

# Osptek Display

## AMOLED SPECIFICATION

Model No:

**AM201Q240296LK1**

*osptek*<sup>®</sup>

## REVISION RECORD

| REV NO.<br>版 本 | CONTENTS<br>内 容 | REVISION ITEM<br>修改项目 | REV DATE<br>日 期 |
|----------------|-----------------|-----------------------|-----------------|
| V1.0           | First release   | Preliminary           | 2024-10-19      |
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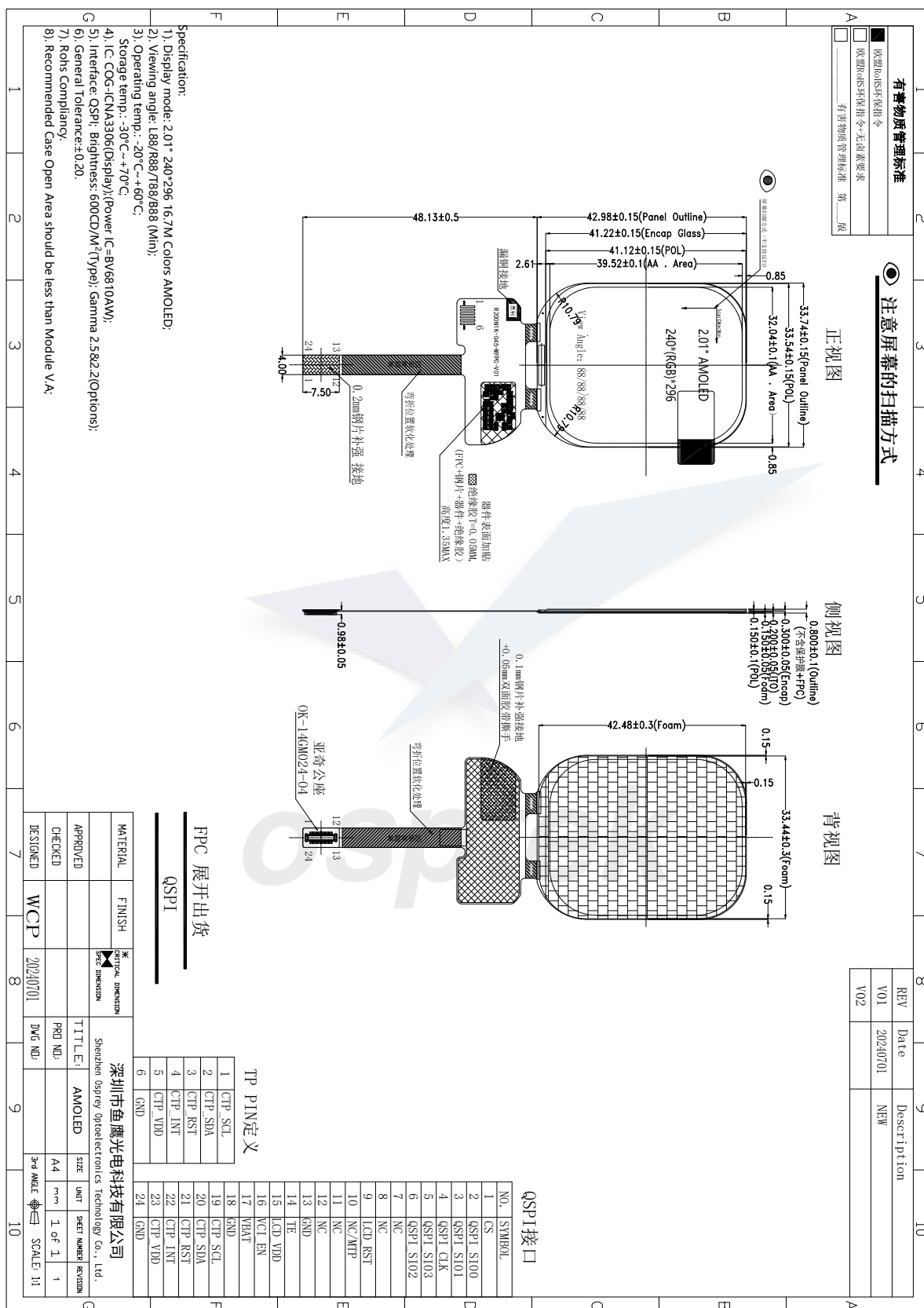
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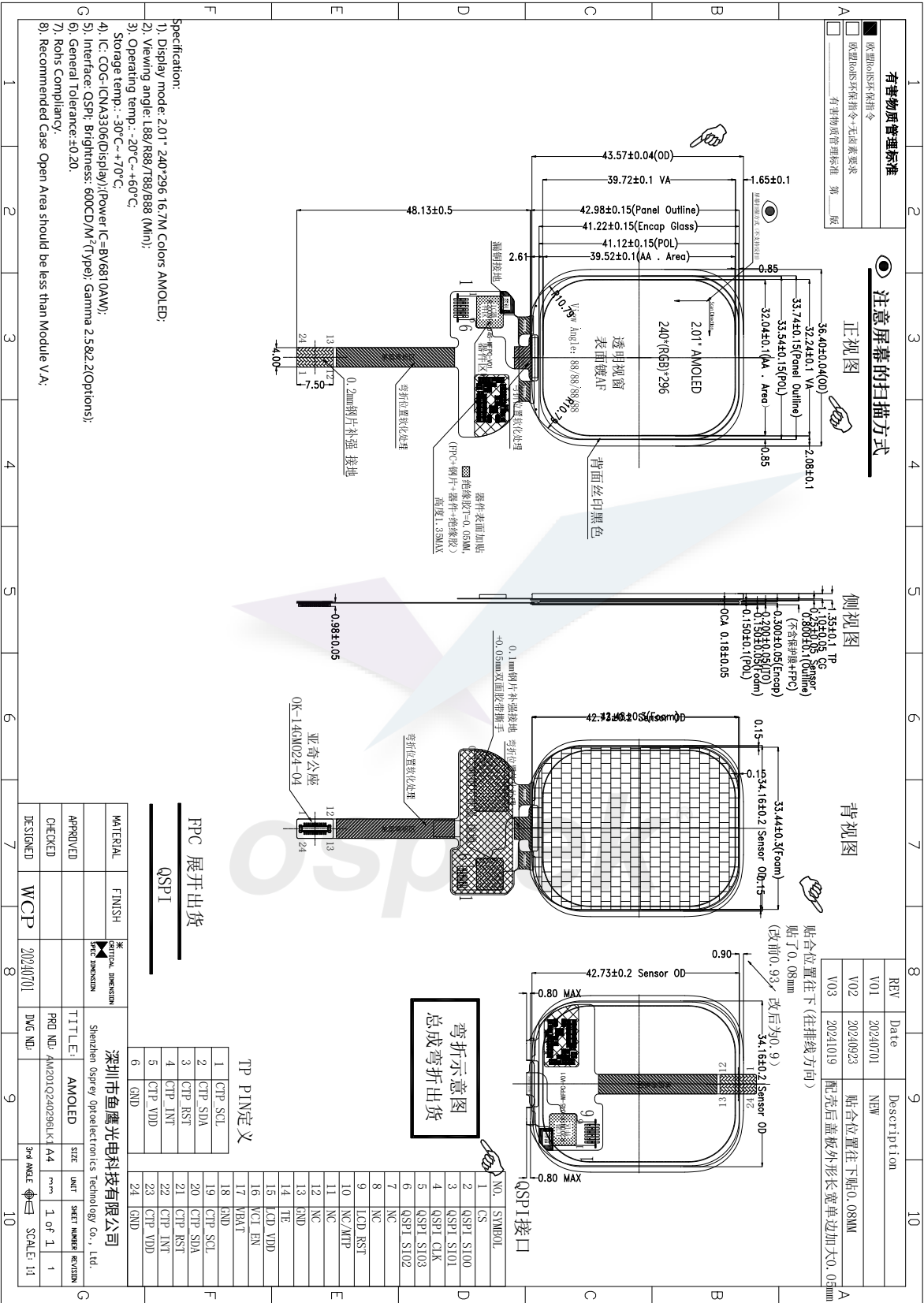
## 1. GENERAL SPECIFICATIONS(主要特征描述)

| Item 项目                                 | Contents 内容       | Unit 单位         |
|-----------------------------------------|-------------------|-----------------|
| Display Type<br>显示类型                    | 16.7M LTPS        | AMOLED          |
| Diagonal Length<br>尺寸                   | 2.01              | Inch            |
| Recommended Viewing Direction<br>推荐使用方向 | ALL               | 0' Clock        |
| Dot arrangement<br>点阵                   | 240*3(R.G.B)*296  | Dot             |
| Assembly size (W*H*T)<br>总成尺寸 (宽*高*厚)   | 36.40*43.57*2.33  | mm <sup>3</sup> |
| Module size (W*H*T)<br>模块外围尺寸 (宽*高*厚)   | 33.74*42.98*0.800 | mm <sup>3</sup> |
| Viewing area (W*H)<br>可视区域 (宽*高)        | 32.24*39.72       | mm <sup>2</sup> |
| Active area (W*H)<br>有效显示区域 (宽*高)       | 32.04*39.52       | mm <sup>2</sup> |
| Pixel size (W*H)<br>像素大小 (宽*高)          | 0.1335*0.1335     | mm <sup>2</sup> |
| Display Driver IC<br>显示驱动芯片             | ICNA3306          |                 |
| Power IC<br>电源芯片                        | BV6810            |                 |
| Interface Type<br>接口类型                  | QSPI              |                 |

## 2. EXTERNAL DIMENSIONS(外形尺寸)



ASSEMBLY SIZE(总成尺寸)



### 3. ABSOLUTE MAXIMUM RATINGS(极限参数)

| 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   | -    |

### 4. ELECTRICAL CHARACTERISTICS(模块电气特性)

| Item                 | Symbol | Min. | Typ. | Max. | Unit | Remark |
|----------------------|--------|------|------|------|------|--------|
| Digital Power supply | VDDIO  | 1.7  | 1.8  | 1.95 | V    | Ref    |
| Analog Power supply  | VBAT   | 2.7  | 3.7  | 4.8  | V    | Ref    |

#### 1) Normal Mode

Power Supply :BV6802, VBAT=3.7, VDDIO=1.8V, ELVDD=4.6V, ELVSS=-2.4V

Frame Frequency: 60Hz

| Display Condition        | Symbol      | Min. | Typ. | Max. | Unit | Remark |
|--------------------------|-------------|------|------|------|------|--------|
| 100% Pixel On<br>500nits | Normal mode |      | /    |      | mW   | Ref    |

#### 2) Idle mode

Power Supply DDIC SH8501A VBAT=3.7, VDDIO=1.8V, ELVDD=4.6V, ELVSS=-2.4V

Frame Frequency: 15Hz

| Display Condition   | Symbol    | Min. | Typ. | Max. | Unit | Remark |
|---------------------|-----------|------|------|------|------|--------|
| 10% Pixel On 50nits | Idle mode |      | /    |      | mW   | Ref    |

#### 3) Deep Standby Mode

| Display Condition                        | Symbol       | Min. | Typ. | Max. | Unit | Remark |
|------------------------------------------|--------------|------|------|------|------|--------|
| All Pixel Off,0nits/ Vci<br>off/Vddio on | Standby mode |      |      | 200  | μA   | Ref    |

#### 4) HBM

Power Supply : BV6802, VBAT=3.7, VDDIO=1.8V, ELVDD=4.6V, ELVSS=-3V

Frame Frequency:60Hz

| Display Condition          | Symbol | Min. | Typ. | Max. | Unit | Remark |
|----------------------------|--------|------|------|------|------|--------|
| 100% Pixel On 1000<br>nits | Power  |      | /    |      | mW   | Ref    |

5.

### 4.1 Display Driver IC

ICNA3306 (Refer to the IC datasheet).

### 6. BACKLIGHT SPECIFICATION(背光电气特性)..... NULL

## 7. ELECTRO-OPTICAL CHARACTERISTICS(光电参数)

| Item                           | Symbol         | Condition                                                    | Min   | Typ      | Max   | Unit              | Note    |
|--------------------------------|----------------|--------------------------------------------------------------|-------|----------|-------|-------------------|---------|
| Surface Luminance              | Lv             | $\theta=0^\circ$<br>$\phi=0^\circ$<br>$T_a=25^\circ\text{C}$ |       | 600      |       | cd/m <sup>2</sup> | Note1   |
| Luminance uniformity           | $\delta$ WHITE |                                                              | 85    | -        | -     | %                 | Note2   |
| Contrast Ratio                 | Cr             |                                                              | -     | 100000:1 | -     | -                 | Note3   |
| Viewing Angle                  | $\theta$       | Up/Down/<br>Right/Left<br>$Cr \geq 10$                       | 85    | -        | -     | deg               | Note4   |
| Color Coordinate of<br>CIE1931 | Red x          | $\theta=0^\circ$<br>$\phi=0^\circ$<br>$T_a=25^\circ\text{C}$ |       | TBD      |       | -                 | Note 5  |
|                                | Red y          |                                                              |       | TBD      |       |                   |         |
|                                | Green x        |                                                              |       | TBD      |       |                   |         |
|                                | Green y        |                                                              |       | TBD      |       |                   |         |
|                                | Blue x         |                                                              |       | TBD      |       |                   |         |
|                                | Blue y         |                                                              |       | TBD      |       |                   |         |
|                                | White x        |                                                              | 0.270 | 0.290    | 0.310 |                   |         |
|                                | White y        |                                                              | 0.290 | 0.310    | 0.330 |                   |         |
| NTSC ratio                     | -              | -                                                            | 97    | 108      | -     | %                 | CIE1931 |
| Life Time                      | T95            | 25 $^\circ\text{C}$                                          | 200   | -        | -     | hours             | -       |

## 8. INTERFACE DESCRIPTION(接口定义描述)

| Pin No.<br>Pin脚 | Symbol<br>符 号 | I/O<br>输入/出 | Description<br>描 述                                    | Memo<br>备注 |
|-----------------|---------------|-------------|-------------------------------------------------------|------------|
| 1               | CS            | I           | Chip selection pin                                    |            |
| 2               | QSPI_SI00     | IO          | QSPI data pin                                         |            |
| 3               | QSPI_SI01     | I           | QSPI data pin                                         |            |
| 4               | QSPI_CLK      | I           | QSPI clock pin                                        |            |
| 5               | QSPI_SI03     | I           | QSPI data pin                                         |            |
| 6               | QSPI_SI02     | I           | QSPI data pin                                         |            |
| 7-8             | NC            | /           | NC                                                    |            |
| 9               | LCD_RST       | I           | AMOLED Reset signal pin                               |            |
| 10              | NC/MTP        | /           | NC                                                    |            |
| 11-12           | NC            | /           | NC                                                    |            |
| 13              | GND           | P           | Ground                                                |            |
| 14              | TE            | O           | Tearing effect output pin ; Enable Cmd:0x35 data:0x00 |            |
| 15              | LCD_VDD       | P           | Power supply for LCM internal Analog                  |            |
| 16              | VCI_EN        | P           | VCI Enable Input Voltage 1.8V/3.3V (Power IC Enable   |            |
| 17              | VBAT          | P           | Input Power Supply to the PMIC (3.3-5.5V)             |            |
| 18              | GND           | P           | Ground                                                |            |
| 19              | CTP_SCL       | I           | CTP Driver I2C clock pin                              |            |
| 20              | CTP_SDA       | IO          | CTP Driver I2C data pin                               |            |
| 21              | CTP_RST       | I           | CTP Driver hardware reset pin                         |            |
| 22              | CTP_INT       | I           | CTP Driver I2C interrupt output pin                   |            |
| 23              | CTP_VCC       | P           | Power supply for CTP internal Analog                  |            |
| 24              | GND           | P           | Ground                                                |            |



## 9.TIMING CHARACTERIST (时序特征)

### 3.3.1 Power On/Off Sequence

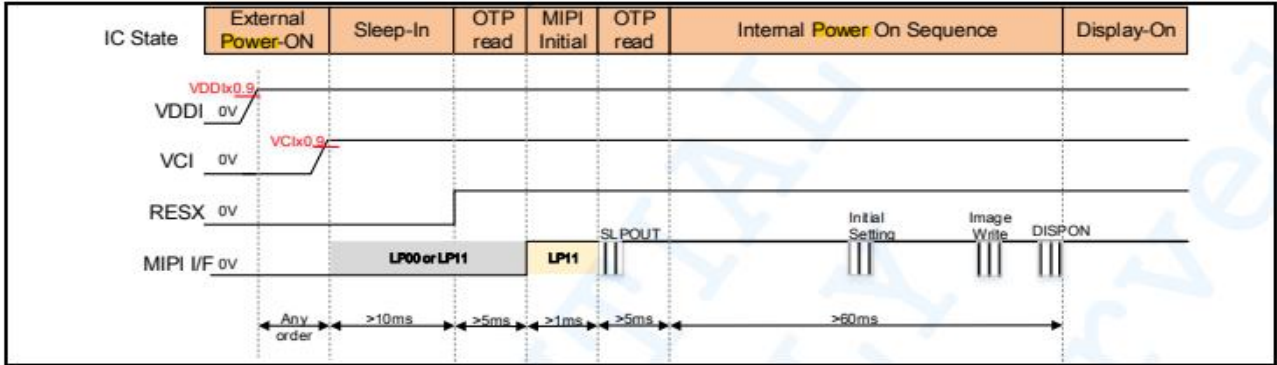
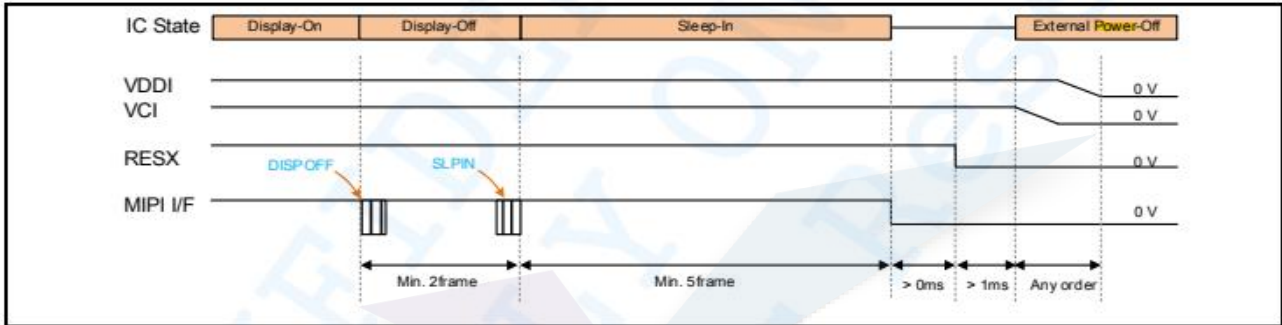


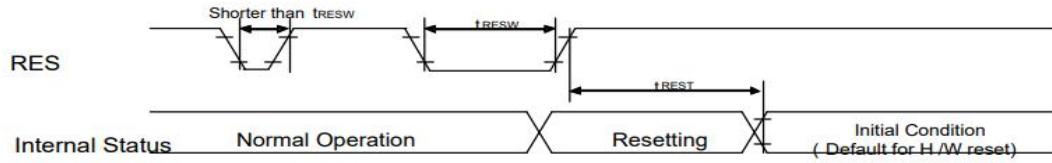
Figure 15 Power-On Sequence



| Characteristic                 | Symbol      |            | Specification |      | Unit |
|--------------------------------|-------------|------------|---------------|------|------|
|                                |             |            | Min.          | Max. |      |
| Chip select setup time         | CSX         | $t_{cssq}$ | 10            | —    | ns   |
| Chip select hold time          |             | $t_{cshq}$ | 10            | —    | ns   |
| Chip select "High" pulse width |             | $t_{chwq}$ | 20            | —    | ns   |
| Write cycle time               | SCL (Write) | $t_{wcq}$  | 20            | —    | ns   |
| SCL "High" period (Write)      |             | $t_{wrhq}$ | 10            | —    | ns   |
| SCL "Low" period (Write)       |             | $t_{wrlq}$ | 10            | —    | ns   |
| Read cycle time                | SCL (Read)  | $t_{rcq}$  | 100           | —    | ns   |
| SCL "High" period (Read)       |             | $t_{rdhq}$ | 50            | —    | ns   |
| SCL "Low" period (Read)        |             | $t_{rdlq}$ | 50            | —    | ns   |
| Data setup time                | SDI         | $t_{dsq}$  | 10            | —    | ns   |
| Data hold time                 |             | $t_{dhq}$  | 10            | —    | ns   |
| Access time                    | SDO         | $t_{accq}$ | —             | 40   | ns   |
| Output disable time            |             | $t_{odq}$  | 20            | —    | ns   |
| Rise/Fall time                 | —           | $t_r/t_f$  | —             | 1    | ns   |



## 10.Reset timing



Reset input timing:

VDDI=1.65 to 1.95V, VDD=2.7 to 3.6V, AGND=DGND=0V, Ta=-40 to 85°C

| Symbol     | Parameter                 | Related Pins | MIN | TYP | MAX | Note                                     | Unit    |
|------------|---------------------------|--------------|-----|-----|-----|------------------------------------------|---------|
| $t_{RESW}$ | *1) Reset low pulse width | RESX         | 10  | -   | -   | -                                        | $\mu s$ |
| $t_{REST}$ | *2) Reset complete time   | -            | -   | -   | 10  | When reset applied during Sleep in mode  | ms      |
|            |                           | -            | -   | -   | 120 | When reset applied during Sleep out mode | ms      |

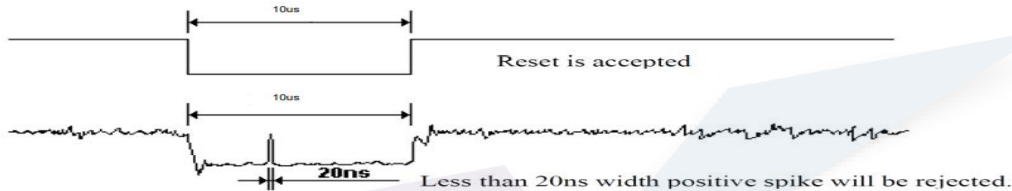
Note 1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

| RESX Pulse                       | Action                                                             |
|----------------------------------|--------------------------------------------------------------------|
| Shorter than 5 $\mu s$           | Reset Rejected                                                     |
| Longer than 10 $\mu s$           | Reset                                                              |
| Between 5 $\mu s$ and 10 $\mu s$ | Reset starts<br>(It depends on voltage and temperature condition.) |

Note 2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for H/W reset.

Note 3. During Reset Complete Time, data in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time ( $t_{REST}$ ) within 10ms after a rising edge of RESX.

Note 4. Spike Rejection also applies during a valid reset pulse as shown below:



Note 5. It is necessary to wait 10msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

## 11.ELIABILITY TEST CONDITIONS(可靠性实验条件)

| NO.<br>序号 | Test Item<br>实验                   | Test Condition<br>实验条件                                                                                                                   | Inspection after test<br>判定标准                                                                                                                                                                                                                                                                                       |
|-----------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | High Temperature Storage          | 80 $\pm$ 2°C, 240 hrs                                                                                                                    | Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects.<br>(试验结束后须正常室温存放2~4个小时之后才能测试判定, 不允许有以下缺陷)                                                                                                                                                                            |
| 2         | Low Temperature Storage<br>低温     | -40 $\pm$ 2°C, 240 hrs                                                                                                                   |                                                                                                                                                                                                                                                                                                                     |
| 3         | High Temperature Operating 高温操作   | 70 $\pm$ 2°C, 240 hrs                                                                                                                    | 1. Air bubble in the LCD<br>(模块中有气泡);<br>2. Seal leak (漏液);<br>3. Non-display (不显示);<br>4. Missing segments(漏笔);<br>5. Glass crack (玻璃破碎);<br>6. Current IDD is twice higher than initial value<br>(电流 Idd 大于初时值的 2倍);<br>7. The surface damage (表面损伤)<br>8. Do not meet the electrical characteristics (不满足模块电气性能) |
| 4         | Low Temperature Operating 低温操作    | -20 $\pm$ 2°C, 240 hrs                                                                                                                   |                                                                                                                                                                                                                                                                                                                     |
| 5         | Damp proof Test Storage<br>高温高湿   | 60 $\pm$ 2°C, 90%RH, 240 hrs                                                                                                             |                                                                                                                                                                                                                                                                                                                     |
| 6         | Temperature Cycle Storage<br>冷热循环 | -40°C $\sim$ +80°C dwell time=0.5hrs 100 Cycles.                                                                                         |                                                                                                                                                                                                                                                                                                                     |
| 7         | Vibration Test<br>振荡试验            | Frequency(频率):10HZ-55Hz ,<br>Amplitude (振幅):1.5mm , x, y, z every direction for 1 hour<br>(Packing condition) (包装状态, X, Y, Z 每个方向各 1 小时) |                                                                                                                                                                                                                                                                                                                     |

|   |                           |                                                                                                                          |  |
|---|---------------------------|--------------------------------------------------------------------------------------------------------------------------|--|
| 8 | Dropping Test<br>跌落<br>试验 | Drop to the ground from 1M height, one time, every side of carton (Packing condition) (包装状态, 一米高度, 6面各一次)                |  |
| 9 | ESD Test<br>静电<br>测试      | Voltage: 8KV;<br>Air discharge(空气放电), 10 times<br>Voltage: 4KV; (C: 150pf; R: 330Ω;)<br>Connet discharge(接触放电), 10 times |  |

Remark (备注):

1. The samples should be applied to only on test item(每个被测试样品只能用于其中的一个测试项目);
2. Sample size for each test item is 5~10 pcs(每个测试项目的样品数量为5~10片);
3. For Damp Proof Test, Pure water(Resistance>10M Ω) should be used (对于防潮试验, 试验箱的用水必须是电阻大于10M 欧姆的纯水);
4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part (如果由静电引起产品故障, 当放置一段时间后能够恢复正常, 则不视为产品缺陷);
5. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, mechanical Characteristic, Optical Characteristic (故障判断标准: 基本规格, 电气特性, 机械特性, 光电特性).

## 12. INSPECTION CRITERION(检查标准)(参考 REX-BZ-001)

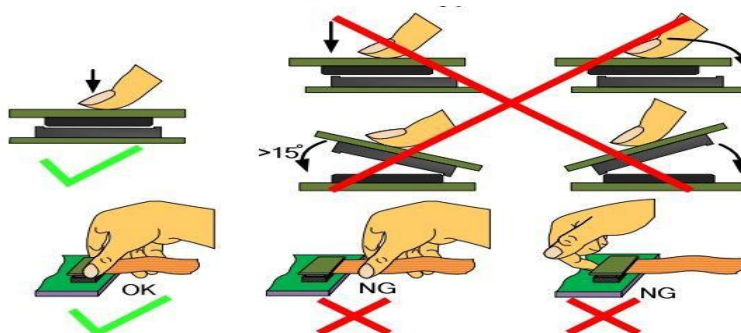
## 13. PRECAUTIONS FOR USING LCD MODULES(使用注意事项)

- 13.1.1 As glass is fragile, It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact. (由于玻璃是脆的, 使用过程请特别注意边缘区, 防止跌落或振动, 不能机械碰撞)。
- 13.1.2 Do not apply excessive force to the display surface or the adjoining are since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals(some cosmetics are determined to the polarizer) (请勿施加过大的压力于显示屏或连接部位, 否则会引起色调变化。不要裸手接触显示屏, 这将弄脏显示区和降低端子之间的绝缘能力。一些外观问题是由偏光片决定的)。
- 13.1.3 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizes with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on it. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in to contact with room temperature air. (覆盖液晶显示模块显示平面的偏光片是软性且易被擦伤, 请小心轻拿。请勿用任何硬度大于 HB 铅笔芯的物品(玻璃, 镊子等) 接触、撞压或摩擦裸露偏光片不要放置或粘附物体在显示区域上以免留下痕迹。冷凝在表面和端子将会损坏或弄脏偏光片。产品在 低温下测试之后, 与室温空气接触之前必须在容器内升温)
- 13.1.4 If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents: Isopropyl alcohol; Ethyl alcohol. Do not scrub hard to avoid damaging the display surface(如果显示平面受污, 可对平面吹热气且轻轻地用软性干布擦除。如果受污严重, 用含下列一种溶剂的湿布擦除: 甘油, 酒精。请勿用力擦拭以免损坏显示平面。)
- 13.1.5 Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following: Water, Ketone, Aromatic solvents. Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contact with oil and fats. (除以上提到的溶剂外, 其他溶剂可能会损坏偏光片, 特别要避免使用以下溶剂: 水, 丙酮, 芳烃溶剂。立即擦掉唾液或水滴, 长时间与水接触会引起变形或褪色。避免接触油和油脂)
- 13.1.6 Do not attempt to disassemble or process the LCD module. (请勿拆卸液晶显示模块)
- 13.1.7 Electro-Static Discharge Control, Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment. (由于液晶显示模块使用 CMOS 集成电路, 要特别注意静电放电问题。对 CMOS 器件, 要特别注意静电。为防止静电损坏, 注意保持合宜的工作环境)

13.1.8 Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable. (开机时, 先让逻辑电压, 再接通模拟高压, 如显示屏驱动电压。关机时, 先断开模拟高压, 再关逻辑电压。正负电源都稳定后再送控制信号。)

13.1.9 In the use of connector products, the operating process of attention to turn off the power before pull off and insert action. To avoid damage to the module (在使用连接器的产品时, 插接过程注意先关闭电源再进行拔插动作, 避免损坏模块)

13.1.10 Precaution for assemble the module with BTB connector: Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows (用板对板连接器安装液晶显示模块注意事项: 请注意连接器的公母及连接位置, 请勿出现下图所示的错误连接方式)



## 13.2 Storage Modules 储存

13.2.1 Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0° C and 35° C, and keep the relative humidity between 40%RH and 60%RH. (避光保存, 避免直接暴露在太阳光或黄光灯下, 保持温度在 0~35 摄氏度之间, 保持相对湿度在 40%RH 和 60%RH 之间。)

13.2.2 The polarizer surface should not come in contact with any other objects (We advise you to store them in the anti-static electricity container in which they were shipped). (偏光片表面避免接触其他物质, 建议存放在货运防静电包装中)

## 13.3 Soldering

13.3.1 Iron head temperature (铬铁头实际温度): 350±10°C, Soldering time (焊接时间): <3-4S. Soldering don't repeat above 3 times (焊接次数勿超过 3 次)

13.3.2 If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation (This does not apply in the of a non-halogen type of flux). It is recommended that you protect the LCD surface case with a cover during soldering to prevent any damage due to flux spatters. (如果使用助焊剂, 完成焊接后一定要清除剩余的助焊剂 (除非卤化物助焊剂)。建议焊接时用盖子保护显示屏面以避免因焊剂油溅出造成的任何损坏。)

## 14. PRIOR CONSULT MATTER (提前商议事项)

14.1 For OSP electronics standard products, we keep the right to change material, process ... for improving the product property without prior notice to our customer.

(对于鱼鹰电子的标准模块产品, 我们保留在不通知客户的情况下, 为提高产品性能而改变原材料及加工方法等的权利。)

14.2 If you have special requirement about reliability condition, please let us know before you start the design on our samples.

(如对可靠性条件有特殊要求, 请在模块设计开发前通知我们。)