

**MODEL NO : TM043NDSP01****MODEL VERSION: 00****SPEC VERSION : 2.1****ISSUED DATE: 2019-09-12**

- ☐ Preliminary Specification  
☒ Final Product Specification

**Customer : \_\_\_\_\_**

Approved by	Notes

**TIANMA Confirmed :**

Prepared by	Checked by	Approved by
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This technical specification is subjected to change without notice

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## Record of Revision

[illegible]

## 1 General Specifications

Feature		Spec
<b>Display Spec.</b>	Size	4.3 inch
	Resolution	480 (RGB) ×272
	Technology Type	a-Si SFT
	Pixel Configuration	Vertical Stripe
	Pixel pitch(mm)	0.198×0.198
	Display Mode	SFT
	Surface Treatment	AG
	Viewing Direction	Full view
	Gray Scale Inversion Direction	NA
<b>Mechanical Characteristics</b>	LCM (W x H x D) (mm)	105.50×67.20×2.9
	Active Area(mm)	95.040×53.856
	With /Without TSP	Without TSP
	Matching Connection Type	FH19SC-40S-0.5SH(HIROS)
	LED Numbers	10 LEDS
	Weight (g)	44.4
<b>Electrical Characteristics</b>	Interface	RGB 24bits
	Color Depth	16.7M
	Driver IC	ILI6485

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(HIROS)

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, VDD=VCI;	
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 falling edge	Note 1
31	DISP	I	Display control/standby mode selection, Internal pull low DISP=" Low" : Standby;	

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			DISP=" High" : Normal display	
32	HSYNC	I	Horizontal sync signal; (HDPOL=1)	Note 1
33	VSYNC	I	Vertical sync signal; (VDPOL=1)	Note 1
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(EXTC)	—	No connection. OTP trim function control. Please keep this pin in floating.	
36	GND	P	Ground	
37	NC(CS)	—	No connection. Serial communication chip select, Please keep this pin in floating.	
38	NC(SCL)	—	No connection. Serial communication clock input, Please keep this pin in floating.	
39	NC(SDA)	—	No connection. Serial communication data input and output, Please keep this pin in floating.	
40	NC(VPP)	—	No connection. For OTP, Please keep this pin in floating.	

Note 1:A combination of hardware and software is required to determine the state of the clock polarity of these pins.

Note 2: Please add the FPC connector type and matched one if necessary.

Note 3:I——Input, O——Output, P——Power/Ground

### 3 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.3	4.0	V	Note1,(Input voltage includes overshoot IO voltage.)
Input voltage	V <sub>IN</sub>	-0.3	3.6	V	
Operating Temperature	Top	-20	70	°C	
Storage Temperature	Tst	-30	80	°C	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40°C
		--	≤85	%	40°C < Ta≤50°C
		--	≤55	%	50°C < Ta≤60°C
		--	≤36	%	60°C < Ta≤70°C
		--	≤24	%	70°C < Ta≤80°C
Absolute Humidity	AH	--	≤70	g/m <sup>3</sup>	Ta>70°C

**Table 3 Absolute Maximum Ratings**

Note1: Input voltage include R0~R7, G0~G7, B0~B7, DCLK, HSYNC, VSYNC, DISP, DE.

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.

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## 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	Note1
Input Signal Voltage	Low Level	V <sub>IL</sub>	DGND	—	0.3×VDD	V	
	High Level	V <sub>IH</sub>	0.7×VDD	—	VDD	V	
Output Signal Voltage	Low Level	V <sub>OL</sub>	DGND	—	DGND+0.4	V	
	High Level	V <sub>OH</sub>	VDD-0.4	—	VDD	V	

Note1: The proposed supply voltage is  $3.3 \pm 0.1V$ , the typical voltage 3.3V is applied in the test in Chapter 6 and Chapter 7.

### 4.2 Backlight Unit

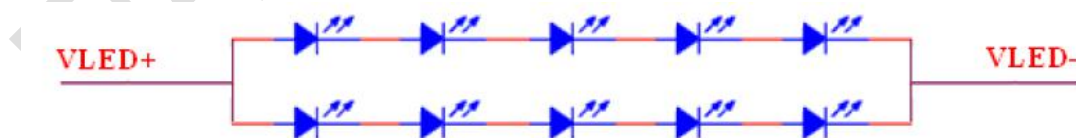
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I <sub>F</sub>	--	40	50	mA	10 LEDs (5LED Serial,2 LED Parallel)
Forward Current Voltage	V <sub>F</sub>	-15	16	18	V	
Backlight Power Consumption	W <sub>BL</sub>	--	640	—	mW	
LED life time	--		30000	-	Hrs	

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.

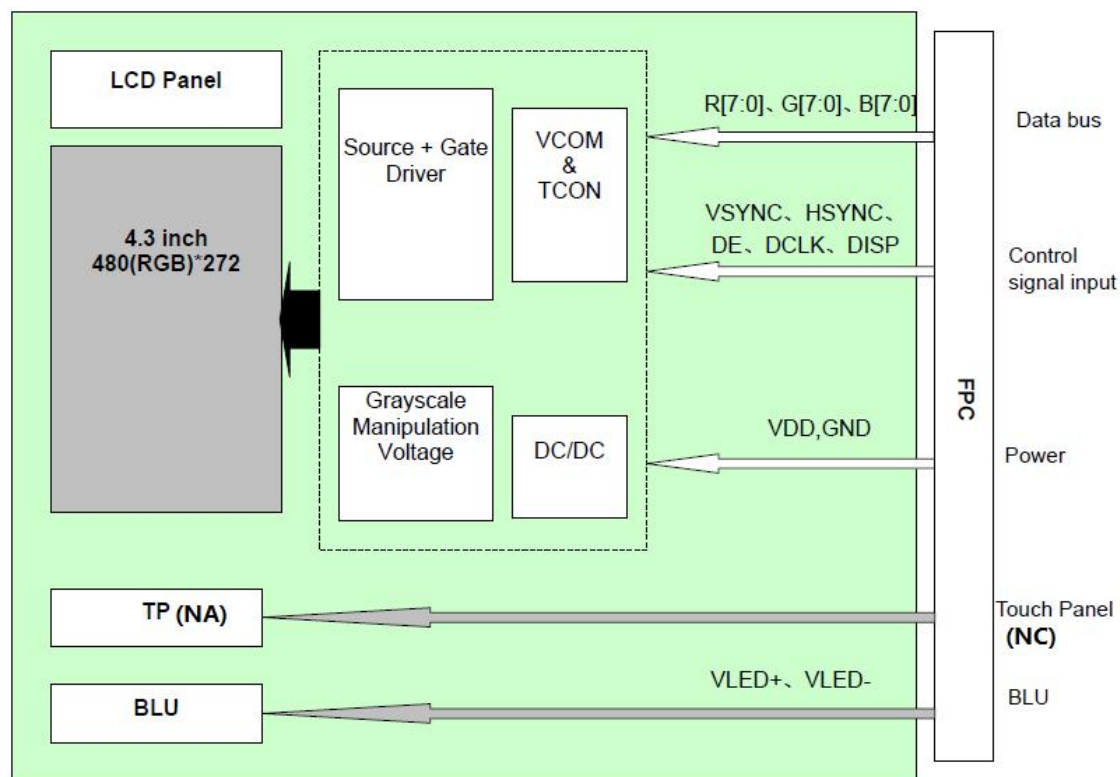
Note3: I<sub>F</sub> is defined for one channel LED. Optical performance should be evaluated at Ta=25℃ only if LED is driven by high current, high ambient temperature & Humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

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



**Figure 4.2**

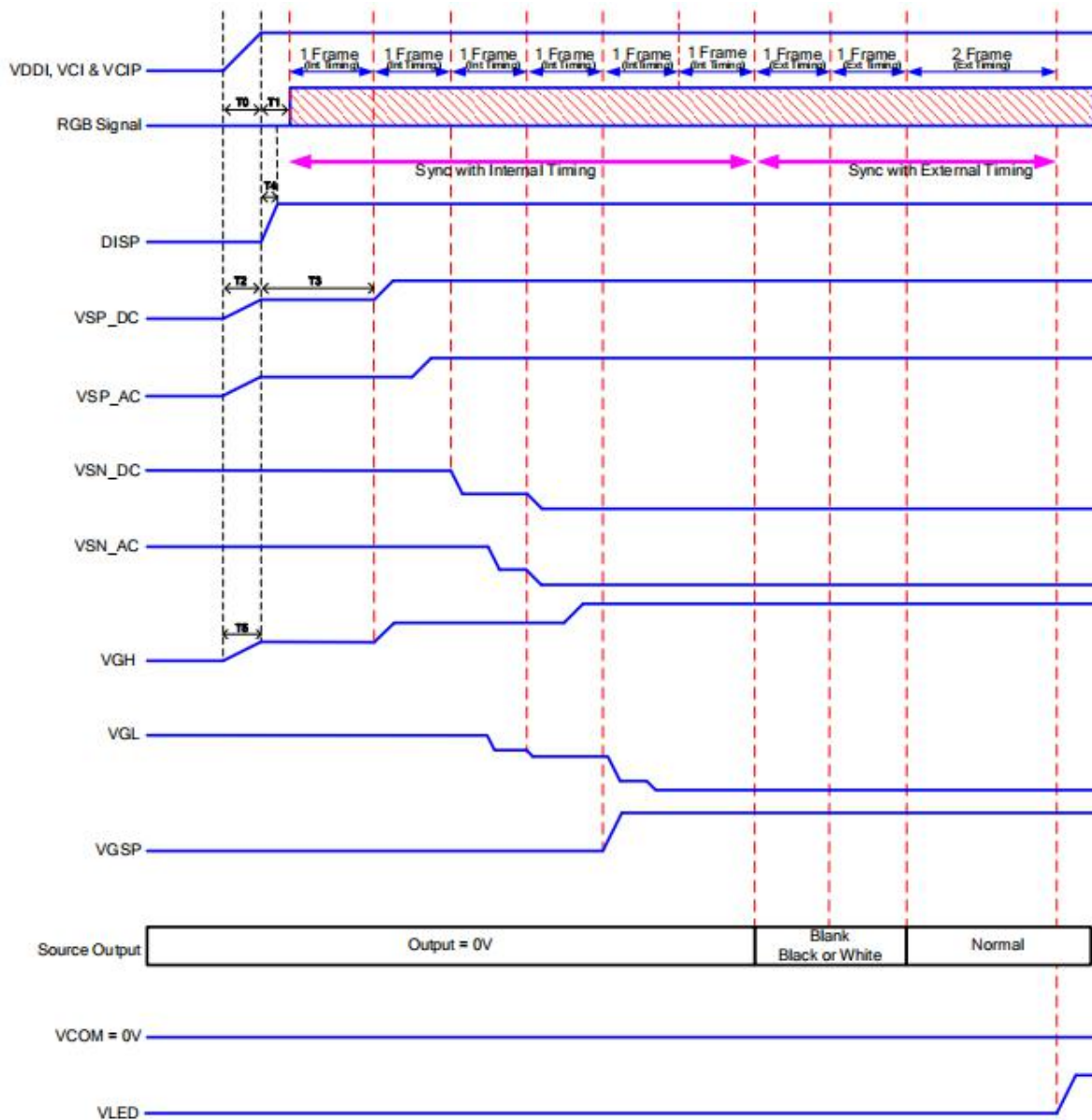
### 4.3 Block Diagram LCD Module diagram





## 5 Timing Chart

### 5.1 Power ON Sequence

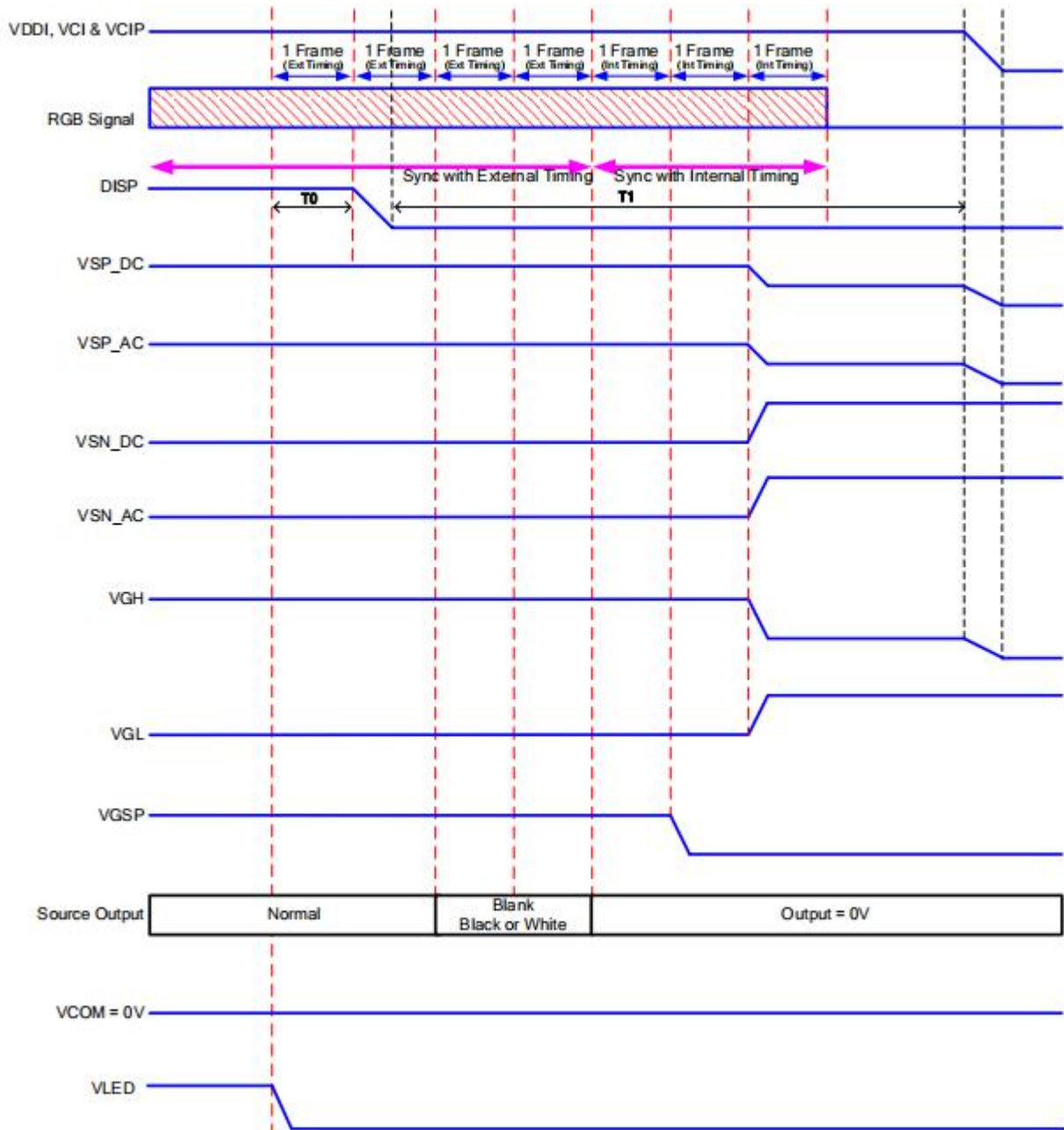


Item	Description	Min. Time
T0	Determined by the external power.	
T1	Time from stable VDDI, VCI, VCIP set-up to the first frame.	T1=0
T2	Time from VSP_DC=0V to VSP_DC=3.3V.	T2=T0
T3	Time from VSP_DC =3.3V to VSP_DC =6.0V.	T3=T1+ (1*Frame)
T4	Time from stable VDDI, VCI, VCIP set-up to DISP asserted.	T4=0
T5	Time from VGH=0V to VGH=3.3V.	T5=T0

Note: Recommend the LCM power on rise time T0= 0~ 1ms.

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## 5.2 Power Off Sequence



Item	Description	Min. Time
T0	Time from backlight power off to DISP="L".	1*Frame
T1	Time from DISP="L" to LCM Power off.	5*Frame

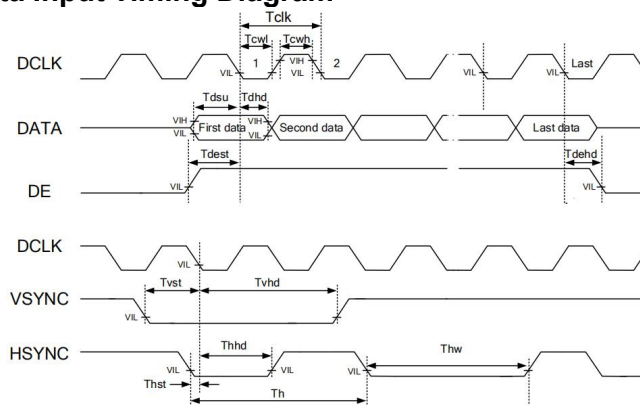
Note: during power on/off, please input signal according timing chart to avoid shake of screen or else.

### AC Characteristics

AC Electrical Characteristics (VCIP=VCI=VDDI= 3.3V, VSSA= 0V, TA=25°C).

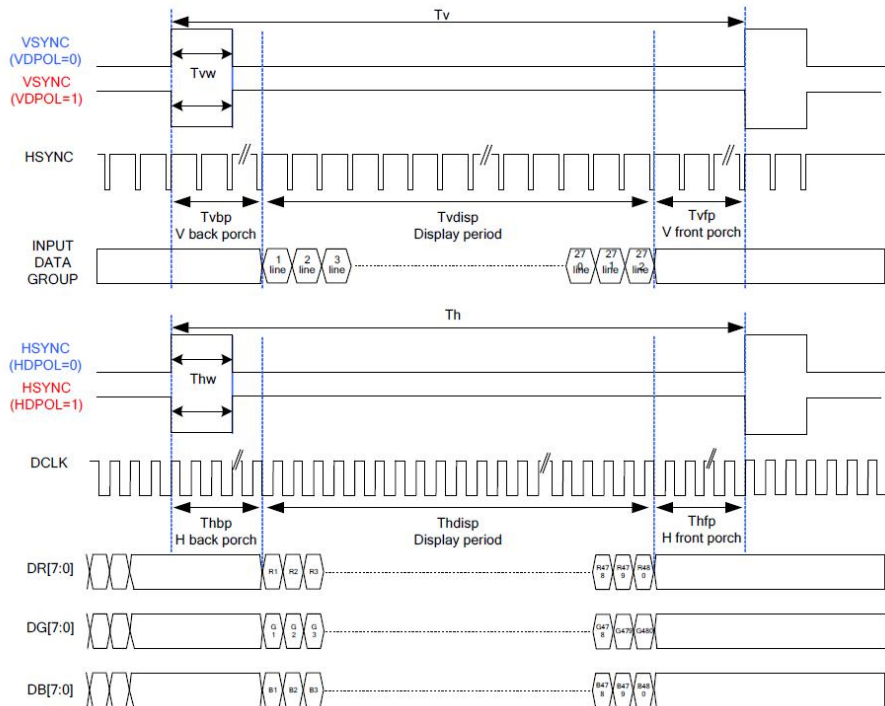
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
<b>System operation timing</b>						
VCI power source slew time	TPOR	-	-	20	ms	From 0V to 99% VCI
RESX pulse width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
<b>Input/ Output timing</b>						
DCLK pulse duty	Tcw	40	50	60	%	
Hsync width	Thw	2	-	-	DCLK	
Hsync period	Th	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 setup 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	ns	Output settled (5%~95%), Loading = 4.7k+29.8pF
<b>3-wire serial communication</b>						
Delay between CSX and VSYNC	Tcv	1	-	-	us	
CSX input setup time	Ts0	50	-	-	ns	
Serial data input setup time	Ts1	50	-	-	ns	
CSX 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	
CSX pulse high width	Tw2	400	-	-	ns	

### 5.3 Clock and Data Input Timing Diagram

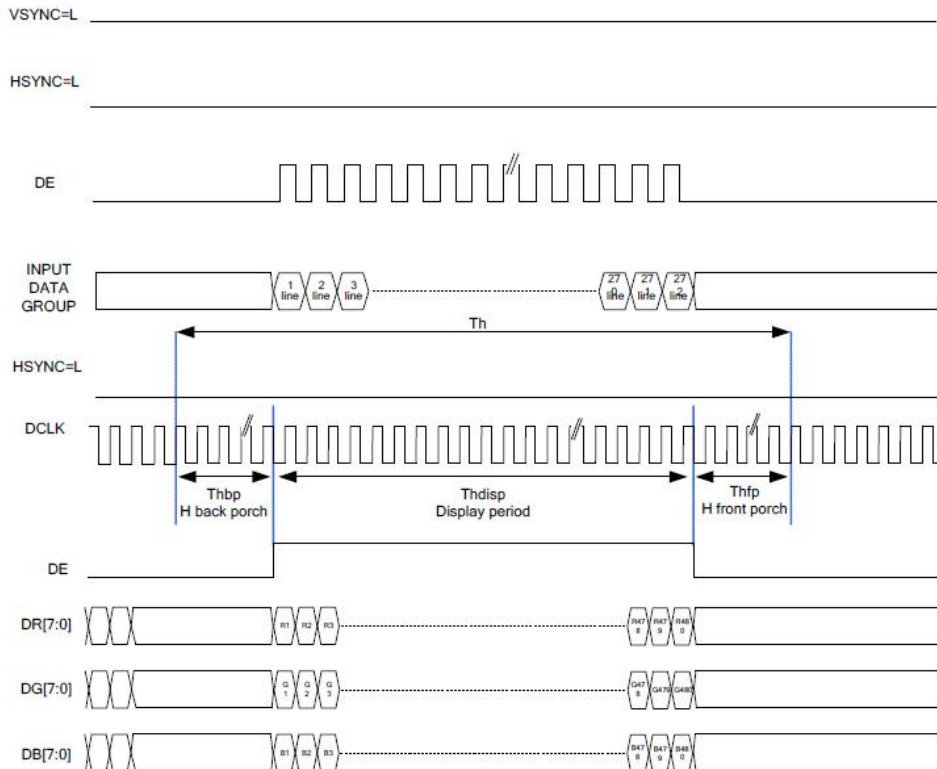


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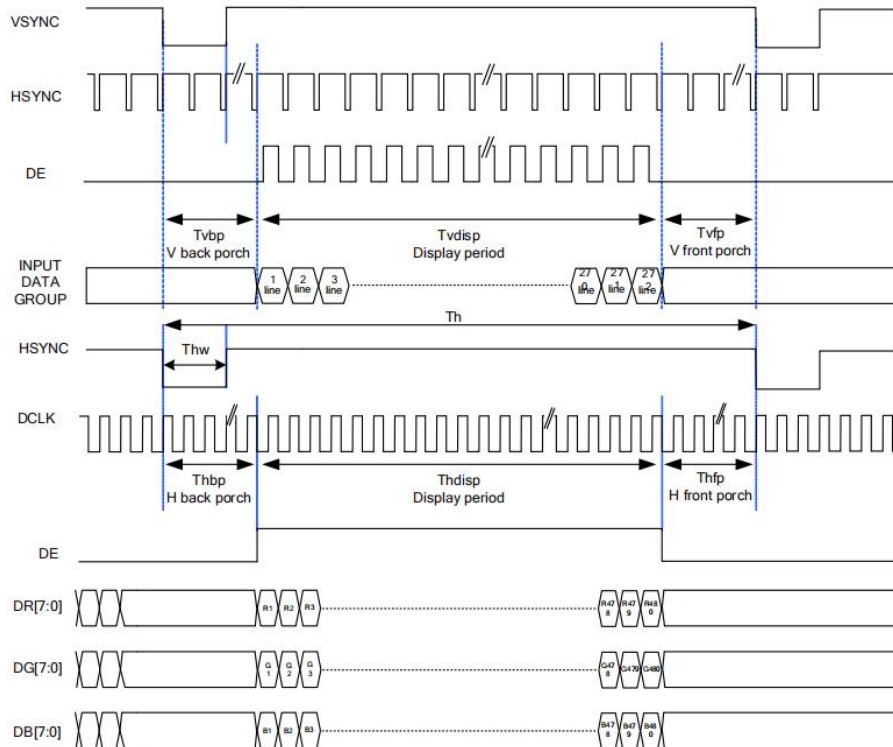
## 5.4 SYNC Mode Timing Diagram



## 5.5 DE Mode Timing Diagram



## 5.6 SYNC-DE Mode Timing Diagram



Note: The default mode is DE mode. Mode can be changed by software. Please confirm with Tianma in advance.

## 5.7 Parallel 24-bit RGB Input Timing Table

480RGB X 272 Resolution Timing Table						
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency	Fclk	8	9	12	MHz	
DCLK Period	Tclk	125	111	83	ns	
HSYNC	Period Time	Th	487	531	598	DCLK
	Display Period	Thdisp	-	480	-	DCLK
	Back Porch	Thbp	3	43	43	DCLK
	Front Porch	Thfp	4	8	75	DCLK
	Pulse Width	Thw	2	4	75	DCLK
VSYNC	Period Time	Tv	276	292	321	H
	Display Period	Tvdsp	-	272	-	H
	Back Porch	Tvbp	2	12	12	H
	Front Porch	Tvfp	2	8	37	H
	Pulse Width	Tvw	2	4	37	H

Note: 1.It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

2.Thbp+Thfp >=7

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## 6 Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≥10	70	80	-	Degree	Note2,3
		θB		70	80	-		
		θL		70	80	-		
		θR		70	80	-		
Contrast Ratio		CR	θ=0°	600	800	-	-	Note 3
Response Time		T <sub>ON</sub>	25℃	-	20	30	ms	Note 4
		T <sub>OFF</sub>						
Chromaticity	White	x	Backlight is on	0.253	0.303	0.353	-	Note 1,5
		y		0.270	0.320	0.370		
	Red	x		0.538	0.588	0.638	-	Note 1,5
		y		0.304	0.354	0.404		
	Green	x		0.288	0.338	0.388	-	Note 1,5
		y		0.533	0.583	0.633		
	Blue	x		0.102	0.152	0.152	-	Note 1,5
		y		0.042	0.092	0.092		
Uniformity		U	-	75	80	-	%	Note 6
NTSC		-	-	45	50	-	%	Note 5
Luminance		L	-	350	400	-	cd/m <sup>2</sup>	Note 7

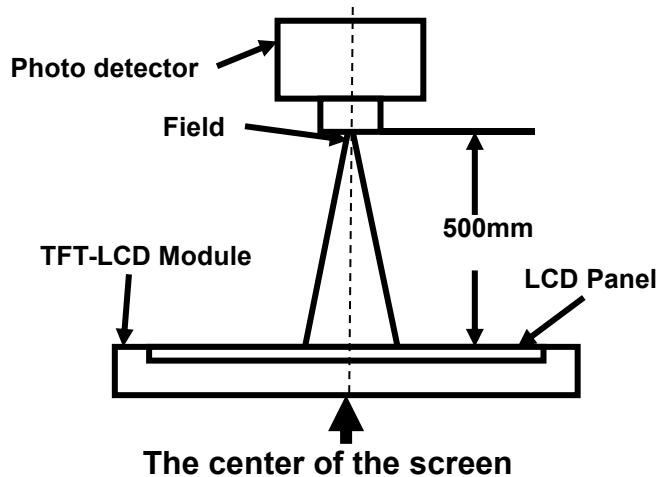
Test Conditions:

1.  $I_F = 40$  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.

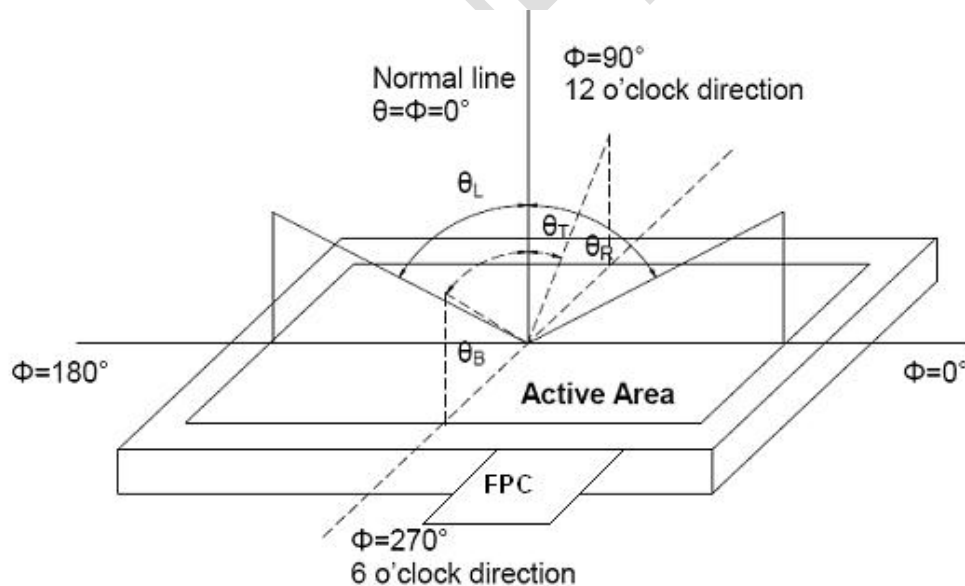
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



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

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

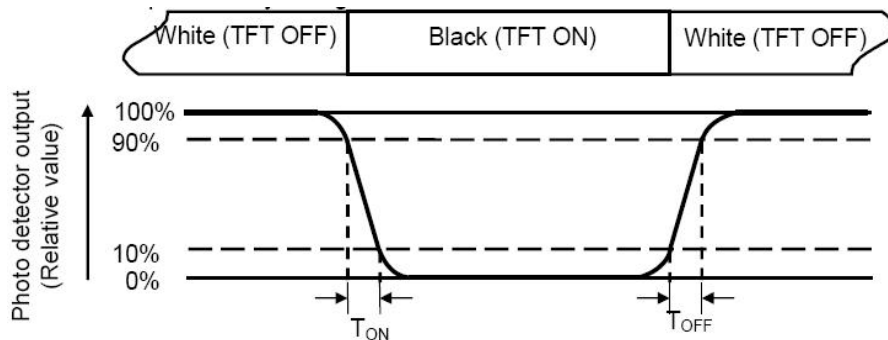
“White state “: The state is that the LCD should drive by Vwhite.

“Black state”: The state is that the LCD should drive by Vblack.

V<sub>white</sub>: To be determined    V<sub>black</sub>: 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<sub>ON</sub>) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T<sub>OFF</sub>) is the time between photo detector output intensity changed from 10% to 90%.



**Note 5: Definition of color chromaticity (CIE1931)**

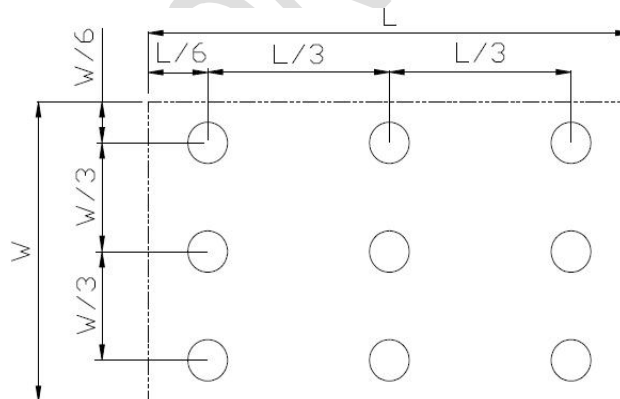
Color coordinates measured at center point of LCD.

**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.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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



L<sub>max</sub>: The measured Maximum luminance of all measurement position.

L<sub>min</sub>: 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

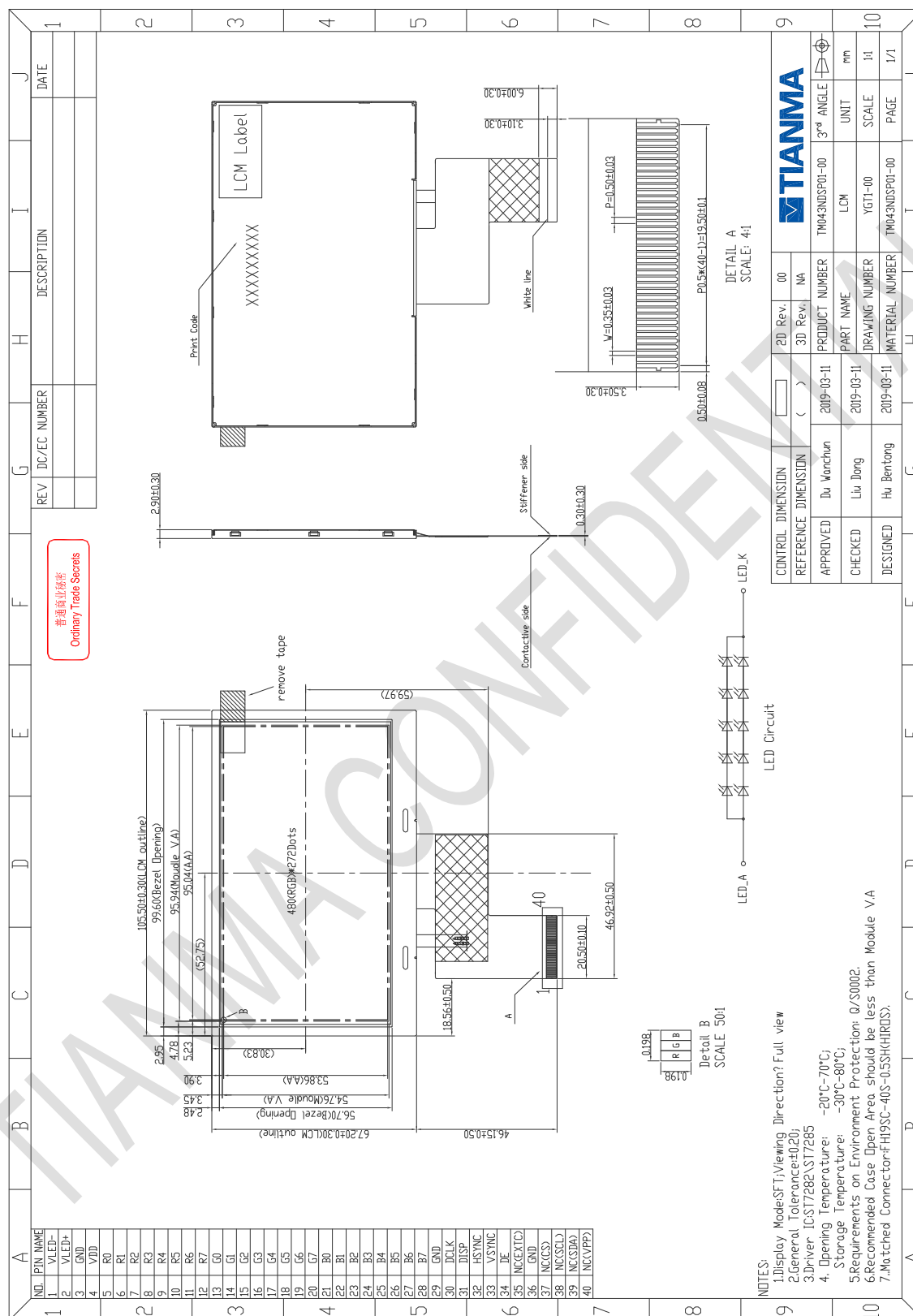
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ta=+70℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta=-20℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta=+80℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta=-30℃, 240 hours	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℃ 30min ~+80℃ 30min, Change time: 5min, 20 cycles	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002
7	ESD	C=150pF,R=330Ω, 5 point/panel, Air: ±8KV, 5 times; Contact ±4KV,5times (Environment:15℃ ~35℃,30%~60%,80Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	Package Drop Test	Height: 60cm(>10KG); 80cm(≤10KG)); 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995
	Package Vibration test	frequency: 5-20-200HZ PSD : 0.01-0.01-0.001 Total:0.781g <sup>2</sup> /HZ,x/y/z direction 30min.	

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.

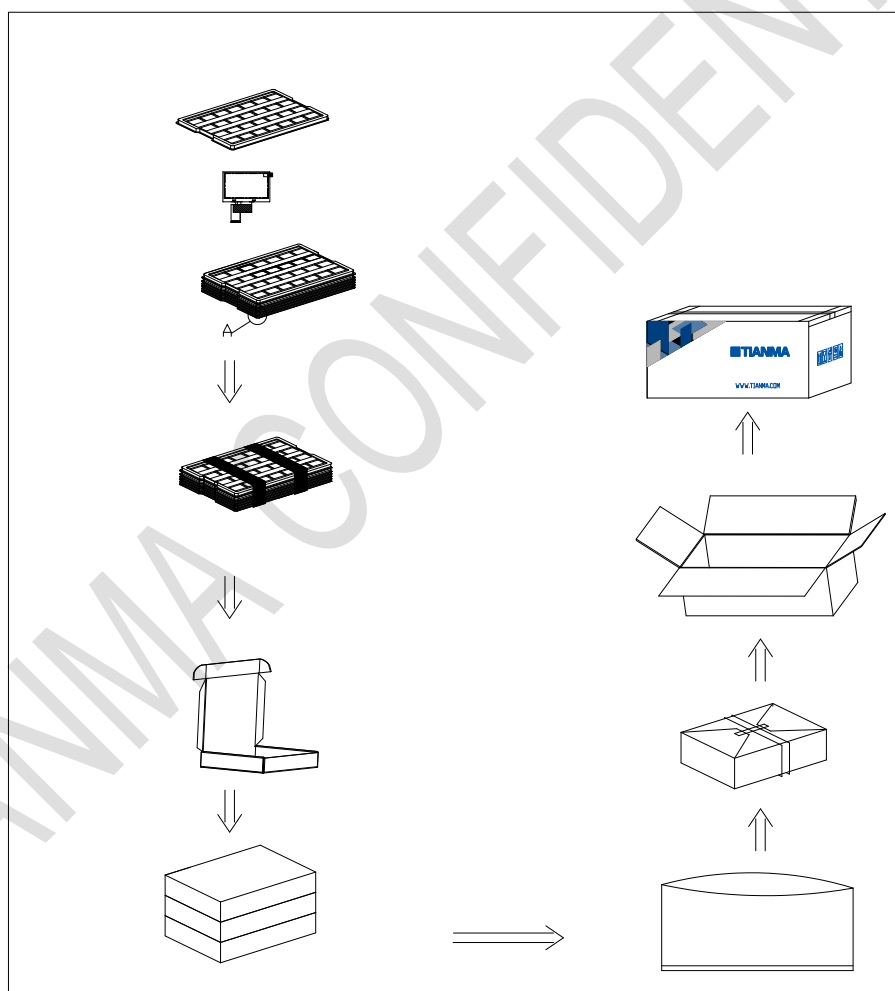
Note 4: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.



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## 9 Packing Drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM043NDSP01-00	105.5×67.20×2.90	TBD	144	
2	Tray	PET (Transmit)	485×330×13.8	TBD	27	
3	Dust Proof Bag	PE	700×545mm	TBD	1	
4	BOX	CORRUGATED PAPER	520*345*74	TBD	3	
5	Carton	CORRUGATED PAPER	544×365×250	TBD	1	
6	Total weight	TBD Kg				



## **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. **And ensure bezel is connected to ground during using.**

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.

## **11 Module Incoming Inspection Standard**

### **11.1. Scope:**

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

### **11.2. 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 buyers right to reject the modules. Shall be lapsed and the modules shall be deemed to have been accepted by the buyer.

### **11.3. Inspection Sampling Method**

11.3.1. Lot size: Quantity per shipment lot per model

11.3.2. Sampling type: Normal inspection, Single sampling

11.3.3. Inspection level: II

11.3.4. Sampling table: GB/T 2828.1, test level II

11.3.5. Acceptable quality level ( AQL )

Major defect: AQL=0.65

Minor defect: AQL=1.00

### **11.4. Inspection Conditions**

11.4.1 Ambient conditions:

a. Temperature: Room temperature  $25\pm 5^{\circ}\text{C}$

b. Humidity:  $(60\pm 10)\% \text{RH}$

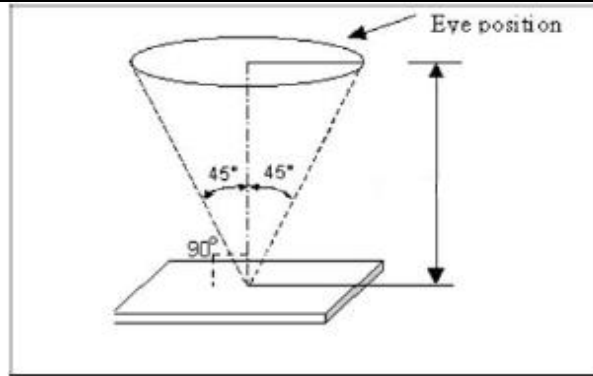
c. Illumination: Appearance  $700\pm 100 \text{ Lux}$ , Display  $100\pm 50 \text{ Lux}$  (The luminance at an inspection desk surface with single non-directive fluorescent lamp)

11.4.2 Viewing distance

The distance between the LCD and the inspector's eyes shall be at least  $30\pm 5 \text{ cm}$ .

11.4.3 Viewing Angle

U/D:  $45^{\circ}/45^{\circ}$ , L/R:  $45^{\circ}/45^{\circ}$



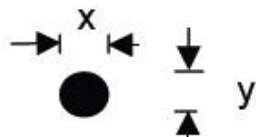
### 11.5. Inspection Criteria

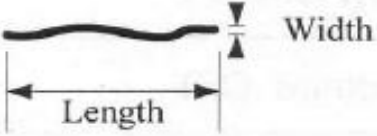

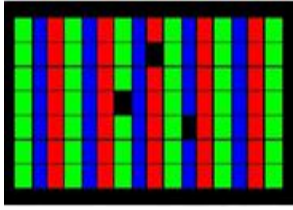
Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

#### 11.5.1 Major defect-- Features

Item No	Items to be inspected	Inspection Standard
11.5.1.1	All functional defects	1) No display 2) Display abnormally 3) line defect
11.5.1.2	missing	Missing function component
11.5.1.3	Crack	Glass Crack

#### 11.5.2 Minor defect --- Display

Item No	Items to be inspected	Inspection standard	
11.5.2.1	Spot Defect Including : Black spot White spot Foreign particle Polarizer dirt Cell particle	For dark/white spot is defined $\varphi = (x + y) / 2$  dots distance=DS	
		Size $\varphi$ (mm)	Acceptable Quantity

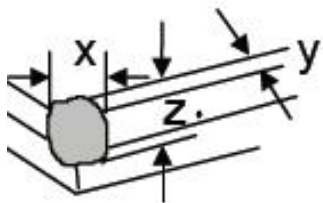
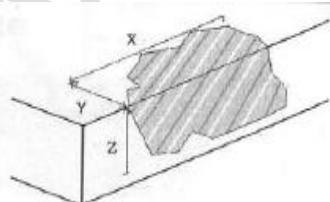
		$\phi \leq 0.15$	Ignore
		$0.15 < \phi \leq 0.3$	3(DS > 10mm)
		$0.3 < \phi$	Not allowed
11.5.2.2	Line Defect Including Black line White line Scratch	Define: 	
		Line defect distance $\geq 5\text{mm}$	
		Width(mm) Length(mm)	Acceptable Quantity
		$W \leq 0.04$	Ignore
		$0.04 < W \leq 0.05$ $L \leq 5.0$	3(DS > 10mm)
		$0.05 < W$	Not allow
11.5.2.4	Electrical Dot Defect	Bright and Black dot define:  and 	
		Item	Acceptable Quantity
		Dark dot defect	3
		Bright dot defect	0
		Total Dot	3
		Distance between dark dot	> 5mm
11.5.2.6	Tiny bright dot Dense tiny highlights	Definition of Tiny bright dot : $\Phi < 0.1\text{mm}$ , <u>ND 6% judgment</u> clustered is not allowed (clustered mean $N > 5, D \leq 5$ )	

11.5.2.7	Mura	<u>Black/Gray screen is not visible with ND2% coverage, other screens are not allowed ,if necessary, building limited sample</u>
11.5.2.8	The light leak of screen edge	<u>The upper edge of screen doesn't allow light leak when angle is less than 20° between normal (vertical on screen) and sight line.</u> <u>The edges(right, left and down) of screen don't allow light leak when angle is less than 45°between normal (vertical on screen and sight line. (FPC is under) .</u>

### 11.5.3 Minor defect --- Exterior

		Size $\phi$ (mm)	Acceptable Quantity
11.5.3.1	Polarizer Dent/Bubble	$\phi \leq 0.2$	Ignore
		$0.2 < \phi \leq 0.4$	3(DS > 10mm)
		$0.4 < \phi$	Not allowed
11.5.3.2	FPC	Broken	Not allowed
		FPC kink 、indentation 、Top wound, scratch	naked wire 、hole is not allowed
		The surface of the dirt	Don't control
11.5.3.3	Bonding IC	Bareness is not allowed	
11.5.3.4	B/L frame Broken 、Oil pollution	Broken 、Oil pollution	not allowed
		Scratch, indelible	ignore
		Bump point	Does not affect the use of allowed
11.5.3.5	Protective film	Top injury 、scratch 、Wear scar	Undamaged polarizer 、ignore
		Can wipe dirt, particle	ignore



11.5.3.6	Glass defect	1. Corner Fragment:	
			
		Size(mm)	Acceptable Quantity
		X≤3mm Y≤3mm Z≤T	Ignore T : Glass thickness X: Length    Y: Width Z: thickness
		2. Side Fragment:	
			
		Size(mm)	Acceptable Quantity
		X≤6.0mm Y ≤1.0mm Z≤T	Ignore T : Glass thickness X: Length    Y: Width Z: thickness

Note: 1. Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area.

2. 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.

3. ND application method: the parallel vertical distance between ND and panel is 3~5cm , the distance of eyes look squarely to the panel is 30±5cm

4. Foreign particle on the surface of the LCM should be ignored.

5. Displaying foreign body points using single eye determination

6. AA (Active Area) area, the display area, ie, the effective product display area, is a poor type of control area for the electrical measurement display. VA (View Area) area,

viewable area, that is, the area that can be visually seen after the product is installed on the customer's entire machine.

### **11.6. Mechanics specification**

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

### **11.7. Precaution**

Please pay attention to the following items when you use the LCD Modules:

- 11.7.1 Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.
- 11.7.2 Adopt measures for good heat radiation. Be sure to use the module with in the specified temperature.
- 11.7.3 Avoid dust or oil mist during assembly.
- 11.7.4 Following the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.
- 11.7.5 Less EMI: it will be more safety and less noise.
- 11.7.6 Please operate module in suitable temperature. The response time & brightness will drift by different temperature.
- 11.7.7 Avoid to display the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image stains.
- 11.7.8 Be sure to turn off the power when connection of disconnecting the circuit.
- 11.7.9 Polarizer scratches easily, please handle it carefully.
- 11.7.10 Display surface never likes dirt of stains.
- 11.7.11 A dew drop may lead to destruction. Please wipe off and moisture before using module.
- 11.7.12 Sudden temperature changes cause condensation, and it will cause polarizer damaged.
- 11.7.13 High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.
- 11.7.14 Acetic acid or chlorine compounds are not friends with TFT display module.
- 11.7.15 Static electricity will damage the module, please do not touch the module without any grounded device.
- 11.7.16 Do not disassemble and reassemble the module by self.
- 11.7.17 Be careful do not touch the rear side directly.
- 11.7.18 Not strong vibration or shock. It will cause module broken.
- 11.7.19 Storage the modules in suitable environment with regular packing.
- 11.7.20 Be careful or injury from a broken display module.
- 11.7.21 Please avoid the pressure adding to the surface (front or rear side) of modules, because it will cause the display non-uniformity of other function issue.