深圳市勋瑞光电科技有限公司
Xunrui Shenzhen Optoelectronics Technology Co., Ltd.

CERT. No. QAC0946535 (ISO9001)　　CERT. No. HKG002005 (ISO14001)

Product Specification

Customer: _____

Model Name: _____ **H0154PHQ 24I1804** _____

Date: _____

Version: _____

■ **Preliminary Specification**

☐ **Final Specification**

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by

Contents

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1. Record of Revision

Version	Revise Date	Content	Editor
1.0	2016/06/12	First Release.	Rich Liang

2 General Specifications

Feature		Spec
Characteristics	LCD Size	1.54 inch
	Display Format	240 (RGB) × 240
	Interface	SPI
	Color Depth	262K
	Technology type	a-Si
	Display Spec.	-
	Display Mode	Normally BACK
	Driver IC	ST7789V
	Surface Treatment	HC
	Viewing Direction	ALL
	Gray Viewing Direction	Free
Mechanical	LCM (W x H x D) (mm)	31.52*35.1*2.1
	Active Area(mm)	27.72*27.72
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	3 LEDs

Note 1: Viewing direction is following the data which measured by optics equipment.
Note 2: Requirements on Environmental Protection: RoHS
Note 3: LCM weight tolerance: +/- 5%

3 Input/Output Terminals

No.	Symbol	Description
1,2	LEDK	Backlight LED Cathode
3,4	GND	System Ground
5	FMARK	Tearing effect signal is used to synchronize MCU to frame memory writing
6	SDA	Serial Data
7	LSA0/WR	Second Data lane in 2 data lane serial interface
8	RS/SCL	Serial Clock.
9	CS	Chip select
10	RESET	Reset Signal pin (Low is enable)
11,12	IOVCC	power supply 1.8V
13,14	VCI	power supply 2.8V
15,16	GND	System Ground
17~22	NC	-
23,24	LEDA	Backlight LED Anode.

4 Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	V_{cc}	-0.3	4.6	V	
Input Signal Voltage	V_{in}	-0.3	Vcc+0.3	V	
Logic Output Voltage	V_{OUT}	-0.3	Vcc+0.3	V	
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

5 Electrical Characteristics

5.1 Operating conditions:

Parameter	Symbol	Min	Typ	Max	Unit
Supply voltage for logic	Vcc -Vss	2.4	2.8	3.2	V
I/O power supply	IOVCC	1.65	1.8	3.2	V
Input Current	Idd	-	TBD	TBD	mA
Input voltage 'H' level	Vih	0.7IOVCC	--	IOVCC	V
Input voltage 'L' level	Vil	GND	0	0.3IOVCC	V
Output voltage 'H' level	Voh	0.8IOVCC	--	IOVCC	V
Output voltage 'L' level	Vol	GND	0	0.2IOVCC	V
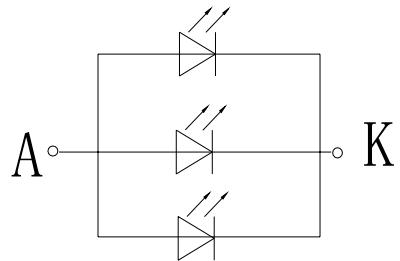
5.2 Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
LED current	I_F	-	60	65	mA	
Power Consumption					mW	
LED Voltage	V_F	3	3.2	3.4	V	Note 1
LED Life Time	W_{BL}	-	TBD	-	Hr	Note 2,3

Note 1 : There are 1 Groups LED

Note 2 : Ta = 25℃

Note 3 : Brightess to be decreased to 50% of the initial value

6 Interface Timing

6.1 Serial Peripheral Interface(SPI)

The SPI is available through the chip select line (CSB), serial transfer clock line (SCK), serial data input (SDI), and serial data output (SDO).

The Driver IC recognizes the start of data transfer at the falling edge of CSB input to initiate the transfer of start byte. It recognizes the end of data transfer at the rising edge of CSB input. The Driver IC is selected when the 6-bit chip address in the start byte transferred from the transmission device and the 6-bit device identification code assigned to the Driver IC are compared and both 6-bit data correspond. The identification code must be 011100(Primary SPI Register) or 011101(Secondary SPI Register). Two different chip addresses must be assigned to the Driver IC because the seventh bit of the start byte is assigned to a register select bit (RS). When RS = 0, index register write or status read is executed. When the RS=1, instruction write. The eighth bit of the start byte is to specify read or write (R/W bit). The data are received when the R/W bit is 0, and are transmitted when the R/W bit is 1.

After receiving the start byte, the Driver IC starts to transmit or receive data by byte.The data transmission adopts a format by which the MSB is first transmitted (9th SCK started). All Driver IC instructions consist of 16 bits and they are executed internally after two bytes are transmitted with the MSB first (IB15 to 0---9th ~24th SCK).

Command write mode:

The command write protocol of 2-wire data lane serial interface is the same with the 3-line serial interface, so users can ignore the input data of WRX.

Any instruction can be sent in any order to the driver. The MSB is transmitted first. The serial interface is initialized when CSX is high. In this state, SCL clock pulse or SDA data have no effect. A falling edge on CSX enables the serial interface and indicates the start of data transmission.


CSX can be "H"between parameter/command and parameter/command SCL, and SDA during CSX="H" is ignored.
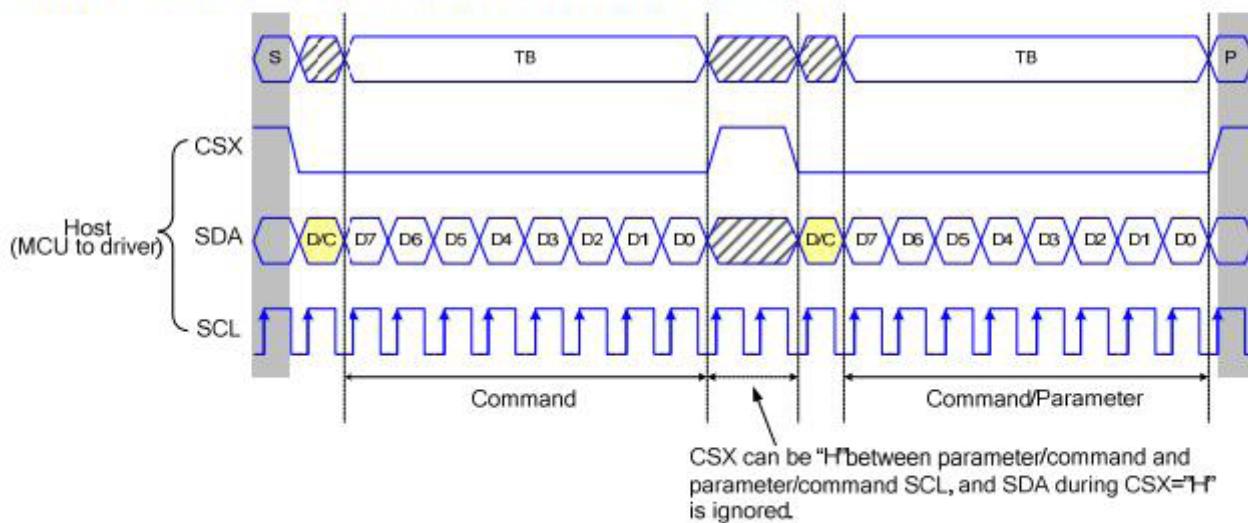
Figure 18 3-line serial interface write protocol (write to register with control bit in transmission)
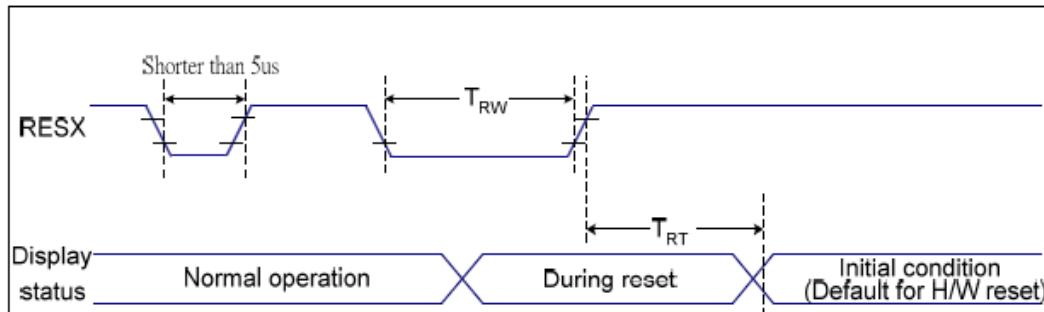
6.2 Reset Timing:

Figure 7 Reset Timing

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 ~ 70 ℃

Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
				120 (Note 1, 6, 7)	ms

Table 8 Reset Timing

7 Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angles		θ_T	Center CR≥10		85	-	Degree.	Note2
		θ_B			85	-		
		θ_L			85	-		
		θ_R			85	-		
Contrast Ratio		CR	$\Theta =0$	-	900	-	-	Note1, Note3
Response Time		T_{ON}	25°C	-	30	45	ms	Note1, Note4
		T_{OFF}		-	35	50		
Chromaticity	White	X_W	Backlight is on	0.282	0.312	0.342	-	Note1, Note5
		Y_W		0.319	0.349	0.379	-	
	Red	X_R		0.609	0.639	0.669	-	
		Y_R		0.314	0.344	0.374	-	
	Green	X_G		0.264	0.294	0.324	-	
		Y_G		0.557	0.587	0.617	-	
	Blue	X_B		0.102	0.132	0.162	-	
		Y_B		0.106	0.136	0.166	-	
Uniformity		U		80	-	-	%	Note1, Note6
NTSC					50		%	Note5
Luminance		. L		150	180			Note1, Note7

Test Conditions:

1. IF= 20mA(one channel),the ambient temperature is 25°C.

2. The test systems refer to Note 1 and Note 2.
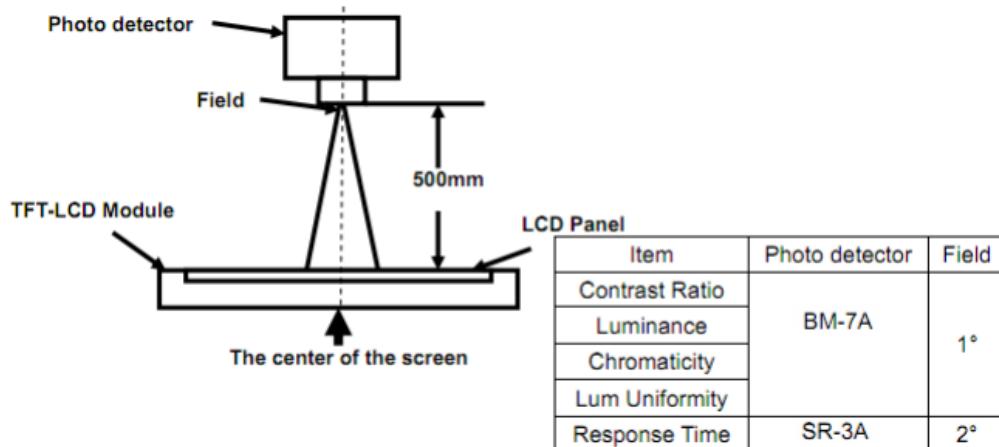
Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.

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Item	Photo detector	Field
Contrast Ratio	BM-7A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	SR-3A	2°

Note 2: Definition of viewing angle range and measurement system.
Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).
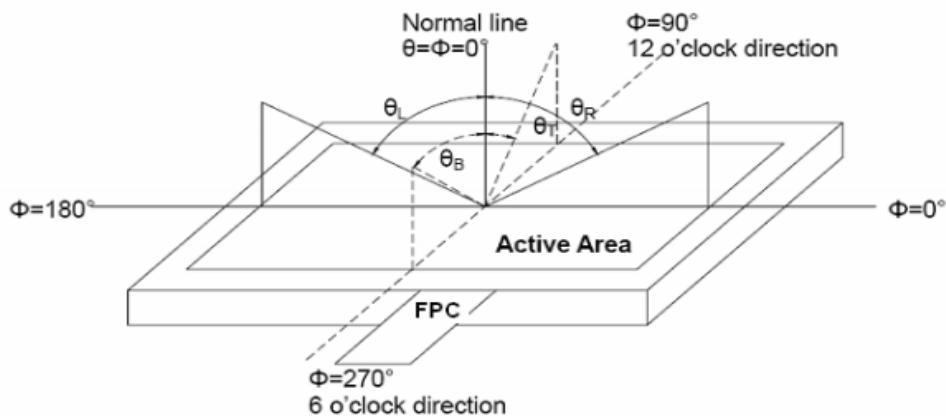
Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

$$Contrast\ ratio\ (CR) = \frac{Luminance\ measured\ when\ LCD\ is\ on\ the\ "White"\ state}{Luminance\ measured\ when\ LCD\ is\ on\ the\ "Black"\ state}$$
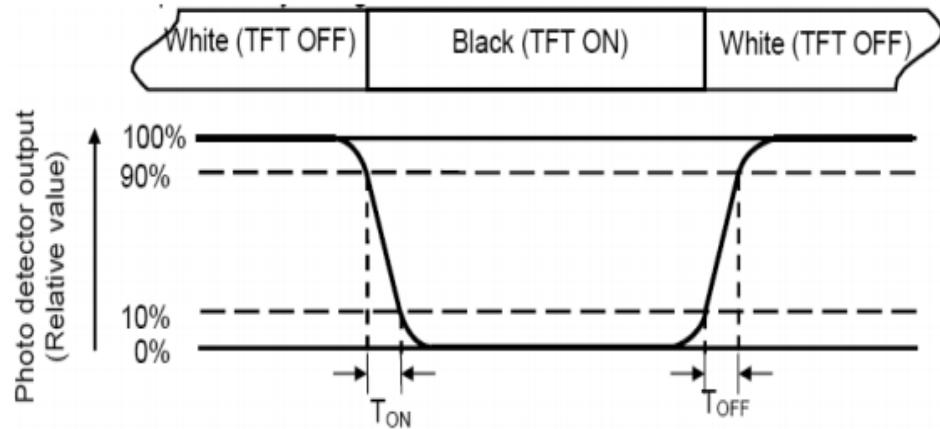
Note 4: Definition of Response time
    The response time is defined as the LCD optical switching time interval
    Between "White" state and "Black" state.   Rise time (TON) is the time between
    Photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is
    The time between photo detector output intensity changed from 10% to 90%

Note 5: Definition of color chromaticity (CIE1931)
        Color coordinates measured at center point of LCD.
Note 6: Definition of Luminance Uniformity
Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the Center of each measuring area
Luminance Uniformity (U) = Lmin/ Lmax X100%
L-------Active area length W----- Active area width
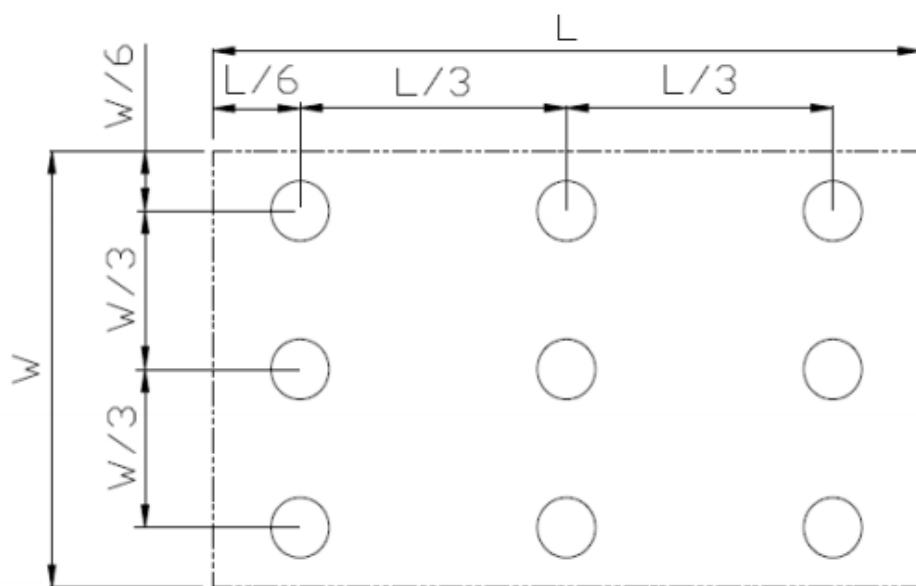
Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.
Lmin: The measured minimum luminance of all measurement position.
Note 7: Definition of Luminance:
Measure the luminance of white state at center point.

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8 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +70℃, 240hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -20℃, 240hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +80℃, 240hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -30℃, 240hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60℃, 90% RH max, 160 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-30℃ 30 min ~ +80℃ 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Static Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15℃ ~ 35℃, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 60 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

Note: 1. T_S is the temperature of panel's surface.
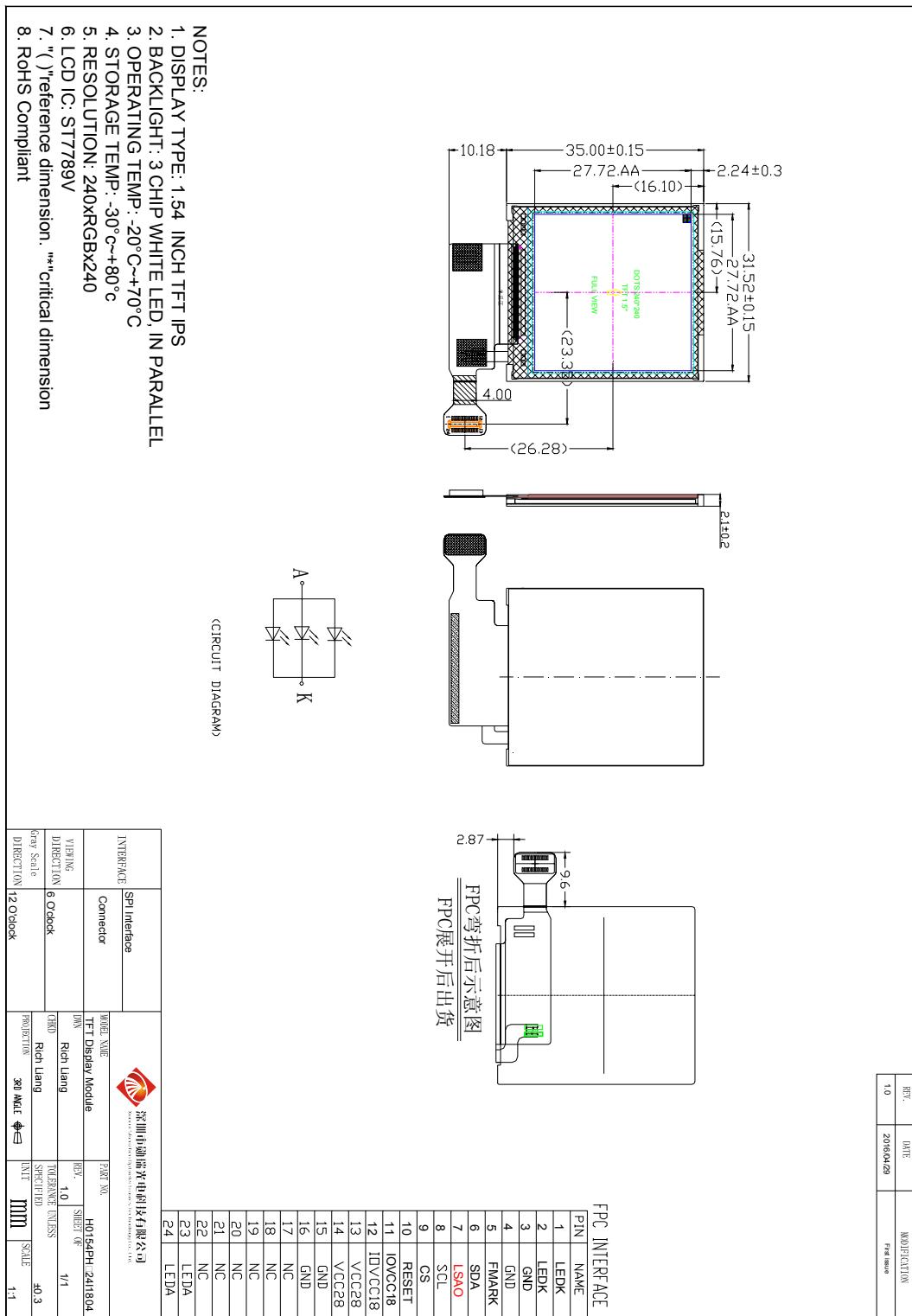
   2. Ta is the ambient temperature of sample.

9 Mechanical Drawing

NOTES:
1. DISPLAY TYPE: 1.54 INCH TFT IPS
2. BACKLIGHT: 3 CHIP WHITE LED, IN PARALLEL
3. OPERATING TEMP: -20°C~+70°C
4. STORAGE TEMP: -30°C~+80°C
5. RESOLUTION: 240xRGBx240
6. LCD IC: ST7789V
7. "( )"reference dimension. "*"critical dimension
8. RoHS Compliant

(CIRCUIT DIAGRAM)

FPC弯折后示意图
FPC展开后出货

FPC INTERFACE

PIN	NAME
1	LEDK
2	LEDK
3	GND
4	GND
5	FMARK
6	SDA
7	LSAO
8	SCL
9	CS
10	RESET
11	IOVCC18
12	IDVCC18
13	VCC28
14	VCC28
15	GND
16	GND
17	NC
18	NC
19	NC
20	NC
21	NC
22	NC
23	LEDA
24	LEDA

INTERFACE: SPI Interface
Connector
VIEWING DIRECTION: 6 O'clock
Gray Scale
DIRECTION: 12 O'clock

MODEL NAME: TFT Display Module
DWN: Rich Liang
CHKD: Rich Liang
PROJECTION: Rich Liang

PART NO. H0154PHQ24I1804
REV. 1.0
SHEET OF 1/1
TOLERANCE UNLESS SPECIFIED ±0.3
UNIT: mm
SCALE: 1:1

REV.	DATE	MODIFICATION
1.0	2016/04/29	First issue

Dimensions: 10.18, 35.00±0.15, 27.72.AA, 2.24±0.3, (16.10), 31.52±0.15, 27.72.AA, (15.76), (23.30), 4.00, (26.28), 2.1±0.2, 2.87, 9.6
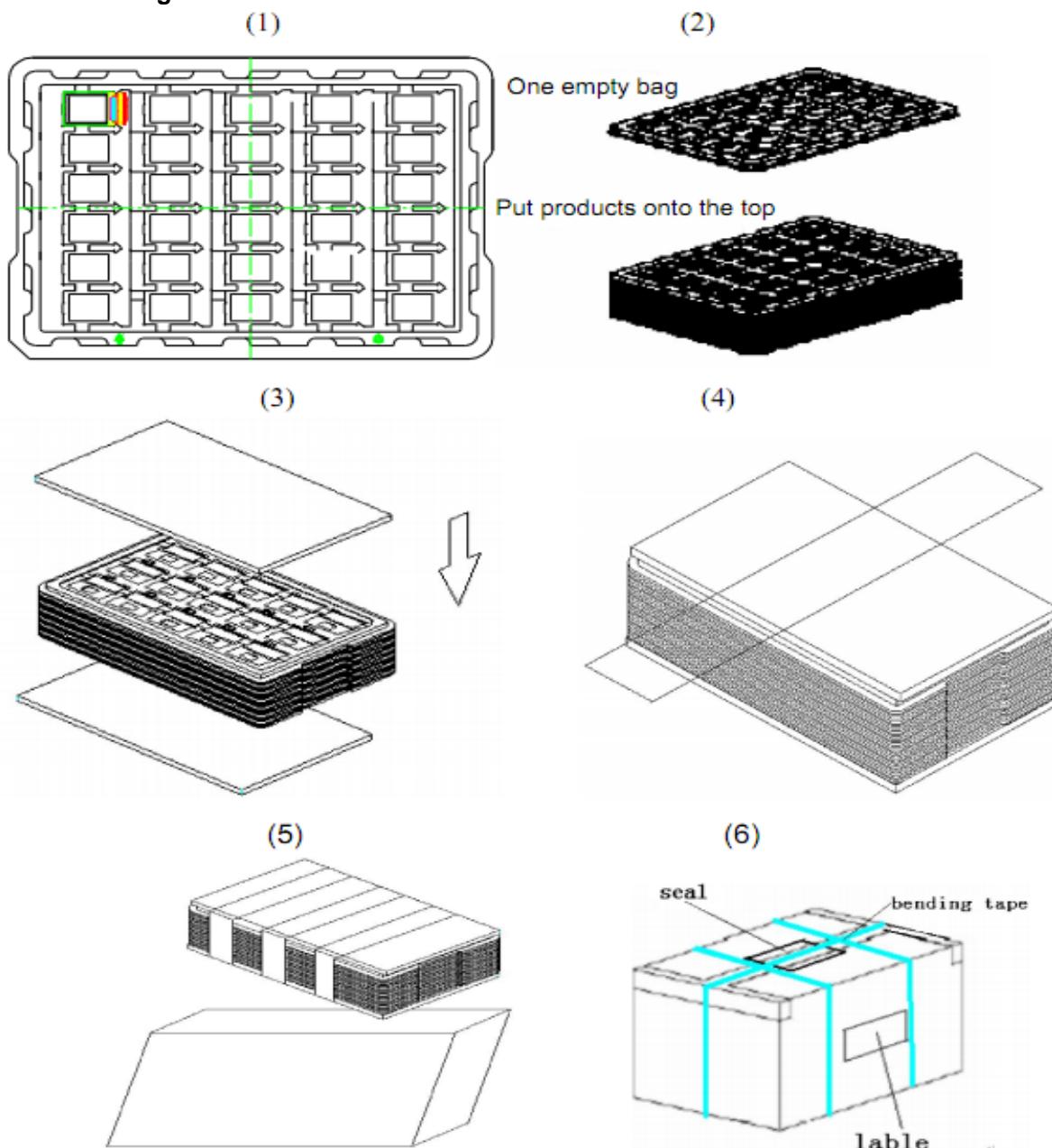
1 0.Packing

Packing Method

1. Put module into tray cavity:
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above:
4. Fix the cardboard to the tray stack with adhesive tape:
5. Put the tray stack into carton.
6. Carton sealing with adhesive tape.

11. Precautions for Use of LCD modules

11.1 Handling Precautions

11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure   not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- ─   Isopropyl alcohol
- ─   Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

Water ； Ketene ； Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

11.1.7. If the logic circuit power is off, do not apply the input signals.

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

11.2 Storage Precautions

11.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2. The LCD modules should be stored under the storage temperature range If the LCD modules will be stored   for a long time, the recommend condition is:

Temperature : 0℃ ～   40℃   Relatively humidity: ≤80%

11.2.3.   The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.