

Specification For Approval

- Preliminary specification
- Final specification

Title	5.96 FB MONO TFT-LCD (FOG)
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Buyer	DUOBOND
Model	

Supplier	Cheng Du BOE Optoelectronics Technology CO., LTD
Model	RV059FBB-N80-28P0

TITLE/SIGNATURE	DATE
_____	_____
_____	_____
_____	_____
_____	_____

Please return one copy confirmation with signature and your comments

ITEM	SIGNATURE/DATE
Approved	_____
Reviewed	_____
Reviewed	_____
Prepared	_____

BOE CHENG DU
Optoelectronics Technology CO., LTD

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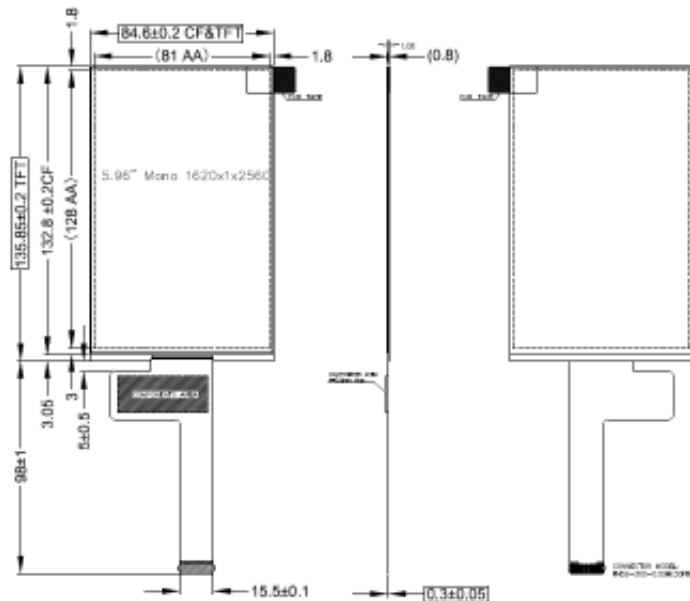
Records Of Revisions

Revision	Date	Page	Description	Released by
Pre.0	2020.05.13		Initial released	Huangli

1.0 GENERAL DESCRIPTION

1.1 Introduction

RV059FBB-N80 is a MONO active matrix TFT-LCD Panel using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. It is a transmissive type display operating in the normal black. This TFT-LCD has a 5.96 inch diagonally measured active area with 1620 Horizontal by 2560 Vertical pixel array.



1.2 Features

- Single Pixle 0.05mm
- Thin and light weight
- High luminance and contrast ratio, low reflection and wide viewing angle
- RoHS Compliant

1.3 Application

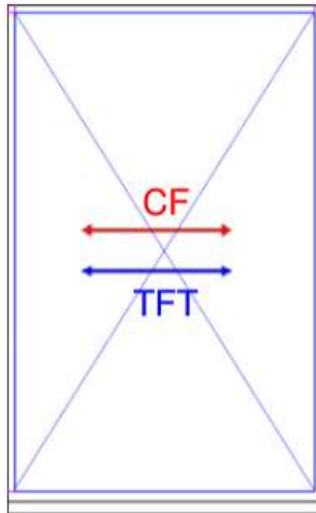
- 3D Printer

1.4 General Specifications (H: horizontal length, V: Vertical length)

Parameter	Specification	Unit	Remark
Active Area	81(H) × 128(V)	mm	
Number of Pixels	1620(H) × 2560(V)	pixels	
Pixel Pitch	50(H) × 50(V)	um	
Pixel Arrangement	WB Vertical stripe		
Display Colors		colors	
Color Gamut	MONO		
Display Mode	Normally black, Transmissive mode		
Dimensional Outline	84.6(H) × 135.85(V) × 1.08(D)	mm	FOG
Viewing Direction (Human Eye)	U/D/L/R Min. 80/80/80/80	°	Note 1,2,3

Note:

- 1.At the U/D/L/R direction, the viewing angle is same
- 2.The TFT and CF Align Direction;



2.0 ELECTRICAL SPECIFICATION

2.1 Absolute Maximum Ratings

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. Make sure all the design characteristics are adequate before the panel is initialed. All the measurements should be operated with driver IC and experimental FPC mounted.

Parameter	Symbol	Min	Max	Unit	Remark
LC Operating Voltage *1)	V _{op}	5.2	5.8	V	Ta = 25°C
Operating Temperature	T _{OP}	0	+70	°C	
Storage Temperature	T _{ST}	-10	+80	°C	
Operating Ambient Humidity *2)	H _{op}	10	*3)	%RH	*3)
Storage Humidity	H _{st}	10	*3)	%RH	*3)

Note:

[VSS = GND = 0V]

*1) Liquid Crystal driving voltage

Due to the characteristics of LC Material, this voltage varies with environmental temperature.

*2) Temp ≤ 60°C 90% RH MAX

*3) Non-condensation

2.2 Electrical Characteristics

Parameter	Symbol	Value	Unit	Remark
		Reference		
TFT Gate ON Voltage	V _{GH}	12~18	V	Note1
TFT Gate OFF Voltage	V _{GL}	-11~-8	V	Note2
TFT Common Electrode Voltage	V _{COM}	-3.5~0	V	Note3
TFT Kick-Back Voltage Max	ΔV _p Max	0.2~0.8	V	
TFT Kick-Back Voltage Min	ΔV _p Min	0.3~0.9	V	

Note:

- V_{GH} is TFT Gate operating voltage.
- V_{GL} is TFT Gate operating voltage. The low voltage level of V_{GL} signal must be fluctuate with same phase as V_{com}, the storage capacitance structure of the product is storage on common.
- V_{com} must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc.,
We just kindly recommend the setting-voltages the reference value.

In order to get the optimized display quality, the setting-voltage should be changed according to customer's developing condition. (The display quality could be changed by customer's setting -voltage.)

3.0 OPTICAL SPECIFICATIONS

3.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Topcon SR-UL1R and Westar TRD-100A) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

3.2 Optical Specifications

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Threshold Voltage	Vsat		4.1	4.3	4.5	V	Fig.1
	Vth		1.6	1.8	2.0	V	
Viewing Angle	Horizontal	CR > 10	Θ_3	80			Note 1
			Θ_9	80			
	Vertical		Θ_{12}	80			
			Θ_6	80			
Contrast Ratio	CR	$\Theta = 0^\circ$	400	800		Note 2	
Transmittance	T(%)	$\Theta = 0^\circ$	5.45	6.4		Note 3	
Response Time	Tr+Tf	$\Theta = 0^\circ$		35	40	ms	Note 5

Note:

- Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIG.2).
- Contrast measurements shall be made at viewing angle of $\Theta = 0^\circ$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state. (See FIG. 2) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

- Transmittance is the value based on UV405nm
- The color chromaticity coordinates specified in Table1 shall be calculated from The spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the C/F. Measurement condition is C - light source & Halogen Lamp
- The electro-optical response time measurements shall be made as FIG.3 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Tf.

Figure 1. The definition of V_{th} & V_{sat}

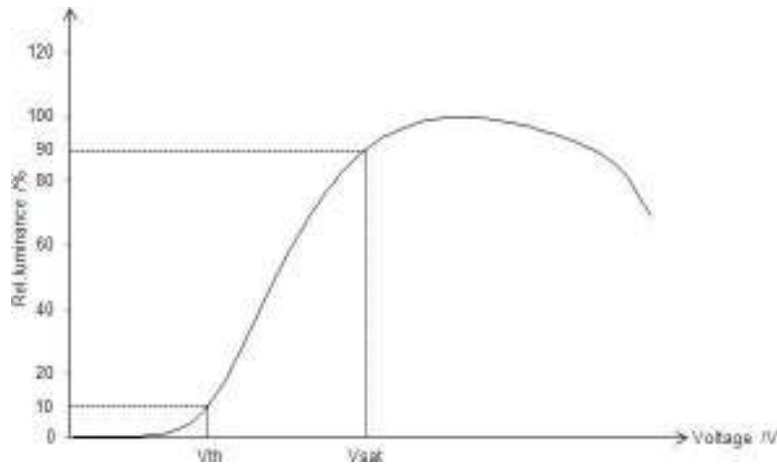


Figure 2. Measurement Set Up

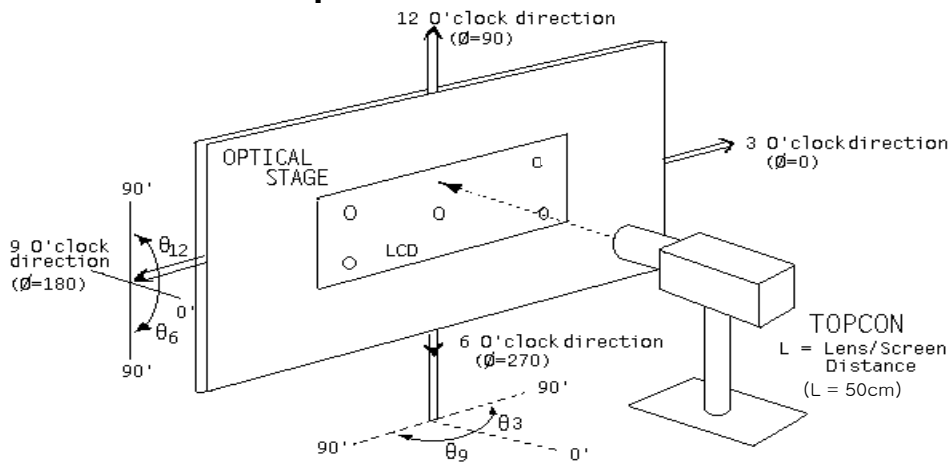
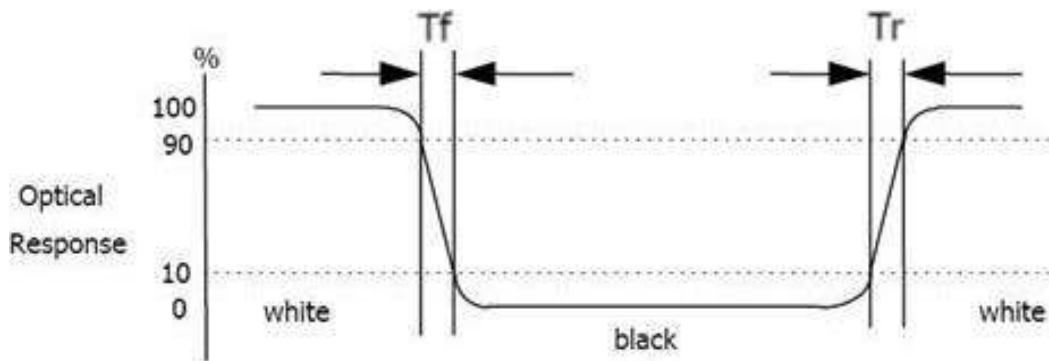


Figure 3. Response Time Testing



4.0 Mechanical Characteristics

4.1 Dimensional Requirements (H: horizontal length, V: Vertical length)

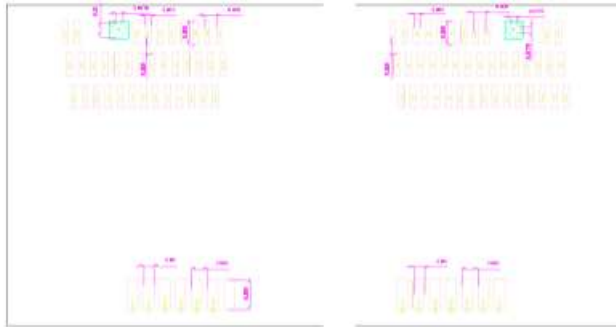
Parameter	Specification	Unit	Remark
Panel size	84.6(H) × 135.85(V)	mm	
CF size	84.6(H) × 132.8(V)	mm	
Active area	81.0(H) × 128.0(V)	mm	
Number of pixels	1620(H) × 2560(V)	pixels	
Pixel pitch	50(H) × 50(V)	um	
Pixel arrangement	WB Vertical stripe		
COG pad area	3.85	mm	
D-IC to FPC distance	0.725	mm	Note
D-IC width	0.895	mm	
D-IC to CF edge	0.63	mm	
FPC width	0.65	mm	
FPC to Glass edge	0.15	mm	
Seal Area(L/R/U/D)	1.8/1.8/1.8/3.0	mm	
Dimensional outline	84.6(H) × 135.85(V) × 1.08(D)	mm	FOG
Display mode	Normally Black		

Note:

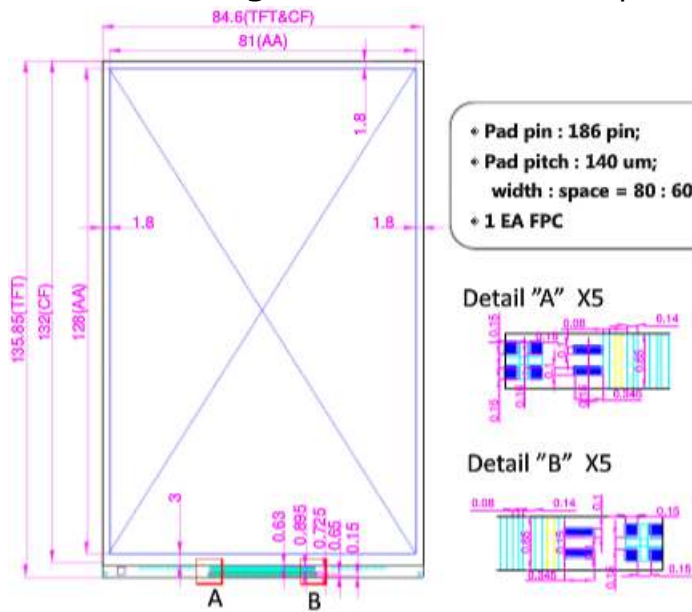
The size specified is calculated by IC-driver HX8252A

5.0 Data IC PAD & FPC Pin Assignment

5.1 Data IC One D-IC (unit: mm if unspecified)



5.2 FPC Pin Assignment (unit: mm if unspecified)



1	SWVWV	86	VGL	86	GPOE1	143	V58WV
2	FILE1	88	VGL	88	GPOE1	143	V58WV
3	DML1	90	V58D	90	LAME1L	144	V58WV
4	CKD1	91	V58D	89	LAME1L	145	V58WV
5	RD0	93	V58D	89	FE_81L	146	DSP
6	RD0	93	V58A	100	PH0V	147	DSP
7	V58D4	95	V58A	101	LAME1R	148	D14
8	V58D4	95	V58A	102	LAME1L	149	D14
9	V58D4	96	V58_81L	103	PARVE1R	150	V58WV
10	V58D4	97	V58_81R	105	PARVE1L	151	D1P
11	V58D4	98	V58_81R	105	PARVE1R	152	D1P
12	V58A	100	V58D_0	106	FE1R1	153	D14
13	V58A	100	V58D_0	107	FE1R1	154	D14
14	C_V58_2H	101	V58D_0	108	FE1R1	155	V58WV
15	C_V58_2H	101	V58A	109	CR0	156	D1P
16	C_V58_1P	102	V58D	110	V58D	157	D1P
17	C_V58_1P	102	V58D	111	V58D	158	D1P
18	V58	106	V58L	112	PARVE1R	159	D14
19	V58	106	V58L	113	FE_1	160	V58WV
20	C_V58_1P	107	V58A	114	V58	161	D1P
21	C_V58_1P	108	V58A	115	V58	162	D1P
22	C_V58_2H	109	V58A	116	V58	163	D14
23	C_V58_2H	110	V58A	117	V58	164	D14
24	C_V58_1P	111	V58	118	V58	165	V58WV
25	C_V58_1P	112	V58	119	V58	166	D1P
26	C_V58_2H	113	V58A	120	V58	167	D1P
27	C_V58_2H	114	V58A	121	V58	168	D14
28	V58L	115	V58A	122	V58	169	D14
29	V58L	115	V58A	123	V58D	170	V58WV
30	V58L	116	V58A	124	V58D	171	V58WV
31	V58D	117	V58A	125	V58D	172	V58WV
32	V58D	118	V58A	126	V58D	173	V58WV
33	V58D	119	V58A	127	V58D	174	V58D
34	V58D	120	V58A	128	V58D_0	175	V58D
35	V58	121	V58D_0	129	V58D_0	176	V58D
36	V58	122	V58D_0	130	V58D_0	177	V58D
37	V58	123	DIFF1	131	V58D	178	V58D
38	V58	124	DIFF1	132	V58D	179	V58D
39	V58	125	DIFF1	133	V58D	180	V58D
40	V58	126	DIFF1	134	V58D	181	V58D
41	V58	127	V58D	135	V58D	182	V58D
42	V58	128	V58D	136	V58D	183	V58D
43	V58	129	V58D	137	V58D	184	V58D
44	C_V58_1P	130	V58D	138	V58D	185	V58L
45	C_V58_1P	131	V58D	139	V58D_0	186	D14WV
46	C_V58_1P	132	V58A	140	V58D_0	187	D14WV
47	C_V58_1P	133	V58A	141	V58D_0	188	D14WV

Notes:

***1) SW must be connected to VGL**

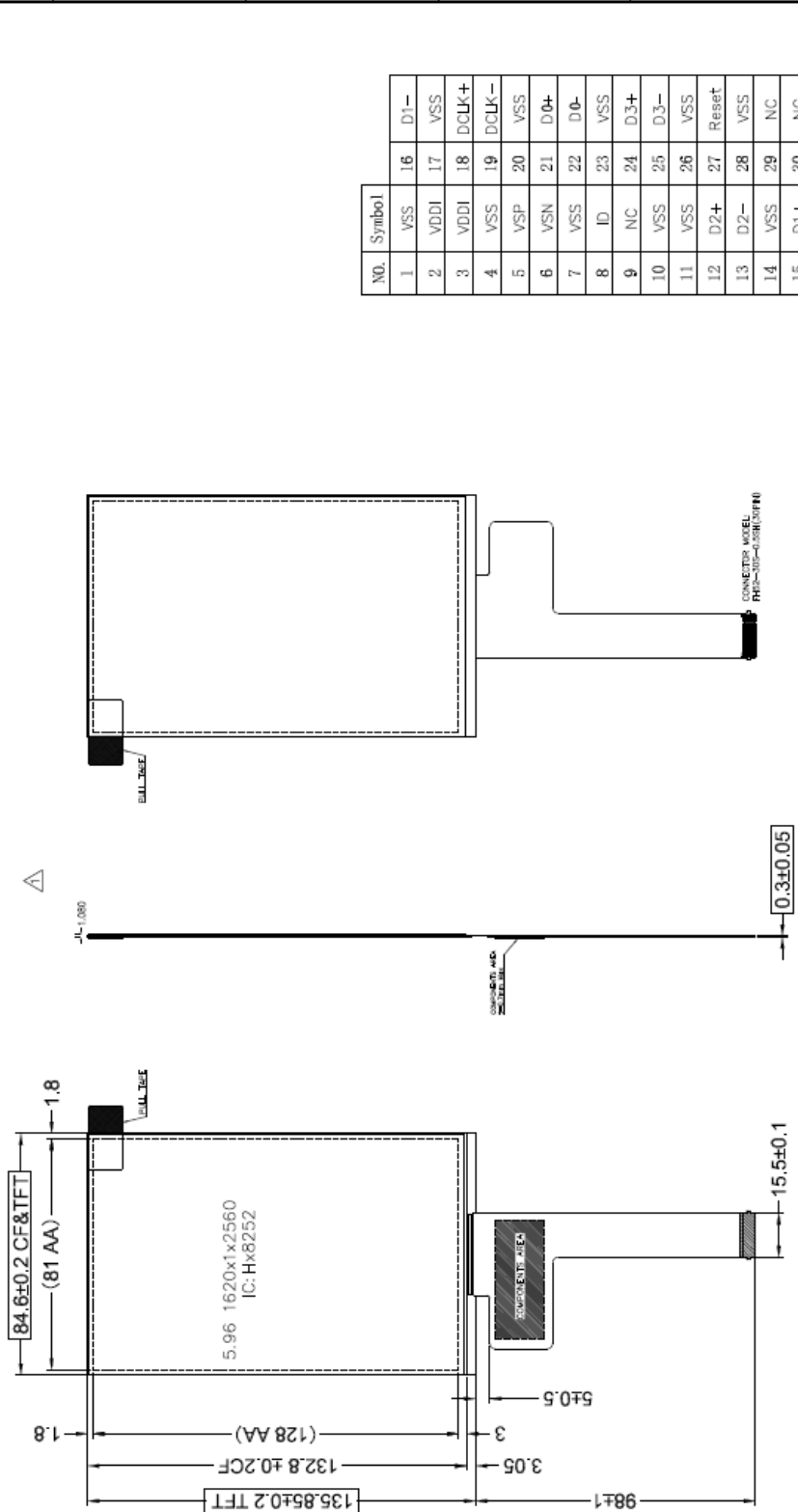
6.0 RELIABILITY TEST

NO	Test Item	Test Condition	Duration
1	High temperature, high humidity operation test(THO)	60°C, 90%	240hr
2	Low temperature operation test(LTO)	0 °C	240hr
3	High temperature operation test(HTO)	70 °C	240hr
4	High temperature storage test(HTS)	80°C	240hr
5	Low temperature storage test(LTS)	-10°C	240hr
6	Thermal shock test	-30 °C → 80 °C	100hr
	(TST)	(Per 30min)	
7	Vibration	5-200Hz,0.015 psd 200-500,-6db/octave, X/Y/Z each axis 2hrs, total 6hrs	-

7.0 APPENDIX

Figure 4. FOG Outline Dimension (unit: mm)

ZONE	DEVN NO	REVISION	Description	DATE	UPDATED BY
A	DEV-007758	R0	INITIAL RELEASE	20200107	HEJIDONG
		R1	INITIAL RELEASE	20200429	Xiao Lichuan



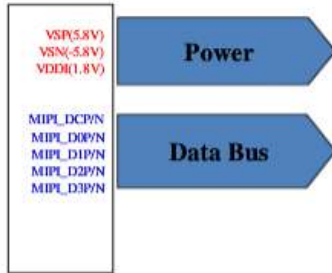
PART NO		DESCRIPTION	
5.96	FH52-30S-0.5SH(30PIN)	UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN MILLIMETERS, UNLESS INDICATED OTHERWISE.	REV
He Oidong	Xiao Lichuan	DATE	R1
20200107	20200107	SIZE	A2
20200107	20200107	SCALE	1/1
20200107	20200107	FACT DIMEN UNITS	± 0.10
BOE	Mechanical Design Dept.	SECTION	
FACTORY		MODEL	
		TITLE	5.96 FOG
		NO.	RV059FBB-N80-28P0

- NOTES:
- 1.DISPLAY TYPE: NORMALLY BLACK
 - 2.CUSTOMER CONNECTOR TYPE: FH52-30S-0.5SH(30PIN)
 - 3.GENERAL TOLERANCE: ±0.3
 - 4.CRITICAL CONTROL POINT : □
 - 5.REFERENCE DIMENSION : ()

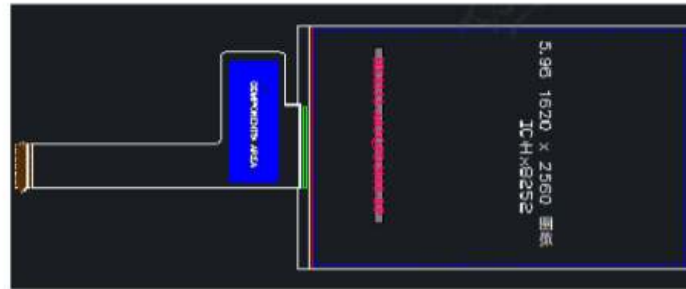
CONFIDENTIAL

Figure 5. FOG Block Diagram

User Connection
 (30 Pin ZIF Connector)



Cell



Input Signal: MIPI DSI Four-lane interface

Connector : 无 Customer connector(FH52-30S-0.5SH, ZIF)

测试 BLU : V_mA (TBD)

Figure 6. Timing and Voltage

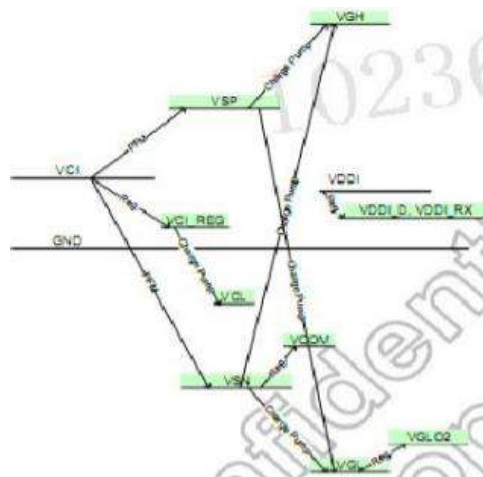


Figure 7. Power ON Sequence

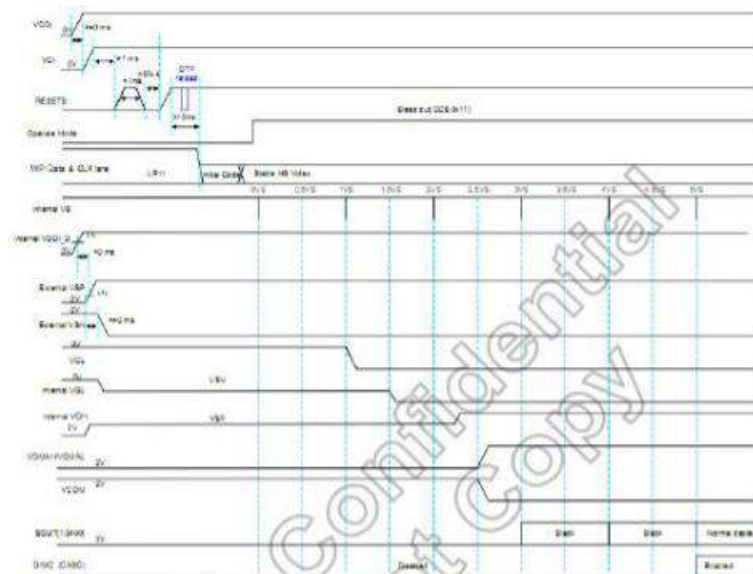
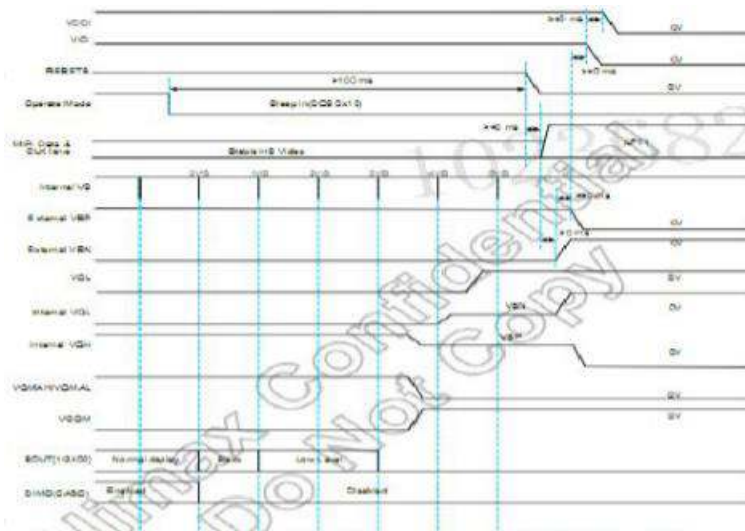


Figure 8. Power OFF Sequence



8.0 PACKING

8.1 Packing Process

<p>将FOG放入到Tray中,产品上面贴EPE PAD.</p> <p>2 ea FOG/2 ea PAD/Tray</p> <p>Step 1</p>	<p>将Tray叠码8层,然后加放1个空Tray作盖(旋转堆叠),用橡皮筋平行于Tray的宽边方向捆缚牢固。</p> <p>1.6ea FOG/1.6ea PAD/9Tray</p> <p>Step 2</p>	<p>将9层 Tray放入一个Shielding Bag中,并抽真空。</p> <p>1.6 FOG/1 Inner Box</p> <p>Step 3</p>	<p>将抽真空后的Tray然后放入Box中。</p> <p>1.6 FOG/1 Inner Box</p> <p>Step 4</p>
<p>用封箱胶带对Inner Box进行封箱,并在Box的Mark处贴粘相应标签。</p> <p>1.6 FOG/1 Inner Box</p> <p>Step 5</p>	<p>将封好的Inner Box装入Outer Box.</p> <p>6 Inner Box/1 Outer Box</p> <p>Step 6</p>	<p>采用“H”形封箱方式,对Box进行封箱,并在Box的Mark处粘贴相应Box标签。</p> <p>9.6 FOG/1 Outer Box</p> <p>Step 7</p>	<p>将1. Dual Cover放置于Pallet上, Outer Box按“田”字型,放置于Dual Cover上。</p> <p>1.6 Paper Box/1 Pallet</p> <p>Step 8</p>

9.0 Product ID Rule

RV059FBB – N80

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① <Application area> ② <Mode> ③ <Size> ④ <Resolution>

Code	Description	Code	Description	Code	Description	Code	Description
R	3D Printer	V	ADS-a Si	059	5.96"	FB	无具体分辨率
H	TV	S	ADS-LTPS	050	5.0"	WQ	WQVGA
A	Automotive	T	TN-a Si	060	6.0"	LC	LQCIF

⑤ <Production type> ⑥ <Product state> ⑦ <Product THK> ⑧ <Product Rev>

Code	Description	Code	Description	Code	Description	Code	Description
B	FOGA	N	Normal	8	0.8mm	0	First Mode
A	Array	E	In cell touch	5	0.5mm	1	Second Mode
E	Cell	A	Add on touch	6	0.6mm	2	Third Mode

10.0 Handling & Cautions

10.1 Mounting Method

- The panel of the LCD consists of two thin glasses with polarizer which easily get damaged. So extreme care should be taken when handling the LCD.
- Excessive stress or pressure on the glass of the LCD should be avoided. Care must be taken to insure that no torsional or compressive forces are applied to the LCD unit when it is mounted.
- If the customer's set presses the main parts of the LCD, the LCD may show the abnormal display. But this phenomenon does not mean the malfunction of the LCD and should be pressed by the way of mutual agreement.
- To determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Mount a LCD module with the specified mounting parts.

10.2 Caution of LCD Handling and Cleaning

- Since the LCD is made of glass, do not apply strong mechanical impact or static load onto it. Handling with care since shock, vibration, and careless handling may seriously affect the product. If it falls from a high place or receives a strong shock, the glass maybe broken.
- The polarizer on the surface of panel are made from organic substances. Be very careful for chemicals not to touch the polarizer or it leads the polarizer to be deteriorated.
- If the use of a chemical is unavoidable, use soft cloth with solvent recommended below to clean the LCD's surface with wipe lightly.
-IPA (Isopropyl Alcohol), Ethyl Alcohol, Tri-chloro, tri-florothane.
- Do not wipe the LCD's surface with dry or hard materials that will damage the polarizer and others. Do not use the following solvent—Water, acetone, Aromatics.
- It is recommended that the LCD be handled with soft gloves during assembly, etc. The polarizer on the LCD's surface are vulnerable to scratch and thus to be damaged by shape particles.
- Do not drop water or any chemicals onto the LCD's surface.
- A protective film is supplied on the LCD and should be left in place until the LCD is required for operation.
- The ITO pad area needs special careful caution because it could be easily corroded. Do not contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent from the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.
- Handle FPC with care.

10.3 Caution Against Static Charge

- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipments to protect against static electricity.
- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, if possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- In handling the LCD, wear non-charged material gloves. And the conducting wrist to the earth and the conducting shoes to the earth are necessary.

10.4 Caution For Operation

- It is indispensable to drive the LCD within the specified voltage limit since the higher voltage than the limit causes the shorter LCD's life. An electro-chemical reaction due to DC causes undesirable deterioration of the LCD so that the use of DC drive should avoid.
- Do not connect or disconnect the LCD to or from the system when power is on.
- Never use the LCD under abnormal conditions of high temperature and high humidity.
- When expose to drastic fluctuation of temperature(hot to cold or cold to hot), the LCD may be affected; specifically, drastic temperature fluctuation from cold to hot, produces dew on the LCD's surface which may affect the operation of the polarizer on the LCD.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand LCD may turn black at temperature above its operational range. However those phenomenon do not mean malfunction or out of order with the LCD. The LCD will revert to normal operation once the temperature returns to the recommended temperature range for normal operation.
- Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.
- Do not disassemble and/or re-assemble LCD module

10.5 Packaging

- Modules use LCD element, and must be treated as such.
 - Avoid intense shock and falls from a height.
 - To prevent modules from degradation, do not operate or store them exposed directly to sunshine or high temperature/humidity for long periods.

10.6 Storage

- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Relative humidity of the environment should therefore be kept below 60%RH.
- Original protective film should be used on LCD's surface (polarizer). Adhesive type protective film should be avoided, because it may change color and/or properties of the polarizer.
- Do not store the LCD near organic solvents or corrosive gasses.
- Keep the LCD safe from vibration, shock and pressure.
- Black or white air-bubbles may be produced if the LCD is stored for long time in the lower temperature or mechanical shocks are applied onto the LCD.
- In the case of storing for a long period of time for the purpose or replacement use, the following ways are recommended.
 - Store in a polyethylene bag with sealed so as not to enter fresh air outside in it.
 - Store in a dark place where neither exposure to direct sunlight nor light is.
 - Keep temperature in the specified storage temperature range.
 - Store with no touch on polarizer surface by the anything else. If possible, store the LCD in the packaging situation when it was delivered.

10.7 Safety

- For the crash damaged or unnecessary LCD, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.
- In the case of LCD is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water and soap as soon as possible.
- If you should swallow the liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
- If the liquid crystal get in your eyes, flush your eyes with running water for at least fifteen minutes.
- If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.

11.0 Applicable Scope

- This product specification only applies to the products manufactured and sold by our company.
- Any specification, quality etc. about other parts mentioned in this product spec are no concern of our company.