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PV119FHM-N81

Final Product Specification

Rev. 0

REVISION HISTORY

Revision No.	Page	Description of Changes	Date	Prepared
P0	28	Release	2023.10.12	

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

PV119FHM-N81 is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 11.9 inch diagonally measured active area with Full-HD resolutions (1920 horizontal by 1080 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M(6bit+2FRC) colors. The TFT-LCD panel used for this module is a low reflection and higher color type. Therefore, this module is suitable for Notebook PC. The LED driver for back-light driving is built in this model.

All input signals are eDP 1.2 interface compatible.

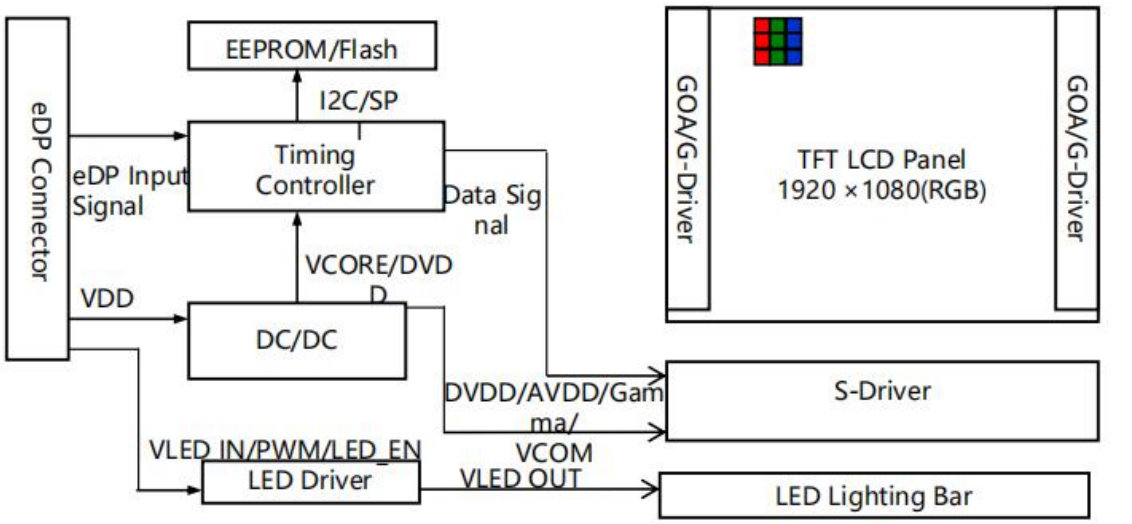


Figure 1. Drive Architecture

1.2 Features

- 2 lane eDP interface with 2.7Gbps link rates
- 16.7M(6 bit+2FRC) color depth
- RoHS Compliant
- Data enable signal mode
- 16.7M(6Bit+2FRC)
- On board LED driving circuit
- Low driving voltage and low power consumption
- On board EDID chip

1.3 Application

- Notebook PC (Wide type)

1.4 General Specification

The followings are general specifications at the model PV119FHM-N81(listed in Table 1)

<Table 1. General Specifications>

Parameter	Specification	Unit	Remarks
Active area	263.232(H) x148.068(V)	mm	
Number of pixels	1920 (H) x RGB(3) x1080 (V)	pixels	
Pixel pitch	45.7(H) x137.1(V)	um	
Pixel arrangement	RGB Vertical stripe		
Display colors	16.7M(6bit+2FRC)		
Color gamut	85%		
Display mode	Normally Black		
Dimensional outline	270 (H)*157.85(V) (PCB)*2.9(D) 270 (H)*169.07(V) (W/PCB)*2.9(D)	mm	
Weight	-(max)	g	
Surface treatment	Anti-Glare		
Surface hardness	3H		
Power consumption	P_D :0.66(Max)	W	@White
	P_{BL} : 2.52(Max)	W	
	P_{Total} : 3.18(Max)	W	

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. Absolute Maximum Ratings>

Ta=25+/-2° C

Parameter	Symbol	Min.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	2.6	5.5	V	Note 1
Logic Supply Voltage	V_{IN}	Vss-0.3	V_{DD}+0.3	V	
Operating Temperature	T_{OP}	0	+50	° C	Note 2
Storage Temperature	T_{ST}	-10	+60	° C	

Notes :
1. Permanent damage to the device may occur if maximum values are exceeded functional operation should be restricted to the condition described under normal operating conditions.
2. Temperature and relative humidity range are shown in the figure below.
95 % RH Max. (40 ° C ≥ Ta) Maximum wet - bulb temperature at 39 ° C or less. (Ta > 40 ° C)
No condensation.

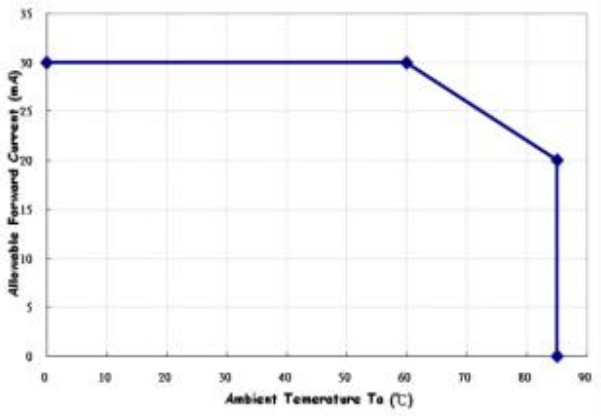


Figure 2. forward current vs ambient temperature

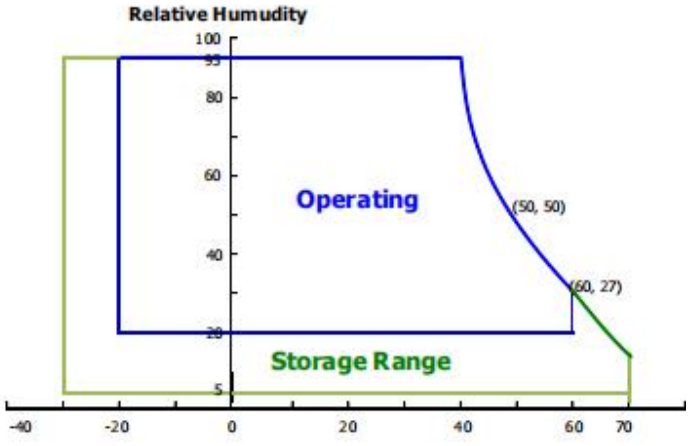


Figure 3. Operation temperature vs Humudity

3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

< Table 3. Electrical Specifications > Ta=25+/-2° C

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	3.0	3.3	3.6	V	Note 1
Permissible Input Ripple Voltage	V_{RF}	-10% VDD	-	+10% VDD	V	@ V_{DD} = 3.3V
BIST Control Level	High Level	0.8VDD	-	VDD	V	@ V_{DD} = 3.3V
	Low Level	0	-	0.15 VDD	V	
Power Supply Current	I_{DD}	-	-	200	mA	Note 1
Power Supply Inrush Current	Inrush	-	-	2.0	A	Note 2
Power Consumption	P_D	-	-	0.66	W	Note 1
	P_{BL}	-	-	2.52	W	-
	P_{total}	-	-	3.18	W	Note 1

Notes :

1.The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.3V at 25℃.
A) White Pattern

2.Measure condition(Figure 4)

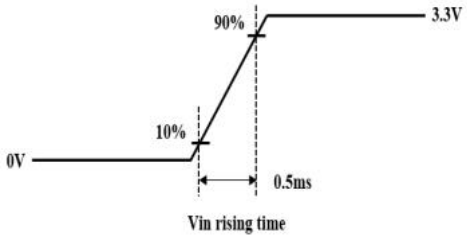


Figure 4. Inrush Measure Condition

3.2 Backlight Unit

< Table 4. LED Driving Guideline Specifications > Ta=25+/-2° C

Parameter			Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage		V_F	2.8	-	3.0	V	-
LED Forward Current		I_F	-	20	-	mA	-
LED Power Consumption		P_{LED}	-	-	2.52	W	Note 1
LED Life-Time		N/A	15,000	-	-	Hour	I_F = 20mA
Power Supply Voltage for LED Driver		V_{LED}	19.6	-	21	V	-
Power Supply Voltage for LED Driver Inrush		Iled inrush	-	-	2.0	A	Note 4
EN Control Level	Backlight On	V_{BL_EN}	2.5	-	5.0	V	-
	Backlight Off		-	-	0.6	V	-
PWM Control Level	High Level	V_{BL_PWM}	2.5	-	5.0	V	-
	Low Level		-	-	0.6	V	-
PWM Control Frequency		F_{PWM}	200	-	10,000	Hz	-
Duty Ratio			5	-	100	%	Note 3

Notes :

1. Power supply voltage 12V for LED driver.
   Calculator value for reference IF × VF ×42 /driver efficiency = PLED
2. The LED life-time define as the estimated time to 50% degradation of initial luminous.
3. 1% duty cycle is achievable with a dimming frequency less than 1KHz.
4. Measure condition (Figure 5)

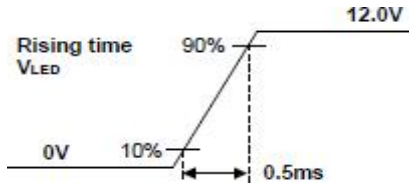


Figure 5. Inrush Measure Condition

3.3 LED Structure

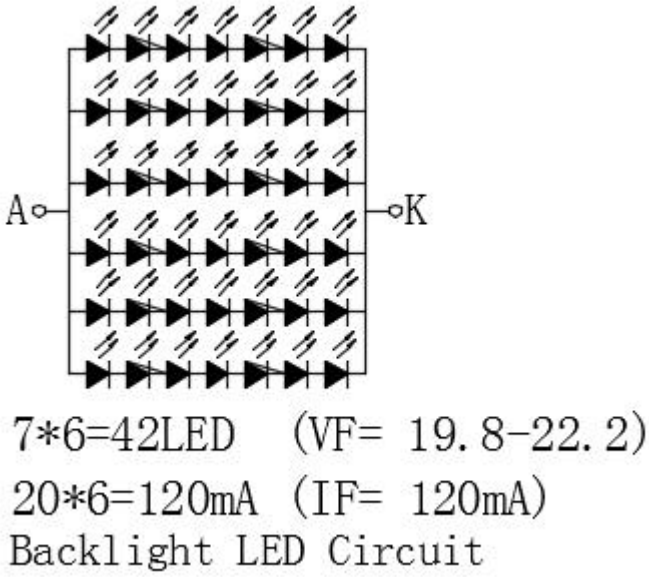


Figure 6. LED Structure

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = 25±2℃) with the equipment of luminance meter system (CA310) 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°. We refer to θØ=0 (=θ3) as the 3 o'clock direction (the "right"), θØ=90 (= θ12) as the 12 o'clock direction ("upward"), θØ=180 (= θ9) as the 9 o'clock direction ("left") and θØ=270(= θ6) as the 6 o'clock direction ("bottom"). While scanning θand/or Ø, the center of the measuring spot on the display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. VDD shall be 3.3+/- 0.3V at 25°C. Optimum viewing angle direction is 6 'clock.

4.2 Optical Specifications

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	Θ_3	CR > 10	80	85	-	Deg.	Note 1
		Θ_9		80	85	-	Deg.	
	Vertical	Θ_{12}		80	85	-	Deg.	
		Θ_6		80	85	-	Deg.	
Luminance Contrast Ratio		CR	Θ = 0°	800	1000	-		Note 2
Luminance of White(centre)	9 Points	Y_w	Θ = 0° I_{LED} = 20mA	200	230	-	cd/m²	Note 3
White Luminance Uniformity	9 Points	ΔY9		70	75	-	%	Note 4
	13 Points	ΔY13		60.5	-	-	%	
White Chromaticity		W_x	Θ = 0°	0.27	0.30	0.33	-	Note 5
		W_y		0.29	0.32	0.35	-	
Reproduction of Color	Red	R_x	Θ = 0°	Typ.-0.03	0.64	Typ.+0.03	-	-
		R_y			0.34		-	-
	Green	G_x			0.27		-	-
		G_y			0.68		-	-
	Blue	B_x			0.14		-	-
		B_y			0.05		-	-
Color Gamut		-	-	85	90	-	%	-
Response Time (Rising + Falling)		T_{RT}	Ta= 25℃ Θ = 0°	25	30	35	ms	Note 6
Cross Talk		CT	Θ = 0°	-	-	2	%	Note 7

Notes :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles 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 Figure 7).

2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ 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 Figure 7) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. Center Luminance of white is defined as luminance values of 5 point average across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in Figure 8 for a total of the measurements per display.

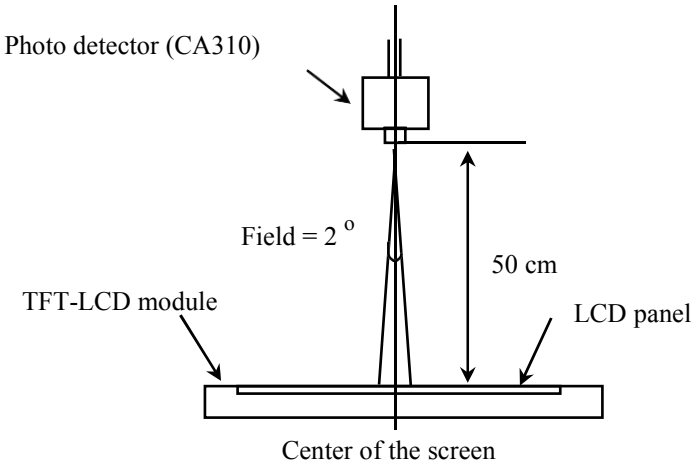
4. The White luminance uniformity on LCD surface is then expressed as : ΔY =Minimum Luminance of 9(or 13) points / Maximum Luminance of 9(or 13) points.(see Figure 8 and Figure 9).

5. The color chromaticity coordinates specified in Table 5 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 panel.

6. The electro-optical response time measurements shall be made as Figure 10 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_f, and 90% to 10% is T_r.

7. Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 10 ± 1mm diameter area, with all display pixels set to gray 127(of 0 to 255), to the luminance (YB) of that same area when any adjacent area is driven dark.The luminance ratio shall not exceed 1:1.05 (See Figure 11).

4.3 Optical Measurements



Optical characteristics measurement setup

Figure 7. Measurement Set Up

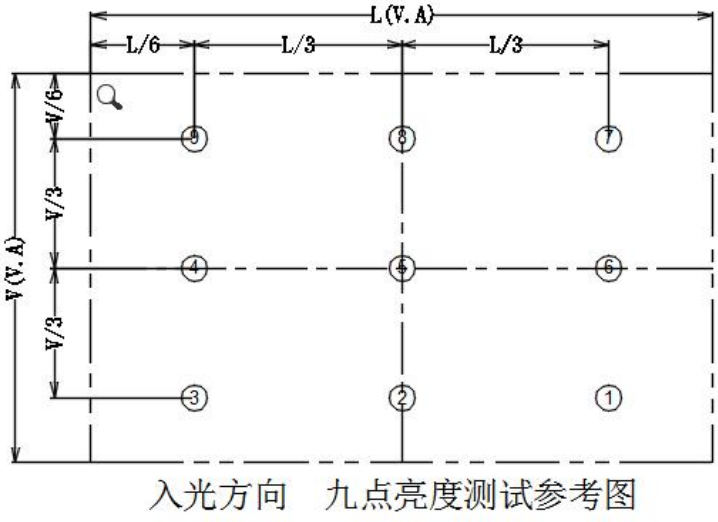


Figure 8. White Luminance and Uniformity Measurement Locations (5 points)

Center Luminance of white is defined as luminance values of center 5 points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in Figure 7 for a total of the measurements per display.

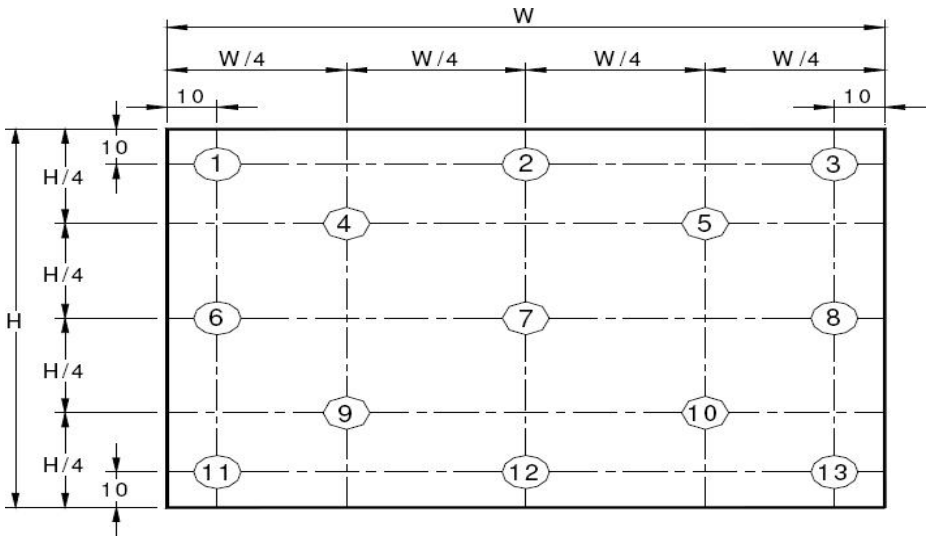


Figure 9. Uniformity Measurement Locations (13 points)

The White luminance uniformity on LCD surface is then expressed as : ΔY5 = Minimum Luminance of five points / Maximum Luminance of five points (see Figure 8) , ΔY13 = Minimum Luminance of 13 points /Maximum Luminance of 13 points (see Figure 9).

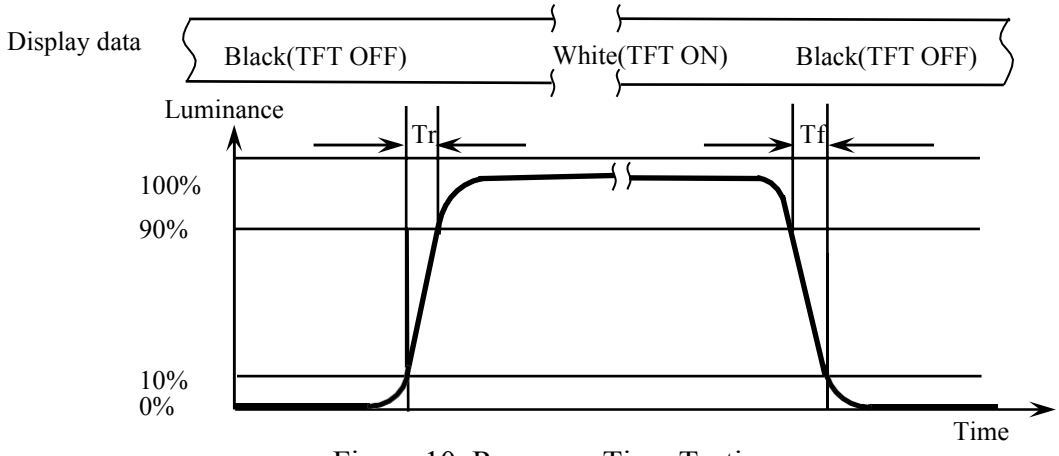
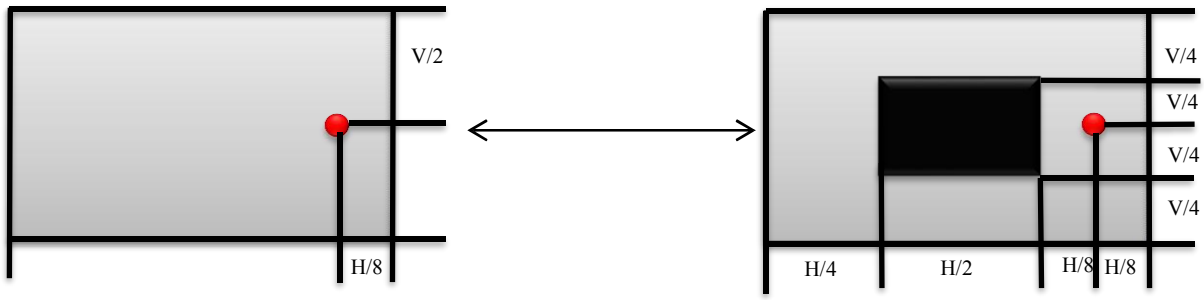


Figure 10. Response Time Testing

The electro-optical response time measurements shall be made as shown in Figure 10 by switching the “data” input signal ON and OFF. Tr: The luminance to change from 10% to 90% ,Tf: The luminance to change from 90% to 10% .

The test system : CA310



$$\text{Cross Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_B} \right| \times 100$$

Figure 11. Cross Talk Modulation Test Description

Where:

Y_A = Initial luminance of measured area (cd/m^2)

Y_B = Subsequent luminance of measured area (cd/m^2)

The location measured will be exactly the same in both patterns. The test background gray is L127.

Cross Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 10±1mm diameter area, with all display pixels set to a gray level 127, to the luminance (YB) of that same area when any adjacent area is driven dark.(Refer to Figure 11)
The test system: CA310

5.0 INTERFACE CONNECTION

5.1 Electrical Interface Connection

The electronics interface connector is MSAK24025P30 or equivalent.
The connector interface pin assignments are listed in Table 6.

<Table 6. Pin Assignments for the Interface Connector>

Terminal	Symbol	Functions
Pin No.	Symbol	Description
1	NC	No Connection
2	H_GND	Ground
3	LANE1_N	eDP RX Channel 1 Negative
4	LANE1_P	eDP RX Channel 1 Positive
5	H_GND	Ground
6	LANE0_N	eDP RX Channel 0 Negative
7	LANE0_P	eDP RX Channel 0 Positive
8	H_GND	Ground
9	AUX_CH_P	eDP AUX CH Positive
10	AUX_CH_N	eDP AUX CH Negative
11	H_GND	Ground
12	LCD_VCC	Power Supply, 3.3V (typ.)
13	LCD_VCC	Power Supply, 3.3V (typ.)
14	BIST	Panel Self Test Enable
15	H_GND	Ground
16	H_GND	Ground
17	HPD	Hot Plug Detect Output
18	BL_GND	LED Ground
19	BL_GND	LED Ground
20	BL_GND	LED Ground
21	BL_GND	LED Ground
22	BL_ENABLE	LED Enable Pin(+3.3V Input)
23	BL_PWM	System PWM Signal Input
24	Privacy_EN	No Connection
25	NC	No Connection
26	BL_POWER	LED Power Supply 5V-21V
27	BL_POWER	LED Power Supply 5V-21V
28	BL_POWER	LED Power Supply 5V-21V
29	BL_POWER	LED Power Supply 5V-21V
30	NC	No Connection

5.2 eDP Interface

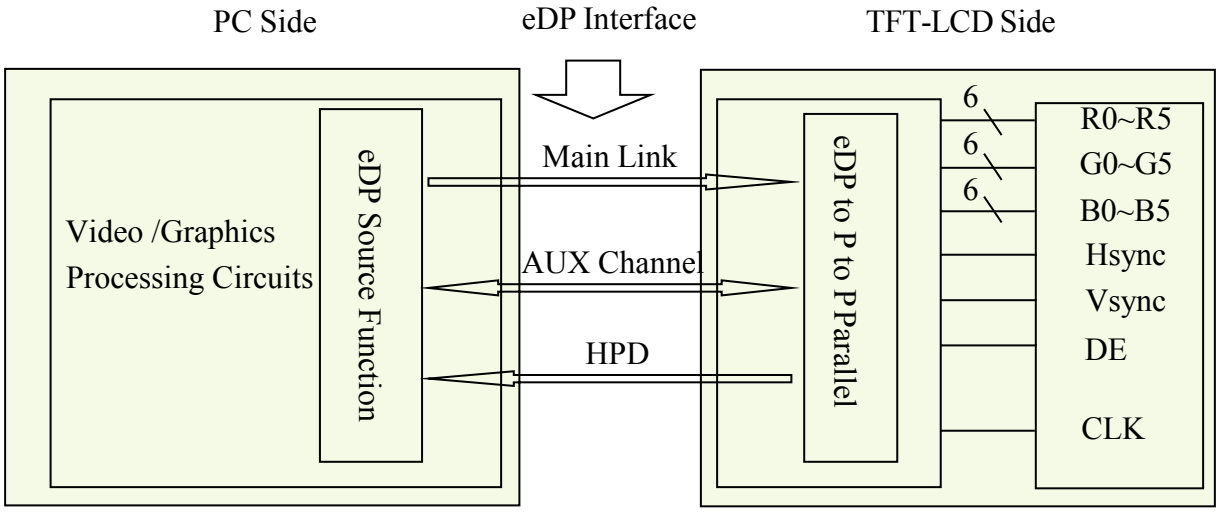


Figure 12. eDP Interface Architecture

Note:
Transmitter : Raydium RM81010 .
Transmitter is not contained in module.

5.3 Data Input Format

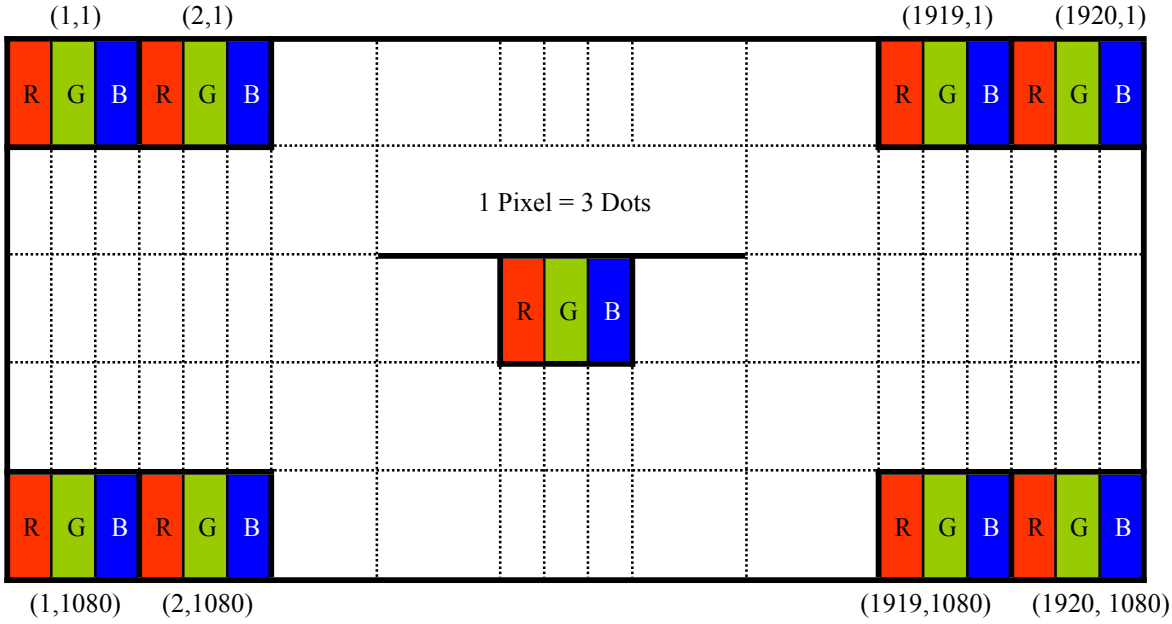
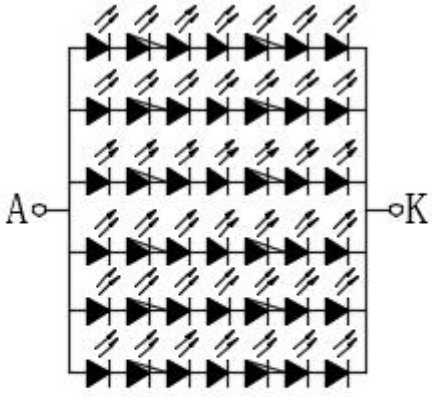


Figure 13. Display Position of Input Data (V-H)

5.4 Back-light & LCM Interface Connection



7*6=42LED (VF= 19.8-22.2)
20*6=120mA (IF= 120mA)
Backlight LED Circuit

6.0 SIGNAL TIMING SPECIFICATION

6.1 The PV119FHM-N81 Is Operated By The DE Only

< Table 8. Signal Timing Specification >

Item		Symbols	Min	Typ	Max	Unit
Clock	Frequency	1/Tc	119.3	149.1	-	MHz
Frame Period		Tv	-	1140	-	lines
			-	60	-	Hz
			-	16.67	-	ms
Vertical Display Period		Tvd	-	1080	-	lines
One line Scanning Period		Th	-	2188	-	clocks
Horizontal Display Period		Thd	-	1920	-	clocks

Note : The above is as optimized setting.

6.2 eDP Rx Interface Timing Parameter

The specification of the eDP Rx interface timing parameter is shown in Table 9.

<Table 9. eDP Main-Link RX TP4 Package Pin Parameters>

Item	Symbol	Min	Typ	Max	Unit	Remark
Spread spectrum clock (Link clock down-spreading)	SSC	0	-	0.5	%	
Differential peak-to-peak input voltage at package pins	VRX-DIFFp-p	100	-	1320	mV	
Rx input DC common mode voltage	VRX_DC_CM	0	-	2	V	
Differential termination resistance	RRX-DIFF	80	-	120	Ω	
Single-ended termination resistance	RRX-SE	40	-	60	Ω	
Rx short circuit current limit	IRX_SHORT	-	-	50	mA	
Intra-pair skew at Rx package pins (HBR) RX intra-pair skew tolerance at HBR	LRX_SKEW_ INTRA_PAIR	-	-	60	ps	

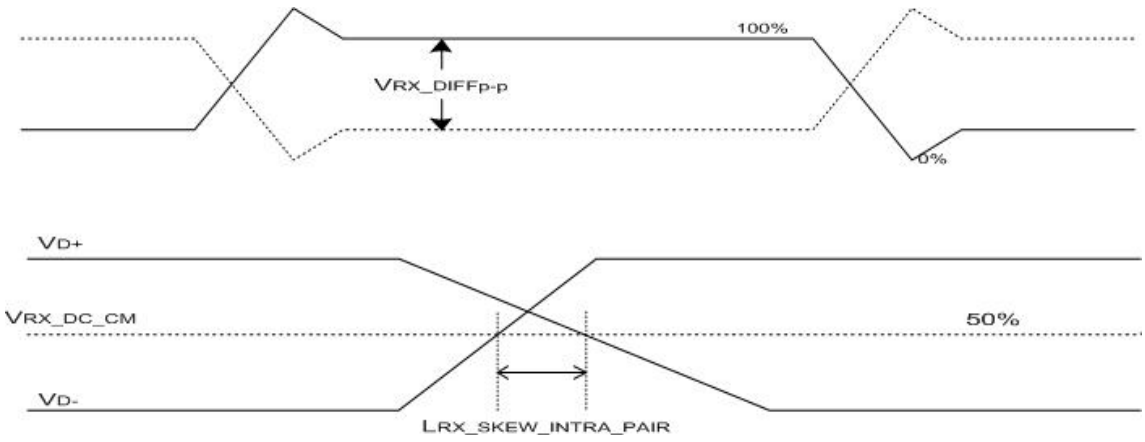


Figure 14. VRX-DIFFp-p & LRX_SKEW_INTRA_PAIR

7.0 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

<Table 10. Input Signal & Basic Display Colors & Gray Scale of Colors >

	Colors & Grayscale	Data signal		
		R0 R1 R2 R3 R4 R5	G0 G1 G2 G3 G4 G5	B0 B1 B2 B3 B4 B5
Basic colors	Black	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
	Blue	0 0 0 0 0 0	0 0 0 0 0 0	1 1 1 1 1 1
	Green	0 0 0 0 0 0	1 1 1 1 1 1	0 0 0 0 0 0
	Light Blue	0 0 0 0 0 0	1 1 1 1 1 1	1 1 1 1 1 1
	Red	1 1 1 1 1 1	0 0 0 0 0 0	0 0 0 0 0 0
	Purple	1 1 1 1 1 1	0 0 0 0 0 0	1 1 1 1 1 1
	Yellow	1 1 1 1 1 1	1 1 1 1 1 1	0 0 0 0 0 0
	White	1 1 1 1 1 1	1 1 1 1 1 1	1 1 1 1 1 1
Gray scale of Red	Black	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
	△	1 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
	Darker	0 1 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
	△ ▽	↑ ↓	↑ ↓	↑ ↓
	Brighter ▽	1 0 1 1 1 1	0 0 0 0 0 0	0 0 0 0 0 0
		0 1 1 1 1 1	0 0 0 0 0 0	0 0 0 0 0 0
	Red	1 1 1 1 1 1	0 0 0 0 0 0	0 0 0 0 0 0
Gray scale of Green	Black	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
	△	0 0 0 0 0 0	1 0 0 0 0 0	0 0 0 0 0 0
	Darker	0 0 0 0 0 0	0 1 0 0 0 0	0 0 0 0 0 0
	△ ▽	↑ ↓	↑ ↓	↑ ↓
	Brighter ▽	0 0 0 0 0 0	1 0 1 1 1 1	0 0 0 0 0 0
		0 0 0 0 0 0	0 1 1 1 1 1	0 0 0 0 0 0
	Green	0 0 0 0 0 0	1 1 1 1 1 1	0 0 0 0 0 0
Gray scale of Blue	Black	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
	△	0 0 0 0 0 0	0 0 0 0 0 0	1 0 0 0 0 0
	Darker	0 0 0 0 0 0	0 0 0 0 0 0	0 1 0 0 0 0
	△ ▽	↑ ↓	↓ ↓	↑ ↓
	Brighter ▽	0 0 0 0 0 0	0 0 0 0 0 0	1 0 1 1 1 1
		0 0 0 0 0 0	0 0 0 0 0 0	0 1 1 1 1 1
	Blue	0 0 0 0 0 0	0 0 0 0 0 0	1 1 1 1 1 1
Gray scale of White & Black	Black	0 0 0 0 0 0	0 0 0 0 0 0	0 0 0 0 0 0
	△	1 0 0 0 0 0	1 0 0 0 0 0	1 0 0 0 0 0
	Darker	0 1 0 0 0 0	0 1 0 0 0 0	0 1 0 0 0 0
	△ ▽	↑ ↓	↑ ↓	↑ ↓
	Brighter ▽	1 0 1 1 1 1	1 0 1 1 1 1	1 0 1 1 1 1
		0 1 1 1 1 1	0 1 1 1 1 1	0 1 1 1 1 1
	White	1 1 1 1 1 1	1 1 1 1 1 1	1 1 1 1 1 1

8.0 POWER SEQUENCE

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence shall be as shown in below.

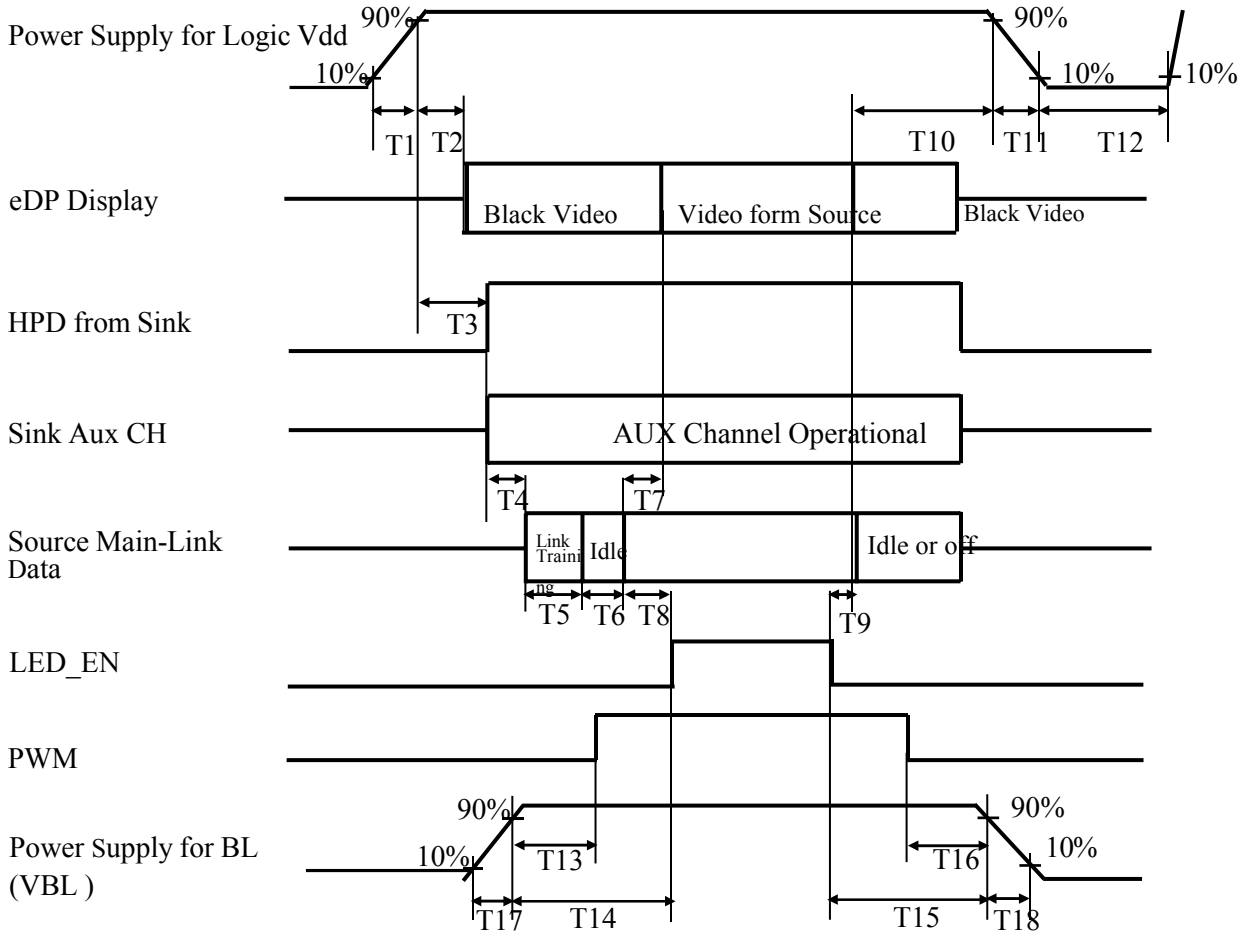


Figure 15. Power Sequence

- 0.5ms ≤ T1 ≤ 10 ms
- 0ms < T2 ≤ 200 ms
- 0ms < T3 ≤ 200 ms
- T3+T4+T5+T6+T8>80ms
- 0ms < T7 ≤ 50ms
- T7 < T8
- 0ms < T9
- 100ms < T10 < 500 ms
- 0.5ms ≤ T11 ≤ 10 ms
- 500ms ≤ T12
- 0ms < T13
- 0ms < T14
- 0ms < T15
- 0ms < T16
- 0.5ms ≤ T17
- 0.5ms ≤ T18

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

9.0 Connector Description

Physical interface is described as for the connector on LCM.
These connectors are capable of accommodating the following signals and will be following components.

9.1 TFT LCD Module

< Table 11. Signal Connector >

Connector Name /Description	For Signal Connector
Manufacturer	STM
Type/ Part Number	MSAK24025P30 or equivalent
Mating Housing/ Part Number	-

10.0 MECHANICAL CHARACTERISTICS

10.1 Dimensional Requirements

Figure 23 shows mechanical outlines for the model PV119FHM-N81.
Other parameters are shown in Table 12.

<Table 12. Dimensional Parameters>

Parameter	Specification	Unit
Active Area	340.998 (H) ×191.808 (V)	mm
Number of pixels	1920 (H) X 1080 (V) (1 pixel = R + G + B dots)	pixels
Pixel pitch	59.2 X 177.6	um
Pixel arrangement	RGB Vertical stripe	
Display colors	16.7M(6bit+2FRC)	
Display mode	Normally black	
Dimensional outline	270 (H)*169.07(V) *2.9(Typ)	mm
Weight	-(Max)	g

10.2 Anti-Glare and Polarizer Hardness.

The surface of the LCD has an Anti-Glare coating to minimize reflection and to reduce scratching.
The polarizer hardness is 3H.

10.3 Light Leakage

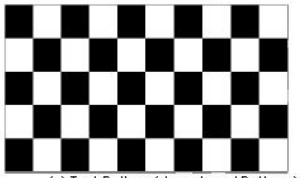
There shall not be visible light from the back-lighting system around the edges of the screen as seen from a distance 50cm from the screen with an overhead light level of 350 lux.

11.0 RELIABILITY TEST

11.1 TEMPERATURE AND HUMIDITY

Test Item	Test Condition	Remark
High Temperature Storage	Ta=60℃; 240hrs	IEC60068-2-1：2007 GB2423.2-2008
Low Temperature Storage	Ta=-20℃;240hrs	IEC60068-2-1：2007 GB2423.1-2008
High Temperature Operation	Ta=50℃，240Hrs	IEC60068-2-1：2007 GB2423.2-2008
Low Temperature Operation	Ta=-0℃; 240hrs	IEC60068-2-1：2007 GB2423.1-2008
High Temperature High Humidity Operation	Ta=40℃，90%RH，240Hrs(no condensation)	IEC60068-2-78：2001 GB/T2423.3-2006
Thermal Shock	-10℃(0.5h) ~ 60℃(0.5h) / 96 cycles	Start with cold temperature， End with high temperature， IEC60068-2-14:1984,GB2423.22-2002
Image Sticking	25℃；0.5hrs	Note1

Note1:Condition of image sticking test :25℃±2℃
Operation with test pattern sustained for 1 hrs,then change to gray pattern immediately.after 3 mins,the mura must be disappeared completely


(a) Test Pattern (chess board Pattern)


(b) Gray Pattern

11.2 VIBRATION&SHOCK

Test item	Conditions	Remark
Packing Shock (non-operation)	686m/s2,1ms, ±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

11.3 ESD

Test item	Conditions	Remark	
Electro Static Discharge Test (non-operation)	150pF，330Ω， Contact:±4KV,Air:±8KV	1	Class C
	200pF，0Ω，±200V contact test	2	

Note: Measure point :
1. LCD glass and metal bezel
2. IF connector pins
3. ESD class C:some performance degradation allowed. Recoverable after restart.
   No data lost,no hardware failures.

12.0 HANDLING & CAUTIONS

(1) Cautions when taking out the module
- Pick the pouch only, when taking out module from a shipping package.

(2) Cautions for handling the module
- As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
- As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.
- As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
- Do not pull the interface connector in or out while the LCD module is operating.
- Put the module display side down on a flat horizontal plane.
- Handle connectors and cables with care.

(3) Cautions for the operation
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.

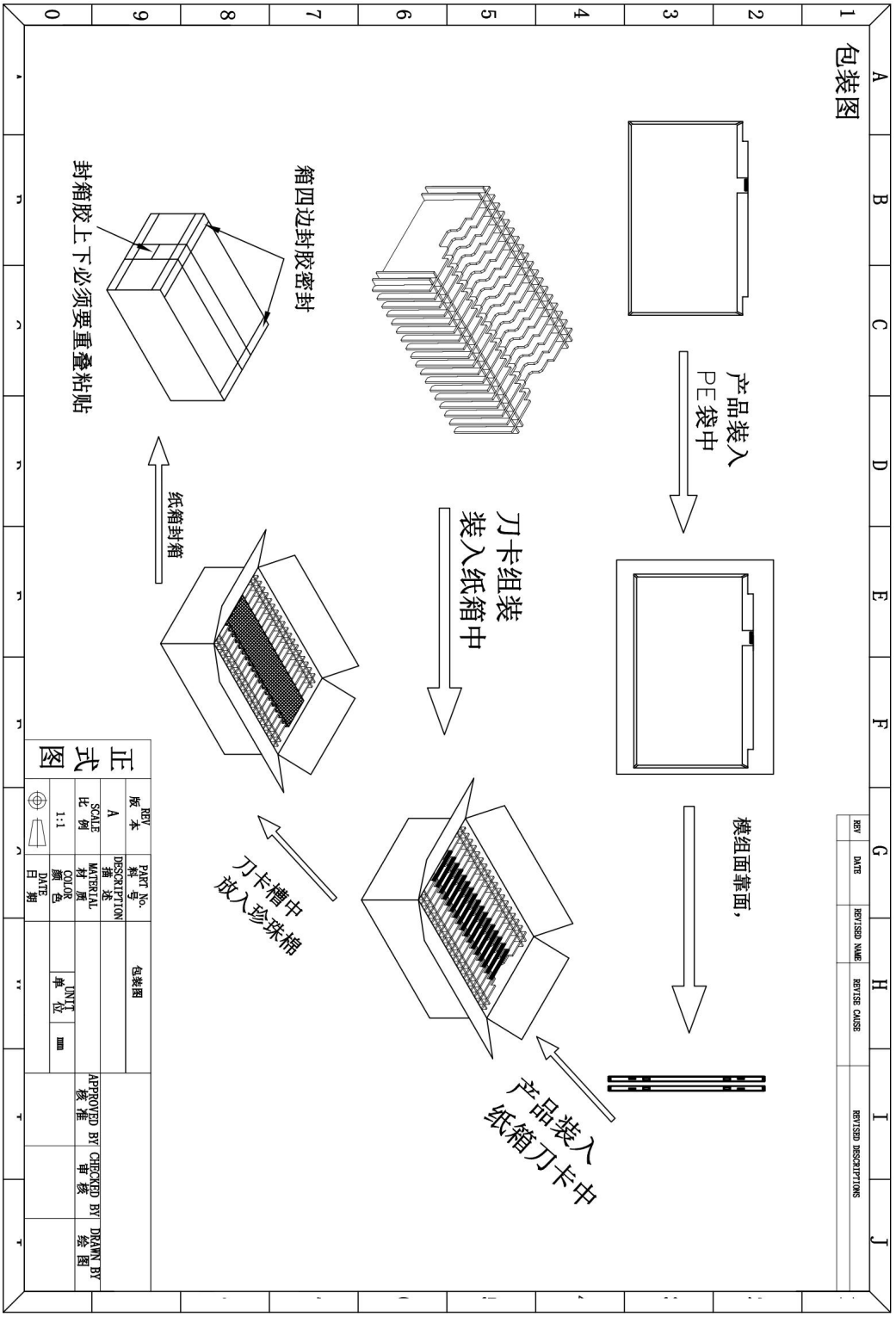
(4) Cautions for the atmosphere
- Dew drop atmosphere should be avoided.
- Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.

(5) Cautions for the module characteristics
- Do not apply fixed pattern data signal to the LCD module at product aging.
- Applying fixed pattern for a long time may cause image sticking.

(6) Other cautions
- Do not disassemble and/or re-assemble LCD module.
- Do not re-adjust variable resistor or switch etc.
- When returning the module for repair or etc. Please pack the module not to be broken. We recommend to use the original shipping packages.

13.0 PACKING INGORMATION

13.1 Packing Order



14.0 MECHANICAL OUTLINE DIMENSION