TIANMA

MODEL NO   :   TM043NBH02

MODEL VERSION: 40

SPEC VERSION :   2.6

ISSUED DATE: 2018-12-19

☐**Preliminary Specification**
■**Final Product Specification**

Customer :

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Panpan Cao	Longping Deng	KimMinHong

This technical specification is subjected to change without notice

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2010-08-23	Preliminary Specification Release	Kelly.hu
1.1	2010-9-13	Updated LCM thickness	Kelly.hu
1.2	2010-9-30	Corrected RA temperature condition	Kelly.hu
2.0	2011-10-17	Final Specification Release	Longping.Deng
2.1	2011-11-29	Add LCM Weight	Longping.Deng
2.2	2015-11-29	Replace LC & IC，update new format	Lifeng Chen
2.3	2016-4-29	Modify LCM drawing	Lifeng Chen
2.4	2018-01-24	Update the mechanical drawing	Junwen Du
2.5	2018-01-26	Update AC characteristics and Data input timing parameter setting	Rui Xu
2.6	2018-12-19	Update packing drawing	Panpan Cao

1 General Specifications

Feature		Spec
Display Spec.	Size	4.3 inch
	Resolution	480(RGB)x272
	Technology Type	RGB 24 bits
	Pixel Configuration	R.G.B Vertical Stripe
	Pixel pitch(mm)	0.198 x0.198
	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)	105.50x67.20x4.10
	Active Area(mm)	95.04x53.86
	With /Without TSP	With TSP
	Matching Connection Type	FH19SC-40S-0.5SH(HIROS)
	LED Numbers	10 LEDS
	Weight (g)	58
Electrical Characteristics	Interface	RGB24bits
	Color Depth	16.7M
	Driver IC	ST7282T2

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

Matched connector:FH19SC-40S-0.5SH(HIROSE)

Pin No.	Symbol	I/O	Function	Remark
1	VLED-	P	Back light cathode	
2	VLED+	P	Back light anode	
3	GND	P	Ground	
4	VDD	P	Power supply	
5	R0	I	Red Data input	
6	R1	I	Red Data input	
7	R2	I	Red Data input	
8	R3	I	Red Data input	
9	R4	I	Red Data input	
10	R5	I	Red Data input	
11	R6	I	Red Data input	
12	R7	I	Red Data input	
13	G0	I	Green Data input	
14	G1	I	Green Data input	
15	G2	I	Green Data input	
16	G3	I	Green Data input	
17	G4	I	Green Data input	
18	G5	I	Green Data input	
19	G6	I	Green Data input	
20	G7	I	Green Data input	
21	B0	I	Blue Data input	
22	B1	I	Blue Data input	
23	B2	I	Blue Data input	
24	B3	I	Blue Data input	
25	B4	I	Blue Data input	
26	B5	I	Blue Data input	
27	B6	I	Blue Data input	
28	B7	I	Blue Data input	
29	GND	P	Ground	
30	DCLK	I	Clock signal; latching data at the rising edge	

31	DISP	I	Display control/standby mode selection, Internal pull low DISP="Low": Standby; DISP="High": Normal display	
32	HSYNC	I	Horizontal sync signal; negative polarity	
33	VSYNC	I	Vertical sync signal; negative polarity	
34	DE	I	Data input enable. Active High to enable the data input When not used in SYNC mode, user should connect it to "Low".	
35	NC	_____	No Connection	
36	GND	P	Ground	
37	X_R	O	XR	
38	Y_B	O	YD	
39	X_L	O	XL	
40	Y_T	O	YU	

Note1：Please add the FPC connector type and matched one if necessary .

Note2：I——Input, O——Output, P——Power/Ground

3　Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.3	4.6	V	Note1
Input voltage	V_{IN}	-0.3	4.6	V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃＜Ta≤50℃
		--	≤55	%	50℃＜Ta≤60℃
		--	≤36	%	60℃＜Ta≤70℃
		--	≤24	%	70℃＜Ta≤80℃
Absolute Humidity	AH	--	≤70	g/m³	Ta＞70℃

Table 3　Absolute Maximum Ratings

Note1: Input voltage include R0~R5, G0~G5, B0~B5, Dotclk, Hsync, Vsync, Enable, R/L, U/D.(For your reference)

Note2: 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

4.1 Driving TFT LCD Panel

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		VDD	3.0	3.3	3.6	V	
NVW Supply Voltage		VPP	7.4	7.5	7.6	V	
Input Signal Voltage	Low Level	V_{IL}	DGND	—	0.3×VDD	V	
	High Level	V_{IH}	0.7×VDD	—	VDD	V	
Output Signal Voltage	Low Level	V_{OL}	DGND	—	DGND+0.4	V	
	High Level	V_{OH}	VDD-0.4	—	VDD	V	

4.2 Backlight Unit

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	--	40	50	mA	10 LEDs (2 LED Serial,5 LED Parallel)
Forward Current Voltage	V_F	15	16	18	V	
Backlight Power Consumption	W_{BL}	--	640	—	mW	
LED life time	--	10000	(20000)	-	Hrs	

Note1: The LED driving condition is defied for each LED module (5 LED Serial,2 LED Parallel).
Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.
Note3: I_F is defined for one channel LED. 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% initial brightness. Typical operating life time is estimated data.
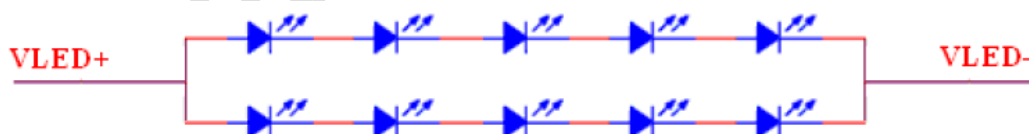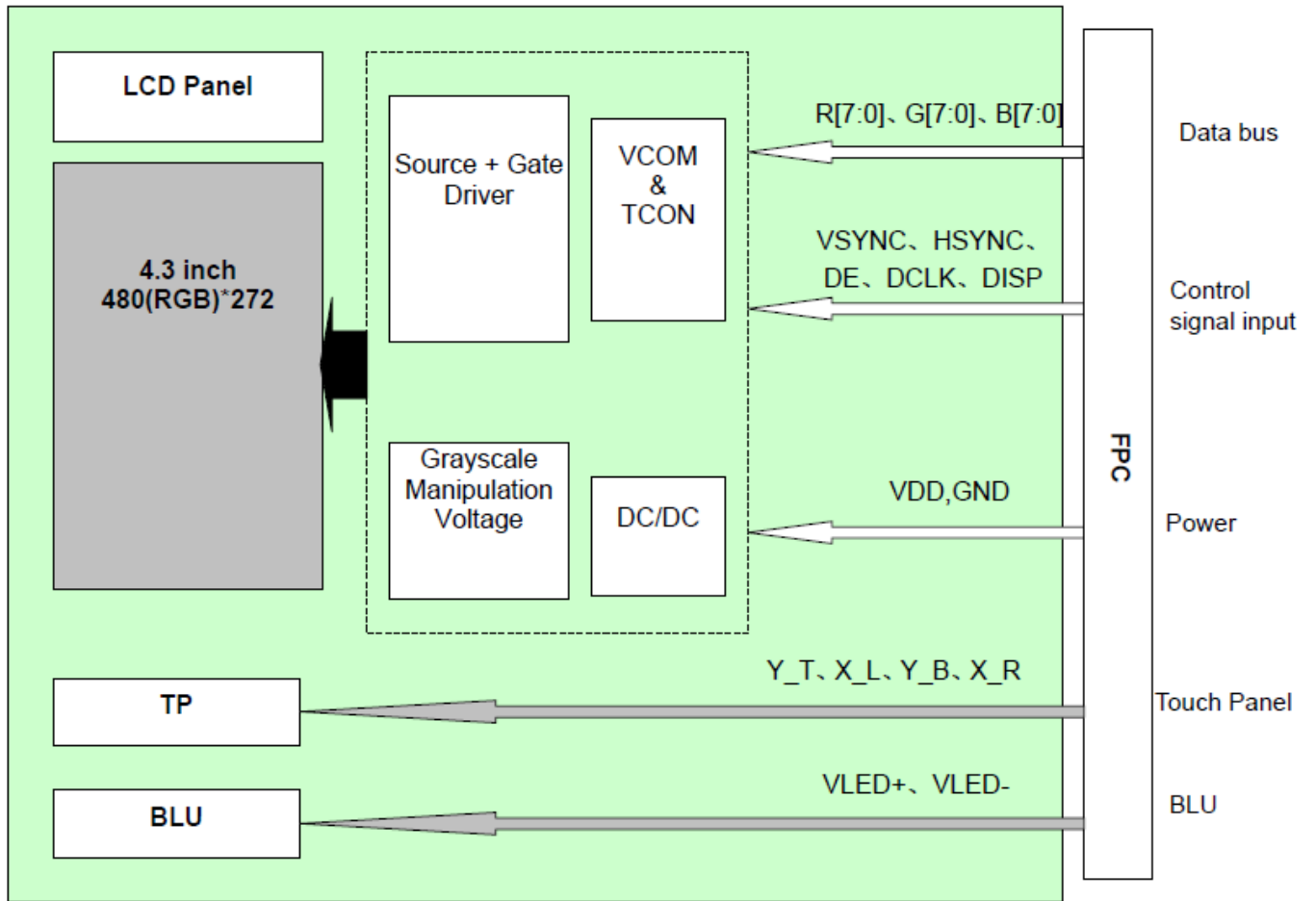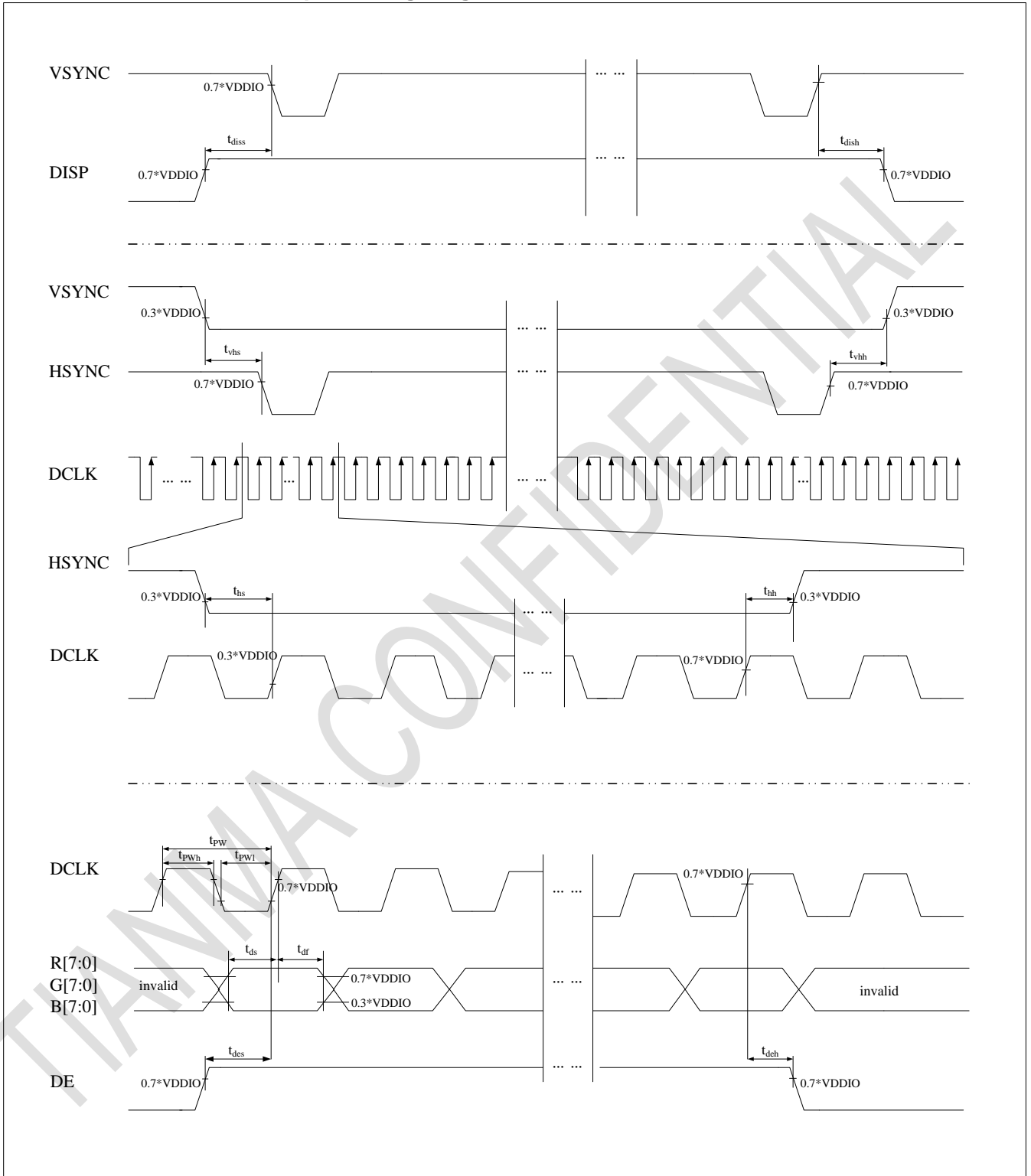Note4: The LED driving condition is defined for each LED module.

Figure 4.2

4.3 Block Diagram
LCD Module diagram

5 Timing Chart

5.1 Clock and Data Input Timing Diagram

5.2 AC Characteristics

VDD=3.3V　Ta=25℃

VDDI= 3.3V, VDD= 3.3V, AGND= 0V

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
System operation timing						
VDD power source slew time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
Input/ Output timing						
CLK pulse duty	Tcw	40	50	60	%	
Hsync width	Thw	1	-	-	DCLK	
Hsync period	Th	55	60	65	us	
Vsync setup time	Tvst	12	-	-	ns	
Vsync hold time	Tvhd	12	-	-	ns	
Hsync setup time	Thst	12	-	-	ns	
Hsync hold time	Thhd	12	-	-	ns	
Data setup time	Tdsu	12	-	-	ns	
Data hold time	Tdhd	12	-	-	ns	
DE setup time	Tdest	10	-	-	ns	
DE hold time	Tdehd	10	-	-	ns	
SD output stable time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD output rise and fall time	Tgst	-	-	6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF
3-wire serial communication						
Delay between CSB and Vsync	Tcv	1			us	
CS input setup time	Ts0	50			ns	
Serial data input setup time	Ts1	50			ns	
CS input hold time	Th0	50			ns	
Serial data input hold time	Th1	50			ns	
SCL pulse high width	Twh1	50			ns	
SCL pulse low width	Twl1	50			ns	
CS pulse high width	Tw2	400			ns	

5.3 SYNC Mode Timing Diagram
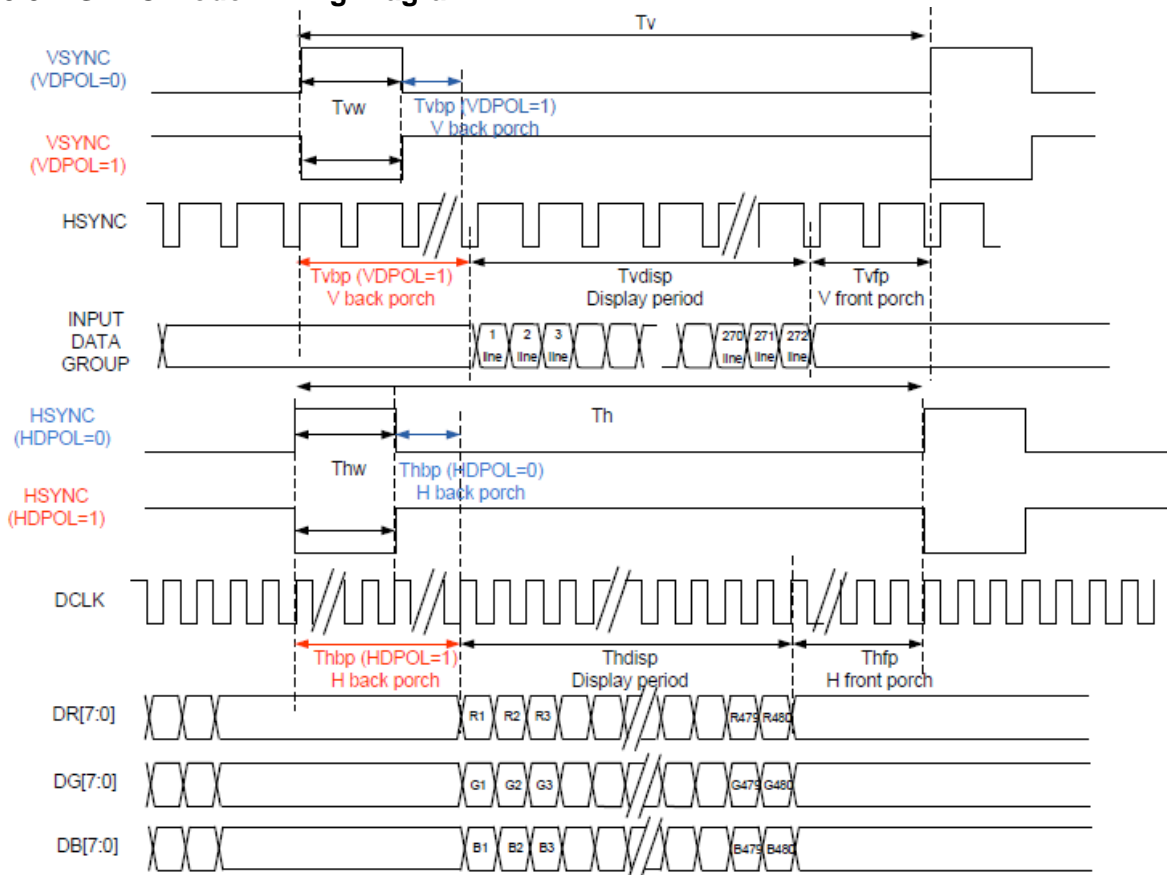
5.4 DE Mode Timing Diagram
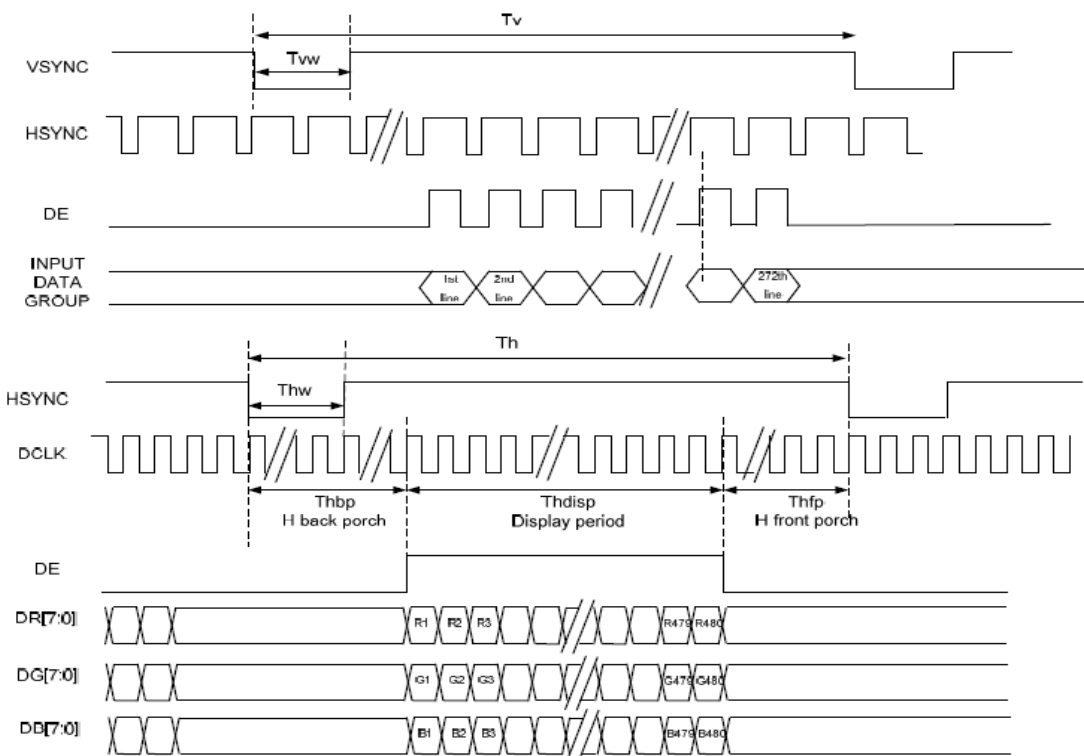
5.5 Data Input Timing Parameter Setting

| Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	f_{clk}	8	9	12	MHZ	Note1
HSYNC frequency	$1/t_h$	--	17.14	--	KHz	
VSYNC frequency	$1/t_v$	--	59.94	--	Hz	
Horizontal cycle	t_h	485	531	598	DCLK	
Horizontal display period	t_{hdisp}		480		DCLK	
Horizontal pulse width	t_{hw}	2	4	75	DCLK	Note2
Horizontal back porch	t_{hbp}	3	43	43	DCLK	
Horizontal front porch	t_{hfp}	2	8	75	DCLK	
Vertical cycle	t_v	276	292	321	HSYNC	
Vertical display period	t_{vdisp}		272		HSYNC	
Vertical pulse width	t_{vw}	2	4	37	HSYNC	Note2
Vertical back porch	t_{vbp}	2	12	12	HSYNC	
Vertical front porch	t_{vfp}	2	8	37	HSYNC	

Note 1：Unit: CLK=1/ f_{CLK} , H= t_h,

Note 2：It is necessary to keep $t_{vp}+t_{vb}$=20 and $t_{hp}+t_{hb}$= 51.

5.6   Power ON Sequence
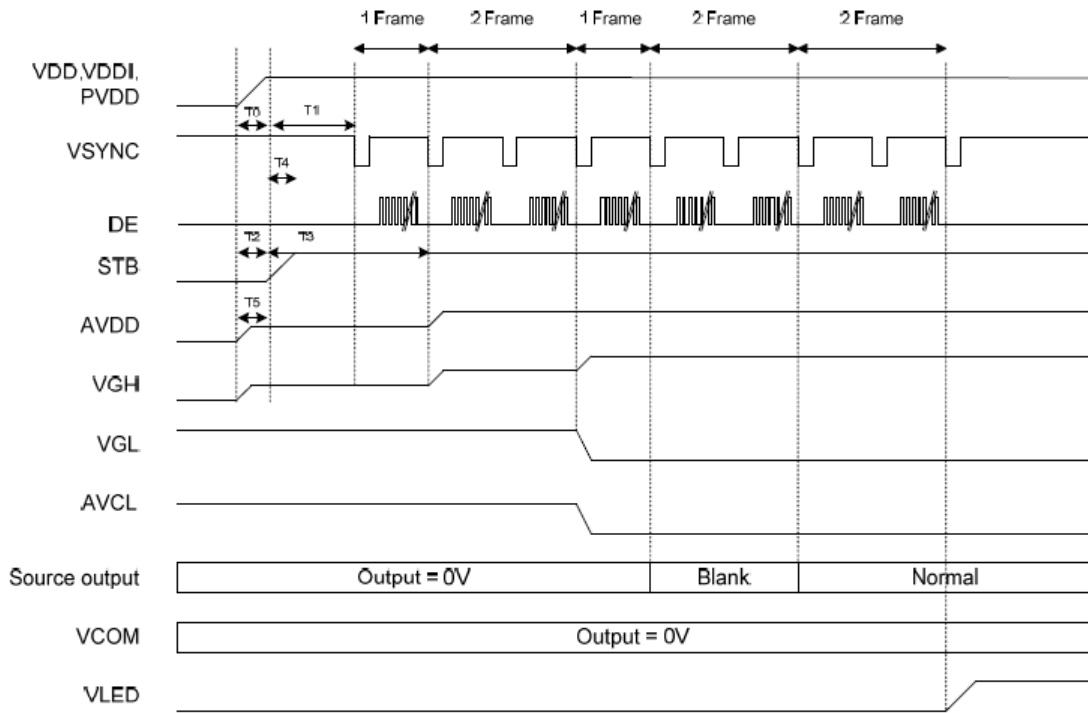
5.7 Power Off Sequence

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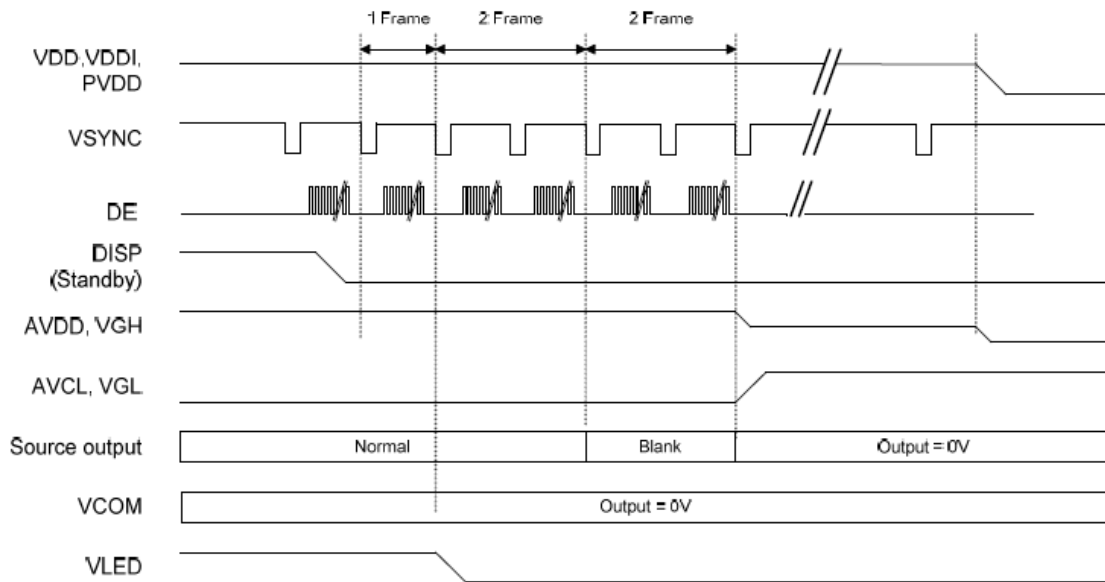
6. Touch Screen Panel Specifications

6.1 Electrical Characteristics

Item		Min.	Typ.	Max.	Unit	
Linearity		---	---	1.5%	---	Each axis: X and Y
Operating Voltage		---	5.0	10.0	V	DC
Resistance	X axis:	480	---	1100	Ω	
	Y axis:	120	---	450	Ω	
Chattering Time		---	---	10.0	ms	
Insulation Resistance		20	---	---	MΩ	@DC25V

6.2 Touch Panel Mechanical & Reliability Characteristics

Item	Value			Unit	Remark
	Min	Typ	Max		
Activation	80	-	160	gf	Note 1
Durability-surface scratching	Write 100000	-	-	characters	Note 2
Durability-surface pitting	1000000	-	-	touches	Note 3
Surface hardness	3			H	JIS K5400

Note1:

1. Input DC 5V on X direction , Drop off Polyacetal Stylus(R0.8),until output voltage stabilize ,then get the activation force；

2. R8 Silicon rubber for finger Activation force test；

3. Test point： 9 points。

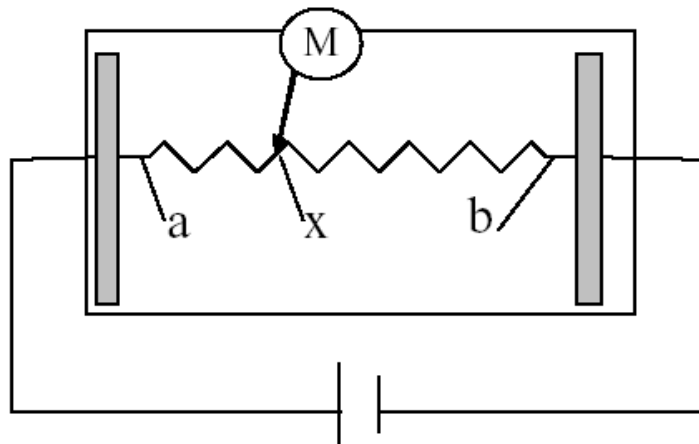<Measurement of Pen Input>

<Measurement of Finger Input>
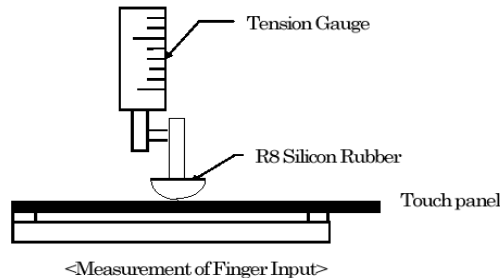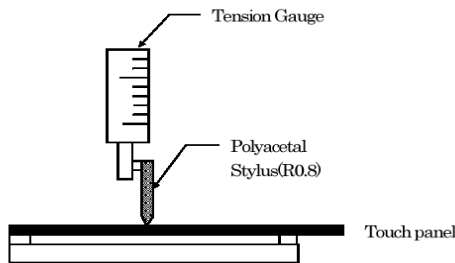
Note2:
End shape: R0.8mm(Stylus)
Load force: 150gf
Writing speed: 60 mm/sec
Material of Pen: Polyacetal resin
Sliding length: 10~100 mm

Note3:
End shape: R8.0mm, Material of Pen: Silicon rubber
Hardness: 60°
Load force: 100gf
Frequency: 2 Hz

6.2 Electrical Characteristic
Linearity Definition

Va: maximum voltage in the active area of touch panel
Vb: minimum voltage in the active area of touch panel
X: random measuring point
Vxm: actual voltage of Lx point
Vxi: theoretical voltage of Lx point
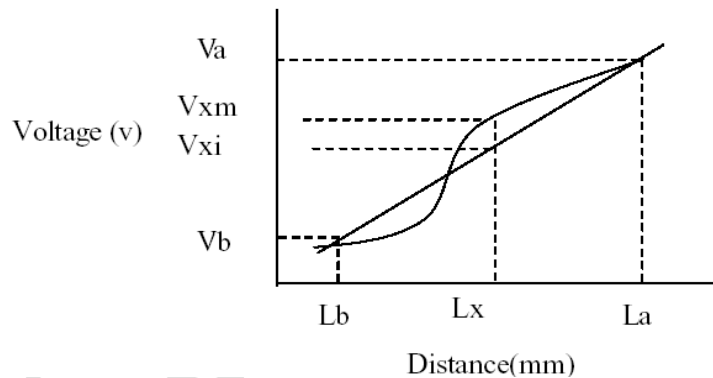
Linearity = [|Vxi-Vxm |/(Va-Vb)]*100%

Note: Test area is as follows and operation force is 150gf(single layer ITO Film), polyacetal stylus: R0.8mm.
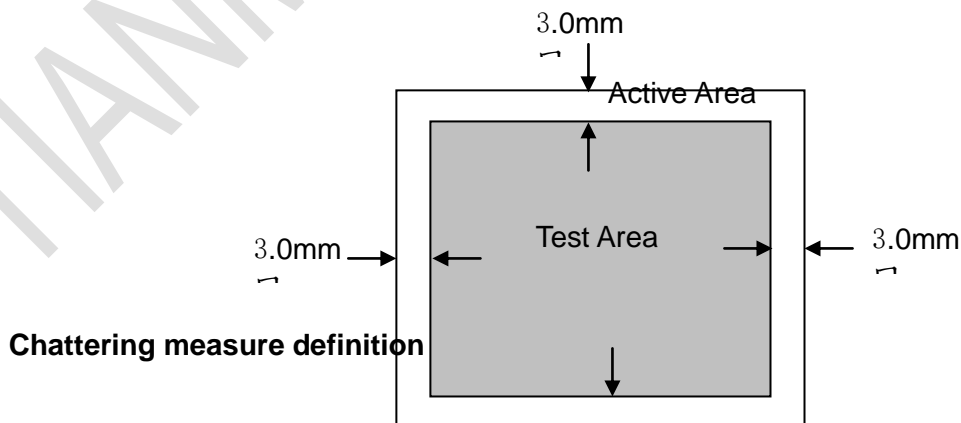
Chattering measure definition

6.3.Housing design guide

Housing design follow as below
1. Avoid the design that housing overlap and press on the active area of the LCM
2. Give enough gap(Over 0.5mm at compressed) between the housing and TSP to Protect wrong operating.
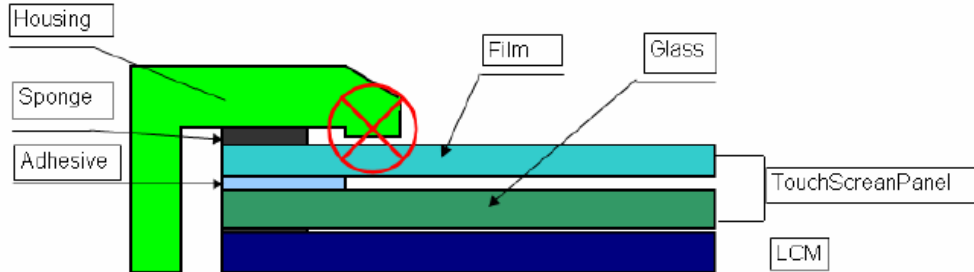
3. Use a buffer material(Gasket) between the TSP and housing to protect damage and wrong operating
4. Avoid the design that buffer material overlap and press on the inside of TSP view area.

7 Optical Characteristics

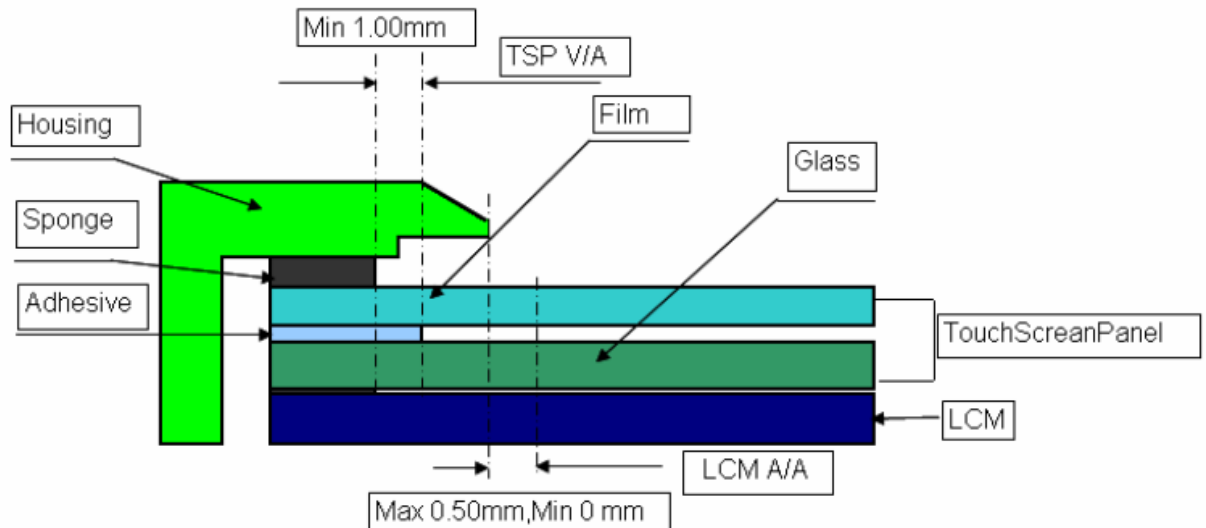| Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	60	70	-	Degree	Note2,3
		θB		40	50	-		
		θL		60	70			
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	450	-		Note 3
Response Time		T$_{ON}$	25℃	-	20	30	ms	Note 4
		T$_{OFF}$						
Chromaticity	**White**	x	Backlight is on	0.265	0.315	0.365		Note 1,5
		y		0.278	0.328	0.378		
	Red	x		0.540	0.590	0.640		Note 1,5
		y		0.300	0.350	0.400		
	Green	x		0.290	0.340	0.390		Note 1,5
		y		0.500	0.550	0.600		
	Blue	x		0.094	0.144	0.194		Note 1,5
		y		0.050	0.100	0.150		
Uniformity		U			75	-	%	Note 6
NTSC				-	50	-	%	Note 5
Luminance		L		230	280	-	cd/m^2	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.

Photo detector

Field

500mm

TFT-LCD Module

LCD Panel

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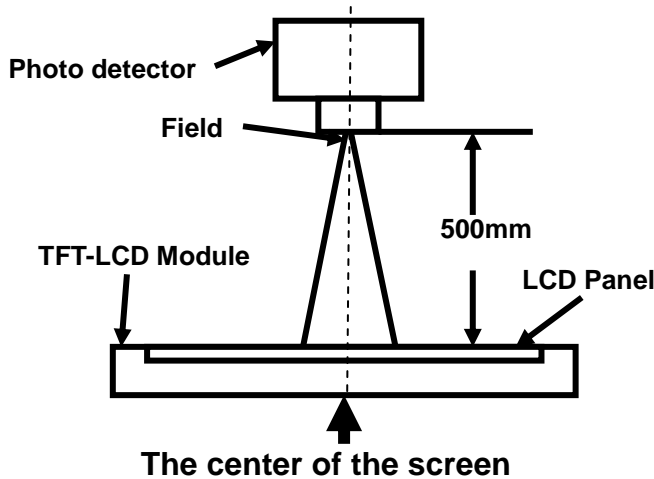
Item	Photo detector	Field
Contrast Ratio		
Luminance	SR-3A	1°
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

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)。

Normal line
θ=Φ=0°

Φ=90°
12 o'clock direction

θ_L

θ_T

θ_R

θ_B

Φ=180°

Φ=0°

Active Area

FPC

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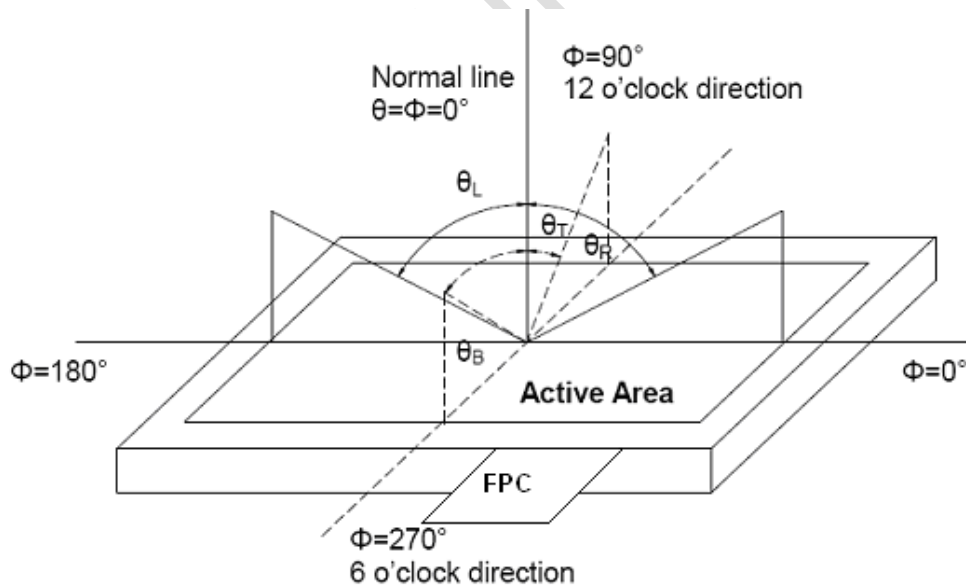
Note 3: Definition of contrast ratio

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

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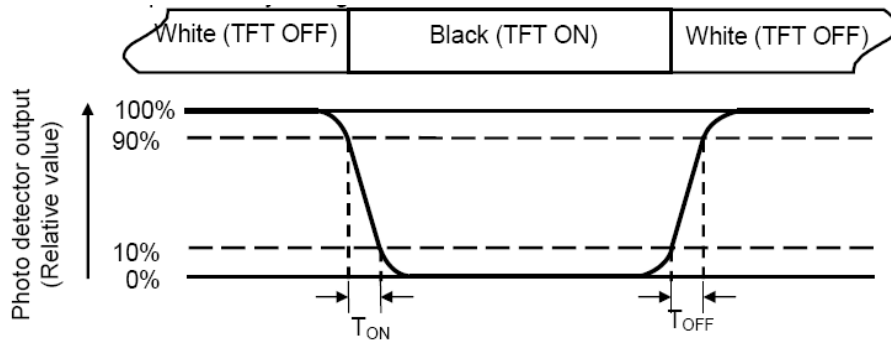
Note 5:   Definition of color chromaticity (CIE1931)

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
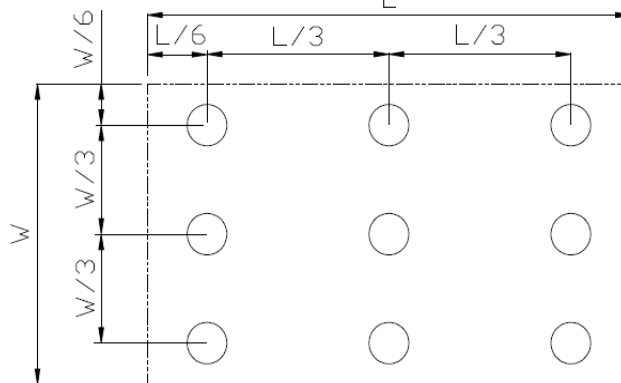
Lmax: The measured Maximum luminance of all measurement position.

Lmin: The measured Minimum luminance of all measurement position.

Note 7:   Definition of Luminance:

Measure the luminance of white state at center point.

8 Environmental / Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+60℃, 240hrs	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	Storage at High Temperature and Humidity	Ta=+60℃, 90% RH 240 hours	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	ESD	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 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)(Package condition)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non OP)	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
11	Package Vibration Test	Random Vibration: 0.015GxG/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 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.

9 Mechanical Drawing

NOTES:

1. Display:TFT;
2. View Direction : 6:00 o'clock;
3. General Tolerance:±0.20;
4. Driver IC: ST7282T2
5. Opening Temperature:
   Storage Temperature: -20°C~70°C;
   -30°C~80°C;
6. Requirements on Environment Protection: Q/S0002.
7. Recommended Case Open Area should be less than Module V.A
8. Recommended Cushion adherent area: TP V.A+1.6mm

PIN NAME

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	DCLK
31	DISP
32	HSYNC
33	VSYNC
34	DE
35	NC
36	GND
37	X_L(XL)
38	Y_B(YD)
39	X_R(XR)
40	Y_T(YU)

CIRCUIT DIAGRAM

SEE DETAIL A

CONTROL DIMENTION:
REFERENCE DIMENTION:

APPROVED:	Hu Yingloi	2016.01.28
CHECKED:	Zhang Xin	2016.01.28
DESIGNED:	Wu Ting	2016.01.28

PRODUCT NUMBER: TM043NBH02-40
PART NAME: LCM
DRAWING NUMBER: YGT1-00
MATERIAL NUMBER: TM043NBH02-40
3rd ANGLE
UNIT: mm
SCALE: 1:1
PAGE: 1/1

DETAIL A
SCALE: 4:1

Dimensions (from drawing):
46.15±0.50
67.20±0.30(LCM outline)
64.90±0.30(TP outline) 0.30
57.10±0.30(TP V.A) 2.30
55.50(TP A.A&Moudle V.A) 3.10
53.86(A.A) 3.90
(30.83) 5.23
3.60
0.30
4.40
105.50±0.30(LCM outline)
104.90±0.30(TP outline)
98.30±0.30(TP V.A)
96.70(TP A.A&Moudle V.A)
95.04(A.A)
(52.75)
480(RGB)*272Dots
23.60±0.50
(59.97)
34.19±0.50
46.44±0.15
20.50±0.10
40
3.50±0.30
0.50±0.07
P0.5*(40-1)=19.50±0.10
W=0.35±0.03
S=0.15±0.03
Contactive side
Stiffener side
0.30±0.03
White line
3.10±0.30
6.00±0.50
2.90±0.30
4.10±0.30(Including TP)
Printing
XXXXXXXXXX

REV DC/EC NUMBER | DESCRIPTION | DATE

10 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM043NBH02	105.5x67.2x4.1	0.0584	120	
2	tray	PET（Transmit）	485×330×13.8	0.16	22	
3	Dust ProofBag	PE	700×545mm	0.046	1	
4	BOX	CORRUGATED PAPER	520×345×74	0.44	2	
5	Carton	CORRUGATED PAPER	544×365×250	1.1	1	
6	Total weight	12.55±5% Kg				

Use empty tray
盖上空Tray
+

LCM
模组
+

Put products into
the 10 trays,6 LCMS
per tray
把产品投入
10个托盘，6个LCMS
每盘

A

**Use strop bind the
trays**
用胶带固定托盘

60 LCMs per
Box
每盒60个LCMS

2 Boxes
2盒

Detail A

Tray4
Tray3
Tray2
Tray1

Rotate tray 180 degrees and place on top
of stack.Check the tray using Fig.A.
旋转托盘180度并置于顶部用图检查托盘。

**Use the tape to seal
Carton**
用胶带封口纸箱

**Put into
Carton
2×10×6=120
LCMs per Carton**
放入纸箱2×6×10
＝120
每箱的LCMS

Use strop
使用胶带

dust-proof bag
放入防尘袋

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.

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

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

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

11.1.8.4 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.