LCD Module

Product Specification

☐ : **APPROVAL FOR SPECIFICATION**

For Customer：_____ ☐ : **APPROVAL FOR SAMPLE**

Module No.： TST101H-T01

For Customer's Acceptance ：

Approved by	Comment

Team Source Display ：

Presented by	Reviewed by	Organized by

RECORDS OF REVISION

DATE	REVISED NO.	REVISED DESCRIPTIONS	PREPARED	CHECKED	APPROVED
2011-7-20	V0	FIRST ISSUE			
2011-08-09	V0.1	ADD TP dwg to see P20			

CONTENTS

1. GENERAL SPECIFICATIONS

1-1 SCOPE:

TST101H-T01 is 10.1" color TFT-LCD(Thin Film Transistor Liquid Crystal Display) module (finish outer lead bonding) composed of LCD panel, driver ICs and the backlight.

The 10.1" screen produces 1024(*3)X600 resolution image. By applying R.G.B. input signal,full color images are displayed.

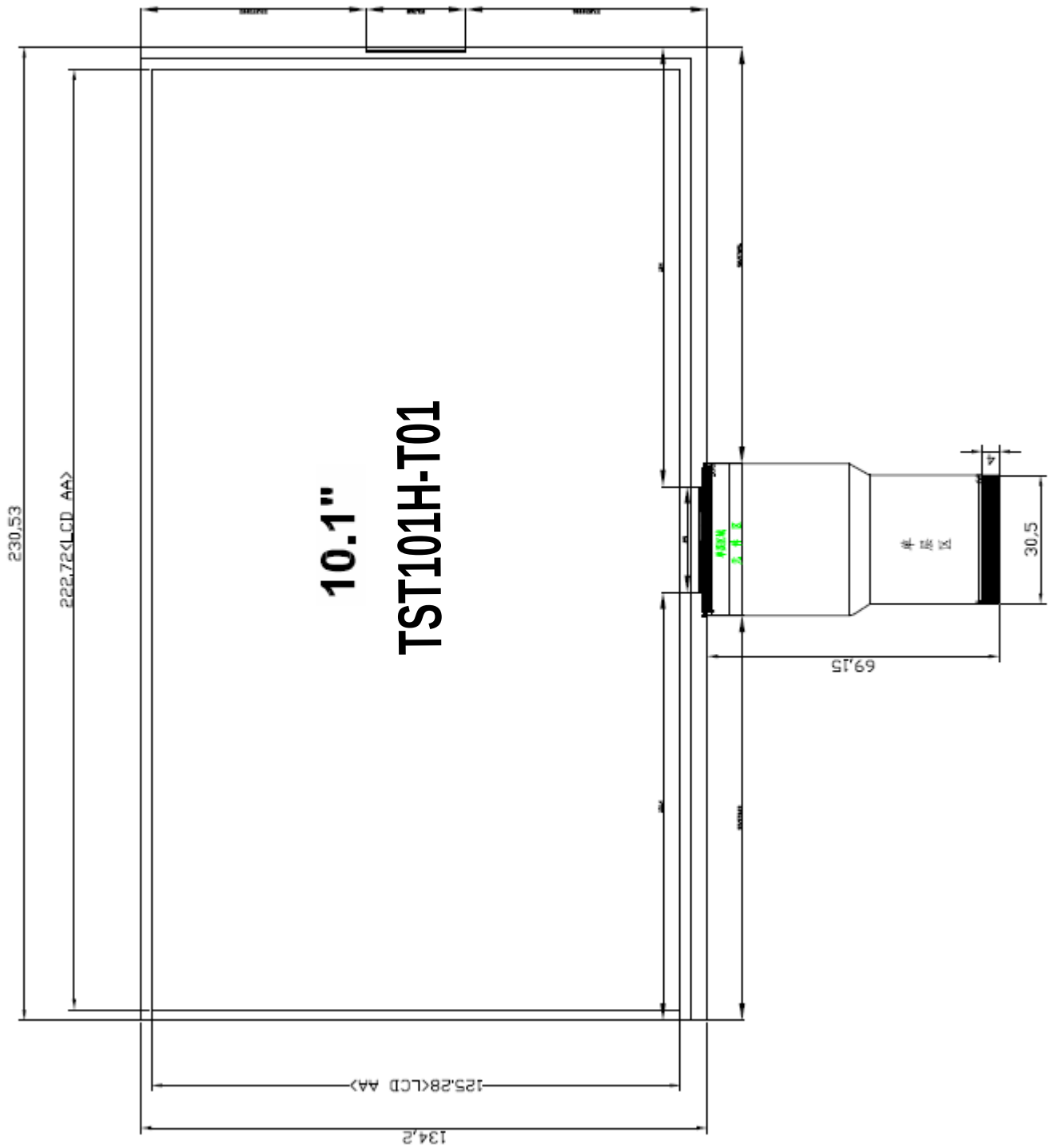
2. FEATURES

ITEM	SPECIFICATIONS
Part No.	TST101H-T01
SIZE	10.1“TFT
Display Type	16.2M TFT, Tramsmissive
Display Mode	Normally white
Driving IC	HX8282/HX8696
Interface connection	LVDS
Operating Temperature	-20℃ ～+70℃
Storage Temperature	-30℃ ～+80℃

3. MECHANICAL SPECIFICATIONS

ITEM	SPECIFICATIONS	UNIT
OUTLINE DIMEMSIONS	235.00(H)*143.00(V)*6.60(T) With TP	mm
ACTIVE AREA	222.78(H) × 125.28(V)	mm
NUMBER OF DOTS	1024(H) × 3(RGB) ×600(V)	---
ASSY. TYPE	COG+FPC+BL+TP	---
WEIGHT	TBD	g

4. OUTLINE DIMENSIONS



5. INTERFACE ASSIGNMENT

PIN NO	SYMBOL	DESCRIPTION
1	AGND	Analog ground
2	AVDD	Analog power
3	VDD	Digital power
4	GND	Digital ground
5	VCOM	Common voltage
6	VDD	Digital power
7	GND	Digital ground
8	V14	Gamma correction voltage reference
9	V13	Gamma correction voltage reference
10	V12	Gamma correction voltage reference
11	V11	Gamma correction voltage reference
12	V10	Gamma correction voltage reference
13	V9	Gamma correction voltage reference
14	V8	Gamma correction voltage reference
15	GND	Digital ground
16	VDD_LVDS	LVDS power
17	GND	Digital ground
18	PIND3	Positive LVDS differential data inputs
19	NIND3	Negative LVDS differential data inputs
20	GND	Digital ground
21	PINC	Positive LVDS differential clock inputs
22	NINC	Negative LVDS differential clock inputs
23	GND	Digital ground
24	PIND2	Positive LVDS differential data inputs
25	NIND2	Negative LVDS differential data inputs
26	GND	Digital ground
27	PIND1	Positive LVDS differential data inputs
28	NIND1	Negative LVDS differential data inputs
29	GND	Digital ground
30	PIND0	Positive LVDS differential data inputs
31	NIND0	Negative LVDS differential data inputs
32	GND	Digital ground
33	GND_LVDS	LVDS ground
34	GRB	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ，C=0.1μF)
35	STBYB	Standby mode, normally pull high STBYB=”1”, normal operation STBYB=”0”,timing control, source driver will turn off, all output are high-Z
36	SHLR	Left or right display control
37	VDD	Digital power
38	UPDN	Up / down display control
39	AGND	Analog ground
40	AVDD	Analog power
41	VCOM	Common voltage
42	DITH	Dithering function enable control. Normally pull low DITHER = “1”, Enable internal dithering function DITHER = “0”, Disable internal dithering function
43	GND	Digital ground
44	VDD	Digital Power

45	GND	Digital ground
46	V7	Gamma correction voltage reference
47	V6	Gamma correction voltage reference
48	V5	Gamma correction voltage reference
49	V4	Gamma correction voltage reference
50	V3	Gamma correction voltage reference
51	V2	Gamma correction voltage reference
52	V1	Gamma correction voltage reference
53	GND	Digital ground
54	VDD	Digital power
55	GND	Digital ground
56	VGH	Positive power for TFT
57	VDD	Digital power for Gate IC
58	VGL	Negative power for TFT
59	GND	Digital ground for Gate IC
60	NC	Not connect

6. TIMING/CHARACTERISTICS

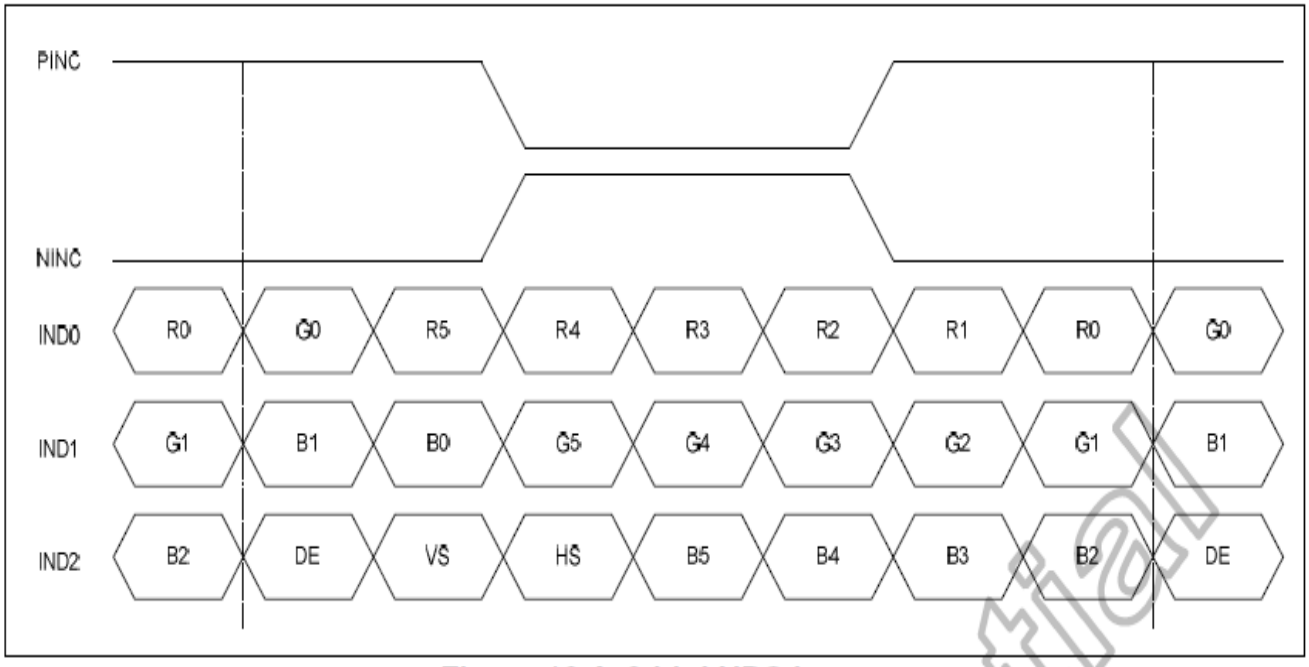


Figure 10.4: 6-bit LVDS input

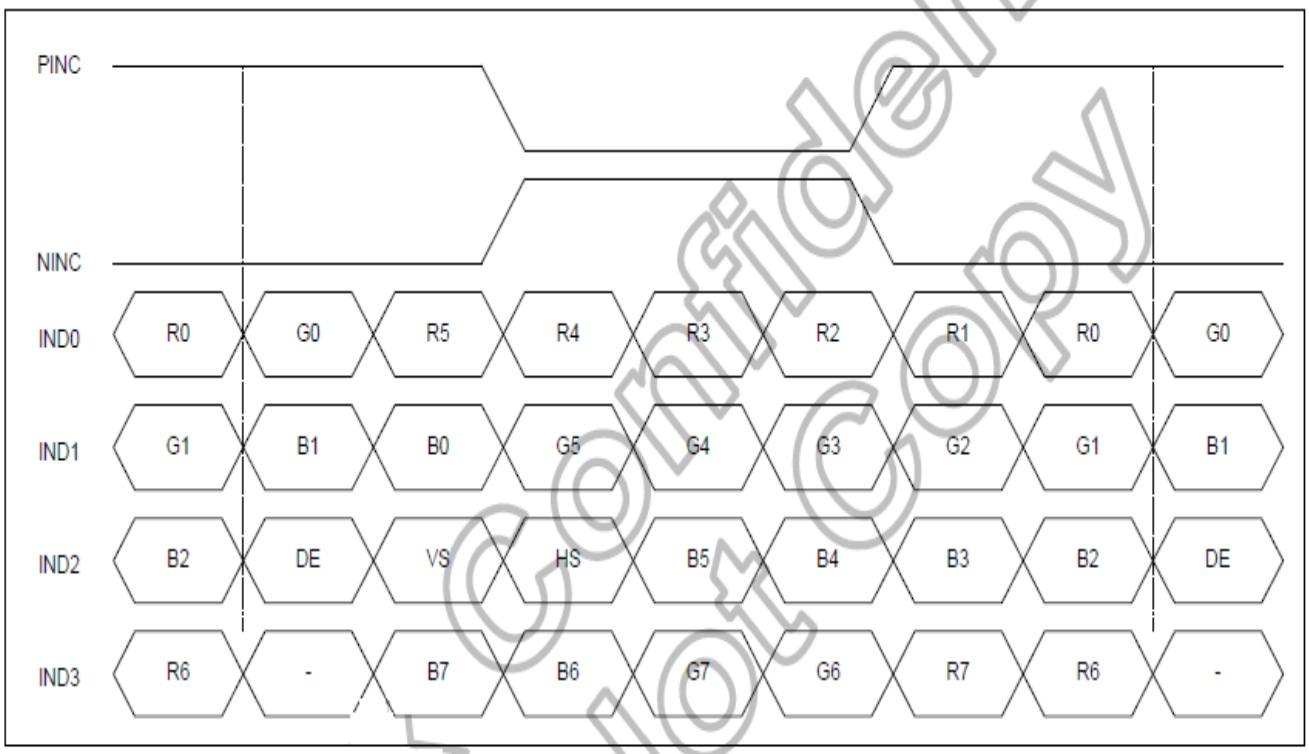
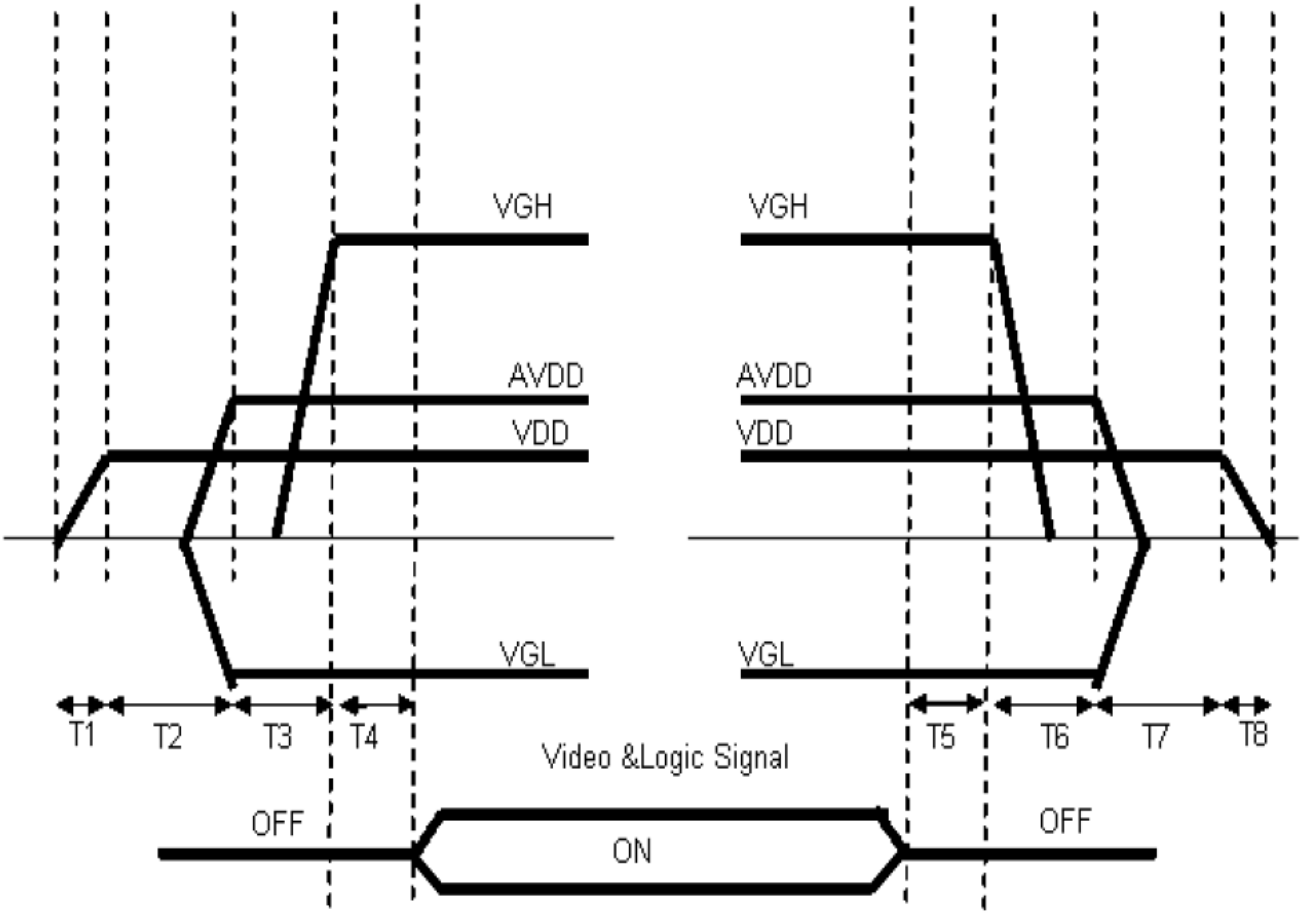


Figure 10.5: 8-bit LVDS Input

7. POWER ON/OFF SEQUENCE

Power On : VDD→AVDD/VGL →VGH →Video &Logic Signal
Power Off : Video &Logic Signal→ VGH→AVDD/VGL→VDD



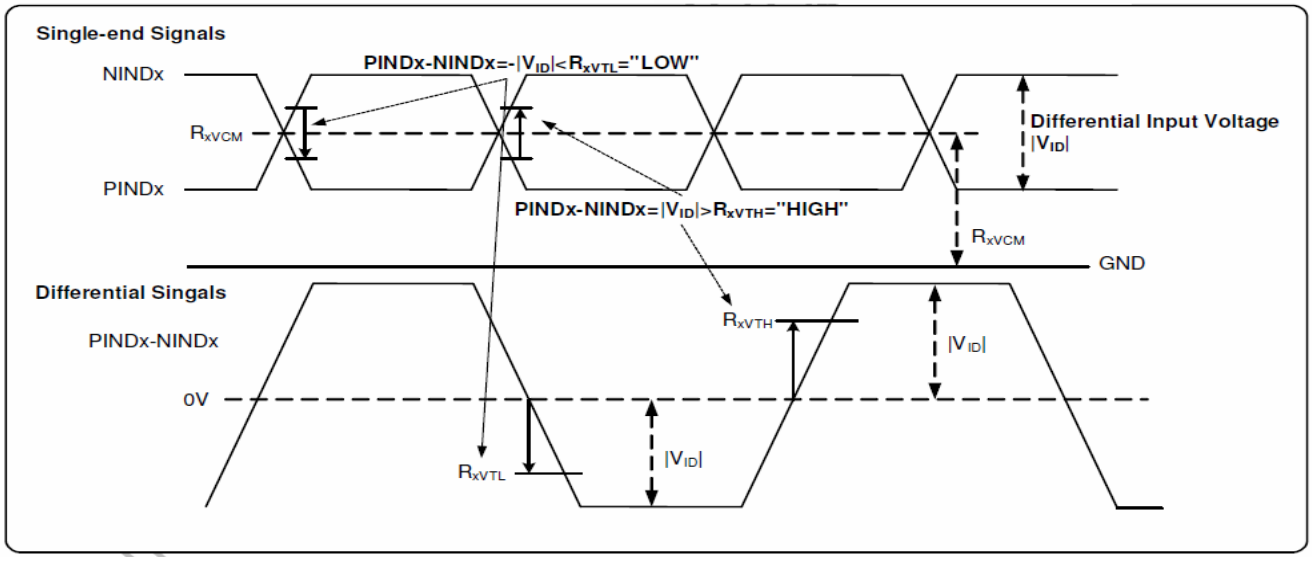
$0 < T1 \leqq 10ms$
$20ms < T2$
$10ms < T3$
$0 < T4 \leqq 10ms$

$0 < T5 \leqq 10ms$
$0 < T6$
$0 < T7$
$0 < T8$

8. ELECTRICAL CHARACTERISTICS

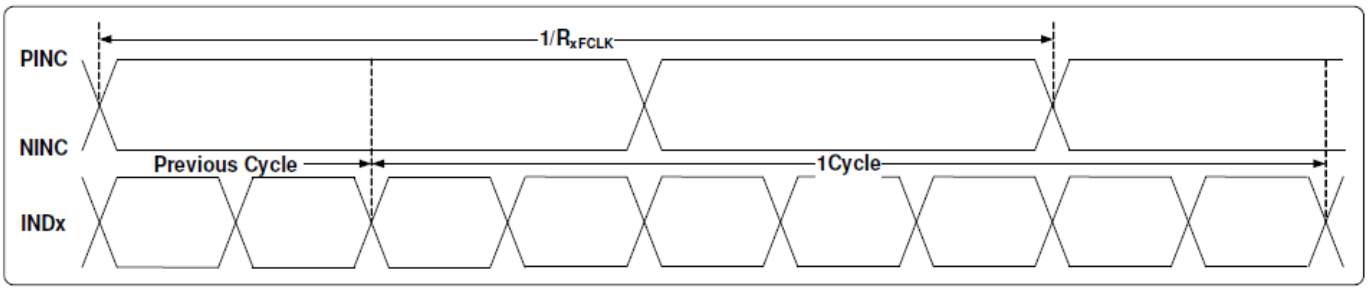
Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R_{XVTH}	-	-	+0.1	V	R_{XVCM}=1.2V
Differential input low threshold voltage	R_{XVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{XVIN}	0	-	VDD-1.2+ $\|V_{ID}\|/2$	V	-
Differential input common Mode voltage	R_{XVCM}	$\|V_{ID}\|/2$	-	VDD-1.2	V	-
Differential input voltage	$\|V_{ID}\|$	0.2	-	0.6	V	-
Differential input leakage Current	RV_{Xliz}	-10	-	+10	μA	-
LVDS Digital Operating Current	Iddlvds	-	15	30	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	Istlvds	-	10	50	μA	Clock & all Functions are stopped

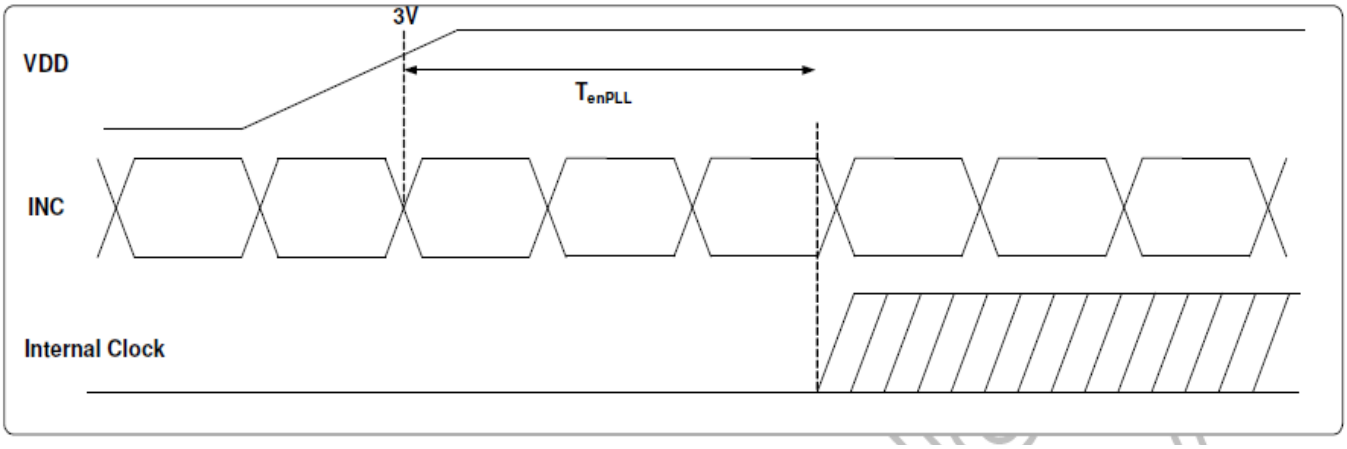
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Digital Power Supply Voltage For LCD	VDD VDD_LVDS	3	3.3	3.6	V	
Logic Input Voltage (LVDS:IN+,IN-)	VCM	$\frac{\|VID\|}{2}$	-	$2.4-\frac{\|VID\|}{2}$	V	Note1
	$\|VID\|$	200	-	600	mV	Note1
	VTH	-	-	100	mV	VCM=1.2V Note1
	VTL	-100	-	-	mV	
Analog Power Supply Voltage	AVDD	TBD	9.6	TBD	V	
Gate On Power Supply Voltage	VGH	17	18	19	V	
Gate Off Power Supply Voltage	VGL	-6.6	-6	-5.4	V	
Common Power Supply Voltage	VCOM		TBD		V	Note2



Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Base drive current for PWM	IDRV	-	-	60	mA	R_{XVCM} =1.2V
DRV output voltage for PWM	VDRV	0	-	VDD	V	
Feed back voltage for PWM	VFB	0.55	0.6	0.65	V	-
Duty cycle maximum	Dmax	-	-	85	%	-
VCOM buffer input voltage	VCOMI	1	-	AVDD	V	-
VCOM buffer output voltage	VCOMO	VCOMI-0.2	VCOMI	VCOMI+0.2	V	-
VCOM buffer output current	IVCOM	-	-	10	mA	Fclk=65MHz, VDD=3.3V

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
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* R_{XFCLK})	-	ns	-
Clock low time	T_{LVCL}	-	3/(7* R_{XFCLK})	-	ns	-
PLL wake-up time	T_{emPLL}	-	-	150	µs	-





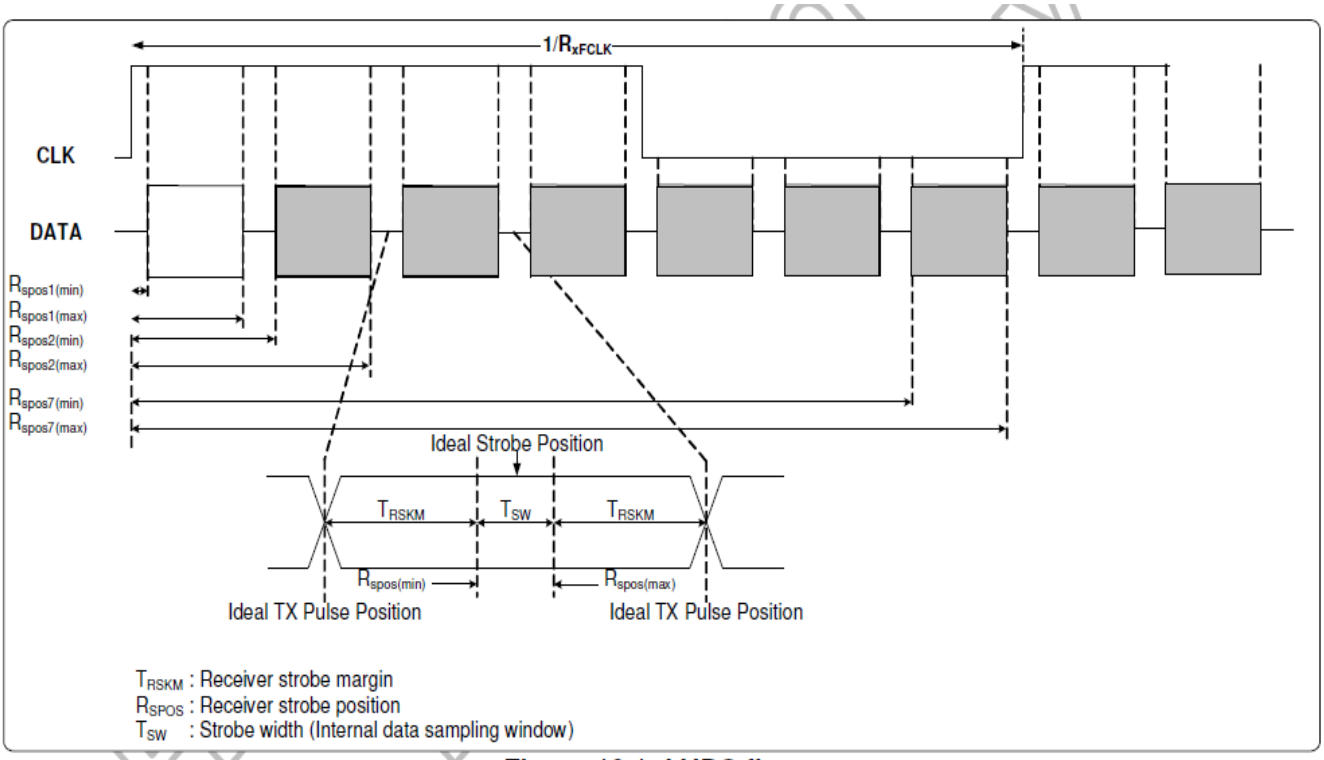


Figure 10.1: LVDS figure

Parameter	Symbol	Spec. Min.	Spec. Typ.	Spec. Max.	Unit	Condition
Modulation Frequency	SSC_{MF}	23	-	93	KHz	-
Modulation Rate	SSC_{MR}	-	-	±3	%	LVDS clock =71MHz center spread

9 LED BACKLIGHT

TO SEE P20

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Panel Transmittance		T	——	4.8	5.1	--	%	
Response Time		Tr +Tf	Point-5	--	25	35	ms	. 1
Viewing Angle	Horizontal	ϕ	Point-5 CR≧10	120	140	--	°	2
	Vertical	θ		100	120	--	°	2
Color Filter Chromacicity	White	x	θ = ϕ = 0°	0.273	0.313	0.353		3
		y		0.289	0.329	0.369		3
	Red	x	θ = ϕ = 0°	(0.562)	(0.602)	(0.642)		3
		y		(0.297)	(0.337)	(0.377)		3
	Green	x	θ = ϕ = 0°	(0.309)	(0.349)	(0.389)		3
		y		(0.547)	(0.587)	(0.627)		3
	Blue	x	θ = ϕ = 0°	(0.123)	(0.163)	(0.203)		3
		y		(0.074)	(0.114)	(0.154)		3

Note 1: Definition of Response Time.(White-Black)
The response time is defined as the time interval between the 10% and 90% amplitudes.

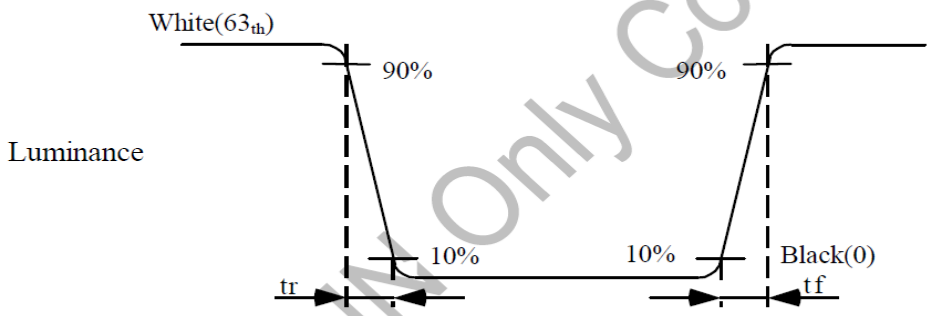


Fig. 6-1 Measuring point

Note 2: Definition of Viewing Angle(θ,ψ)

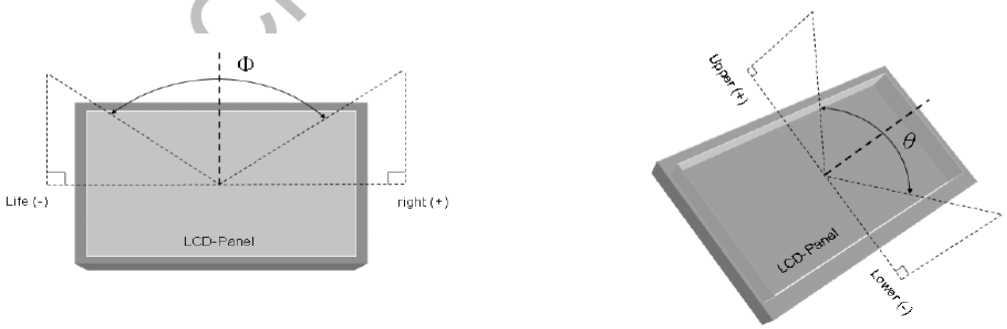


Fig.6-2 Definition of Viewing Angle

Note 3: Under C light

11. ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Power supply voltage 1	VDD	-0.5	-	+3.96	V
Power supply voltage 2	AVDD	-0.5	-	+14.85	V
Logic Output Voltage	V_{OUT}	-0.5	-	+5.0	V
Input voltage	Vin	-0.5	-	AVDD+0.5	V
Operation temperature	T_{OPR}	-20	-	+85	℃
Storage temperature	T_{STG}	-55	-	+125	℃

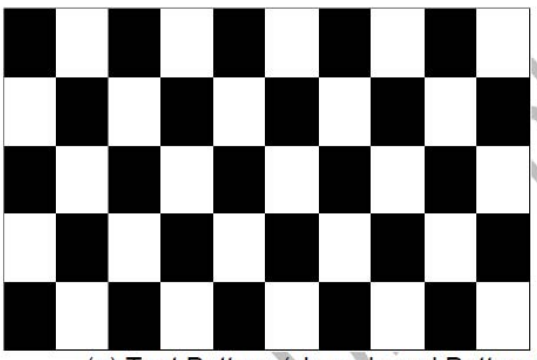
Note: (1) All of the voltages listed above are with respective to GND=0V.
(2) Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

Table 9.1: Absolute maximum rating

12. RELIABILITY TEST

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	70℃ ; 240hrs	
High Temperature Storage	80℃ ; 240hrs	
High Temperature High Humidity Operation	60℃ ; 90%RH ; 240hrs (No condensation)	
Low Temperature Operation	-20℃ ; 240hrs	
Low Temperature Storage	-30℃ ; 240hrs	
Thermal Shock	–30℃(0.5hr) ~ 80℃(0.5hr) ; 200 Cycles	Non-Operating
Image Sticking	25℃ ; 4hrs	1

Note 1: Condition of Image Sticking test：25 ℃± 2 ℃
Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.
After 5 mins, the mura must be disappeared completely .



(a) Test Pattern (chess board Pattern)

(b) Gray Pattern

13. USING LCD MODULES

13-1 LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

(1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

(2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).

(3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.

(4) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, wipe gently with absorbent cotton or other soft material like chamois soaked in Isopropyl alcohol or Ethyl alcohol. Do not scrub hard to avoid damaging the display surface.

(5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

(6) Avoid contacting oil and fats.

(7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(8) Do not put or attach anything on the display area to avoid leaving marks on.

(9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).

(10) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(11) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

13-2 PRECAUTION FOR HANDING LCD MODULES

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

(1) Do not alter, modify or change the the shape of the tab on the metal frame.

(2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

(3) Do not damage or modify the pattern writing on the printed circuit board.

(4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

(5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

(6) Do not drop, bend or twist LCM. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(7) In order to avoid the cracking of the FPC,you should to pay attention to the area of FPC where the FPC was bent .the edge of coverlay;the area of surface of Ni-Au plating,the area of soldering land,the area of through hole.

13-3 ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

(1) Make certain that you are grounded when handing LCM. To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules. - Exposed area of the printed circuit board. - Terminal electrode sections.

(2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.

(3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.

(4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

(5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

(6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

13-4 PRECAUTIONS FOR OPERATION

(1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.

(2) Driving the LCD in the voltage above the limit shortens its life.

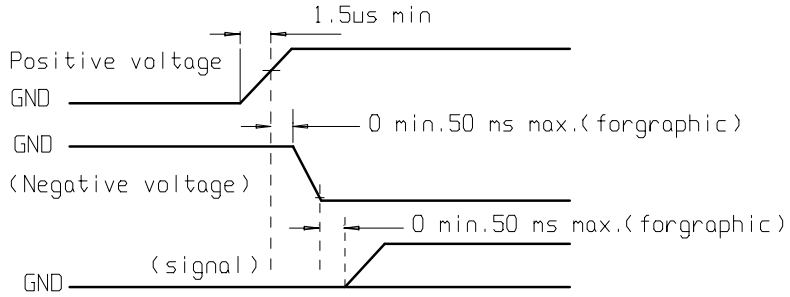
(3) If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

(4) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.

(5) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

(6) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.

(7) When turning the power on, input each signal after the positive/negative voltage becomes stable.



13-5 STORAGE

When storing LCDs as spares for some years, the following precaution are necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)

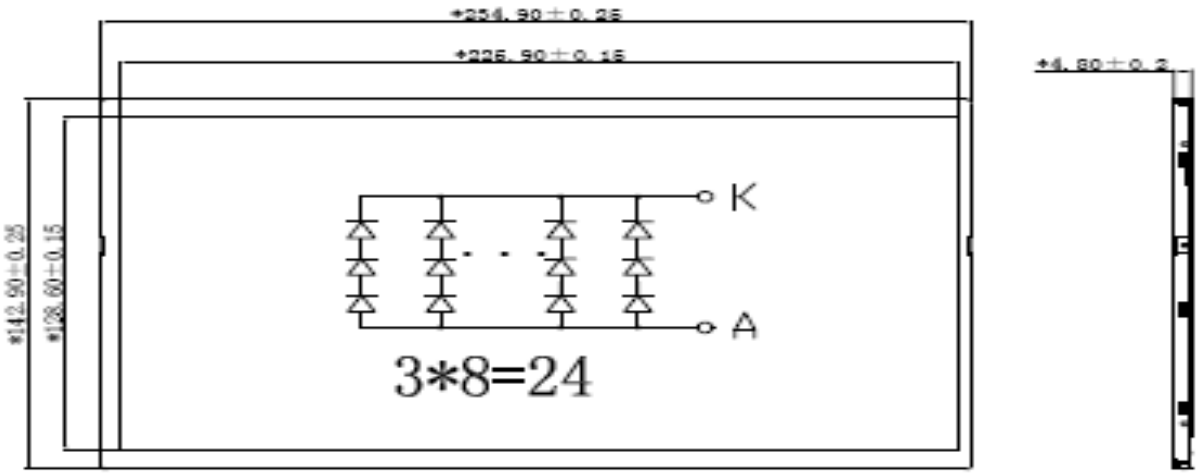
(4) Environmental conditions :

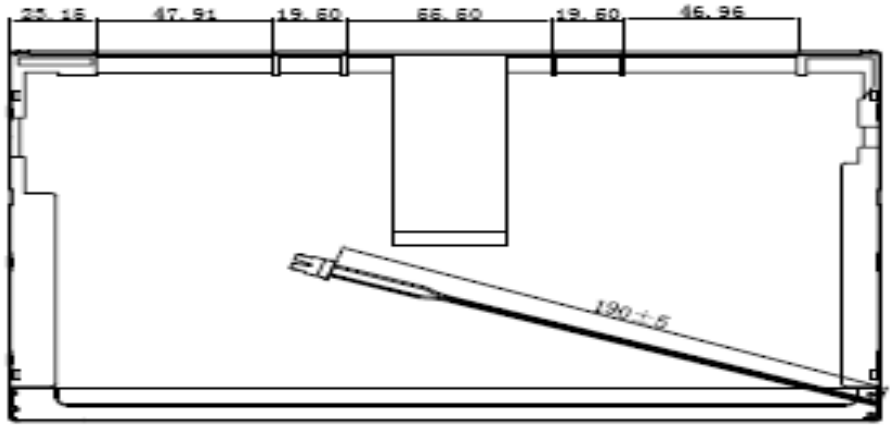
- Do not leave them for more than 160hrs. at 70°C.
- Should not be left for more than 48hrs. at -20°C.

13-6 SAFETY

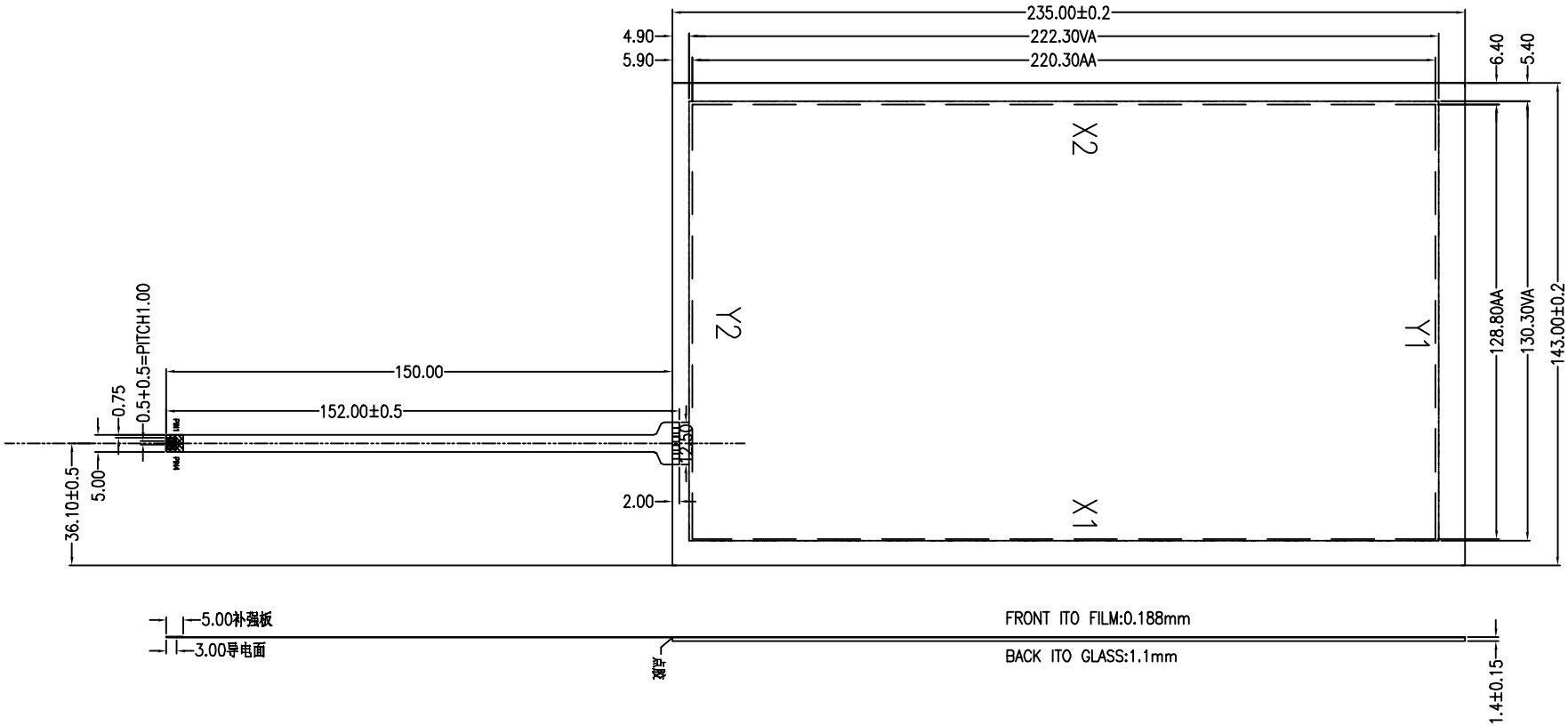
(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leakes out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

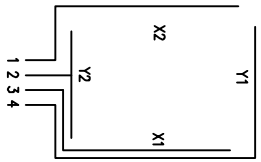




项 目 Item		符 号 Symbol	最小值 Min.	典型值 Typ.	最大值 Max.	单 位 Unit	测试条件 Condition
主屏 Main screen	亮度 Luminance	Lv	160	200	--	cd/m²	If=160mA (恒定电流测试)
	均匀性 Uniformity	Avg	75	--	--	%	
	色度坐标 Colour Coordinate	X	0.26	--	0.31		
		Y	0.26	--	0.31		
正向电压	Forward Voltage	Vf	9.0	9.4	10.2	V	
工作温度	Operating Temperature Range	Topr	-30	--	70	° C	
贮存温度	Storage Temperature Range	Tstg	-40		80	° C	



逻辑 ：



说明 ：

1.结构 ：film+glass+FPC
　film:雾面防刮伤⌒0.188mm⌣
　glass:500Ω/□ (1.1mm)
　tail:FPC (pitch=1.0mm)
　总厚度 ：1.4±0.15mm
2.工作电压 ：5.0V
3.电路等级 ：DC5V 1mA
4. 绝缘阻抗 ：≥20MΩ(25V DC)
5.线性 ：≤1.5%
6.透光率 ：≥80%
7.操作压力 ：10-100g
8.使用寿命 ：≥1,000,000次
9.工作环境 ：-10℃~+60℃ ’≤90%RH
10.储存环境 ：-20℃~+70℃ ’≤90%RH
11.未注尺寸公差按±0.20