


SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
MODEL	SCE141001-V01
CUSTOMER APPROVED	

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Specification Revision History

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1 Scope

This Specification defines AMOLED manufactured by Shenzhen Sinocrystal technology Limited.

2 Features

2.1 Product Applications

Smart Watch

2.2 Product Features

- 1) Display color: 16.7M (RGB x 8bits)
- 2) Display format: 1.41 "(320RGBx360)
- 3) Pixel arrangement: Real RGB arrangement
- 4) Interface: MIPI

3 Mechanical Specifications

Item	Specification	unit
LTPS Glass outline	26.04x31.78	mm
Encapsulation Glass outline	26.04 x30.18	mm
Number of dots	320(W) x RGB x 360(H)	dots
Active area	23.84x26.82	mm
Diagonal size	1.413	inch
Pixel pitch	74.49 x 74.49	μm
Glass thickness (LTPS/Encap. glass)	0.2 / 0.3	mm
Weight	TBD	g

4 Maximum Rating

Parameter	Symbol	Spec			Unit	Note
		Min.	Typ.	Max.		
Analog/boost power voltage	VCI	-0.3	-	5.5	V	-
I/O voltage	VDDIO	-0.3	-	5.5	V	-
Operating temperature	Top	-20	-	70	°C	-
Storage temperature	Tstg	-40	-	80	°C	-

5 Electrical Specifications

5.1 Electrical Characteristics

5.1.1 Power Characteristic:

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
AMOLED Power positive	ELVDD	4.55	4.6	4.65	V	-
AMOLED power Negative	ELVSS	-2.45	-2.4	-2.35	V	Ref
Digital Power supply	VDDIO	1.65	1.8	1.95	V	Ref
Analog Power supply	VCI	2.7	2.8	2.9	V	Ref

1) Normal Mode

Power Supply: IOVCC=1.8V VCI=2.8V

Frame Frequency: $F_{frame}=60\text{HZ}$ @ 25degC, Brightness 350 nits, **Command Mode**.

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
100% Pixel On 350nits	IELVDD /ELVSS	-	16	19	mA	Ref
	IVCI	-	6.0	7.2	mA	Ref
	IVDDIO	-	5.8	7	mA	Ref
50% Pixel On 175nits	IELVDD /ELVSS	-	8	9.5	mA	Ref
	IVCI	-	6.6	8	mA	Ref
	IVDDIO	-	5.8	7	mA	Ref

2) Idle Mode

Power Supply: IOVCC=1.8V VCI=2.8V

Frame Frequency: $F_{frame}=15\text{HZ}$ @ 25degC, Brightness 30 nits,

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
10% Pixel On 30 nits	IELVDD /ELVSS	-	-	-	mA	Supplied by Driver IC
	IVCI	-	5	6.5	mA	Ref
	IVDDIO	-	0.8	1.1	mA	Ref

3) Deep Standby Mode

Display Condition	Symbol	Min.	Typ.	Max.	Unit	Remark
Deep Standby	IVCI	-	-	3	uA	-
	IVDDIO	-	-	3	uA	-

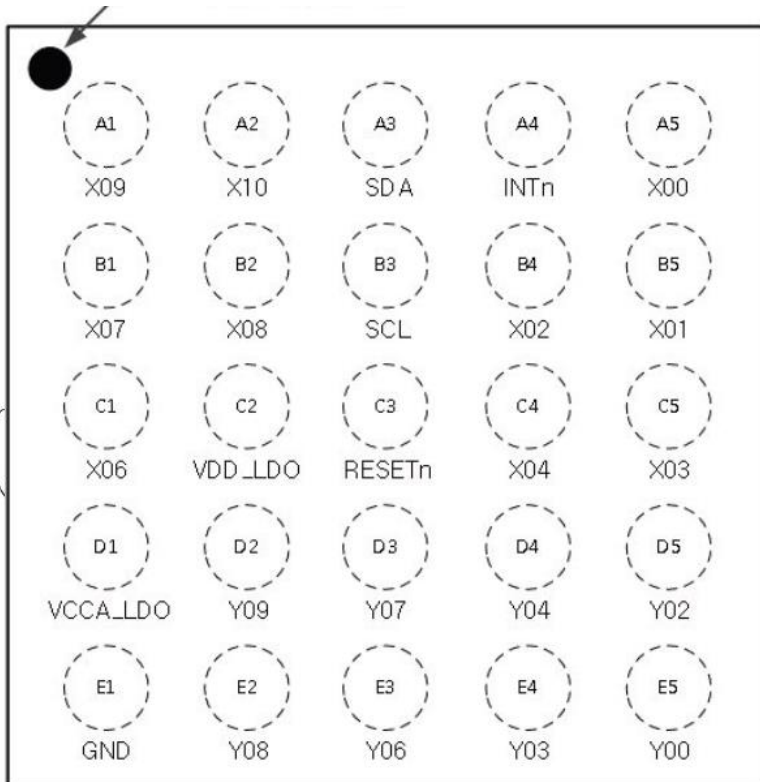
5.1.2 Driver IC

RM67162 (refer to the datasheet).

5.2 TP IC Recommended Operating Conditions

Touch IC: ZTW522 (refer to the datasheet)

Symbol	Description	Min	TYP	MAX	UNIT
VCCA	Analog power supply voltage	2.7	3.3	3.6	V
V _{IN} (I2C)	Input voltage range	0	-	3.6	V
V _{OUT} (I2C)	Output voltage range	0	-	VBUS	V
V _{IN} (INT)	Input voltage range	0	-	3.6	V
V _{OUT} (INT)	Output voltage range	0	-	VBUS	V
V _{OUT} (TX)	Output voltage range	0	-	3.3	V
V _{OUT} (RX)	Input voltage range	0	-	3.3	V



25 Ball WLCSP (TOP VIEW) assignments

项目	规格	备注
Operating voltage	2.7-3.6V	
Operating current	2.5mA	
Linearity	Center part≤1mm	Test tool: φ6mm copper cylinder

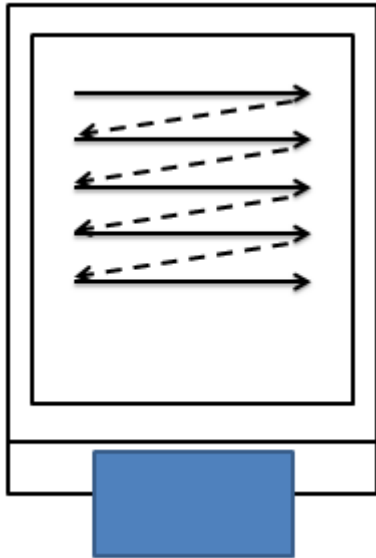
	The peripheral position $\leq 2\text{mm}$	
Sensitivity	No broken line	Lineation with 5mm/s&20mm/s respectively by $\Phi 6\text{mm}$ copper cylinder
Response time	$\leq 10\text{ms}$	

5.3 I/O Connection

#	Pin name	I/O	Description
1	TP_INT	I/O	Interrupt to Host
2	TP_SDA	I/O	I2C Data Line
3	TP_SCL	I/O	I2C Clock Line
4	TP_VDD	Power	TP Power Supply
5	ELVDD	Power	Power supply for OLED
6	VDD1	Power	Driver IC analog supply
7	SWIRE	O	Power IC control signal
8	GND1	Power	GND
9	REST	I	This signal will reset the device and must be applied to properly initialize the chip. Active low.
10	NC	-	No connector
11	NC	-	No connector
12	NC	-	No connector
13	NC	-	No connector
14	NC	-	No connector
15	GND2	Power	GND
16	NC	-	No connector
17	GND3	Power	GND
18	DSI_D0N	I/O	MIPI DSI data0+
19	DSI_D0P	I/O	MIPI DSI data0-
20	GND4	Power	GND
21	DSI_CLKN	I/O	MIPI DSI clock-
22	DSI_CLKP	I/O	MIPI DSI clock+
23	GND5	Power	GND
24	VDDIO	Power	Driver IC digital I/O supply.
25	TE	O	Tear effect output
26	VDD2	Power	Driver IC analog supply

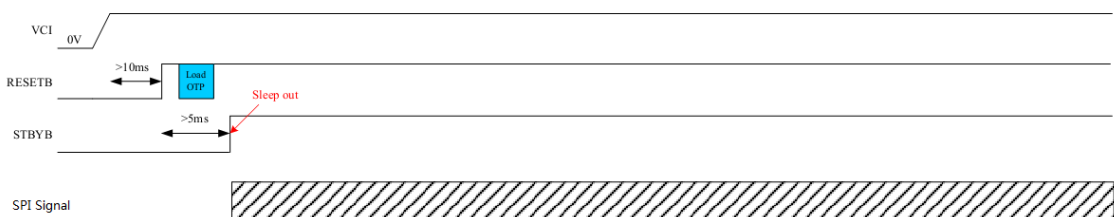
27	ELVSS	Power	Power supply for OLED
28	GND6	Power	GND
29	TP_RST	I	Reset
30	GND7	Power	GND

5.4 Graphic memory writing direction

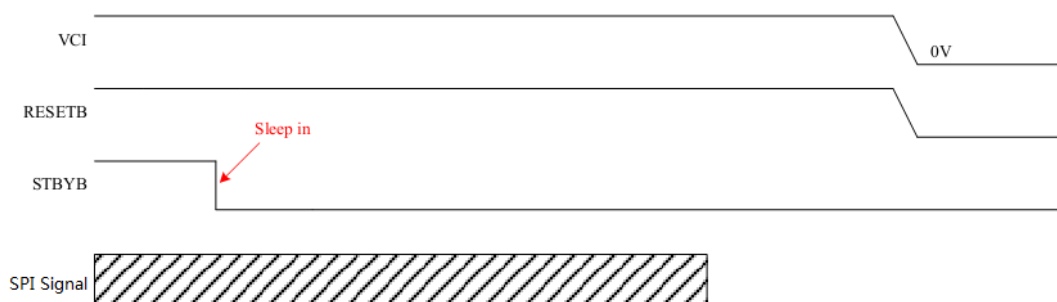


5.5 Recommended Operating Sequence

5.5.1 Power on sequence



5.5.2 Power off sequence



5.5.3 Timing requirements for RESETB

When RESETB of the reset pin equals to Low, it will be in the condition of reset.

When it is in the condition of reset, it will make the device recover the initial set.

However, in order to avoid the reset noise cause reset, there is a mechanism to judge about whether the reset is needed or not.

The closed interval of Low can be shown as the following.

(Test condition: VDDIO=1.65V~3.6V, VSS=0V, TA=-20°C~+70°C)

Parameter	Symbol	Conditions	Spec			Unit
			Min.	Typ.	Max.	
Reset low pulse width	Trst	-	20	-	-	μs

Table: Reset timing

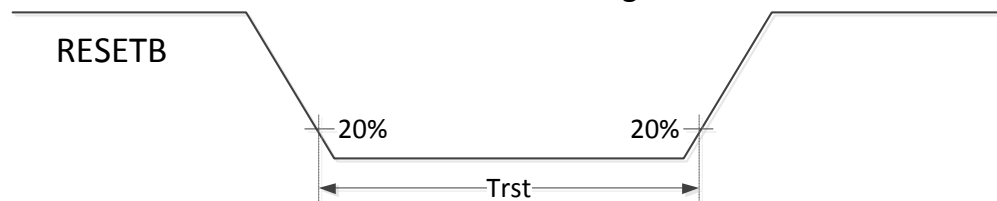


Figure: Reset timing

6 Electro-Optical Specification

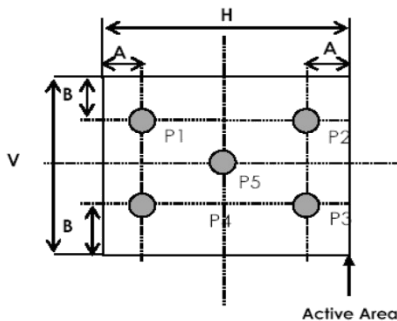
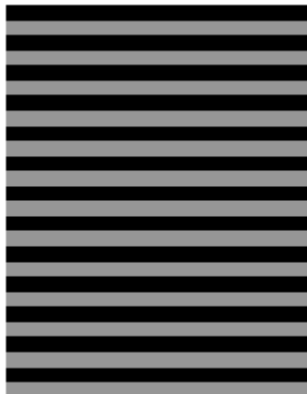
Test condition: 25°C±3°C, 65±20%RH, darkroom.

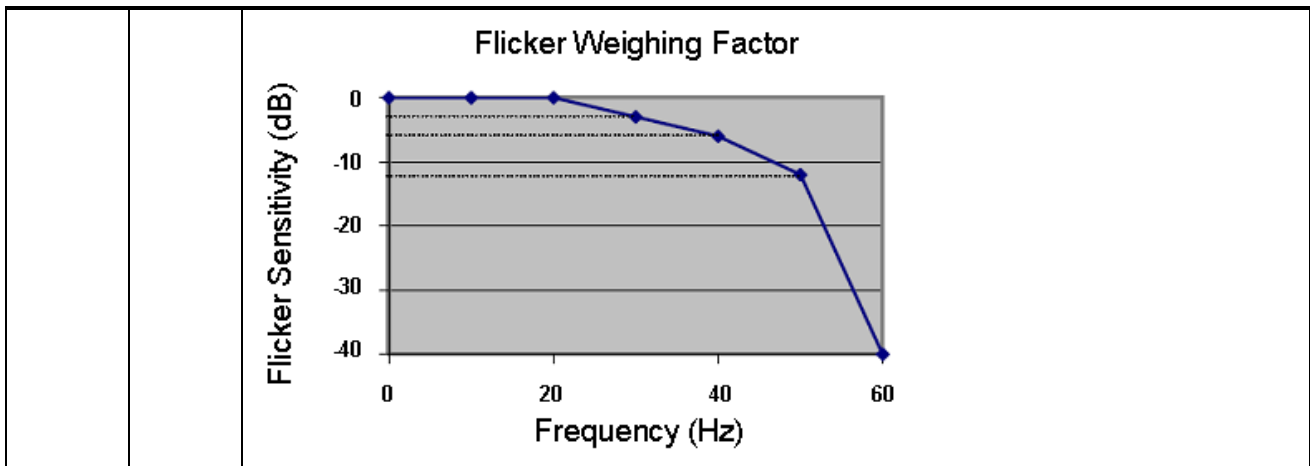
No	Item	Symbol	Condition	Value			Unit	Remark	
				Min.	Typ.	Max.			
1	Brightness	L	Full white	300	350	385	cd/m ²	Note1.	
2	Brightness Uniformity	UL	Full white	80	-	-	%	Note4	
3	Contrast Ratio	CR	Normal θ=Φ=0°	10000	-	-	-	Note3.	
4	Response time	Ton+Toff	Normal θ=Φ=0°	-	2	4	ms	Note2.	
5	Color Coordinate of CIE1931	White	X	Normal θ=Φ=0°	0.28	0.30	0.32	-	Note1.
			Y		0.29	0.31	0.33		
		Red	X		0.64	0.67	0.70		
			Y		0.30	0.33	0.36		
		Green	X		0.16	0.21	0.26		
			Y		0.68	0.73	0.78		
		Blue	X		0.09	0.13	0.17		
			Y		0.02	0.06	0.10		
6	Color Gamut	NTSC	CIE1931	90	105	-	%		
7	Viewing Angle		Top/Bottom/Right/Left CR ratio ≥1000	80			°	Note3.	
8	Gamma		Log(Lv-Lb)=log(V)+log(a) V(Gray)= 48,72,104,132,	2.0	2.2	2.4	-		

		164,192,224,252 ,255 Lum(gray255)=3 50nit					
9	Luminance decrease ratio	@30 degree	-	-	45	%	Note5.
10	Flicker	Normal $\Theta=\Phi=0^\circ$	-	-35	-30	dB	Note6.
11	Crosstalk	-	-	-	4	%	Note7.
12	OLED Life Time	$L > 92\% @ 25^\circ\text{C}$	100				Note8.

See the note in the table below:

No	Item	Details
Note1	Brightness	
Note 2	Response time	
Note 3	Viewing Angle	<p>Contrast Ratio Dark Room C.R=LW/LB LW: full white brightness of display center P0; LB: full black brightness of display center P0.</p>

<p>Note 4</p>	<p>Brightness Uniformity</p>	 <p>A: 1/4H B: 1/4V H.V: Active Area</p>
<p>Note 5</p>	<p>Luminance decrease ratio</p>	<p>Definition of Luminance decrease ratio Test pattern : Full White The luminance decrease ratio is calculated by using following formula:</p> $\text{Luminance decrease ratio} = 1 - \frac{\text{Luminance test at left, right, top, bottom} = 30^\circ}{\text{Luminance test at left, right, top, bottom} = 0^\circ}$
<p>Note 6</p>	<p>Flicker</p>	<p>Suggested Instruments: Konica Minolta CA-310 or Klein Instruments K-8</p>  <p>Odd row : L0 Black Even row : L186 gray level</p> <p>Flicker Test Pattern</p> <p>The flicker level is defined by Fast Fourier Transformation (FFT) as follows:</p> $\text{Flicker} = 20 \log_{10} \left(2 \frac{f_{FFTC}(n)}{f_{FFTC}(0)} \right) + FS(Hz) \quad (\text{dB})$ <p>Where fFFTC(n) is the n-th FFT coefficient. fFFTC(0) is the 0-th FFT coefficient which is DC component. FS(Hz) is the flicker sensitivity as a function of frequency. The peak flicker level shall be reported based on the calculation using above formula in which FS(Hz) is determined by the flicker weighing factor shown below.</p>



Crosstalk shall be calculated by the luminance of **B1~B4** and **G1~G4** in the patterns shown below.
 Box Pattern: **L128** gray level background with a **L255** White window in the central area.
 Gray Pattern: **L128** gray level background only.

Crosstalk

$$\equiv \text{Maximum} : \left\{ \frac{|B1 - G1|}{G1}, \frac{|B2 - G2|}{G2}, \frac{|B3 - G3|}{G3}, \frac{|B4 - G4|}{G4} \right\} \times 100\%$$

Note 8 **Life Time** OLED life time is defined by the **Minimum Duration Time** that the luminance is decayed to a specific ratio (ex. **92%**) of initial state.
 Test Pattern under duration period: **L255** White

7 Reliability

7.1 Environmental Test

Item	Main spec	No. of failures / No. of examinations
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High Temperature Operation	70°C/ 128hrs	0/5
Low Temperature Operation	-20°C/ 128hrs	0/5
High Temperature Storage	80°C/ 128hrs	0/5
Low Temperature Storage	-40°C/ 128hrs	0/5
High Temperature Humidity Operation	60°C/93%RH/ 128hrs	0/10
Thermal Shock	-40°C~85°C dwell time=0.5hr, 50 cycles.	0/10

7.2 Electrical Test

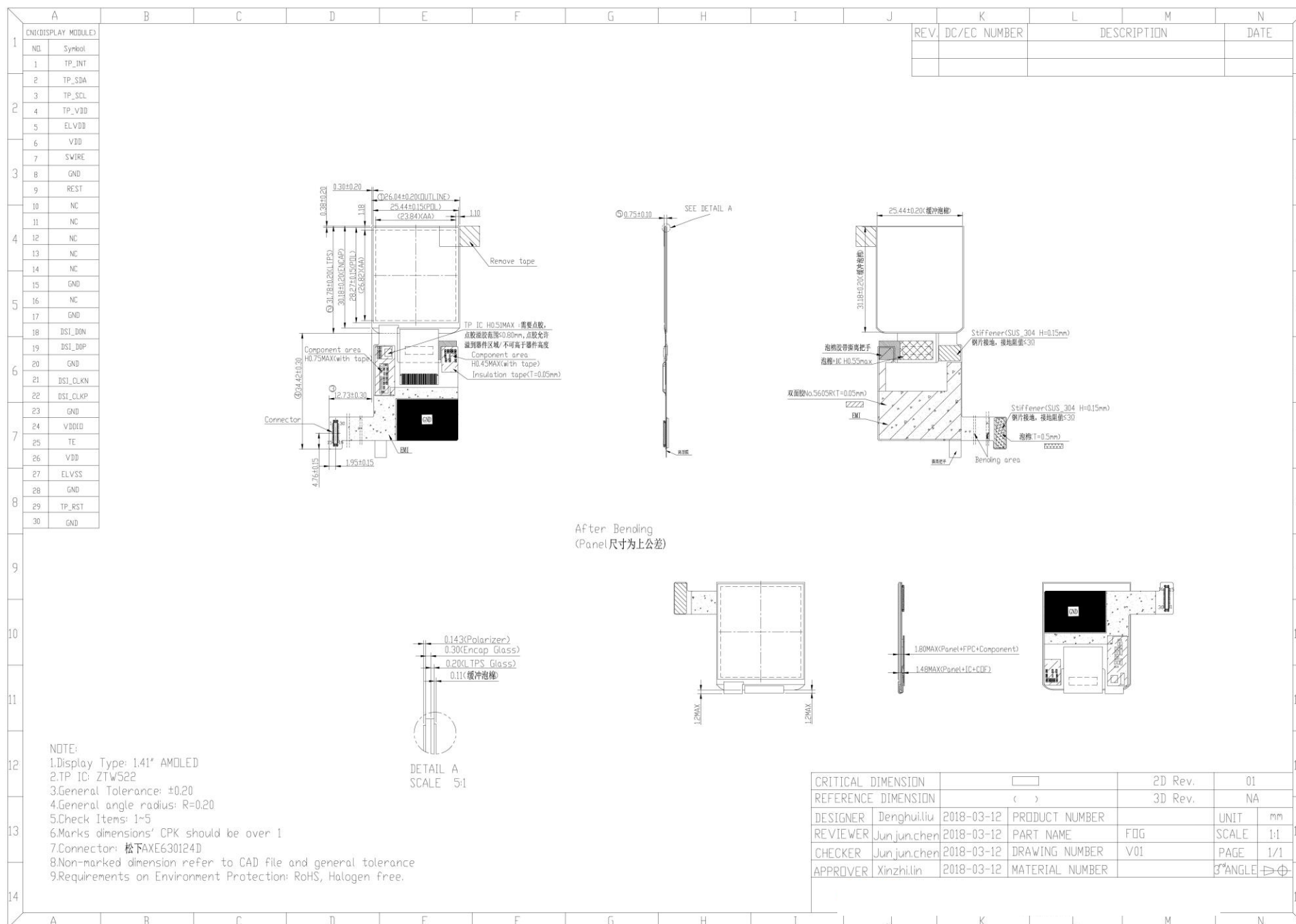
Item	Main spec	Note
Air Discharge	±4 kV , 150pF/330Ω (Module level; without CG)	5Points, Each 10times. After one time discharge, panel and gun touch the ground, through the whole test, turn on ion fan. No degradation of OLED performance after this test.
Contact Discharge	±4kV, 150pF/330Ω (Module level; without CG)	

7.3 Mechanical Test

Test item	Test condition	Note
Packing vibration-proof test	f=10->55->10Hz apply in each of X, Y, and Z direction for 30 min	Package
Packing Drop test	Drop the packing from 60cm height, 6-faces, 3-edges and 1-corner(one time for each)	Package

8 Outline Dimension Drawing

Refer to the 2D drawing.



9 Packing Specification

TBD