLKLT	-	5	-	-	ns
Pixel clock high time	PCLKHT	-	5	-	-	ns
Data setup time DB[23:0]	DST	-	5	-	-	ns
Data hold time DB[23:0]	DHT	-	5	-	-	ns

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	Resolution=480x854	860	-	-	Line
		Resolution=480x800	806			Line
		Resolution=360x640	646			Line
Vertical low pulse width	VS	-	2	-	Note(4)	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note(4)	Line
Vertical data start point	-	VS+VBP	4	-	Note(4)	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP(480x854)	-	854	-	Line
		VDISP(480x800)	-	800		
		VDISP(360x640)	-	640		
Vertical Refresh rate	VRR	-	50	-	70	Hz

Table 5.4.1 Timing Parameters

5.5 Reset input timing

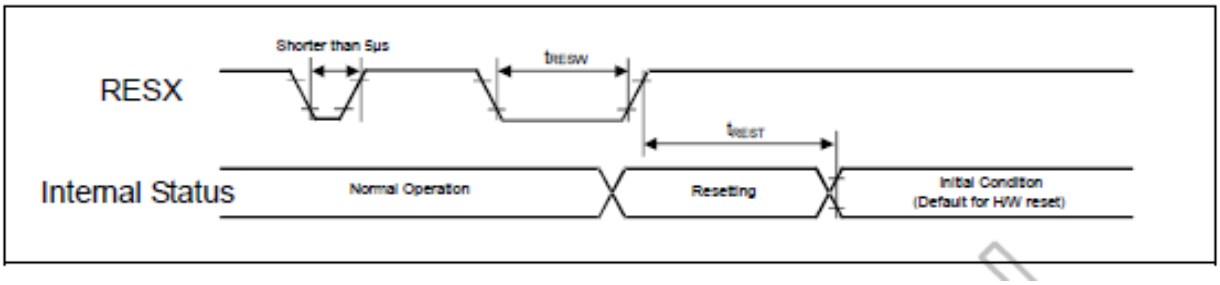


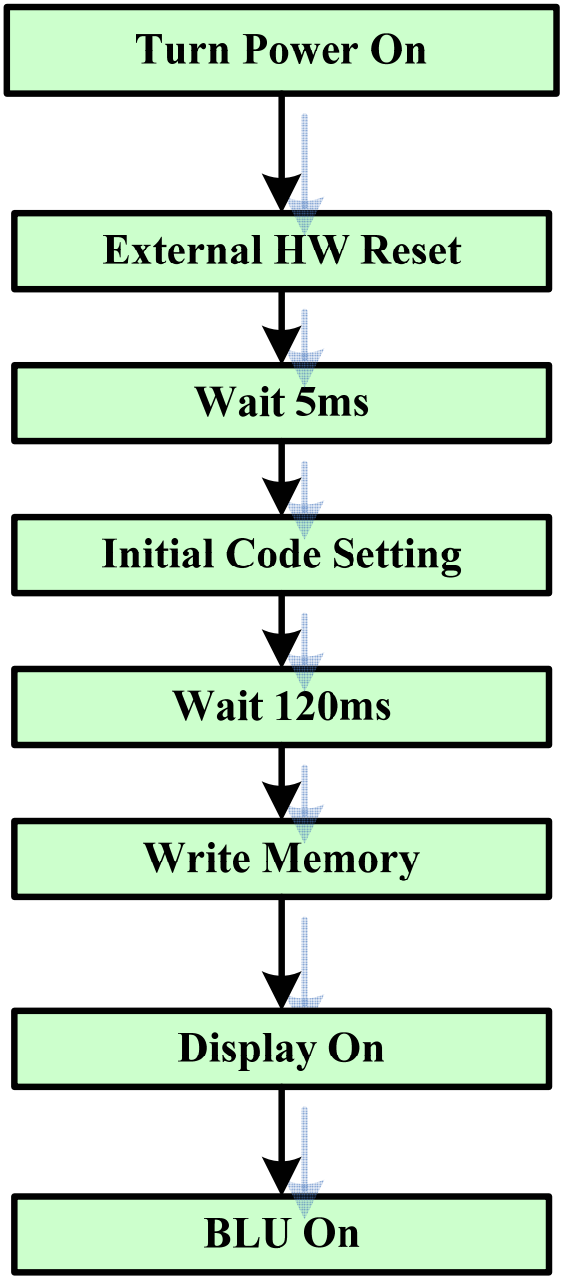
Figure5.5.1 Reset Timing

Symbol	Parameter	Related pins	Min.	Typ.	Max.	Note	Unit
t_{RESW}	Reset low pulse width(1)	RESX	10	-	-	-	µs
t_{REST}	Reset complete time(2)	-	5	-	-	When reset is applied during Sleep In mode	ms
		-	120	-	-	When reset is applied during Sleep Out mode	ms

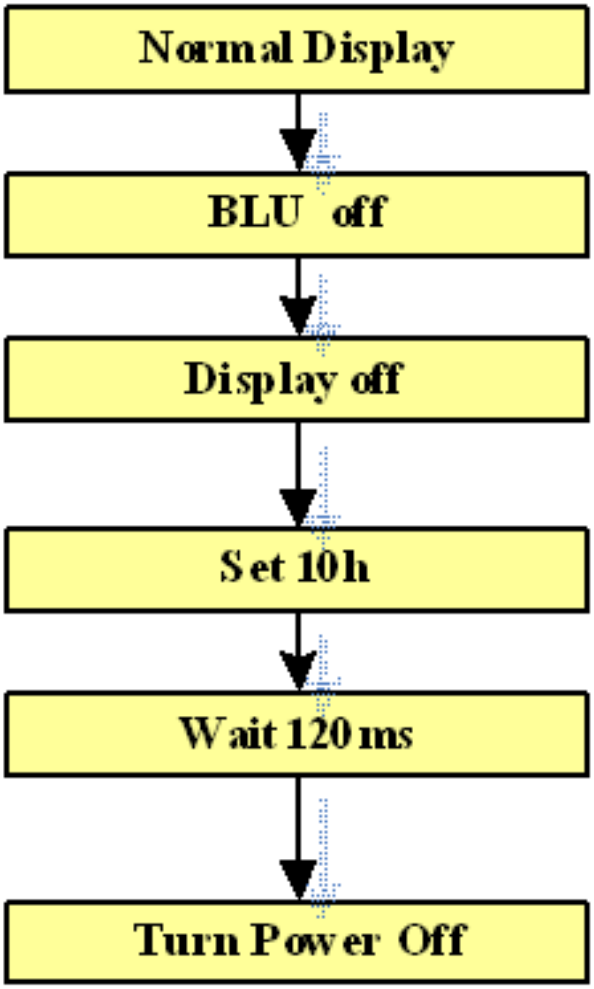
Figure5.5.1 Reset Timing Parameters

5.6 POWER ON/OFF SEQUENCE

5.6.1 Power on Sequence



5.6.2 Power off Sequence



6 Optical Characteristics

Ta=25℃

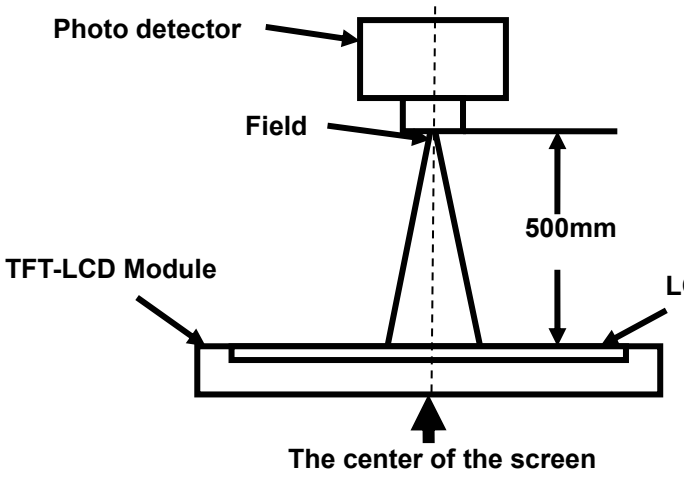
Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	-	80	-	Degree	Note 2
		θB		-	80	-		
		θL		-	80	-		
		θR		-	80	-		
Contrast Ratio		CR	θ=0°	600	800	-	-	Note1 Note3
Response Time		T_{ON}	25℃	-	25	35	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.24	0.29	0.34	-	Note5 Note1
		y		0.26	0.31	0.36		
	Red	x		0.59	0.64	0.69		
		y		0.30	0.35	0.40		
	Green	x		0.25	0.30	0.35		
		y		0.54	0.59	0.64		
	Blue	x		0.1	0.15	0.2		
		y		0.01	0.06	0.11		
Uniformity		U	-	75	80	-	%	Note1 Note6
NTSC		-	-	65	70	-	%	Note 5
Luminance		L		320	350	-	cd/m^2	Note1 Note7

Test Conditions:

1. V_F=3.2V, I_F=20mA(One LED current), 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.



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)。

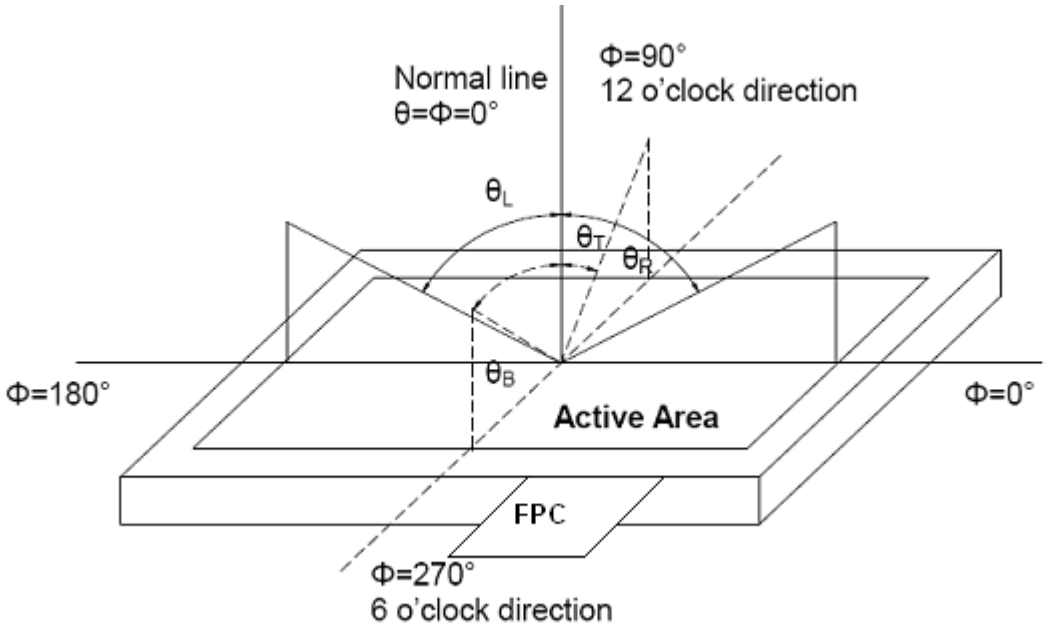


Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

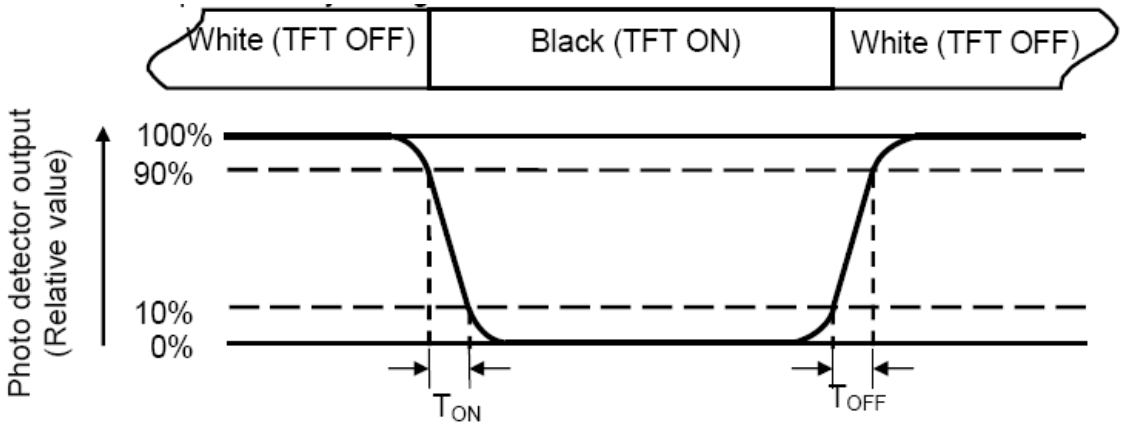
“White state “:The state is that the LCD should driven by Vwhite.

“Black state”: The state is that the LCD should driven 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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) 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.

Luminance Uniformity(U) = Lmin/ Lmax

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

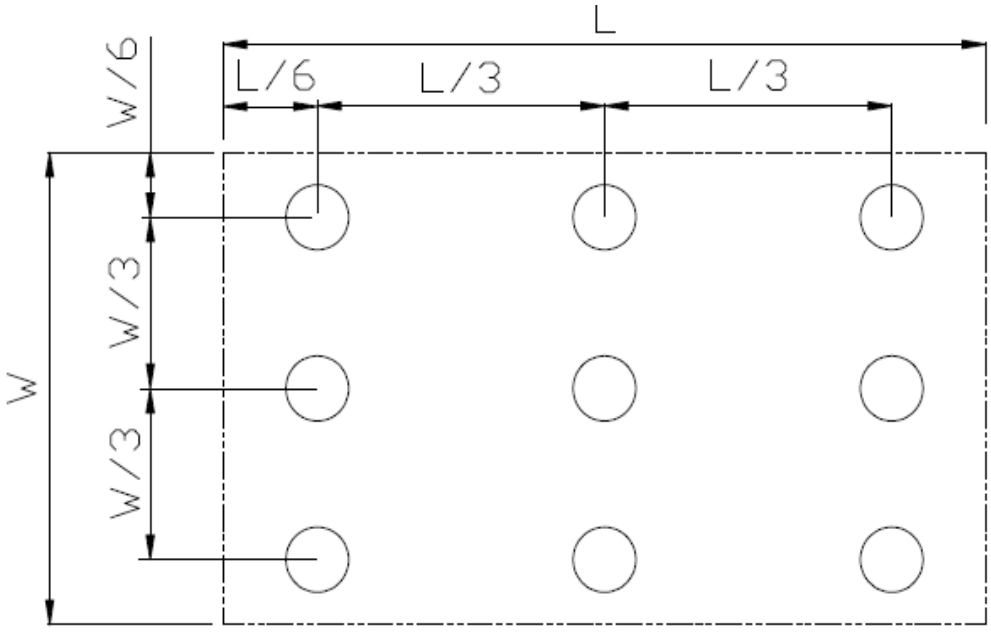


Fig. 2 Definition of uniformity

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.

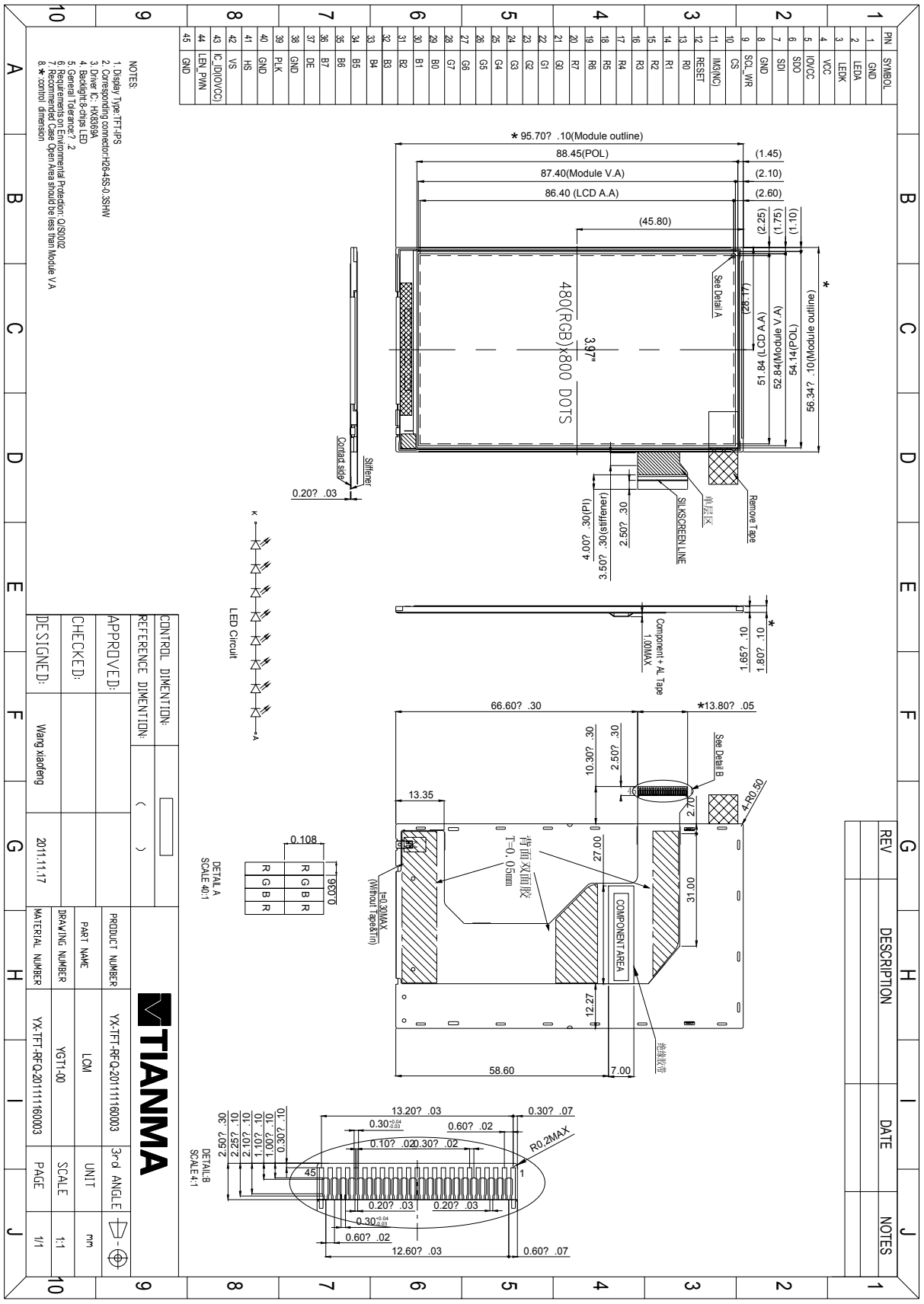
7 Environmental / Reliability Test

No	Test Item	Condition	Remark
1	High Temperature Operation	Ts=+70℃, 240hrs	Note1 IEC60068-2-1:2007,GB2423.2-2008
2	Low Temperature Operation	Ta=-20℃,240hrs	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta=+80℃, 240hrs	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta=-30℃, 240hrs	IEC60068-2-1:2007 GB2423.1-2008
5	High Temperature & High Humidity Storage	Ta=+60℃, 90% RH 240 hours	Note2 IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (Non-operation)	-30℃ 30 min~+70℃ 30 min, Change time:5min, 20 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,5points/panel Air:± 8KV, 5times, Contact:± 4KV, 5 times, （Environment: 15℃～35℃, 30%～60%, 86Kpa～106Kpa）	IEC61000-4-2:2001 GB/T17626.2-2006
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total)(Package condition)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Shock (Non-operation)	60G 6ms, ± X,± Y,± Z 3times, 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

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

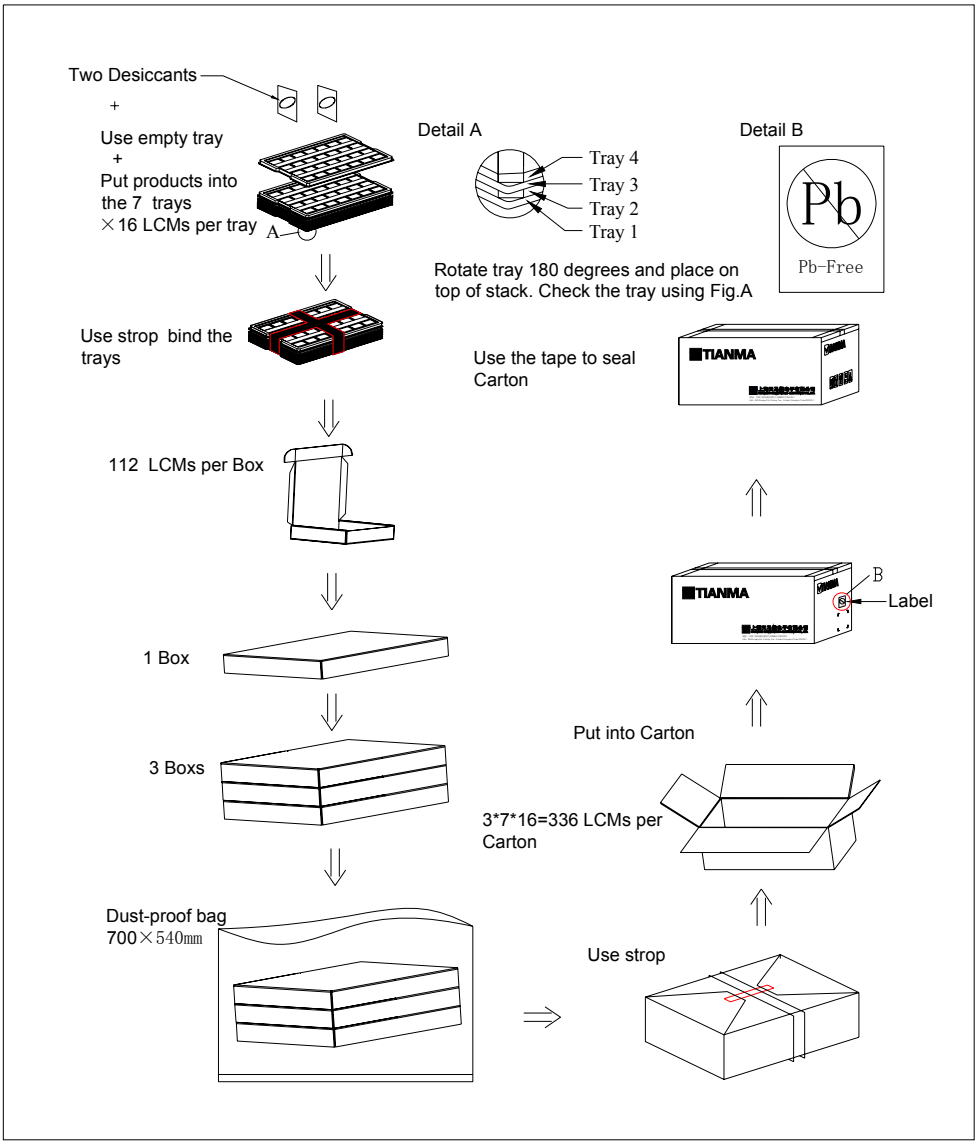
Note2: Ta is the ambient temperature of sample.

8 Mechanical Drawing



9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM040YDHP05	56.34*95.70*1.80	TBD	336	
2	Tray	PET（Transmit）	485*330*13.8	0.161	24	Anti-static
3	Dust-Proof Bag	PE	700×545×0.05	0.046	1	
4	BOX	CORRUGATED PAPER	520*345*74	0.369	3	
5	Desiccant	Desiccant	45*35	0.002	6	
6	label	Paper	40*56	TBD	1	
7	Carton	CORRUGATED PAPER	544*365*250	0.76	1	
8	Total weight	TBD				



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

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