

MODEL NO. : TM097TDH01ISSUED DATE: 2010-2-24VERSION : Ver. 2.0☒ Preliminary Specification☐ Final Product Specification

Customer : _____

Approved by	Notes

SHANGHAI AVIC Confirmed :

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Record of Revision

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1 General Specifications

Feature		Spec
Display Spec	Size	9.7 inch
	Resolution	1024 (RGB) x 768
	Interface	RGB 24 bits with TCON
	Color Depth	16.7M
	Technology Type	a-Si
	Pixel Pitch (mm)	0.192 (H) x 0.192 (V)
	Pixel Configuration	R.G.B. Vertical Stripe
	Display Mode	TM with Normally White
	Surface Treatment(Up Polarizer)	Anti Glare(3H)
	Viewing Direction	3 o'clock
	Gray Scale Inversion Direction	9 o'clock
Mechanical Characteristics	Active Area(mm)	196.608 (W) x 147.456 (H)
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	36 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: RoHS

Note 3: LCM weight tolerance: +/- 5%



2 Input/Output Terminals

2.1 CN1 of FPC

Pin No.	Symbol	I/O	Function	Remarks
1	NC	-	No connection	-
2	CABC_EN1	-	-	-
3	CABC_EN0	-	-	-
4	DIMO	-	-	-
5	GND	P	Power ground	-
6	VCOM	I	Common voltage	-
7	DVDD	P	Power supply 3.3V	-
8	MODE	I	DE/SYNC mode select	MODE=1, DE mode; MODE=0, HSD/VSD mode.
9	DE	I	Data input enable	-
10	VS	I	Vertical sync input	-
11	HS	I	Horizontal sync Input	-
12	B7	I	Blue data (MSB)	-
13	B6	I	Blue data	-
14	B5	I	Blue data	-
15	B4	I	Blue data	-
16	B3	I	Blue data	-
17	B2	I	Blue data	-
18	B1	I	Blue data	-
19	B0	I	Blue data (LSB)	-
20	G7	I	Green data (MSB)	-
21	G6	I	Green data	-
22	G5	I	Green data	-
23	G4	I	Green data	-
24	G3	I	Green data	-
25	G2	I	Green data	-
26	G1	I	Green data	-
27	G0	I	Green data (LSB)	-
28	R7	I	RED data (MSB)	-
29	R6	I	RED data	-
30	R5	I	RED data	-
31	R4	I	RED data	-
32	R3	I	RED data	-
33	R2	I	RED data	-
34	R1	I	RED data	-
35	R0	I	RED data (LSB)	-
36	GND	P	Power ground	-
37	DCLK	I	Clock for input data	-
38	GND	P	Power ground	-
39	L/R	I	Left/right scan selection	L/R=1, from left to right; L/R=0, from right to left.
40	U/D	I	Up/down selection	U/D=0, from up to down; U/D=1, from down to up.

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41	VGH	P	Gate on voltage	-
42	VGL	P	Gate off voltage	-
43	AVDD	P	Power for analog circuit	-
44	RESET	I	Global reset pin	-
45	NC	-	No connection	-
46	VCOM	I	Common voltage	-
47	DITHB	I	Dithering function	DITHB=1, Disable internal dithering function; DITHB=0, Enable internal dithering function
48	GND	P	Power ground	-
49	NC	-	No connection	-
50	NC	-	No connection	-

Note: I/O definition.

I---Input pin, O---Output pin, P--- Power/Ground, N--- No Connection

2.2 U/D R/L Function Description

Scan Control Input		Scanning Direction
UPDN	SHLR	
GND	DVDD	Up to Down, Left to Right
DVDD	GND	Down to Up, Right to Left
GND	GND	Up to Down, Right to Left
DVDD	DVDD	Down to Up, Left to Right



3 Absolute Maximum Ratings

AGND= GND=0V, Ta = 25°C

Item	Symbol	Min	Max	Unit	Remark
Power Voltage	DVDD	-0.5	5.0	V	
	AVDD	-0.5	13.5	V	
	VGH	-0.3	+42	V	
	VGL	VGH-42	+0.3	V	
Operating Temperature	T _{OPR}	-20	70	°C	
Storage Temperature	T _{STG}	-30	80	°C	



4 Electrical Characteristics

4.1 Recommended Operating Condition

AGND=GND=0V, Ta = 25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Digital Supply Voltage	DVDD	3.0	3.3	3.6	V	
Analog Supply Voltage	AVDD	12.3	12.5	12.7	V	
Gate On Voltage	VGH	20.8	22	23.3	V	
Gate Off Voltage	VGL	-7.5	-7.0	-6.5	V	
Common Electrode Driving Signal	VCOM	TBD	TBD	TBD	V	

Note: The value is for design stage only.



4.2 Recommended Driving Condition for Backlight

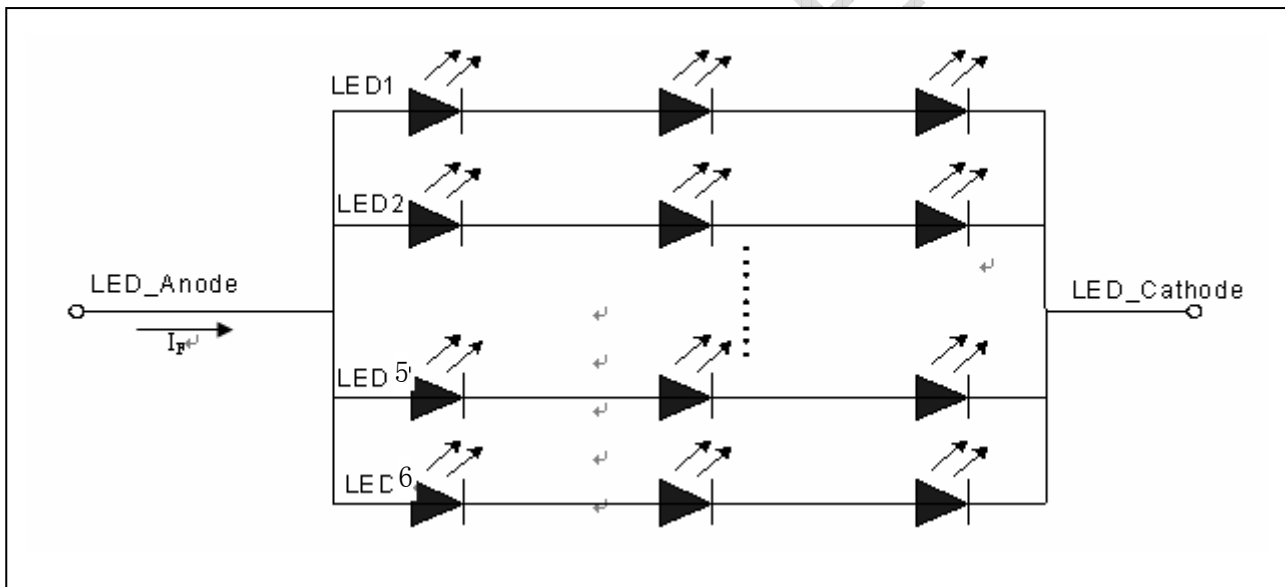
Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F		120		mA	36 LEDs (6 LED Serial, 6 LED Parallel)
Forward Voltage	V_F		19.2		V	
Operating Life Time	-		30000	-	Hrs	

Note1: For each LED: $I_F (1/6) = 20\text{mA}$, $V_F (1/6) = 3.2\text{V}$.

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.

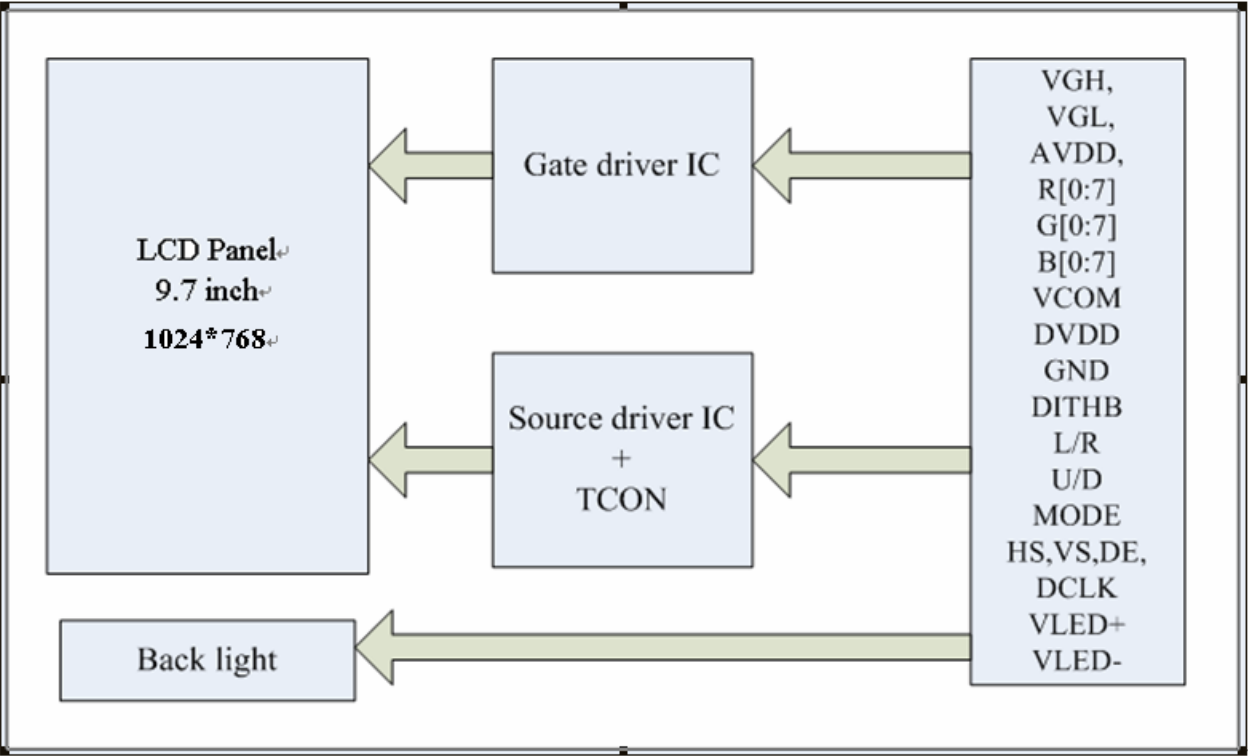


4.3 Power Consumption

AGND=GND=0V, Ta = 25℃

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Digital Supply Current	I _{DVDD}	DVDD=3.3V	-	TBD	TBD	mA	
Analog Supply Current	I _{AVDD}	AVDD=12.5V	-	TBD	TBD	mA	
Gate On Current	I _{VGH}	VGH=22V	-	TBD	TBD	mA	
Gate Off Current	I _{VGL}	VGL=-7.0V	-	TBD	TBD	mA	
Power Consumption	Panel&Gamma		-	TBD	TBD	mW	
	Backlight		-	TBD	TBD	W	
	Total		-	TBD	TBD	W	

4.4 Block Diagram





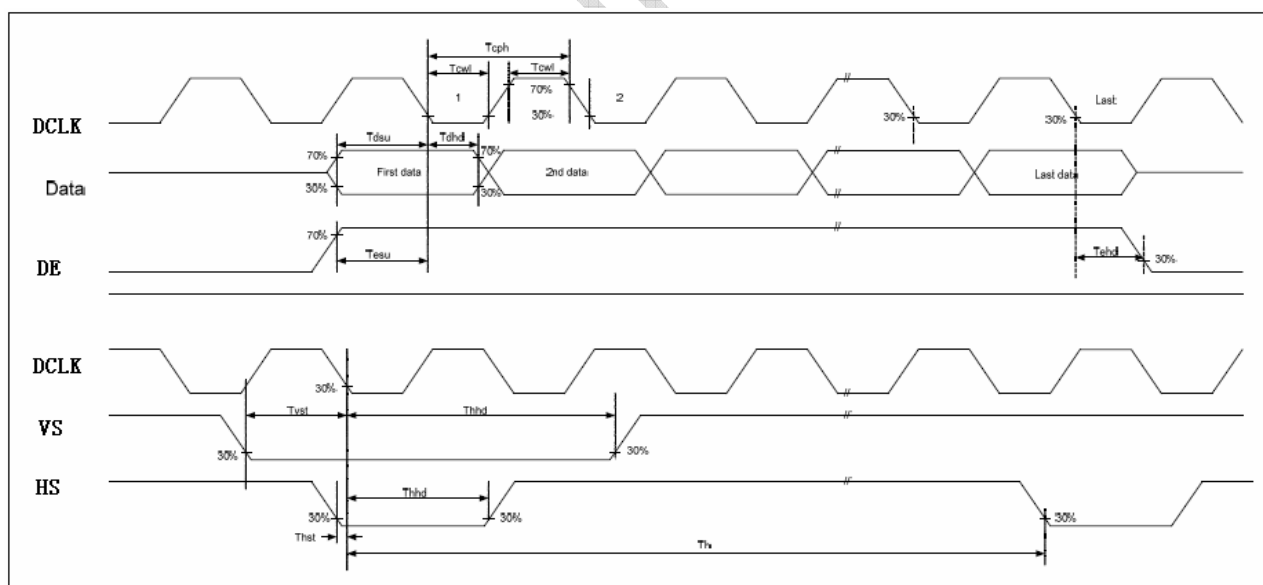
5 Timing Chart

5.1 TFT-LCD Input Timing

DVDD=3.3V, AVDD=10.4V, AGND=GND=0V, Ta=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Conditions
DCLK Cycle Time	Tcph	14	-	-	ns	
DCLK Pulse Width	Tcwh	40	50	60	%	
VSD Setup Time	Tvst	5	-	-	ns	
VSD Hold Time	Tvhd	5	-	-	ns	
HSD Setup Time	Thst	5	-	-	ns	
HSD Hold Time	Thhd	5	-	-	ns	
Data Setup Time	Tdsu	5	-	-	ns	Data to DCLK
Data Hold Time	Tdhd	5	-	-	ns	Data to DCLK
DE Setup Time	Tesu	5	-	-	ns	
DE Hold Time	Tehd	5	-	-	ns	

Input Clock and Data timing Diagram:





5.2 Recommended Timing Setting Of TCON

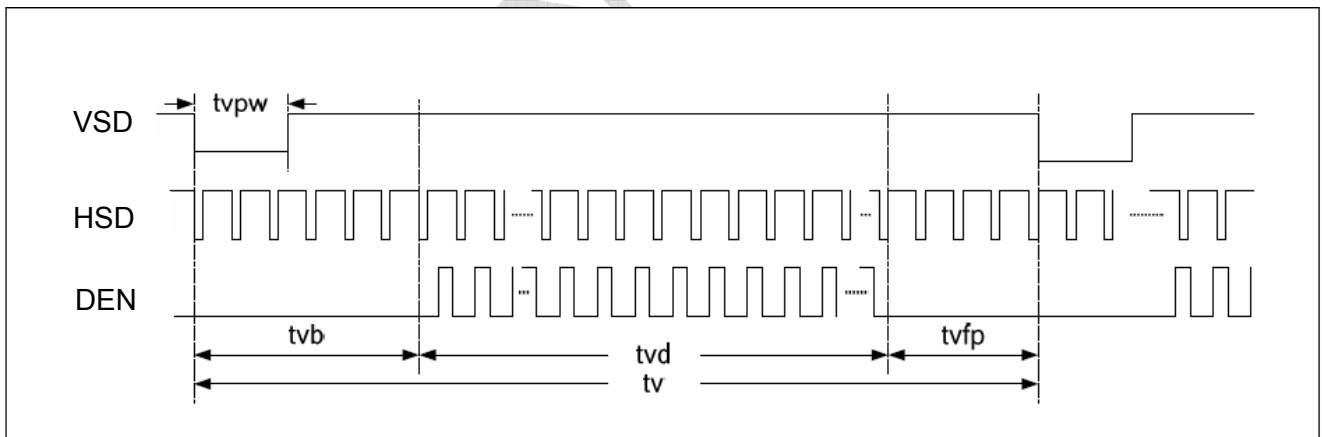
TCON (Embedded In Source IC) Input Timing (DCLK, HSD, VSD, DE)

DVDD=3.3V, AVDD=10.4V, AGND=GND=0V, Ta=25°C

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	Fclk	-	65	-	MHZ	
HSD	th	-	1344	-	tclk	
	thd	-	1024	-	tclk	
	thpw	1	-	140	tclk	
	thb	-	160	-	tclk	
	thfp	-	160	-	tclk	
VSD	tv	-	806	-	th	
	tvd	-	768	-	th	
	tvpw	1	-	20	th	
	tvb	-	23	-	th	
	tvfp	-	15	-	th	

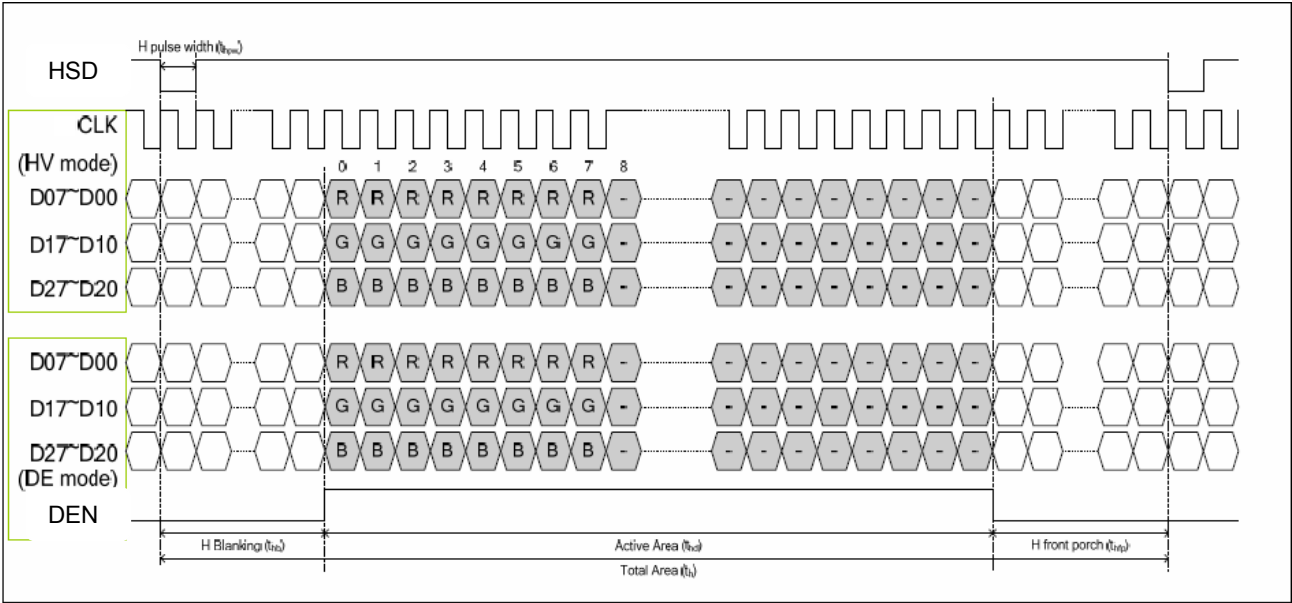
Note: DE timing refer to HSD, VSD input timing.

Vertical input timing Diagram:

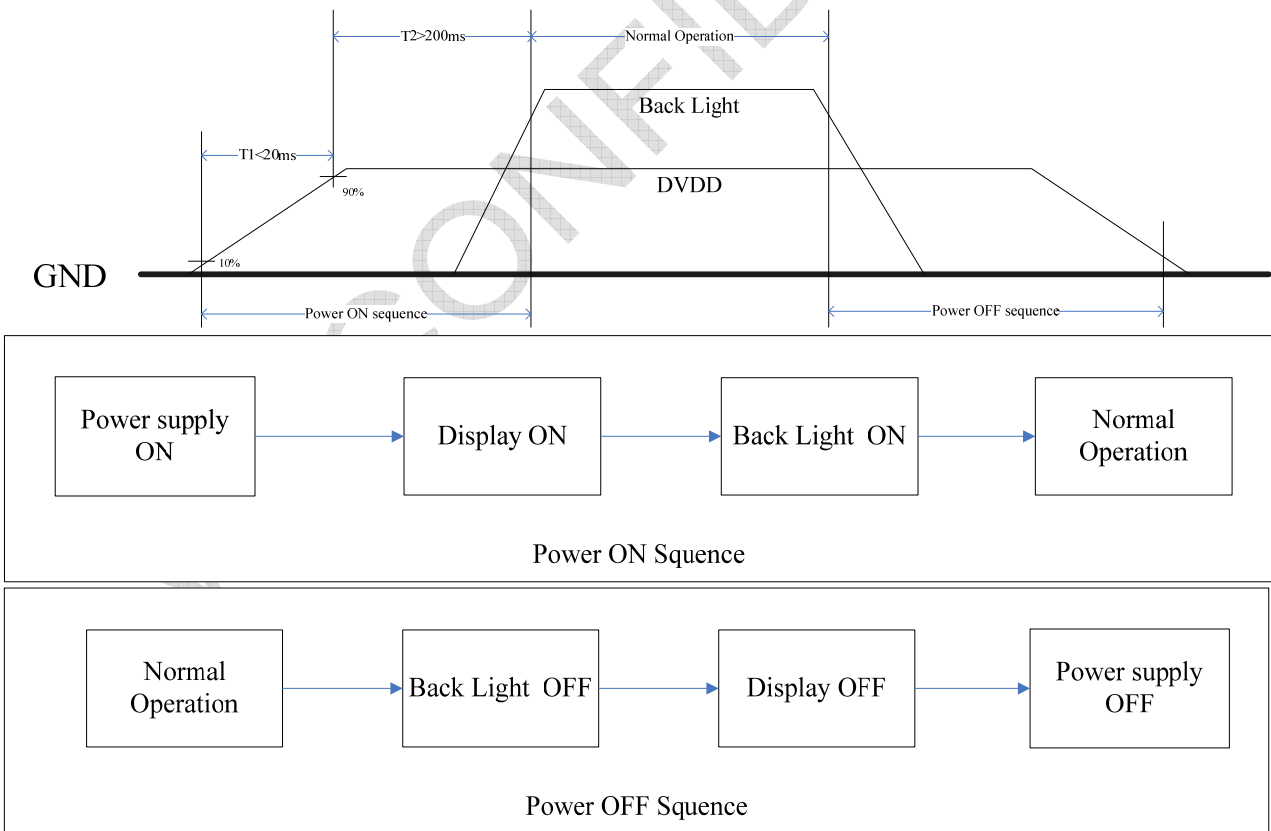




Horizontal input timing Diagram:



5.3 POWER ON/OFF SEQUENCE





6 Optical Characteristics

Ta=25℃

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≥10		70	-	Degree	Note 2
		θB			70	-		
		θL			70	-		
		θR			60	-		
Contrast Ratio		CR	θ=0°		500	-		Note1 Note3
Response Time		T _{ON}	25℃	-	20		ms	Note1 Note4
		T _{OFF}						
Chromaticity	White	x	Backlight is on	-	0.313	-		Note1 Note5
		y		-	0.329	-		
	Red	x		-	TBD	-		
		y		-	TBD	-		
	Green	x		-	TBD	-		
		y		-	TBD	-		
	Blue	x		-	TBD	-		
		y		-	TBD	-		
Uniformity		U		-	75	--	%	Note1 Note6
NTSC				-	50	-	%	Note 5
Luminance		L		-	220	-	cd/m ²	Note1 Note7

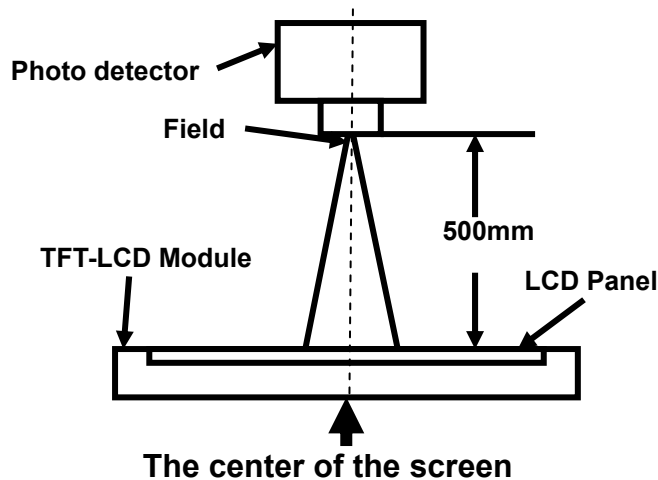
Test Conditions:

1. $I_F = 120 \text{ mA}$, $V_F = 19.2 \text{ V}$ and the ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note 2.



Note 1: Definition of optical measurement system.

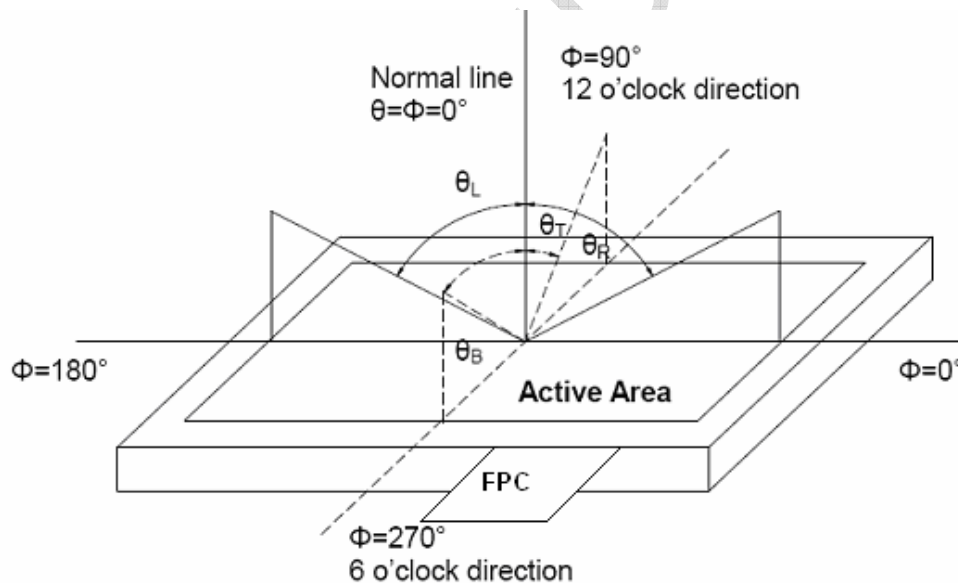
The optical characteristics should be measured in dark room. After 5 Minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	BM-5A	1°
Luminance		
Lum Uniformity		
Chromaticity	SR-3A	-
Response Time	TRD100	

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.

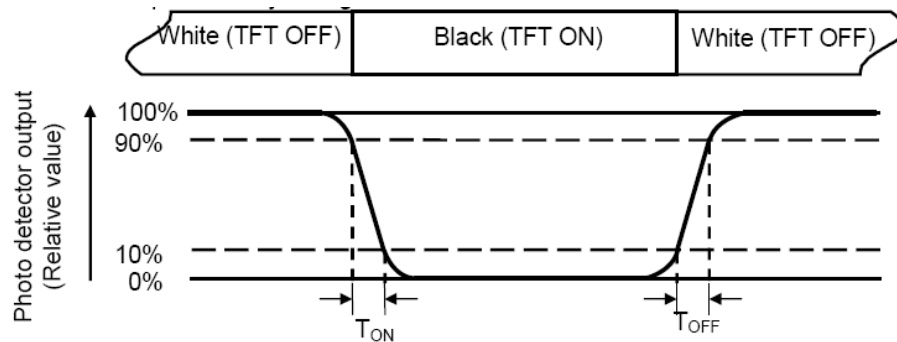
“Black state”: The state is that the LCD should drive by Vblack.

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)

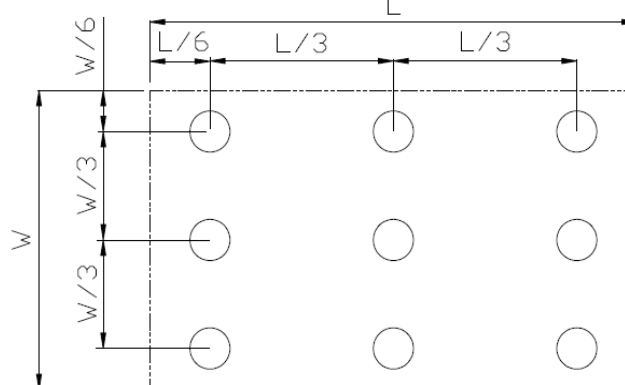
Color coordinates measured at center point of LCD.

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.

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

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



L_{\max} : The measured Maximum luminance of all measurement position.

L_{\min} : 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

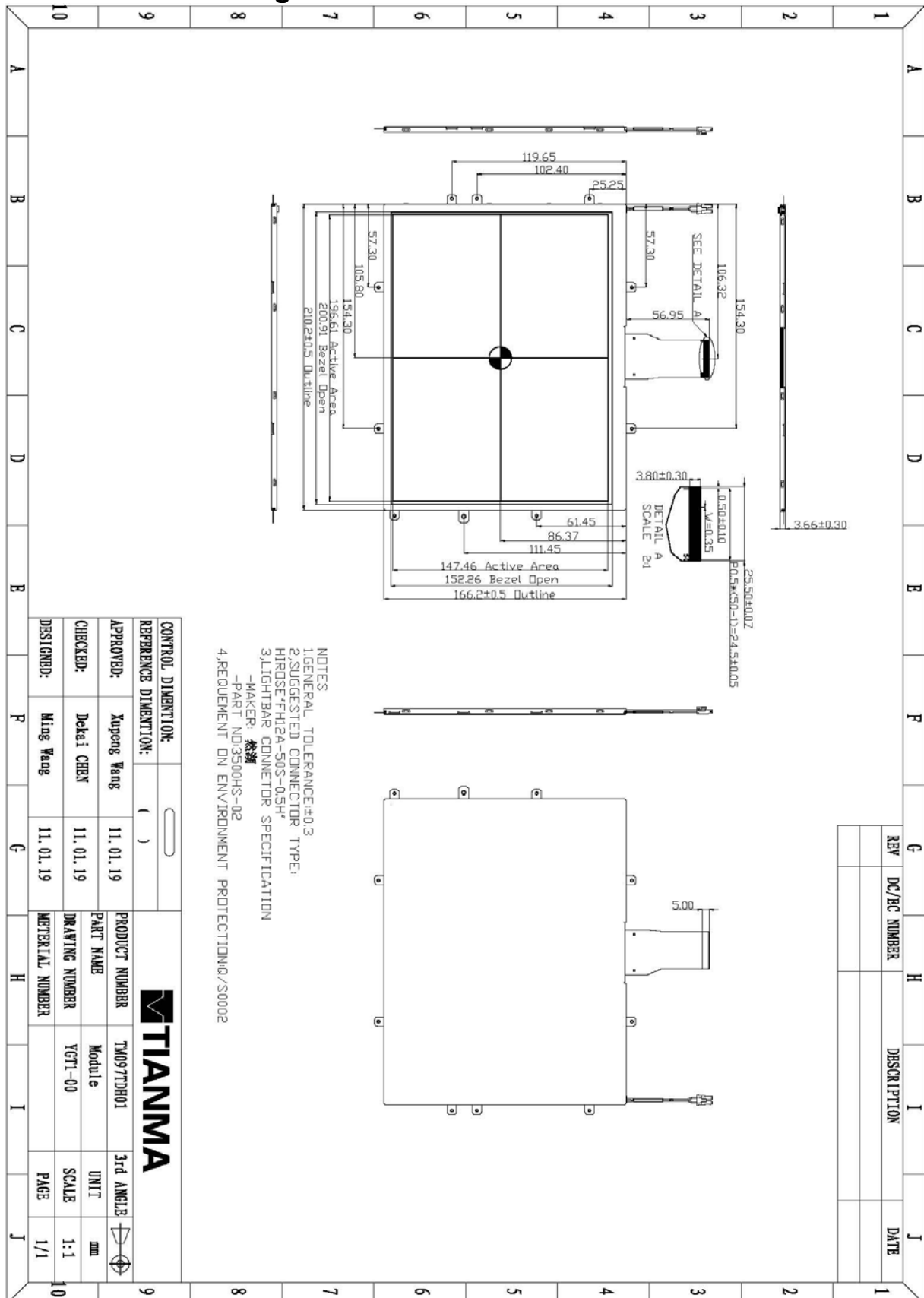
No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max, 240 hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 20 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (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)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non Op)	Half Sine Wave 60G 6ms, ±X,±Y,±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height:80cm, 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

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

Note2: Ta is the ambient temperature of samples.



8 Mechanical Drawing



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9 Packing drawing

TBD

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10 Precautions for Use of LCD Modules

10.1 Handling Precautions

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

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

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

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

10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

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

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

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

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

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

10.1.8.4 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage precautions

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

10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ~ 40℃ Relatively humidity: ≤80%

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

10.3 Transportation Precautions

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.