TFT MODULE SPECIFICATION

RVT70HSLNWC00

IPS LVDS 7.0" LCD TFT DATASHEET

Rev.1.2
2021-07-29

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally black/IPS	/
Size	7.0	Inch
Viewing Direction	Free	/
Outside Dimensions (W x H x D)	179.96 x 119.00 x 8.15	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	800	cd/m^2
LCD Interface Type	LVDS	/
Color Depth	16.7 M	/
Pixel Arrangement	RGB Vertical Stripe	/
With/Without Touch	With Projected Capacitive Touch Panel	/
CTP Driver	ILI2132A	/
Touch Interface Type	USB /I2C/ Optional UART	/
Weight	220	g

Note 1: RoHS3 compliant

Note 2: LCM weight tolerance: ± 5%.

1. REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2020-08-05	Initial Release	
1.1	2021-03-24	PCAP data added	
1.2	2021-07-29	Updating new template	

2. CONTENTS

3. MODULE CLASSIFICATION INFORMATION

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

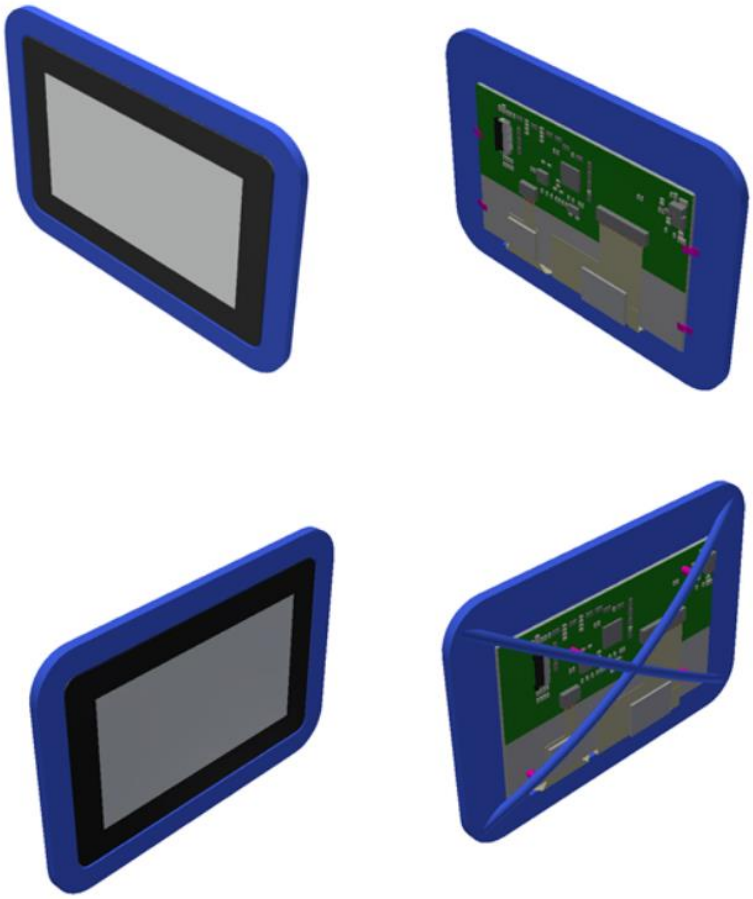
NO.	PARAMETER	SYMBOL
1.	BRAND	RV – Riverdi
2.	PRODUCT TYPE	T – TFT Standard
3.	DISPLAY SIZE	70 – 7.0”
4.	MODEL SERIAL NO.	H – High Brightness, IPS
5.	RESOLUTION	S – 1024 x 600 px
6.	INTERFACE	L – TFT LCD, LVDS
7.	FRAME	N – Without Mounting Metal Frame
8.	BACKLIGHT TYPE	W – LED White
9.	TOUCH PANEL	C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

4. uxTouch ASSEMBLY

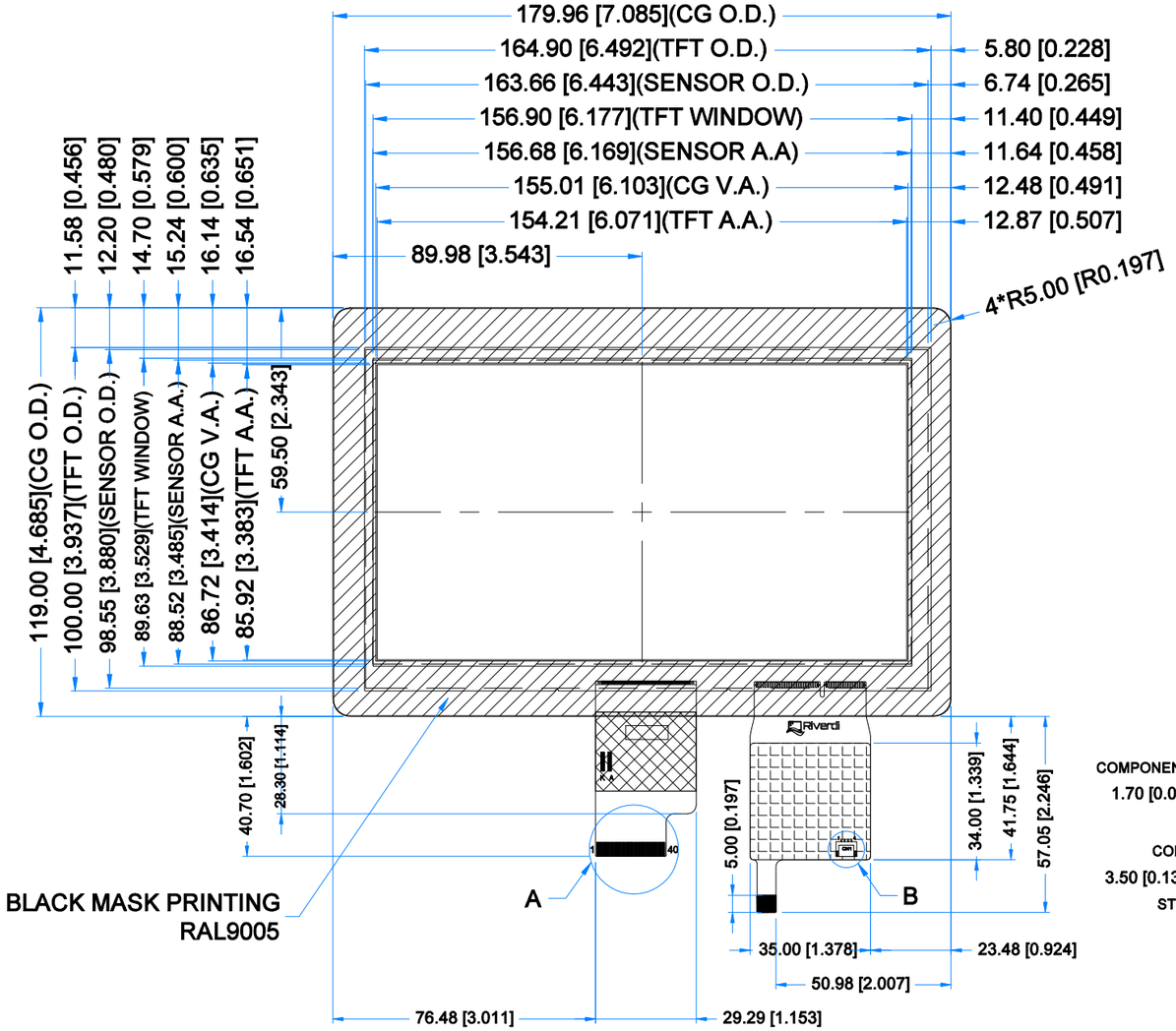
uxTouch are LCD TFT displays with specially designed projected capacitive touch panels. uxTouch display can be mounted without any holed in the housing. Our standard uxTouch displays include double-sided adhesive tape (DST) to stick TFT easily to the housing. Basic series include 4.3”, 5.0”,7.0” and 10.1” display sizes.

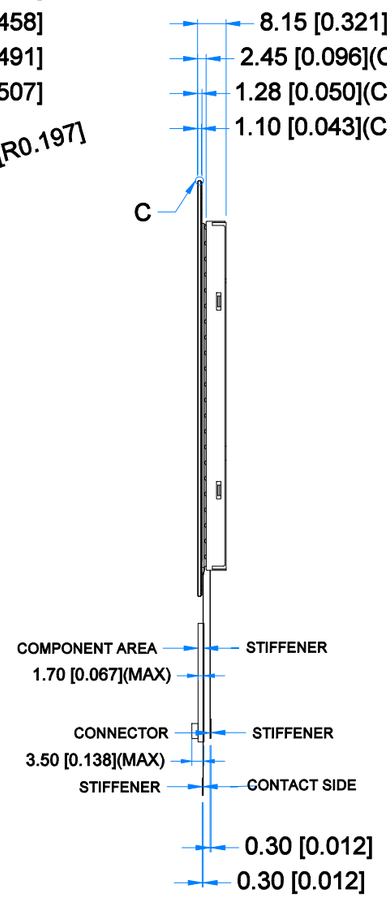
uxTouch models with double-side adhesive tape can be mounted by connecting the glass to the housing. Riverdi recommends using support brackets assembled to display’s back. An additional support will stiffen the whole structure and minimize the influence of external factors such as vibration. Figure 1 below show examples of using support elements.

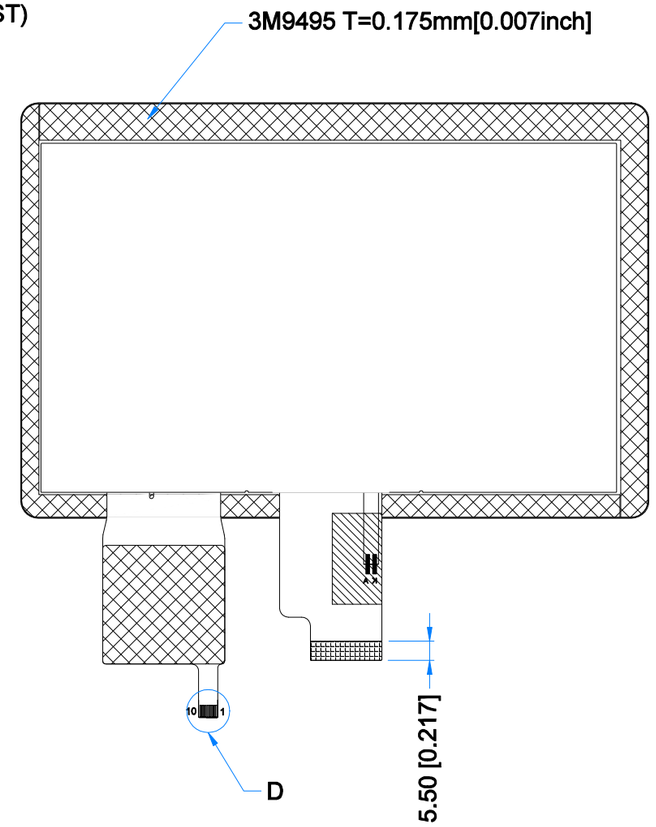
Figure 1. Example of using support brackets



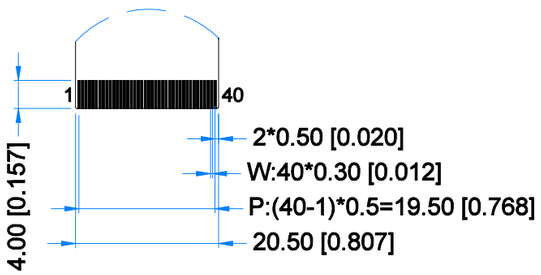
Revision:	Changes:	Date:
1.0	Initial Case	2020.07.15
1.1	Dimensions Overhaul	2021.06.24



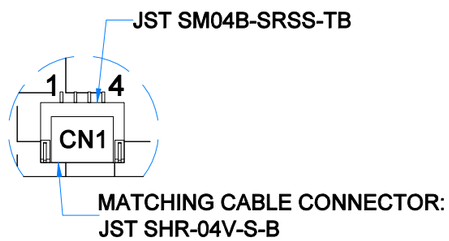




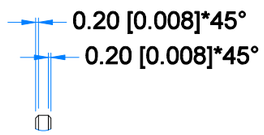
DETAIL A
SCALE 2:1



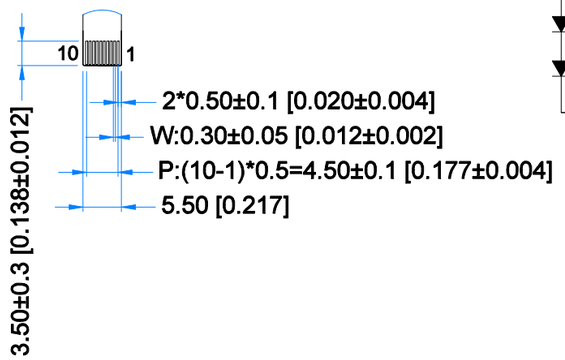
DETAIL B
SCALE 4:1

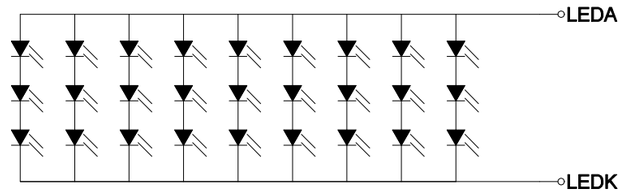


DETAIL C
SCALE 4:1



DETAIL D
SCALE 2:1





LED Diagram Circuit

TFT NOTES:
1. LCD TYPE: TRANSMISSIVE, NORMALLY BLACK, IPS
2. RESOLUTION: 1024x600
3. VIEWING ANGLE: FREE
4. IC CONTROLLER: EK79001HK+EK73215BCGA
5. OPERATION VOLTAGE: 3.3V
6. BACKLIGHT: 27PCS LED, V_f=9.6V, I_f=270mA

TP NOTES:
1. TP STRUCTURE: G+G
2. CG THICKNESS:1.10mm[0.043inch]
3. DRIVER IC: ILI2132A
4. INTERFACE: USB/I2C/OPTIONAL UART
5. OPERATING VOLTAGE: 3.3V(CTP I2C); 5.0V(CTP USB)

GENERAL NOTES:
1. MODULE SURFACE LUMINANCE: 800 cd/m^2
2. OPERATING TEMPERATURE: -20°C ~ 70°C
3. STORAGE TEMPERATURE: -30°C ~ 80°C
4. WITHOUT INDIVIDUAL TOLERANCE:
   DIM ACCORDING DIRECTLY to TFT:
   ±0.2mm[0.008inch]
   DIM ACCORDING DIRECTLY to TP:
   ±0.3mm[0.012inch]
5. RoHS COMPLIANT

PN: RVT70HSLNWC00			
SN:			
DRAWN: M.Natywa	2021.06.24	1:2.00	
CHECKED: K.Brodacka	2021.07.06	[mm]	
APPR:		ISO A3	P. 1 of 1

6. ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Power for Circuit Driving	VDD	-0.3	3.96	V
	AVDD	-0.5	14.85	
	VGH	-0.3	40	
	VGL	-20.0	0.3	
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Operating Humidity (@ 25 ± 5°C)	RH	10%	-	RH
Storage Humidity (@ 25 ± 5°C)	RH	10%	-	RH

7. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Supply Voltage for Module	DVDD	3.0	3.3	3.6	V	
	VGH	17	18	19		
	VGL	-6.6	-6.0	-5.4		
	AVDD	9.4	9.6	9.8		
	VCOM	3.6	3.8	4.0		
Current of Power Supply	IDD	-	30	45	mA	DVDD = 3.3V
	IADD	-	35	45	mA	AVDD = 9.6V
	IGH	-	0.5	1	uA	VGH = 18V
	IGL	-	0.5	1	mA	VGL= -6V
Input Voltage ' H ' level	V_{IH}	0.7DVDD	-	DVDD	V	Note 1
Input Voltage ' L ' level	V_{IL}	0	-	0.3VDD	V	Note 1

Note 1. STHL, STHR, OEH, L/R, CPH1÷CPH3, STVD, STVU, OEV, CKV, U/D.

8. BACKLIGHT ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Backlight Driving Voltage	V_F	9.0	9.6	10.2	V	
Backlight Driving Current	I_F	-	270	-	mA	
Backlight Power Consumption	W_{BL}	-	2592	-	mW	
LED Lifetime	-	-	50,000	-	hours	Note 1

Note 1. If LED is driven by high current, the lifetime of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating lifetime is estimated data.

9. POWER CONSUMPTION

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Gate on Power Current	IVGH	VGH=18V	-	0.5	1	mA	Note 1
Gate off Power Current	IVGL	VGL=6V	-	0.5	1		
Digital Power Current	IDVDD	DVDD=3.3V	-	30	45		
Analog Power Current	IAVDD	AVDD=9.6 V	-	35	45		
Total Power Consumption	PC		-	447	604	mW	

Note. Typ. Specification: Gray-level test pattern; Max Specification: Black test pattern

256ay patten

black pattern

10. 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° ø=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		-	800	-	cd/m²	FIG 3.	2
Viewing Angle Range	θ	ø = 90°	-	85	-	deg	FIG 4.	6
		ø = 270°	-	85	-	deg	FIG 4.	
		ø = 0°	-	85	-	deg	FIG 4.	
		ø = 180°	-	85	-	deg	FIG 4.	
CIE (x, y) Chromaticity	Rx	θ=0° ø=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.

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 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 make average value.

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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

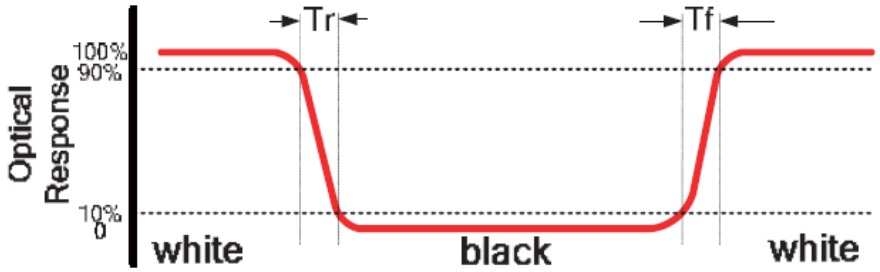
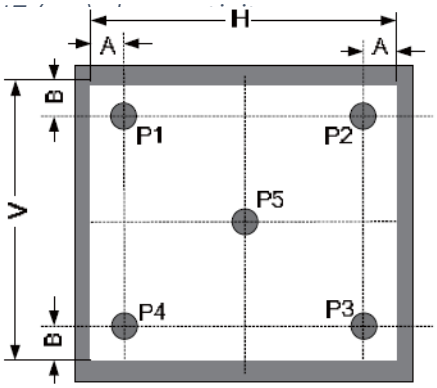


Figure 3. Measuring method for Contrast ratio, surface luminance, Luminance uniformity,



A: 5mm

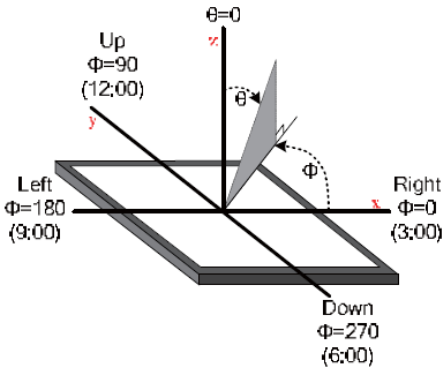
B: 5mm

H, V: Active Area

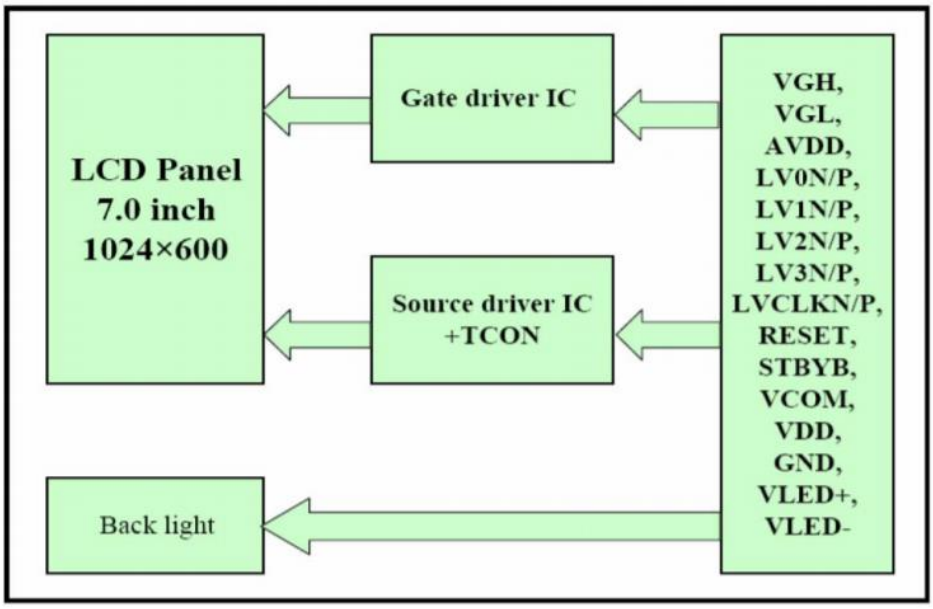
Light spot size Ø=5mm, 500mm distance from the LCD surface to detector lens.

Measurement instrument is TOPCON'S luminance meter BM-5

Figure 4. The definition of viewing angle



11. BLOCK DIAGRAM



12. INTERFACES DESCRIPTION

12.1 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	NC	-	No Connection
5	NC	-	No Connection
6	NC	-	No Connection
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	NC	-	No Connection
27	NC	-	No Connection
28	NC	-	No Connection
29	NC	-	No Connection
30	GND	P	Ground
31	LED-	P	LED Cathode
32	LED-	P	LED Cathode
33	NC	-	No Connection
34	NC	-	No Connection
35	NC	-	No Connection
36	NC	-	No Connection
37	NC	-	No Connection
38	NC	-	No Connection
39	LED+	P	LED Anode
40	LED+	P	LED Anode

I: input, P:Power

Note 1. If LVDS input data is 6 bits, SELB must be set to High;
If LVDS input data is 8 bits, SELB must be set to Low.

Note 2. When CABC_EN = ”00”, CABC OFF.
When CABC_EN = “01”, user interface image.
When CABC_EN = “10”, still picture.
When CABC_EN = “11”, moving image.
When CABC off, don’t connect DIMO, else connect it to backlight.

Note 3. When L/R = “0”, set right to left scan direction.
When L/R = “1”, set left to right scan direction.
When U/D = “0”, set top to bottom scan direction.

Note 4. U/D R/L Function Description

SETTING OF SCAN CONTROL INPUT		SCANNING DIRECTION
U/D	L/R	
GND	DVDD	Up to down, left to right
DVDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
DVDD	DVDD	Down to up, left to right

12.2 Touch panel assignment

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	USB_GND	USB_ Ground	
2	USB_VDD	USB Power for CTP, 5.0V	
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	
7	I2C_RST	I2C _Reset Pin, Active low	Note 1
8	I2C_SCL	I2C _Clock Input	
9	I2C_INT	I2C _Interrupt Signal from CTP, Active low	
10	I2C_SDA	I2C _Data Signal	

Note 1. External pull-up resistors are required.

12.3 CON1 assignment

PIN NO.	SYMBOL	DESCRIPTION
1	USB_VDD	USB_Power for CTP, DC 5.0V
2	USB_D–	USB_Data Signal -
3	USB_D+	USB_Data Signal +
4	USB_GND	USB_Ground

13. TIMING CHARACTERISTICS

13.1 Parallel RGB timing characteristic

13.1.1 DE MODE

PARAMETER	SYMBOL	VALUE			UNIT
		MIN.	TYP.	MAX.	
DCLK frequency (Frame rate 60Hz)	fclk	40.8	51.2	67.2	MHz
Horizontal display area	thd		1024		DCLK
HSYNC period time	th	1114	1344	1400	
HSYNC blanking	thb+thfp	90	320	376	
Vertical display area	tvd		600		H
VSYNC period time	tv	610	635	800	
VSYNC blanking	tvb+tvfp	10	85	200	

13.1.2 HV MODE – Horizontal input timing

PARAMETER	SYMBOL	VALUE			UNIT
		MIN.	TYP.	MAX.	
Horizontal display area	thd		1024		DCLK
DCLK frequency (frame rate 60Hz)	fclk	44.9	51.2	63	MHz
1 Horizontal Line	th	1200	1344	1400	DCLK
HSYNC pulse width	thpw	1	-	140	
HSYNC back porch	thbp	160	160	160	
HSYNC front porch	thfp	16	160	216	

13.1.3 HV MODE – Vertical input timing

PARAMETER	SYMBOL	VALUE			UNIT
		MIN.	TYP.	MAX.	
Vertical display area	tvd		600		H
VSYNC period time	tv	624	635	750	
VSYNC pulse width	tvpw	1	-	20	
VSYNC back porch	tvb	23	23	23	
VSYNC front porch	tVfp	1	12	127	

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13.1.4 Data input format

Figure 4. 6 -bit LVDS Input Timing chart

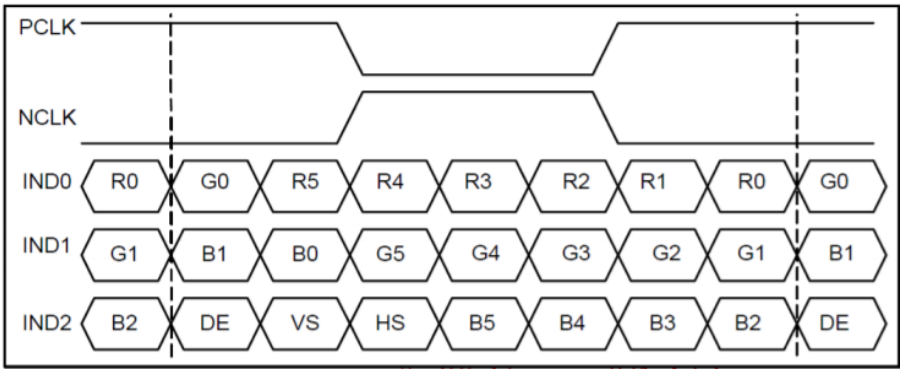
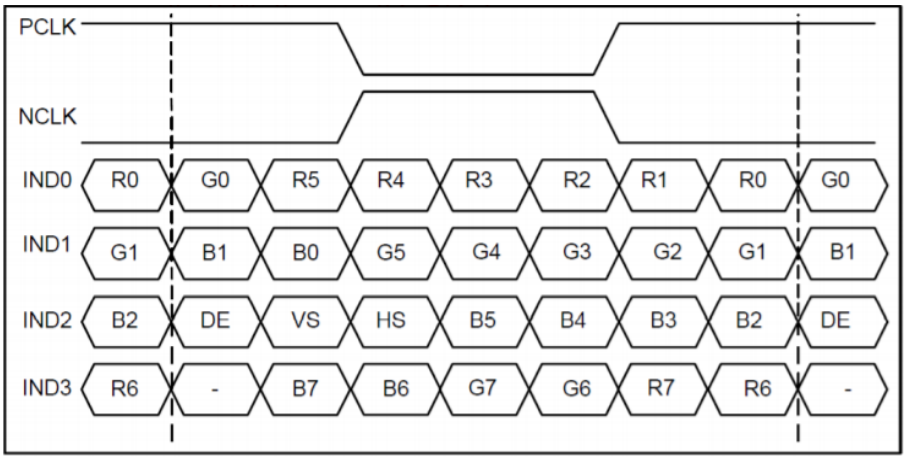
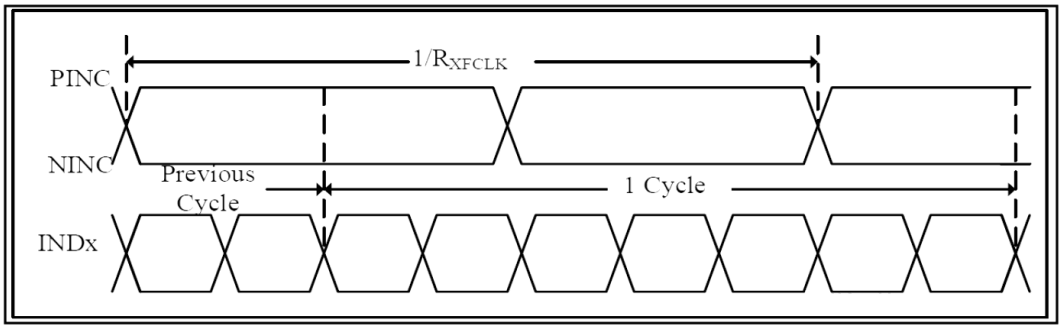


Figure 5. 8- bit LVDS Input Timing chart

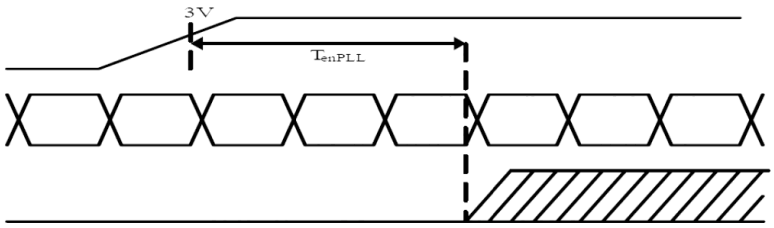


13.2 AC characteristics

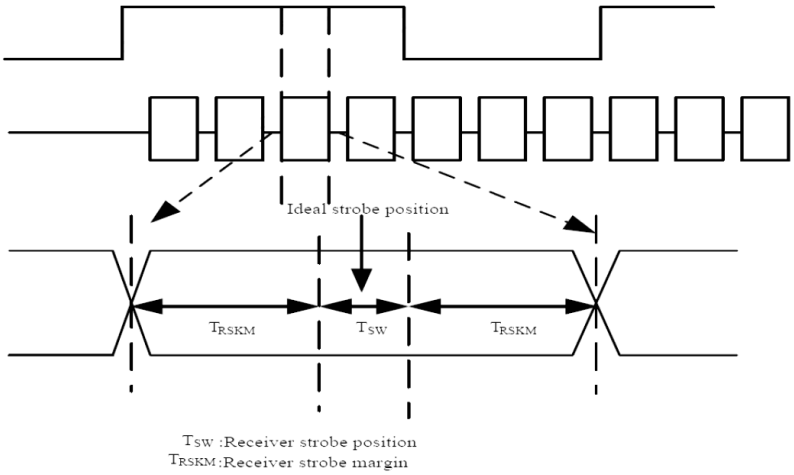
PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Clock Frequency	RxFCLK		20	-	71	MHz
Input Data Skew Margin	TRSKM	|VID|=400mV RxVCM=1.2V RxFCLK=71MHz	500	-	-	ps
Clock High Time	TLVCH	-	-	4/(7*RxFCLK)	20	ns
Clock Low Time	TLVCL	-	-	3/(7*RxFCLK)	23	ns
PLL wake-up-time	TenPLL	-	-	-	150	us



LVDS timing(1)



LVDS timing(2)

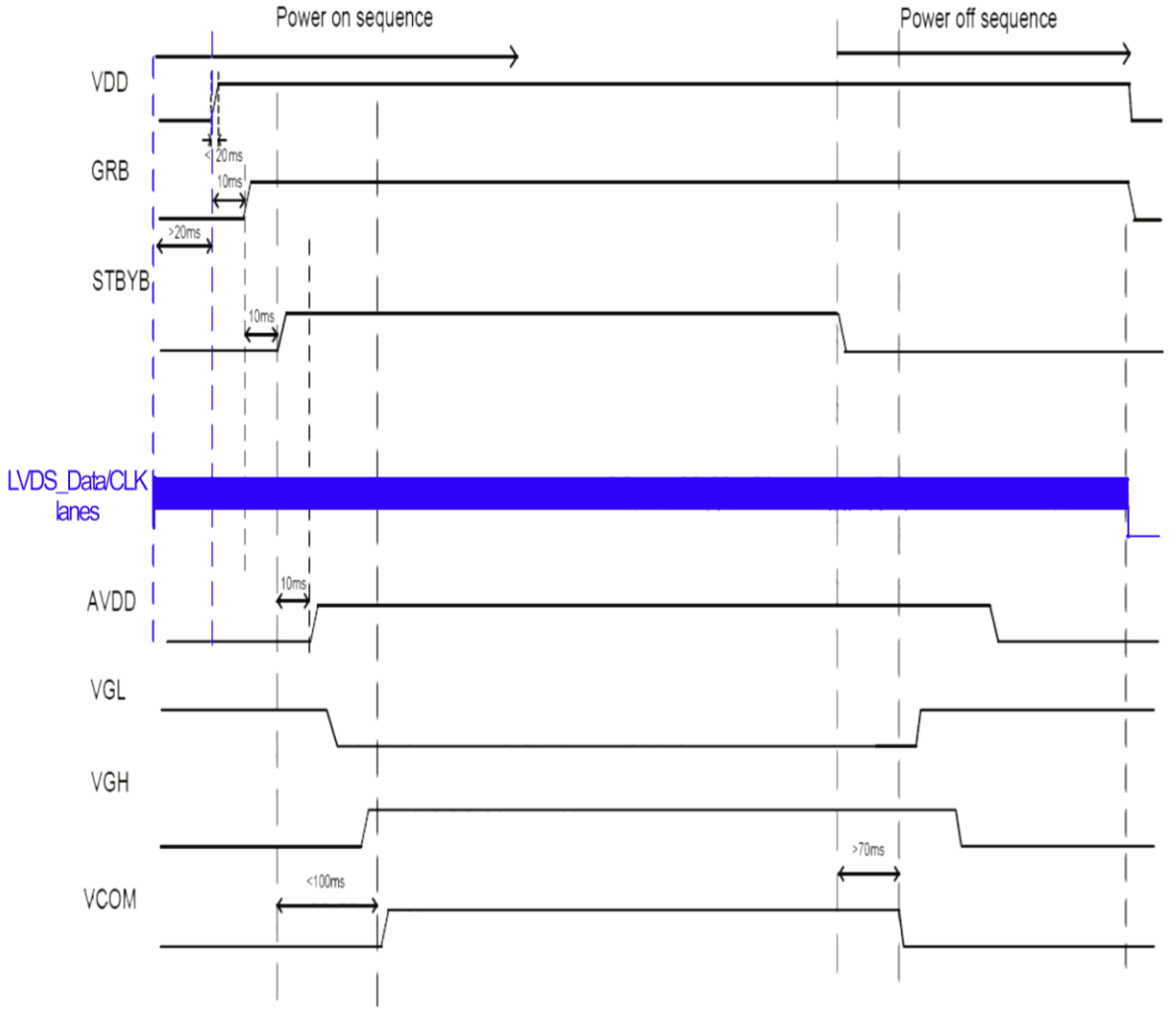


LVDS timing(3)

13.3 Power ON/OFF sequence

In order to prevent IC from power on reset fail, the rising time (TROP) of the digital power supply VDD should be maintained with the given specifications. Refer to “AC Characteristics ” for more detail on timing.

There is another paragraph of sub-function description.



14. CAPACITIVE TOUCH SCREEN PANEL SPECIFICATIONS

14.1 Mechanical characteristics

DESCRIPTION	SPECIFICATION	REMARK
Touch Panel Size	7.0 inch	uxTouch
Outline Dimension of CTP	179.96 mm x 119.00 mm	
Product Thickness	2.45 mm	
Glass Thickness	1.1 mm	
CTP View Area	115.08 mm x 87.42 mm	
Sensor Active Area	156.08 mm x 88.52 mm	
Structure type	Glass + Glass	
Surface Hardness	7H	

14.2 Electrical characteristics

DESCRIPTION		SPECIFICATION
Power Consumption (IDD)	Active Mode	90 mA
	Sleep Mode	10 mA
Linearity		+/- 1.5mm
Controller		ILI2132A
Resolution		1024 x 600

15. INSPECTION

Standard acceptance/rejection criteria for TFT module

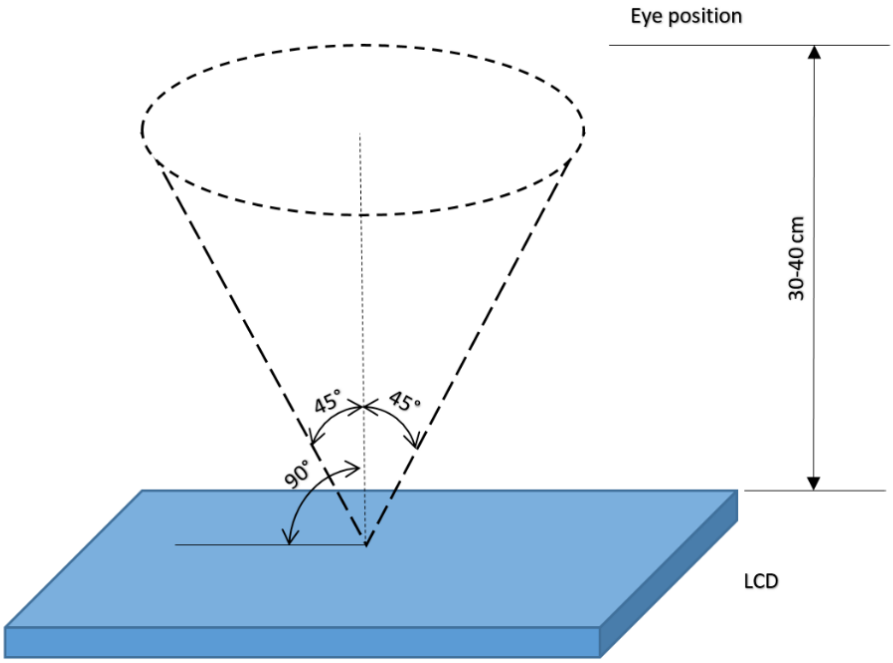
15.1 Inspection condition

Ambient conditions:

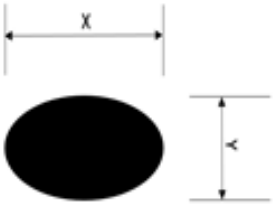
- Temperature: 25 ± 2°C
- Humidity: (60 ± 10) %RH
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

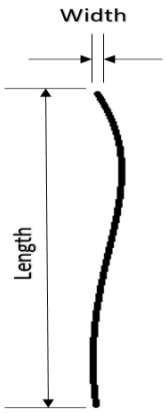
Viewing distance: 35 ± 5cm between inspector bare eye and LCD.

Viewing Angle: U/D: 45°/45°, L/R: 45°/45°



15.2 Inspection standard

<table>
<tr><th>ITEM</th><th colspan="4">CRITERION</th></tr>
<tr><td rowspan="5">Black spots, white spots, light leakage, Foreign Particle (round Type)</td><td rowspan="5"> 

D=(x+y)/2
Spots density: 10 mm</td><td colspan="3">Size =7”</td></tr>
<tr><td colspan="2">Average Diameter</td><td>Qualified Qty</td></tr>
<tr><td colspan="2">D ≤ 0.2 mm</td><td>Ignored</td></tr>
<tr><td colspan="2">0.2 mm < D ≤ 0.3 mm</td><td>N≤3</td></tr>
<tr><td colspan="2">0.5mm < D</td><td>Not allowed</td></tr>
<tr><td rowspan="5">LCD black spots, white spots, light leakage (line Type)</td><td rowspan="5"> 

Spots density: 10 mm</td><td colspan="3">Size = 7”</td></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>N≤3</td></tr>
<tr><td>5.0 < L</td><td>0.1< W</td><td>Not allowed</td></tr>
<tr><td rowspan="5">Bright/Dark Dots</td><td colspan="3">Size = 7</td></tr>
<tr><td>Item</td><td colspan="2">Qualified Qty</td></tr>
<tr><td>Bright dots</td><td colspan="2">N ≤ 2</td></tr>
<tr><td>Dark dots</td><td colspan="2">N ≤ 3</td></tr>
<tr><td>Total Bright and Dark Dots</td><td colspan="2">N ≤ 4</td></tr>
<tr><td rowspan="7">Clear spots</td><td colspan="3">Size ≥ 5”</td></tr>
<tr><td>Average Diameter</td><td colspan="2">Qualified Qty</td></tr>
<tr><td>D < 0.2 mm</td><td colspan="2">Ignored</td></tr>
<tr><td>0.2 mm < D < 0.3 mm</td><td colspan="2">4</td></tr>
<tr><td>0.3 mm < D < 0.5 mm</td><td colspan="2">2</td></tr>
<tr><td>0.5 mm < D</td><td colspan="2">0</td></tr>
<tr><td colspan="3">Spots density: 10 mm</td></tr>
<tr><td rowspan="5">Polarizer bubbles</td><td colspan="3">Size ≥ 5”</td></tr>
<tr><td>Average Diameter</td><td colspan="2">Qualified Qty</td></tr>
<tr><td>D < 0.25 mm</td><td colspan="2">Ignored</td></tr>
<tr><td>0.25 mm < D < 0.5 mm</td><td colspan="2">3</td></tr>
<tr><td>0.5 mm < D</td><td colspan="2">0</td></tr>
<tr><td rowspan="4">Touch panel spots</td><td colspan="3">Size ≥ 5”</td></tr>
<tr><td>Average Diameter</td><td colspan="2">Qualified Qty</td></tr>
<tr><td>D < 0.25 mm</td><td colspan="2">Ignored</td></tr>
<tr><td>0.25 mm < D < 0.5 mm</td><td colspan="2">4</td></tr>
</table>

	0.5 mm < D		0
Touch panel white line scratch	Size ≥ 5”		
	Length	Width	Qualified Qty
	-	W < 0.03	Ignored
	L < 5.0	0.03 < W < 0.05	2
	-	0.05 < W	0

16.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℃, 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	Note 2
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.

17.LEGAL INFORMATION

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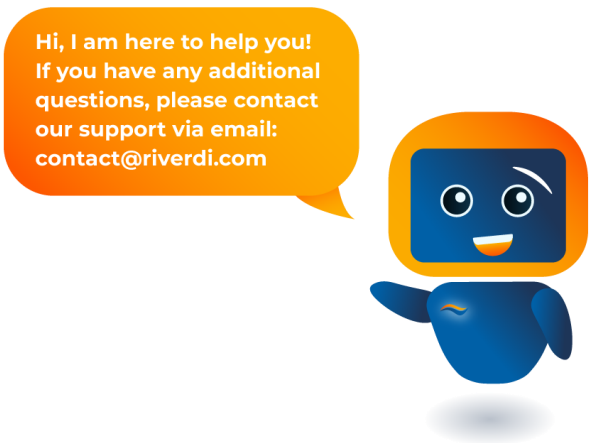

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