MODEL NO. : TM043NBH01

ISSUED DATE: 2010-12-10

VERSION : Ver 1.4

■Preliminary Specification
□Final Product Specification

Customer :   MITAC

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	2010-07-09	Preliminary Specification Release	Kelly.hu
1.1	2010-11-24	1.Update the 45th pin definition to ID PIN in Input/Output Terminals and ME drawing 2.Updated RA conditions 3.Added Mechanical Design Guide	Kelly.hu
1.2	2010-11-24	Updated the pin definition	Kelly.hu
1.3	2010-12-25	Updated power sequence	Kelly.hu
1.4	2010-10-10	Revised Data Input Timing Diagram Added Power on/off timing parameter	Kelly.hu

1   General Specifications

Feature		Spec
Display Spec.	Size	4.3 inch
	Resolution	480(RGB)x272
	Interface	RGB 24 bits
	Color Depth	16.7M
	Technology Type	a-Si
	Pixel Configuration	R.G.B Vertical Stripe
	Display Mode	TN,NW
	Surface Treatment	AG
	Viewing Direction	6 o'clock
	Gray Scale Inversion Direction	12 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	105.50x67.20x4.15
	Active Area(mm)	95.04x53.856
	With /Without TSP	With TSP
	Weight (g)	TBD
	LED Numbers	10 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   TFT LCD Panel

NO	Symbol	I/O	Description	Comment
1	VSS	P	Ground	
2	VSS	P	Ground	
3	VDD	P	Power supply	
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	VSS	P	Ground	
30	PCLK	I	Clock for input data. Data is latched at falling edge of this signal.	
31	PON	I	Standby mode. PON ="1": Normally operation. PON ="0": Standby mode.	
32	HSYNC	I	Horizontal sync input with negative polarity. If unused, please pull high level.	
33	VSYNC	I	Vertical sync input with negative polarity. If unused, please pull high level.	
34	DE	I	Data input enable. If unused, please pull low level.	
35	PWRSEL	——	No connection	
36	VSS	P	Ground	
37	Y2	——	YU	
38	X2	——	XL	

39	Y1	——	YD	
40	X1	——	XR	
41	VSS	P	Ground	
42	LED1-	P	Back light cathode	
43	LED1+	P	Back light anode	
44	NC	——	No connection	
45	ID	O	GND level	

3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

Ta =25℃

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	VDD	-0.3	4.0	V	
Back Light Forward Current	I_{LED}	--	25	mA	For each LED
Operating Temperature	T_{OPR}	-10	60	℃	
Storage Temperature	T_{STG}	-40	75	℃	

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}	--	--	0.2xVDD	V	
	High Level	V_{OH}	0.8xVDD	--	VDD	V	
(Panel+LSI) Power Consumption	Black Mode (60Hz)			TBD		mW	
	Standby Mode			TBD		mW	

4.2   Backlight Unit

Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	--	22	25	mA	
Forward Current Voltage	V_F	--	32	--	V	
Backlight Power Consumption	W_{BL}	--	704	--	mW	
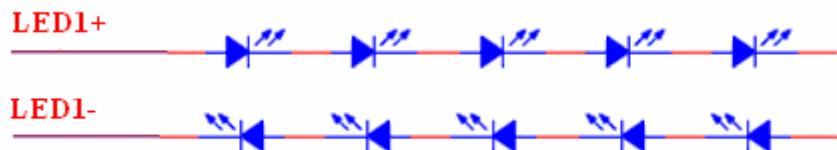
4.3   Block Diagram

LCD module diagram
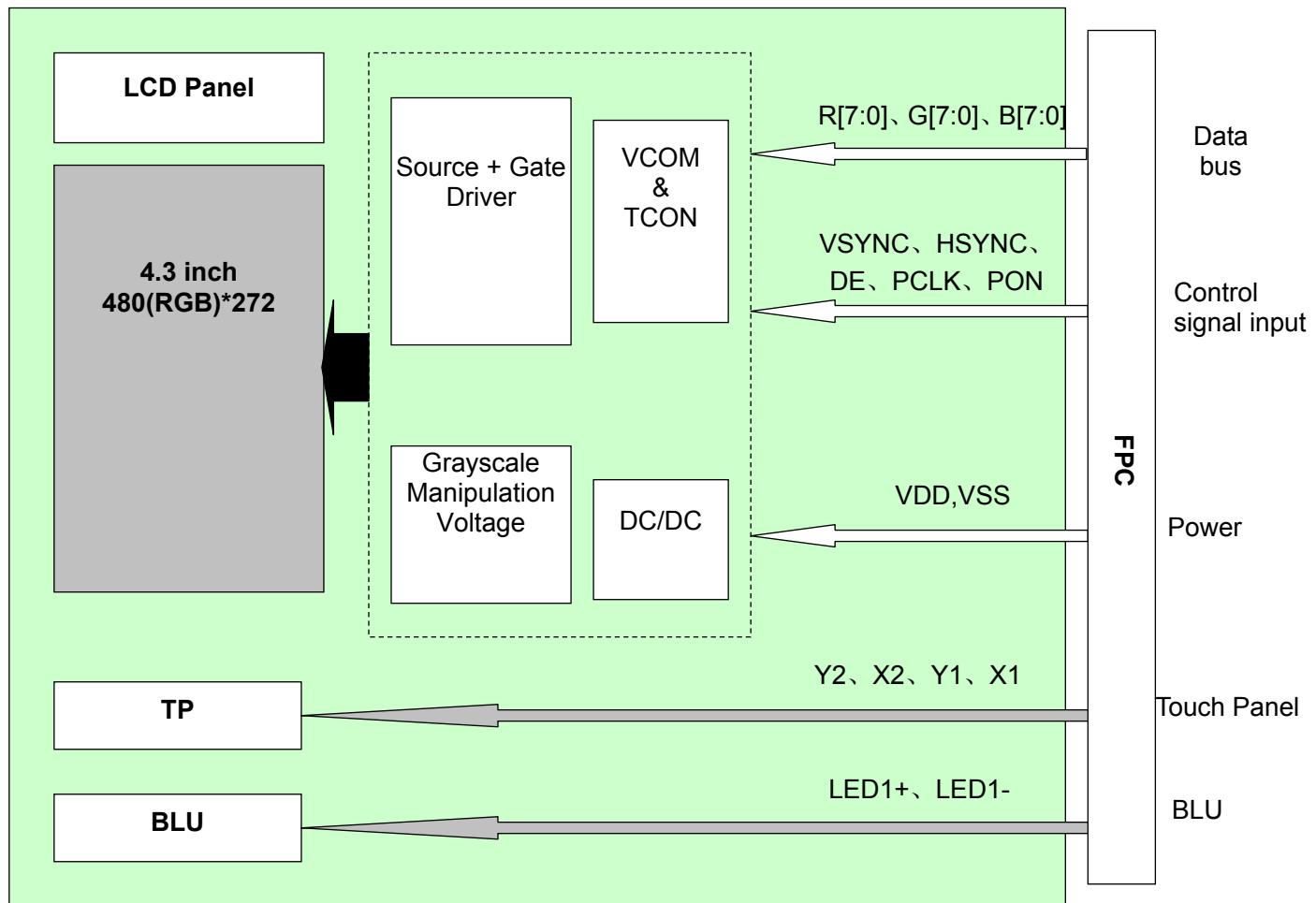
5 Timing Chart

5.1   Input Setup Timing
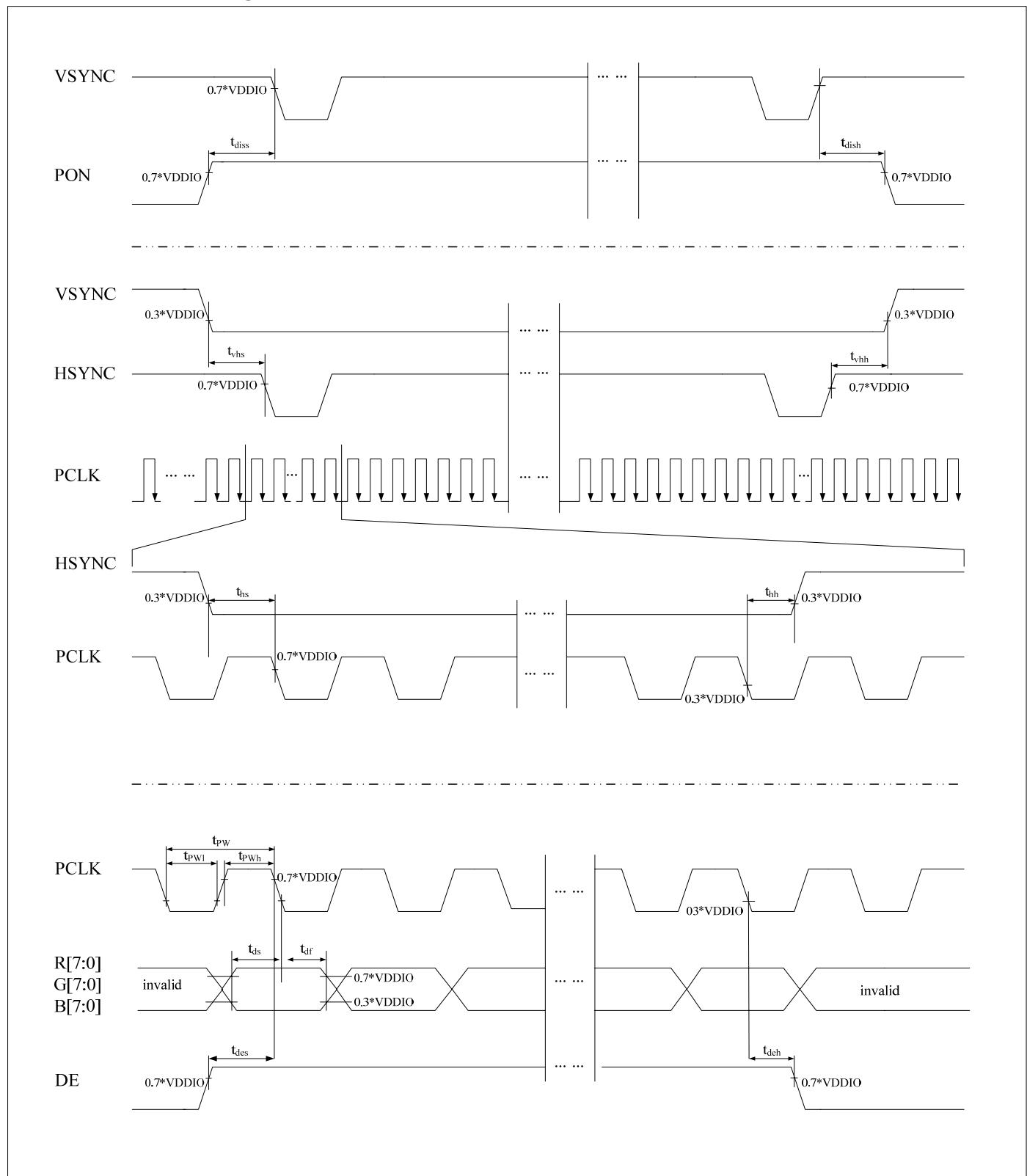
5.2   Input Setup Timing Parameter Setting

VDD=3.3V   Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK Cycle Time	T_{pw}	66.7	-	-	ns	
DCLK Pulse High Width	T_{pwh}	26.7	-	-	ns	
DCLK Pulse Low Width	T_{pwl}	26.7	-	-	ns	
DE Setup Time	T_{des}	10	-	-	ns	
DE Hold Time	T_{deh}	10	-	-	ns	
HSYNC Setup Time	T_{hs}	10	-	-	ns	
HSYNC Hold Time	T_{hh}	10	-	-	ns	
VSYNC Setup Time	T_{vhs}	10	-	-	ns	
VSYNC Hold Time	T_{vhh}	10	-	-	ns	
Data Setup Time	T_{ds}	10	-	-	ns	
Data Hold Time	T_{dh}	10	-	-	ns	
DISP Setup Time	T_{diss}	10	-	-	us	
DISP Hold Time	T_{dish}	10	-	-	ms	

Note 1: $t_r=t_f=2ns.t_r$, t_f is defined 10% to 90% of signal amplitude.
Note 2:   For parallel interface, maximum clock frequency is 15MHz.

5.3 Data Input Format

5.3.1 Data Input Timing Diagram
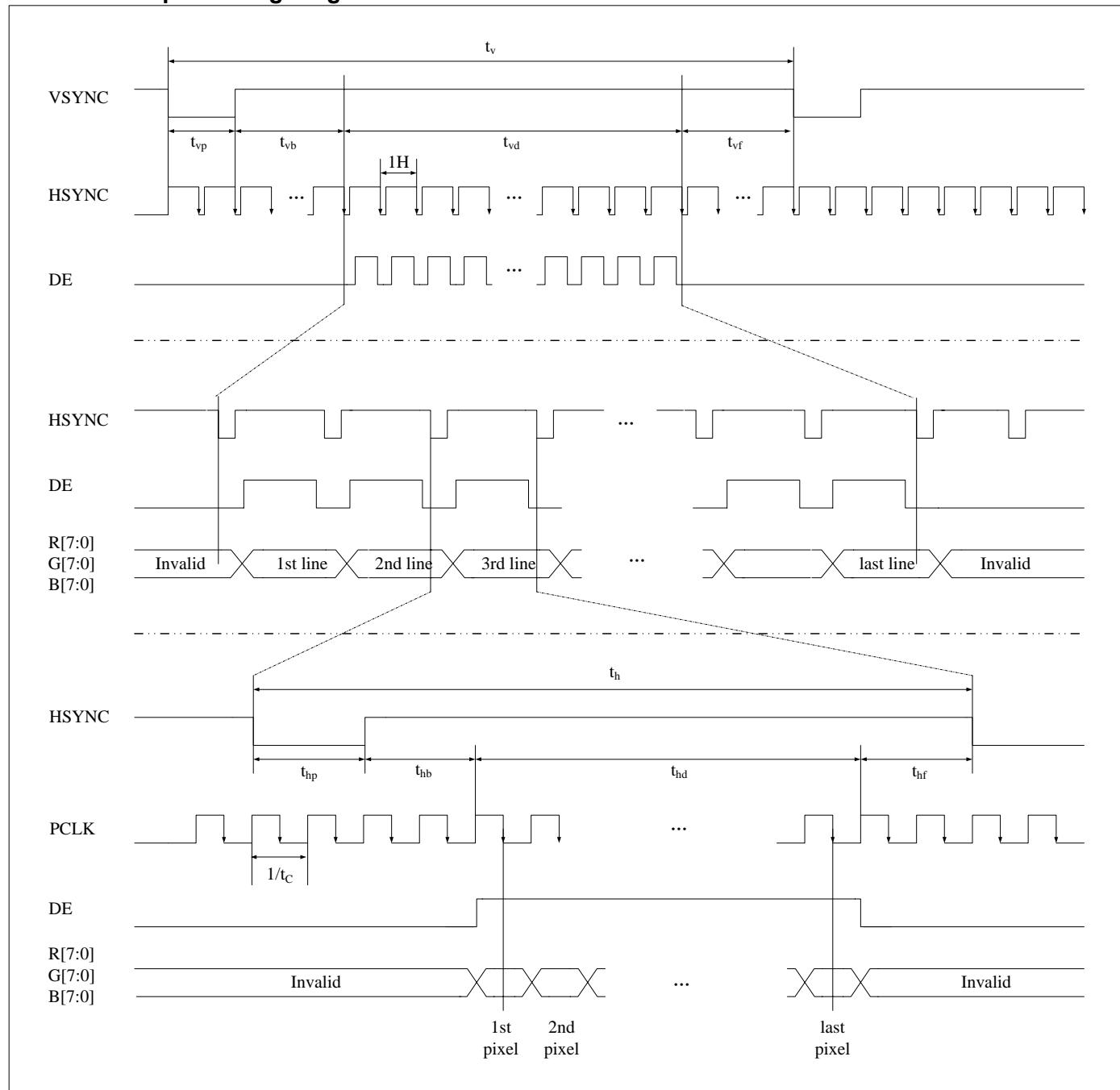
Note 1: When DE is pulled low, Sync mode is active using HSYNC+ VSYNC for timing control.
Note 2: When DE is pulled high for active data and pulled low for blanking data, DE mode is active for timing control.

5.4 Data Input Timing Parameter Setting

| Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	f_{clk}	-	9	15	MHZ
HSYNC frequency	$1/t_h$	-	17.14	-	KHz
VSYNC frequency	$1/t_v$	-	59.94	-	Hz
Horizontal cycle	t_h	525	525	605	DCLK
Horizontal display period	t_{hd}		480		DCLK
Horizontal pulse width	t_{hp}	2	41	41	DCLK
Horizontal back porch	t_{hb}	2	2	41	DCLK
Horizontal front porch	t_{hf}	2	2	82	DCLK
Vertical cycle	t_v	285	286	399	HSYNC
Vertical display period	t_{vd}		272		HSYNC
Vertical pulse width	t_{vp}	1	10	11	HSYNC
Vertical back porch	t_{vb}	1	2	11	HSYNC
Vertical front porch	t_{vf}	1	2	227	HSYNC

Note 1: Unit: CLK=1/ f_{CLK} , H= t_h,

Note 2: It is necessary to keep $t_{vp}+t_{vb}=12$ and $t_{hp}+t_{hb}= 43$ in sync mode. DE mode is unnecessary to keep it.

5.5   Power ON Sequence
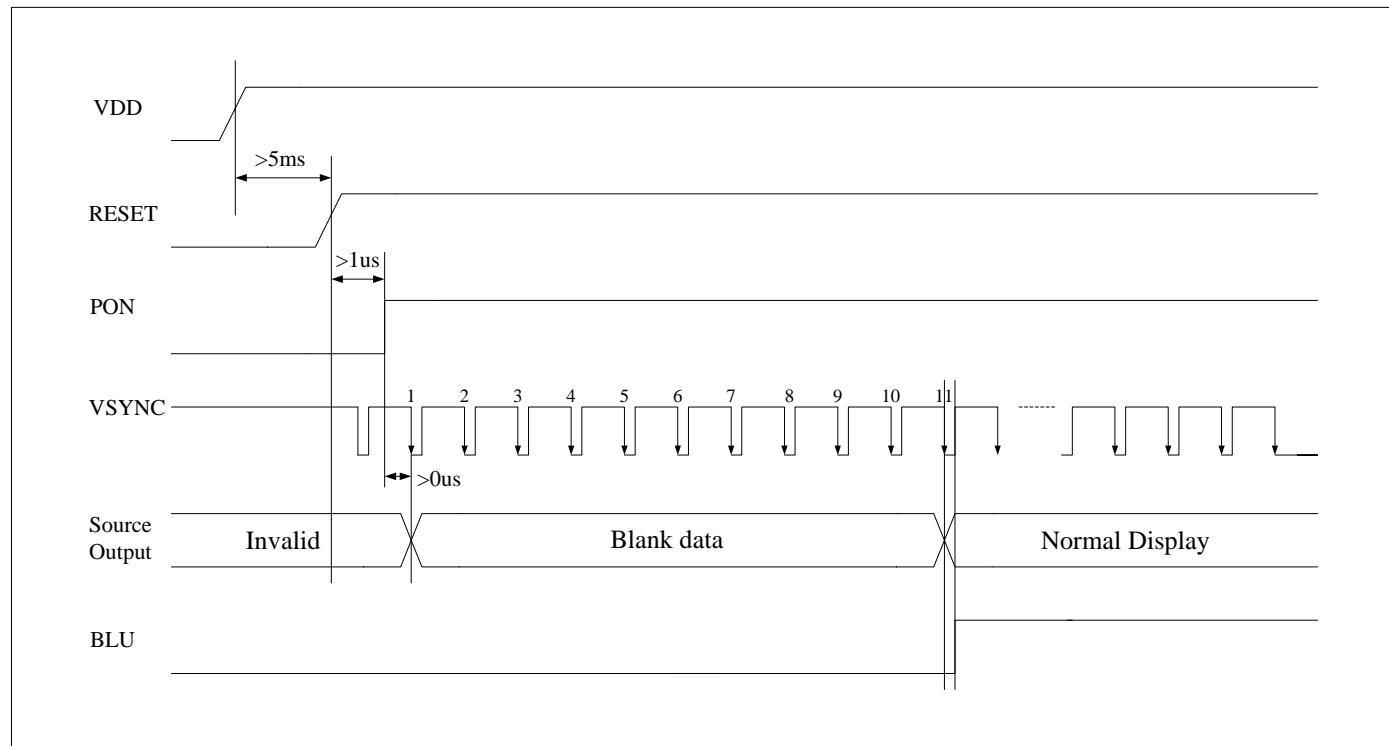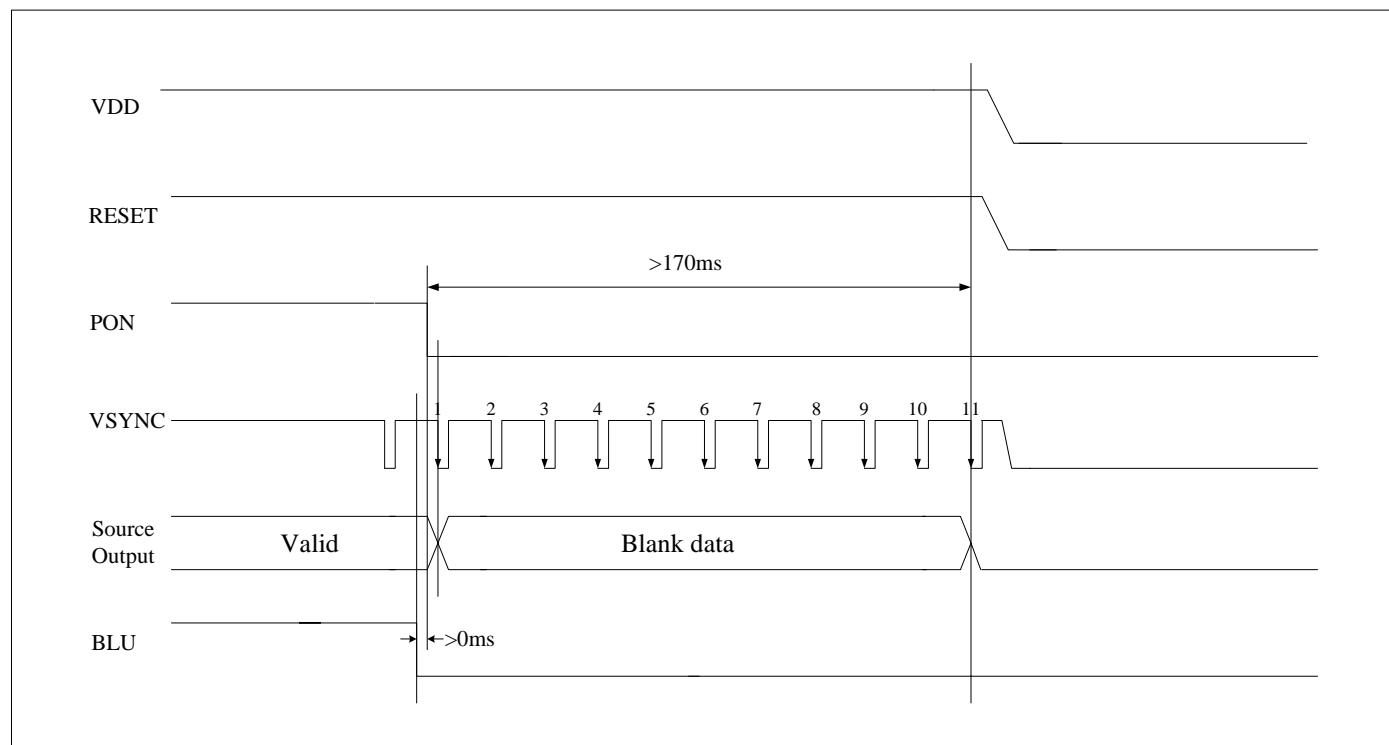
VDD

>5ms

RESET

>1us

PON

VSYNC   1 2 3 4 5 6 7 8 9 10 11 -------

>0us

Source
Output   Invalid   Blank data   Normal Display

BLU

5.6   Power Off Sequence

VDD

RESET

>170ms

PON

VSYNC   1 2 3 4 5 6 7 8 9 10 11

Source
Output   Valid   Blank data

BLU   → ←>0ms

6 Optical Characteristics

Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR ≧ 10	60	70	-	Degree	Note2,3
		θB		40	50	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	450	-		Note 3
Response Time		T_{ON}	25℃	-	20	30	ms	Note 4
		T_{OFF}						
Chromaticity	**White**	x	Backlight is on	0.270	0.320	0.370		Note 1,5
		y		0.290	0.340	0.390		
	Red	x		0.531	0.581	0.631		Note 1,5
		y		0.295	0.345	0.395		
	Green	x		0.298	0.348	0.398		Note 1,5
		y		0.531	0.581	0.631		
	Blue	x		0.103	0.153	0.203		Note 1,5
		y		0.045	0.095	0.145		
Uniformity		U			80	-	%	Note 6
NTSC				-	50	-	%	Note 5
Luminance		L		300	400	-	cd/m²	Note 7

Test Conditions:

1. I_F= 22 mA, and 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.

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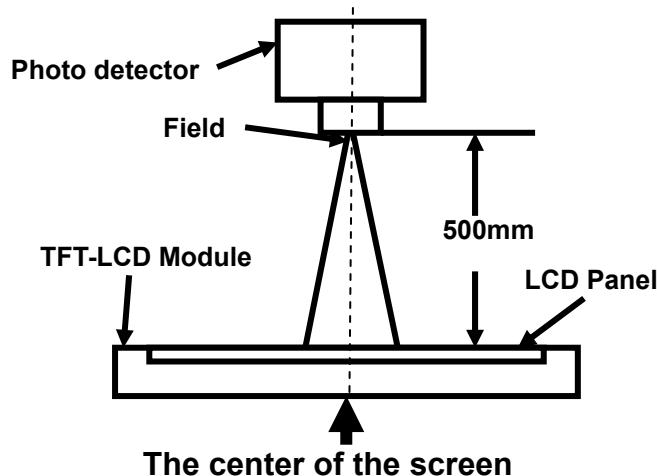
Item	Photo detector	Field
Contrast Ratio		
Luminance	SR-3A	1°
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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)。
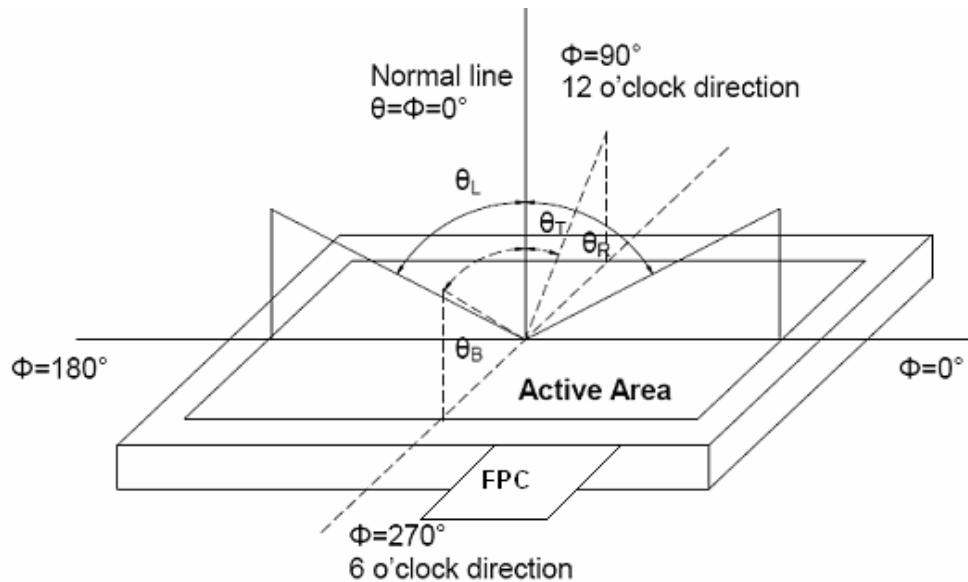
Note 3: Definition of contrast ratio

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

"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%.
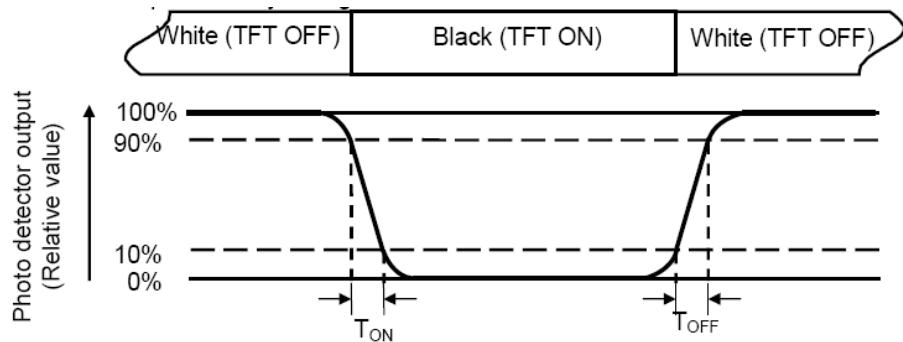
Note 5: Definition of color chromaticity (CIE1931)

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
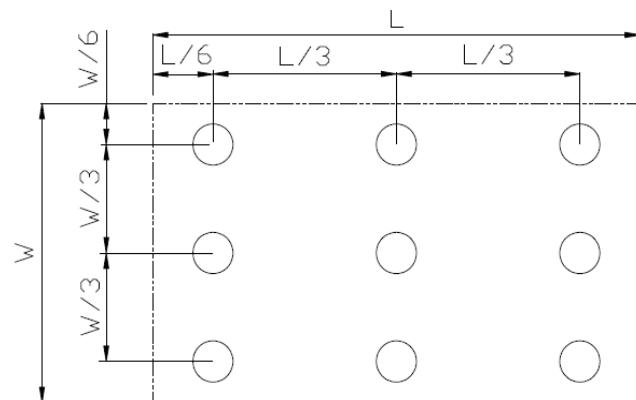
    Lmax: The measured Maximum luminance of all measurement position.

    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

| Test Item	Test Condition	Remark
Operating temp./Humi	Spec.Temp:-10~+60℃ (cycles) Humidity:10~90%(R.H)Temp	
Storage	Spec.Temp:-40~+75℃ (cycles) Humidity:10~90%(R.H)Temp	
Low/High temperature kick off display quality performance test	1.Single panel with demo kit or system. 2.Cold start and pattern switch on LCD display. 3.Single panel with Demo Kit or system put into Low/high environment. (Non-operation).During cold boot check the LCD display pattern is exist any flicker(闪烁),drag(拖尾),shake(抖動),Blur(模糊),line(線條),cascade(瀑布狀 clock/frequency issue),bright /black dots(亮/暗點).Newton ring(牛頓環) ..etc the abnormal display on LCD screen. 4. Test procedure: 4-1.specimens soaks in each temperature at least 2 hours. 4-2.Cold start (kick off) into idle screen and each pattern shall switch to check the screen is stable under display and power off (or shutdown). The process finish it, we call one cycle. Before next cycle starting the period shall wait for 5 minutes. 4-3.Test temperature range -10℃,0℃,10℃,50℃,60℃. Each temperature range has 5 cycles for test. 4-4.All abnormal phenomenon shall record	
Thermal shock A	Type A Operation temp:-10℃to+60℃,change specification:15℃/min at least 1hour after stabilization for 10 cycles	
Thermal shock B	Type B Non-operation temp:-40℃to+75℃,change specification:15℃/min at least 1hour after stabilization for 10 cycles	
Shock	60G 6ms,±X,±Y,±Z 3times for each direction	
ESD	Contact:±4KV,Air:±8KV,150pF/330Ω	

8 Mechanical Drawing

NOTES:
1. Display:TFT;
2. View Direction : 6:00 o'clock
3. General Tolerance:±0.30;
4. Backlight : 10 LED
5. IC:HX8257A
6. Requirements on Environment Protection:Q/S0002;
7. Connector: FH23-45S-0.3SHW

DETAIL A
SCALE 2:1

(CIRCUIT DIAGRAM)

LED+
LED-

CONTROL DIMENTION		
REFERENCE DIMENTION		
APPROVED	SHUWEI	2010.11.25
CHECKED	YANGQINGJU	2010.11.25
DESIGNED	CHENJUNJUN	2010.11.25

MODEL NAME: TM043NBH01
PART NAME: LCM
DRAWING NUMBER: YGT1-01
MATERIAL NUMBER: TM043NBH01-00
PAGE: 1
UNIT: mm
SCALE: 1:1
3rd ANGLE

TIANMA

480(RGB)*272Dots

REV	DC/EC NUMBER	DESCRIPTION	DATE
		Modify Pin Name	2010.11.24

Pin / Pin Name
1 VSS
2 VSS
3 VDD
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 VSS
30 PCLK
31 PDN
32 HSYNC
33 VSYNC
34 DE
35 PWRSEL
36 VSS
37 Y2
38 X2
39 Y1
40 X1
41 VSS
42 LEDI-
43 LEDI+
44 NC
45 ID

结 构 注 意 事 项

说明：

①区域：动作区此区域按压时触摸屏正常工作。

②区域：危险区

按压此区域触摸屏不能正常工作，若对此区域做打点、划线测试，将损坏产品，导致产品寿命下降，此区域大约是动作区外侧0.5~1mm。

③区域：禁止按压区

按压此区域会严重损伤内部导电层，使触摸屏的功能严重破坏。

④区域：非动作区

按压此区域触摸屏不工作。

2、敏感区的处理：

(1)区域②、③为敏感区，由于该区域在产品上下导电面之间存在间隙，按压此处时ITO导电膜受压产生较大变形，引起ITO导电膜断裂，从而使触摸屏表失功能。故使用触摸屏产品时，一定要充分考虑敏感区的尺寸及外壳的构造，必须避免最终的用户使用时触及到此区域。

(2)组装触摸屏时，必须在产品表面四周加上一级缓冲垫圈，再装外壳，垫圈应落在双面胶上，且不能超出双面胶范围。

(3)若外壳设计比动作区大时，最终用户有可能触及敏感区而损伤产品，

(4)若外壳设计比动作区小时，由于外壳四周完全遮盖了敏感区，因此当沿屏边缘划动时，不会造成ITO层的损伤，但是因为外壳伸进了动作区，因此防垫圈的厚度就显得很重要，太厚，外壳与膜表面之间的间隙太大，影响产品的外观，太薄，外壳直接压在膜表面上，会造成短路，最好外壳与膜表面之间保持在0.2~0.3mm之间。

建议尺寸
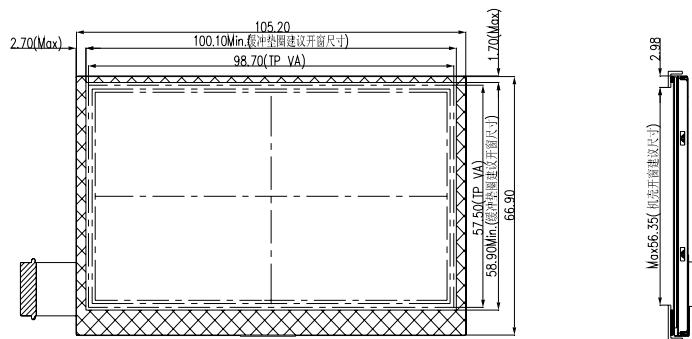
9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight (Kg)	Quantity	Remark
1	LCM module	TM043NBH01	105.50x67.20x4.15	TBD	180	
2	Tray	PET（Transmit）	485x330x14.8mm	TBD	18	
3	EPE	EPE	485x330x5	0.08	3	
4	Anti-static bag	PE	700x545mm	0.046	1	
5	BOX	Corrugated Paper	520x345x74	0.44	3	
6	Desiccant	Desiccant	45x50	0.002	6	
7	Carton	Corrugated Paper	544x365x250	1.01	1	
8	Total weight	TBD Kg				
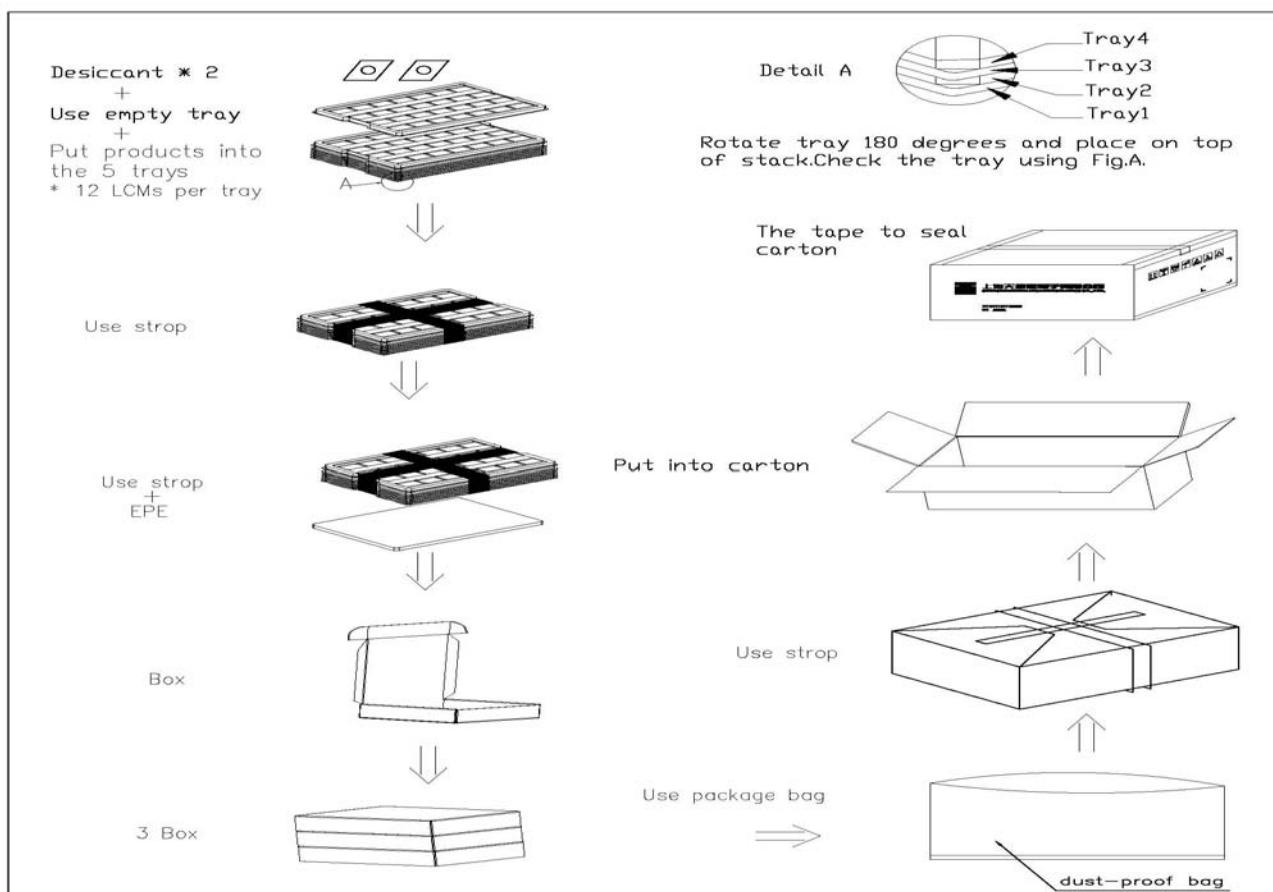
10 TFT- LCD Module Incoming Inspection Standard

10.1   Scope

The incoming inspection standards shall be applied to TFT-LCD Modules (hereinafter called "Modules") that supplied by Shanghai Tianma Micro-Electronics Corporation.

10.2   Incoming Inspection

The customer shall inspect the modules within twenty calendar days of the delivery date(the "inspection period)at its own cost. The result of the inspection(acceptance or rejection)shall be recorded in writing, and a copy of this writing will be promptly sent to the seller, If the results of the inspecting from buyer does not send to the seller within twenty calendar days of the delivery date. The modules shall be regards as acceptance.

Should the customer fail to notify the seller within the inspection period, the buyer's right to reject the modules. Shall be lapsed and the modules shall be deemed to have been accepted by the buyer.

10.3   Inspection Sampling Method

Lot size: Quantity per shipment lot per model

Sampling type: Normal inspection, Single sampling

Inspection level: II

Sampling table: MIL-STD-105D

Acceptable quality level (AQL)

      Major defect: AQL=0.65

      Minor defect: AQL=1.00

## 10.4   Inspection Conditions

 10.4.1   ambient conditions:

    a. Temperature: Room temperature 25±5℃

    b. Humidity: (60±10) %RH

    c. Illumination: Single fluorescent lamp non-directive (1000 to 1200 Lux)

 10.4.2   The viewing distance between the LCD and the inspector's eyes shall be at least 30±5 ㎝.

 10.4.3   Viewing Angle: U/D: 45º/45º, L/R: 45º/45º
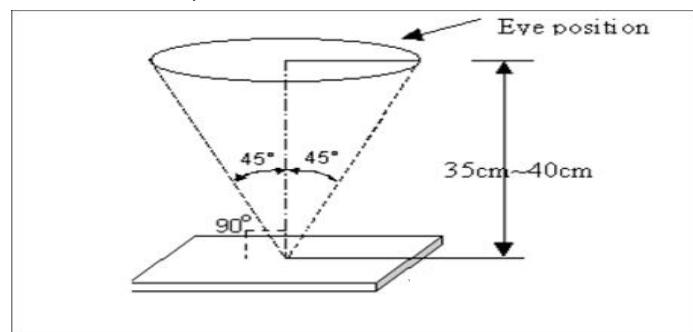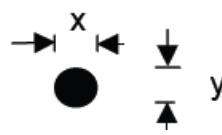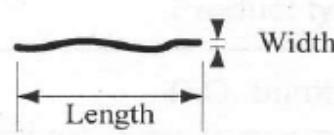

10.5   Inspection Criteria
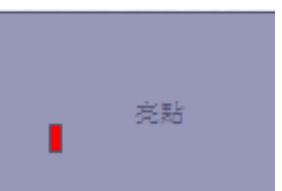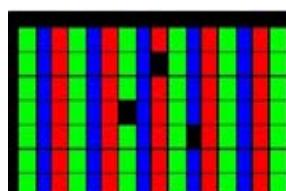
Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

Major defect

Item	Inspection Standard
All Functional Defects	1) No display 2) Display abnormally 3) Short circuit 4) line defect
Missing	Missing function component
Crack	Glass Crack

Minor defect

No	Item	Inspection Standard	
1	**Spot Defect (Including black spot and white spot)**	For black/white spot is defined $\varphi = (x+y)/2$	
		Size φ(mm)	Acceptable Quantity
		φ≤0.20	Ignore
		0.20<φ≤0.30	2
		0.30<φ≤0.40	1
		0.40<φ	Not allowed
2	**Line Defect (Including black line, white line and scratch)**	Define:	
		Width(mm) Length(mm)	Acceptable Quantity
		W≤0.03	Ignore
		0.03<W≤0.1 0.8<L≤2.0	2
		0.1<W or L>2.0	Not allowed
3	**Polarizer Dent/Bubble**	Sizeφ(mm)	Acceptable Quantity
		φ≤0.1	Ignore
		0.1<Φ≤0.3	2
		0.3<φ	0

		Bright and black dot define:
4	**Electrical Dot Defect**	and

Inspection pattern: Full white、Full black、Red、green and blue screens

Item	Acceptable Quantity
Black dot defect	2
Bright dot defect	1
Total Dot	2

5	**Newton Ring**	Sizeφ(mm)	Acceptable Quantity
		D <15mm	1

Note1:   Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.

Note2:   The distance between two bright dot defects (red, green, blue, and white) should be larger than 10mm.

Note3:   The distance between black dot defects or black and bright dot defects should be more than 5mm apart.

Note4:   The definitions of the inner display area and outer display area

I: Inner display area   O: Outer display area
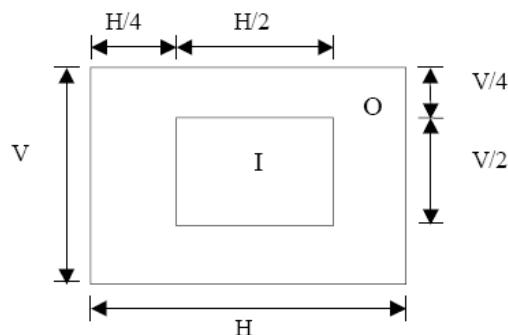
Note5:   Polarizer bubble is defined as the bubble appears on active display area. The defect of polarizer bubble shall be ignored if the polarizer bubble appears on the outside of active display area.

10.6   Mechanics specification

As for the outside dimension, weight of the modules, please refer to product specification for more details

11 Precautions for Use of LCD Modules

11.1   Handling Precautions

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

11.1.2   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.

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

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

11.1.5   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

11.1.6   Do not attempt to disassemble the LCD Module.

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

11.1.8   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.

11.2   Storage precautions

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

11.2.2   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%

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

11.3   Transportation Precautions

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