Specification for Approval

Customer:_____

Model Name:_____

Supplier Approval			**Customer approval**
R&D Designed	R&D Approved	QC Approved	
Peter	*Peng Jun*		

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Document Revision History

Change No.	Date	Subject And Reason	Version No.	Responser
1	2019.07.23	New	01	

1.0   General Description

1.1 Introduction

AM-1024600-101E   is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel and a driving circuit.This TFT LCD has a 10.1 (16:9) inch diagonally measured active display area with (1024 horizontal by600 vertical pixe l) resolution.

1.2. Features

10.1 (16:9 diagonal) inch configuration
Compatible with NTSC & PAL system
Image Reversion: UP/DOWN and LEFT/RIGHT
ROHS design

1.3. General information

Item	Specification	Unit
Outline Dimension	235(H) x 143 (V) x4.5(D)	mm
Display area	222.72 (H) x125.28 (V)	mm
Number of Pixel	1024RGB (H) x 600(V)	pixels
Pixel pitch	0.2178 (H) x3(RGB) 0.2088 (V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white TN	
Color Filter Array	RGB vertical stripes	
Backlight	White LED	
Weight	TBD	g
Interface	LVDS（40pin）	
View direction	6:00 0" clock	
Luminous	450-500cd/m2	

2.0 Absolute Maximum Ratings

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	Topa	-10	60	℃	
Storage Temperature	Tstg	-20	70	℃	

2.3 Back-light Unit:

PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Note
LED Current	IF	–	160	175	mA	–	–
LED Voltage	VF	19	19.5	23.5	V	–	–
Life Time		–	20000	–	Hr.	I≦160mA	–
Color	White						

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2)Ta=25±2℃

(3)Test condition: LED Current 160mA
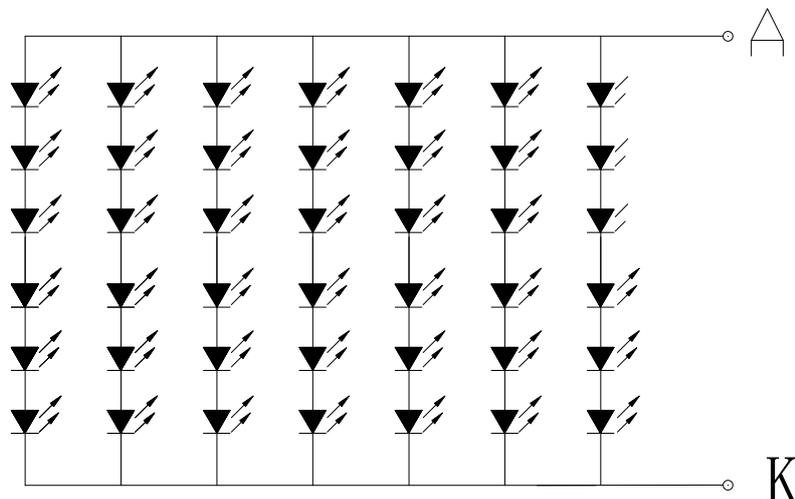
LED 电路图

3.0 Optical Characteristics

3.1 Optical Characteristics

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Transmittance (without Polarizer)		$T(\%)$		14.54	16.16	—	%	
Transmittance (with Polarizer)		$T(\%)$		4.84	5.37	—	%	Measuring with EWV Polarizer, Reference Only
Contrast Ratio		CR		400	500	—		(1)(2)
Response Time		Tr		—	4	8	msec	(1)(3)
		Tf		—	12	24		
Color Gamut		S		—	45	—	%	C light
Color Chromaticity (CIE1931)	Red	R_x	$\Theta=0$ Normal viewing angle	-0.05	0.605	+0.05		(1)(4) CF Glass C light
		R_Y			0.327			
	Green	G_x			0.288			
		G_Y			0.517			
	Blue	B_x			0.150			
		B_Y			0.145			
	White	W_x			0.302			
		W_y			0.323			
Viewing Angle (With PZ)	Hor.	Θ_L	CR>10	70	80	—		(1)(4)
		Θ_R		70	80	—		
	Ver.	Θ_U		60	70	—		
		Θ_D		70	80	—		
Optima View Direction			6 o'clock					(5)

3.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : 25±2℃
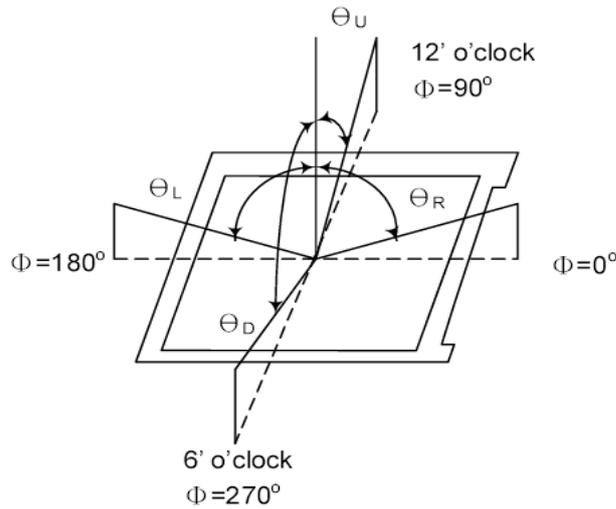- 30min. warm-up time.

3.3 Measuring Equipment

- TOPCON BM-7
- Measuring spot size : field 2°

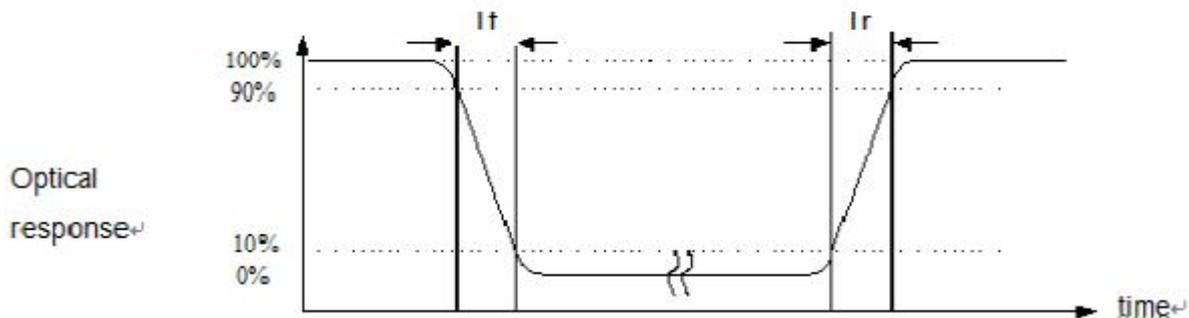**Note (1)** Definition of Vsat and Vth (at 20℃)
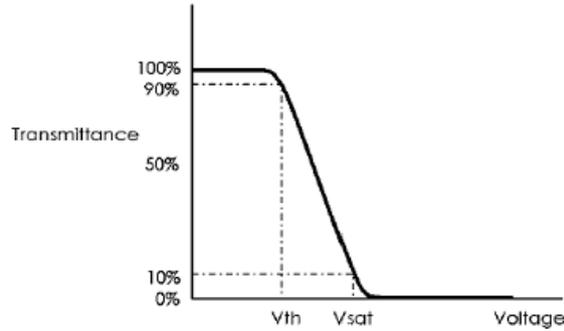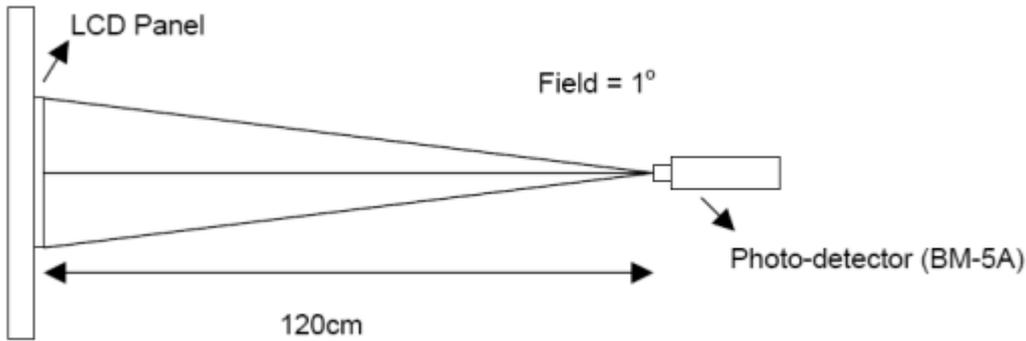

Note (2) Definition of Viewing Angle :

Note (3) Definition of Contrast Ratio(CR) :
measured at the center point of panel

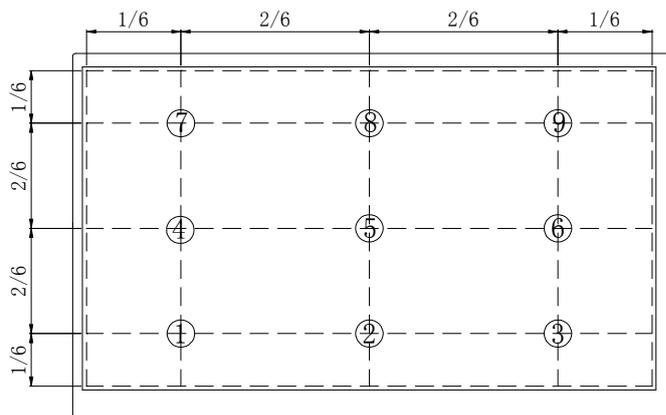$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (4) Definition of Response Time : Sum of T_R and T_F

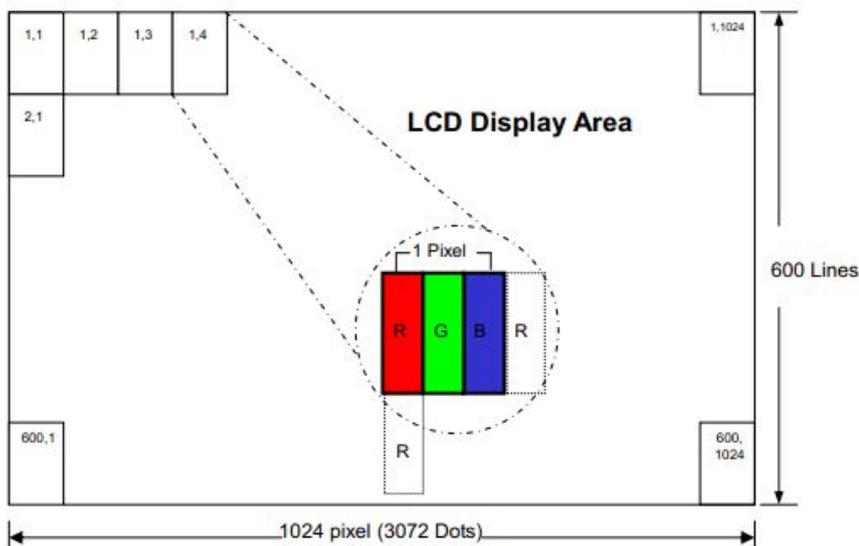**Note (5)** Definition of optical measurement setup

Note (6) Definition of brightness uniformity

Note (7) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.

4.0 PIXEL FORMAT

5.0 Interface Pin Connection

(Input signal): FPC Down Connector, (FH19SC-60S-0.5SH (HIROSE), 50pin, pitch = 0.5mm)

PIN NO	SYMBOL	DESCRIPTION
1	VCOM	VCOM buff in
2	VDD	Power supply 3.3V(Digital Power)
3	VDD	Power supply 3.3V(Digital Power)
4	NC	No connect
5	RESET	Reset signal 3.3V
6	STBYB	Standby mode 3.3V
7	GND	Ground
8	LVDS_D0N	LVDS_D0_Nare differential small amplitude signals
9	LVDS_D0P	LVDS_D0_Pare differential small amplitude signals
10	GND	Ground
11	LVDS_D1N	LVDS_D1_Nare differential small amplitude signals
12	LVDS_D1P	LVDS_D1_Pare differential small amplitude signals
13	GND	Ground
14	LVDS_D2N	LVDS_D2_Nare differential small amplitude signals
15	LVDS_D2P	LVDS_D2_Pare differential small amplitude signals
16	GND	Ground
17	LVDS_CLKN	LVDS _CLK_Nare differential small amplitude signals
18	LVDS_CLKP	LVDS _CLK_Pare differential small amplitude signals
19	GND	Ground
20	LVDS_D3N	LVDS _D3_Nare differential small amplitude signals
21	LVDS_D3P	LVDS _D3_Pare differential small amplitude signals
22	GND	Ground
23	NC	No connect
24	NC	No connect
25	GND	Ground
26	NC	No connect
27	NC	No connect
28	SELB	6bit/8bit mode select
29	AVDD	Power for Analog Circuit
30	GND	Ground
31	LED-	Power for LED backlight (Cathode)
32	LED-	Power for LED backlight (Cathode)
33	SHLR	Source Right or Left sequence control.
34	UPDN	Source UP or Down sequence control.
35	VGL	Gate Off Voltage 液晶翻转电压
36	NC	No connect
37	NC	No connect
38	VGH	Gate ON Voltage 液晶翻转电压
39	LED+	Power for LED backlight(Anode)
40	LED+	Power for LED backlight(Anode)

VCOM按照实际效果调

6. Electrical Characteristics

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V_{DD}	3.0	3.3	3.6	V	
	V_{GH}	14.55	15.0	15.45	V	
	V_{GL}	-7.35	-7	-6.65	V	
	AV_{DD}	9.8	10	10.2	V	
	VCOM	3.7	4.0	4.3	V	Note (1)
Video signal amplitude (VR,VG,VB)	V_{IA}	-	-	$AV_{DD} - 0.4$	V	
	V_{IAC}	-	-	-	V	AC component,
	V_{IDC}	-	$AV_{DD}/2$	-	V	DC component
VCOM	V_{CAC}		-	-	VP-P	AC component
	V_{CDC}	-	-	-	V	DC component, (1)
Input signal voltage	V_{IH}	$0.7DV_{DD}$	-	DV_{DD}	V	(2)
	V_{IL}	0	-	$0.3DV_{DD}$	V	(2)
Current of power supply	I_{DD}	-	22		mA	DV DD=3.3V
	I_{ADD}	-	26		mA	AV_{DD}=8.9V
	I_{GH}	-	0.36		uA	V_{GH}=15V
	I_{GL}	-	0.85		mA	V_{GL}=-6.9V

Note (1): **Vcom**电压按实际效果而定

256 gray pattern

Black Pattern

6.2 Timing Diagram of Interface Signal

DE mode

DE mode

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd		1024		DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		600		H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	35	200	H

HV mode(1)

HV mode
Horizontal input timing

Parameter		Symbol	Value			Unit
Horizontal display area		thd	1024			DCLK
DCLK frequency@ Frame rate=60hz		fclk	Min.	Typ.	Max.	
			44.9	51.2	63	Mhz
1 Horizontal Line		th	1200	1344	1400	
HSYNC pulse width	Min.	thpw		1		DCLK
	Typ.			—		
	Max.			140		
HSYNC back porch		thbp	160	160	160	
HSYNC front porch		thfp	16	160	216	

HV mode(2)

Vertical input timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd		600		H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tvpw	1	—	20	H
VSYNC back porch	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

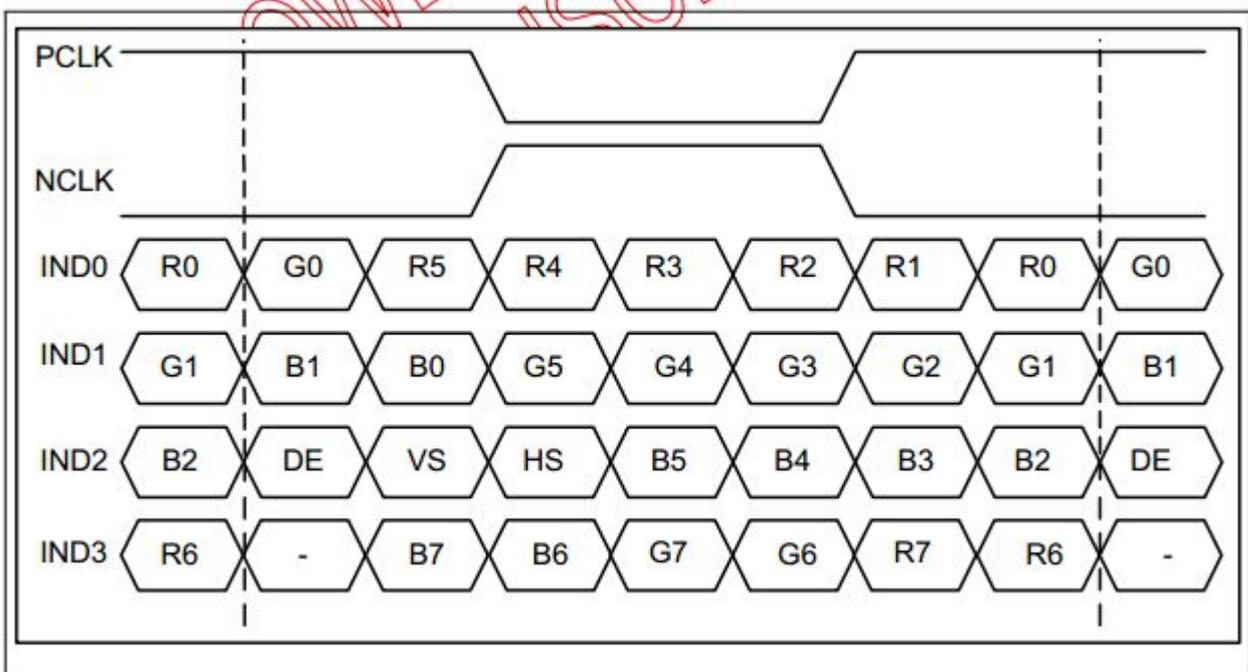### 6.3. Power-On/Off Timing Sequence for LVDS Interface
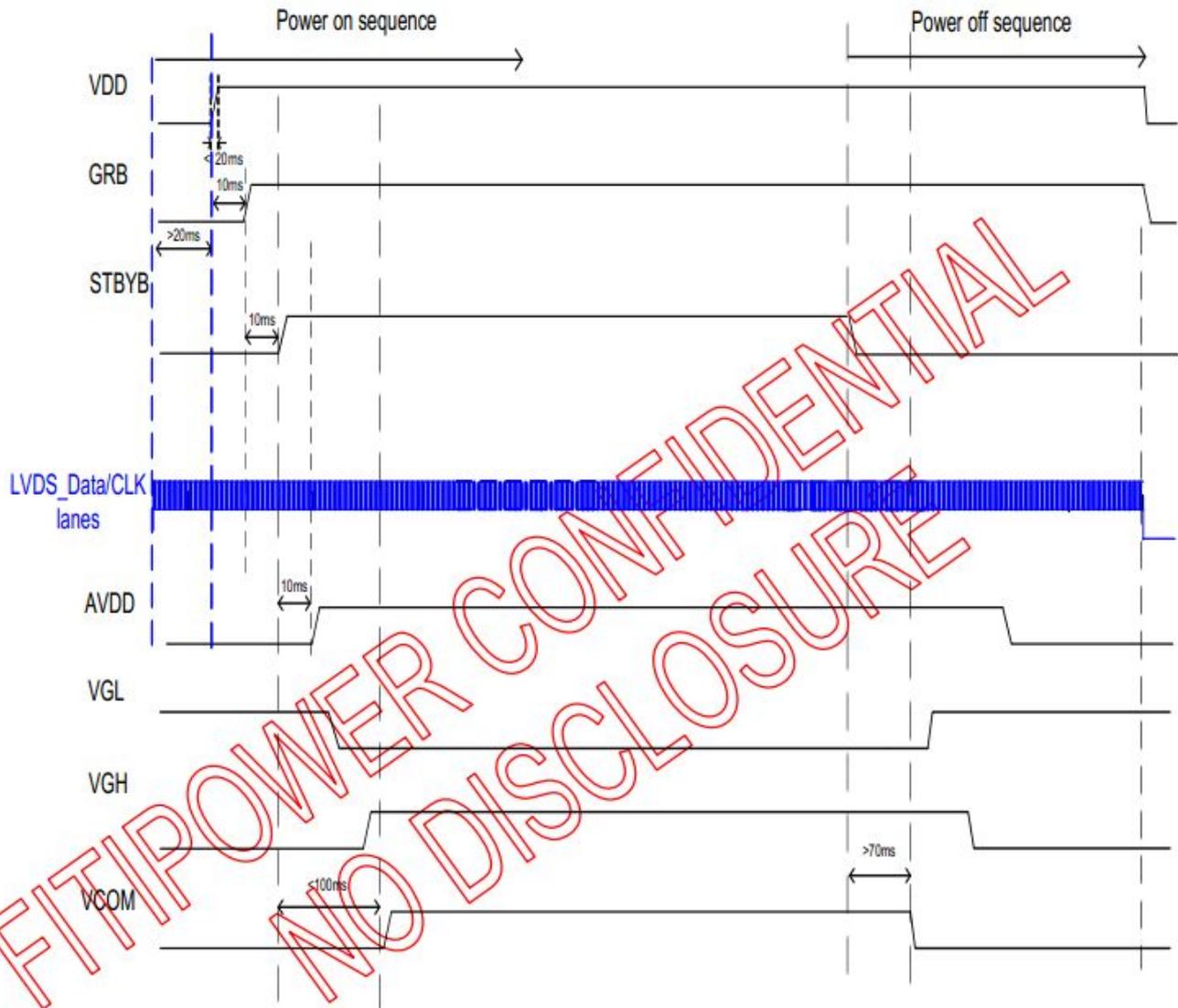
6.4   Data Input Format for LVDS

### 6.4.1 6-bit LVDS input(SELB="H")
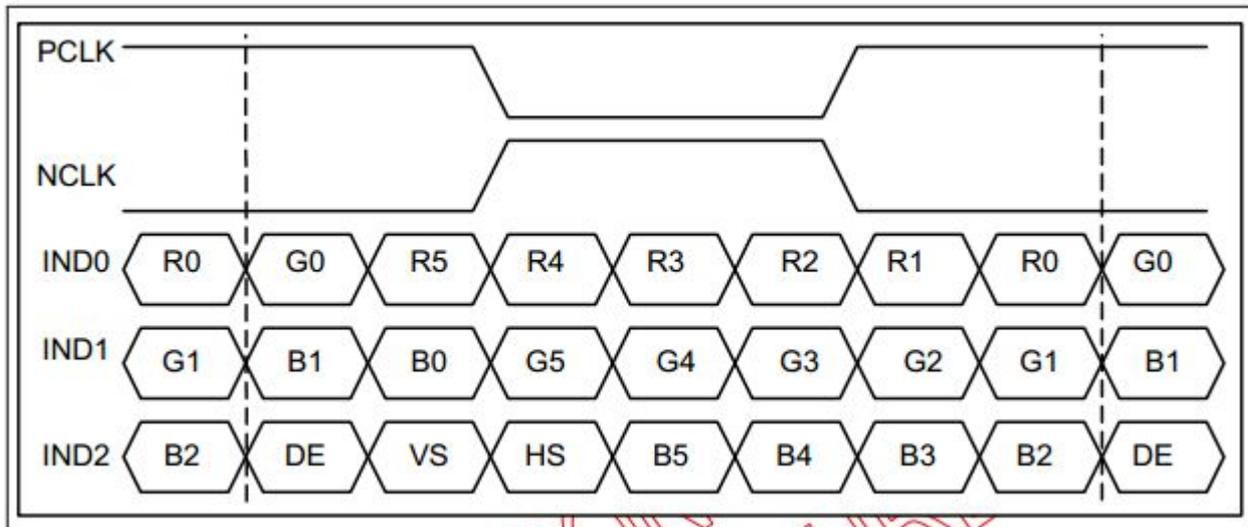
6.4.2 8-bit LVDS input(SELB="L")

6.4.3 LVDS mode(Receiver Differential :PIND0~PIND3,NIND0~NIND3,PINC,NINC)

LVDS DC characteristic

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential input high threshold voltage	RxVTH			+0.1V	V	RxVCM=1.2V
Differential input low threshold voltage	RxVTL	-0.1			V	
Input voltage range(single-end)	RxVIN	0		2.4	V	
Differential input common mode voltage	RxVCM	$|V_{ID}|/2$		$2.4 - |V_{ID}|/2$	V	
Differential input voltage	$|V_{ID}|$	0.2		0.6	V	
Differential input leakage current	RxVTH	-10		+10	V	
LVDS Digital Operating Current	Iddlvsd	-	40(TBD)	50	mA	Fclk=65Mhz, VDD=3.3V
LVDS Digital Standby Current	Istlvds	-	10(TBD)	50	uA	Clock & all functions are stop
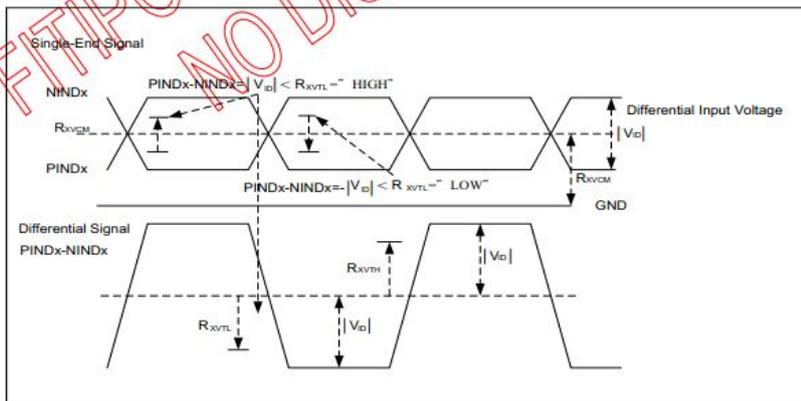
LVDS DC Characteristic

6.4.4 AC Electrical Characteristics

LVDS mode

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Clock Frequency	RxFCLK		20	-	71	MHz
Input data skew margin	TRSKM	$|V_{ID}|$=400mV RxVCM=1.2V RxFCLK=71MHz	500			ps
Clock High Time	TLVCH			4/(7* RxFCLK)		ns
						ns
Clock Low Time	TLVCL			3/(7* RxFCLK)		ns
PLL wake-up-time	TenPLL				150	us

7.0 Reliability test items

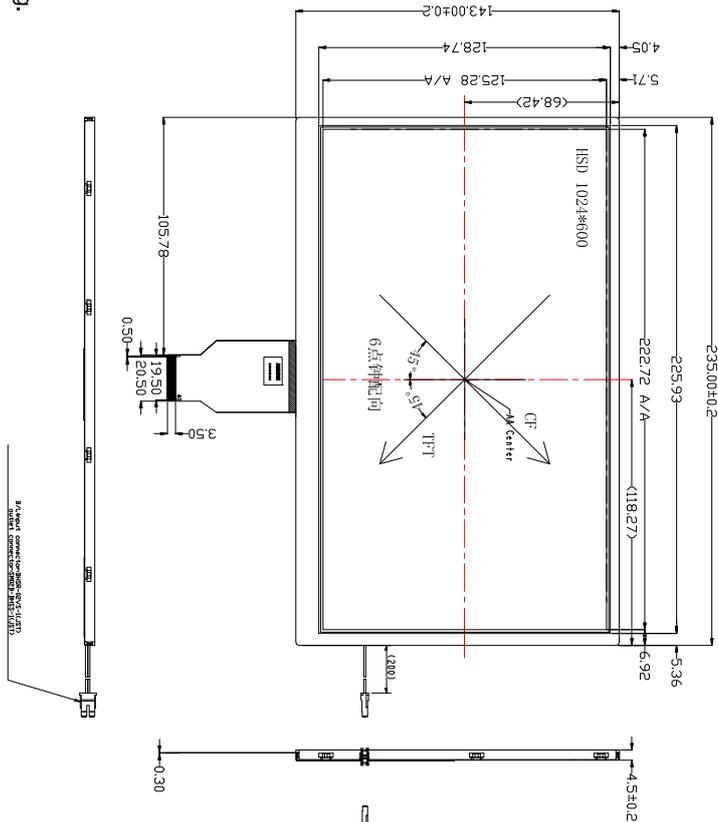| NO	Item	Conditions	Remark
1	High Temperature Storage	Ta=+70℃,24hrs	
2	Low Temperature Storage	Ta=-20℃,24hrs	
3	High Temperature Operation	Ta=+60℃,24hrs	
4	Low Temperature Operation	Ta=-10℃,24hrs	
5	High Temperature and High Humidity (operation)	Ta=+40℃,90%RH,24hrs	
6	Thermal Cycling Test (non operation)	-20℃(0.5hr)→+70℃(0.5hr),200cycles	
7	Vibration	1.Random:1.04G,10-500HZ,X,Y,Zdirection 30min/each direction 2.Sweep sine:1.5G, 5~500Hz, X/Y/Z,30min/each direction	
8	Shock	100G,6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
9	Vibration (with carton)	Random:1.04Grms, 10~500Hz, X/Y/Z 45min/each direction Fixed:5Hz, 1.5Grms, X/Y/Z 45min/each direction	
10	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202
11	Electrostatic Discharge	±200V,200PF,0Ω1 time/each terminal	

Note: All tests above are practiced at module type.
There is no display function NG issue occurred, All the cosmetic specification is judged before the reliability stress.
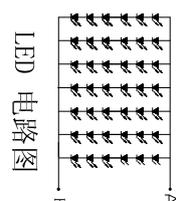
8.0 Outline dimension

Notes:
1. Unit:mm
2. Do not scale drawing.
3. ⚠ Modification rev.number.
4. Genral Tolerance:±0.2
5. "*" For important dimension;( ) for reference dimention
6. RoHs must be complied.(Use Lead-free process)

ITEM		SYMBOL	MIN	TYP	MAX	UNIT
Luminous (Without PET)		IV	450	500		cd/m²
Chromaticity Coordinatses Without PET	X	X	(0.260)	(0.320)		
	Y	Y	(0.265)	(0.325)		
Uniformity			70			%
Backlight voltage		VF	17	19	21	V
Backlight current		IF		160		mA

T=25°C

所有测试
误差为±5%

HSD 1024*600

6点钟配向

45°

TFT

CF
AM center

RoHS

B/L input connector:SHDR-04V-S(JST)
outlet connector:SM02B-BHS-1(JST)

LED 电路图

TITLE: OUTLINE DIMENSION

D/N:AM1024600-101E

Rev:01

SCALE: 1 : 1

SHEET NO: 1 OF 1

UNIT: mm

DRAWN BY:
CHECKED BY:
APPROVED BY:

SMK.	DESCRIPTION OF REVISION	REASON	REVISED BY	DATE
⚠	first issue	01	XG. SU	2019/08/02

9.0 Packing form

9.1 Packing form 1

① 泡沫胶B 2 PCS

10.1" 模组 60 PCS

③ 内隔板A 3 PCS

④ 内隔板B 25 PCS

⑤ 泡沫胶A 1PCS

⑥ 纸箱 1 PCS
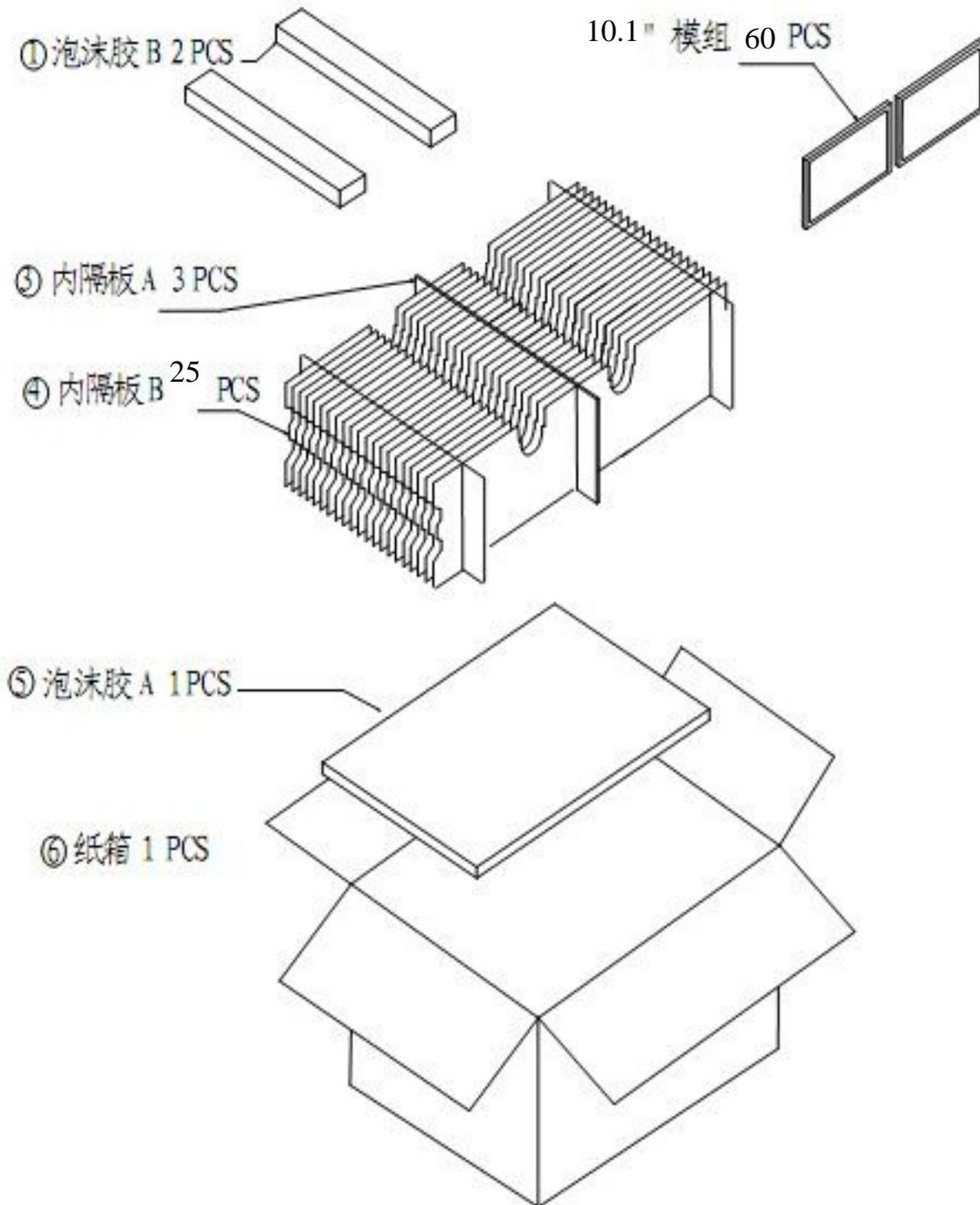
t

10.0 General Precaution

10.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

10.2 Asembly Precaytton

10.2.1 Please use the mounting hole on the module side in installing and do not bending or wrenching LCD in assembling. And please do not drop, bend or twist LCD module in handling.

10.2.2 Please design display housing in accordance with the following guide lines.

10.2.2.1 Housing case must be destined carefully so as not to put stresses on LCD all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.

10.2.2.2 Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. The clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.

10.2.3 Please do not push or scratch LCD panel surface with any-thing hard. And do not soil LCD panel surface by touching with bare hands. (Polarizer film, surface of LCD panel is easy to be flawed.)

10.2.4 Please do not press any parts on the rear side such as source IC, gate IC, and FPC during handling LCD module. If pressing rear part is unavoidable, handle the LCD module with care not to damage them.

10.2.5 Please wipe out LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.

10.2.6 Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.

10.2.7 Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.

10.3 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

10.4 Breakage of LCD Panel

10.4.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

10.4.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.

10.4.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

10.4.4 Handle carefully with chips of glass that may cause injury, when the glass is broken.

10.5 Absolute Maximum Ratings and Power Protection Circuit

10.5.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

10.5.2 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

10.5.3 It's recommended employing protection circuit for power supply.

10.6 Operation

10.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

10.6.2 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

10.6.3 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

10.6.4 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

10.7 Static Electricity

10.7.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

10.7.2 Because LCD module uses CMOS-IC on TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.

10.7.3 Persons who handle the module should be grounded through adequate methods.

10.8 Disposal

When disposing LCD module, obey the local environmental regulations.

10.9 OTHERS

10.9.1 A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight land strong UV rays.

10.9.2 Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.

10.9.3 For the packaging box, please pay attention to the followings:

10.9.3.1 Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.

10.9.3.2 Please do not pile them up more than 6 boxes. (They are not designed so.) And please do not turn over.

10.9.3.3 Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.

10.9.3.4 Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)