MODEL NO: TM070RVHG04

MODEL VERSION: 01

SPEC VERSION: 2.0

ISSUED DATE: 2019-07-16

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

Customer :

Approved by	**Notes**

TIANMA Confirmed :

Prepared by	**Checked by**	**Approved by**
Zhiming_Yuan	Felix Tan	Kevin Kim

This technical specification is subjected to change without notice.

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Record of Revision

Rev	Issued Date	Description	Editor
1.0	2019-01--09	Preliminary Specification release.	Zhiming_yuan
1.1	2019-03-22	Update entire spec.	Zhiming_Yuan
2.0	2019-07-16	Final Specification release.	Zhiming_Yuan

1. General Specification

TM070RVHG04 evaluates a new product which base on TM070RVHG01. It is color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver IC with CABC function, FPC, a back light unit and CTP (Capacitive Touch Panel) with Multi-Touch function. The mounting method is with optical bonding. This product accords with RoHS environmental criterion.

Item	Feature	Spec	Unit	Note
TFT	Size	7	inch	--
	Resolution	800(RGB) x 480	--	--
	Control IC	HX8264-D05	--	--
	Interface	RGB 24 bits	--	--
	Color Depth	16.7M	--	--
	Technology Type	a-Si	--	--
	Pixel Pitch	0.1926(H)x0.179(V)	mm	--
	Pixel Configuration	R.G.B. Vertical Stripe	--	--
	Display Mode	TM with Normally White	--	--
	Surface Treatment(Up Polarizer)	Anti-Glare(3H)	--	--
	Viewing Direction	12 o'clock	--	1
	Gray Scale Inversion Direction	6 o'clock	--	--
	Module size (W x H x D)	LCM:165x100x5.7	mm	--
		LCM+CTP:171.5x110.3x7.35	mm	
TP	Operation Technology	Projected Capacitive	--	--
	Control IC	ILI2118A	--	--
	Input Method	Bare finger	--	--
	Number of simultaneous touches	10	--	--
	Minimum Touch Area	Φ7	mm	--
	Finger Pitch	≥16	mm	--
	Product structure	GG	--	2
	Interface	I2C	--	--
	I2C address	0x26	--	--
Mechanical Characteristics	TFT Active Area	154.08x85.92	mm	--
	TP Active Area	157.00(W) x 92.80(H)	mm	--
	Matching Connection Type	LCM: Hirose FH12A-50S-0.5H	--	--
		CTP:FH19S-10S-0.5SH	--	--
	LED Numbers	30 LEDs	--	--
	Weight	207.57	g	--
Reliability Characteristics	Operation temperature	-20~70	℃	--
	Storage temperature	-30~80	℃	--

Note 1: Viewing direction for best image quality is different from Gray Scale Inversion Direction, there is a 180 degree shift.
Note 2: Requirements on Environmental Protection: RoHS.

2. Input/output Terminals

2.1 TFT CN1 pin assignment

Matching Connection Type: FH12A-50S-0.5SH

PIN	SYMBOL	I/O	Description	remark
1	VLED +	P	Led anode	
2	VLED +	P	Led anode	
3	VLED -	P	Led cathode	
4	VLED -	P	Led cathode	
5	GND	P	Ground	
6	VCOM	P	Common voltage input	
7	VCC	P	Digital power supply	
8	MODE	I	DE/SYNC mode select. H:DE mode, L:SYNC mode	
9	DE	I	Date enable signal, active high to enable data, if not used, please pull low. DE=DEN	
10	VSYNC	I	Vertical sync input, negative polarity, if not used, please pull High.	
11	HSYNC	I	Horizontal sync input, negative polarity, if not used, please pull High.	
12	B7	I	Blue date(MSB)	
13	B6	I	Blue date	
14	B5	I	Blue date	
15	B4	I	Blue date	
16	B3	I	Blue date	
17	B2	I	Blue date	
18	B1	I	Blue date	
19	B0	I	Blue date(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	Ground	
37	DCLK	I	Clock for input data. DCLK=CLKIN	
38	GND	P	Ground	
39	LR	I	Source left or right sequence control	
40	UD	I	Gate up or down scan control	
41	VGH	P	Positive power of TFT	
42	VGL	P	Negative power of TFT	

43	AVDD	P	Analog power supply	
44	RESET	I	Global reset pin	
45	NC	NC	NC	
46	VCOM	P	Common voltage input	
47	DITHB	I	Dithering setting. H:6bit resolution, L:8bit resolution	
48	GND	P	Ground	
49	NC	NC	NC	
50	NC	NC	NC	

Note1: I/O definition.

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

Note2:

Scan control input		Scanning direction
UD	LR	
GND	VCC	Up to down, left to right
VCC	GND	Down to up, right to left
GND	GND	Up to down, right to left
VCC	VCC	Down to up, left to right

2.2 TP pin assignment

Matching Connection Type: FH19S-10S-0.5SH

Pin NO.	Symbol	I/O	Description	Remark
1	SCL	I	IIC clock input	
2	SDA	I/O	IIC data input and output	
3	GND	P	Ground	
4	GND	P	Ground	
5	ATTN	I/O	External interrupt to the host	
6	GND	P	Ground	
7	VPP	I/O	Reset from the host	
8	VDD	P	CTP power supply	
9	GND	P	Ground	
10	GND	P	Ground	

3. Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage	VCC	-0.3	3.6	V	Note1
Input voltage	V_{IN}	-0.3	3.6	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~R7, G0~G7, B0~B7, Dclk, Hsync, Vsync,DITHB, LR, UD.
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 .1 Driving TFT LCD Panel

Ta = 25℃

Item		Symbol	Min	Typ	Max	Unit	Remark
Voltage for logic circuit		VCC	3.00	3.30	3.60	V	
Analog Supply Voltage		AVDD	10.1	10.4	10.7	V	
Gate On Voltage		VGG	14.4	16	17.6	V	
Gate Off Voltage		VEE	-7.70	-7.00	-6.30	V	
Common Electrode Driving Signal		VCOM	3.85	3.95	4.05	V	
Input Signal Voltage	Low Level	VIL	0	-	0.3xVCC	V	
	High Level	VIH	0.7xVCC	-	VCC	V	

Table 4.1 LCD module electrical characteristics

Note1: For different LCM, the value may have a bit of difference.
Note2: To test the current dissipation, use “all Black Pattern”.

4.1.2 TFT Driving Backlight

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Forward Voltage	VLED	I_F=150mA	--	19.2	20.4	V	Note 1
Forward Current	I_F	-	-	150		mA	
Backlight Power Consumption	WBL	I_F=150mA	--	2880	--	mW	
Life Time	-	I_F=150mA		40000	-	Hrs	Note 3

Table 4.2 LED backlight characteristics

Note 1: I_F is defined for one channel LED. There are total three LED channels in back light unit.Under LCM operating, the stable forward current should be inputted.

Note 2: Optical performance should be evaluated at Ta=25℃ only.

Note 3: 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.

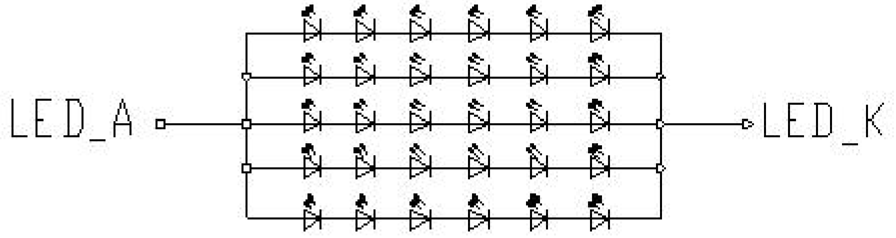


Figure 4.2 LED connection of backlight

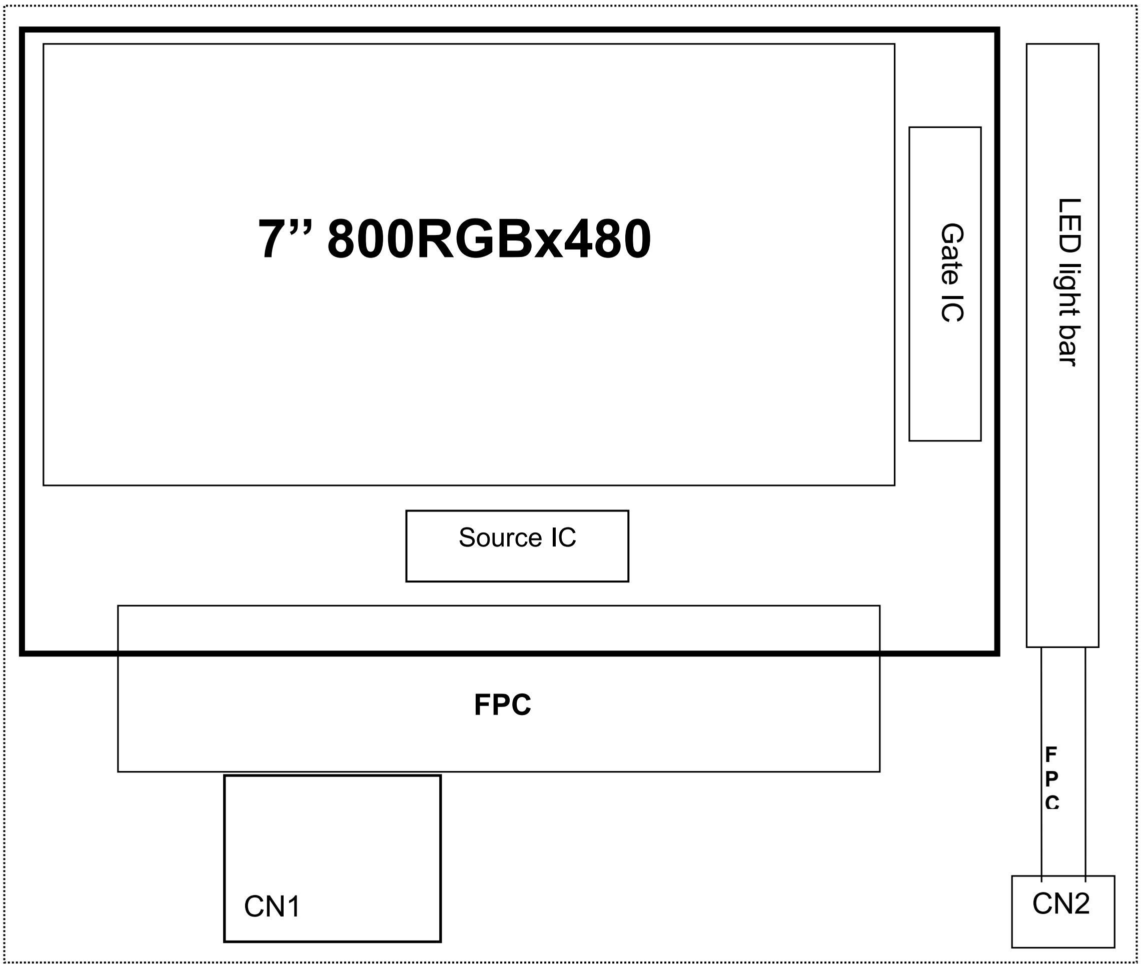
4.2 TP DC Characteristics

(T_A= 25℃,VDD=3.3V)

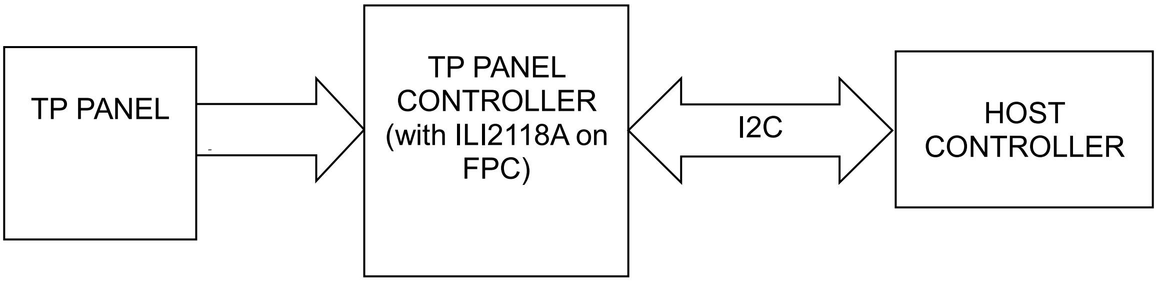
Item	Min	Typ	Max	Unit	Remark
power supply voltage	2.8	3.3	3.6	V	
Input Voltage High	1	-	-	V	
Input Voltage Low	-	-	0.5	V	
Output Voltage High	-	See Note	-	V	
Output Voltage Low	-	-	0.1	V	
Power supply current	-	25	-	mA	Operating mode

Note:
VOH is for ATTN output voltage level which is programmable by registers. Typical values are 1.2V/1.5V/1.8V/V_{VDD}.

4.3 TFT Block Diagram


7" 800RGBx480
Gate IC
LED light bar
Source IC
FPC
FPC
CN1
CN2

4.4 TP Circuit Block Diagram


TP PANEL
TP PANEL CONTROLLER (with ILI2118A on FPC)
I2C
HOST CONTROLLER

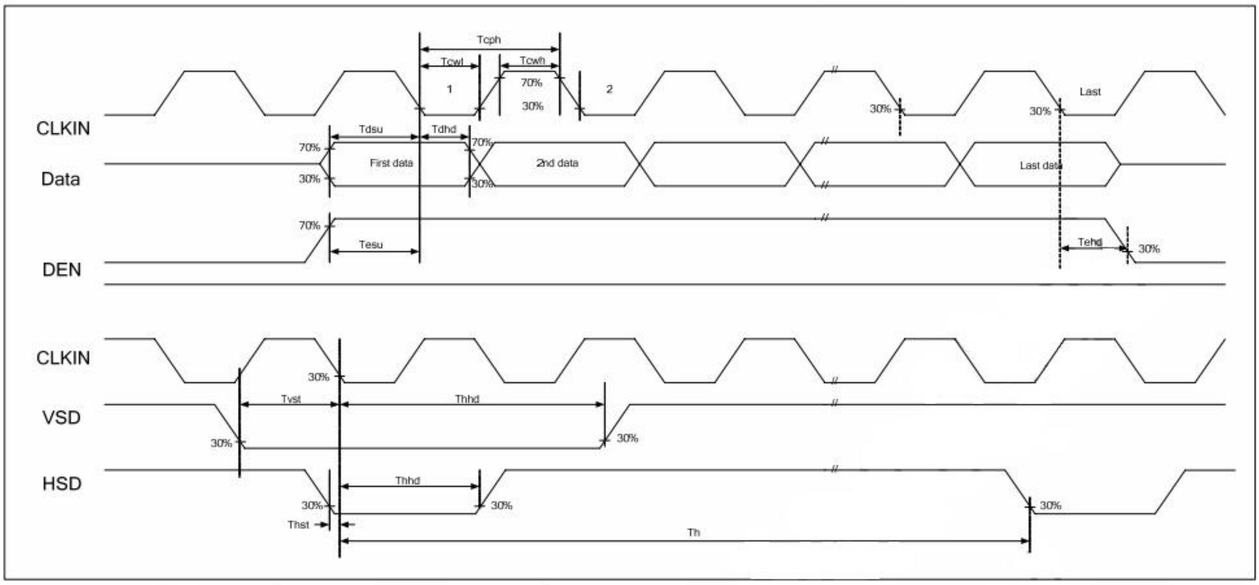
5. Timing Chart

5.1 TFT - LCD Input Timing

VDD=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	F_{clk}	28	30.0	40.0	MHz	Graph:CLKIN
DCLK cycle time	T_{cph}	25	33.3	36	ns	Graph:CLKIN
DCLK pulse width	T_{cw}	40%	50%	60%	T_{cph}	Graph:CLKIN
VS setup time	T_{vst}	8			ns	Graph:VSD
VS hold time	T_{vhd}	8	-	-	ns	Graph:VSD
HS setup time	T_{hst}	8			ns	Graph:HSD
HS hold time	T_{hhd}	8	-	-	ns	Graph:HSD
Data setup time	T_{dsu}	8			ns	Data to DCLK
Data hold time	T_{dhd}	8	-	-	ns	Data to DCLK
DE setup time	T_{esu}	8	-	-	ns	Graph:DEN
DE hold time	T_{ehd}	8	-	-	ns	Graph:DEN

Input Clock and Data timing Diagram:


Tcph
Tcwl
Tcwh
70%
30%
1
2
Last
CLKIN
Data
DEN
Tdsu
Tdhd
First data
2nd data
Last data
Tesu
Tehd
CLKIN
VSD
HSD
Tvst
Thhd
Thst
Th

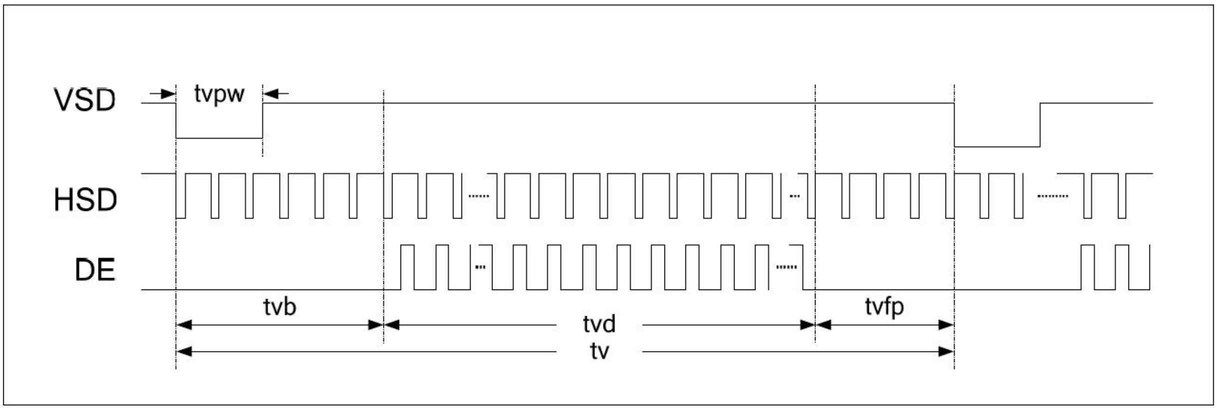
5.2 Recommended Timing Setting Of TCON

TCON (Embedded In Source IC) Input Timing (DCLK, HS, VS, DE)

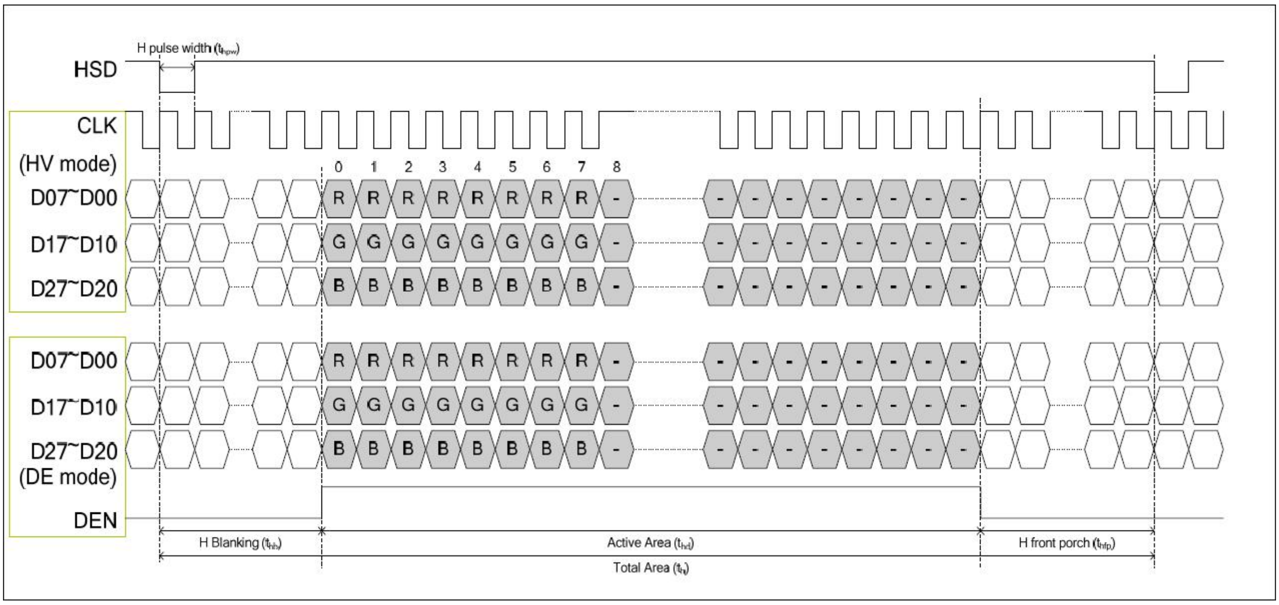
VDD=3.3V, GND=0V, Ta=25℃

Parameter	Symbol	Min	Typ	Max	Unit	Remark
DCLK	Fclk	28	30	40	MHZ	
	tclk	20	33.3	36	ns	
HSD	th	862	1056	1200	tclk	
	thd	800	800	800	tclk	
	thpw	1	-	40	tclk	
	thb	46	46	46	tclk	
	thfp	16	210	354	tclk	
DE mode blanking	th-thd	85	256	400	tclk	
VSD	tv	513	525	650	th	
	tvd	480	480	480	th	
	tvpw	3	-	20	th	
	tvb	23	23	23	th	
	tvfp	7	22	147	th	
DE mode blanking	tv-tvd	30	45	170	th	

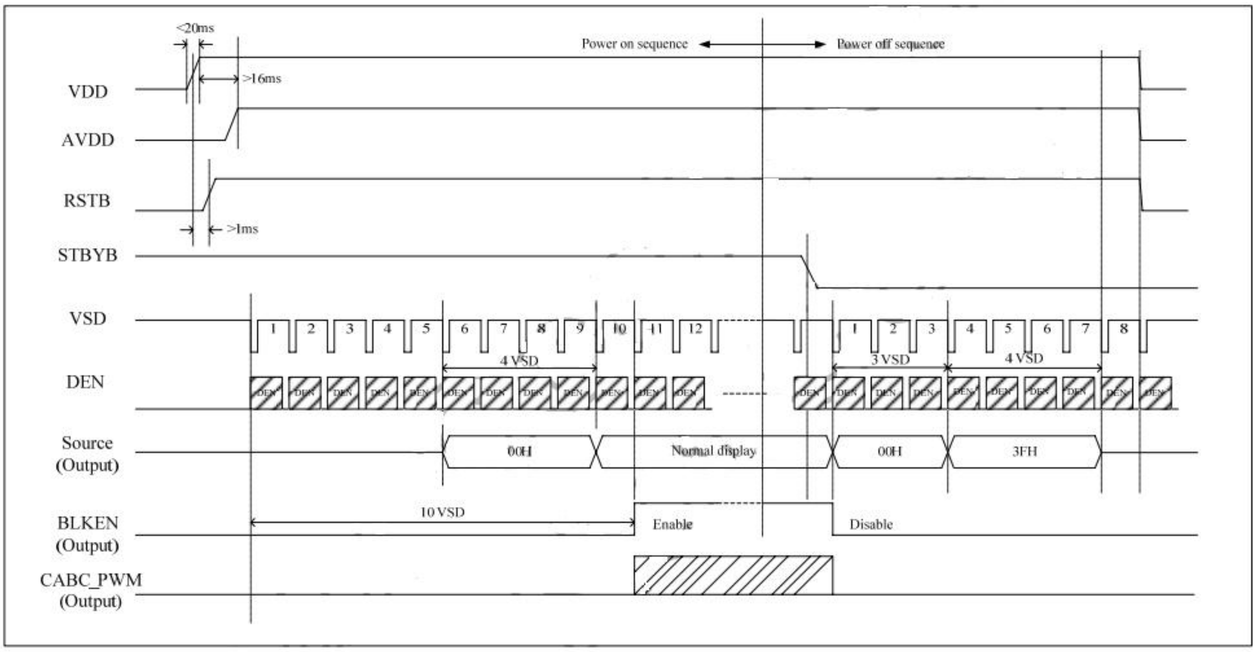
TCON Vertical Input Timing Diagram



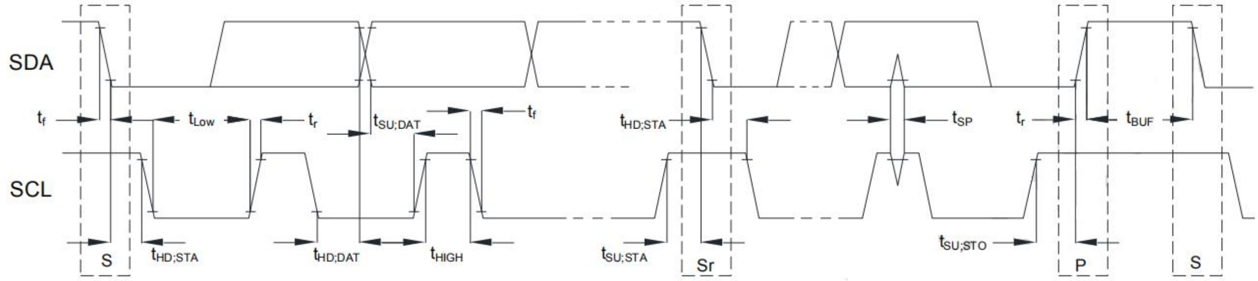
TCON Horizontal Input Timing Diagram


H pulse width (t_{hpw})
HSD
CLK
(HV mode)
D07~D00
D17~D10
D27~D20
0
1
2
3
4
5
6
7
8
R
G
B
-
D07~D00
D17~D10
D27~D20
(DE mode)
DEN
H Blanking (t_{hb})
Active Area (t_{hd})
H front porch (t_{hfp})
Total Area (t_h)

5.3 POWER ON/OFF SEQUENCE


<20ms
>16ms
>1ms
Power on sequence
Power off sequence
VDD
AVDD
RSTB
STBYB
VSD
1
2
3
4
5
6
7
8
9
10
11
12
4 VSD
3 VSD
4 VSD
DEN
Source
(Output)
00H
Normal display
00H
3FH
BLKEN
(Output)
10 VSD
Enable
Disable
CABC_PWM
(Output)

5.4 TP I2C Interface Timing



Symbol	**Parameter**	**100KHz**			**400KHz**		
		Min	**Max**	**Unit**	**Min**	**Max**	**Unit**
f_{SCL}	SCL clock frequency	0	100	kHz	0	400	KHz
$t_{HD;STA}$	Hold time (repeated) START condition. After this period, the first clock pulse is generated	4.0	–	µs	0.6	–	µs
t_{LOW}	LOW period of the SCL clock	4.7	–	µs	1.3	–	µs
t_{HIGH}	HIGH period of the SCL clock	4.0	–	µs	0.6	–	µs
$t_{SU;STA}$	Set-up time for a repeated START condition	4.7	–	µs	0.6	–	µs
$t_{HD;DAT}$	Data hold time	0	3.45	µs	0	0.9	µs
$t_{SU;DAT}$	Data set-up time	250	–	ns	100	–	ns
t_r	Rise time of both SDA and SCL signals	–	1000	ns	–	300	ns
t_f	Fall time of both SDA and SCL signals	–	300	ns	–	300	ns
$t_{SU;STO}$	Set-up time for STOP condition	4.0	–	µs	0.6	–	µs
t_{BUF}	Bus free time between a STOP and START condition	4.7	–	µs	1.3	–	µs

Fig4: IIC Timing

Note1:Command flow referred to the IC protocol file.

Note2:TP firmware should be adjusted again after assembled on the overall unit.

Note3:Tianma should evaluate the firmware adjustment, if there is any change about the overall unit.

6. **Optical Characteristics**

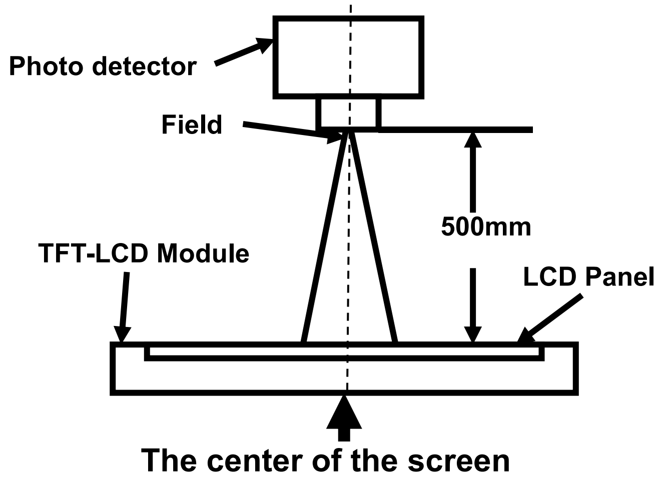
6.1 TFT Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Remark
View Angles		θT	CR≧10	50	60	--	Degree	Note 2
		θB		60	80	--		
		θL		60	80	--		
		θR		60	80	--		
Contrast Ratio		CR	θ=0°	400	500	--		
Response Time		T_{ON} T_{OFF}	25℃	--	25	35	ms	Note1 Note4
Chromaticity	White	x	Backlight is on	0.274	0.324	0.374		Note5 Note1
		y		0.299	0.349	0.399		
	Red	x		0.539	0.589	0.639		
		y		0.300	0.350	0.400		
	Green	x		0.292	0.342	0.392		
		y		0.547	0.597	0.647		
	Blue	x		0.103	0.153	0.203		
		y		0.056	0.106	0.156		
Uniformity		U		70	80	--	%	Note1、Note6
NTSC				45	50	--	%	
Luminance		L		1000	1200	--	cd/m^2	Note7

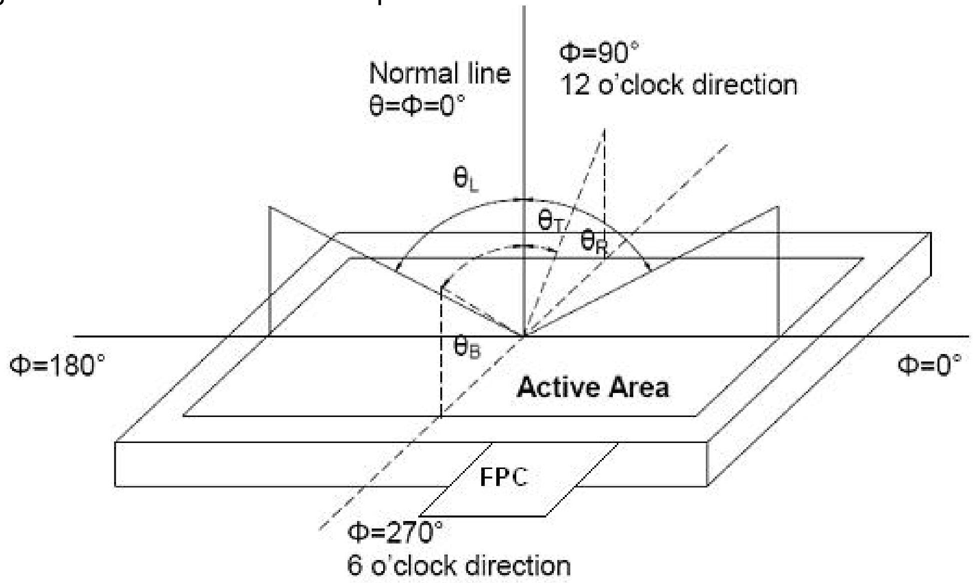
Test Conditions:

1. I_F= 30mA(one channel), 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 10 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.

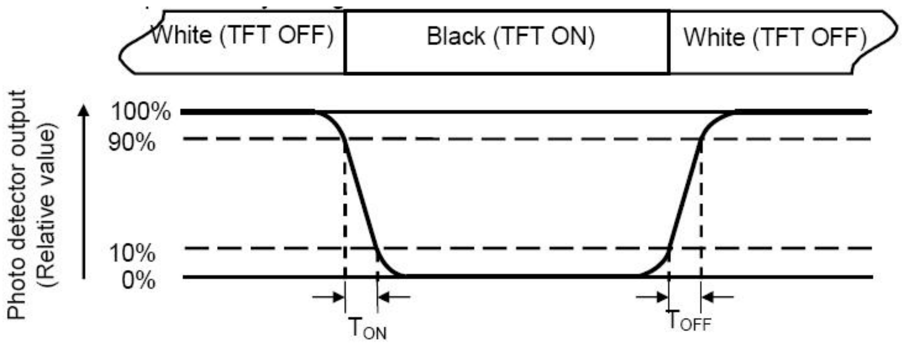


Note 3: Definition of contrast ratio

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

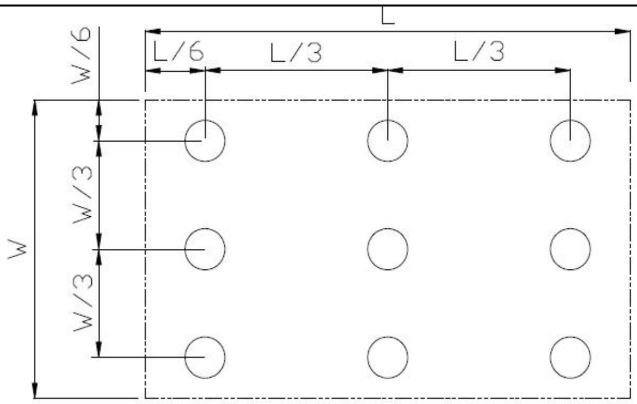
"White state ": The state is that the LCD should drive by Vwhite.
"Black state": The state is that the LCD should drive by Vblack.
Vwhite: To be determined;
Vblack: To be determined.

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. 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	Operation at High Temperature and Humidity	Ta = +60℃, 90% RH ,240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃（30min）~＋80℃（30min）,Change Time:5min,100cycle	Start with cold temperature End with high temperature, IEC60068-2-14,GB2423.22
7	ESD	C=150pF、R=330Ω 5point/panel Air: ±8KV Contact:±4KV 5times (Environment:15℃~35℃, 30%~60%.86Kpa~106Kpa)	GB/T17626.6-2006
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)	GB/T 2423.10-2008
9	Shock Test	Half Sine Wave 100G ,6ms,±X,±Y,±Z 3times for each direction	GB/T 2423.5-1995
10	Drop Test(package state)	Height: X cm,1 corner, 3edges, 6 surfaces actual parameter of “X”: Box weight>10kg,X=60cm Box weight≤10kg,X=80cm	GB/T 4857.5-1992

Note1: Ta is the ambient temperature of sample.

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note3: 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

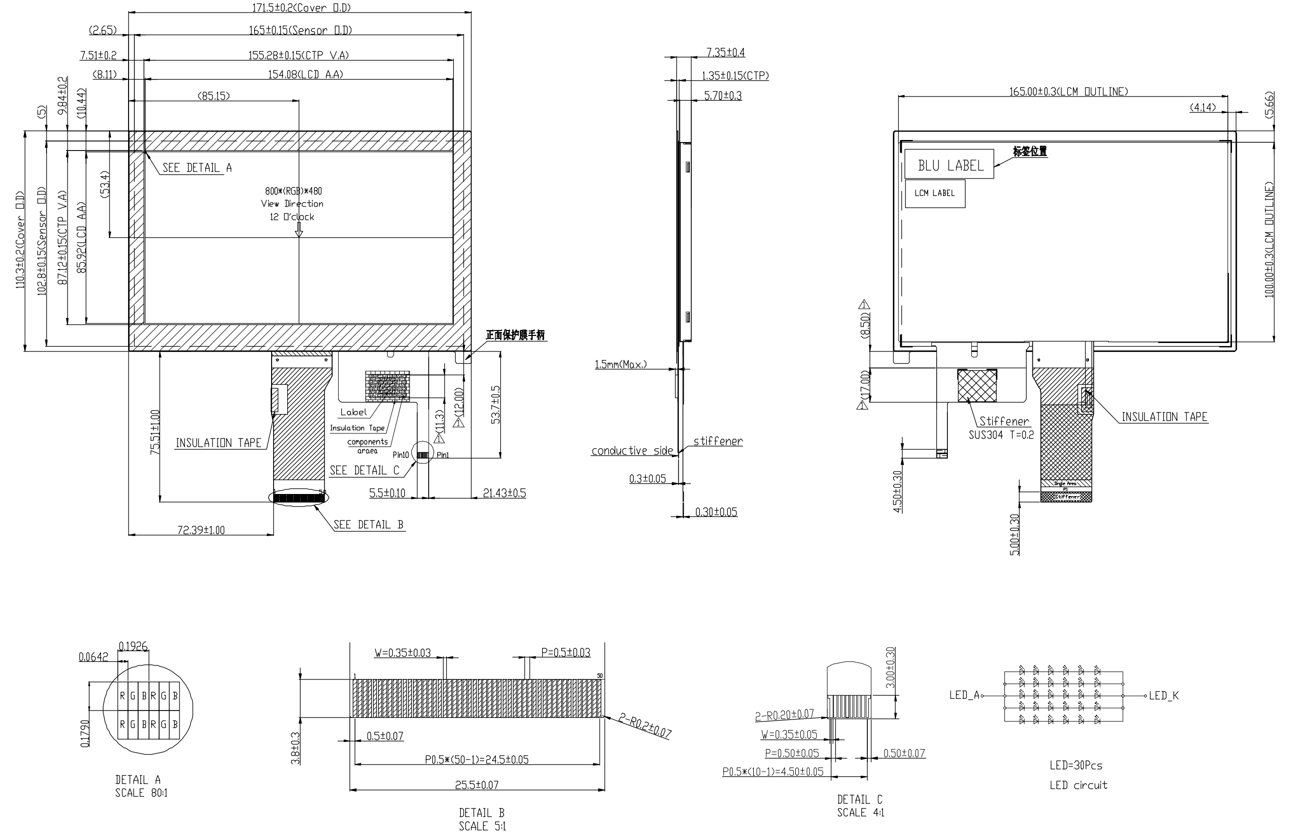
PIN	SYMBOL
1	VLED+
2	VLED+
3	VLED-
4	VLED-
5	GND
6	VCOM
7	VCC
8	MODE
9	DE
10	VS
11	HS
12	B7
13	B6
14	B5
15	B4
16	B3
17	B2
18	B1
19	B0
20	G7
21	G6
22	G5
23	G4
24	G3
25	G2
26	G1
27	G0
28	R7
29	R6
30	R5
31	R4
32	R3
33	R2
34	R1
35	R0
36	GND
37	DCLK
38	GND
39	LR
40	UD
41	VGH
42	VGL
43	AVDD
44	RESET
45	NC
46	VCOM
47	DITHB
48	GND
49	NC
50	NC

CTP

NO.	PIN
1	SCL
2	SDA
3	GND
4	GND
5	ATTN
6	GND
7	VPP
8	VDD
9	GND
10	GND

普通商业秘密
Ordinary Trade Secrets

REV	DC/EC NUMBER	DESCRIPTION	DATE
△1	XM-ZXBG201901100002	Change CTP FPC shape and component position	2019-01-08

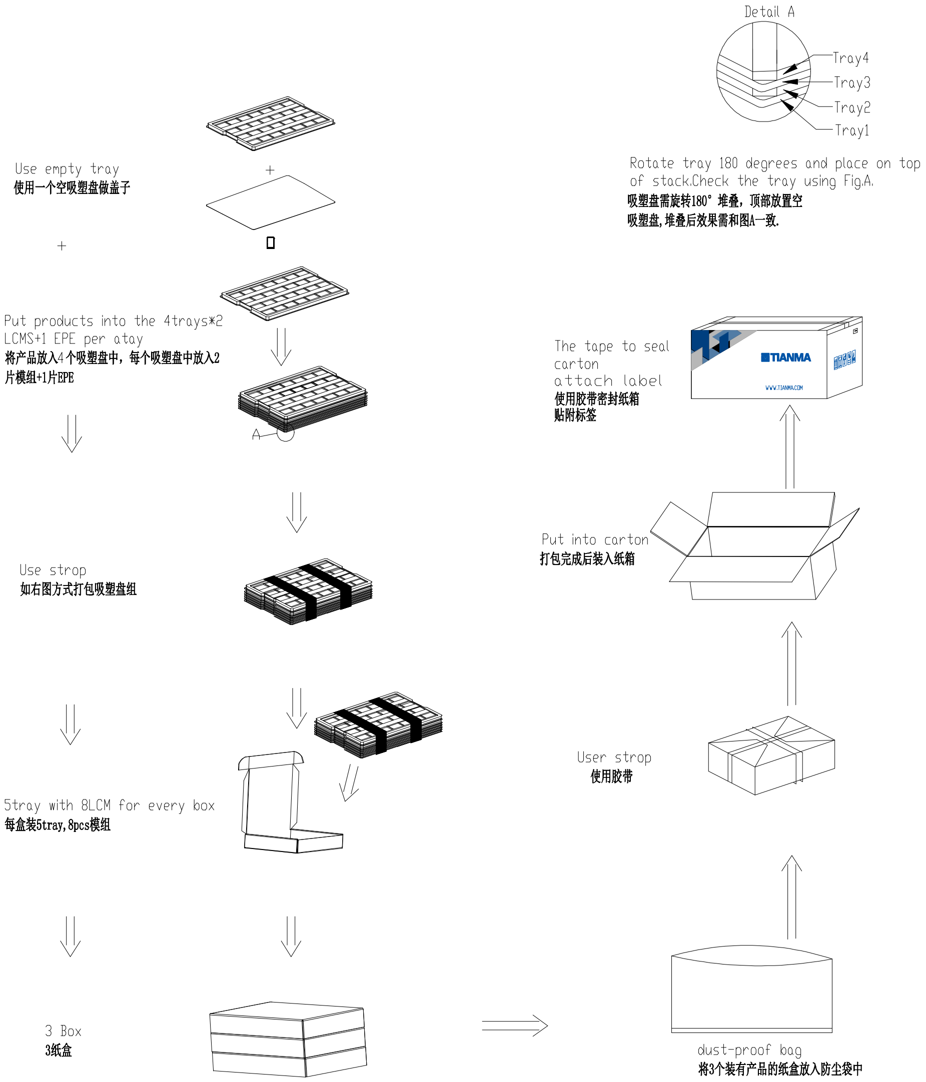

171.5±0.2(Cover O.D)
(2.65)
165±0.15(Sensor O.D)
7.51±0.2
155.28±0.15(CTP V.A)
(8.11)
154.08(LCD A.A)
(85.15)
(5)
9.84±0.2
(10.44)
110.3±0.2(Cover O.D)
102.8±0.15(Sensor O.D)
87.12±0.15(CTP V.A)
85.92(LCD A.A)
(53.4)
SEE DETAIL A
800*(RGB)*480
View Direction
12 O'clock
正面保护膜手柄
75.51±1.00
INSULATION TAPE
Label
Insulation Tape
components
araea
Pin10
Pin1
SEE DETAIL C
(11.3)
(12.00)
53.7±0.5
5.5±0.10
21.43±0.5
SEE DETAIL B
72.39±1.00
7.35±0.4
1.35±0.15(CTP)
5.70±0.3
1.5mm(Max.)
conductive side
stiffener
0.3±0.05
0.30±0.05
165.00±0.3(LCM OUTLINE)
(4.14)
(5.66)
BLU LABEL
标签位置
LCM LABEL
100.00±0.3(LCM OUTLINE)
(8.50)
(17.00)
Stiffener
SUS304 T=0.2
INSULATION TAPE
4.50±0.30
5.00±0.30
Single Area
PI
Stiffener
0.1926
0.0642
0.1790
R G B R G B
R G B R G B
DETAIL A
SCALE 80:1
W=0.35±0.03
P=0.5±0.03
1
50
3.8±0.3
0.5±0.07
2-R0.2±0.07
P0.5*(50-1)=24.5±0.05
25.5±0.07
DETAIL B
SCALE 5:1
3.00±0.30
2-R0.20±0.07
W=0.35±0.05
P=0.50±0.05
0.50±0.07
P0.5*(10-1)=4.50±0.05
DETAIL C
SCALE 4:1
LED_A
LED_K
LED=30Pcs
LED circuit

NOTES:
1.Display Type: a-Si TFT;
2.Backlight: 30-chips LED, 6 series 5parallels;
3.Gray Scale Inversion: 6 o'clock;
4.Matched connector:HIROSE FH12A-50S-0.5H,CTP:FH19S-10S-0.5SH;
5.Source IC: HX8264,Gate IC:HX8664; CTP IC:ILI2118A
6.General Tolerance: ±0.3;
7.General angle radius: R=1.00;
8.Requirements on environment protection: Q/S0002;

CONTROL DIMENSION	☐		2D Rev.	01	TIANMA	
REFERENCE DIMENSION	( )		3D Rev.	NA		
APPROVED	Du Wanchun	2019-01-08	PRODUCT NUMBER	TM070RVHG04-01	3rd ANGLE	
CHECKED	Liu Guowei	2019-01-08	PART NAME	LCM OUTLINE	UNIT	mm
			DRAWING NUMBER	YGT1-01	SCALE	1 : 1
DESIGNED	Wang Wenyue	2019-01-08	MATERIAL NUMBER	TM070RVHG04-01	PAGE	1 / 1

9. Packaging Material

No	Item	Model (Material)	Dimensions(mm)	Unit Weight(Kg)	Quantity	Remark
1	LCM module	TM070RVHG04-01	171.5*110.3*7.35	0.21	24	
2	Tray	PET	485×330×17	0.2	15	
3	Dust-proof Bag	PE	700×545×0.05	0.046	1	
4	Carton	Corrugated Paper	544×365×250	1.01	1	
5	BOX	Corrugated Paper	520×345×111	0.4	3	
6	EPE	EPE	308.68×190.04×1	0.0004	12	
7	Label	PP	100×52	0.011	1	
8	Total weight	10.3KG±5%				



Use empty tray
使用一个空吸塑盘做盖子

Put products into the 4trays*2 LCMS+1 EPE per atay
将产品放入4个吸塑盘中，每个吸塑盘中放入2片模组+1片EPE

Use strop
如右图方式打包吸塑盘组

5tray with 8LCM for every box
每盒装5tray,8pcs模组

3 Box
3纸盒

Rotate tray 180 degrees and place on top of stack.Check the tray using Fig.A.
吸塑盘需旋转180° 堆叠，顶部放置空吸塑盘,堆叠后效果需和图A一致.

The tape to seal carton
attach label
使用胶带密封纸箱
贴附标签

Put into carton
打包完成后装入纸箱

User strop
使用胶带

dust-proof bag
将3个装有产品的纸盒放入防尘袋中

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.