PRODUCT SPECIFICATION

MODEL: CT070HD-IPS 97262711

<◇>PRELIMINARY SPECIFICATION

<◆>APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED

PREPARED BY:
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REVISION STATUS

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V1.0	2017.08.27	-	First Issued.	Ahha

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1. GENERAL DESCRIPTION

1.1 DESCRIPTION

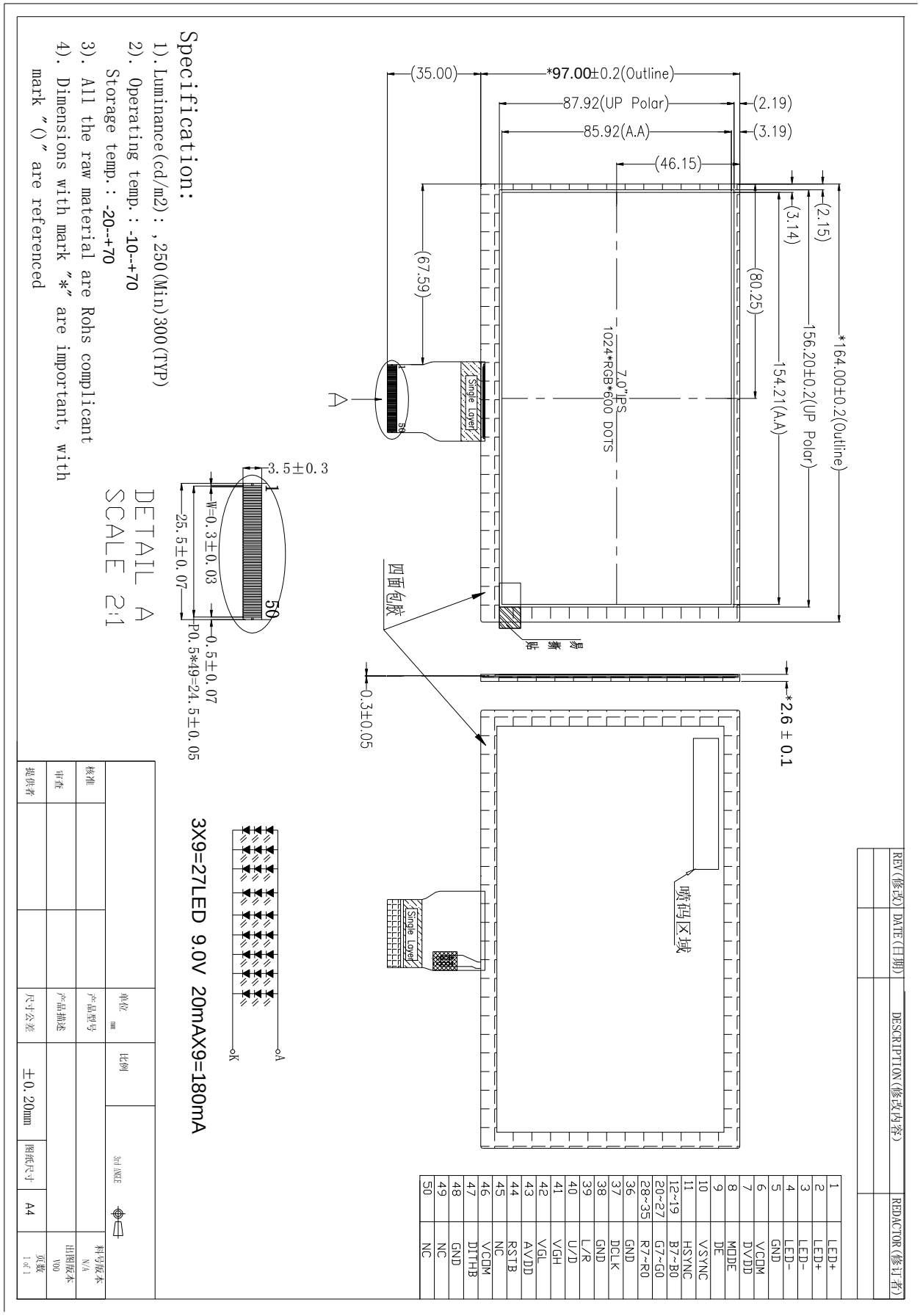
CT070HD-IPS is a color active matrix thin film transistor (TFT) IPS liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, Driver IC ,FPC and Backlight.

This is a high quality and high luminance IPS LCD module with quite thin thickness, and specially for various industrial electronic products.

1.2 FEATURES:

No.	Item	Specification	Unit
1	Panel Size	7”	inch
2	Number of Pixels	1024×RGB (3) ×600	pixels
3	Active Area	154.21(H)x 85.92(V)	mm
4	Pixel Pitch	0.1506(H)×0.1432(V)	mm
5	OutlineDimension	164(W)×97(H)×2.6(D)	mm
6	Number of Colors	16.7M	-
7	Display Mode	Normally Black	-
8	Viewing Direction	whole view	-
9	Display Format	RGB vertical stripe	-
10	Luminance(cd/m^2)	300(TYP.)	net
11	Contrast Ratio	800(TYP.)	
12	Surface Treatment	Anti-Glare	-
13	Interface	TTL	-
14	Backlight	White LED	-
15	OperationTemperature	-10~70	℃
16	StorageTemperature	-20~70	℃
17	Polarizer Type	AG: Anti Glare (2H,3H) HC: Hard Coating	

2. MECHANICAL SPECIFICATION



3. PIN DESCRIPTION

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

No.	Symbol	Function	Remark
1	A	Power for LED backlight (Anode)	
2	A	Power for LED backlight (Anode)	
3	K	Power for LED backlight (Cathode)	
4	K	Power for LED backlight (Cathode)	
5	GND	Power ground	
6	VCOM	Common voltage	
7	VDD	Digital Power	
8	MODE	DE/SYNC mode select. Normally pull high	Note1
9	DE	Data Input Enable	
10	VS	Vertical sync input. Negative polarity	
11	HS	Horizontal sync input. Negative polarity	
12	B7	Blue data(MSB)	
13	B6	Blue data	
14	B5	Blue data	
15	B4	Blue data	
16	B3	Blue data	
17	B2	Blue data	
18	B1	Blue data	
19	B0	Blue data(LSB)	
20	G7	Green data(MSB)	
21	G6	Green data	
22	G5	Green data	
23	G4	Green data	
24	G3	Green data	
25	G2	Green data	
26	G1	Green data	
27	G0	Green data(LSB)	
28	R7	Red data(MSB)	
29	R6	Red data	
30	R5	Red data	
31	R4	Red data	
32	R3	Red data	
33	R2	Red data	
34	R1	Red data	
35	R0	Red data(LSB)	
36	GND	Power Ground	
37	DCLK	Clock input	
38	GND	Power Ground	

39	L/R	Left or Right Display Control	Note2
40	UPDN	Up / Down Display Control	Note3
41	VGH	Positive Power for TFT	
42	VGL	Negative Power for TFT	
43	AVDD	Analog Power	
44	RESET	Global reset pin.	Note4
45	NC	No connection	
46	VCOM	Common Voltage	
47	DITH	Dithering setting	Note5
48	GND	Power Ground	
49	NC	No connection	
50	NC	No connection	

Note1: DE/SYNC mode select .normally pull high
H:DE mode
L:HS/VS mode

Note2: Source right or left sequence control.
L/R="L",shift left:last data=S1<-S2…S1200=first data
L/R="H",shift right:first data=S1->SS2…S1200=last data

Note3: gate up or down scan control.
U/D="L" , down shift : G1->G2…->G480 ;
U/D="H", up shift: G1<-G2…<-G480

Note4: Global reset pin. Active low to enter reset state.
Suggest to connecting with an RC reset circuit for stability.Normally pull high.

Note5: Dithering setting: DITH="L" 8bit resolution (default setting)
DITH="H" 6bit resolution (last 2 bits of input data truncated)

4. ELECTRICAL CHARACTERISTICS

4.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Digital Supply Voltage	VDD	-0.3	5	V	
Analog Supply Voltage	AVDD	-0.5	15	V	
Gate On Voltage	VGH	-0.3	40	V	
Gate Off Voltage	VGL	-20	0.3	V	
Gate On-Gate Off Voltage	VGH-VGL	12	40	V	

4.2 TFT LCD MODULE

4.2.1 Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
TFT Gate on voltage	VGH	17	18	19	V	
TFT Gate off voltage	VGL	-7	-6	-5	V	
TFT Common electrode voltage	VCOM	3.2	3.4	3.6	V	
Analog power supply voltage	AVDD	9.4	9.6	9.8	V	

4.2.2 Current Consumption

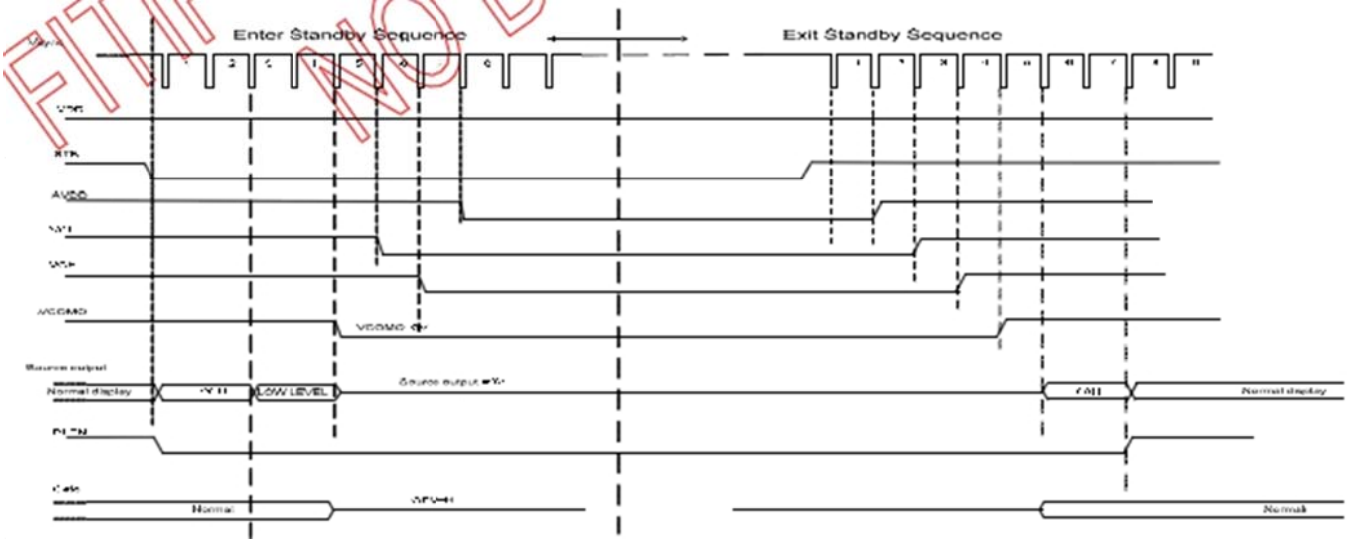
Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Gate on power Current	IVGH	VGH =18 V	-	0.5	1	mA	
Gate off power current	IVGL	VGL= -6V	-	1	2	mA	
Digital power current	IVDD	VDD = 3.3V	-	30	45	mA	
Analog power current	IAVDD	AVDD =9.6V	-	35	45	mA	

4.3POWER ON/OFF SEQUENCE

In order to prevent IC from power on reset fail, the rising time (TPOR) of the digital power supply VDD should be maintained within the given specifications. Refer to “ AC Characteristics” for more detail on timing.

4.3.1 POWER-ON/OFF TIMING SEQUENCE

Power On/Off timing chart



Enter and Exit Standby Mode timing chart

Note: Low level=3Fh,when NBW=L(Normally white)

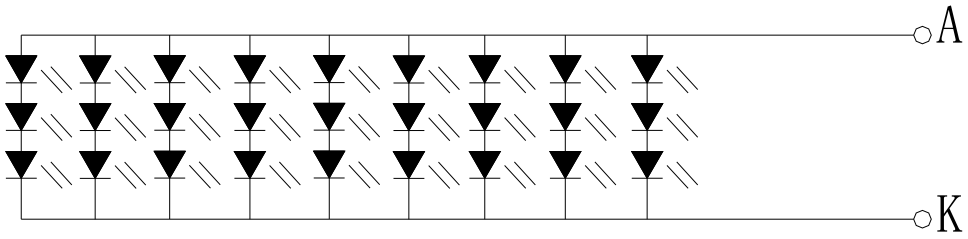
Low level=00h,when NBW=H(Normally black)

4.4 BACK LIGHT UNIT

Ta=25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	ILED	-	180	-	mA	27LEDS
Forward voltage	VF	8.4	9.0	9.6	V	IF=180mA 27LEDS
Reverse current	IR	-	-	50	μA	VR=3V,1LED
Power dissipation	Pd	1890			mW	27LEDS
Peak forward current	IFP	20			mA	1LED
Reverse Voltage	VR	3			V	1LED

4.4.1Internal Circuit Diagram



3X9=27LED 9.0V 20mAX9=180mA

5. TIMING CHARACTERISTICS OF INPUT SIGNALS

5.1 PARALLEL RGB INPUT TIMING TABLE

5.1.1DE MODE

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	40.8	51.2	67.2	MHz
Horizontal Display Area	thd		1024		DCLK
HSD Period	th	1114	1344	1400	DCLK
HSD Blanking	thb+ thfp	90	320	376	DCLK
Vertical Display Area	tvd		600		T_H
VSD Period	tv	610	635	800	T_H
VSD Blanking	tvbp+ tvfp	10	35	200	T_H

5.1.2HV MODE

Horizontal Timing

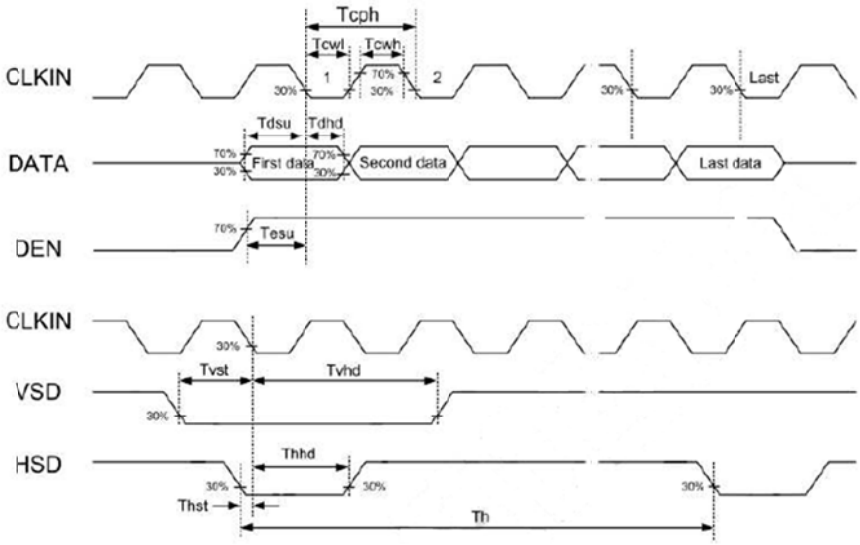
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	44.9	51.2	63	MHz
Horizontal Display Area	thd		1024		DCLK
HS Period	th	1200	1344	1400	DCLK
HS Pulse Width	thpw	1	-	140	DCLK
HS Back Porch	thbp		160		DCLK
HS Front Porch	thfp	16	160	216	DCLK

Vertical Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd		600		T_H
VS Period	tv	624	635	750	T_H
VS Pulse Width	tvpw	1	-	20	T_H
S Back Porch	tvbp		23		T_H
VS Front Porch	tvfp	1	12	127	T_H

5.2 Input Clock and Data Timing Diagram

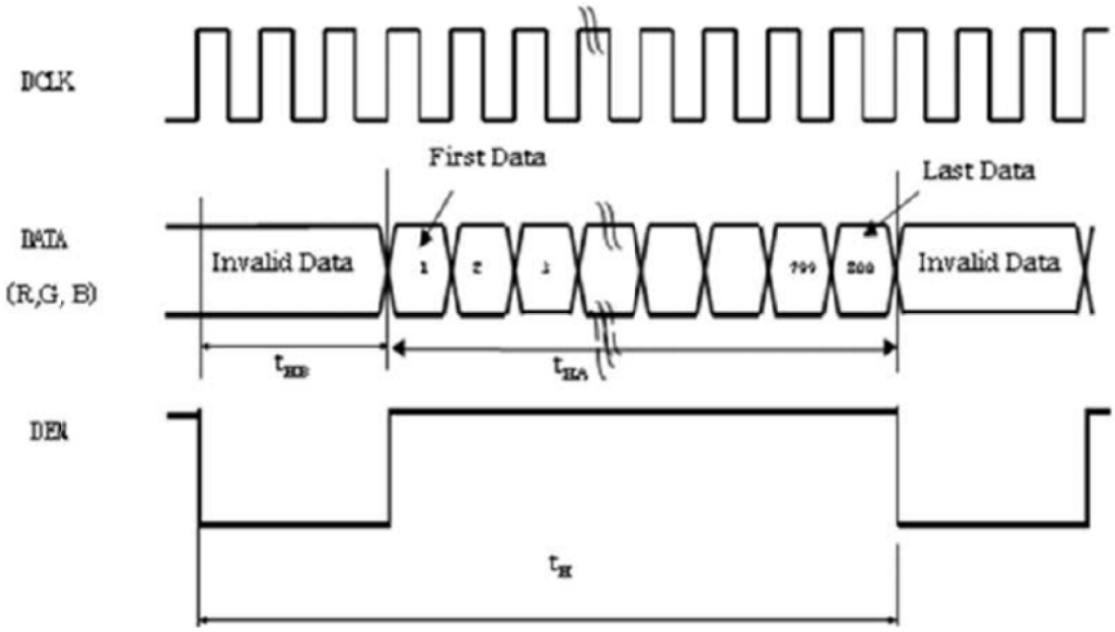
Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
DVDD Power On Slew Rate	TPOR	-	-	20	ms	From 0V to 90% DVDD
RSTB Pulse Width	TRst	50	-	-	us	DCLK=65MHz
DCLK Cycle Time	Tcph	14	-	-	ns	
DCLK Pulse Duty	Tcwh	40	50	60	%	
VSD Setup Time	Tvst	5	-	-	ns	
VSD Hold Time	Tvhd	5	-	-	ns	
HSD Setup Time	Thst	5	-	-	ns	
HSD Hold Time	Thhd	5	-	-	ns	
Data Setup Time	Tdsu	5	-	-	ns	D0[7:0],D1[7:0],D2[7:0] to DCLK
Data Hold Time	Tdhd	5	-	-	ns	D0[7:0],D1[7:0],D2[7:0] to DCLK
DEN Setup Time	Tesu	5	-	-	ns	
DEN Hold Time	Tehd	5	-	-	ns	



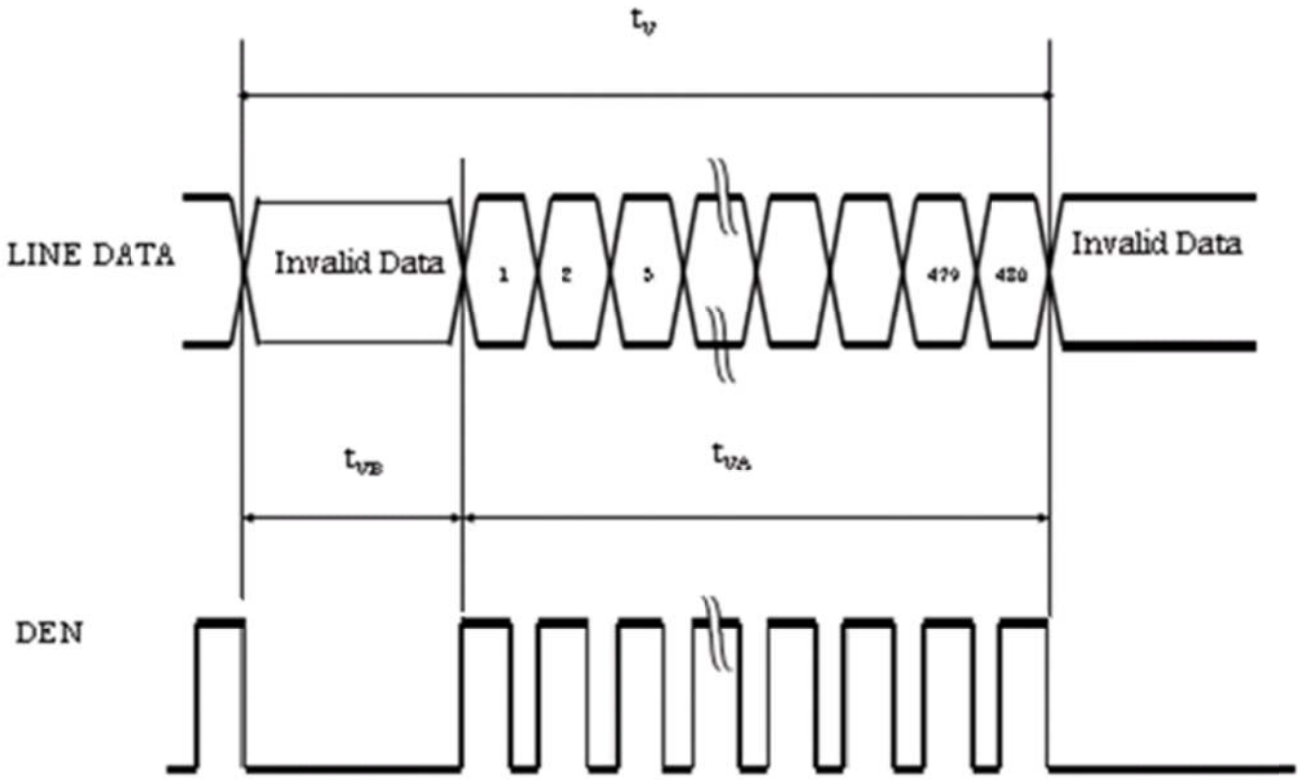
6. TIMING SEQUENCE(TIMING CHART)

6.1 DE MODE

Horizontal timing：

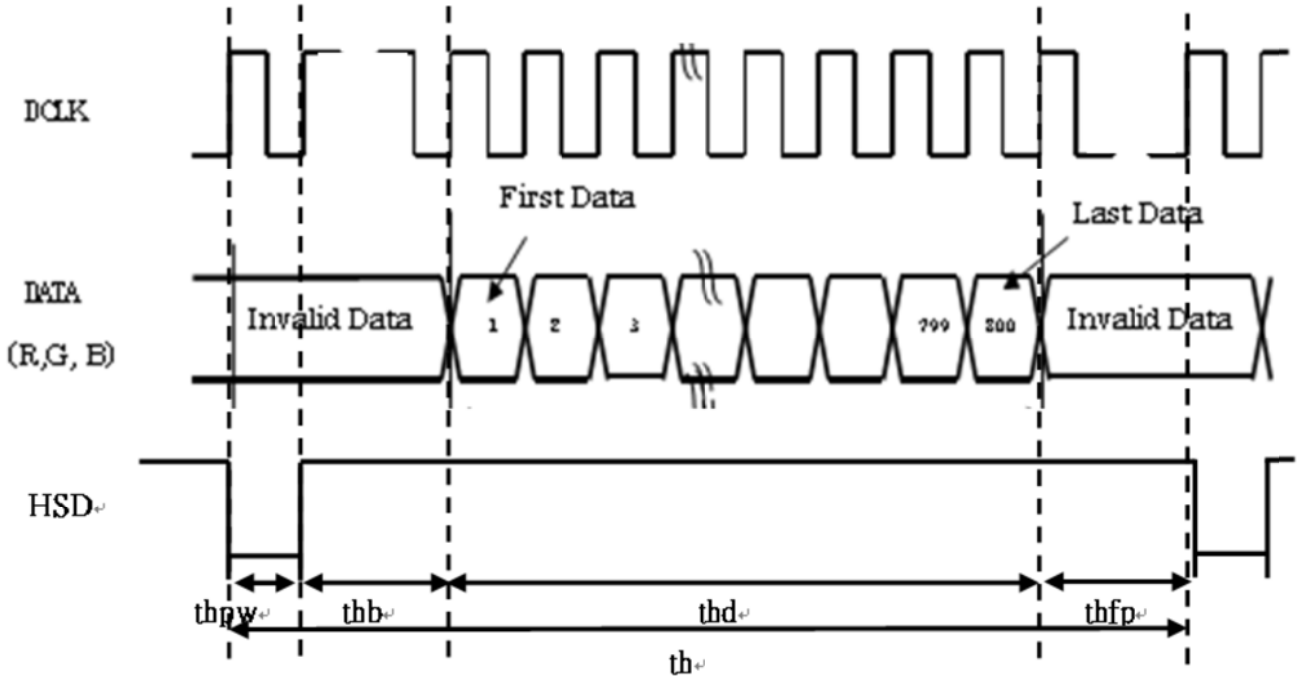


Vertical timing：

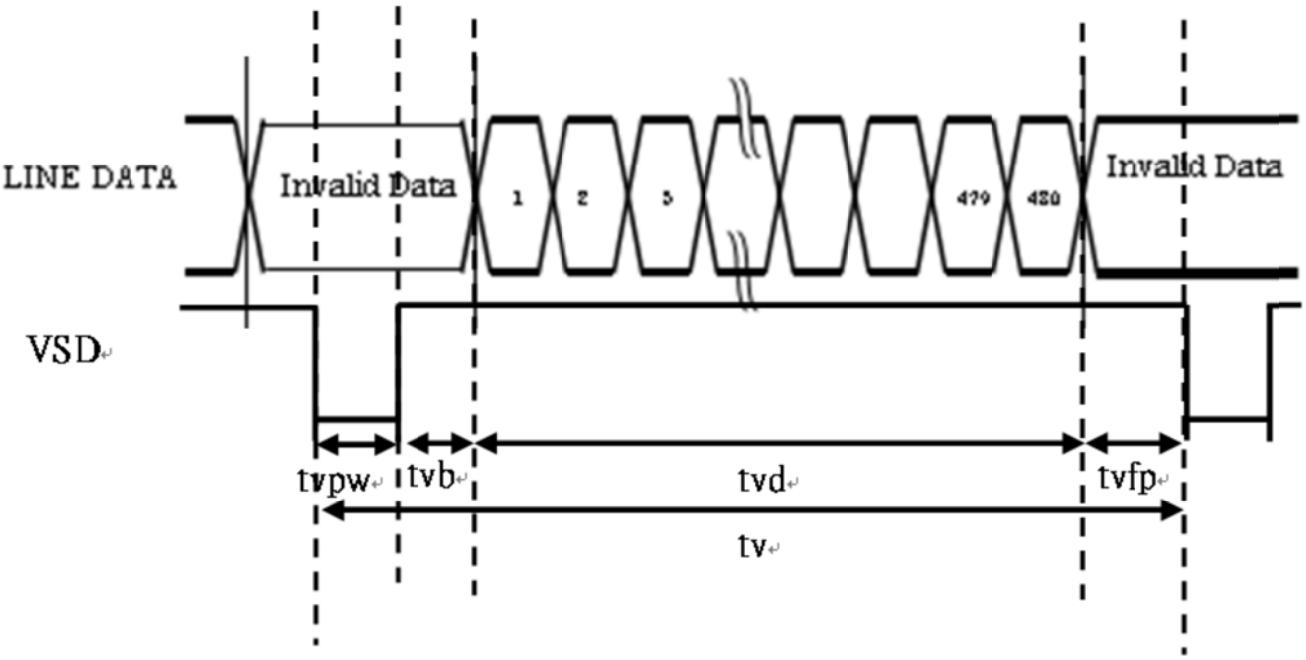


6.2 SYNC MODE

Horizontal timing：

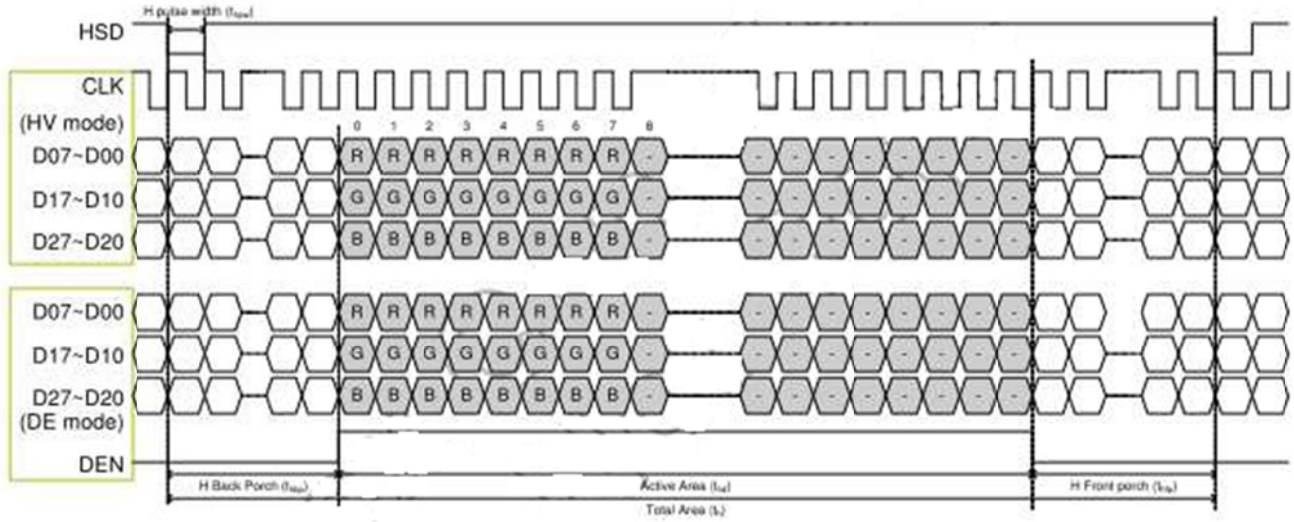


Vertical timing：

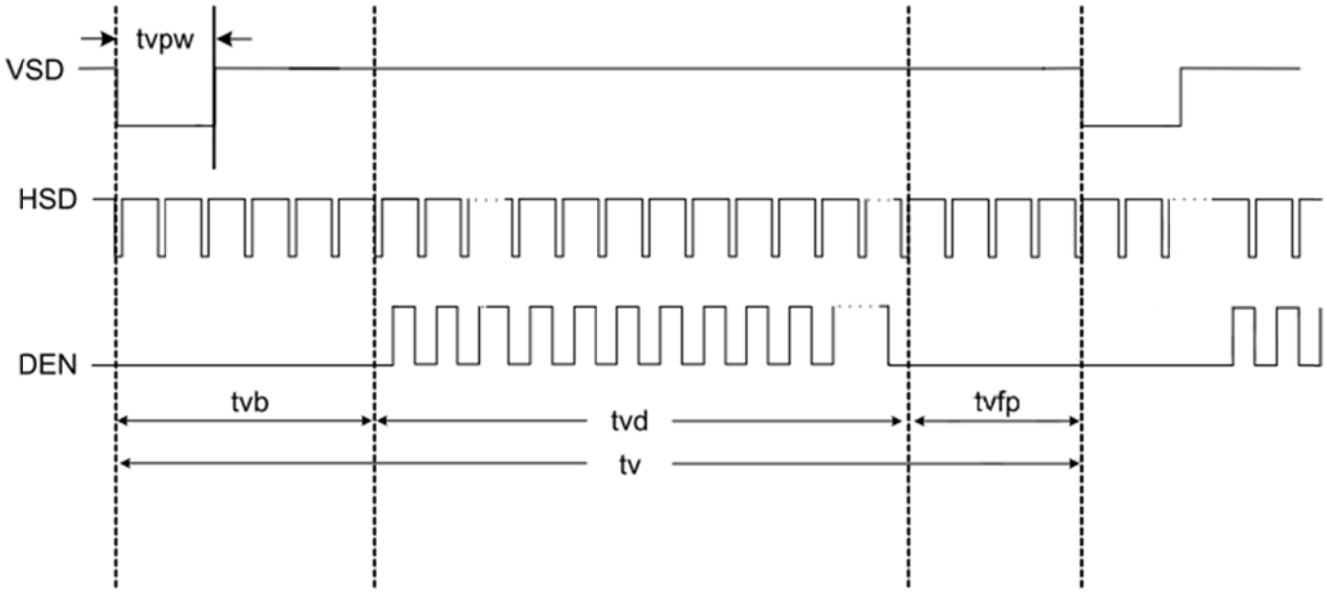


6.3 DATA INPUT FORMAT

Horizontal timing：



Vertical timing：

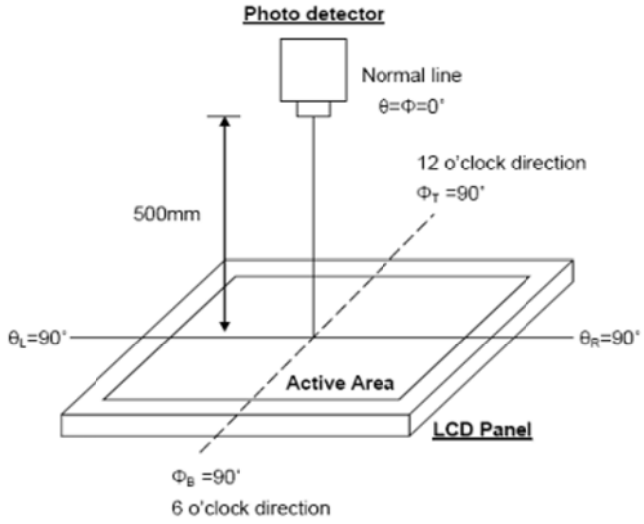


7.OPTICAL CHARACTERISTICS

Ta=25℃±2

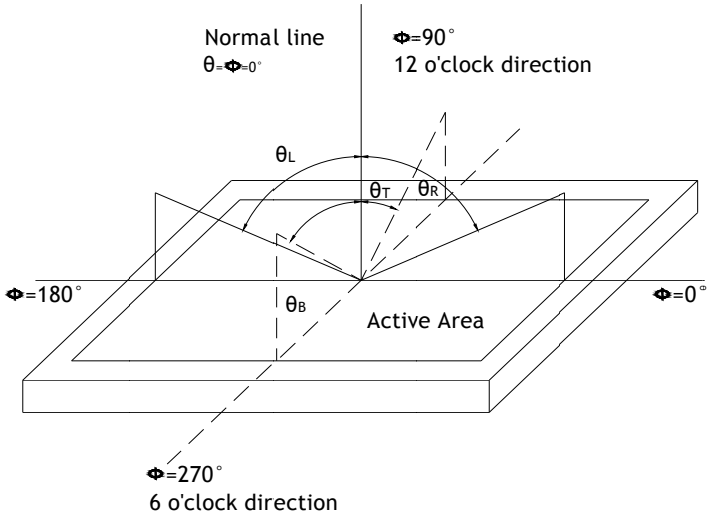
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	Θ = 0°	600	800	-		Note1 Note4
Luminance		YL		250	300	-	cd/m2	Note1 Note6 Note7
Luminance Uniformity		IV-M		70	75		%	
Response Time (Rising + Falling)		TRT	Ta= 25℃ Θ = 0°	-	25	40	ms	Note1 Note3
Viewing Angle range	Horizontal	ΘL	CR > 10	75	80	-		Note2
		ΘR		75	80	-		
	Vertical	ΘU		75	80	-		
		ΘD		75	80	-		
Color Chromaticity	White	x		0.230	0.280	0.330		Note1 Note5 Note7
		y		0.260	0.310	0.360		
	Red	x		0.557	0.607	0.657		
		y		0.274	0.324	0.374		
	Green	x		0.266	0.316	0.366		
		y		0.528	0.578	0.628		
	Blue	x		0.092	0.142	0.192		
		y		0.044	0.094	0.144		
NTSC				45	50		%	

Note1: Definition of optical measurement system
The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm , other items are measured by Photo detector TOPCON BM-7 Field of view: 1° /Height: 500mm.)



Note2: Definition of viewing angle range and measurement system

Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).



Note3: 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%.

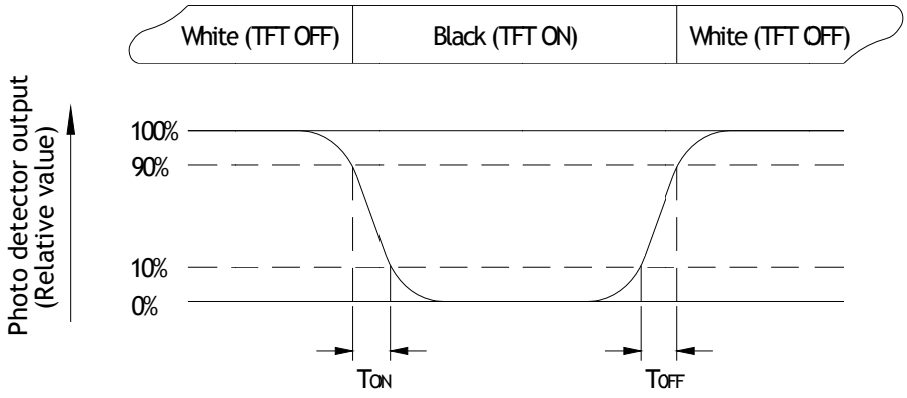


Fig. 6-3 Definition of response time

Note4: Definition of contrast ratio

$$\text{Contrast ratio(CR)}=\frac{\text{Luminance measured when LCD on the Whitestate}}{\text{Luminance measured when LCD on the Blackstate}}$$

"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.

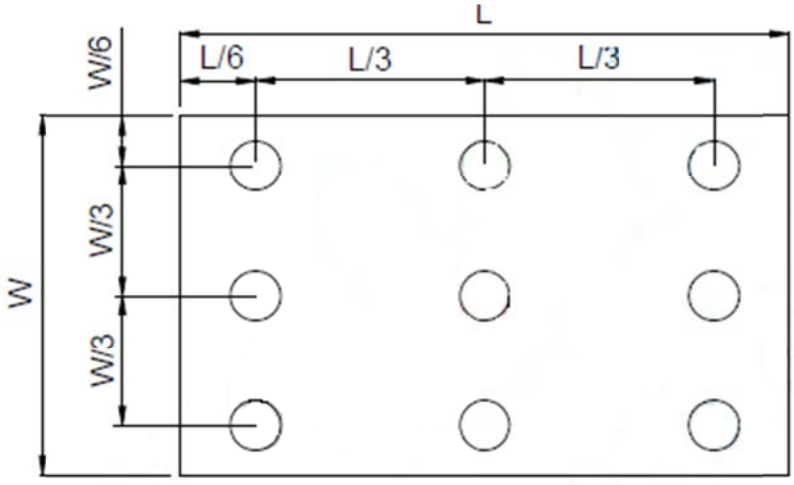
Note5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.

Note6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is IL=140mA.

Note7: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas.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



Bmax: The measured maximum luminance of all measurement position.
Bmin: The measured minimum luminance of all measurement position.

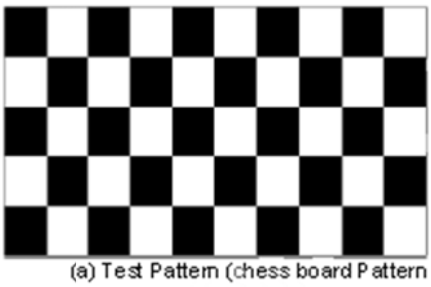
8.RELIABILITY TEST ITEMS

8.1 TEMPERATURE AND HUMIDITY

Test Item	Test Condition	Remark
High Temperature Storage	Ta=55℃; 72hrs	IEC60068-2-1：2007 GB2423.2-2008
Low Temperature Storage	Ta=-15℃; 72hrs	IEC60068-2-1：2007 GB2423.1-2008
High Temperature Operation	Ta=50℃; 72hrs	IEC60068-2-1：2007 GB2423.2-2008
Low Temperature Operation	Ta=-10℃; 72hrs	IEC60068-2-1：2007 GB2423.1-2008
High Temperature High Humidity Operation	Ta=45℃，90%RH，72Hrs(no condensation)	IEC60068-2-78：2001 GB/T2423.3-2006
Thermal Shock	-15℃(0.5h) ~ 55℃(0.5h) / 10cycles	Start with cold temperature，End with high temperature，IEC60068-2-14:1984,GB2423.22-2002
Image Sticking	25℃；2hrs	Note1

Note1:Condition of image sticking test :25°C±2°C

Operation with test pattern sustained for 2hrs,then change to gray pattern immediately.after5 mins,themura must be disappeared completely



(a) Test Pattern (chess board Pattern)

(b) Gray Pattern

8.2 VIBRATION&SHOCK

Test item	Conditions	Remark
Packing Shock (non-operation)	980m/s2,6ms, ±x,y,z 3times for direction	IEC60068-2-27：1987 GB/T2423.5-1995
Packing Vibration (non-operation)	Frequency range:10 HZ~50HZ Stroke:1.0mm,sweep:10 HZ ~50HZ x,y,z 2 hours for each direction	IEC60068-2-32：1990 GB/T2423.8-1995

8.3ESD

Test item	Conditions	Remark	
Electro Static Discharge Test (non-operation)	150pF，330Ω，Contact:±4KV,Air:±8KV	1	IEC61000-4-2：2001 GB/T17626.2-2006
	200pF，0Ω，±200V contact test	2	

Note: Measure point :

1. LCD glass and metal bezel
2. IF connector pins

9. General Precaution

9.1 Safety

1. Do not swallow any liquid crystal, even if there is no proof that liquid crystal ispoisonous.
2. If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
3. If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

9.2 Storage Conditions

1. Store the panel or module in a dark place where the temperature is 23±5°C andThehumidity is below 50±20%RH.
2. Store in anti-static electricity container.
3. Store in clean environment, free from dust, active gas, and solvent.
4. Do not place the module near organics solvents or corrosive gases.
5. Do not crush, shake, or jolt the module.

9.3 Handling Precautions

(1) Avoid static electricity which can damage the CMOS LSI.
(2) The polarizing plate of the display is very fragile. So, please handle it verycarefully.
(3) Do not give external shock.
(4) Do not apply excessive force on the surface.
(5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch theSurface of plate.
(6) Do not use ketonics solvent & Aromatic solvent, use with a soft cloth soaked witha cleaning naphtha solvent.
(7) Do not operate it above the absolute maximum rating.
(8) Do not remove the panel or frame from the module.
(9)When the module is assembled, it should be attached to the system firmly,Be careful not to twist and bend the module.
(10)Wipe off water droplets or oil immediately. If you leave the droplets for a long time,staining and discoloration may occur.
(11) If the liquid crystal material leaks from the panel,it should be kept away from theeyes or mouthIn case of contact with hands,legs or clothes, it must be washedawaythoroughly with soap.

9.4 Warranty

(1)The period is within twelve months since the date of shipping out under normal using and storage conditions.
(2) Do not repaired or modified the LCM. It may cause function to lose efficacy, XianChuang does not warrant the LCM.
(3) All process and material comply ROHS.

10. PACKAGE DRAWING