



MODEL NO. : TM043NBH02

ISSUED DATE: 2011-10-17

VERSION : Ver 2.0

- 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



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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

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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)	105.50x67.20x4.10
	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: $\pm 5\%$



2 Input/Output Terminals

2.1 TFT LCD Panel

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	DCLK	I	Clock for input data. Data latched at rising edge of this signal.	
31	DISP	I	Standby mode. DISP =“1”: Normally operation. DISP =“0”: Standby mode.	
32	HSYNC	I	Horizontal sync input with negative polarity. If unused, please pull high level.	

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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	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	

Note 1: I——Input, O——Output, P——Power/Ground



3 Absolute Maximum Ratings

3.1 Driving TFT LCD Panel

Ta =25°C

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}	-20	60	°C	
Storage Temperature	T _{STG}	-30	70	°C	



4 Electrical Characteristics

4.1 Driving TFT LCD Panel

GND=0V, Ta=25°C

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}	—	—	0.3xVDD	V
	High Level	V _{OH}	0.7xVDD	—	VDD	V
(Panel+LSI) Power Consumption	Black Mode (60Hz)		TBD		mW	
	Standby Mode		TBD		mW	

4.2 Backlight Unit

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I _F	--	40	50	mA	24 LEDs (3 LED Serial, 8 LED Parallel)
Forward Current Voltage	V _F	--	16	18	V	
Backlight Power Consumption	W _{BL}	--	640	—	mW	
LED life time	--	10000	(20000)	-	Hrs	

Note1: The LED driving condition is defined 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°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.

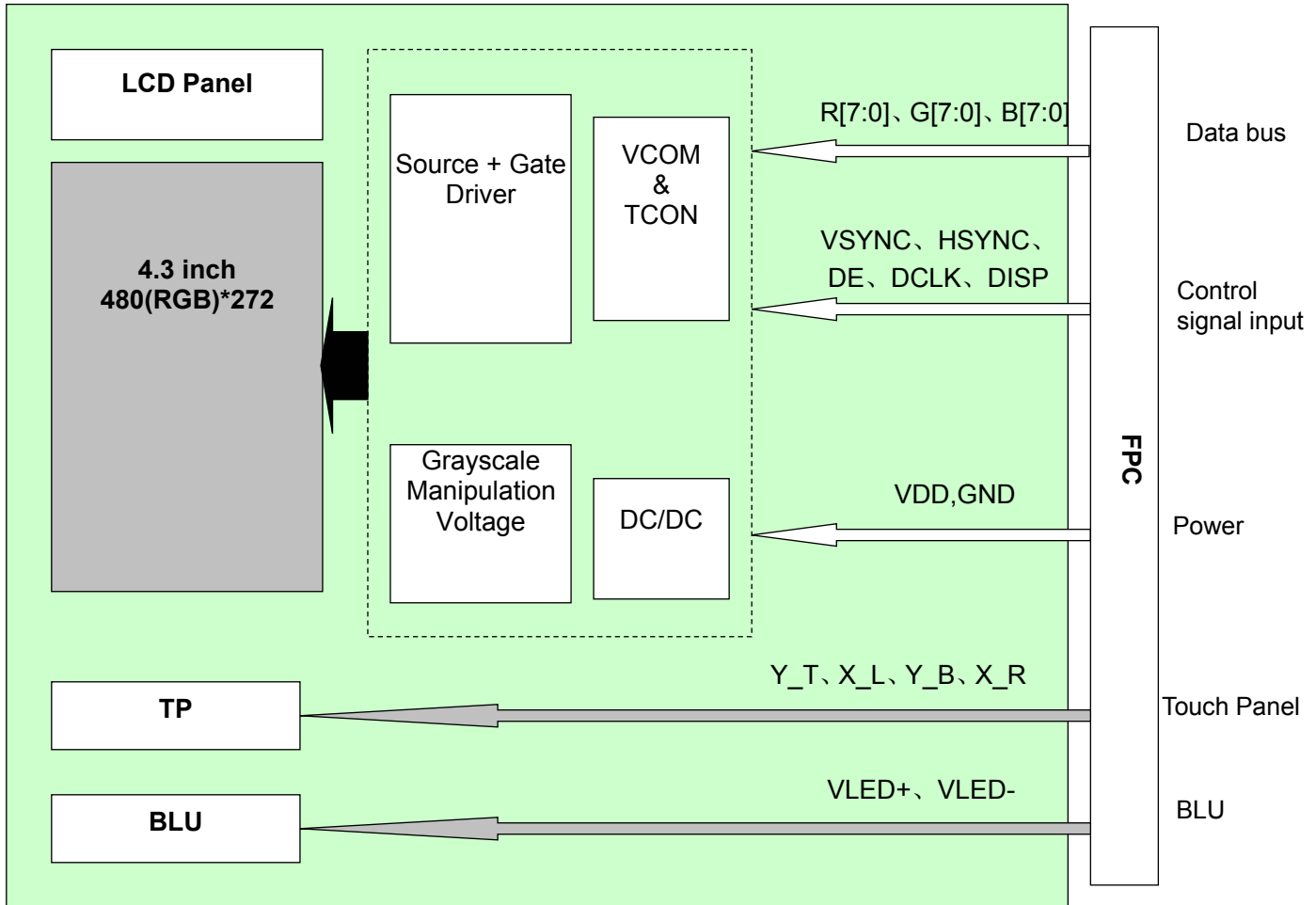
Note4: The LED driving condition is defined for each LED module.





4.3 Block Diagram

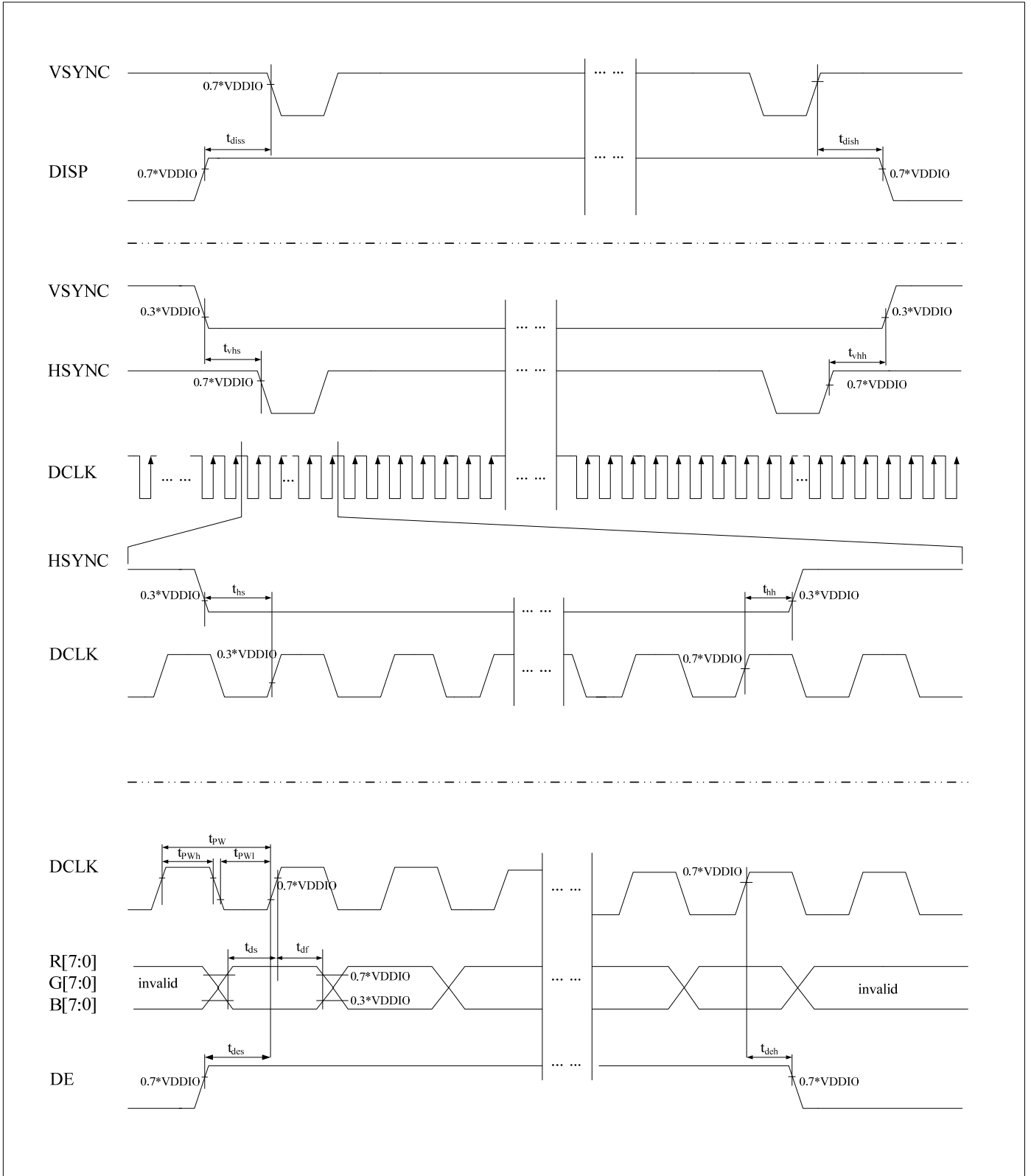
LCD module diagram





5 Timing Chart

5.1 Input Setup Timing



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5.2 Input Setup Timing Parameter Setting

VDD=3.3V Ta=25°C

Parameter	Symb ol	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	

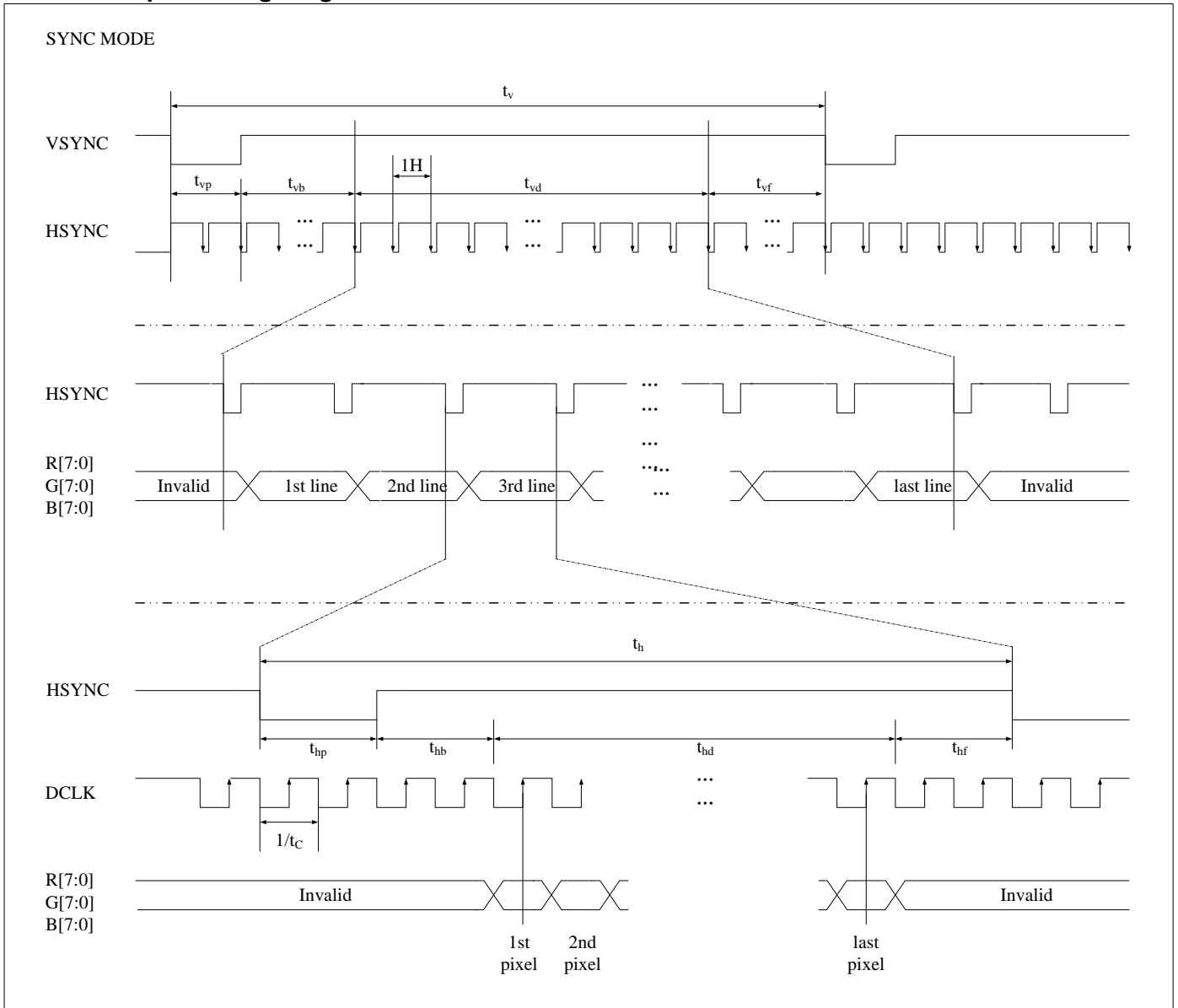
Note 1: $t_r=t_f=2ns$, t_r , t_f is defined 10% to 90% of signal amplitude.

Note 2: For parallel interface, maximum clock frequency is 15MHz.



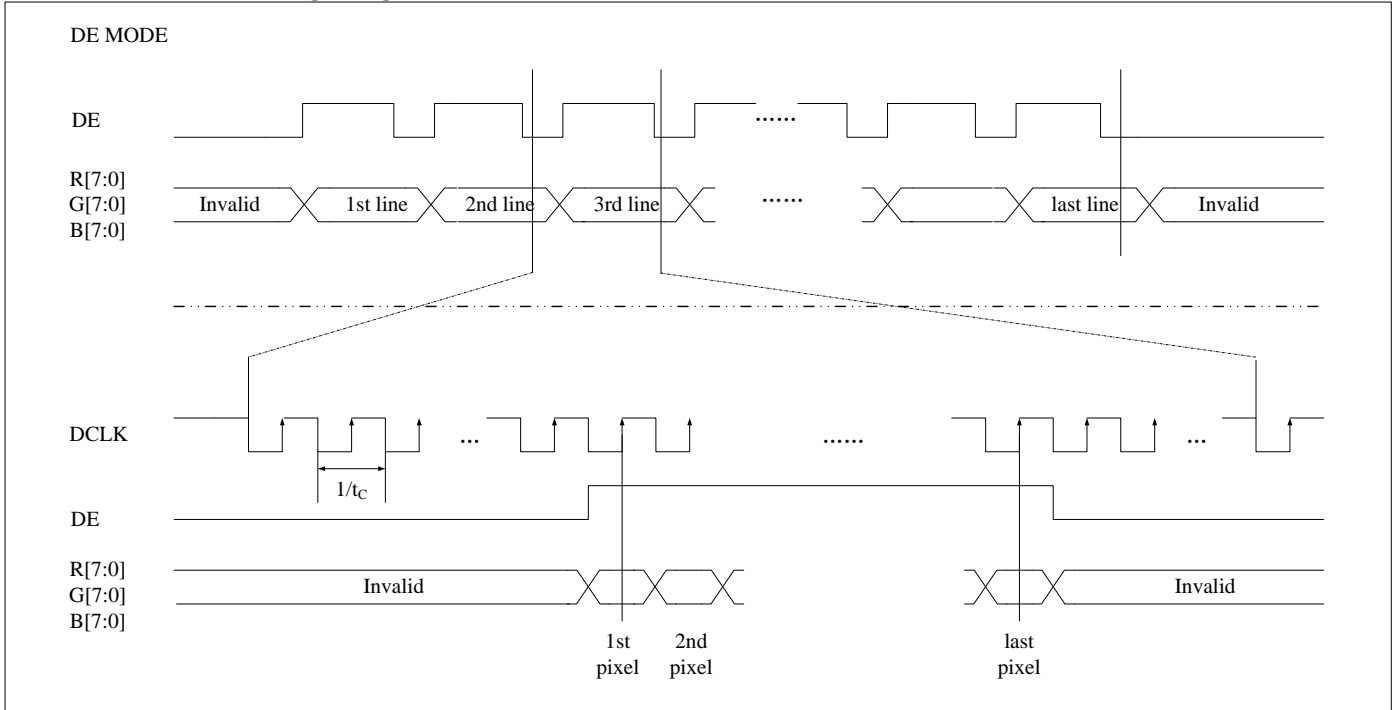
5.3 Data Input Format

5.3.1 Data Input Timing Diagram under SYNC Mode





5.3.2 Data Input Timing Diagram under DE Mode



5.4 Data Input Timing Parameter Setting

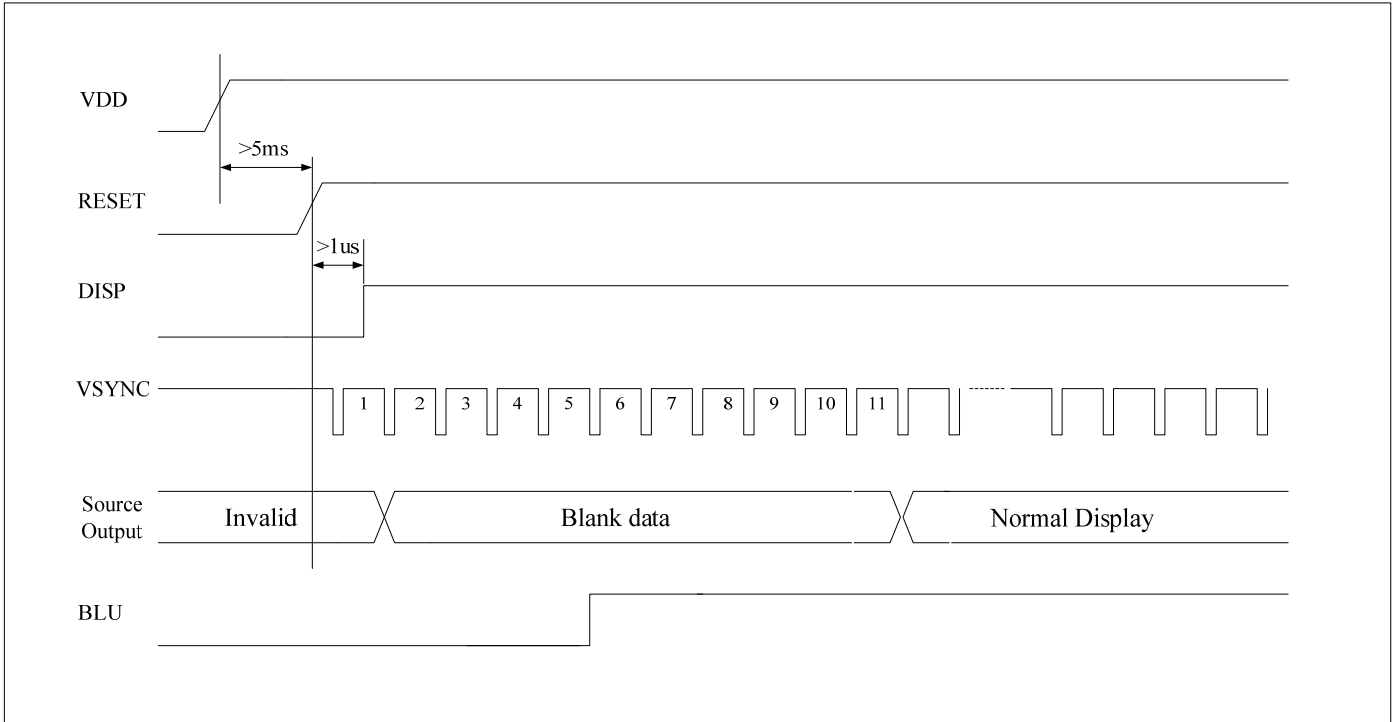
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	f_{clk}	-	9	15	MHZ
HSYNC frequency	$1/t_h$	-	17.14	-	KHz
VSYNC frequency	$1/t_v$	-	59.94	-	Hz
Horizontal cycle	t_h	525	525	605	DCLK
Horizontal display period	t_{hd}	480			DCLK
Horizontal pulse width	t_{hp}	2	41	41	DCLK
Horizontal back porch	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 ,

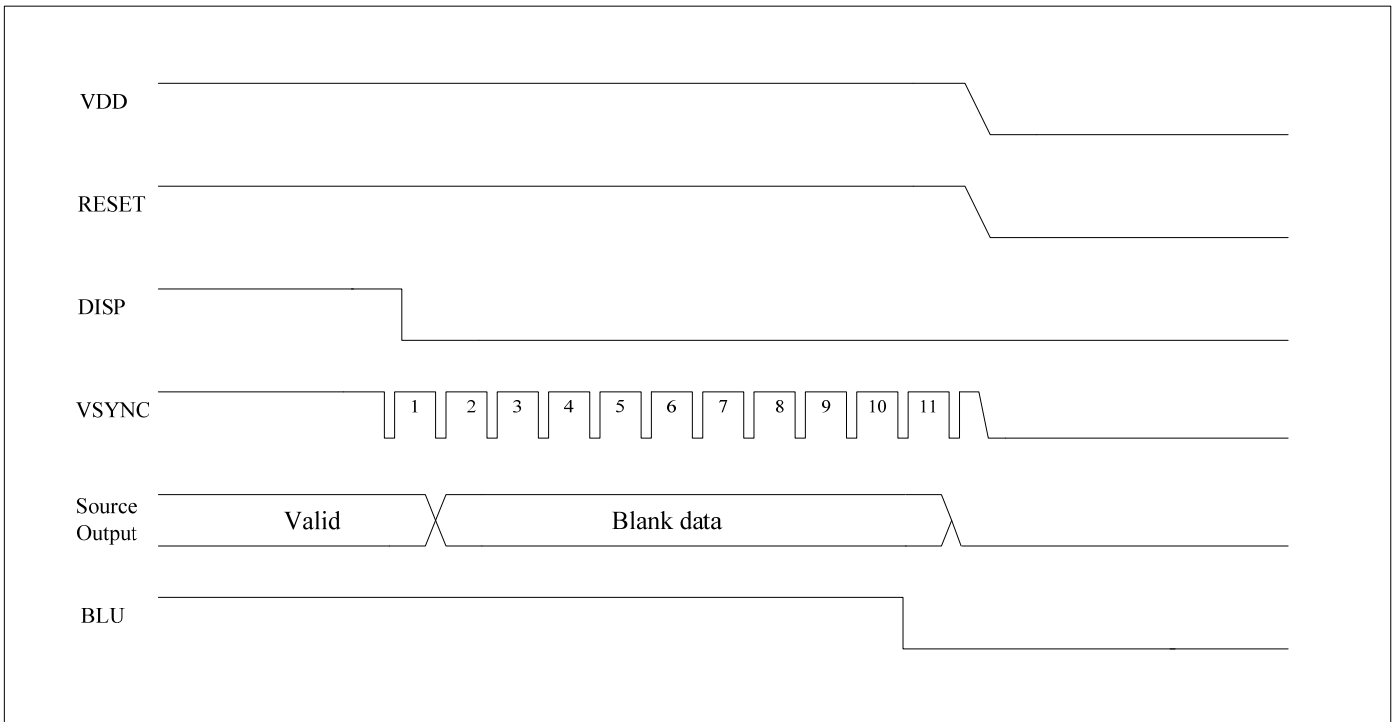
Note 2: It is necessary to keep $t_{vp}+t_{vb}=12$ and $t_{hp}+t_{hb}= 43$ in sync mode. DE mode is unnecessary to keep it.



5.5 Power ON Sequence



5.6 Power Off Sequence





6 Touch Screen Panel Specifications

6.1 Electrical Characteristics

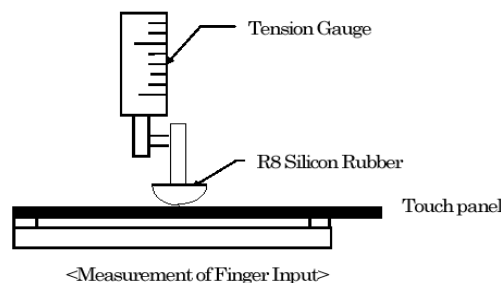
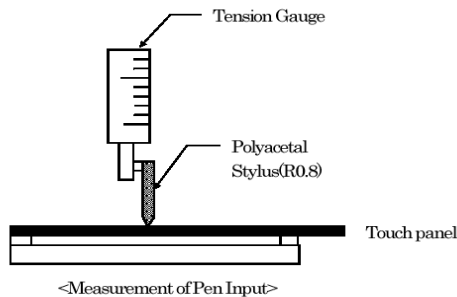
Item	Min.	Typ.	Max.	Unit	
Linearity	---	---	1.5%	---	Each axis: X and Y
Operating Voltage	---	5.0	10.0	V	DC
Resistance	X axis:	480	---	1100	Ω
	Y axis:	120	---	450	Ω
Chattering Time	---	---	10.0	ms	
Insulation Resistance	20	---	---	M Ω	@DC25V

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.



Note2:

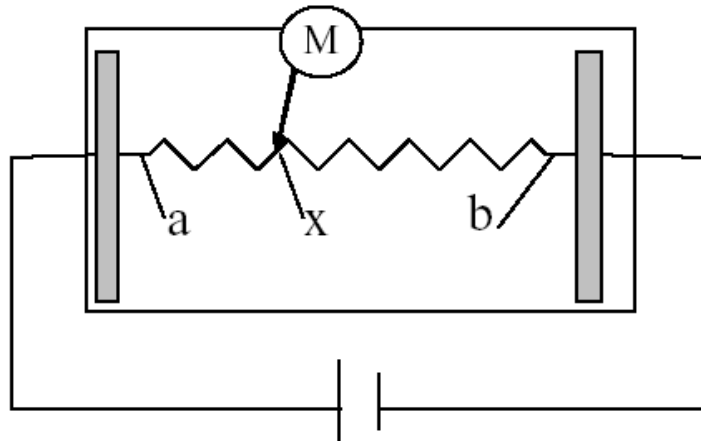
- End shape: R0.8mm(Stylus)
- Load force: 150gf
- Writing speed: 60 mm/sec
- Material of Pen: Polyacetal resin
- Sliding length: 10~100 mm

Note3:

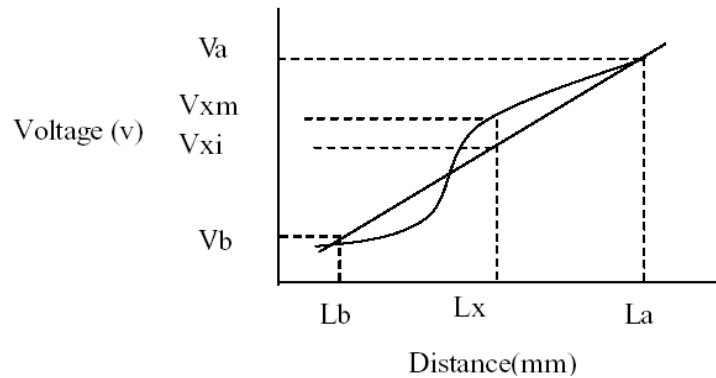
- End shape: R8.0mm, Material of Pen: Silicon rubber
- Hardness: 60°
- Load force: 100gf
- Frequency: 2 Hz

6.2 Electrical Characteristic Linearity Definition

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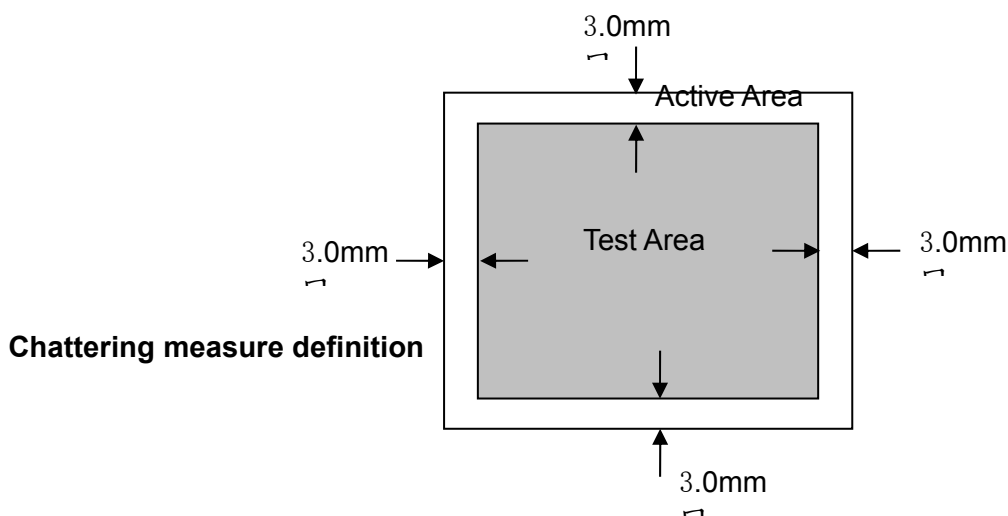


Va: maximum voltage in the active area of touch panel
 Vb: minimum voltage in the active area of touch panel
 X: random measuring point
 Vxm: actual voltage of Lx point
 Vxi: theoretical voltage of Lx point



$$\text{Linearity} = \frac{|Vxi - Vxm|}{(Va - Vb)} * 100\%$$

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

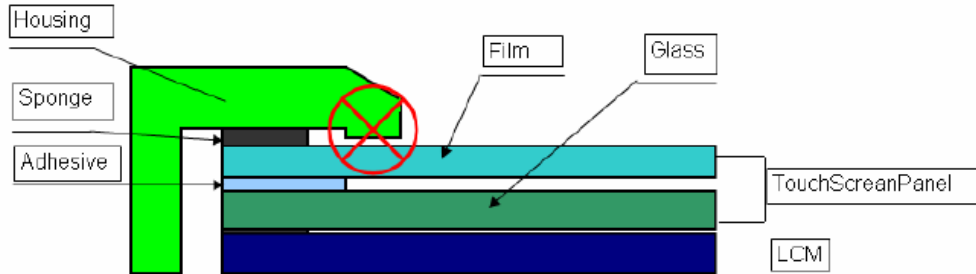




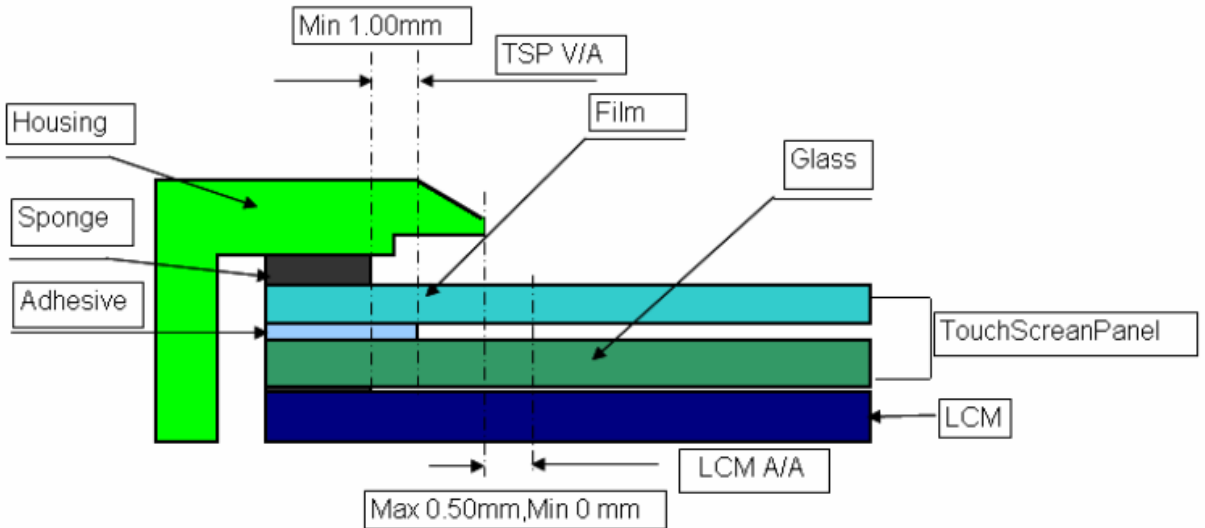
6.3.Housing design guide

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

Ta=25°C

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	
View Angles	θT	$CR \geq 10$	60	70	-	Degree	Note2,3	
	θB		40	50	-			
	θL		60	70	-			
	θR		60	70	-			
Contrast Ratio	CR	$\theta=0^\circ$	400	450	-		Note 3	
Response Time	T_{ON}	25°C	-	20	30	ms	Note 4	
	T_{OFF}							
Chromaticity	White	Backlight is on	x	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	

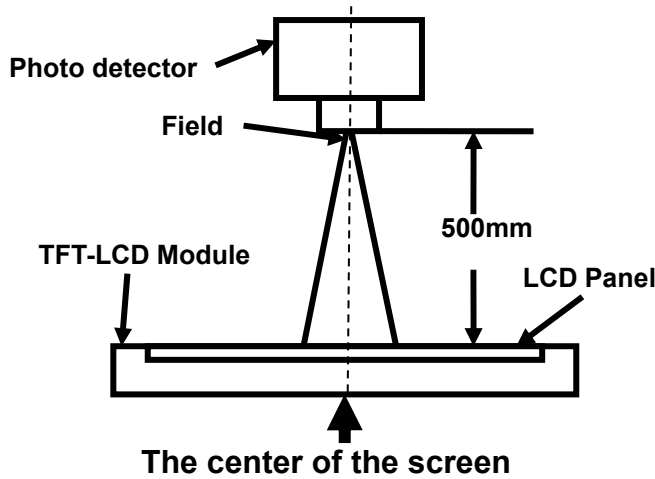
Test Conditions:

1. $I_F=22$ mA, and the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

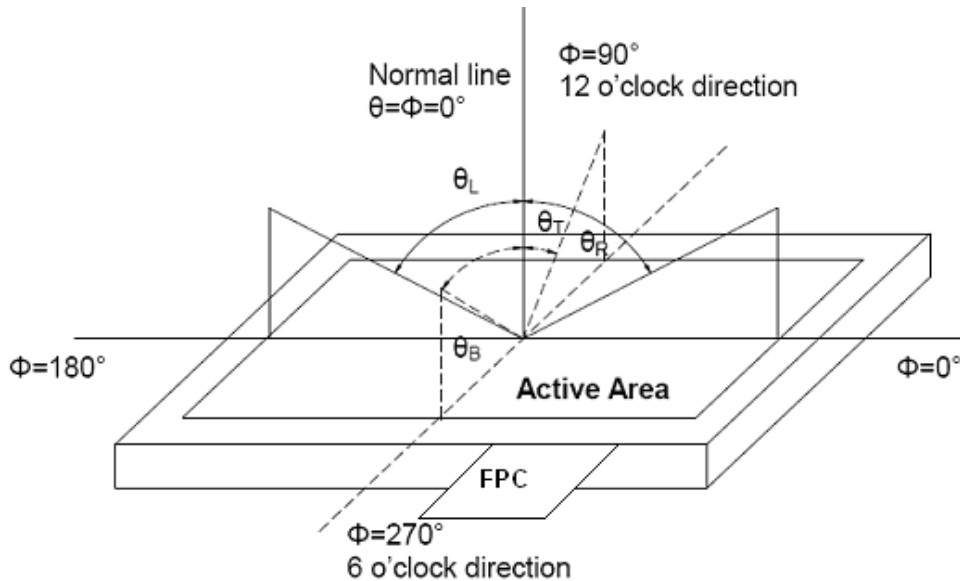
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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 V_{white}.

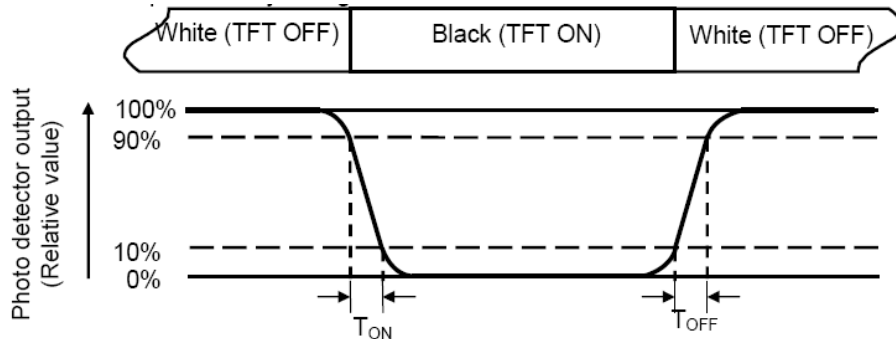
“Black state”: The state is that the LCD should drive by V_{black}.

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 (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)

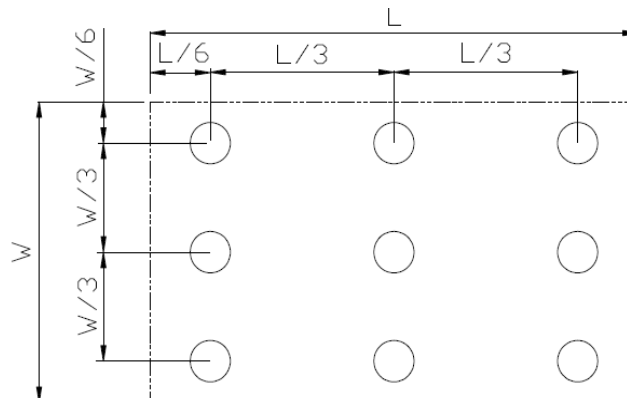
Color coordinates measured at center point of LCD.

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



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 Tests**

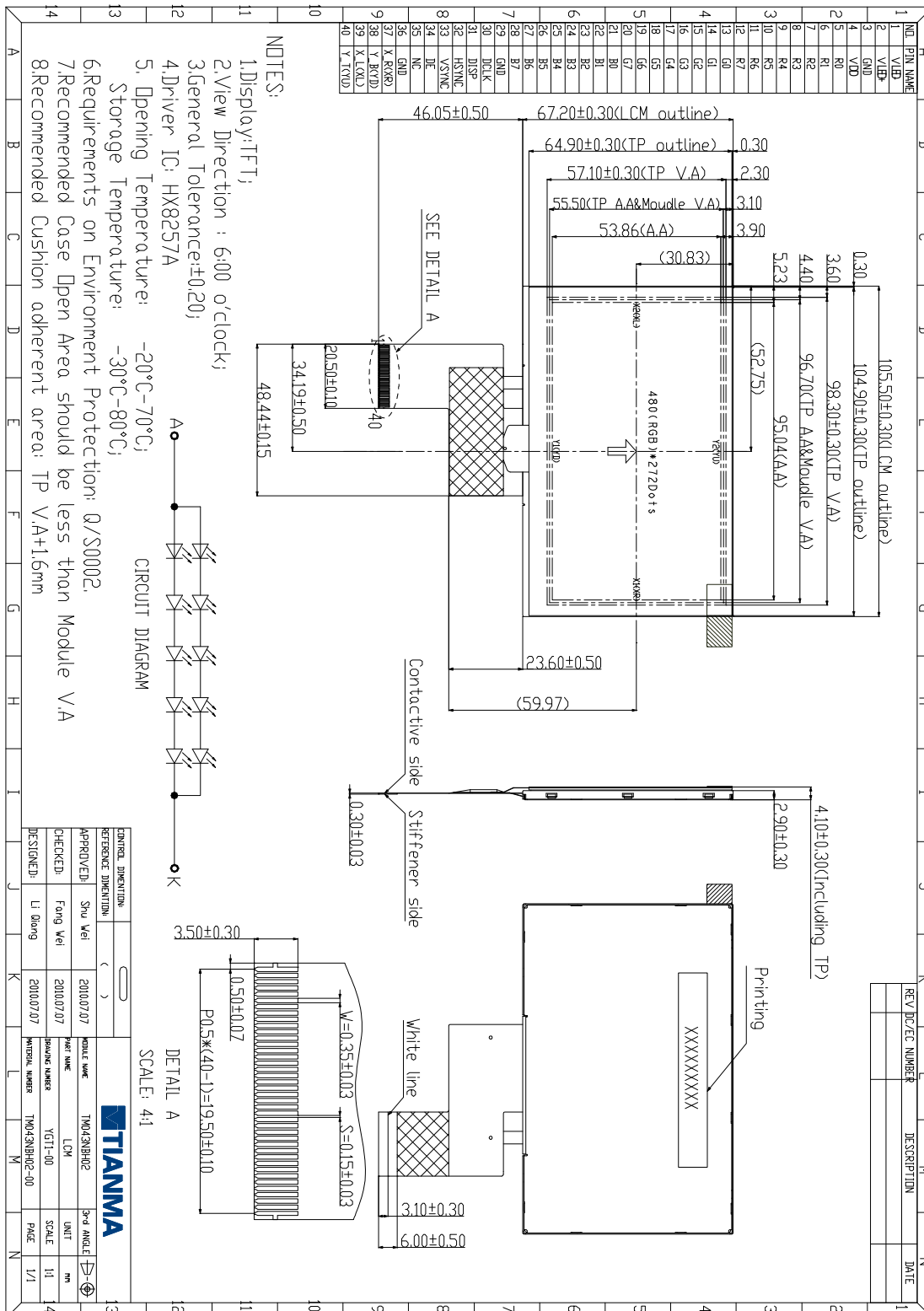
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts=+60°C, 240hrs	Note1 IEC60068-2-1,GB2423.2
2	Low Temperature Operation	Ta=-20°C, 240hrs	IEC60068-2-1 GB2423.1
3	High Temperature Storage	Ta=+70°C, 240hrs	IEC60068-2-1 GB2423.2
4	Low Temperature Storage	Ta=-30°C, 240hrs	IEC60068-2-1 GB2423.1
5	High Temperature & High Humidity Storage	Ta=+60°C, 90% RH 240 hours	Note2 IEC60068-2-78 GB/T2423.3
6	Thermal Shock (Non-operation)	-30°C 30 min~+70°C 30 min, Change time:5min, 20 Cycles	Start with cold temperature, End with high temperature, IEC60068-2-14,GB2423.22
7	Electro Static Discharge (Operation)	C=150pF, R=330Ω · 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times; (Environment: 15°C~35°C, 30%~60%, 86Kpa~106Kpa)	IEC61000-4-2 GB/T17626.2
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 GB/T2423.10
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	IEC60068-2-27 GB/T2423.5
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8
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.



9 Mechanical Drawing

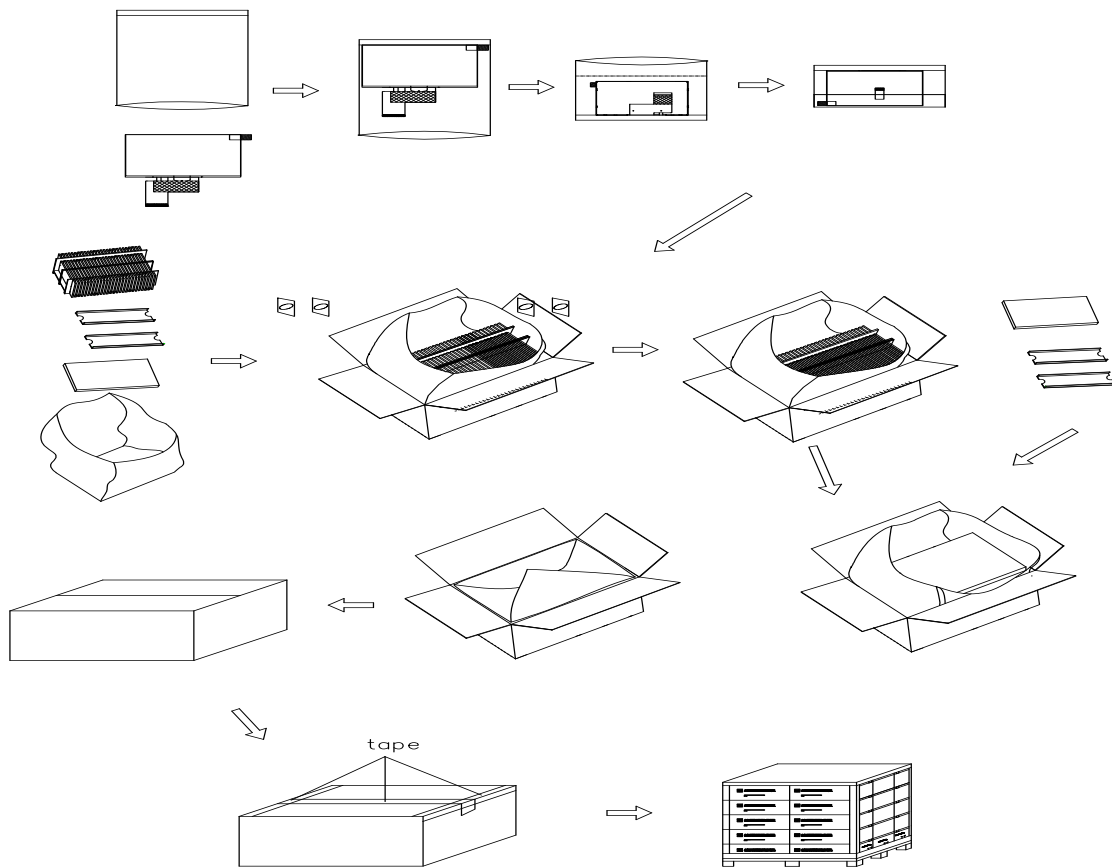


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10 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM043NBH02	105.5x67.2x4.1	TBD	112	
2	Partition_1	Corrugated Paper	513x333x106	0.7	2	
3.	Anti-Static Bag	PE	175.8x125x0.05	0.0007	112	Anti-static
4	Dust-Proof Bag	PE	700x530	0.0600	1	
5	Partition_2	Corrugated Paper	505x332x4.00	0.09	3	
6	Corrugated Bar	Corrugated Paper	513x117x3	0.04	8	
7	Carton	Corrugated Paper	530x350x250	1.1000	1	
8	Total weight	TBD Kg				



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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°C ~ 40°C 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.