TFT MODULE SPECIFICATION

Riverdi

RVT70HSHFWN00

IPS 7.0" HDMI LCD TFT DATASHEET

Rev.1.3
2021-08-05

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally Black/IPS	/
Size	7.0	Inch
Viewing Direction	Free	/
Outside Dimensions (W x H x D)	181.60 x 100.60 x 22.83	mm
Active Area (W x H)	154.21 x 85.92	mm
Pixel Pitch (W x H)	0.1506 x 0.1432	mm
Resolution	1024 (RGB) x 600	/
Brightness	Max. 1000	cd/m^2
Color Depth	16.7 M	/
Pixel Arrangement	RGB Vertical Stripe	/
Controller of the Main Board	RTD2662	/
Video Interface	HDMI	/
With/Without Touch	Without Touch Panel	/
Power Supply	Power Jack (DC 7.0V - 30.0 V), USB-C	V
Weight	212	g

Note 1: RoHS3 compliant

Note 2: LCM weight tolerance: ± 5%.

1. REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2021-02-11	Initial Release	
1.1	2021-04-16	HDMI board picture updated	
1.2	2021-07-21	Correction of J5 connector description	
1.3	2021-08-05	Updating new template Correction of external keyboard connector pinout	

2. CONTENTS

3. MODULE CLASSIFICATION INFORMATION

RV	T	70	H	S	H	F	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	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 Mounting Metal Frame
8.	BACKLIGHT TYPE	W – LED White
9.	TOUCH PANEL	N – Without Touch Panel
10.	VERSION	00 – (00-99)

4. ASSEMBLY GUIDE

4.1 Mounting frame
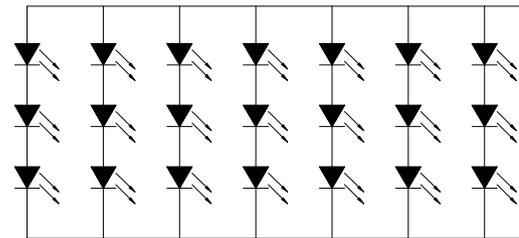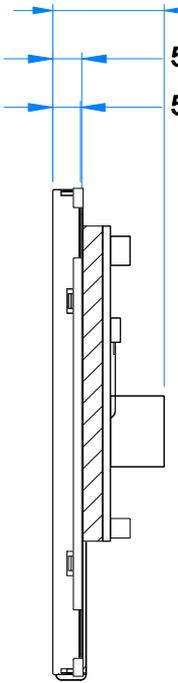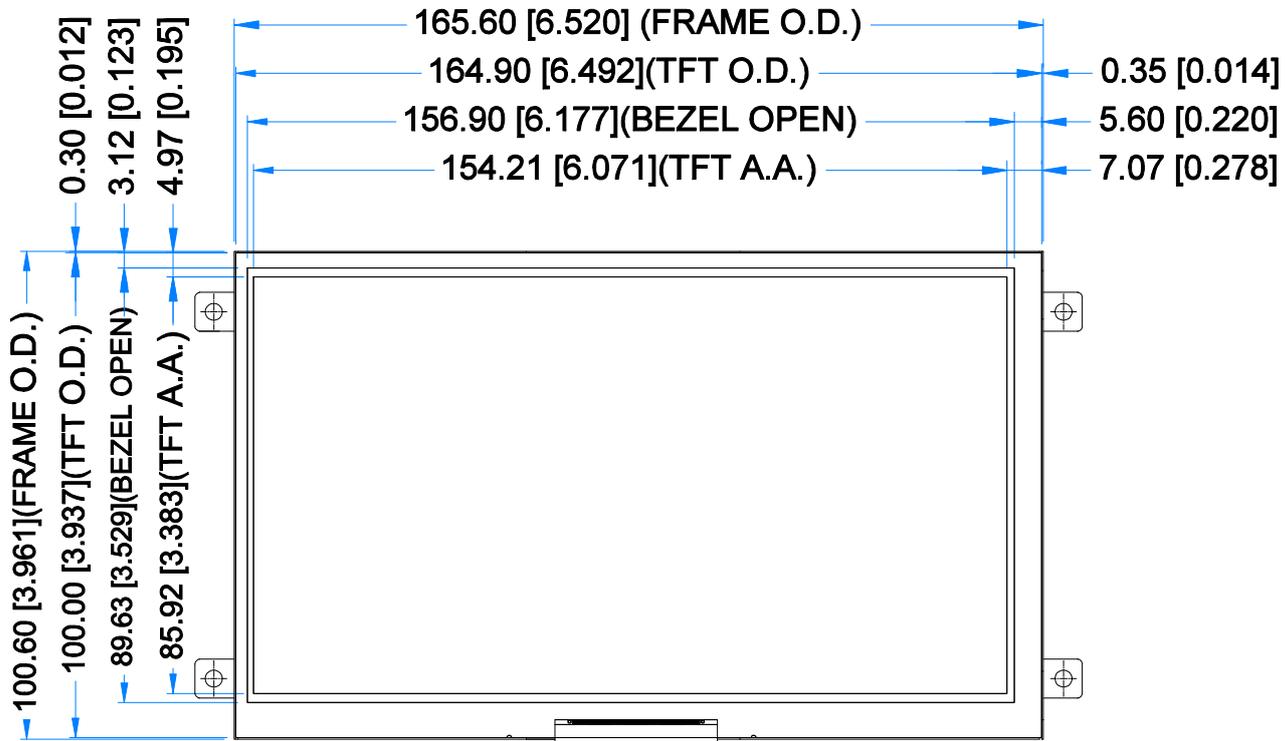
For dimensions 3.5", 4.3", 5.0", 7.0" and 10.1", the product with mounting frame version is available. Thanks to the four catches attached to the side, frame provides strong assembly to the surface by mounting element (like the screw, see Figure 1). The frames are specially designed to fit Riverdi products perfectly. The diameter of the mounting hole is 3.5mm.

Figure 1. Mounting frame

165.60 [6.520] (FRAME O.D.)

164.90 [6.492](TFT O.D.)

156.90 [6.177](BEZEL OPEN)

154.21 [6.071](TFT A.A.)

0.30 [0.012]

3.12 [0.123]

4.97 [0.195]

0.35 [0.014]

5.60 [0.220]

7.07 [0.278]

100.60 [3.961](FRAME O.D.)

100.00 [3.937](TFT O.D.)

89.63 [3.529](BEZEL OPEN)

85.92 [3.383](TFT A.A.)
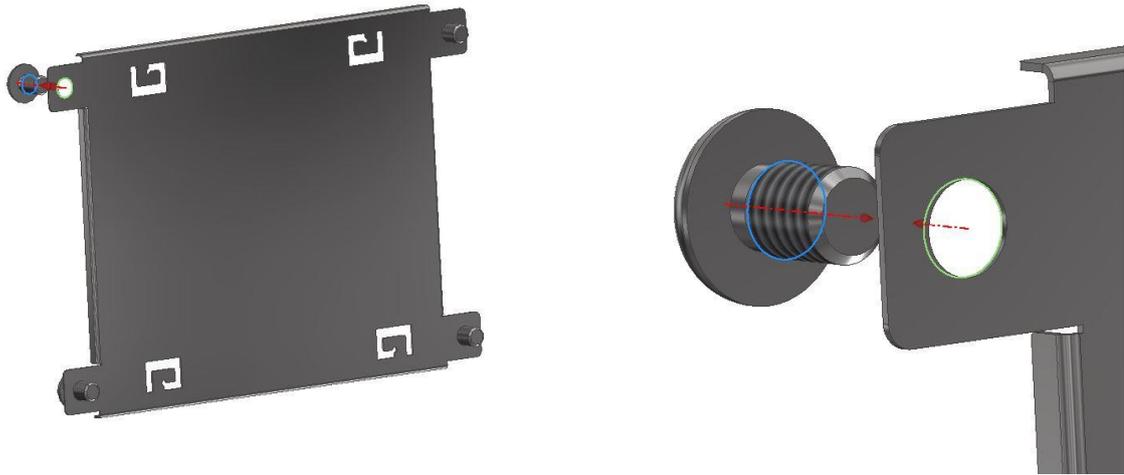
LED Diagram

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

6. ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage for Module	VDD	7.0	30.0	V
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. Exceeding maximum values may cause operation or damage to the unit.

7. 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		
Current drawn from VDD	$I_{VDD=24.0V}$	95	155	220		
Current drawn from VDD	$I_{VDD=30.0V}$	80	125	180		
Current drawn from USB-C	I_{USB-C}	245	505	815		Note 1, 2

Note 1. Mi. 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.

8. BACKLIGHT DRIVING CONDITIONS

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

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.

9. 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 ℃. 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	RMK	NOTE
Response Time	Tr+Tf	θ=0° ∅=0° Ta=25 °C	-	35	-	ms	FIG 2.	4
Contrast Ratio	Cr		-	800	-	---	FIG 3.	1
Luminance Uniformity	δ WHITE		-	75	-	%	FIG 3.	3
Surface Luminance	Lv		-	-	1000	cd/m²	FIG 3.	2
Viewing Angle Range	θ	∅ = 90°	-	85	-	deg	FIG 4.	6
		∅ = 270°	-	85	-	deg	FIG 4.	
		∅ = 0°	-	85	-	deg	FIG 4.	
		∅ = 180°	-	85	-	deg	FIG 4.	
CIE (x, y) Chromaticity	Rx	θ=0° ∅=0° Ta=25 °C	0.578	0.618	0.658	-	FIG 3.	5
	Ry		0.489	0.329	0.369	-		
	Gx		0.376	0.416	0.456	-		
	Gy		0.493	0.533	0.573	-		
	Bx		0.071	0.111	0.151	-		
	By		0.108	0.148	0.188	-		
	Wx		0.270	0.310	0.350	-		
	Wy		0.290	0.330	0.370	-		

Note 1. Contrast Ratio (CR) is defined mathematically as below, for more information see Figure 3.

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

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see Figure 3.

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

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 3.

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

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 2. 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 calculating 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 4.

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.

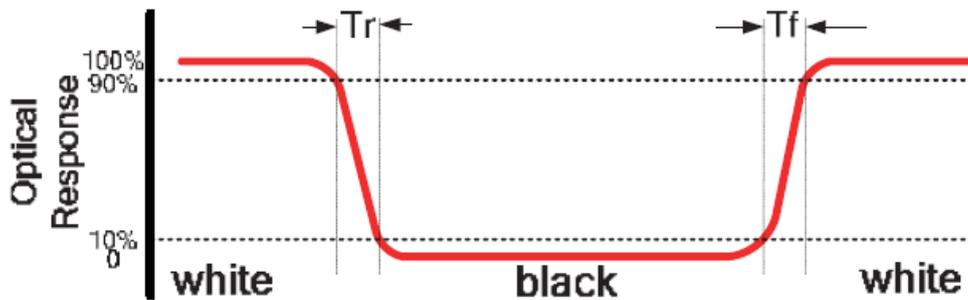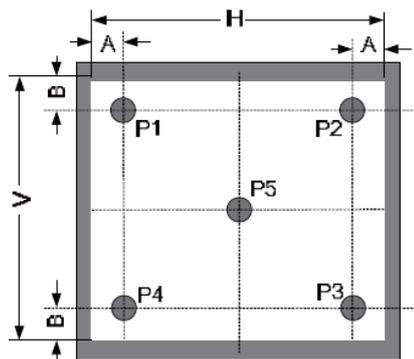*Figure 2. The definition of response time*

Figure 3. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity
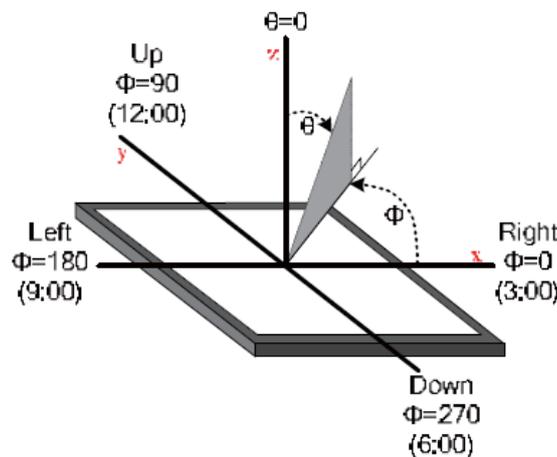

A: 5mm

B: 5mm

H, V: Active Area

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

Measurement instrument is TOPCON'S luminance meter BM-5

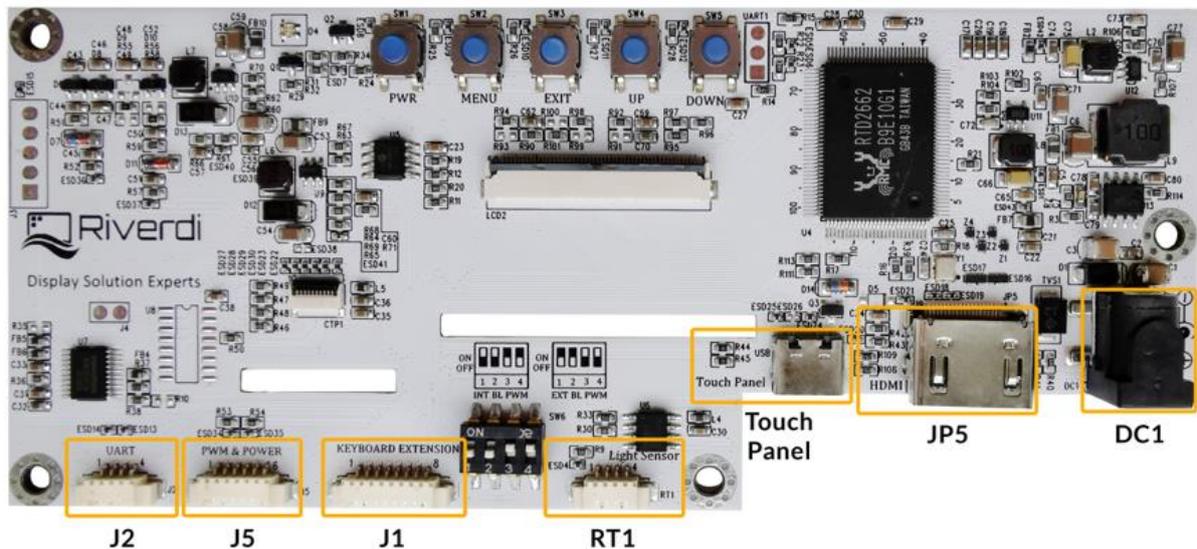*Figure 4. The definition of viewing angle*

10.   INTERFACE DESCRIPTION

10.1 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 14.0V	
JP2	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 This is only for versions with touch panel.	
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 externally.	**Note 2**.
J2	UART	Molex 53261-0471; Horizontal, 1.25mm; 4 pins. It supports asynchronous serial communication UART port.	**Note 3**
RT1	Light sensor	Molex 53261-0471; Horizontal, 1.25mm; 4 pins. To connect external light sensor	**Note 1**

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:

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.
Note 3. UART functionality is under development process and will be documented in next version of this datasheet.

10.2 Power connector -DC1

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

10.3 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

10.4 Touch panel connector -USB-C

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	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.

10.5 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

10.6 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.

10.7 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.

10.8 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	GND	Ground
8	Keyboard VDD	Keyboard VDD, max. 3.3 V

11. DISPLAY SPECIFICATION

11.1 TFT resolution

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

11.2 Full TFT specification

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

12. INSPECTION
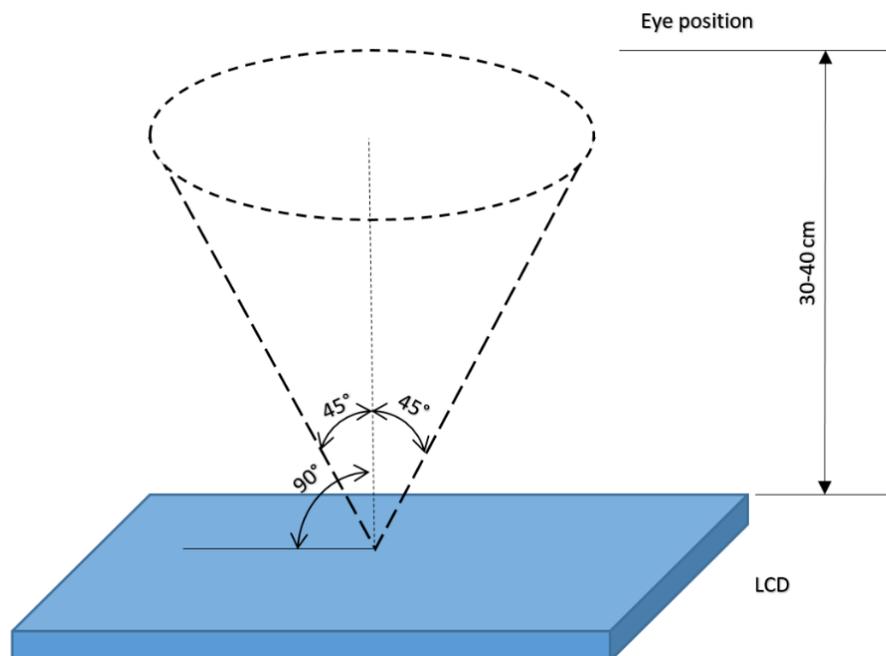
Standard acceptance/rejection criteria for TFT module

12.1 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°

12.2 Inspection standard

ITEM	CRITERION		
Black spots, white spots, light leakage, Foreign Particle (round Type)	 D=(x+y)/2 Spots density: 10 mm	Size = 7"	
		Average Diameter	Qualified Qty
		D ≤ 0.2 mm	Ignored
		0.2 mm < D ≤ 0.3 mm	N≤3
		0.5mm < D	Not allowed

		Size = 7"		
LCD black spots, white spots, light leakage (line Type)		Length	Width	Qualified Qty
		-	W ≤ 0.05	Ignored
		L ≤ 5.0	0.05 < W ≤ 0.1	3
		5.0 < L	0.1 < W	Not allowed

	Size = 7"	
Bright/Dark Dots	Item	Qualified Qty
	Bright dots	N≤2
	Dark dots	N≤3
	Total bright and dark dots	N≤4

	Size ≥ 5"	
Clear spots	Average Diameter	Qualified Qty
	D < 0.2 mm	Ignored
	0.2 mm < D < 0.3 mm	4
	0.3 mm < D < 0.5 mm	2
	0.5 mm < D	0

	Size = 7"	
Polarizer bubbles	Average Diameter	Qualified Qty
	D ≤ 0.2 mm	Ignored
	0.2 mm < D ≤ 0.5 mm	2
	0.5 mm < D	1

13. RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION
1	High Temperature Storage	80°C/120 hours
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℃, 90%RH, 120Hrs
6	Thermal Cycling Test (No operation)	-20℃ for 30min, 70℃ for 30 min. 100 cycles. Then test at room temperature after 1 hour
7	Vibration Test	Frequency: 10 ÷ 55 Hz. Stroke: 1.5 mm. Sweep: 10Hz ÷ 55Hz ÷ 10 Hz. 2 hours for each direction of X, Y, Z (Total 6 hours)
8	Package Drop Test	Height: 60 cm 1 corner, 3 edges, 6 surfaces

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.

14. 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 guaranteed 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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