



RVT121HVHNWN00

HB, IPS HDMI 12.1" LCD DATASHEET

Rev.1.0

2024-03-27

| ITEM                           | CONTENTS                            | UNIT              |
|--------------------------------|-------------------------------------|-------------------|
| LCD Type                       | TFT/Transmissive/Normally Black/IPS | /                 |
| Size                           | 12.1                                | Inch              |
| Viewing Direction              | Free                                | /                 |
| Outside Dimensions (W x H x D) | 277.70 x 180.60 x 19.03             | mm                |
| Active Area (W x H)            | 261.12 x 163.20                     | mm                |
| Pixel Pitch (W x H)            | 0.204 x 0.204                       | mm                |
| Resolution                     | 1280 (RGB) x 800                    | /                 |
| Brightness                     | 1000                                | cd/m <sup>2</sup> |
| Color Depth                    | 16.7 M                              | /                 |
| Pixel Arrangement              | RGB Vertical Stripe                 | /                 |
| Controller of the Main Board   | RTD2556QR                           | /                 |
| Video Interface                | HDMI                                | /                 |
| With/Without Touch             | Without Capacitive Touch Panel      | /                 |
| Power Supply                   | Power Jack (DC 7.0V - 14.0 V)       | V                 |
| Weight                         | 583                                 | g                 |

**Note 1.** RoHS3 compliant**Note 2.** LCM weight tolerance:  $\pm 5\%$ .



## 1. REVISION RECORD

| REV NO. | REV DATE   | CONTENTS        | REMARKS |
|---------|------------|-----------------|---------|
| 1.0     | 2024-03-27 | Initial Release |         |



## 2. CONTENTS

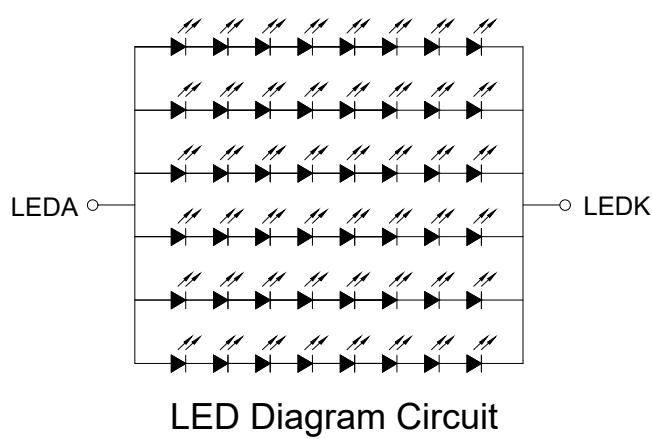
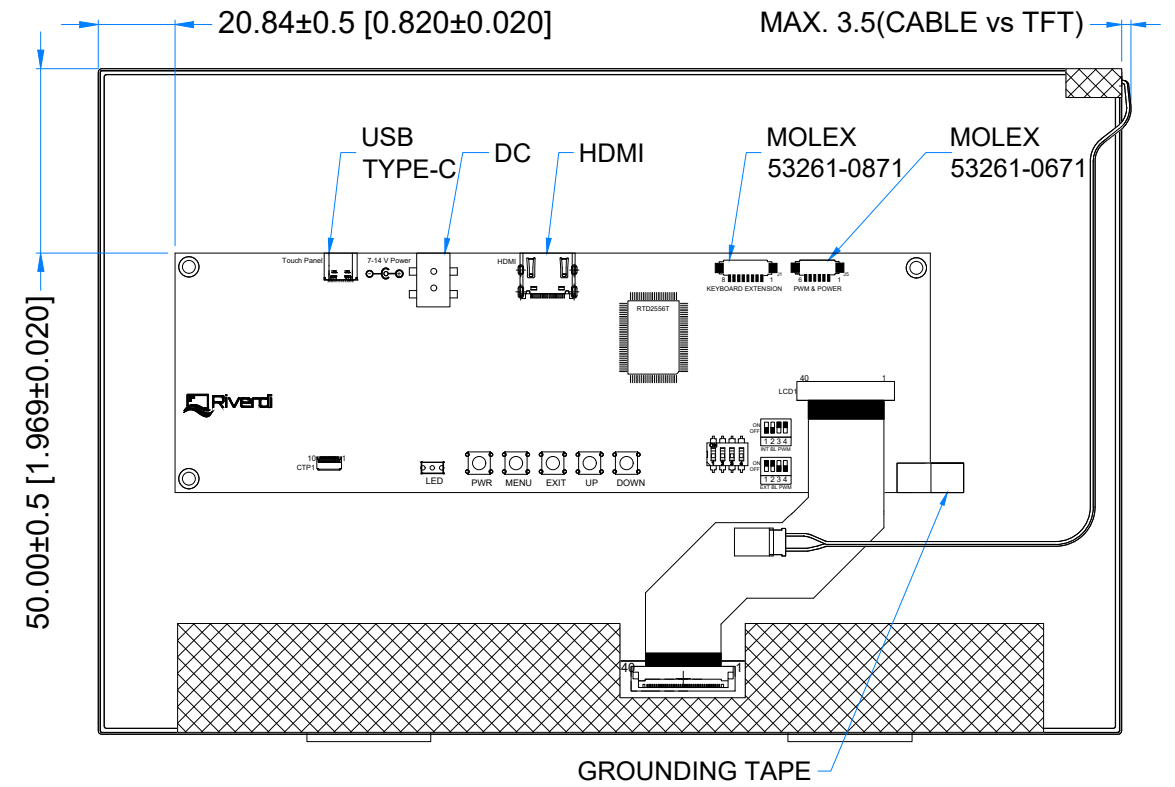
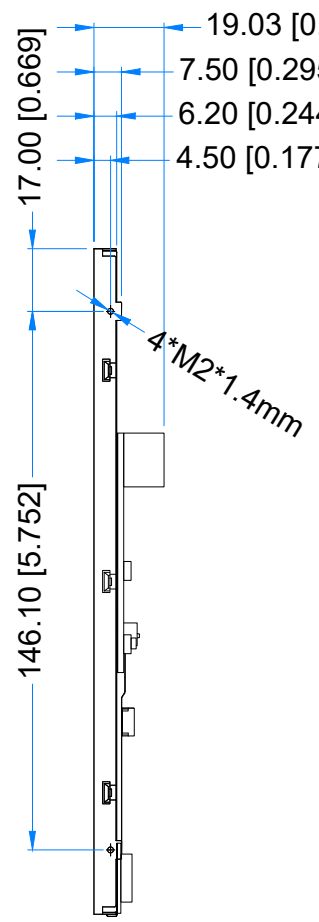
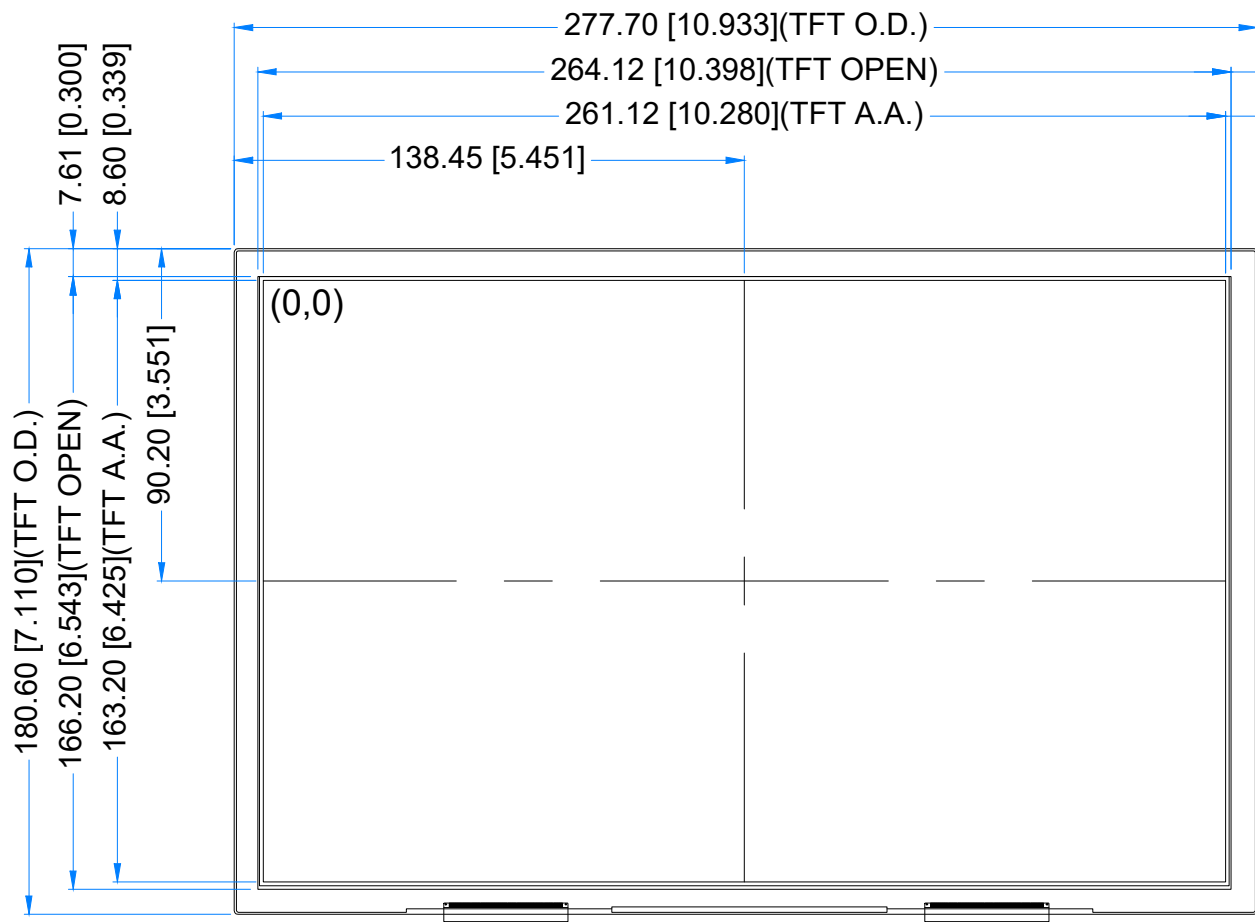
|      |                                        |    |
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3. MODULE CLASSIFICATION INFORMATION

|    |    |     |    |    |    |    |    |    |     |
|----|----|-----|----|----|----|----|----|----|-----|
| RV | T  | 121 | H  | V  | H  | N  | W  | N  | 00  |
| 1. | 2. | 3.  | 4. | 5. | 6. | 7. | 8. | 9. | 10. |

| NO. | PARAMETER        | SYMBOL                             |
|-----|------------------|------------------------------------|
| 1.  | BRAND            | RV – Riverdi                       |
| 2.  | PRODUCT TYPE     | T – TFT Standard                   |
| 3.  | DISPLAY SIZE     | 121 – 12.1"                        |
| 4.  | MODEL SERIAL NO. | H – High Brightness, IPS           |
| 5.  | RESOLUTION       | V – 1280 x 800 px                  |
| 6.  | INTERFACE        | H – HDMI                           |
| 7.  | FRAME            | N – Without Mounting Metal Frame   |
| 8.  | BACKLIGHT TYPE   | W – LED White                      |
| 9.  | TOUCH PANEL      | N – Without Capacitive Touch Panel |
| 10. | VERSION          | 00 – (00-99)                       |



PINOUT ON THE 2ND PAGE

|                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |  |                        |  |                                                                                       |        |                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------|--|---------------------------------------------------------------------------------------|--------|---------------------------------------------------------------------------------------|
| <b>LCM NOTES:</b><br>1. LCD TYPE: TRANSMISSIVE, NORMALLY BLACK, IPS<br>2. RESOLUTION: 1280x800<br>3. VIEWING ANGLE: FREE<br>4. SURFACE LUMINANCE:1000cd/m^2<br>5. CONTROLLER IC OF MAIN BOARD: RTD2556QR<br>6. VIDEO INTERFACE: HDMI<br>7. POWER SUPPLY: POWER JACK (7.0-14.0V) | <b>GENERAL NOTES:</b><br>1. OPERATING TEMPERATURE: -20°C ~ 70°C<br>2. STORAGE TEMPERATURE: -30°C ~ 80°C<br>3. WITHOUT INDIVIDUAL TOLERANCE:<br>±0.3mm[0.012inch]<br>4. RoHS3 COMPLIANT |  |                        |  |  |        |                                                                                       |
|                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |  | PN: RVT121HVHNWN00     |  |                                                                                       |        |                                                                                       |
|                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |  | SN:                    |  |                                                                                       |        |                                                                                       |
|                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |  | DRAWN: M.Natywa        |  | 2024.03.27                                                                            | 1:2.05 |  |
|                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |  | CHECKED: M.Wierzbowski |  | 2024.03.27                                                                            | [mm]   |                                                                                       |
|                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                        |  | APPR: T.Soldat         |  | 2024.03.27                                                                            | ISO A3 |                                                                                       |



## 5. ABSOLUTE MAXIMUM RATINGS

| PARAMETER                               | SYMBOL          | MIN | MAX  | UNIT |
|-----------------------------------------|-----------------|-----|------|------|
| Supply Voltage for Module               | VDD             | 7.0 | 14.0 | V    |
| Operating Temperature                   | T <sub>OP</sub> | -20 | 70   | °C   |
| Storage Temperature                     | T <sub>ST</sub> | -30 | 80   | °C   |
| Storage Humidity (@ 25 ± 5°C)           | H <sub>ST</sub> | 10  | -    | % RH |
| Operating Ambient Humidity (@ 25 ± 5°C) | H <sub>OP</sub> | 10  | -    | % RH |

**Note.** Exceeding maximum values may cause operation or damage to the unit.

## 6. ELECTRICAL CHARACTERISTICS

| PARAMETER                 | SYMBOL | MIN | TYP  | MAX  | UNIT | NOTE |
|---------------------------|--------|-----|------|------|------|------|
| Supply Voltage for Module | VDD    | 7.0 | 12.0 | 14.0 | V    |      |

| PARAMETER                     | SYMBOL           | BL 0% | BL 50% | BL 100% | UNIT | NOTE   |
|-------------------------------|------------------|-------|--------|---------|------|--------|
| Current Drawn from VDD@7.0V   | I <sub>VDD</sub> | 515   | 2180   | 2720    | mA   | Note 1 |
| Current Drawn from VDD@12.0V  |                  | 283   | 867    | 1580    | mA   |        |
| Current Drawn from VDD @14.0V |                  | 253   | 720    | 1270    | mA   |        |

**Note 1.** BL 0% current was measured with BL brightness set to 0%,  
 BL 50% current was measured with BL brightness set to 50%,  
 BL 100% current was measured with BL brightness set to 100%.  
 Test condition: ambient temp is 25 °C

## 7. BACKLIGHT DRIVING CONDITIONS

| PARAMETER                   | SYMBOL | MIN | TYP    | MAX | UNIT |
|-----------------------------|--------|-----|--------|-----|------|
| Backlight Power Consumption | WBL    | -   | 5760   | -   | mW   |
| Lifetime                    | -      | -   | 50,000 | -   |      |

**Note.** Operating life means the period in which the LED brightness goes down to 50% of the initial brightness. Typical operating lifetime is the estimated parameter.



## 8. ELECTRO-OPTICAL CHARACTERISTICS

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of  $\Phi$  and  $\theta$  equal to 0°.

| ITEM                    | SYMBOL            | CONDITION                                      | MIN  | TYP  | MAX  | UNIT              | RMK    | NOTE |
|-------------------------|-------------------|------------------------------------------------|------|------|------|-------------------|--------|------|
| Response Time           | Tr+Tf             | $\theta=0^\circ$<br>$\phi=0^\circ$<br>Ta=25 °C | -    | 25   | 35   | ms                | FIG 1. | 4    |
| Contrast Ratio          | Cr                |                                                | -    | 800  | 1000 | ---               | FIG 2. | 1    |
| Luminance Uniformity    | $\delta$<br>WHITE |                                                | -    | 75   | -    | %                 |        | 3    |
| Surface Luminance       | Lv                |                                                | -    | 1000 | -    | cd/m <sup>2</sup> |        | 2    |
| Viewing Angle Range     | $\theta$          | $\phi = 90^\circ$                              | 75   | 85   | -    | deg               | FIG 3. | 6    |
|                         |                   | $\phi = 270^\circ$                             | 75   | 85   | -    | deg               |        |      |
|                         |                   | $\phi = 0^\circ$                               | 75   | 85   | -    | deg               |        |      |
|                         |                   | $\phi = 180^\circ$                             | 75   | 85   | -    | deg               |        |      |
| CIE (x, y) Chromaticity | Rx                | $\theta=0^\circ$<br>$\phi=0^\circ$<br>Ta=25 °C | 0.22 | 0.26 | 0.30 | -                 | FIG 2. | 5    |
|                         | Ry                |                                                | 0.20 | 0.24 | 0.28 | -                 |        |      |
|                         | Gx                |                                                | 0.34 | 0.38 | 0.42 | -                 |        |      |
|                         | Gy                |                                                | 0.50 | 0.54 | 0.58 | -                 |        |      |
|                         | Bx                |                                                | 0.10 | 0.14 | 0.18 | -                 |        |      |
|                         | By                |                                                | 0.09 | 0.13 | 0.17 | -                 |        |      |
|                         | Wx                |                                                | 0.28 | 0.32 | 0.36 | -                 |        |      |
|                         | Wy                |                                                | 0.29 | 0.33 | 0.37 | -                 |        |      |

**Note 1.** Contrast Ratio (CR) is defined mathematically as below, for more information see Figure 2.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P3, P4, P5)}}$$

**Note 2.** Surface luminance is the LCD surface from the surface with all pixels displaying white at BL 100%. For more information see Figure 2.

$$Lv = \text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}$$

**Note 3.** The uniformity in surface luminance  $\delta$  WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the minimum luminance of 5 points luminance by maximum luminance of 5 points luminance. For more information see Figure 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

**Note 4.** Response time is the time required for the display to transition from white to black (Rise Time, Tr) and from black to white (Decay Time, Tf). For additional information see Figure 1. The test equipment is BM-7A.

**Note 5.** CIE (x, y) chromaticity, the x, y value is determined by measuring luminance at each test position 1 through 5, and then calculating the average value.

**Note 6.** For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to LCD surface. For more information see Figure 3.

**Note 7.** Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80). For response time testing, the testing data is based on BM-7A. Instruments for Contrast Ratio, Surface Luminance, Luminance Uniformity, Chromaticity the test data is based on SR-3A.

Figure 1. The definition of response time

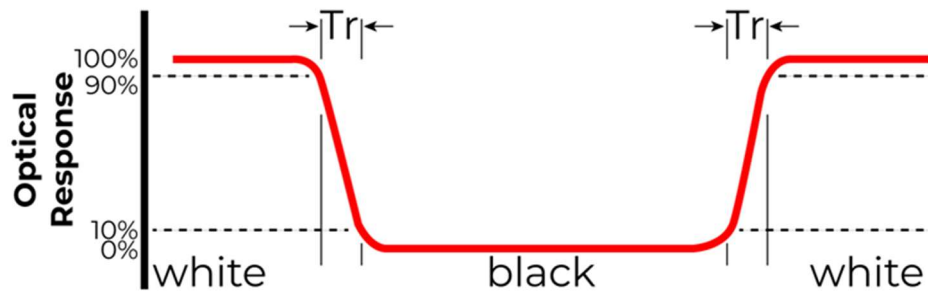


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

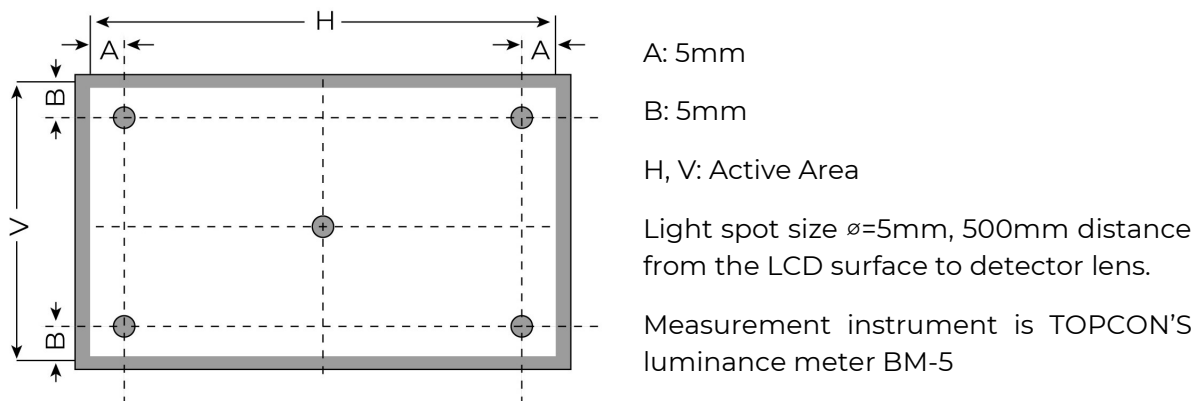
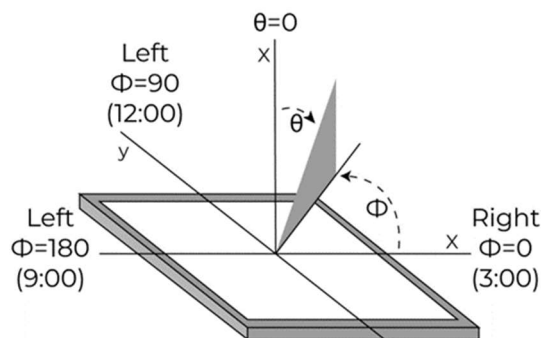


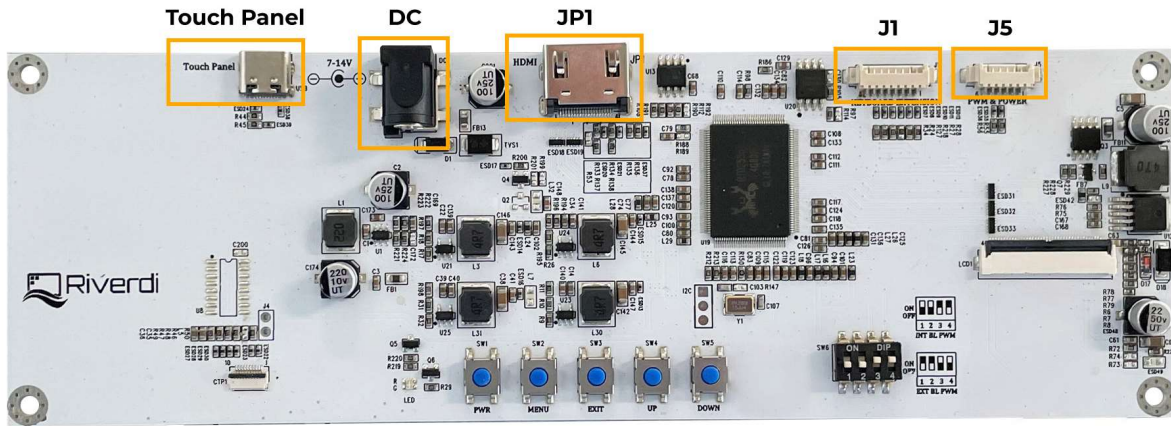
Figure 3. The definition of viewing angle



## 9. INTERFACE DESCRIPTION

### 9.1 PCB overview

Picture below shows the connectors exact placement and their descriptions.



| NAME        | CONNECTOR                   | DESCRIPTION                                                                                                                                                                                                     | NOTE   |
|-------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Touch Panel | USB-C                       | Touch panel interface<br>This is only for versions with touch panel.                                                                                                                                            |        |
| DC          | Power Jack                  | DC Jack, (5.5 mm OD; 2.1mm ID)<br>This is the connector to power on the TFT module.<br>It allows DC for voltage range from 7.0V to 14.0V                                                                        |        |
| JP1         | HDMI connector              | This is the connector to which you can connect the HDMI signal source to the module.                                                                                                                            |        |
| J1          | External keyboard connector | Molex 53261-0871 or alternative; Horizontal, 1.25mm pitch; 8 pins.<br>The connector is reserved for external keyboard.<br>Performs the same functions:<br>PWR, MENU, EXIT, UP, DOWN as the push buttons on PCB. | Note 1 |
| J5          | Backlight PWM & Power       | Molex 53261-0671 or alternative; Horizontal, 1.25mm pitch; 6 pins.<br>The unit realizes the function of digital dimming. This connector enables to control backlight PWM externally.                            | Note 2 |

**Note 1.** External keyboards are optional, not included in the standard kit.

**Note 2.** 4 position-DIP onboard switch SW6 is used to choose the power to backlight.

The settings are:

INTERNAL BL PWM: Set 1&2 to OFF, and 3&4 to ON,

EXTERNAL BL PWM: Set 1&2 to ON, and 3&4 to OFF.



## 9.2 Power connector - DC

| PIN NO. | SYMBOL | DESCRIPTION                 |
|---------|--------|-----------------------------|
| 1       | VDD    | Power supply DC; 7.0V-14.0V |
| 2       | GND    | GND                         |

## 9.3 HDMI connector – JP1

| PIN NO. | SYMBOL             | DESCRIPTION                     |
|---------|--------------------|---------------------------------|
| 1       | TMDS Data 2+       | TMDS differential signal 2+     |
| 2       | TMDS Data2 Shield  | Data2 shielding ground          |
| 3       | TMDS Data 2-       | TMDS differential signal 2-     |
| 4       | TMDS Data 1+       | TMDS differential signal 1+     |
| 5       | TMDS Data1 Shield  | Data1 shielding ground          |
| 6       | TMDS Data 1-       | TMDS differential signal 1-     |
| 7       | TMDS Data 0+       | TMDS differential signal 0+     |
| 8       | TMDS Data 0 Shield | Data0 shielding ground          |
| 9       | TMDS Data 0-       | TMDS differential signal 0-     |
| 10      | TMDS Data Clock+   | TMDS differential signal Clock+ |
| 11      | TMDS Data Shield   | Clock shielding ground          |
| 12      | TMDS Data Clock-   | TMDS differential signal Clock- |
| 13      | CEC                | Electronic protocol CEC         |
| 14      | NC                 | No Connection                   |
| 15      | SCL                | I <sup>2</sup> C clock Line     |
| 16      | SDA                | I <sup>2</sup> C data Line      |
| 17      | DDC/CEC GND        | Data display channel            |
| 18      | +5V                | HDMI 5V                         |
| 19      | Hot Plug Detect    | Hot plug Detect                 |

**Note 1.** Matched Riverdi 4K HDMI cable accessory: 4K HDMI CABLE

## 9.4 USB-C connector

| PIN NO. | SYMBOL  | DESCRIPTION           |
|---------|---------|-----------------------|
| A1      | USB_GND | USB_ Ground           |
| B12     | USB_GND | USB_ Ground           |
| A4      | V_BUS   | V_Bus Power; 5V       |
| B9      | V_BUS   | V_Bus Power; 5V       |
| A5      | CC1     | Configuration channel |
| A6      | DP1     | NC, not connected     |
| A7      | DN1     | NC, not connected     |
| A8      | SBU1    | Sideband use          |
| B5      | CC2     | Configuration channel |
| B6      | DP2     | NC, not connected     |
| B7      | DN2     | NC, not connected     |
| B8      | SBU2    | Configuration channel |
| A9      | V_BUS   | V_Bus Power; 5V       |
| B4      | V_BUS   | V_Bus Power; 5V       |



|     |         |            |
|-----|---------|------------|
| A12 | USB_GND | USB_Ground |
| B1  | USB_GND | USB_Ground |

**Note 1.** All the signals in Touch panel connector are in accordance with USB-C standard.

**Note 2.** Matched Riverdi cable accessory: USB-A 2.0 TO USB-C CABLE

## 9.5 External keyboard extension - J1

| PIN NO. | SYMBOL       | DESCRIPTION                    |
|---------|--------------|--------------------------------|
| 1       | Down         | Page down                      |
| 2       | Up           | Page up                        |
| 3       | Exit         | Exit                           |
| 4       | Menu         | Menu                           |
| 5       | PWR          | Power on/off                   |
| 6       | LED_EN       | LED Enable; Output signal 3.3V |
| 7       | GND          | Ground                         |
| 8       | Keyboard VDD | Keyboard VDD; Output 3.3V      |

**Note 1.** Matched Riverdi cable accessory: RVA-0108M-1.25FF

## 9.6 Backlight PWM & power - J5

| PIN NO. | SYMBOL | DESCRIPTION                | NOTE   |
|---------|--------|----------------------------|--------|
| 1       | GND    | Ground                     |        |
| 2       | GND    | Ground                     |        |
| 3       | EN     | Backlight enable, active H |        |
| 4       | PWM    | PWM input; 3.3V            | Note 1 |
| 5       | VDD    | Power supply; 7.0V - 14.0V | Note 2 |
| 6       | VDD    | Power supply; 7.0V - 14.0V |        |

**Note 1.** PWM frequency range : 1kHz - 10kHz.

100% PWM duty cycle corresponds to minimum brightness

0% PWM duty cycle corresponds to maximum brightness

**Note 2.** Pin 5&6 are internally connected with power connector(DC-Jack), VDD.

So, the voltage range is the same as power connector(DC-Jack)

**Note 3.** 4 position-DIP onboard switch **SW6** is used to choose the power source to backlight. The settings are:

- a) INTERNAL BL PWM: Set 1&2 to OFF, and 3&4 to ON,
- b) EXTERNAL BL PWM: Set 1&2 to ON, and 3&4 to OFF.

**Note 4.** Matched Riverdi cable accessory: RVA-0106M-1.25FF-1

**Attention!** An essential detail concerning this cable setup in your application: pins 1,2 and 5,6 have misleading colors.

## 10. DISPLAY SPECIFICATION

The TFT of the module applies Riverdi high brightness, IPS, 12.1" LVDS: RVTI21HVLNWN00

The supported resolution of the display in this module is 1280\*800.

For detailed information, please refer to datasheet of display.

## 11. INSPECTION

Standard acceptance/rejection criteria for TFT module

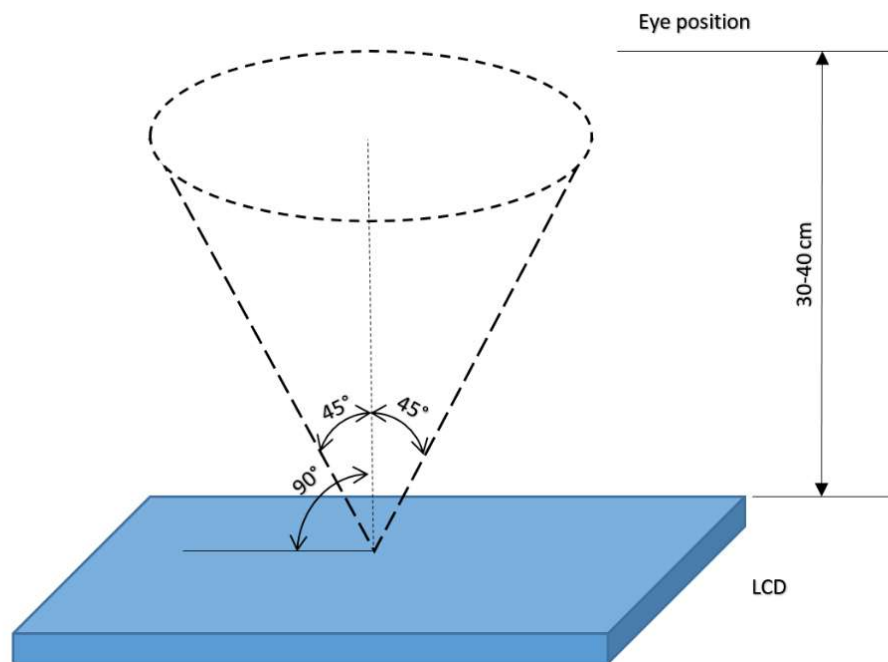
### 11.1 Inspection condition

Ambient conditions:

- Temperature:  $25 \pm 2^{\circ}\text{C}$
- Humidity:  $(60 \pm 10) \% \text{RH}$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

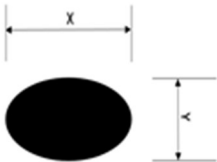
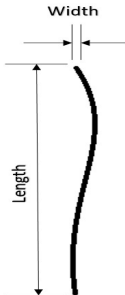
Viewing distance:  $35 \pm 5\text{cm}$  between inspector bare eye and LCD.

Viewing Angle: U/D:  $45^{\circ}/45^{\circ}$ , L/R:  $45^{\circ}/45^{\circ}$



## 11.2 Inspection standard

The LCD TFT has zero bad pixels. Please refer the item "Bright/Dark dots".

| ITEM                                                                               | CRITERION                                                                                                                    |                                          |                         |               |
|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------|---------------|
| Black spots,<br>white spots,<br>light leakage,<br>Foreign Particle<br>(round Type) | <br>$D=(x+y)/2$<br><br>Spots density: 10 mm | Size = 12.1"                             |                         |               |
|                                                                                    |                                                                                                                              | Average Diameter                         | Qualified Qty           |               |
|                                                                                    |                                                                                                                              | $D \leq 0.2 \text{ mm}$                  | Ignored                 |               |
|                                                                                    |                                                                                                                              | $0.2 \text{ mm} < D \leq 0.3 \text{ mm}$ | $N \leq 5$              |               |
|                                                                                    |                                                                                                                              | $0.5 \text{ mm} < D$                     | Not allowed             |               |
| LCD black spots,<br>white spots,<br>light leakage<br>(line Type)                   | <br><br>Spots density: 10 mm               | Size = 12.1"                             |                         |               |
|                                                                                    |                                                                                                                              | Length                                   | Width                   | Qualified Qty |
|                                                                                    |                                                                                                                              | -                                        | $W \leq 0.05$           | Ignored       |
|                                                                                    |                                                                                                                              | $L \leq 5.0$                             | $0.05 < W \leq 0.1$     | $N \leq 3$    |
|                                                                                    |                                                                                                                              | $5.0 < L$                                | $0.10 < W$<br>$5.0 < L$ | $N = 0$       |
| Bright/Dark<br>Dots                                                                | Size = 12.1                                                                                                                  |                                          |                         |               |
|                                                                                    | Item                                                                                                                         |                                          | Qualified Qty           |               |
|                                                                                    | Bright dots                                                                                                                  |                                          | 0                       |               |
|                                                                                    | Dark dots                                                                                                                    |                                          | 0                       |               |
|                                                                                    | Cluster Bright Dots or Dark Dots                                                                                             |                                          | 0                       |               |
|                                                                                    | Total Bright and Dark Dots                                                                                                   |                                          | 0                       |               |
| Clear spots                                                                        | Size = 12.1"                                                                                                                 |                                          |                         |               |
|                                                                                    | Average Diameter                                                                                                             |                                          | Qualified Qty           |               |
|                                                                                    | $D < 0.2 \text{ mm}$                                                                                                         |                                          | Ignored                 |               |
|                                                                                    | $0.2 \text{ mm} < D < 0.3 \text{ mm}$                                                                                        |                                          | 4                       |               |
|                                                                                    | $0.3 \text{ mm} < D < 0.5 \text{ mm}$                                                                                        |                                          | 2                       |               |
|                                                                                    | $0.5 \text{ mm} < D$                                                                                                         |                                          | 0                       |               |
|                                                                                    | Spots density: 10 mm                                                                                                         |                                          |                         |               |



## 12. RELIABILITY TEST

| NO. | TEST ITEM                           | TEST CONDITION                                                                                                                       | NOTE   |
|-----|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|--------|
| 1   | High Temperature Storage            | 80°C/120 hours                                                                                                                       | Note 1 |
| 2   | Low Temperature Storage             | -30°C/120 hours                                                                                                                      |        |
| 3   | High Temperature Operating          | 70 °C /120 hours                                                                                                                     |        |
| 4   | Low Temperature Operating           | -20°C/120 hours                                                                                                                      |        |
| 5   | High Temperature and High Humidity  | Humidity 40°C, 90%RH, 120Hrs                                                                                                         |        |
| 6   | Thermal Cycling Test (No operation) | -20°C for 30min, 70°C for 30 min.<br>100 cycles. Then test at room temperature after 1 hour                                          | Note 2 |
| 7   | Vibration Test                      | Frequency: 10 ÷ 55 Hz.<br>Stroke: 1.5 mm.<br>Sweep: 10Hz ÷ 55Hz ÷ 10 Hz.<br>2 hours for each direction of X, Y, Z<br>(Total 6 hours) |        |

**Note 1.** Sample quantity for each test item is 5 ÷ 10 pcs.

**Note 2.** Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.



### 13. LEGAL INFORMATION

CE marking is usually obligatory only for a complete end product. Riverdi display modules are semi-finished goods which are used as inputs to become part of the finished products.

Therefore, Riverdi display modules are not CE marked.

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