LCD TFT Module Specification

RVT70HSHFWN00

IPS 7.0” HDMI LCD TFT Datasheet

Rev.1.1

2021-04-16

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally Black/IPS	/
Size	7.0	Inch
Viewing Direction	Free	/
Outside Dimensions (W × H × D)	181.60 x 100.60 x 22.93	mm^3
Active Area (W × H)	154.21 × 85.92	mm^2
Pixel Pitch (W × H)	0.1506 × 0.1432	mm^2
Resolution	1024 (RGB) × 600	/
Brightness	1000	cd/m^2
Color Depth	16.7 M	/
Pixel Arrangement	RGB Vertical Stripe	/
Controller IC of Main Board	RTD2662	/
Video interface	HDMI	/
Touch panel interface	USB-C	/
Power Supply	Power Jack (DC 7.0 V- 30.0V); USB-C	/
With/Without Touch	Without Touch Panel	/
Weight	212	g

Note 1: RoHS3 compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

REVNO.	REVDATE	CONTENTS	REMARKS
1.0	2020-02-11	Initial Release	
1.1	2021-04-16	HDMI board picture updated	

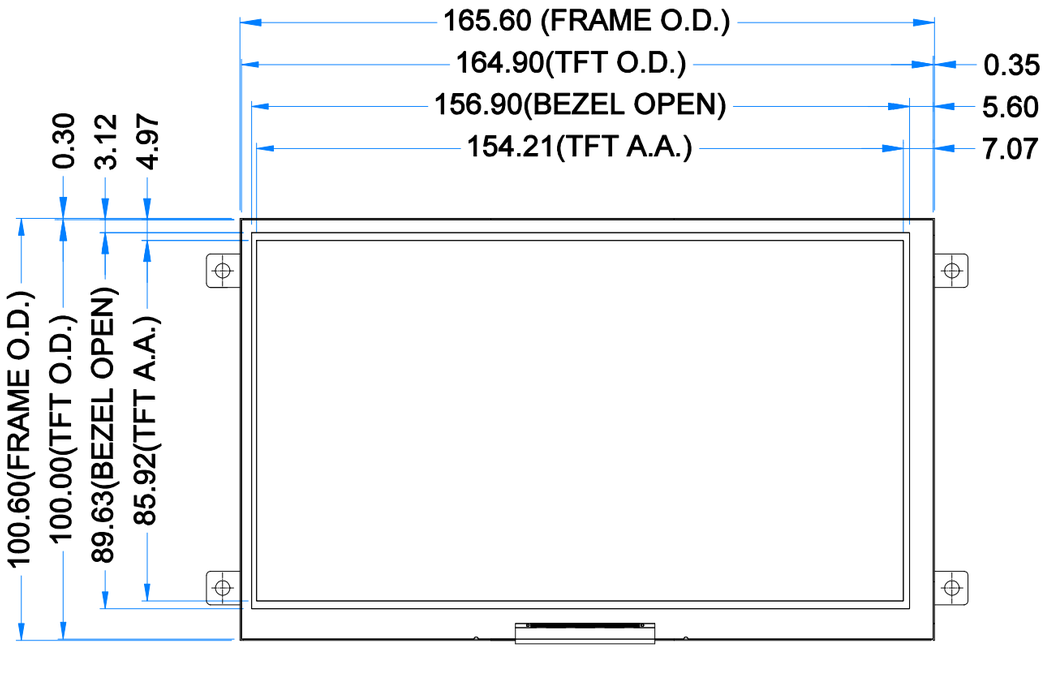
CONTENTS

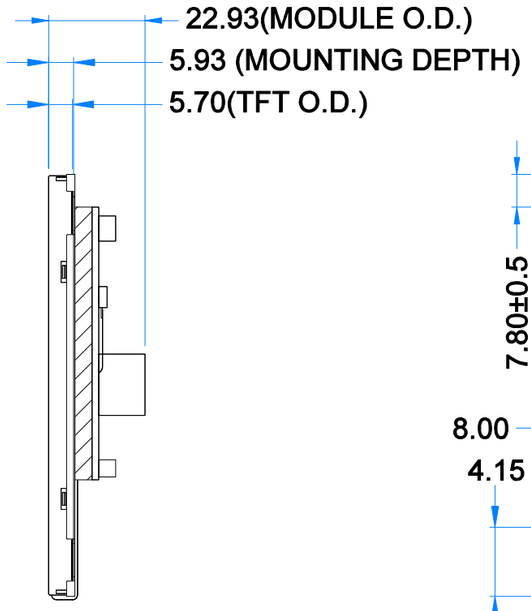
1 MODULE CLASSIFICATION INFORMATION

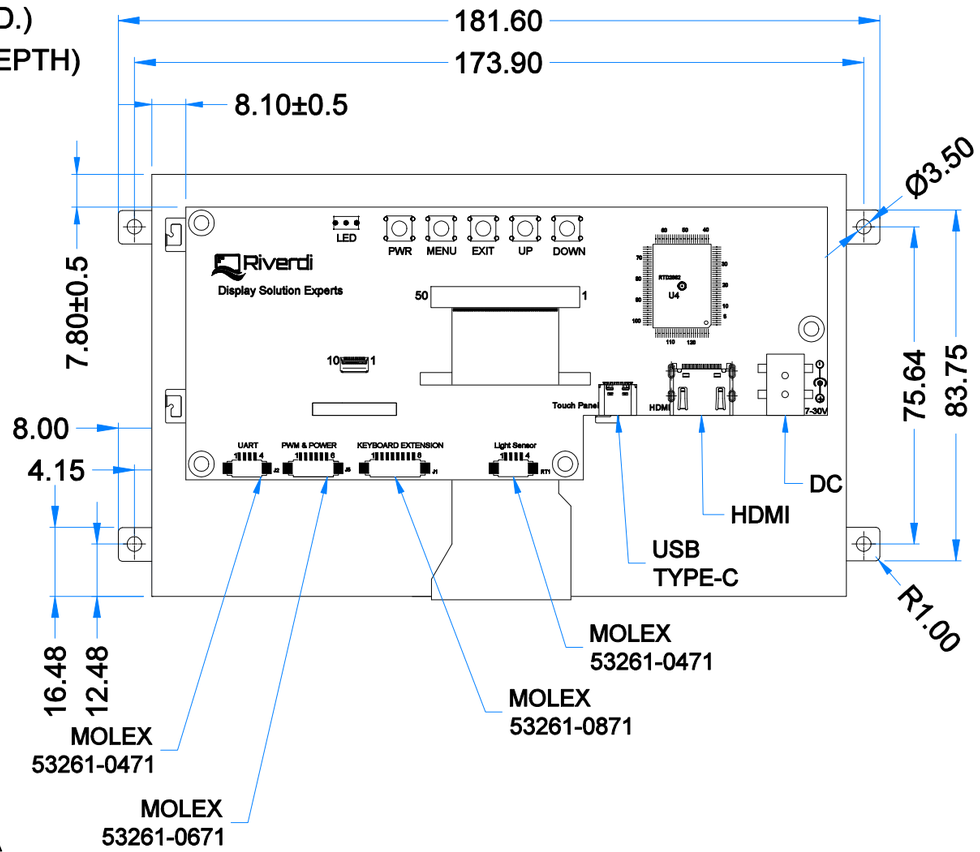
RV	T	70	H	S	H	F	W	N	00
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

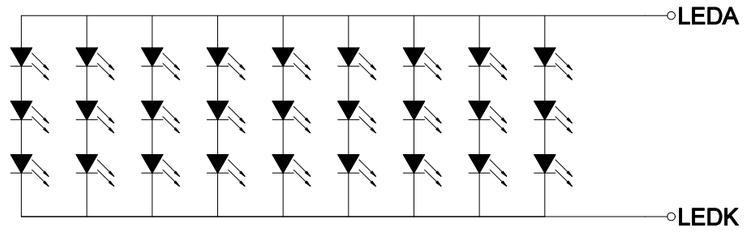
1.	**BRAND**	**RV – Riverdi**
2.	**PRODUCT TYPE**	**T – TFT Standard**
3.	**DISPLAY SIZE**	**70 – 7.0”**
4.	**MODEL SERIAL NO.**	**H – High Brightness, IPS**
5.	**RESOLUTION**	**S – 1024 x 600 px**
6.	**INTERFACE**	**H– HDMI**
7.	**FRAME**	**F – With Frame**
8.	**BACKLIGHT TYPE**	**W – LED White**
9.	**TOUCH PANEL**	**N – Without Touch Panel**
10.	**VERSION**	**00 – (00-99)**

Revision:	Changes:	Date:
1.0	Initial Case	2021.02.11









LED Diagram Circuit

LCM NOTES:
1. LCD TYPE: TRANSMISSIVE, NORMALLY BLACK, IPS
2. RESOLUTION: 1024x600
3. VIEWING ANGLE: FREE
4. MODULE SURFACE LUMINANCE: MAX. 1000 cd/m^2
5. CONTROLLER IC OF MAIN BOARD: RTD2662
6. VIDEO INTERFACE: HDMI
7. POWER SUPPLY: POWER JACK (7.0-30.0V); USB-C.

GENERAL NOTES:
1. OPERATING TEMPERATURE: -20°C ~ 70°C
2. STORAGE TEMPERATURE: -30°C ~ 80°C
3. WITHOUT INDIVIDUAL TOLERANCE: ±0.2mm
4. RoHS COMPLIANT

PN: RVT70HSHFWN00			
SN:			
DRAWN: M.Natywa	2021.02.11	1:1.46	
CHECKED: Carol Gao	2021.02.22	[mm]	
APPR:		ISO A3	P. 1 of 1

3 ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT	NOTE
Supply Voltage for Module	VDD	7	30	V	Note 1
Operating Temperature	T_{OP}	-20	70	°C	
Storage Temperature	T_{ST}	-30	80	°C	
Storage Humidity (@ 25 ± 5°C)	H_{ST}	10	90	% RH	
Operating Ambient Humidity (@ 25 ± 5°C)	H_{OP}	10	90	% RH	

Note 1. Exceeding the maximum values may cause improper operation or permanent damage to the unit.

4 ELECTRICAL CHARACTERISTICS

Standard: All the inputs to the HDMI boards operate in 3.3V standard, unless otherwise stated.

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Supply Voltage for Module	VDD	7.0	12.0	30.0	V	From Power Jack
Current drawn from VDD	$I_{VDD=7.0V}$	295	500	755	mA	Note 1
Current drawn from VDD	$I_{VDD=12.0V}$	175	300	430	mA	
Current drawn from VDD	$I_{VDD=24.0V}$	95	155	220	mA	
Current drawn from VDD	$I_{VDD=30.0V}$	80	125	180	mA	
Current drawn from USB-C	I_{USB-C}	245	505	815	mA	Note 1, Note 2

Note 1. Min. current was measured with BL brightness set to 0%,
Typ. current was measured with BL brightness set to 50%,
Max. current was measured with BL brightness set to 100%.

Note 2. USB-C interface can be used as a sole power supply for all modules with or without touch panels. If DC1 power jack is used, the power from the USB-C connector is not drawn, as the onboard MOSFET key cuts it off.

5 BACKLIGHT DRIVING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Backlight Power Consumption	W_{BL}	-	-	2595	mW	100% backlight
Life Time	-	-	50,000	-	hours	Note 1

Note 1. Operating life means the period of time in which the LED brightness goes down to 50% of the initial brightness. Typical operating life time is the estimated parameter.

6 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 Φ and θ equal to 0°.

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time		Tr+Tf	θ=0° Ø=0° Ta=25 °C	-	35	-	ms	FIG 1.	4
Contrast Ratio		Cr		-	800	-	---	FIG 2.	1
Luminance Uniformity		δ WHITE		-	75	-	%	FIG 2.	3
Surface Luminance		Lv		-	1000		cd/m^2	FIG 2.	2
Viewing Angle Range		θ	Ø = 90°	-	85	-	deg	FIG 3.	6
			Ø = 270°	-	85	-	deg	FIG 3.	
			Ø = 0°	-	85	-	deg	FIG 3.	
			Ø = 180°	-	85	-	deg	FIG 3.	
CIE (x, y) Chromaticity	Red	x	θ=0° Ø=0° Ta=25 °C	0.578	0.618	0.658	FIG 2.		5
		y		0.489	0.329	0.369			
	Green	x		0.376	0.416	0.456			
		y		0.493	0.533	0.573			
	Blue	x		0.071	0.111	0.151			
		y		0.108	0.148	0.188			
	White	x		0.270	0.310	0.350			
		y		0.290	0.330	0.370			

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

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

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

Lv = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

Note 3. The uniformity in surface luminance δ 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 Figure2. The test equipment is Autronic-Melchers's ConoScope series.

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

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. 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. For viewing angle and response time testing, the testing data is based on Autronic-Melchers's ConoScope series. Instruments for Contrast Ratio, Surface Luminance, Luminance Uniformity, CIE the test data is based on TOPCON's BM-5 photo detector.

Figure 1. The definition of response time

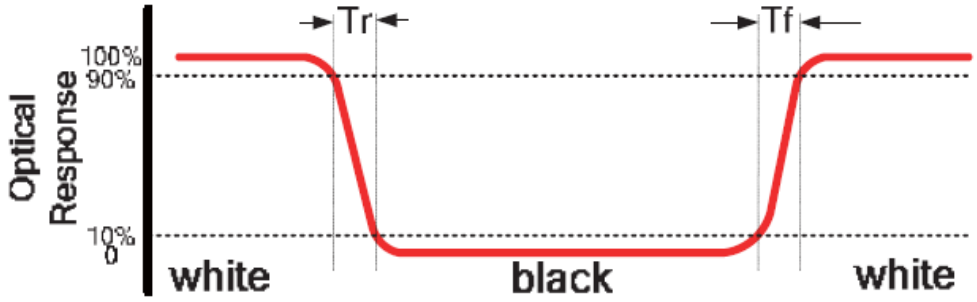
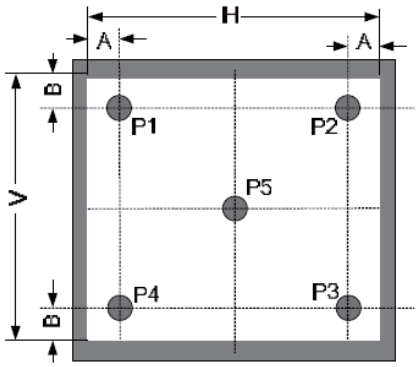


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity



A: 5mm

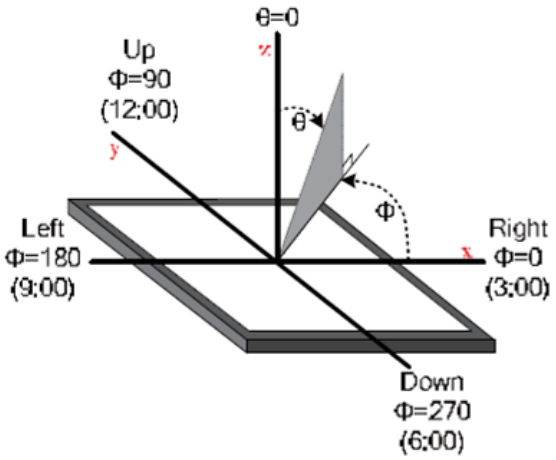
B: 5mm

H,V: Active Area

Light spot size ϕ=5mm, 500mm distance from the LCD surface to detector lens.

Measurement instrument is TOPCON'S luminance meter BM-5

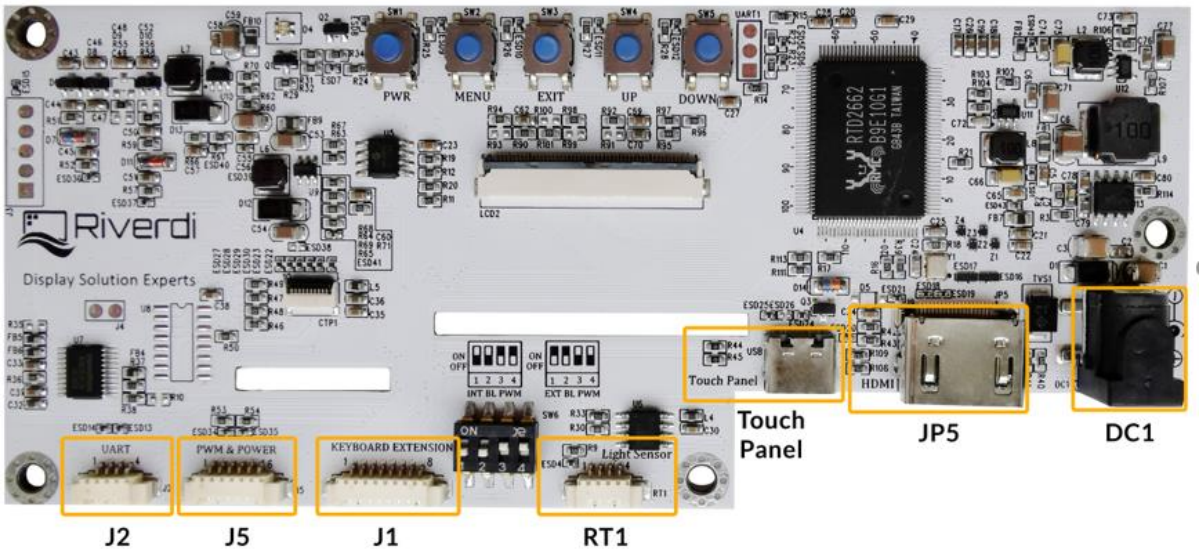
Figure 3.The definition of viewing angle



7 INTERFACE DESCRIPTION

7.1 PCB OVERVIEW

Picture below shows the connectors exact placement and their descriptions. The descriptions were extended for legibility reasons (table references).



NAME	CONNECTOR	DESCRIPTION	NOTE
DC1	Power Jack	DC jack, (5.5 mm OD; 2.1mm ID) This is the connector to power on the TFT module. It allows DC for voltage range from 7.0V to 30.0V	
JP5	HDMI Connector	This is the connector to which you can connect the HDMI signal source to the module.	
Touch Panel	USB-C	Touch panel interface and touch panel power supply. Only for versions with touch panel. It can be used as a sole power supply when the DC jack is not applied.	
RT1	Light sensor connector	Molex 53261-0471; Horizontal, 1.25mm; 4 pins. To connect external light sensor	**Note 1.**
J1	External keyboard connector	Molex 53261-0871; Horizontal, 1.25mm; 8 pins. The connector is reserved for external keyboard. Performs the same functions: PWR, MENU, EXIT, UP, DOWN as the pushbuttons on PCB.	**Note 1.**
J5	Backlight PWM & Power	Molex 53261-0671; Horizontal, 1.25mm; 6 pins. The unit realizes the function of digital dimming. This connector enables to control backlight PWM internally or externally.	**Note 2.**
J2	UART	Molex 53261-0471; Horizontal, 1.25mm; 4 pins. It supports asynchronous serial communication UART port.	**Note 3.**

Note 1. Light sensor and external keyboard are optional, not included in the standard completion.
Note 2. 4 position-DIP onboard switch **SW6** is used to choose the power 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 3. UART functionality is under development process and will be documented in next version of this datasheet.

7.2 Power connector -DC1

PIN NO.	SYMBOL	DESCRIPTION
1	VDD	Power supply DC
2	GND	GND

7.3 HDMI connector-JP5

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	Clo6ck shielding ground
12	TMDS Data Clock-	TMDS differential signal Clock-
13	CEC	Electronic protocol CEC
14	NC	No Connection
15	SCL	I^2C clock Line
16	SDA	I^2C data Line
17	DDC/CEC GND	Data display channel
18	+5V	HDMI 5V
19	Hot Plug Detect	Hot plug Detect

7.4 Touch Panel connector- USB-C standard

PIN NO.	SYMBOL	DESCRIPTION (Note 1)
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	USB differential pair, position 1, positive
A7	DN1	USB differential pair, position 1, negative
A8	SBU1	Sideband use
B5	CC2	Configuration channel
B6	DP2	USB differential pair, position 2, positive
B7	DN2	USB differential pair, position 2, negative
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.

7.5 Light sensor connector-RT1

PIN NO.	SYMBOL	DESCRIPTION
1	GND	Ground
2	ADC_IN	ADC Input from Light sensor (max 3.3 V, TBD)
3	NC	No connection
4	Light sensor VDD	Light sensor VDD, max. 3.3 V

7.6 External Keyboard connector-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. Active H, 3.3V
7	Keyboard VDD	Keyboard VDD, max. 3.3 V
8	GND	Ground

7.7 Backlight PWM &Power-J5

PIN NO.	SYMBOL	DESCRIPTION
1	GND	Ground
2	GND	Ground
3	EN	Backlight enable, active H
4	PWM	PWM input (frequency - TBD)
5	VDD	Power supply (max. 30.0 V)
6	VDD	Power supply (max. 30.0 V)

Note 1. 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.

7.8 UART connector-J2

PIN NO.	SYMBOL	DESCRIPTION
1	GND	Ground
2	RXD	Receive Data
3	TXD	Transmit Data
4	VDD	UART VDD 3.3V

Note 1. UART functionality is under development process and will be documented in next version of this datasheet.

8 DISPLAY SPECIFICATION

8.1 TFT resolution

The supported resolution of the display in this module is 1024*600.

8.2 Full TFT specification

For detailed information on the display used, please refer to datasheet of display RVT70HSTFWN00.

https://riverdi.com/product/rvt70hstfwn00/

9 INSPECTION

Standard acceptance/rejection criteria for TFT module.

9.1 Inspection condition

Ambient conditions:

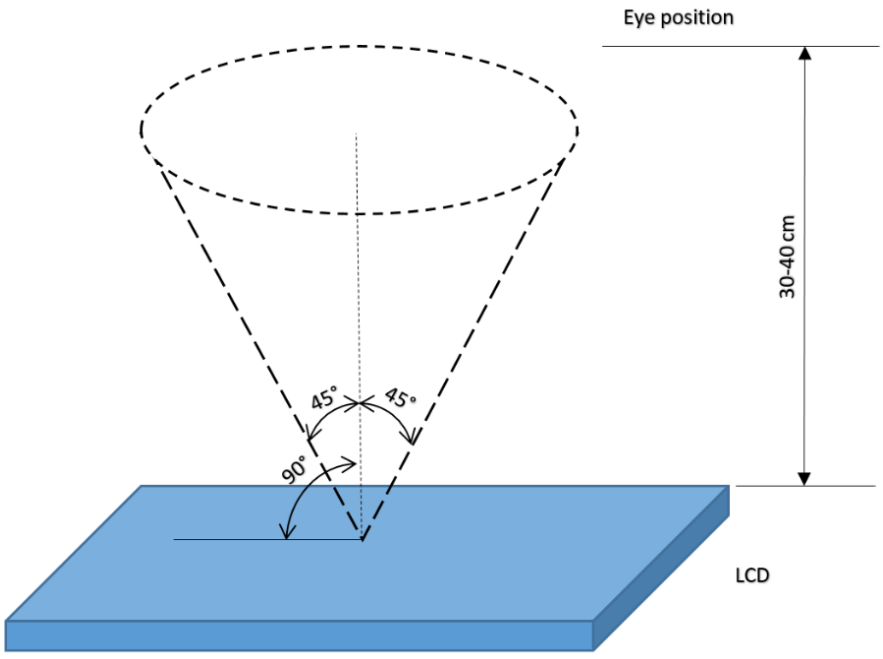
- Temperature: 25 ± 2 °C
- Humidity: (60 ± 10) %RH
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

Viewing distance:

35 ± 5cm between inspector bare eye and LCD.

Viewing Angle:

U/D: 45°/45°, L/R: 45°/45°



9.2 Inspection standard

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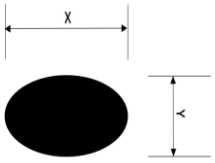

$$D = \frac{(x+y)}{2}$$
*Spots density: 10 mm
<table>
<tr><th colspan="2">Size = 7”</th></tr>
<tr><td>Average Diameter</td><td>Qualified Qty</td></tr>
<tr><td>D ≤ 0.2 mm</td><td>Ignored</td></tr>
<tr><td>0.2 mm < D ≤ 0.3 mm</td><td>N ≤ 3</td></tr>
<tr><td>0.5mm < D</td><td>Not allowed</td></tr>
</table>
</td></tr>
<tr><td>LCD black spots, white spots, light leakage (line Type)</td><td>


*Spots density: 10 mm
<table>
<tr><th colspan="3">Size = 7”</th></tr>
<tr><td>Length</td><td>Width</td><td>Qualified Qty</td></tr>
<tr><td>-</td><td>W ≤ 0.05</td><td>Ignored</td></tr>
<tr><td>L ≤ 5.0</td><td>0.05 < W ≤ 0.1</td><td>3</td></tr>
<tr><td>5.0 < L</td><td>0.10 < W</td><td>Not allowed</td></tr>
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<tr><td>Bright/Dark Dots</td><td>
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<tr><td>Item</td><td>Qualified Qty</td></tr>
<tr><td>Bright Dots</td><td>N ≤ 2</td></tr>
<tr><td>Dark Dots</td><td>N ≤ 3</td></tr>
<tr><td>Total Bright and Dark Dots</td><td>N ≤ 4</td></tr>
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</td></tr>
<tr><td>Clear spots</td><td>
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<tr><td>0.3 mm < D < 0.5 mm</td><td>2</td></tr>
<tr><td>0.5 mm < D</td><td>0</td></tr>
</table>
*Spots density: 10 mm
</td></tr>
<tr><td>Polarizer bubbles</td><td>
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<tr><td>Average Diameter</td><td>Qualified Qty</td></tr>
<tr><td>D ≤ 0.2 mm</td><td>Ignored</td></tr>
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<tr><td>0.5 mm < D</td><td>1</td></tr>
</table>
</td></tr>
</table>

10 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION	REMARK
1	High Temperature Storage	80 °C / 120 hours	Note 1
2	Low Temperature Storage	-30 °C / 120 hours	Note 1
3	High Temperature Operating	70 °C / 120 hours	Note 1
4	Low Temperature Operating	-20 °C / 120 hours	Note 1
5	High Temperature & High Humidity	Humidity 40 ℃, 90 %RH, 120 hours	Note 1
6	Thermal Cycling Test (No operation)	-20 ℃ for 30 min, 70 ℃ for 30 min. 100 cycles. Then test at room temperature after 1 hour	Note 2
7	Damp Proof Test	40 °C, 90 %RH/120 hours	
8	Vibration Test	Frequency: 10 ÷ 55 Hz; Stroke: 1.5 mm; Sweep: 10 Hz ÷ 55 Hz ÷ 10 Hz; 2 hours for each direction of X, Y, Z (6 hours for total)	
9	Package Drop Test	Height: 60 cm 1 corner, 3 edges, 6 surfaces	
10	ESD Test	Air: ±2 kV, human body mode, 100 pF /1500 Ω	

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

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

11 LEGAL INFORMATION

Riverdi grants the guarantee for the proper operation of the goods for a period of 12 months from the date of possession of the goods. If in a consequence of this guarantee execution the customer has received the defects-free item as replacement for the defective item, the effectiveness period of this guarantee shall start anew from the moment the customer receives the defects-free item.

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