MODEL NO　:　　　**TM097TDHG04**

MODEL VERSION:　　　**66**

SPEC VERSION :　　　**1.0**

ISSUED DATE:　　　**2021-06-23**

　□**Preliminary Specification**
　■**Final Product Specification**

Customer :_____

Approved by	Notes

TIANMA Confirmed :

Prepared by	Checked by	Approved by
Chunhui Yang	Longping Deng	Jinquan Liu

This technical specification is subjected to change without notice

Table of Contents

Record of Revision

Rev	Issued Date	Description	Editor
1.0	2021-06-23	Final Specification Released.	Chunhui Yang

1   General Specifications

Feature		Spec
Display Spec.	Size	9.7 inch
	Resolution	1024 (RGB) x 768
	Technology Type	a-Si
	Pixel Configuration	R.G.B. Vertical Stripe
	Pixel pitch(mm)	0.192 (H) x 0.192 (V)
	Display Mode	TM with Normally White
	Surface Treatment	Clear
	Viewing Direction	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D) (mm)	210.20 (W) x166.30(H)x3.28(D)
	Active Area(mm)	196.61 (W) x 147.46 (H)
	With /Without TSP	Without TSP
	LVDS Connector Type	I-PEX 20474-0-30E
	Suggested Connector Type	I-PEX 20472-0-30T
	LED Numbers	36 LEDs
	Weight (g)	200
Electrical Characteristics	Interface	LVDS 6-bit
	Color Depth	262K

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

LVDS Connector Type：I-PEX 20474-0-30E

Suggested Connector Type：I-PEX 20472-0-30T

Pin No.	Symbol	I/O	Function	Remarks
1	GND	P	Ground	-
2	VCC	P	Power supply 3.3V	-
3	VCC	P	Power supply 3.3V	-
4	V EEDID	P	DDC 3.3V	-
5	GSP	N	No connection	-
6	Clk EEDID	I	DDC clock	-
7	Data EEDID	I/O	DDC data	-
8	R_{IN} 0-	I	Negative LVDS differential data input	-
9	R_{IN} 0+	I	Positive LVDS differential data input	-
10	GND	P	Ground	-
11	R_{IN} 1-	I	Negative LVDS differential data input	-
12	R_{IN} 1+	I	Positive LVDS differential data input	-
13	GND	P	Ground	-
14	R_{IN} 2-	I	Negative LVDS differential data input	-
15	R_{IN} 2+	I	Positive LVDS differential data input	-
16	GND	P	Ground	-
17	Clk_{IN} -	I	Negative LVDS differential data input	-
18	Clk_{IN} +	I	Positive LVDS differential data input	-
19	GND	P	Ground	-
20	NC	N	No connection	-
21	Vdc	P	LED Anode (positive)	-
22	Vdc	P	LED Anode (positive)	-
23	NC	N	No connection	-
24	Vdc 1	P	LED Cathode (Negative)	-
25	Vdc 2	P	LED Cathode (Negative)	-
26	Vdc 3	P	LED Cathode (Negative)	-
27	Vdc 4	P	LED Cathode (Negative)	-
28	Vdc 5	P	LED Cathode (Negative)	-
29	Vdc 6	P	LED Cathode (Negative)	-
30	NC	N	No connection	-

Note:　I/O definition.

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

3   Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.5	5.0	V	Note1
Input voltage	V_{IN}	-0.5	5.0	V	
Operating Temperature	Top	-20	70	℃	
Storage Temperature	Tst	-30	80	℃	
EDID Power Voltage	V EEDID	-0.5	6.5	V	NOTE3
EDID Votage on Any Pin	V P EEDID	-0.5	V EEDID+0.5	V	
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/m^3	Ta＞70℃

Table 3   Absolute Maximum Ratings

Note1: Input voltage include R_{IN} 0-/ R_{IN} 0+、 R_{IN} 1-/ R_{IN} 1+、 R_{IN} 2-/ R_{IN} 2+、 Clk_{IN} -/ Clk_{IN} + .
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.
Note3：V P EEDID contains Clk EEDID and Data EEDID.

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4 Electrical Characteristics

4.1 Recommended Operating Condition

AGND=GND=0V, Ta = 25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Digital Supply Voltage	VCC	3.0	3.3	3.6	V	
Power Supply Current	I$_{VCC}$	--	335	502	mA	Note1
EDID Supply Voltage	V EEDID	3.0	3.3	3.6	V	
EDID Input High Votage	EDID VIH	0.7* V EEDID	-	V EEDID	V	
EDID Input Low Votage	EDID VIL	0	-	0.3* V EEDID	V	

Note1 The power supply current is tested in black picture. VCC=3.3V.

4.2 Recommended Driving Condition for Backlight

Ta=25℃

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I_F	90	120	150	mA	
Forward Voltage	V_{dc}	18	19.2	21.6	V	36 LEDs (6 LED Serial, 6 LED Parallel)
Power Consumption		1.62	2.304	3.240	W	
Operating Life Time	-	20000	30000	--	Hrs	

Note1: For each LED: I_F (1/6) =20mA, V_F (1/6) =3.2V.

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.
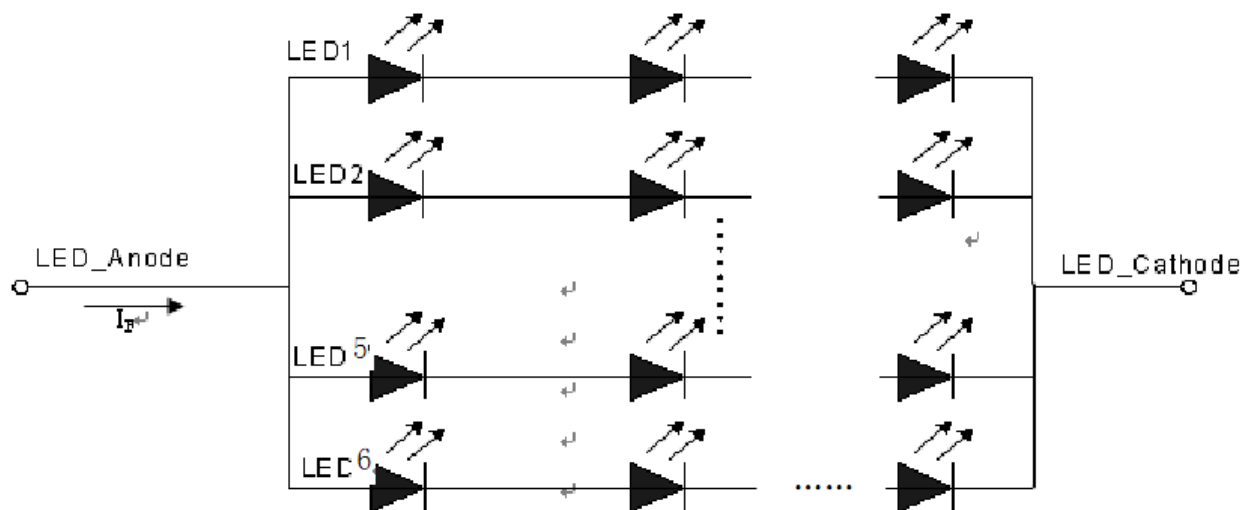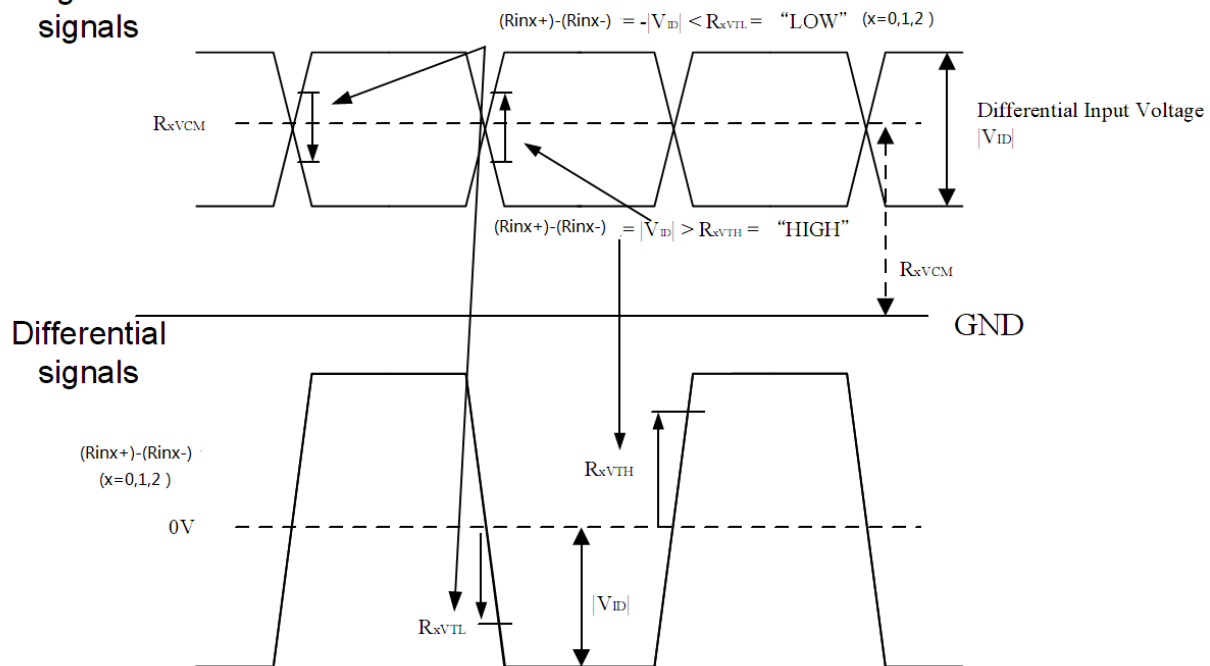
5   Timing Chart
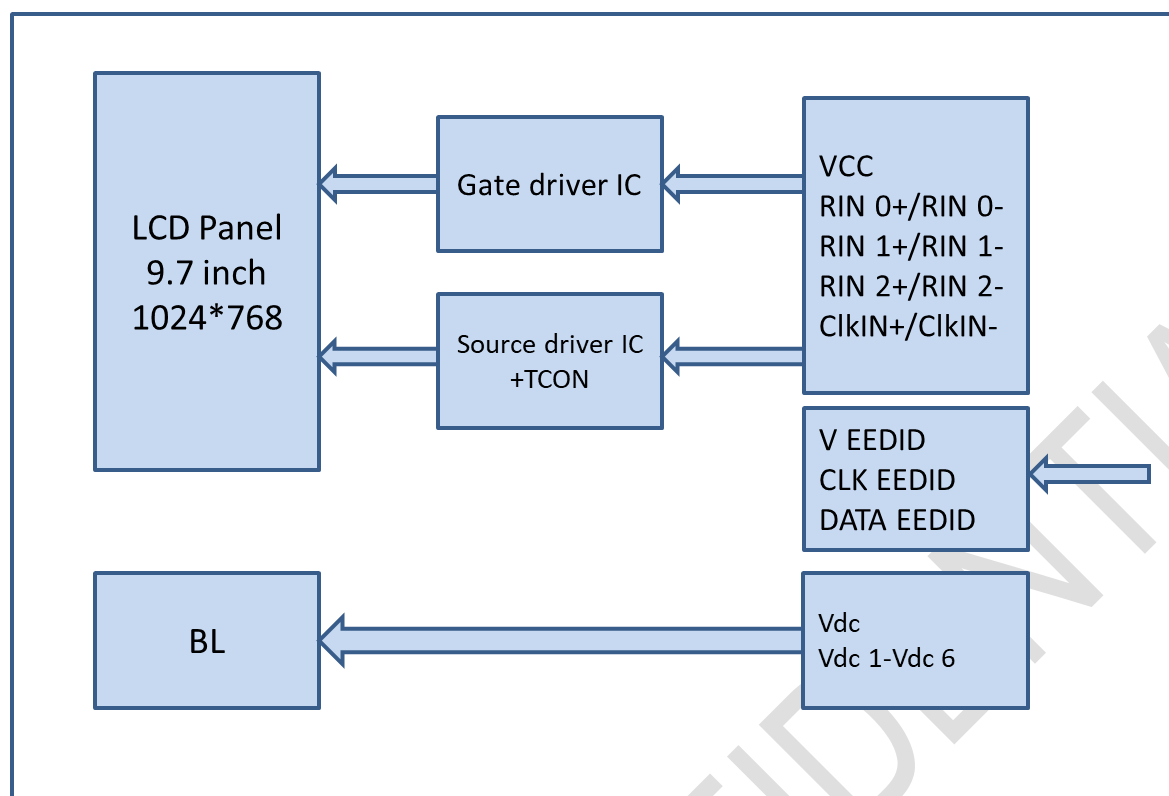
5.1 TFT-LCD Input Timing

DC specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential Input high Threshold voltage	R_{XVTH}	-	-	+0.2	V	R_{XVCM}=1.2V
Differential Input Low Threshold voltage	R_{XVTL}	-0.2	-	-	V	
Input voltage range (signaled-end)	R_{XVIN}	0	-	**VCC**-1.2	V	-
Differential Input common Mode voltage	R_{XVCM}	$|V_{ID}|$/2	-	**VCC**-1.2-$|V_{ID}|$/2	V	-
Differential Input voltage	$|V_{ID}|$	0.2	-	0.6	V	-

Single-end
signals

$(Rinx+)-(Rinx-) = -|V_{ID}| < R_{xVTL} = \text{"LOW"}$ (x=0,1,2)

R_{xVCM}

$(Rinx+)-(Rinx-) = |V_{ID}| > R_{xVTH} = \text{"HIGH"}$

Differential Input Voltage $|V_{ID}|$

R_{xVCM}

GND

Differential
signals

$(Rinx+)-(Rinx-)$
(x=0,1,2)

0V

R_{xVTH}

R_{xVTL}

$|V_{ID}|$

AC specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency	R_{XFCLK}	20	-	71	Mhz	
Input data skew margin	T_{RSKM}	-	-	500	ps	$|V_{ID}|$=400mV R_{XVCM}=1.2V R_{XFCLK}=71MHz
Clock high time	T_{LVCH}	-	4/(7*RXFCLK)	-	ns	
Clock low time	T_{LVCL}	-	3/(7*RXFCLK)	-	ns	

Rinx+
(x=0,1,2)

Rinx-
(x=0,1,2)

$1/R_{xFCLK}$

Previous Cycle

1 Cycle

Clkin+/-
(x=0,1,2)

CLK

DATA

Rspos1(min)

Rspos1(max)

Rspos2(min)

Rspos2(max)

Rspos7(min)

Rspos7(max)

T_{RSKM} Tsw T_{RSKM}

Rspos →   ← Rspos

Ideal TX Pulse Position   Ideal TX Pulse Position
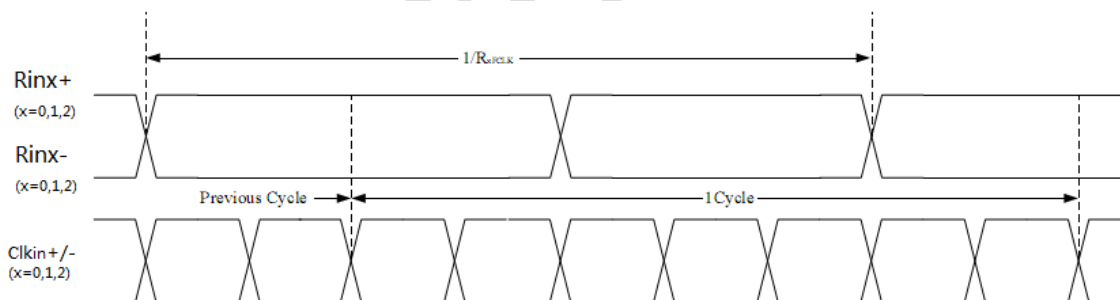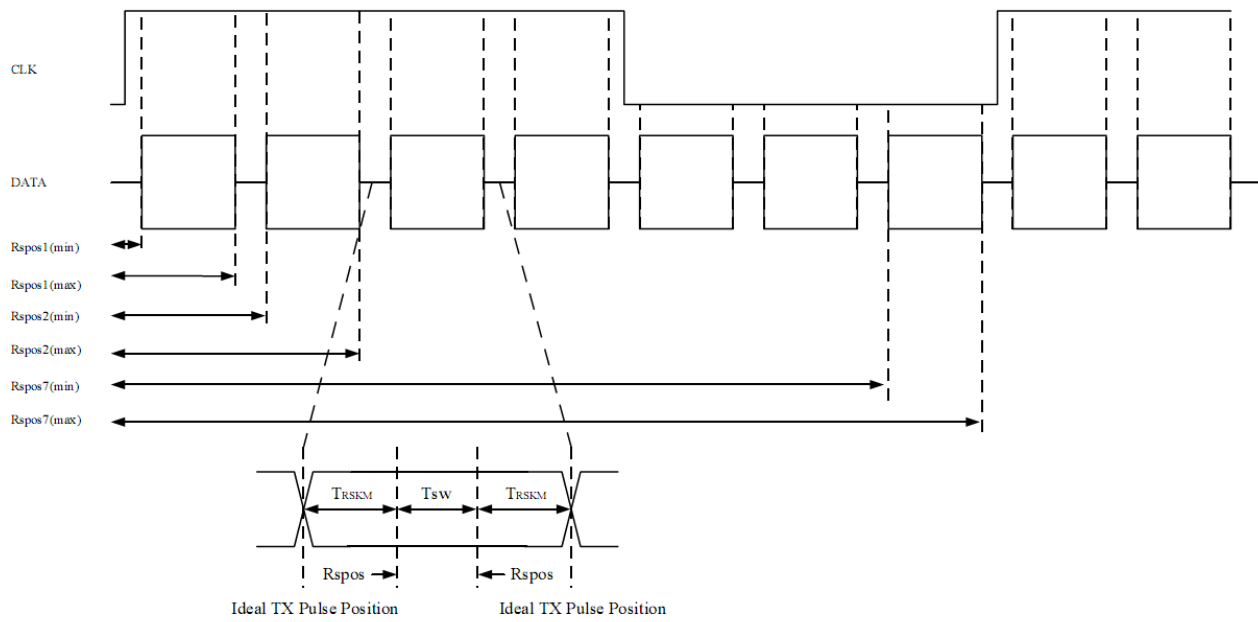
T_{RSKM}: Receiver strobe margin
Rspos: Receiver strobe position
Tsw : Strobe width (internal data sampling window)
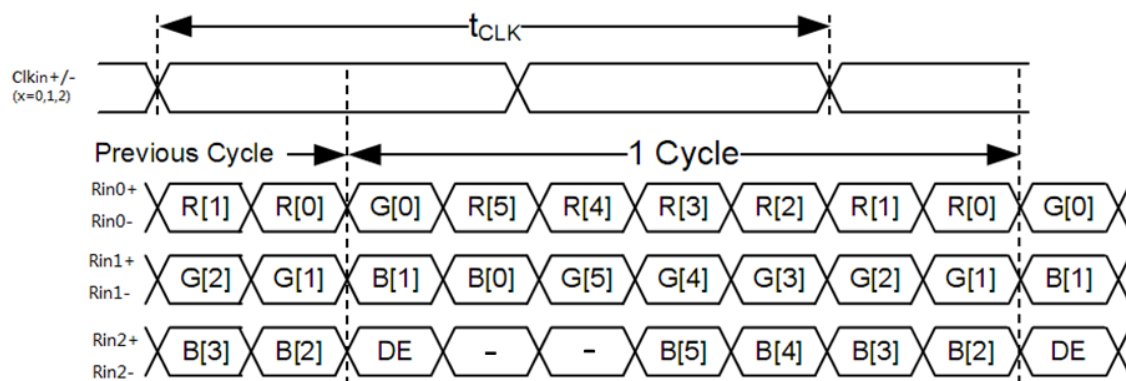
5.2   Timing Setting Of Signal

Input Timing Of Connector

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	F_{clk}	53	65	71	MHZ	
Horizontal display area	thd		1024		DCLK	
HSYNC period time	th	1136	1344	1400	DCLK	
HSYNC blanking	thb	112	320	376	DCLK	
Vertical display area	tvd		768		H	
VSYNC period time	tv	778	806	845	H	
VSYNC blanking	tvb	10	38	77	H	
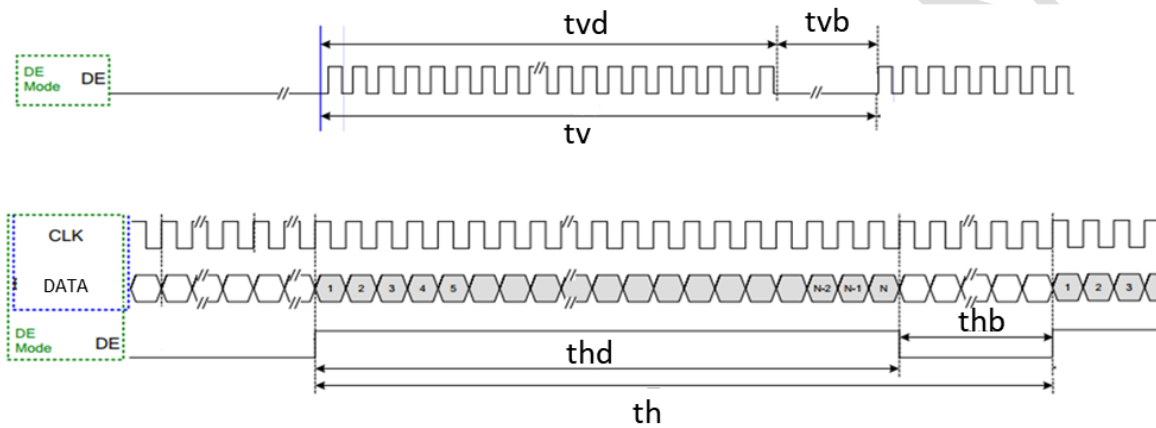
Date input:

6-bit LVDS

5.3   POWER ON/OFF SEQUENCE

VCC

LVDS

Backlight Vdc

1ms<t<20ms   t>1ms

t>0ms

t>200ms   t>200ms
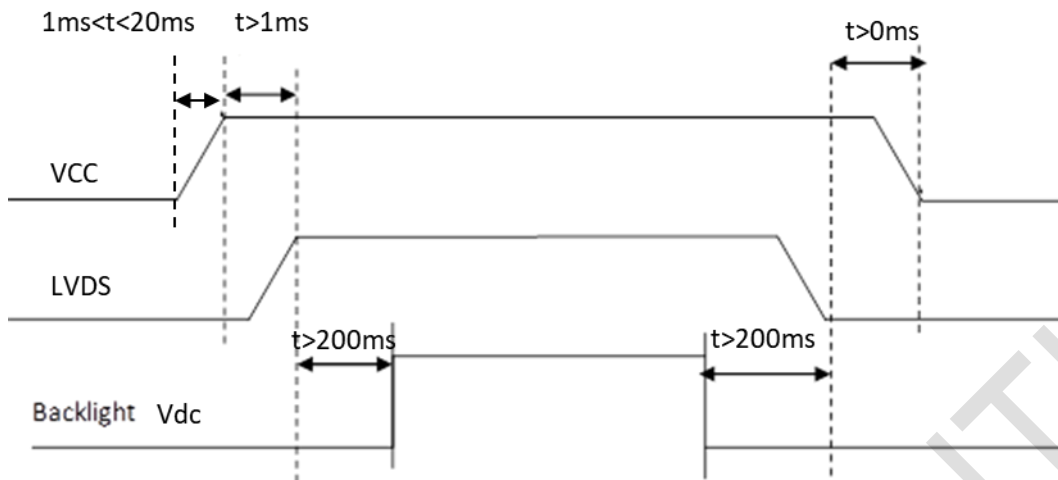
6 Optical Characteristics

Ta=25℃

| Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	50	60	-	Degree	Note 2
		θB		60	70	-		
		θL		60	70	-		
		θR		60	70	-		
Contrast Ratio		CR	θ=0°	400	500	-		Note1 Note3
Response Time		T_{ON}	25℃	-	20	25	ms	Note1 Note4
		T_{OFF}						
Chromaticity	White	x	Backlight is on	0.258	0.308	0.358		Note1 Note5
		y		0.269	0.319	0.369		
	Red	x		0.539	0.589	0.639		
		y		0.301	0.351	0.401		
	Green	x		0.299	0.349	0.399		
		y		0.519	0.569	0.619		
	Blue	x		0.104	0.154	0.204		
		y		0.033	0.083	0.133		
Uniformity		U			75	--	%	Note1 Note6
NTSC				45	50	-	%	Note 5
Luminance		L		280	350	-	cd/m^2	Note1 Note7

Test Conditions:

1. I_F= 120 mA, V_F=19.2 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.
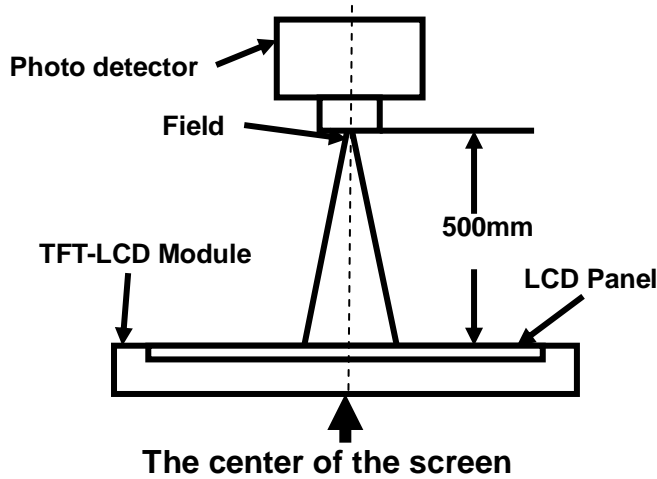
Note 2: Definition of viewing angle range and measurement system.

viewing angle is measured at the center point of the LCD。
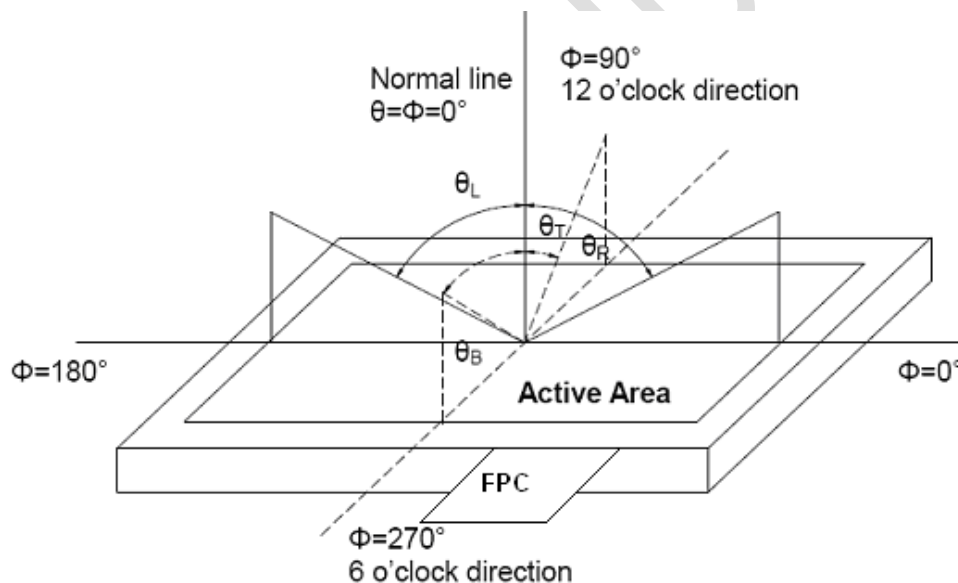
Note 3: Definition of contrast ratio

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

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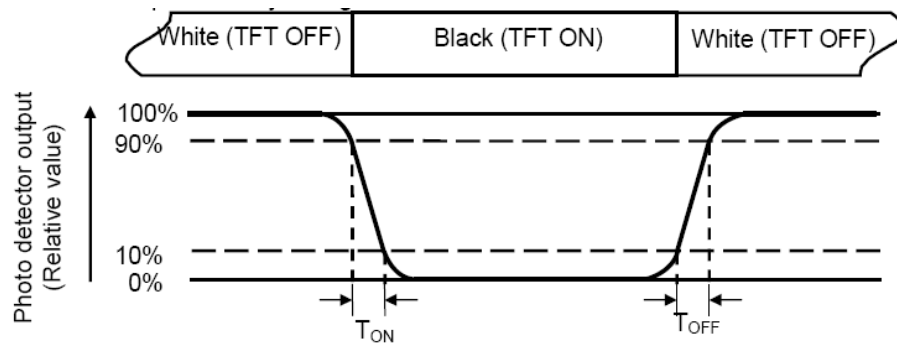
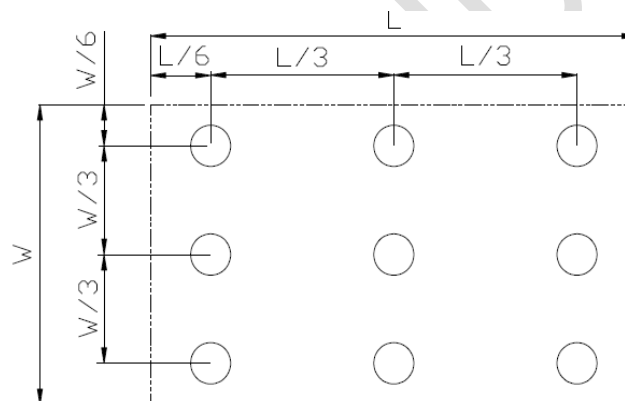Note 5: Definition of color chromaticity (CIE1931)

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.

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,240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-20℃ 30 min~+70℃ 30 min, Change time:5min, 20 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,GB2423.22-2002
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:50cm, 1corner,3edges,6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

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

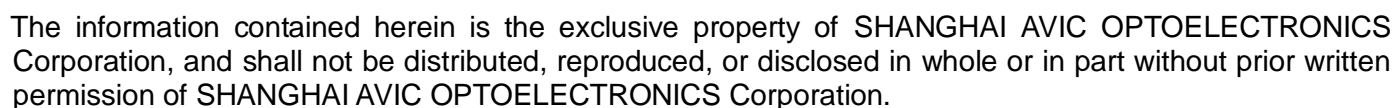Note2: Ta is the ambient temperature of sample.

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.

8 Mechanical Drawing

NOTES:
1. Display Type: a-Si TFT;
2. Backlight: 36-chips LED, 6series, 6parallel(20mA/pcs);
3. Gray Scale Inversion: 6 o'clock;
4. Matched connector:
   CN1: I-PEX 20474-030E;
   CN2: Kyocera-046298609100883;
5. General Tolerance: ±0.30;
6. Requirements on environment protection: 0/S0002;
7. Recommended Case Open Area should be less than Module V.A.

Pin Name

Pin	Pin Name
1	GND
2	VCC
3	VCC
4	V_EEDID
5	GSP
6	Clk_EEDID
7	Data_EEDID
8	Rin 0-
9	Rin 0+
10	GND
11	Rin 1-
12	Rin 1+
13	GND
14	Rin 2-
15	Rin 2+
16	GND
17	Clk_in -
18	Clk_in +
19	GND
20	Vdc
21	Vdc
22	Vdc
23	NC
24	Vdc 1
25	Vdc 2
26	Vdc 3
27	Vdc 4
28	Vdc 5
29	Vdc 6
30	NC

Viewing direction 12 O'clock

1024(RGB)×768 DOTS

Detail: A
Scale 200:1

| R | G | B |

LED CIRCUIT

S/N Label

Components Area

LED_A, LED_A
LED_K1, LED_K2, LED_K3, LED_K4, LED_K5, LED_K6

CONTROL DIMENSION	REFERENCE DIMENSION	
APPROVED	Du Wen chun	2021-07-26
CHECKED	Zhang Xin	2021-07-26
DESIGNED	Feng Yang	2021-07-26

PART NAME	LCM
DRAWING NUMBER	YG11-00
MATERIAL NUMBER	TM097TDHG04-66
PRODUCT NUMBER	TM097TDHG04-66

| PAGE | SCALE | UNIT | 3rd ANGLE |
| 1/1 | 1:1 | mm | |

TIANMA

9   Packing drawing

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM097TDHG04-66	210.20x166.30x3.28	0.2	20	
2	Partition-1	Corrugated paper	513×333×217	1.42	1	
3	Anti-static Bag	PE	285×245×6	0.011	20	
4	Dust-Proof Bag	PE	700×545	0.05	1	
5	Corrugated Bar	Corrugated paper	409×253×37	0.082	1	
6	Partition-2	Corrugated paper	505×332×7	0.1	1	
7	Carton	Corrugated paper	530×350×250	0.76	1	
8	Total weight	6.632 ±5% Kg				
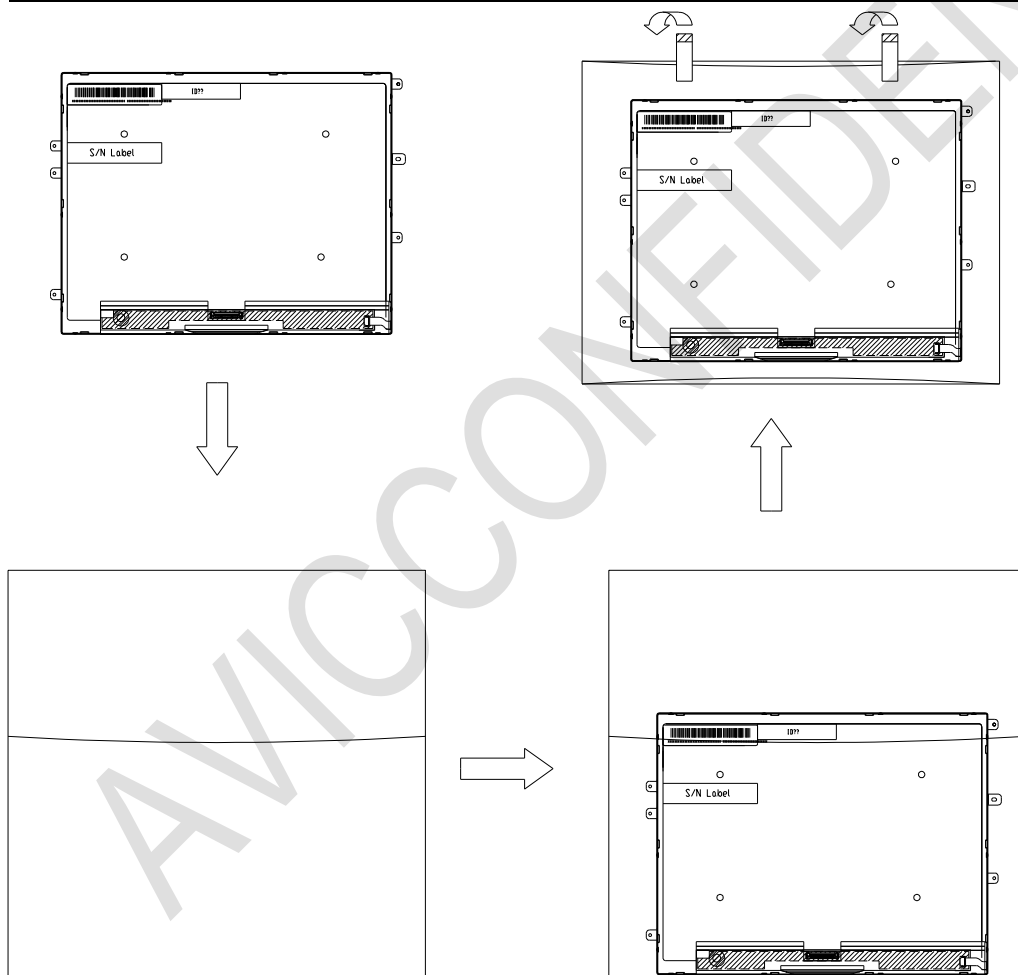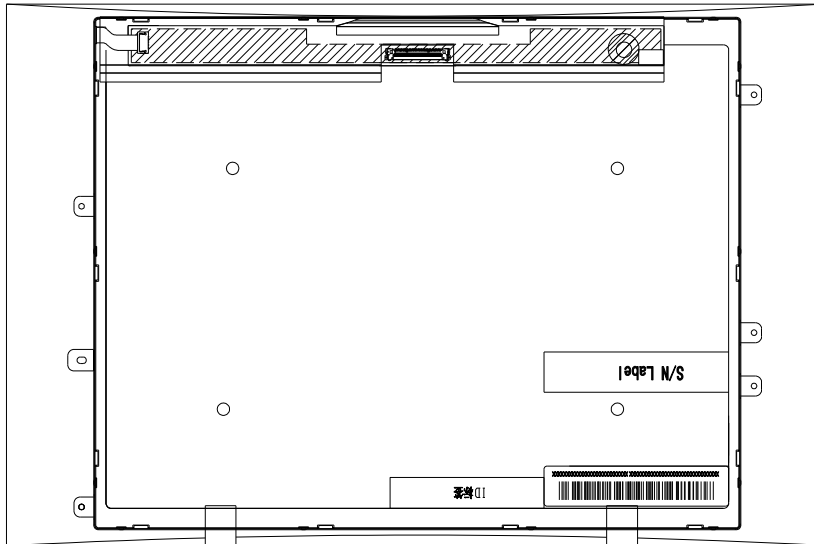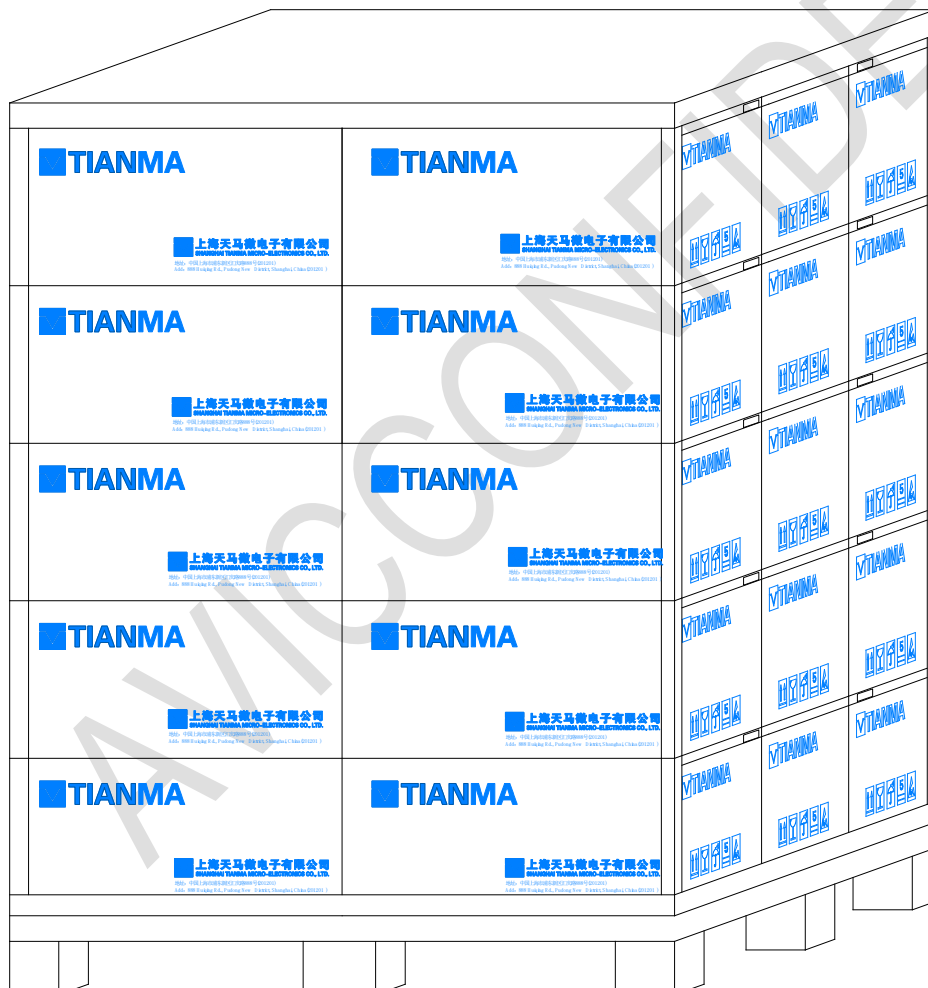
10 Precautions for Use of LCD Modules

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.

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.