

PRODUCT SPECIFICATION

- Tentative Specification
- Preliminary Specification
- Approval Specification

MODEL NAME: G084LT-D01

Version: C4

Customer:

APPROVED BY

SIGNATURE

Name / Title _____

Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By

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REVISION HISTORY

Version	Date	Page	Description
1.0	2020.06.01	ALL	First issue
1.1	2020.11.23	21	Update Drawings
1.2	2020.12.09	22	Add packaging process
1.3	2022.05.12	21	Update Drawings
1.4	2023.04.28	21	Update drawing, update POWER circuit on FPC, add EMC electromagnetic film on FPC
1.5	2023.12.06	21	Update the drawing, update the FPC material from the have glue RA to no glue RA
	2023.12.18	ALL	Adjust the specification book format

PRODUCT SPECIFICATION

1. General Description

G084LT-D01 is a transmissive type a-Si TFT-LCD (amorphous silicon thin film transistor liquid crystal display) module, which is composed of a TFT-LCD panel, a driver circuit and a backlight unit. The panel size is 8.4 inch and the resolution is 800(RGB)*600, the panel can display up to 16.7M colors. The LCM can be easily accessed by RGB interface.

2. Physical Features

Display Mode	TFT-LCD Module
	Active matrix TFT, Transmissive type
Display Format	Graphic 800×RGB×600 Dot-matrix
Input Data	24 bit RGB interface
Viewing Direction	12 O'clock

3. Mechanical Specification

Item	Contents	Unit
Module size (W×H×T)	189.75 × 149.40 × 4.75	mm
Number of dots	800(RGB) × 600	---
Active area (W×H)	170.40 × 127.80	mm

4. Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Remark
Power voltage	VCC	-0.5	3.96	V	---
	AVDD	-0.5	14.85	V	
	VGH	-0.3	42	V	
	VGL	-19	0.3	V	
	VGH-VGL	12	40	V	
Operating temperature	T_{OP}	-20	70	°C	
Storage temperature	T_{ST}	-30	80	°C	

Remark:

Note1: If users use the product out off the environmental operation range (temperature and humidity,it will have visual quality concerns) .

5. Pin Decription

PIN NO.	Symbol	I/O	Description
1	GND	P	Power ground
2	NC	NC	DUMMY
3	VCC	P	Power supply for digital block.
4-11	R0-R7	I	Red data
12-19	G0-G7	I	Green data
20-27	B0-B7	I	Blue data
28	DCLK	I	Clock for input data
29	DE	I	Input data enable control.
30	HSD	I	Horizontal sync signal
31	VSD	I	Vertical sync signal
32	MODE3	I	DE / SYNC mode select.
33	RESET	I	Hardware global reset. Low active.
34	STBYB	I	Standby mode control
35	SHLR	I	Source shift direction control.
36	VCC	P	Power supply for digital block.
37	UPON	I	Gate scan direction control
38	GND	P	Power ground
39	GND	p	Power ground
40-41	NC	NC	DUMMY
42	DITH	I	Dithering function enable control.
43-58	NC	NC	DUMMY
59	GND	P	Power ground
60	NC	NC	DUMMY

6. Electrical Characteristics

6.1 Typical Operation Conditions

Item	Symbol	Rating			Unit	Remark
		Min	Typ	Max		
Digital Supply Voltage	VCC	3.0	3.3	3.6	V	Note2
Analog Supply Voltage	AVDD	10	11	13.5	V	---
Gate On Voltage	VGH	20	24	26	V	---
Gata Off Voltage	VGL	-8	-7	-6	V	---
Common Voltage	VCOM	---	4.2	---	V	Note4
Input logic high voltage	V_{IH}	0.8*VDD	---	3.6	V	Note3
Input logic low voltage	V_{IL}	0	---	0.2*VDD	V	

Remark:

Note1:Vcom must be adjusted to optimize display quality: Cross-talk, Contrast Ratio and etc.

6.2 TFT-LCD Current Consumption

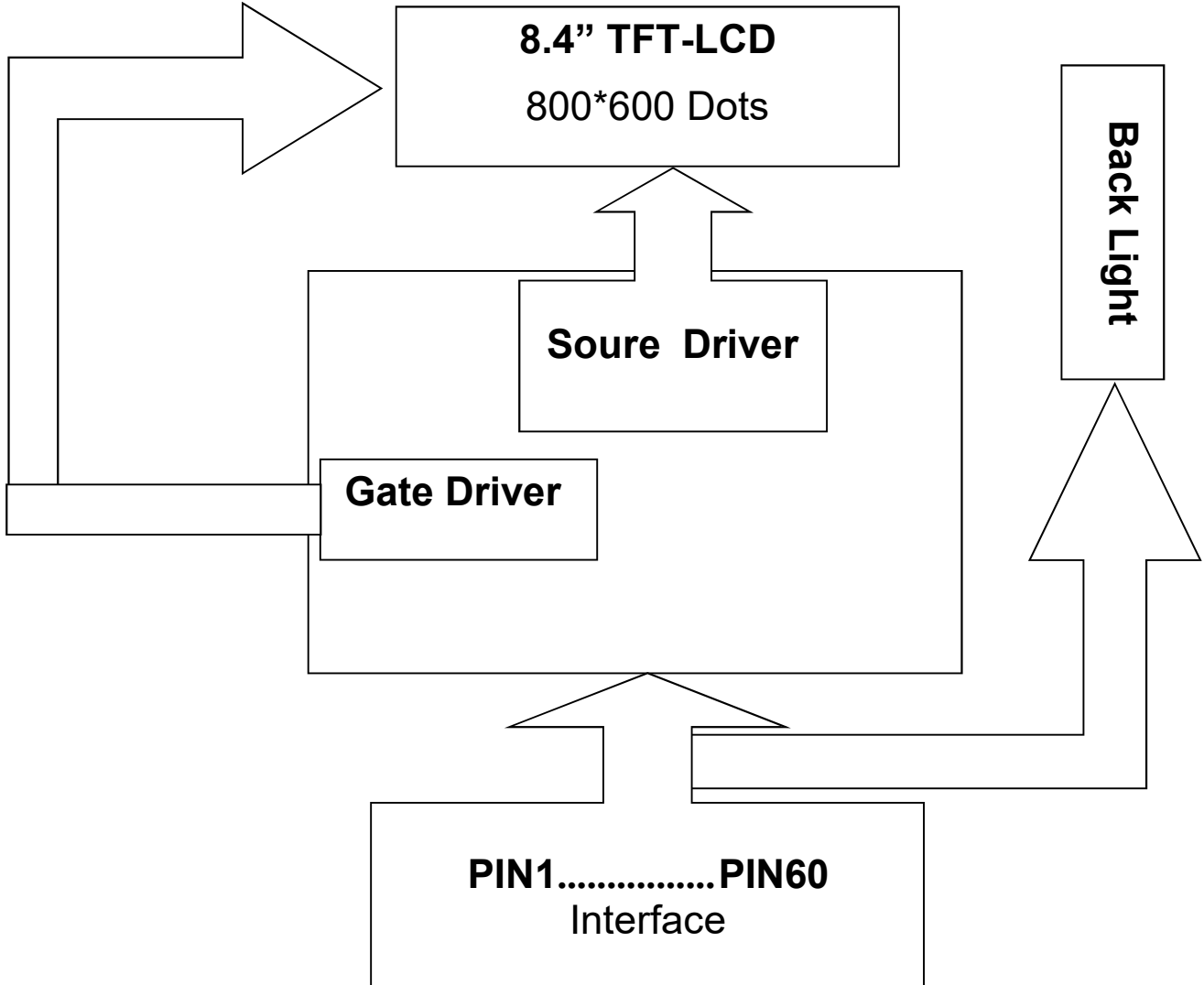
Dynamic Range of Output	Vdr	SO1 ~ SO1200	0.1	-	AVDD-0.1	V
Sinking Current of Outputs	IOLy	SO1 ~ SO1200; Vo=0.1V v.s 1.0V , AVDD=13.5V	80	-	-	uA
Driving Current of Outputs	IOHy	SO1 ~ SO1200; Vo=13.4V v.s 12.5V , AVDD=13.5V	80	-	-	uA
Resistance of Gamma Table	Rg	Rn: Internal gamma resistor	0.7*Rn	1.0*Rn	1.3*Rn	ohm

*NOTE

VDDG=VGH VEEG=VGL

7. Module Function Description

7.1 Block Diagram Of LCM



PIN1.....PIN60
Interface

8. Timing Characteristics

8.1 TTL mode DC electrical Characteristics

(VDD=2.3~3.6V, AVDD=6.5~13.5V, GND= AGND= 0V, TA=20°C~+85°C)

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Power supply voltage	VDD	2.3	-	3.6	V	-
Power supply voltage	AVDD	6.5	-	13.5	V	-
Power supply voltage	AVDDL	6.5	-	13.5	V	Full range application
		-	V8+0.1	-	V	Half AVDD application
Power supply voltage	AGNDH	0			V	Full range application
		-	V7-0.1	-	V	Half AVDD application
Low level input voltage	VIL	0	-	0.3VDD	V	For digital circuit
High level input voltage	VIH	0.7VDD	-	VDD	V	For digital circuit
Output low voltage	VOL	-	-	GND+0.4	V	IOL=400µA
Output high voltage	VOH	VDD-0.4	-	-	V	IOH=400µA
Pull low/high resistance	Ri	200	250	300	KΩ	For the digital input pin @ VDD=3.3V
Input leakage current	Ii	-	-	±1	µA	For digital circuit
Digital Operation current	Idd	-	12	20	mA	Fclk=50MHz, LD=48KHz, VDD=3.3V, No load
Digital stand-by current	Ist1	-	10	50	µA	Clock & all functions are stopped
Analog Operating current	Idda	-	8	10	mA	No load, Fclk=50MHz, LD=48KHz @ AVDD=10V, V1=8V, V14=0.4V
Analog Stand-by current	Ist2	-	10	50	µA	No load, clock & all functions are stopped
Input level of V1~V7	Vref1	0.4AVDD	-	AVDD-0.1	V	Gamma correction voltage input
Input level of V8~V14	Vref2	0.1	-	0.6AVDD	V	Gamma correction voltage input
Output Voltage deviation	Vod1	-	±20	±35	mV	Vo=AGND+0.1V~AGND+0.5V & Vo=AVDD-0.5V~AVDD-0.1V
Output Voltage deviation	Vod2	-	±15	±20	mV	Vo=AGND+0.5V~AVDD-0.5V
Output Voltage Offset between Chips	Voc	-	-	±20	mV	Vo=AGND+0.5V~AVDD-0.5V
Dynamic Range of Output	Vdr	0.1	-	AVDD-0.1	V	SO1~SO1200
Sinking Current of Outputs	IOLy	80	-	-	µA	SO1~SO1200; Vo=0.1V vs. 1.0V, AVDD=13.5V
Driving Current of Outputs	IOHy	80	-	-	µA	SO1~SO1200; Vo=0.1V vs. 12.5V, AVDD=13.5V
Resistance of Gamma Table	Rg	0.7*Rn	1.0-Rn	1.3*Rn	Ω	Rn: Internal gamma resistor

Table 9 2: DC electrical characteristics

8.2 TTL mode AC electrical Characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
VDD Power On Slew rate	TPOR	-	-	20	ms	From 0V to 90% VDD
GRB pulse width	TRST	50	-	-	µs	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 set-up 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
DE setup time	Tesu	5	-	-	ns	-
DE hold time	Tehd	5	-	-	ns	-
Output stable time	Tsst	-	-	6	µs	10% to 90% target voltage. CL=90pF, R=10K ohm(Cascade)
				3		

Table 10.1: TTL mode AC electrical characteristics

8.3 Input Clock and Data Timing Diagram

DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	32.6	39.6	62.4	MHz
Horizontal Display Area	thd	800			DCLK
HSD Period	th	890	1000	1300	DCLK
HSD Blanking	thb+ thfp	90	200	500	DCLK
Vertical Display Area	tvd	600			T _H
VSD Period	tv	610	660	800	T _H
VSD Blanking	tvbp+tvfp	10	60	200	T _H

Table 10.10: DE mode (800x600)

HV mode

Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	34.5	39.6	50.4	MHz
Horizontal Display Area	thd	800			DCLK
HSD Period	th	900	1000	1200	DCLK
HSD Pulse Width	thpw	1	-	40	DCLK
HSD Back Porch	thbp	88			DCLK
HSD Front Porch	thfp	12	112	312	DCLK

Table 10.11: HV mode horizontal timing (800x600)

Vertical timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	600			T _H
VSD Period	tv	640	660	700	T _H
VSD Pulse Width	tvpw	1	-	20	T _H
VSD Back Porch	tvbp	39			T _H
VSD Front Porch	tvfp	1	21	61	T _H

Table 10.12: HV mode vertical timing (800x600)

8.4 RGB Interface Characteristics

Vertical timing

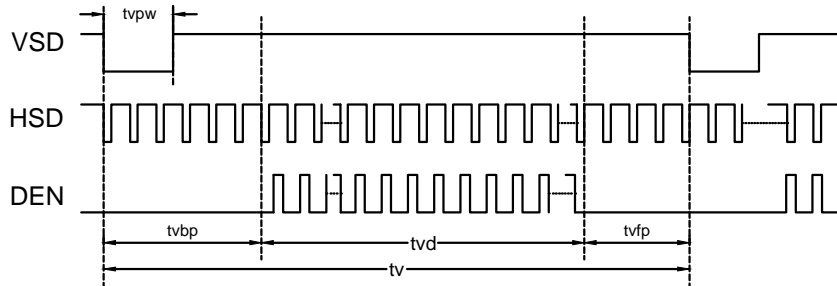


Figure 10.2: Vertical input timing diagram

Horizontal timing

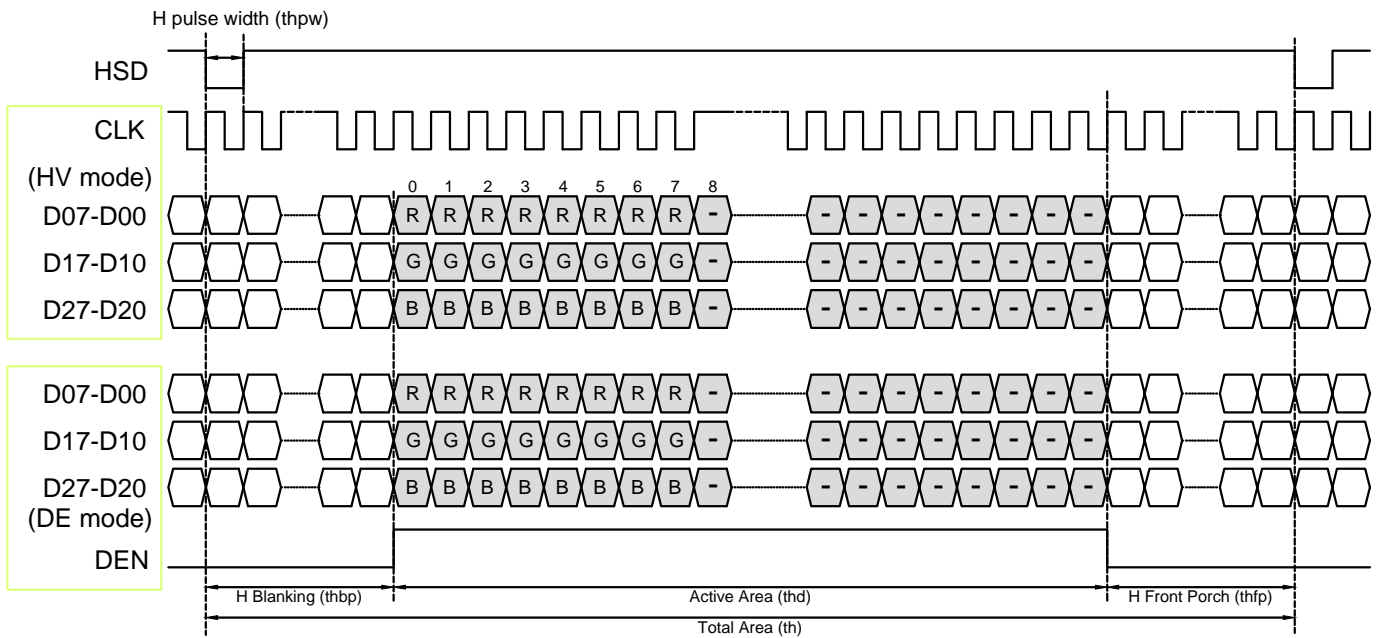
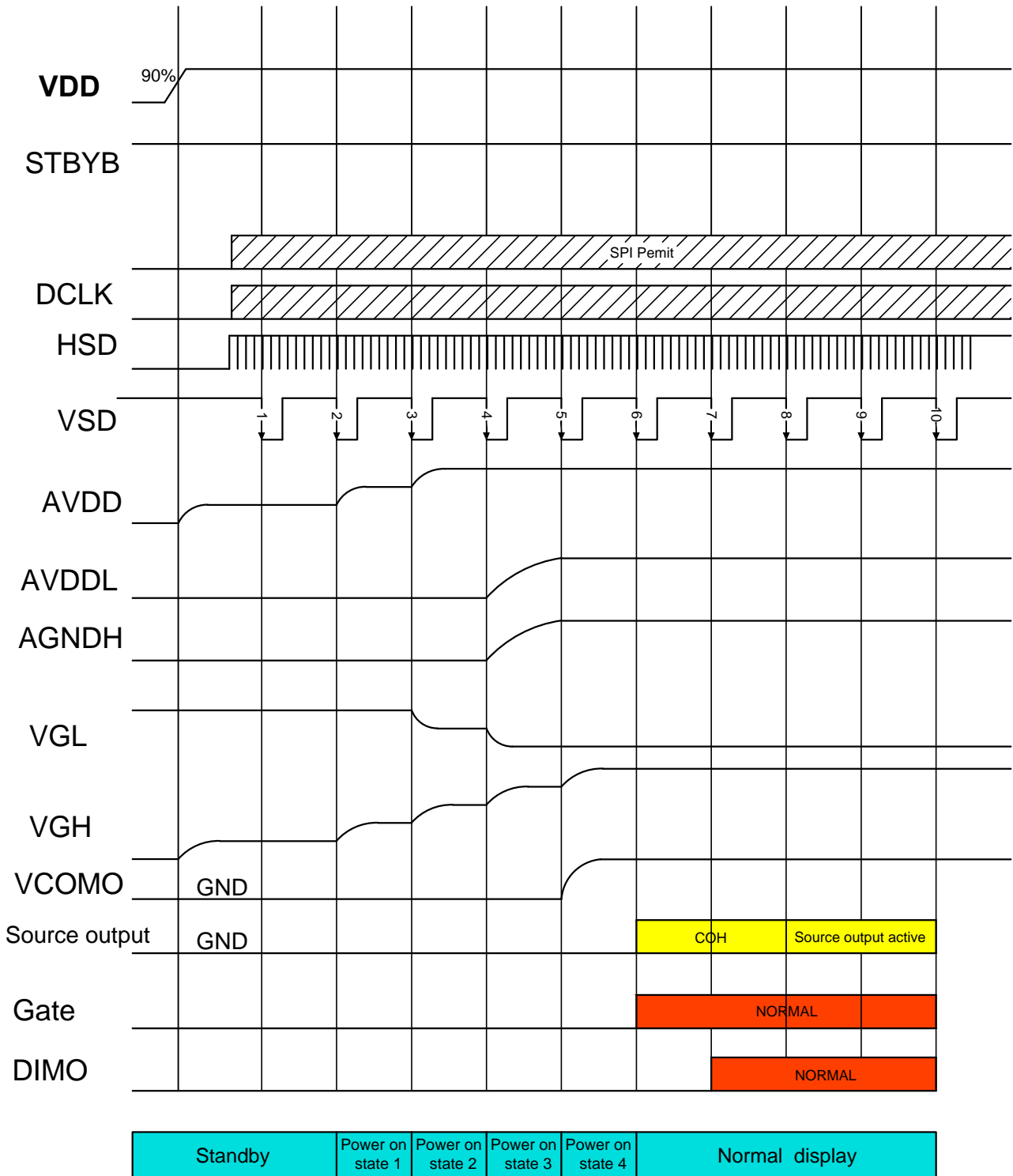


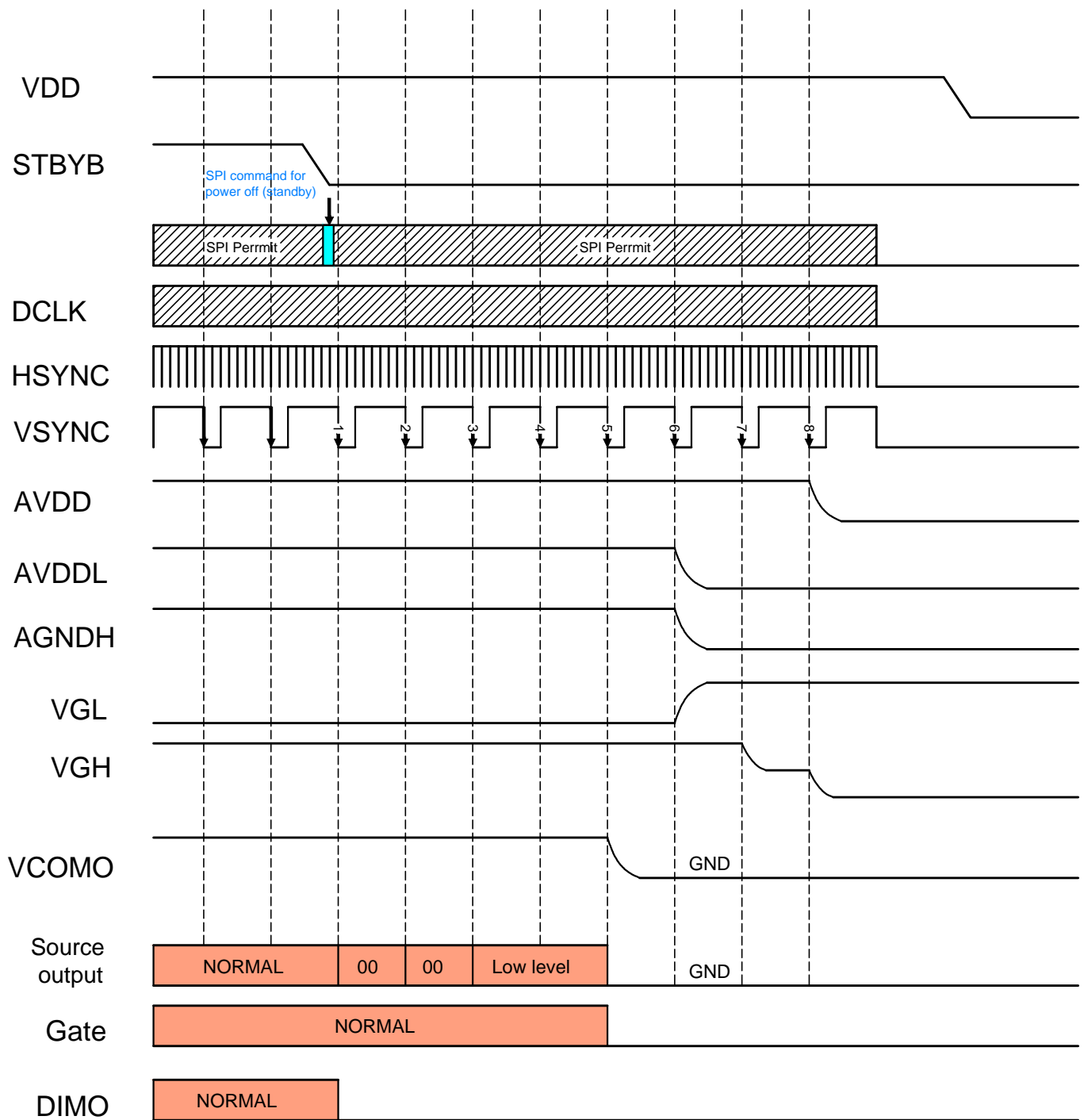
Figure 10.3: Horizontal input timing diagram

9. Power ON/OFF Sequence

HX8282-A01 has a power on/off sequence control function. In order to prevent IC from power on reset fail, the rising time (T_{POR}) of the digital power supply VDD should be maintained within the given specifications. Please refer to "AC Characteristics" for more detail on timing.



Power on timing sequence



Power off timing sequence

NOTE: Low level=3FH, when NBW=L(Normally white)
 Low level=00H, when NBW=H(Normally black)

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10. Backlight Unit

LED GND=GND=0V, Ta = 25°C

Item	Symbol	Min	Typ		Unit	Remark
Channel1	I _F	-	180	225	mA	Note 1
Forward Voltage	V _F	9	9.6	10.8	V	
Backlight Power Consumption		-	1728	-	mW	
Life Time	-	-	30,000	-	Hrs	

Note 1: 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 an estimated data.

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11. Electro-Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	T_r+T_f	Normal $\theta = \Phi = 0^\circ$	-	16	40	ms	Note3
Contrast Ratio	CR		500	600	-	-	Note4
Transmittance	T%		--	5.7	-		
Color chromaticity	Wx		0.23	0.27	0.31	-	Note2,Note5, Note6
	Wy		0.26	0.30	0.34		
Viewing Angle ($CR \geq 10$)	$\theta X+$ (3 o'clock)	70	80	-	degree	Note1	
	$\theta X-$ (9 o'clock)	70	80	-			
	$\theta Y+$ (12 o'clock)	70	80	-			
	$\theta Y-$ (6 o'clock)	50	60	-			
Luminance	$I_F = 180mA$		280	350	-	cd/m2	Note7

*Note(1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L255 / L0$$

L255 : Luminance of gray level 255

L 0: Luminance of gray level 0

$$CR = CR (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

Note (1) Measurement Setup:

The LCD module should be stabilized at given ambient temperature (25°C) for 30 minutes to avoid abrupt temperature changing during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 30 minutes in the windless room.

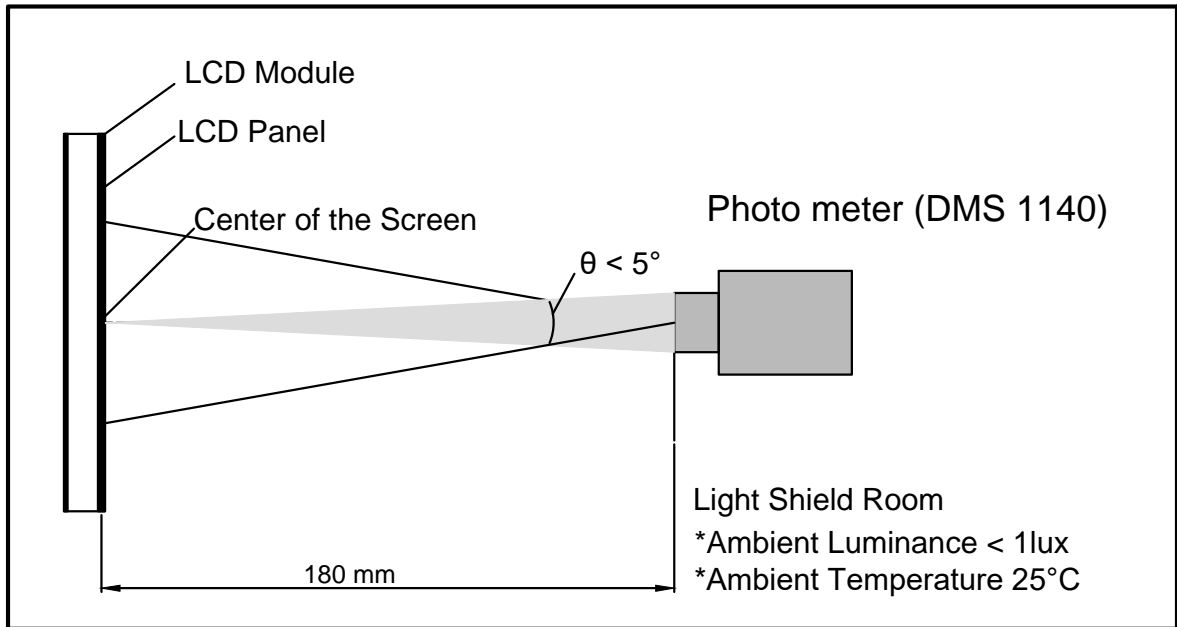
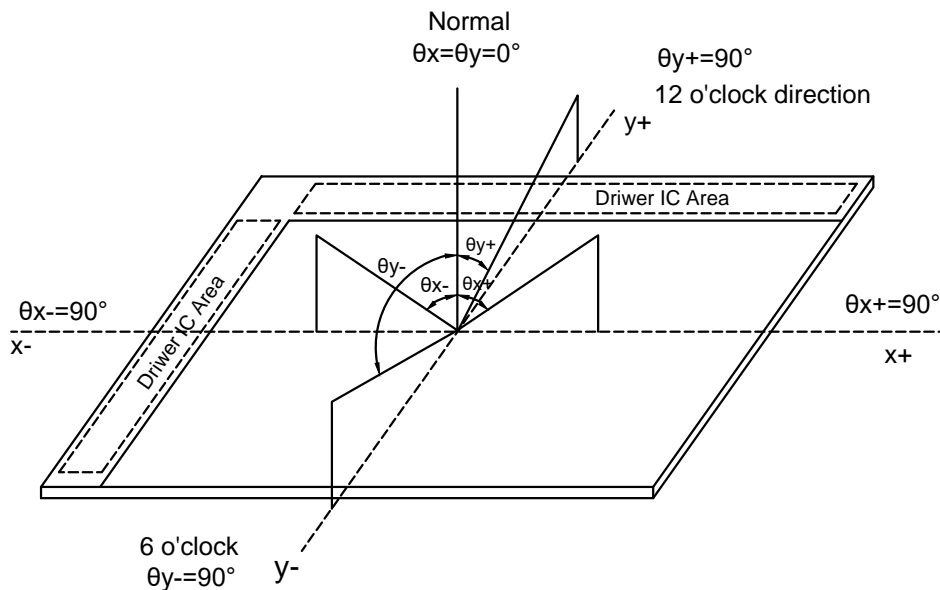


Figure 1 Optical Characteristic Measurement Equipment and Method

Note(2) Definition of Viewing Angle.



Note(3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression:

Contrast Ratio (CR) = the luminance of White pattern/ the luminance of Black pattern

Note(4) Definition of Response Time

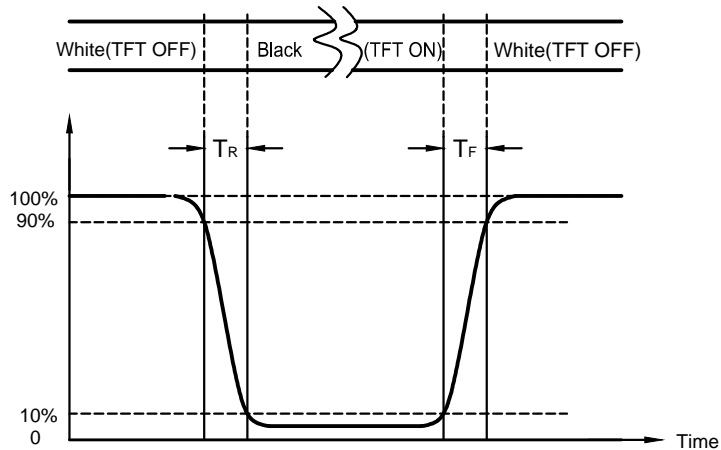
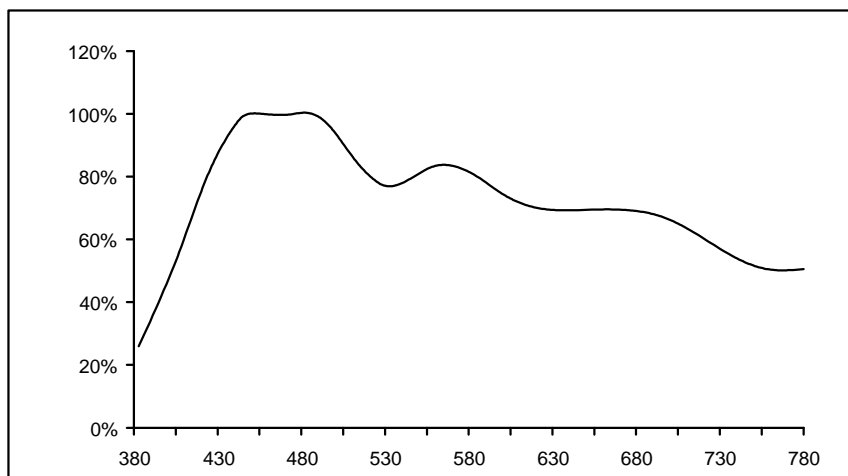


Figure 3: Definition of Response Time

Note(5) Definition of Transmittance

$$\text{Transmittance} = \frac{\text{Center Luminance of LCD}}{\text{Center Luminance of Back Light}} \times 100\%$$

Note(6) The C-light Light Spectrum



Note(7) The Back Light Spectrum

TBD

Figure 4 Back Light Spectrum

Note(8) The polarizer type: ShengBo POL.

Note(9) All optical data are based on LS given system & nominal parameter & testing machine in this document.

Note(10) The direction of polarizer. It is recommended that customer should choose O Mode or E Mode according to the actual situation.

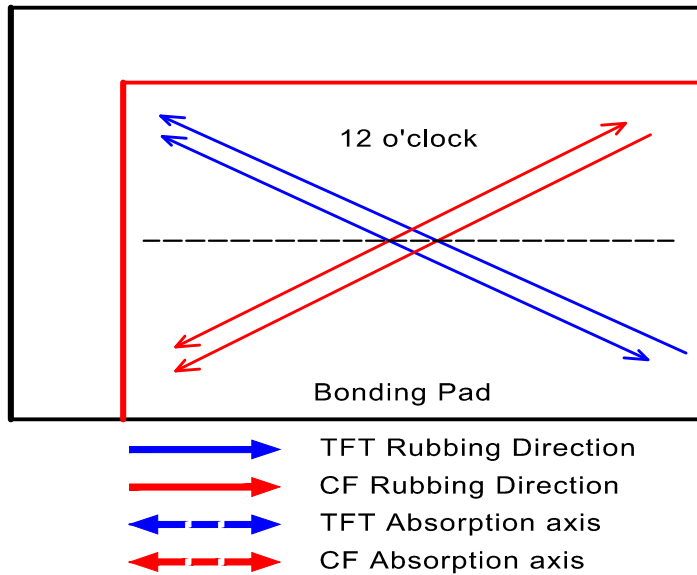


Figure 5 Polarizer Direction

12. Reliability Test

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70°C, 240 hours	(1),(2) (4),(5)
2	Low Temperature Operation	Ta = -20°C, 240 hours	
3	High Temperature Storage	Ta = +80°C, 240 hours	
4	Low Temperature Storage	Ta = -30°C, 240 hours	
5	Storage at High Temperature and Humidity	Ta = +60°C, 90% RH max,240hours	
6	Thermal Shock (non-operation)	-30°C 30 min~+80°C 30 min, Change time:5min, 100 Cycle	(2), (3)
7	ESD	C=150pF,R=330Ω,5point/panel Air:±8Kv,5times; Contact:±4Kv,5times (Environment:15°C~35°C, 30%~60%.86Kpa~106Kpa)	(1), (4)

Note (1) There should be no condensation on the surface of panel during test ,

Note (2) Temperature of panel display surface area should be 80°C Max.

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

Note (4) In the standard conditions, there is no function failure issue occurred. All the cosmetic specification is judged before reliability test.

Note (5) Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

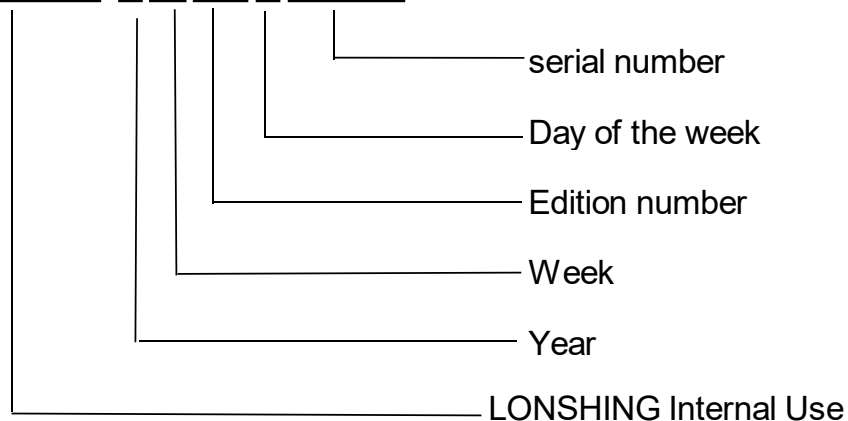
13. Definition Of Labels

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: G084ST-S01

(b) Serial ID: X X X X X Y W X X X X X X X



Serial ID includes the information as below:

(a) Manufactured Date:

Year: 00~99, ... 2019=19, 2020=20, 2021=21..., 2028=28.

Week: 01~56, first week of the year=01; second week of the year=02;...

Day of the week: A~G=Monday~Sunday

(b) Edition number: cover all the change; A1, A2... Sample order;

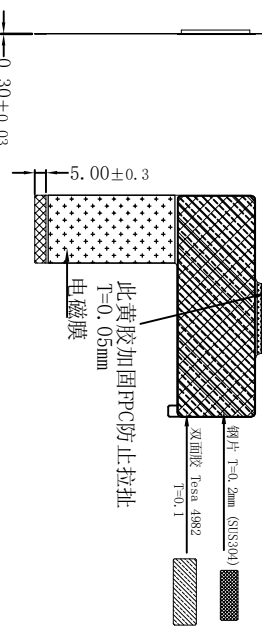
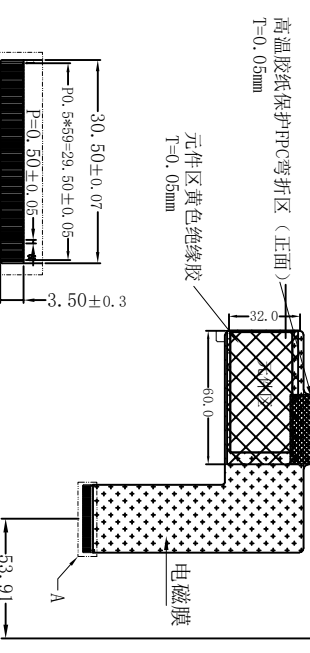
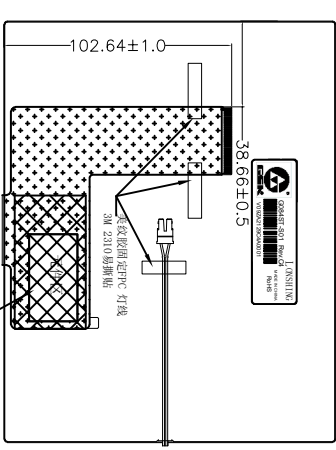
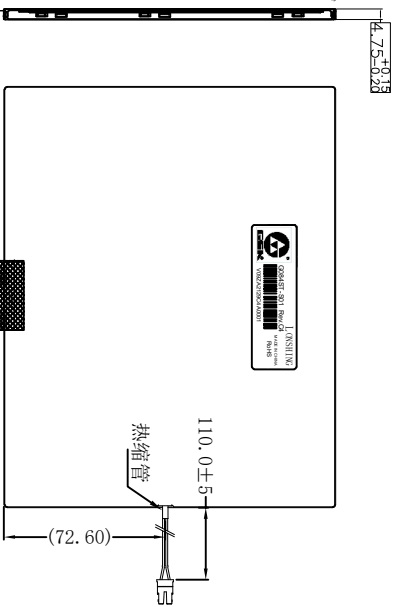
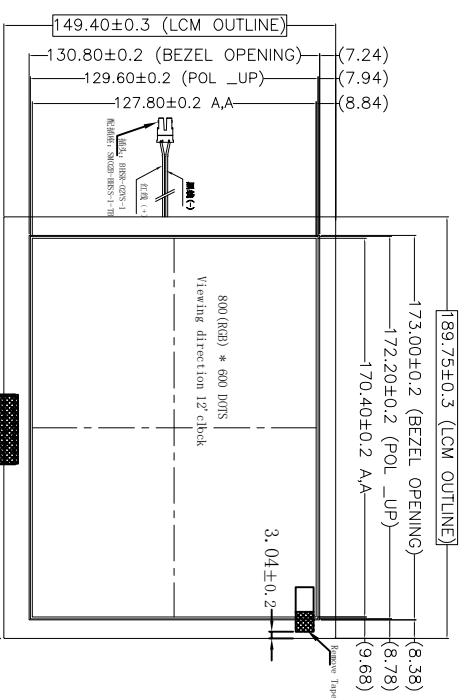
C for mass production, C1, C2... change of order

(c) Serial No.: Manufacturing sequence of product

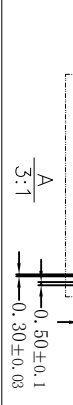
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01		增加可调电阻, 缩小厚度公差	2020.11.23	05		FPC材质由有胶压延铜变更为无胶压延铜	2023.12.06
02		正面弯折位置加宽防止弯折后起翘	2022.05.12	06			

NO.	PIN NAME	NO.	PIN NAME
1	GND	31	VSD
2	NC	32	MODE3
3	VCC	33	RS1B
4	R0	34	TS1B
5	R1	35	SH1R
6	R2	36	VCC
7	R3	37	UPON
8	R4	38	GND
9	R5	39	GND
10	R6	40	NC
11	R7	41	NC
12	G0	42	DITH
13	G1	43	NC
14	G2	44	NC
15	G3	45	NC
16	G4	46	NC
17	G5	47	NC
18	G6	48	NC
19	G7	49	NC
20	B0	50	NC
21	B1	51	NC
22	B2	52	NC
23	B3	53	NC
24	B4	54	NC
25	B5	55	NC
26	B6	56	NC
27	B7	57	NC
28	DCLK	58	NC
29	DE	59	GND
30	HSD	60	NC

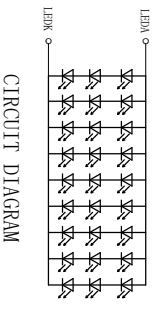
Customer Approved
客户确认回签



NO.	PIN NAME	NO.	PIN NAME
1	GND	31	VSD
2	NC	32	MODE3
3	VCC	33	RS1B
4	R0	34	TS1B
5	R1	35	SH1R
6	R2	36	VCC
7	R3	37	UPON
8	R4	38	GND
9	R5	39	GND
10	R6	40	NC
11	R7	41	NC
12	G0	42	DITH
13	G1	43	NC
14	G2	44	NC
15	G3	45	NC
16	G4	46	NC
17	G5	47	NC
18	G6	48	NC
19	G7	49	NC
20	B0	50	NC
21	B1	51	NC
22	B2	52	NC
23	B3	53	NC
24	B4	54	NC
25	B5	55	NC
26	B6	56	NC
27	B7	57	NC
28	DCLK	58	NC
29	DE	59	GND
30	HSD	60	NC



注意事项:
#0 标有 为重要管控尺寸, 必须检测!
#1
#2
#3
#4



ITEM	Symbol	Min	Typ	Max	Unit	Condition
Chromaticity Coordinates	X	0.22	0.27	0.32	—	VF=8, 4-9, 6V IF= 180 mA;
Luminance	Y	0.25	0.30	0.35	—	亮度测量方法: -> 2.0寸以下测量1点 (中心点) -> 2.0~3.5寸测量3点 (取中心点及边缘3点) -> 3.5~5.0寸测量5点 (取中心点及边缘5点) -> 5.0寸以上测量9点
	Lv	280	350	—	cd/m²	
Uniformity	Avg	80	—	—	%	

DISPLAY TYPE:	Color NUMBER:	OPERATION TEMP:	CHECKED BY:	TITLE:	SIZE	UNITS
8, 4' TFT TRANSMISSIVE	262K/16, 7M	-20° C TO +70° C		LCM	A4	mm [INCH]
VIEW DIRECTION:	DRIVER IC:	STORAGE TEMP:	DESIGN BY:	DWG NO.:	SCALE	REV
12' clock	HX8282-A01DDP300-A HX8696-A00DDP300	-30° C TO +80° C		G084LT-D01	NONE	C4
NUMBER OF DOTS:	STRUCTURE:	MATERIAL NOTE:	ROHS REQUEST		SHEET	
800 (RGB) * 600 DOTS	LCD+PLZ+IC+BL +FPC				1/1	

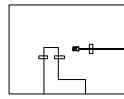
REV	LTR	ECN/DESCRIPTION	DATA	REV	LTR	ECN/DESCRIPTION	DATA
00		NEW RELEASE	2020.04.29	04		增加EMI,改TI的POWER	2023.04.26
01		增加可调电阻, 缩小厚度公差	2020.11.23	05		FPC材质由有胶压延铜变更为无胶压延铜	2023.12.06
02		正面弯折位置加宽防止弯折后起翘	2022.05.12	06			

PRODUCT SPECIFICATION

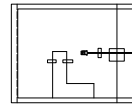
15. Packaging



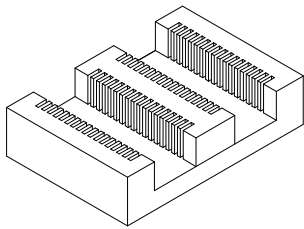
1. packing bag



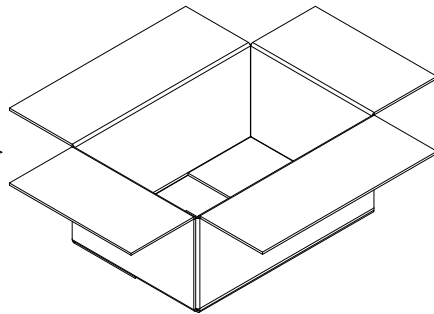
2. LCM



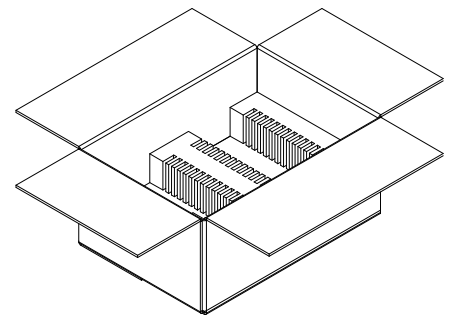
3. LCM into the packaging bag (backlight line facing outwards), Seal the opening of the packing bag with sticky tape



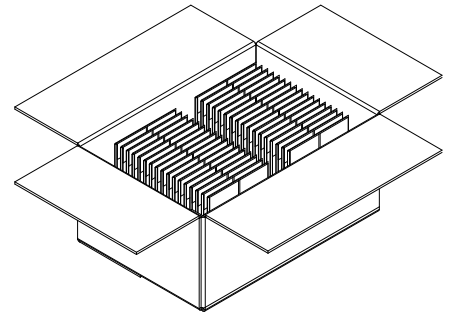
4. Bottom pearl wool



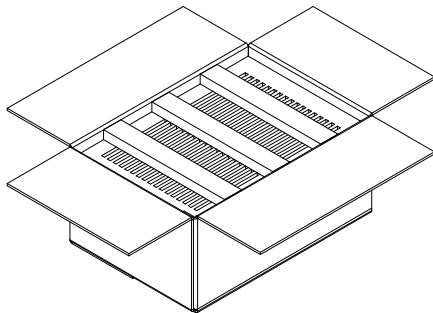
5. BOX



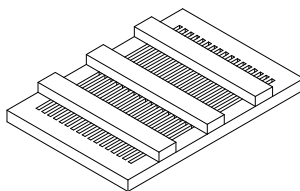
6. Put the bottom pearl wool into the box



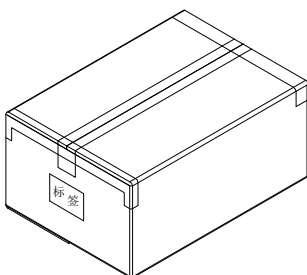
7. Put the products in the packaging bag, 1PCS for each card slot, with the backlight line facing up. Total 34pcs in the packaging bag.



9. Cover with Top pearl wool



8. Top pearl wool



10. Seal the case with transparent adhesive into "work" type seal, affixed to the outer label

16. PRECAUTIONS

16.1 ASSEMBLY AND HANDLING PRECAUTIONS

- (1) The module should be assembled into the system firmly by using every mounting hole. Be careful not to twist or bend the module.
- (2) While assembling or installing modules, it can only be in the clean area. The dust and oil may cause electrical short or damage the polarizer.
- (3) Use fingerstalls or soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (4) Do not press or scratch the surface harder than a HB pencil lead on the panel because the polarizer is very soft and easily scratched.
- (5) If the surface of the polarizer is dirty, please clean it by some absorbent cotton or soft cloth. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanently damage the polarizer due to chemical reaction.
- (6) Wipe off water droplets or oil immediately. Staining and discoloration may occur if they left on panel for a long time.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contacting with hands, legs or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static electricity, it may cause damage to the C-MOS Gate Array IC.
- (9) Do not disassemble the module.
- (10) Do not pull or fold the lamp wire.
- (11) Pins of I/F connector should not be touched directly with bare hands.

16.2 STORAGE PRECAUTIONS

- (1)When storing for a long time, the following precautions are necessary.
 - (a) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5°C and 30°C at humidity 50+-10%RH.
 - (b) The polarizer surface should not come in contact with any other object.
 - (c) It is recommended that they be stored in the container in which they were shipped.
 - (d) Storage condition is guaranteed under packing conditions.
 - (e)The phase transition of Liquid Crystal in the condition of the low or high storage temperature will be recovered when the LCD module returns to the normal condition
 - (2)High temperature or humidity may reduce the performance of module. Please store LCD module within the specified storage conditions.
 - (3)It is dangerous that moisture come into or contacted the LCD module, because the moisture may damage LCD module when it is operating.
 - (4)It may reduce the display quality if the ambient temperature is lower than 10 °C. For example, the response time will become slowly, and the starting voltage of lamp will be higher than the room temperature.
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16.3 OTHER PRECAUTIONS

(1) Normal operating condition

(a) Display pattern: dynamic pattern (Real display)

(Note) Long-term static display can cause image sticking.

(2) Operating usages to protect against image sticking due to long-term static display

(a) Suitable operating time: under 16 hours a day.

(b) Static information display recommended to use with moving image.

(c) Cycling display between 5 minutes' information(static) display and 10 seconds' moving image.

(3) Abnormal condition just means conditions except normal condition.
