



RVT121HVLFWCA0-B

HB, IPS LVDS 12.1" LCD TFT DATASHEET

Rev.1.0
2024-01-17

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally black/IPS	/
Size	12.1	Inch
Viewing Direction	Free	/
Outside Dimensions (W x H x D)	278.76 x 181.66 x 12.68	mm
Active Area (W x H)	261.12 x 163.2	mm
Pixel Pitch (W x H)	0.204 x 0.204	mm
Resolution	1280 (RGB) x 800	/
Brightness	850	cd/m ²
LCD Interface Type	LVDS	/
Color Depth	16.7M	/
Pixel Arrangement	RGB Vertical Stripe	/
With/Without Touch	With Projected Capacitive Touch Panel	/
CTP Driver	ILI2511	/
Touch Interface Type	USB/I2C	/
Bonding Technology	Optical Bonding	/
Weight	880	g

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



1. REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2024-01-17	First Release	



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3. MODULE CLASSIFICATION INFORMATION

RV	T	121	H	V	L	F	W	C	A0	B
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.

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	L – TFT LCD, LVDS
7.	FRAME	F – With Mounting Metal Frame
8.	BACKLIGHT TYPE	W – LED White
9.	TOUCH PANEL	C – With Capacitive Touch Panel
10.	VERSION	A0 – aTouch
11.	BONDING TECHNOLOGY	B – Optical Bonding

4. ASSEMBLY GUIDE

4.1 Mounting frame

For dimensions 3.5", 4.3", 5.0", 7.0", 10.1" and 12.1", 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.

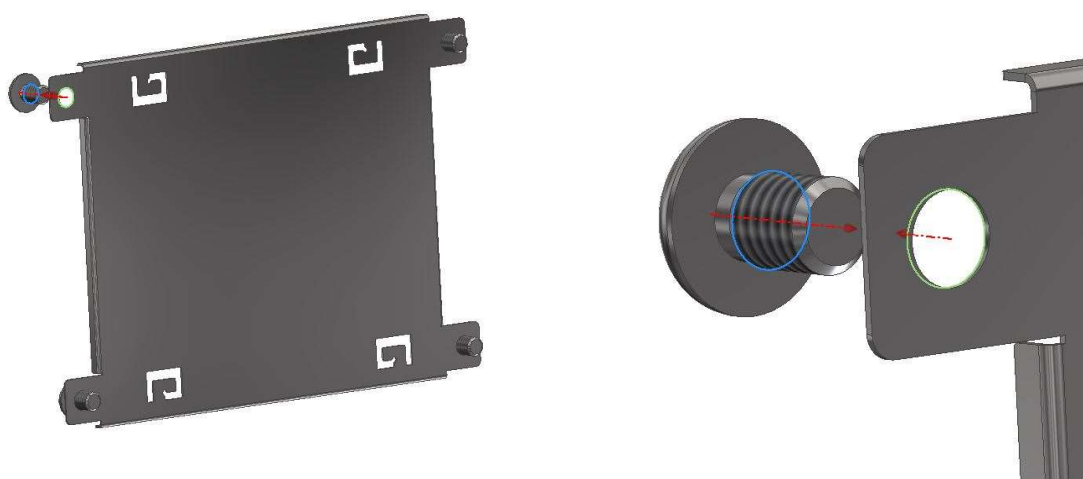
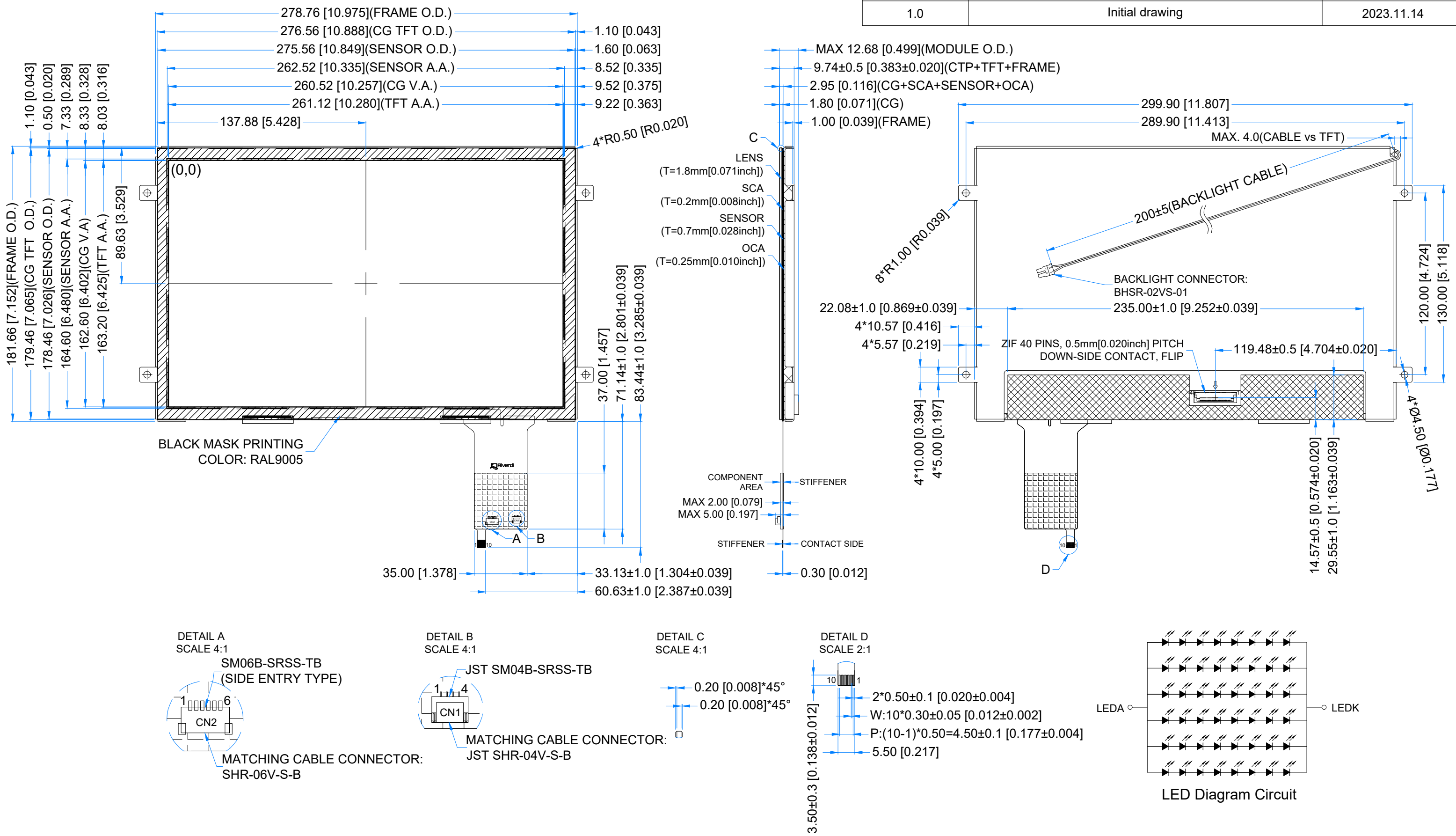


Figure 1. Mounting frame



6. ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage for Module	VDD	-0.3	5.0	V
Operating Temperature	T _{OP}	-20	70	°C
Storage Temperature	T _{ST}	-30	80	

Note 1. The absolute maximum rating values must not be exceeded at any times. The module MUST NOT be used when any of the absolute maximum ratings is exceeded.

The characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

7. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage	V _{DD}	3.0	3.3	3.6	V
Operating Current	I _{VDD=3.3V}	-	210	-	mA
Standby Current	I _{ST}	-	120	-	mA
Logic input voltage	V _{IH}	0.7*VDD	-	VDD	V
	V _{IL}	GND	-	0.3*VDD	V

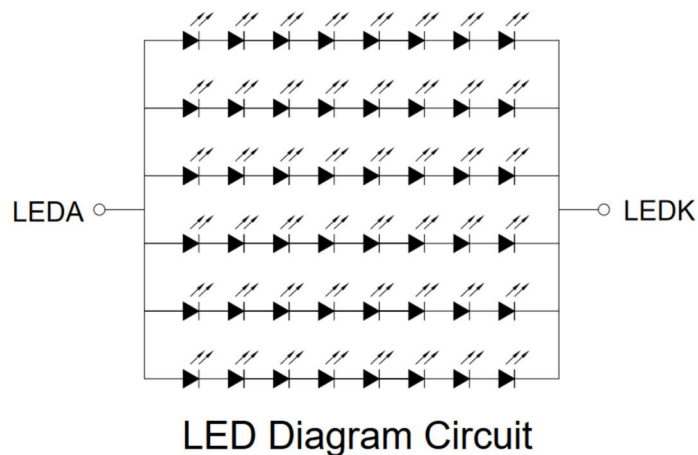
8. BACKLIGHT ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Backlight Driving Voltage	V _F	23.0	25.6	26.5	V	
Backlight Driving Current	I _F	-	360	-	mA	
Backlight Power Consumption	W _{BL}	8.28	9.22	9.54	W	
LED Lifetime	-	-	50,000	-	hours	Note 1

Note 1. Each LED: I_F = 40 mA, V_F = 3.2 ± 0.2V.

Note 2. Optical performance should be evaluated at T_a = 25 °C only.

Note 3. 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

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	RMK	NOTE
Response Time	Tr+Tf	$\theta=0^\circ$ $\phi=0^\circ$ $T_a=25^\circ\text{C}$	-	30	34	ms	FIG 2.	4
Contrast Ratio	Cr		1000	1200	-	---	FIG 3	1
Luminance Uniformity	δ WHITE		70	80	-	%		3
Surface Luminance	Lv		650	850	-	cd/m ²		2
Viewing Angle Range	θ	$\phi = 90^\circ$	80	85	-	deg	FIG 4.	6
		$\phi = 270^\circ$	80	85	-	deg		
		$\phi = 0^\circ$	80	85	-	deg		
		$\phi = 180^\circ$	80	85	-	deg		
CIE (x, y) Chromaticity	Rx	$\theta=0^\circ$ $\phi=0^\circ$ $T_a=25^\circ\text{C}$	0.59	0.64	0.69	-	FIG 3.	5
	Ry		0.27	0.32	0.37	-		
	Gx		0.25	0.30	0.35	-		
	Gy		0.53	0.58	0.63	-		
	Bx		0.08	0.13	0.18	-		
	By		0.01	0.06	0.11	-		
	Wx		0.24	0.29	0.34	-		
	Wy		0.26	0.31	0.36	-		

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. 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 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 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 make 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.

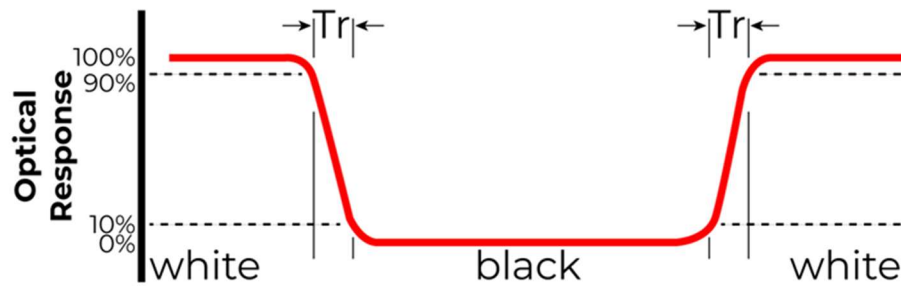


Figure 2. The definition of response time

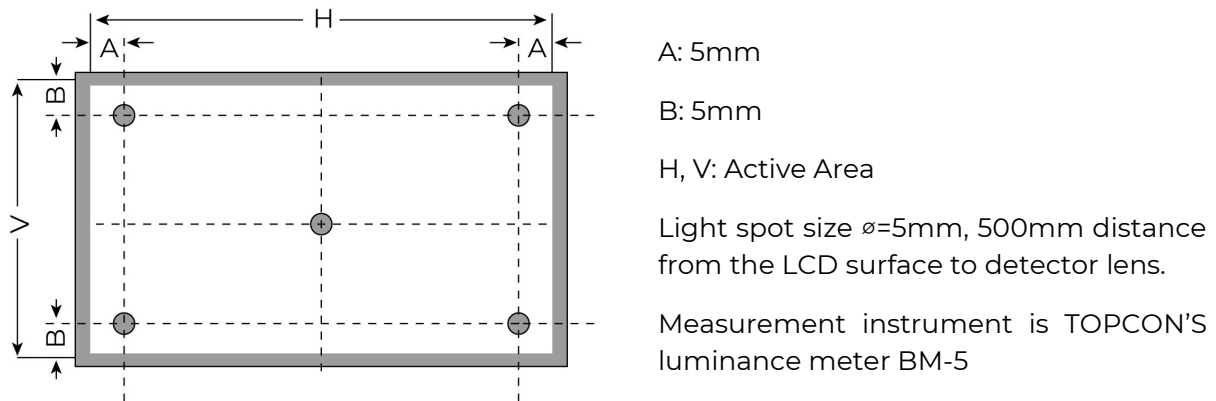


Figure 3. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

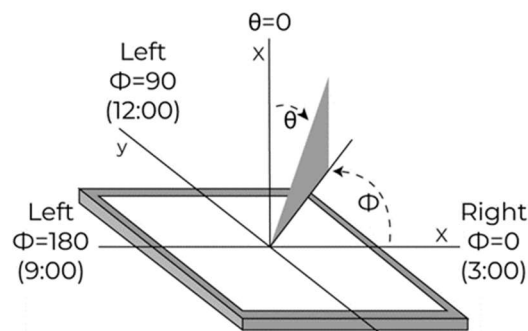


Figure 4. The definition of viewing angle



10. INTERFACES DESCRIPTION

10.1 TFT assignment

PIN NO.	SYMBOL	I/O	DESCRIPTION
1	NC	-	No Connection
2	V _{DD}	P	Power Supply, 3.3V
3	V _{DD}	P	Power Supply, 3.3V
4	V _{DD}	P	Power Supply, 3.3V
5	NC	-	No Connection
6	GND	P	Ground
7	GND	P	Ground
8	Rxin0-	I	-LVDS Differential Data Input
9	Rxin0+	I	+LVDS Differential Data Input
10	GND	P	Ground
11	Rxin1-	I	-LVDS Differential Data Input
12	Rxin1+	I	+LVDS Differential Data Input
13	GND	P	Ground
14	Rxin2-	I	-LVDS Differential Data Input
15	Rxin2+	I	+LVDS Differential Data Input
16	GND	P	Ground
17	RxCLK-	I	-LVDS Differential Data Input
18	RxCLK+	I	+LVDS Differential Data Input
19	GND	P	Ground
20	Rxin3-	I	-LVDS Differential Data Input
21	Rxin3+	I	+LVDS Differential Data Input
22	GND	P	Ground
23	NC	-	No Connection
24	NC	-	No Connection
25	GND	P	Ground
26-27	NC	-	No Connection
28	GND	P	Ground
29	NC	-	No Connection
30	NC	-	No Connection
31	GND	P	Ground
32	GND	P	Ground
33	GND	P	Ground
34	NC	-	No Connection
35	NC	-	No Connection
36	NC	-	No Connection
37	NC	-	No Connection
38	NC	-	No Connection
39	NC	-	No Connection
40	NC	-	No Connection

Note 1. Matched Riverdi ZIF connector: ZIF0540DH-CF25

Note 2. I: Input, P: Power



10.2 Touch panel assignment

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	USB_GND	USB_ Ground	
2	USB_VDD	USB Power for CTP, 5.0V	Note 1
3	USB_D-	USB _Data Signal -	
4	USB_D+	USB _Data Signal +	
5	I2C_GND	I2C _ Ground	
6	I2C_VDD	I2C _Power for CTP, 3.3 V	Note 1
7	I2C_RST	I2C _Reset Pin, Active low	Note 2
8	I2C_SCL	I2C _Clock Input	
9	I2C_INT	I2C _Interrupt Signal from CTP, Active low	
10	I2C_SDA	I2C _Data Signal	

Note 1. Please do not supply power to both USB_VDD and I2C_VDD at the same time, Otherwise, there is a risk that the LDO on the PCAP FPC will be destroyed.

Note 2. External pull-up resistors are required.

10.3 CON1 assignment

Matched PCAP USB programing cable accessory: RVA-PCAP-USB-CABLE

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	USB_VDD	USB_Power for CTP, DC 5.0V	Note 1
2	USB_D-	USB _Data Signal -	
3	USB_D+	USB _Data Signal +	
4	USB_GND	USB_Ground	

Note 1. If USD_VDD of CON1 is powered, please make sure to disconnect the PCAP FPC from the PCAP ZIF connector on your application.

Otherwise, there is a risk that the PCAP electrical circuit will be destroyed.

10.4 CON2 assignment

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	I2C_GND	I2C _ Ground	
2	I2C_VDD	I2C _Power for CTP, 3.3 V	
3	I2C_RST	I2C _Reset Pin, Active low	Note 1
4	I2C_SCL	I2C _Clock Input	
5	I2C_INT	I2C _Interrupt Signal from CTP, Active low	
6	I2C_SDA	I2C _Data Signal	

Note 1. External pull-up resistors are required.

10.5 Backlight assignment

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	LEDA	LEDA(23-26.5V)	Note 1
2	LEDK	LEDK	

Note 1. Backlight cable connector: **BHSR-02VS-1**.

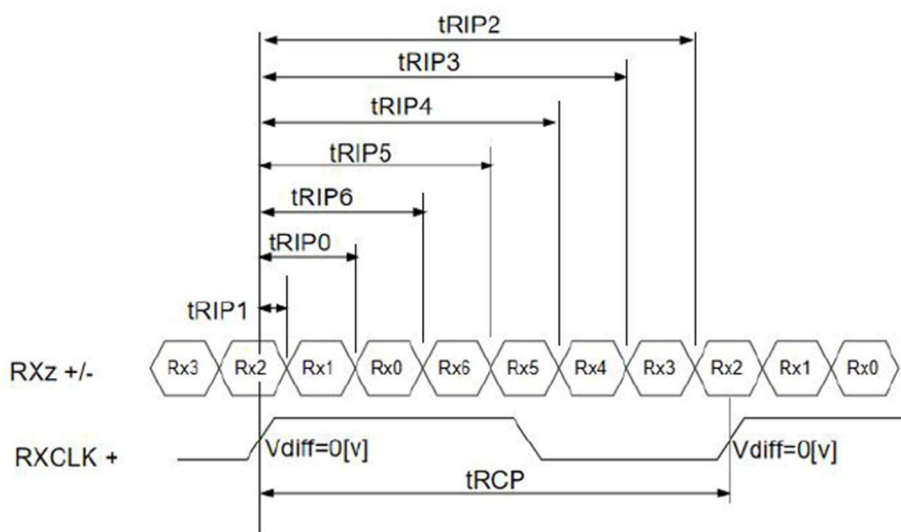
Matched Riverdi connector: **RVA-0235-BHS**.

11. TIMING CHARACTERISTICS

11.1 LVDS interface characteristic

LVDS Interface Timing Specification

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
CLKIN Period	tRCP	10	T	40	nsec	
Receiver Data Input Margin	tRMG	-0.45	-	+0.45	nsec	fCLKIN=80.9MHz
		-0.60	-	+0.60	nsec	fCLKIN=75MHz
Input Data 0	tRIP1	- tRMG	0.0	tRMG	Clock	
Input Data 1	tRIP0	T/7- tRMG	T/7	T/7+ tRMG	Clock	
Input Data 2	tRIP6	2T/7- tRMG	2T/7	2T/7+ tRMG	Clock	
Input Data 3	tRIP5	3T/7- tRMG	3T/7	3T/7+ tRMG	Clock	
Input Data 4	tRIP4	4T/7- tRMG	4T/7	4T/7+ tRMG	Clock	
Input Data 5	tRIP3	5T/7- tRMG	5T/7	5T/7+ tRMG	Clock	
Input Data 6	tRIP2	6T/7- tRMG	6T/7	6T/7+ tRMG	Clock	



$$* V_{diff} = (RXz+) - (RXz-), \dots, (RXCLK+) - (RXCLK-)$$

Figure 5. LVDS timing specification

LVDS DC Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Differential Input High Threshold Voltage	VTH	-	-	+100	mV	VCM=1.2V
Differential Input Low Threshold Voltage	VTL	-100	-	-	mV	
Differential Input Common Mode Voltage	VCM	1	1.2	1.4	V	
Differential Input Voltage	VID	200	-	600	mV	

Single-end Signals

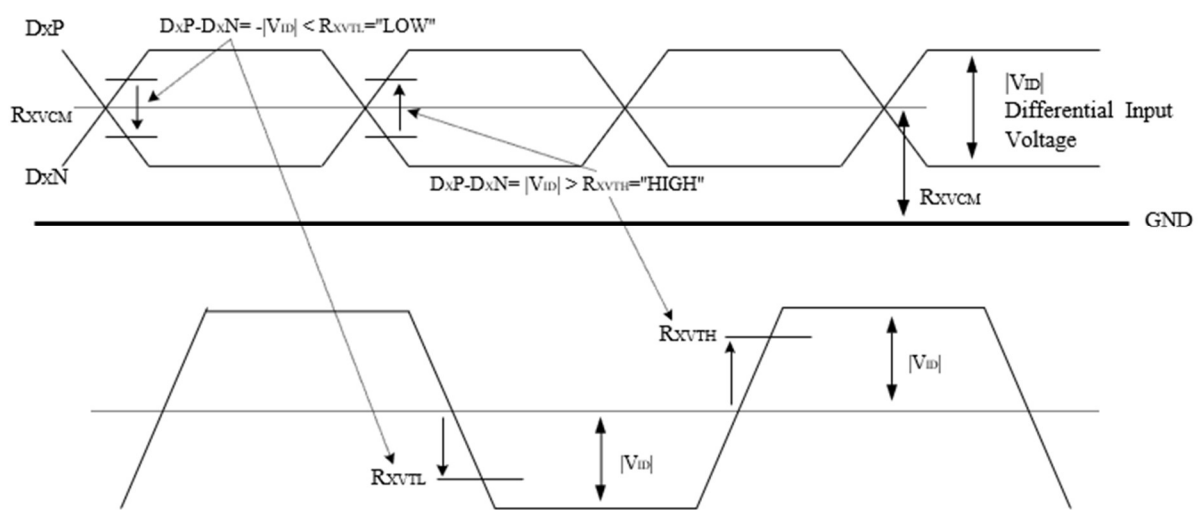


Figure 6. LVDS DC characteristics

LVDS AC Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
LVDS Strobe Width	tSW	200	-	-	ps	VCM=1.2V VID = 200mV @81 MHz
LVDS Receiver Skew Margin	tRSM	500	-	-	ps	

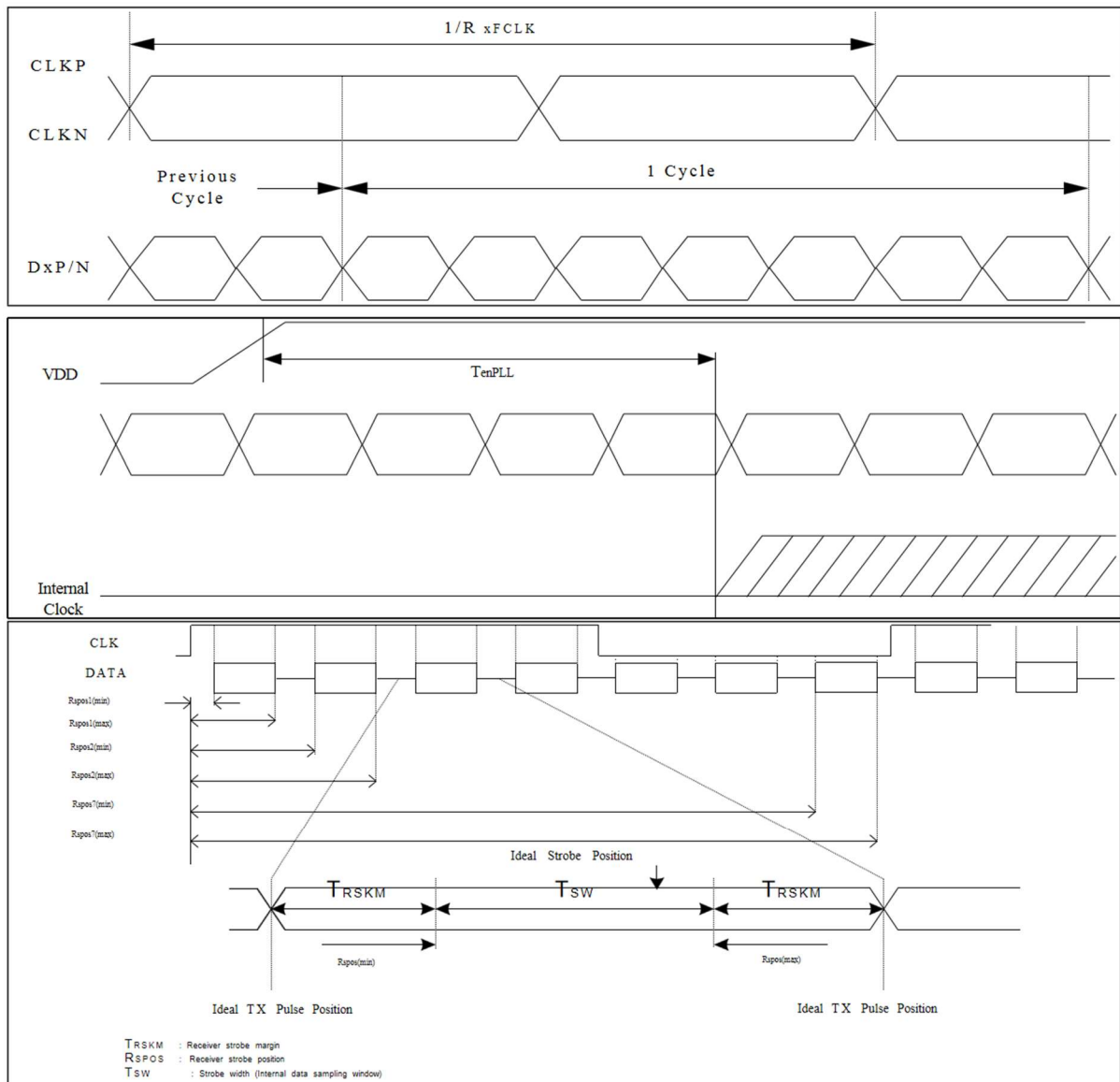


Figure 7. LVDS AC characteristics

11.2 Timing table

For 1280RGBx800 DE mode

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Clock Frequency (Rate=60Hz (LVDS))	FDCLK	66.3	72.4	78.9	MHz
HSYNC Period Time	T _H	1380	1440	1500	DCLK
Horizontal Display area	T _{HD}	1280			DCLK
HSYNC pulse Width	T _{HPW}	2	-	40	T _c
HSYNC Back Porch (With pulse width)	T _{HBP}	88	88	88	DCLK
HSYNC Front Porch	T _{HFP}	12	72	132	DCLK
HSYNC blanking	T _{HBP} +T _{HFP}	100	160	220	DCLK
VSYNC blanking	T _{VBP} +T _{VFP}	24	38	72	H
VSYNC Period Time	T _V	824	838	872	
Vertical Display area	T _{VD}	800			
VSYNC pulse Width	T _{VW}	2	-	20	
VSYNC Back Porch (With pulse width)	T _{VBP}	23	23	23	
VSYNC Front Porch	T _{VFP}	1	15	49	

Signal Timing Waveform

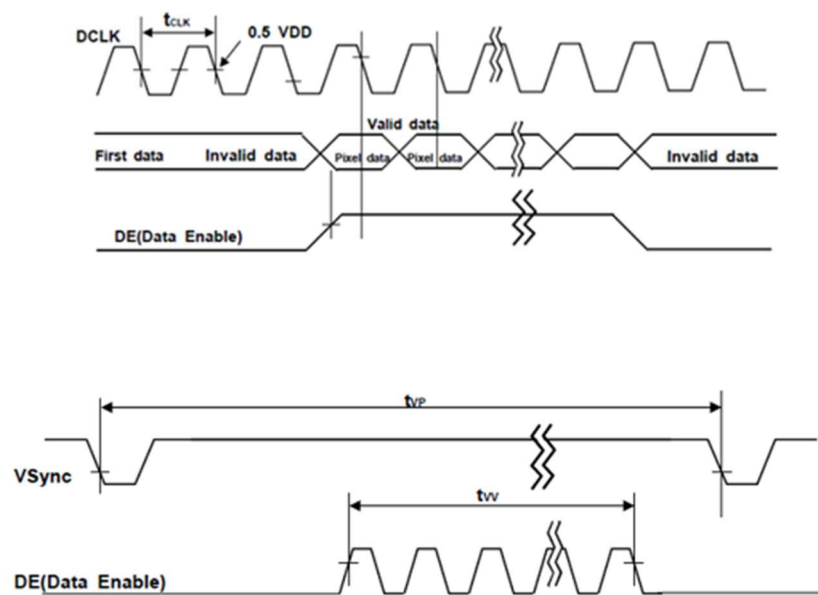


Figure 8. Signal Timing Waveform

11.3 Power ON/OFF sequence

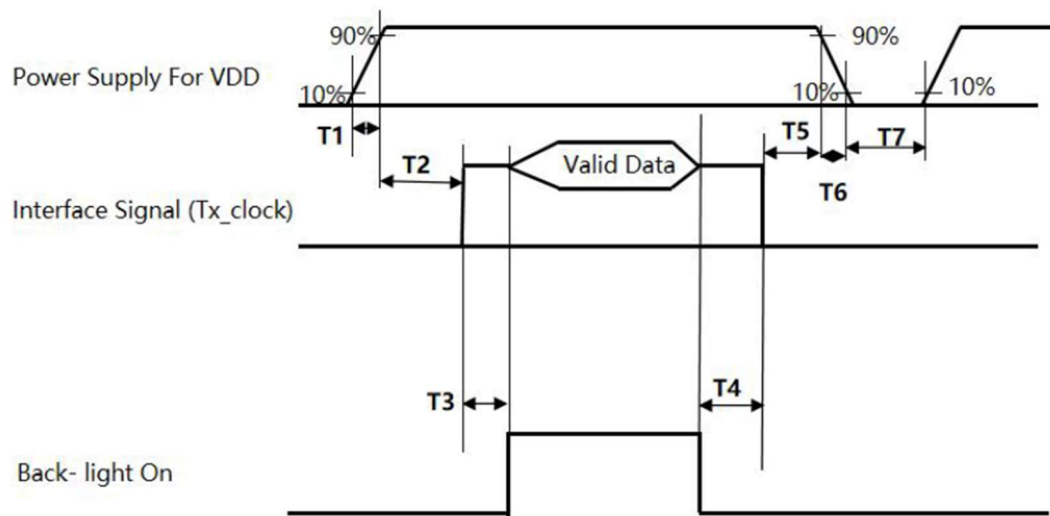


Figure 9. Power on/off sequence

PARAMETER	VALUE			UNIT
	MIN.	TYP.	MAX.	
T1	0.1	-	10	ms
T2	0.1	-	50	
T3	300	-	-	
T4	200	-	-	
T5	0.1	-	50	
T6	0.1	-	10	
T7	500	-	-	

12. CAPACITIVE TOUCH SCREEN PANEL SPECIFICATIONS

12.1 Mechanical characteristics

DESCRIPTION	SPECIFICATION	REMARK
Touch Panel Size	12.1 inch	aTouch
Sensor outline dimension	275.56 mm x 178.46 mm	
Glass Thickness	1.8 mm	
CTP View Area	260.52 mm x 162.60 mm	
Sensor Active Area	262.52 mm x 164.60 mm	
Surface Hardness	6H	
Touch Structure	G + G	
Touch Count Max	10 points	
I2C slave address	0x82	
Origin of coordinate	Top left corner	

12.2 Electrical characteristics

DESCRIPTION	SPECIFICATION
Linearity	+/- 1.5mm
Controller	ILI2511
Resolution	1280 x 800

Touch Panel(I²C)

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Power supply voltage	I2C_VDD	-	3.3	-	V	
Supply current (Active mode)	I _{VDD(active)}	-	100	-	mA	I2C_VDD=3.3V
Supply current (Sleep mode)	I _{VDD(sleep)}	-	80	-	mA	I2C_VDD=3.3V
Input high-level voltage	VIH	0.7*VDD	-	VDD	V	
Input low-level voltage	VIL	GND	-	0.3*VDD	V	

Touch Panel(USB)

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Power supply voltage	USB_VDD	-	5.0	-	V	
Supply current (Active mode)	I _{VDD(active)}	-	100	-	mA	USB_VDD=5.0V
Supply current (Sleep mode)	I _{VDD(sleep)}	-	80	-	mA	USB_VDD=5.0V
Input high-level voltage	VIH	0.7*VDD	-	VDD	V	
Input low-level voltage	VIL	GND	-	0.3*VDD	V	

12.3 State diagram

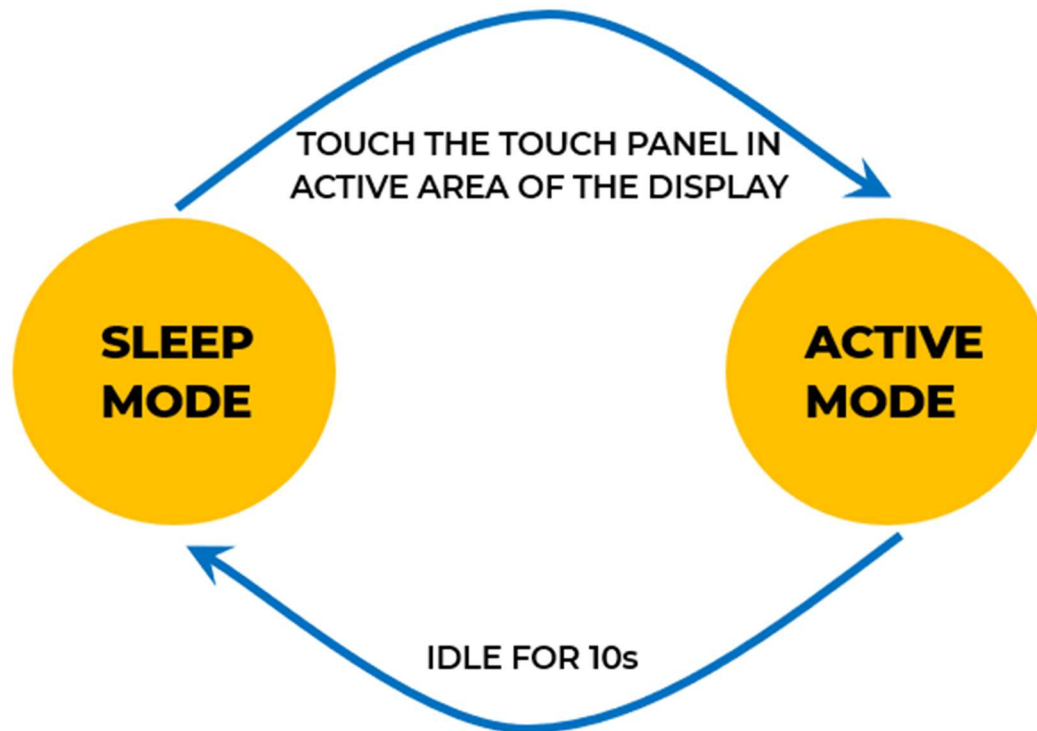


Figure 10. State diagram

13. INSPECTION

Standard acceptance/rejection criteria for TFT module

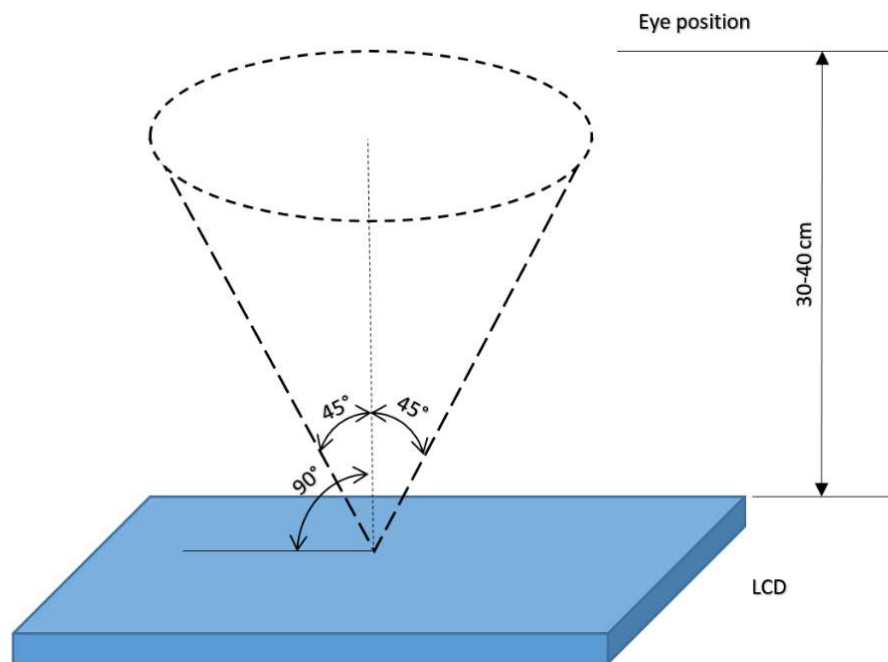
13.1 Inspection condition

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)

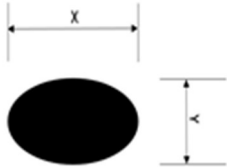
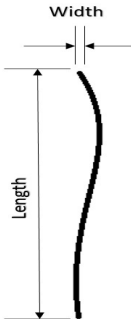
Viewing distance: $35 \pm 5\text{cm}$ between inspector bare eye and LCD.

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



13.2 Inspection standard

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

ITEM		CRITERION		
Black spots, white spots, light leakage, Foreign Particle (round Type)	 D=(x+y)/2 Spots density: 10 mm	Size = 12.1"		
		Average Diameter		Qualified Qty
		D ≤ 0.2 mm		Ignored
		0.2 mm < D ≤ 0.3 mm		N≤5
		0.5mm < D		Not allowed
LCD black spots, white spots, light leakage (line Type)	 Spots density: 10 mm	Size = 12.1"		
		Length	Width	Qualified Qty
		-	W ≤ 0.05	Ignored
		L ≤ 3.0	0.05< W ≤ 0.1	N≤3
		5.0 < L	0.10< W 5.0 < L	Not allowed
Bright/Dark 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 mm		Ignored	
	0.2 mm < D < 0.3 mm		4	
	0.3 mm < D < 0.5 mm		2	
	0.5 mm < D		0	
	Spots density: 10 mm			
Touch panel spots	Size = 12.1"			
	Average Diameter		Qualified Qty	
	D < 0.3 mm		Ignored	
	0.3 mm < D < 0.5 mm		N≤5	
	0.5 mm < D		0	
Touch panel white line scratch	Size ≥ 5.0"			
	Length	Width	Qualified Qty	
	-	W ≤ 0.07	Ignored	
	L ≤ 5.0	0.07 < W < 0.05	N≤5	
	-	0.05 < W	0	



14. RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION	NOTE
1	High Temperature Storage	80°C/96 hours	Note 1
2	Low Temperature Storage	-30°C/96 hours	
3	High Temperature Operating	70°C/96 hours	
4	Low Temperature Operating	-20°C/96 hours	
5	High Temperature and High Humidity	Humidity 60°C, 90%RH, 96Hrs	
6	Electro static discharge	Contact = ±8kV, class B Air = ±15kV, class B	
7	Thermal Cycling Test (No operation)	-30°C for 30min, 80°C for 30 min. 20 cycles. Start with cold temperature, end with high temperature	Note 2
8	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)	
9	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.



15. 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.

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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