

 Preliminary Specification Approval Specification

# SPECIFICATION FOR LCD MODULE

Customer : \_\_\_\_\_

ProductModel:                     PV05031PY40C                    

Sample Code: \_\_\_\_\_

| Designed by | Checked by | Approved by |
|-------------|------------|-------------|
|             |            |             |

## Final Approval by Customer

|  |  |
|--|--|
| <input type="checkbox"/> LCM Machinery OK<br><br>Checked By _____<br><br><input type="checkbox"/> LCM Display OK<br><br>Checked By _____ | <input type="checkbox"/> LCM OK<br><br><br><input type="checkbox"/> NG, Problem survey:<br><br>Approved By _____ |
|--|--|



## Revision History

| Version | Contents | Date      | Note |
|---------|----------|-----------|------|
| 00      | Original | 2023.4.10 |      |
|         |          |           |      |
|         |          |           |      |
|         |          |           |      |
|         |          |           |      |

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## 1. Scope

This specification applies to the OLED module which is designed and manufactured by Kingtech

## 2. Features

- 4.97" OLED
- Supported 720RGBx1280
- Driver IC(1 Chip ): RM67295

## 3. General Specifications

| NO | Item             | Specification                     |
|----|------------------|-----------------------------------|
| 1  | Panel Size       | 4.97 inch                         |
| 2  | Number of Pixels | 720(H) x 1280 (V)                 |
| 3  | Active Area      | 61.88(H) x 110.02(V)              |
| 4  | OutlineDimension | 64.12(W) X 116.72(H) X 0.84(D) mm |

## 4. Electrical Specifications

### 4.1 Absolute Maximum Ratings

| Parameter                  | Symbol | Spec |      |      | Unit | Note |
|----------------------------|--------|------|------|------|------|------|
|                            |        | Min. | Typ. | Max. |      |      |
| Analog/boost power voltage | VCI    | -0.3 | -    | 5.5  | V    | -    |
| VCI I/O voltage            | VCI_IF | -0.3 | -    | 5.5  | V    | -    |
| I/O voltage                | VDDI   | -0.3 | -    | 5.5  | V    | -    |
| VSP voltage                | VSP    | -0.3 | -    | 6.6  | V    | -    |
| VPP(OTP power)             | VPP    | -    | -    | 8.25 | V    | -    |



## 4.2DC Characteristics

| Item                  | Symbol | Min. | Typ. | Max. | Unit | Remark |
|-----------------------|--------|------|------|------|------|--------|
| AMOLED Power positive | ELVDD  |      | 4.6  |      | V    |        |
| AMOLED power Negative | ELVSS  |      | -2.5 |      | V    | Ref    |
| Gamma Voltage         | VSP    |      | 6.4  | -    | V    | Ref    |
| Digital Power supply  | VDDI   | 1.65 | 1.8  | 3.3  | V    | Ref    |
| Analog Power supply   | VCI    | 2.5  | 3.3  | 3.6  | V    | Ref    |

| Mode                  | Symbol       | Condition                | Min. | Typ. | Max. | Unit |
|-----------------------|--------------|--------------------------|------|------|------|------|
| 350 nits<br>@Gray 255 | IELVDD/ELVSS | VELVDD=4.6V              | -    | 160  | 190  | mA   |
|                       | IVCI         | VELVSS=-2.5V<br>VCI=3.3V | -    | 1.5  | 2    | mA   |
|                       | IVDDIO       | VDDIO=1.8V               | -    | 15   | 20   | mA   |
|                       | IVSP         | VSP=6.4V                 | -    | 10   | 13   | mA   |

| Item                  | Symbol                             | Value            | Unit |
|-----------------------|------------------------------------|------------------|------|
| Power supply voltage  | VDDI                               | -0.3 ~ 5.5       | V    |
| Power supply voltage  | VDDA, VDDDB,<br>VDDR, VDDAM<br>VCC | -0.3 ~ 5.5       | V    |
| Supply voltage (MV)   | AVDD-AVSS                          | -0.3 ~ 6.6       | V    |
|                       | AVEE-AVSS                          | -0.3 ~ -6.6      | V    |
| Supply voltage (HV)   | VGHR - VGLR                        | -0.3 ~ 33        | V    |
| Input voltage         | VIN                                | -0.3 ~ VDDI+ 0.3 | V    |
| Output voltage        | VO                                 | -0.3 ~ VDDI+ 0.3 | V    |
| Operating temperature | Topr                               | -40 ~ 85         | °C   |
| Storage temperature   | Tstg                               | -55 ~ 125        | °C   |

**Notes:**

If one of the above items exceeds its maximum limitation momentarily, the quality of the product may be degraded. Absolute maximum limitation. Therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the recommend range.



| Parameter                                    | Symbol  | Condition           | Min.           | Typ. | Max.                     | Unit | Related Pins |
|--|---------|---------------------|----------------|------|--------------------------|------|--------------|
| Analog Power Supply Voltage                  | VDD     | Operation Voltage   | 2.5            | 3.3  | 4.8                      | V    | Note 1       |
|  | VCC     | Operating Voltage   | 1.65           | 1.8  | 4.8                      | V    | Note 1       |
| I/O pin Power Supply Voltage                 | VDDI    | I/O supply voltage  | 1.65           | 1.8  | 3.3                      | V    | Note 1       |
| OTP Program Supply Voltage                   | MTP_PWR | Program Voltage     | 7.75           | 8.0  | 8.25                     | V    |              |
| Logic High level input voltage               | VIH     | VDDI = 1.65V ~ 3.3V | 0.8* VDDI      | -    | VDDI                     | V    | Note 2       |
| Logic Low level input voltage                | VIL     | VDDI = 1.65V ~ 3.3V | 0.0            | -    | 0.2* VDDI                | V    | Note 2       |
| Logic High level Output voltage              | VOH     | Iout = -1 mA        | 0.8* VDDI      | -    | VDDI                     | V    | Note 2       |
| Logic Low level Output voltage               | VOL     | Iout = +1 mA        | 0.0            | -    | 0.2* VDDI                | V    | Note 2       |
| Logic High level input current (Except MIPI) | IiHD    | Vin=0~VDDI          |                |      | 1                        | uA   | Note 2       |
| Logic Low level input current (Except MIPI)  | IiLD    | Vin=0~VDDI          | -1             |      |                          | uA   | Note 2       |
| Logic High level input current (MIPI)        | IiHD    | Vin=0~VDDAM         |                |      | 1                        | uA   | Note 2       |
| Logic Low level input current (MIPI)         | IiLD    | Vin=0~VDDAM         | -1             |      |                          | uA   | Note 2       |
| AVDD booster voltage                         | AVDD    |                     | 4.5            |      | 6.5                      | V    | Note 2       |
| AVEE booster voltage                         | AVEE    |                     | -6.5           |      | -4.5                     | V    | Note 2       |
| VCL booster voltage                          | VCL     |                     | -VDDDB         |      | -1.5                     | V    | Note 2       |
| VGH booster voltage                          | VGH     |                     | AVDD<br>+VDDDB |      | 3xAVDD                   | V    | Note 2       |
| VGL booster voltage                          | VGL     |                     | AVEE<br>-AVDD  |      | 2AVEE<br>-AVDD<br>-VDDDB | V    | Note 2       |
| Voltage difference between VGHR and VGLR     | VGHL    | VGHR-VGLR           |                |      | 25                       | V    | Note 2       |
| Gamma reference voltage                      | VGMP    |                     | 2.5            |      | AVDD-0.3                 | V    | Note 3       |
|  | VGSP    |                     | 0.0            |      | 3.5                      | V    | Note 3       |
| OSC  | Fosc    |                     | 23             | 25   | 27                       | MHz  |              |
| Channel deviation voltage                    | Vcev    | Code 231 ~ Code 255 |                | 5    | 10                       | mV   |              |
|  |         | Code 0 ~ Code 230   |                | 5    | 10                       | mV   |              |

Notes:

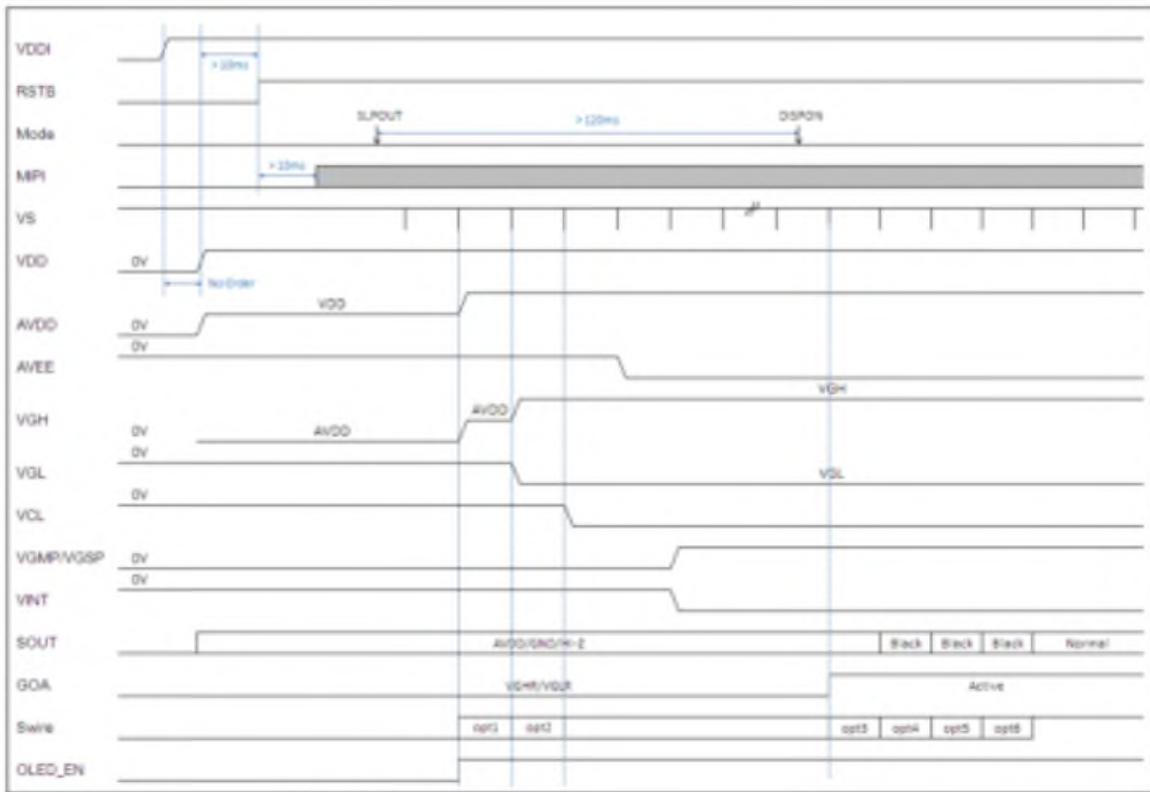
1. VDDI=1.65 to 3.3V, VDD=2.5 to 3.6V, VSSI=VSS=DVSS=0V, VDD means VDDA, VDDR, VDDDB, VCC, VDDAM. And VSS means VSSA, VSSR, VSSB, AVSS, and VSSAM. VDDDB, VDDA and VDDR should be the same input voltage level and larger than VDDI voltage.
2. TA = -30 to 70°C. (To +85°C no damage).
3. Please keep AVDD-0.3V >= VGMP > VGSP

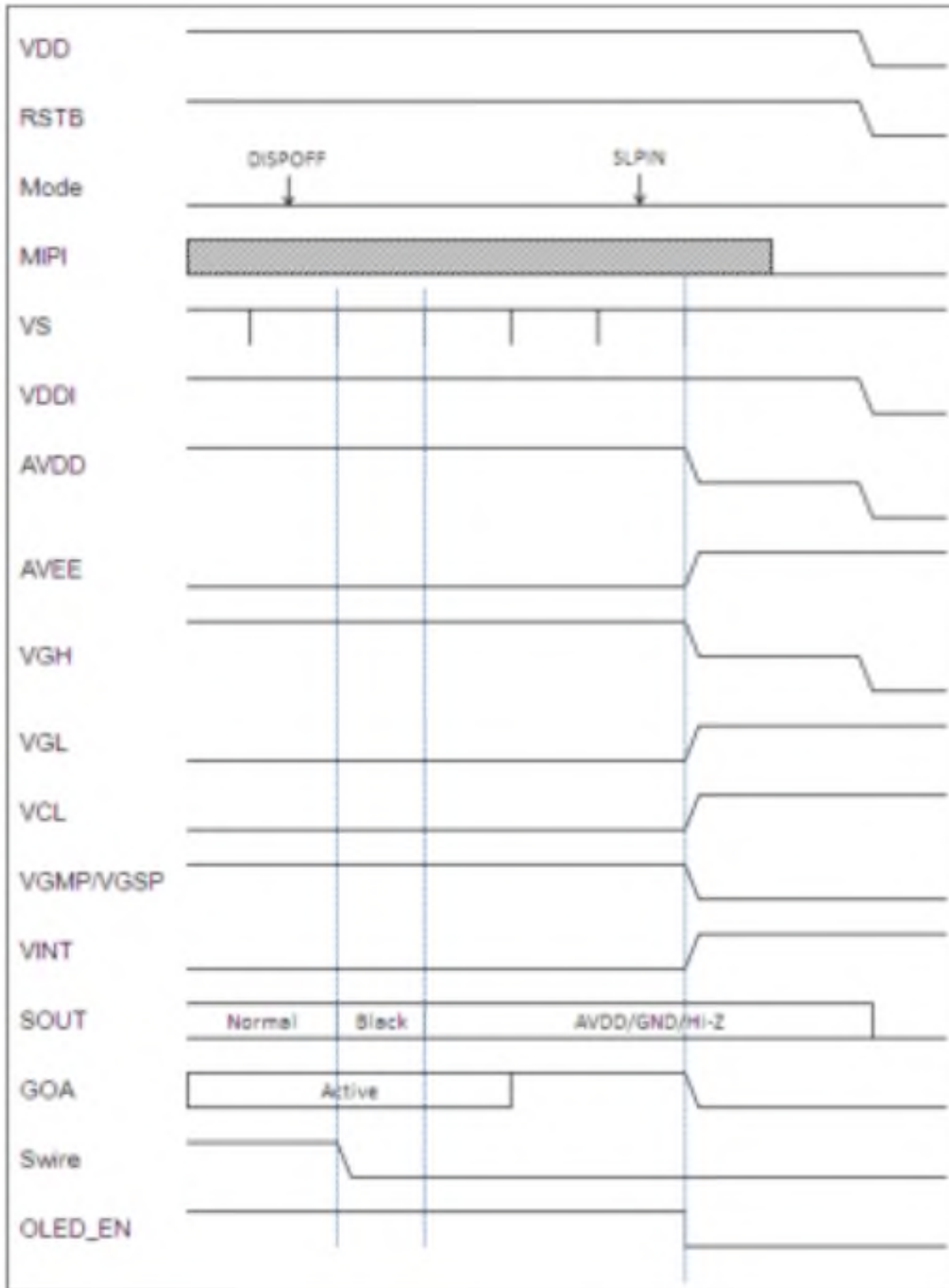


| No. | Item                            | Description           |   |
|-----|---------------------------------|-----------------------|---|
| 1   | Source Driver                   | 2160 pins             |   |
| 2   | Gate control timing Level shift | VGHR – VGLR           |   |
| 3   | Input Voltage                   | VDDI                  | 1.65V ~ 3.3V                                      |
|     |                                 | VDD (VDDA/VDDDB/VDDR) | 2.5V ~ 4.8V                                       |
|     |                                 | VCC                   | Connect to VDDI(suggested) or VDD                 |
|     |                                 | VDDAM                 | Connect to VDDI(suggested) or VDD                 |
|     |                                 | AVDD                  | 4.5V ~ 6.5V                                       |
| 4   | OLED drive voltages             | VGHR                  | 3.5V ~ 12V (Step= 0.1V)                           |
|     |                                 | VGLR                  | -3.5V ~ -9.8V (Step= -0.1V)                       |
|     |                                 | VREFFP5               | 0.2V ~ 6V (Step= 0.1V)                            |
|     |                                 | VREFN5                | -0.2V ~ -6V (Step= -0.1V)                         |
| 5   | Internal step-up circuits       | AVEE                  | AVDD x (-1)                                       |
|     |                                 | VGH                   | AVDD + VDDB, AVDD x 2<br>AVDD x 2+ VDDB, AVDD x 3 |
|     |                                 | VGL                   | AVEE – AVDD, AVEE x 2 – VDDB<br>AVEE x 2 – AVDD   |
|     |                                 | VCL                   | VDDB x (-1)                                       |

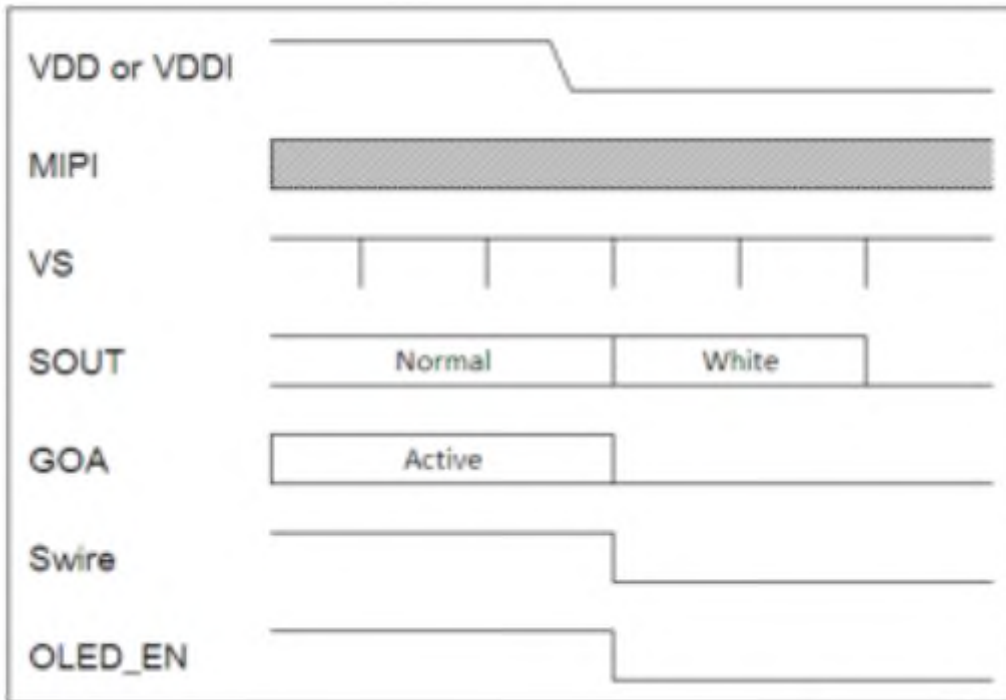


## 4.3 power on/off

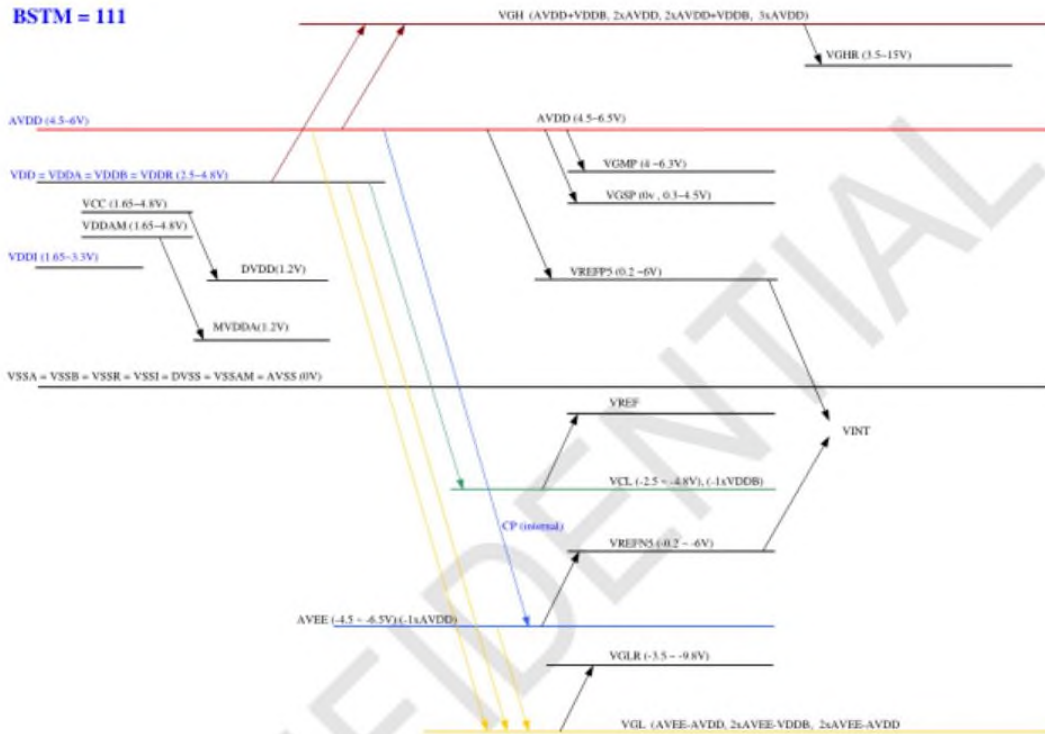








### BSTM = 111





#### 4.4 Optical specifications

| Item                   | Symbol | Conditions  | Min.      | Typ.  | Max.  | Unit              | Remark                    |
|------------------------|--------|---|-----------|-------|-------|-------------------|---------------------------|
| Brightness             |        |   | 315       | 350   | 385   | cd/m <sup>2</sup> | Suggest MDL Brightness    |
| Brightness Uniformity  |        |   | 75        | 85    | -     | %                 | Note 1                    |
| Contrast Ratio         |        | CR  | 10000     | 20000 |       |                   | Based on CA-310<br>Note 2 |
| CIE                    | Red    | x   | 0.660     | 0.690 | 0.720 | -                 | Set F                     |
|                        |        | y   | 0.281     | 0.311 | 0.341 | -                 |                           |
|                        | Green  | x   | 0.195     | 0.235 | 0.275 | -                 |                           |
|                        |        | y   | 0.680     | 0.720 | 0.760 | -                 |                           |
|                        | Blue   | x   | 0.113     | 0.143 | 0.173 | -                 |                           |
|                        |        | y   | 0.015     | 0.045 | 0.075 | -                 |                           |
| Color Gamut            |        | vs. NTSC ( CIE 1931 )   | 90        | 105   | -     | %                 |                           |
| Viewing angle          | Left   | θL  | 75        | 80    | -     | Deg.              | Note 3                    |
|                        | Right  | θR  | 75        | 80    |       | Deg.              | Note 3                    |
|                        | Top    | φT  | 75        | 80    |       | Deg.              | Note 3                    |
|                        | Bottom | φB  | 75        | 80    |       | Deg.              | Note 3                    |
| Color Shift            |        | White @ 30 degree   |           |       | 6     | JNCD              | Note 4                    |
| Flicker                |        |   |           |       | -30   | dB                | Note 5                    |
| Cross Talk             |        |   |           |       | 1.7   | %                 | Note 6                    |
| Polarization Direction |        | PdF   |           | 135   |       | Deg.              | Note 7                    |
| OLED Life Time         |        | With a Full-white image, lighting on with brightness of 350 nits for 120 hrs. | T94>=120h |       |       |                   |                           |
| Response time          |        |   |           |       | 2     | ms                | Note 8                    |



### 5. Reliability Test Conditions And Methods

| Item                                     | Test Conditions   | Remark |
|--|---|--------|
| High Temperature Storage                 | Ta = 70°C 120 hrs   |        |
| Low Temperature Storage                  | Ta = -30°C 120 hrs  |        |
| High Temperature Operation               | Ta = 60°C 120 hrs   |        |
| Low Temperature Operation                | Ta = -20°C 120 hrs  |        |
| Storage at High Temperature and Humidity | +60°C, 90% 120 hrs  |        |
| Thermal Shock Test                       | -30°C (30min) ∼ +70°C (min);<br>Cycles: 30times;  |        |
| ESD test                                 | 150pf, 330 Ω,<br>discharge mode: contact discharge ±4KV,<br>air discharge ±8KV<br>static discharge times: 10 times; |        |



## 6. Interface Pin Connection

| NO | Symbol       | description   |
|----|--------------|---|
| 1  | GND          | POWER Ground  |
| 2  | VBAT         | Power for power IC (3.5-4.2v)   |
| 3  | VBAT         | Power for power IC (3.5-4.2v)   |
| 4  | VBAT         | Power for power IC (3.5-4.2v)   |
| 5  | VBAT         | Power for power IC (3.5-4.2v)   |
| 6  | VBAT         | Power for power IC (3.5-4.2v)   |
| 7  | GND          | POWER Ground  |
| 8  | GND          | POWER Ground  |
| 9  | GND          | POWER Ground  |
| 10 | MTP_PWR      | MTP programming power supply pin  |
| 11 | TE           | Tearing effect output pin to synchronize MCU to frame writing, activated by S/W |
| 12 | RESX         | Display rest Active low   |
| 13 | VDDI         | Power supply for display logic circuits   |
| 14 | GND          | POWER Ground  |
| 15 | D2P          | Mipi data lane  |
| 16 | D2N          | Mipi data lane  |
| 17 | GND          | POWER Ground  |
| 18 | D1P          | Mipi data lane  |
| 19 | D1N          | Mipi data lane  |
| 20 | GND          | POWER Ground  |
| 21 | CKP          | Mipi Clock lane   |
| 22 | CKN          | Mipi Clock lane   |
| 23 | GND          | POWER Ground  |
| 24 | D0P          | Mipi data lane  |
| 25 | D0N          | Mipi data lane  |
| 26 | GND          | POWER Ground  |
| 27 | D3P          | Mipi data lane  |
| 28 | D3N          | Mipi data lane  |
| 29 | GND          | POWER Ground  |
| 30 | VCI 3.3V     | Power supply for display analog circuits  |
| 31 | GND          | POWER Ground  |
| 32 | TP_VCC 3.3V  | Analog power for TP   |
| 33 | TP_VDDI 1.8V | Logic power for TP  |
| 34 | TP_INT       | INT pin for TP  |
| 35 | TP_SDA       | SDA pin for TP  |
| 36 | TP_SCL       | SCL pin for TP  |
| 37 | TP_RESX      | Rest Pin for TP, Active low   |
| 38 | NC           | NC  |
| 39 | GND          | POWER Ground  |
| 40 | NC           | NC  |

