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

Product Specification

Customer: _____

Model Name: _____ H013BQ16I2502-CT8 _____

Date: _____ 2022-11-19 _____

Version: _____ A1 _____

■ **Preliminary Specification**

☐ **Final Specification**

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by

深圳市勋瑞光电科技有限公司

Contents

1. Record of Revision

Version	Revise Date	Content	Editor
A0	2022/10/13	First Release.	
A1	2022/11/19	Updated backlight power consumption	

2 General Specifications

Feature		Spec
Characteristics	LCD Size	1.3 inch
	Display Format	240 (RGB) ×240
	Interface	SPI
	Color Depth	262 K
	Technology type	a-Si
	Display Spec.	/
	Display Mode	Normally Black
	Driver IC	ST7789V
	Surface Treatment	HC
	Viewing Direction	ALL
	Gray Viewing Direction	FREE
Mechanical	LCM+CTP (W x H x D) (mm)	33.12 (W) ×37.08 (H)×3.48(T)
	Active Area(mm)	23.4(W) ×23.4(H) mm
	With /Without TSP	With TSP
	Weight (g)	TBD
	LED Numbers	2 LEDs

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

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3 Input/Output Terminals

NO.	SYMBOL	Description	I/O
1	LEDK	LED backlight input (Cathode)	Power supply
2	LEDA	LED anode	Power supply
3	VDD	Power supply	Power supply
4	GND	System Ground	Power supply
5	D/C	Data/Commander selection	I/O
6	CS	Chip select	I/O
7	SCL	Serial Data	I/O
8	SDA	Serial Clock.	I/O
9	RST	Reset PIN	I/O
10	CTP_3.3V	TP Power Supply	Power supply
11	CTP_SCL	Touch I2C clock	I/O
12	CTP_SDA	Touch I2C data	I/O
13	CTP_RST	TSP Reset signal. Active low.	I/O
14	CTP_INT	Touch State change interrupt	I/O
15	CTP_GND	System Ground	Power supply
16	GND	System Ground	Power supply

4 Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	V_{DD}	-0.3	4.6	V	
Input Signal Voltage	V_{in}	-0.3	VDD+0.3	V	
Logic Output Voltage	V_{OUT}	-0.3	VDD+0.3	V	
Operating Temperature	T_{OPR}	-10	60	℃	
Storage Temperature	T_{STG}	-20	70	℃	

5 Electrical Characteristics

5.1 Operating conditions:

Parameter	Symbol	MIN	TYP	MAX	Unit	Remark
Power Voltage	V_{DD}	2.4	2.8	3.3	V	
Digital Operation Current	Icc	-	8	-	mA	

5.2 Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
LED current	I_F	-	40	50	mA	
Power Consumption		-	145.9	165	mW	
LED Voltage	V_F	2.9	3.1	3.3	V	Note 1
LED Life Time	W_{BL}	-	TBD	-	Hr	Note 2,3

Note 1 Calculator Value for reference ILED x VLED/0.85 = PLED

Note 2 : There are 2 Groups LED

Note 3 : Ta = 25℃

Note 4 : Brightess to be decreased to 50% of the initial value

6 Interface Timing

6.1 AC Electrical Characteristics

Parameter	Symbol	Condition	Specification MIN.	Specification TYP.	Specification MAX.	Unit	Related Pins
Power & Operation Voltage							
System Voltage	VDD	Operating voltage	2.4	2.75	3.3	V	
Interface Operation Voltage	VDDI	I/O Supply Voltage	1.65	1.8	3.3	V	
Gate Driver High Voltage	VGH		12.2		14.97	V	Note 4
Gate Driver Low Voltage	VGL		-12.5		-7.16	V	
Gate Driver Supply Voltage		| VGH-VGL |	19.36		27.47	V	Note 5
Input / Output							
Logic-High Input Voltage	VIH		0.7VDDI		VDDI	V	Note 1
Logic-Low Input Voltage	VIL		VSS		0.3VDDI	V	Note 1
Logic-High Output Voltage	VOH	IOH = -1.0mA	0.8VDDI		VDDI	V	Note 1
Logic-Low Output Voltage	VOL	IOL = +1.0mA	VSS		0.2VDDI	V	Note 1
Logic-High Input Current	IIH	VIN = VDDI			1	uA	Note 1
Logic-Low Input Current	IIL	VIN = VSS	-1			uA	Note 1
Input Leakage Current	IIL	IOH = -1.0mA	-0.1		+0.1	uA	Note 1
VCOM Voltage							
VCOM amplitude	VCOM			VSS		V	
Source Driver							
Source Output Range	Vsout		VAN		VAP	V	
Gamma Reference Voltage(Positive)	VAP		4.45		6.4	V	Note 6
Gamma Reference Voltage(Negative)	VAN		-4.6		-2.65	V	
Source Output Settling Time	Tr	Below with 99% precision			20	us	Note 2
Output Offset Voltage	VOFFSET				35	mV	Note 3

Notes:

1. TA= -30 to 70℃ (to +85℃ no damage).

2. Source channel loading= 2KΩ+12pF/channel, Gate channel loading=5KΩ+40pF/channel.

3. The Max. value is between measured point of source output and gamma setting value.

4. When evaluating the maximum and minimum of VGH, VDD=2.8V.

5. The maximum value of |VGH-VGL| can no over 30V.

6. Default register setting of Vcom and Vcomoffset is 20h

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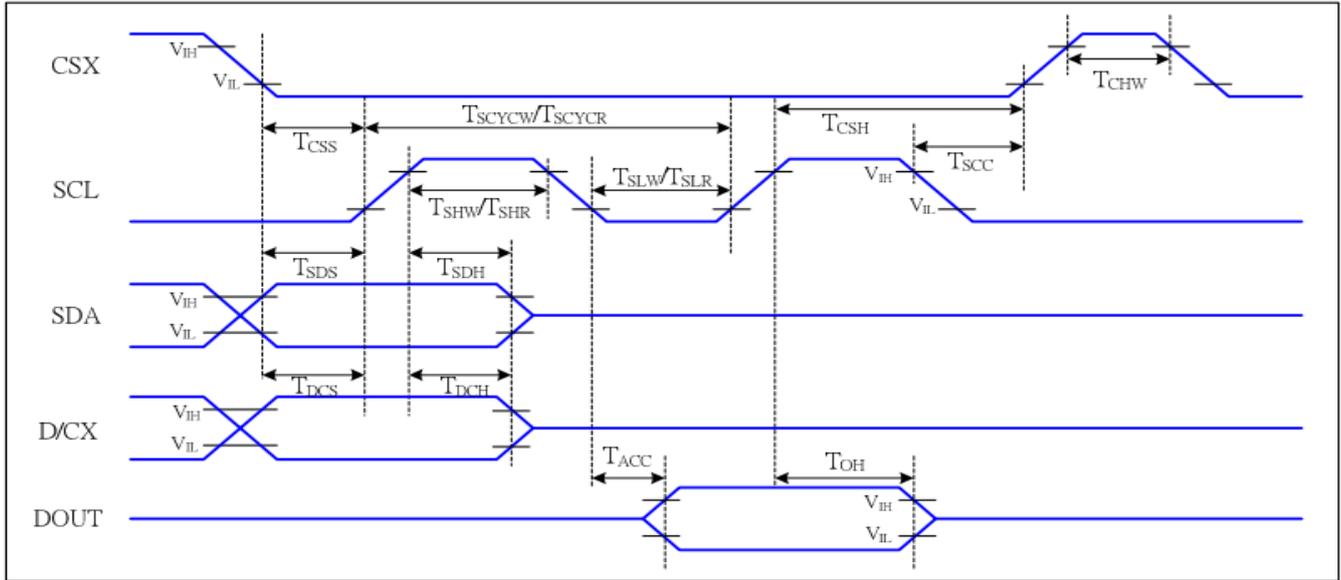
VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 to 70 ℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	-read command & data ram
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

Note : The rising time and falling time (Tr, Tf) of input signal are specified at 15 ns or less.
Logic high and low levels are specified as 30% and 70% of VDDI for Input signals.

7 Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angles		θ_T	Center CR≥10	-	80	-	Degree.	Note2
		θ_B		-	80	-		
		θ_L		-	80	-		
		θ_R		-	80	-		
Contrast Ratio		CR	$\Theta = 0$	-	800	-	-	Note1, Note3
Response Time		T_{ON}	25°C	-	25	35	ms	Note1, Note4
		T_{OFF}		-	25	35		
Chromaticity	White	X_W	Backlight is on	0.282	0.312	0.342	-	Note1, Note5
		Y_W		0.339	0.369	0.399	-	
	Red	X_R		0.560	0.639	0.669	-	
		Y_R		0.314	0.344	0.384	-	
	Green	X_G		0.264	0.294	0.324	-	
		Y_G		0.507	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				43	48	-	%	Note5
LCM+CTP Luminance		L		-	150	-		Note1, Note7

Test Conditions:

1. IF= 40mA(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.

Item	Photo detector	Field
Contrast Ratio	BM-7A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	SR-3A	2°
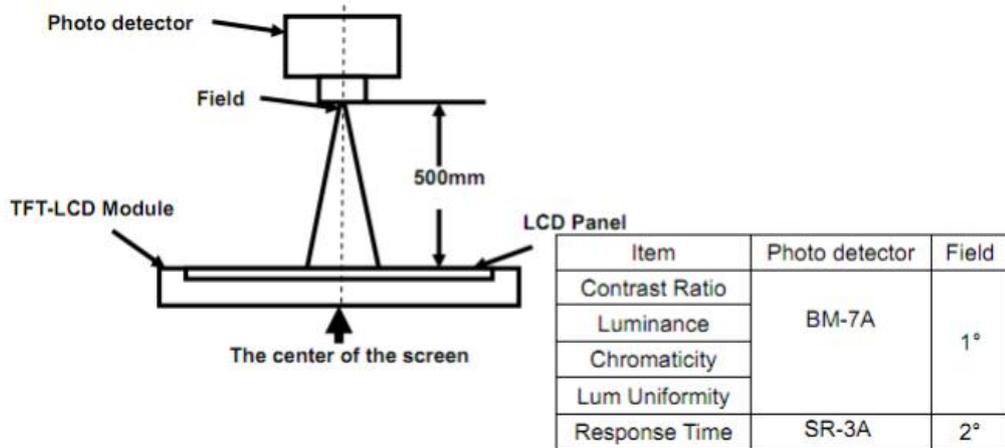
Note 2: Definition of viewing angle range and measurement system.
Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).
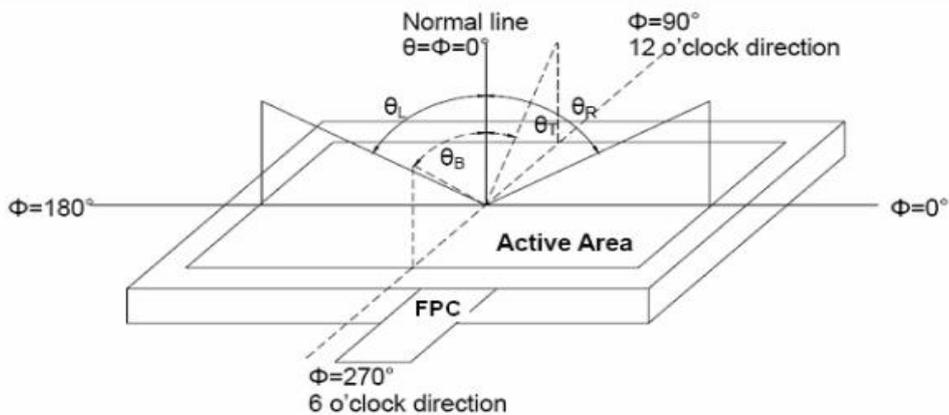
Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

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 10% to 90%. And fall time (TOFF) is
The time between photo detector output intensity changed from 90% to 10%
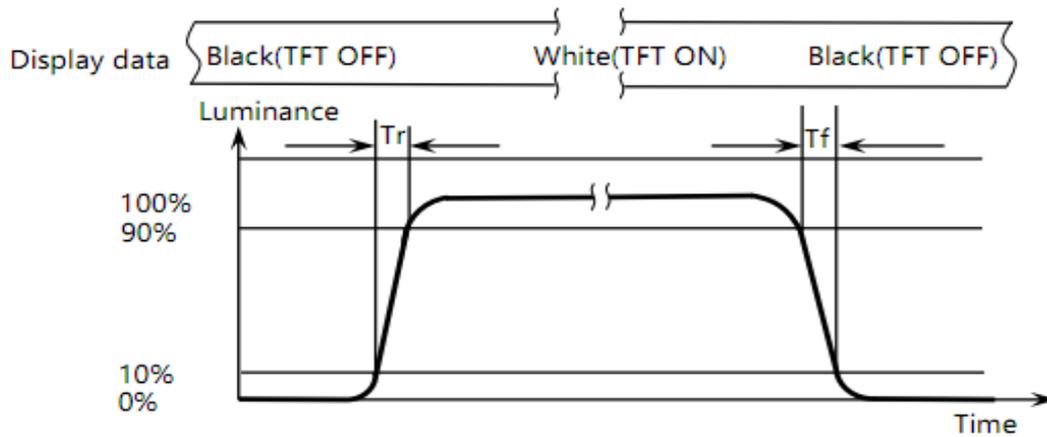
Note 5: Definition of color chromaticity (CIE1931)

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
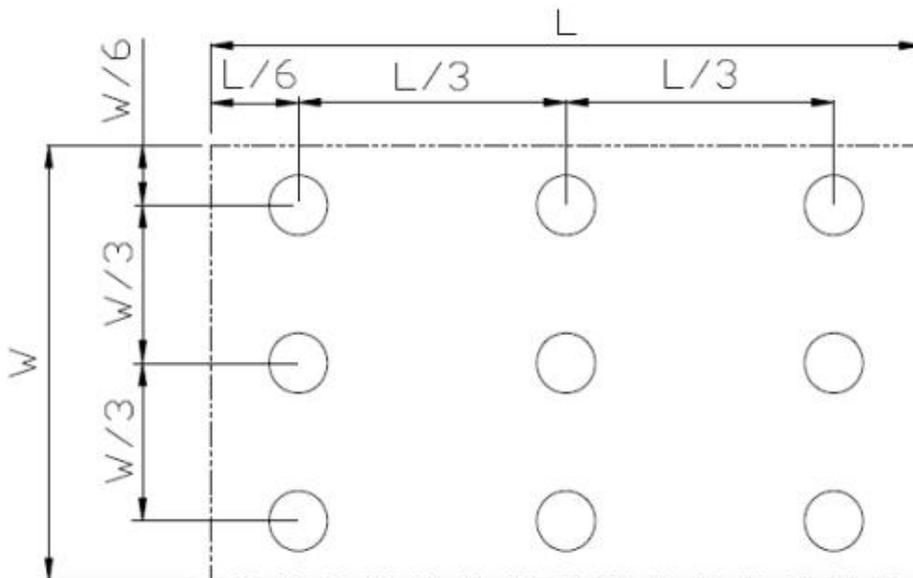
Fig. 2 Definition of uniformity

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= +60℃, 240hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -10℃, 240hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +70℃, 240hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -20℃, 240hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	60±5℃ x 90%RH x 240Hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-10℃ 30 min ~ +60℃ 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

客户签名:

RoHS

FRONT VIEW

CG: 37.08±0.1
29.15±0.1 BL
CTP/LCD AA:23.40±0.1
4-R1.50
4.99
4.86
6.39
CTP/LCD AA:23.40±0.1
CG:33.12±0.1
26.00±0.1 BL
4.86
3.48
10.61
11.01
4.34±0.1
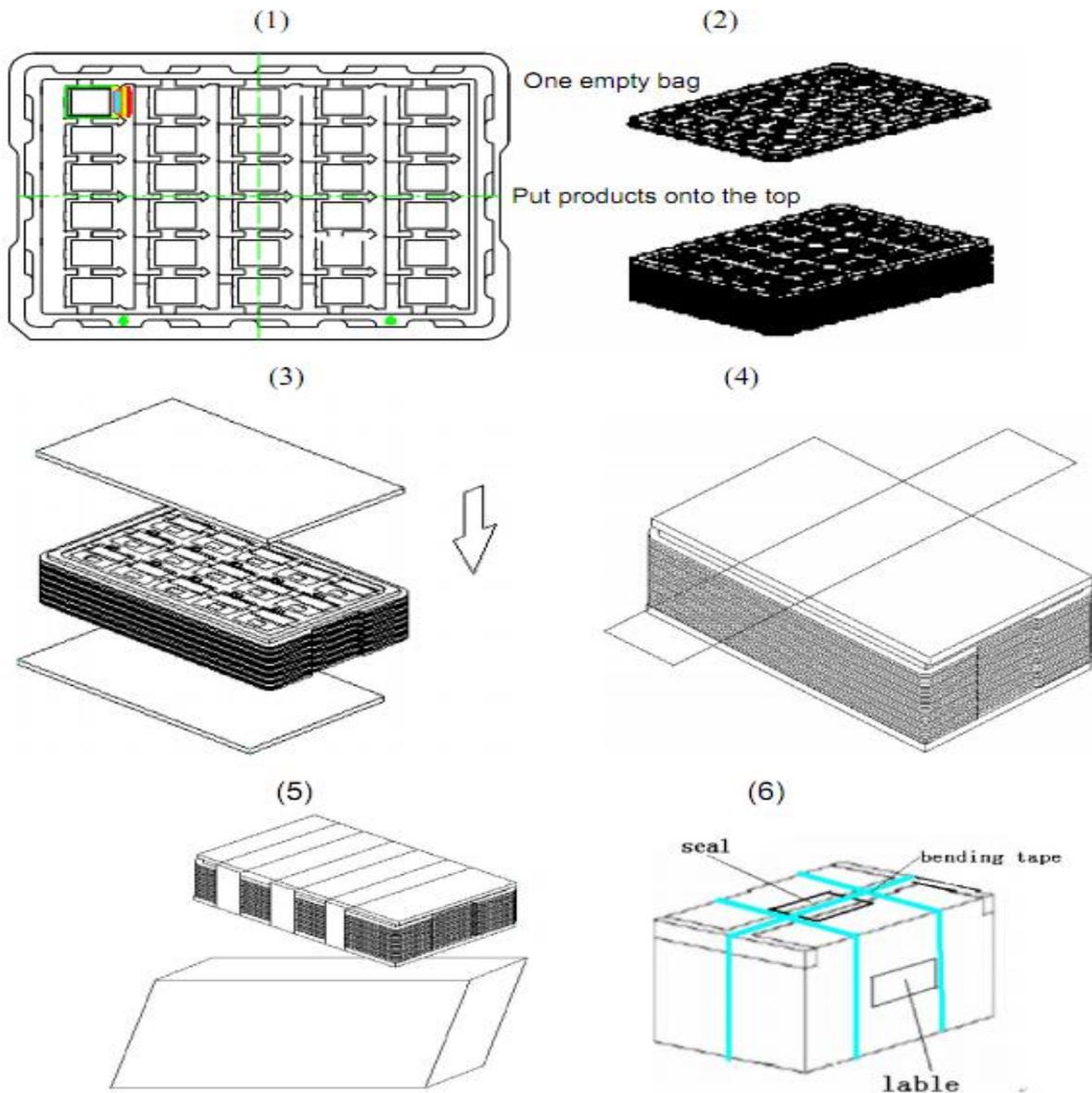2.04±0.1
W:5.41±0.2
17.47±0.3
DOTS:240*240 TFT 1.33" 262K
FULL VIEW
黑色
黑色
黑色半透效果
正面贴高温胶纸
贴接在TFT fpc上
DE37C-16D2-0.4V(51)
This area for BENDING
pull

SIDE VIEW

LCD (EYE)
盖板2.5D
CTP soldering area
LCM Connector
Stiffener T≤0.2mm
1 MAX
元件+0.2铜片补强（接地）+0.05
强（接地）+0.05
导电双面胶
Total:1.37±0.1
3.48±0.2 TP+LCM
1.12±0.1 二次强化玻璃
0.25(OCA+FILM)SENSOR
0.175 OCA
1.93 ±0.1 LCM total

REAR VIEW

3.56±0.1
10.61±0.2
1.78±0.2
2.00
4.62±0.2
1.00±0.05
0.80±0.05
1.15±0.1
6.90±
4.62±0.2
24.00 ±0.2 SENSOR AA
27.10 ±0.2 SENSOR OD
26.00
27.08 ±0.2 SENSOR AA
27.98
29.15 ±0.2 SENSOR OD
黑密封胶
Protective glue
后视黑色或灰色绝缘屏蔽膜

LCD/FPC:1.54±0.2
LCD/FPC:2.60±0.2
LCD/FPC:2.79±0.2

CTP SPECIFICATION

CTP结构	G+F	表面硬度	≥7H
FPC类型	COF	CTP透光率	25%±10%
LCM分辨率	240*240	视窗原点位置	视窗左上
DRIVER IC	CST816D	供电电压	3.3V
IO口电压	3.3V	通信方式	IIC
IIC地址	/	IIC通信速率	≤400kbs
报点频率	≥60HZ	INT触发方式	下降沿
报点精度		按键实现方式	无按键
存储温度	-20℃ TO 70℃	操作温度	-10℃ TO 60℃
未注公差	±0.2	接键实现方式	无按键

LCM SPECIFICATION

1.DISPLAY TYPE	1.33" TFT, TRANSMISIVE
2.VIEWING DIRECTION	FULL VIEW
3.LCD DRIVER IC	ST7789V
4.BACKLIGHT	2 Chip-White LED, Parallel
5.OPERATIVE VOLTAGE	2.8V
6.OPERATIVE TEMP.	-10° C TO 60° C
7.STORAGE TEMP.	-20° C TO 70° C
8.CONNECTOR	FPC

CTP SPECIFICATION

1.VCC	3.3V
2.OPERATION TEMP.	-10 ° C TO 60 ° C
3.STORAGE TEMP.	-20 ° C TO 70 ° C
4.CONNECTOR	FPC

REVISED RECORD

VER.	REVISED RECORD	DATE
A0	NEW ISSUE	22-04-09
A1		
A2		
A3		

If=40mA Vf=2.9 V～3.3 V

LEDA   LEDK

DRAWED BY	CHECKED BY	APPROVED BY
M		
22-04-13		

深圳市和瑞光电科技有限公司
Xinrid Shenzhen Optoelectronic Technology Co., Ltd.

CUSTOM NO.	
DESIGN NO.& (VERSION)	A0
MODEL. NO.	H013BQ16I2S02-CT8
UNMARKED TOLERANCE	±0.2
UNIT	mm
SHEET	1 OF 1

CTP PIN DEFINE

PIN #	Assignment
1	VCC(3.3V)
2	SCL(3.3V)
3	SDA(3.3V)
4	RST(3.3V)
5	INT(3.3V)
6	GND

PIN DEFINE

PIN NO.	SYMBO
1	LED-K
2	LED-A
3	VDD
4	GND
5	D/C
6	CS
7	SCL
8	SDA
9	RST
10	CTP-3.3V
11	CTP-SCL
12	CTP-SDA
13	CTP-RST
14	CTP-INT
15	CTP-GND
16	GND

1 0.Packing

(1)

(2)

One empty bag

Put products onto the top

(3)

(4)

(5)

(6)

seal   bending tape

lable

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.