

## IPS MIPI 7.0" LCD TFT DATASHEET

Rev.1.1 2021-09-02

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 8.68	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 <sup>2</sup>
LCD Interface Type	MIPI	/
Color Depth	16.7 M	/
Pixel Arrangement	RGB Vertical Stripe	/
LCD Driver	EK79007AD3+EK73217BCGA	/
With/Without Touch	With Projected Capacitive Touch Panel	/
CTP Driver	ILI2132A	/
Touch Interface	USB /I2C/Optional UART	/
Weight	246	g

Note 1: RoHS3 compliant

Note 2: LCM weight tolerance: ± 5%.



## **1. REVISION RECORD**

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2021-05-28	Initial Release	
1.1	2021-09-02	Updating New Template	



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## 2. MODULE CLASSIFICATION INFORMATION

		70							
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	M – MIPI
7.	FRAME	F – With Mounting Metal Frame
8.	BACKLIGHT TYPE	W – LED White
9.	TOUCH PANEL	C – With Capacitive Touch Panel, aTouch
10.	VERSION	A0 – aTouch

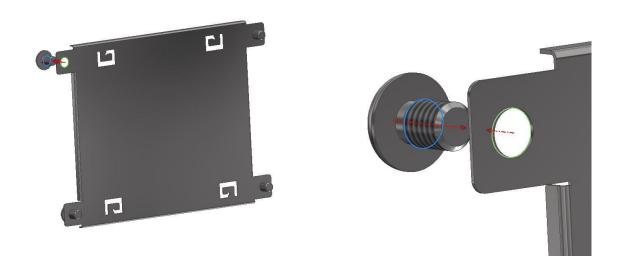


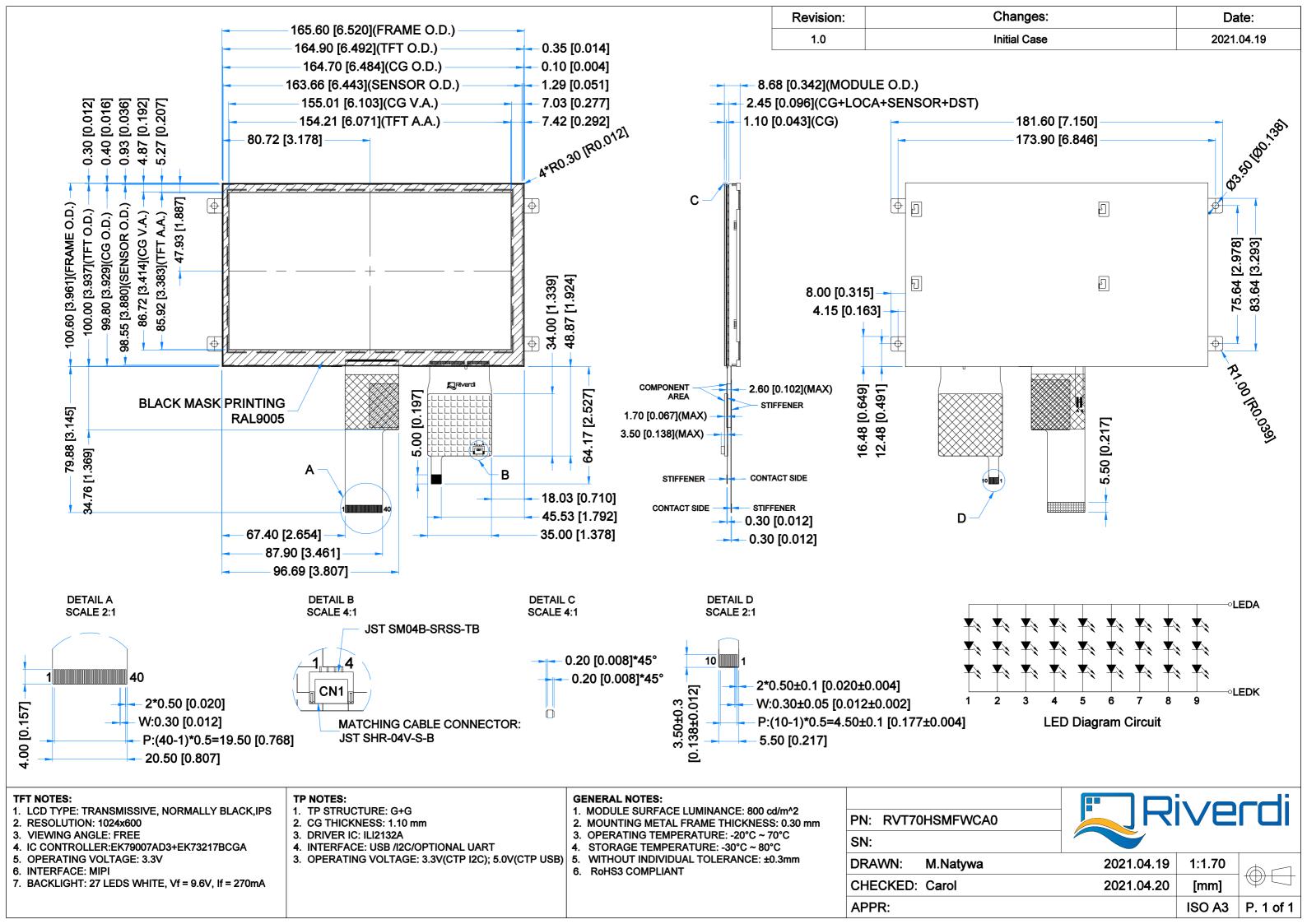
#### 3. ASSEMBLY GUIDE

#### 3.1 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







### **5. ABSOLUTE MAXIMUM RATINGS**

PARAMETER	SYMBOL	MIN	MAX	UNIT
Power for Circuit Driving	VDD	-0.3	+4.6	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.** The above are maximum values. If exceeded, they may cause permanent damage to the unit.

#### **6. ELECTRICAL CHARACTERISTICS**

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage for Module	VDD	2.6	3.3	3.6	V
Digital Power Current	IDD	-	30	45	mA
Logic Input Signal Voltage	VIH	0.7VDD	-	VDD	V
Logic input signal voltage	VIL	0	-	0.3VDD	V

#### 7. BACKLIGHT ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Backlight Driving Voltage	VF	9.0	9.6	10.2	V
Backlight Driving Current	IF	-	270	315	mA
Backlight Power Consumption	WBL	-	2592	-	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		-	35	-	ms	FIG 2.	4
Contrast Ratio	Cr	θ=O°	-	800	-		FIG 3.	1
Luminance Uniformity	δ WHITE	ø=0° Ta=25 °C	-	75	-	%	FIG 3.	3
Surface Luminance	Lv	14-25 C	-	800	-	cd/m2	FIG 3.	2
		ø = 90°	-	85	-	deg	FIG 4.	6
Viewing Angle	θ	ø = 270°	-	85	-	deg	FIG 4.	
Range		ø = O∘	-	85	-	deg	FIG 4.	
		ø = 180°	-	85	-	deg	FIG 4.	
	Rx		0.578	0.618	0.658	-		
	Ry		0.489	0.329	0.369	-		
	Gx	θ=0°	0.376	0.416	0.456	-		
CIE (x, y)	Gy	%=0°	0.493	0.533	0.573	-	FIC 7	5
Chromaticity	Bx	=0 Ta=25 °C	0.071	0.111	0.151	-	FIG 3.	5
	Ву	1a-25 C	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.

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  $\delta$  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 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.



**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

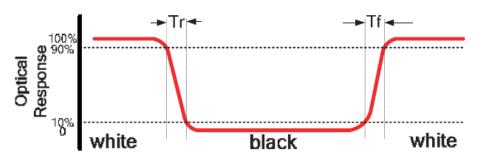
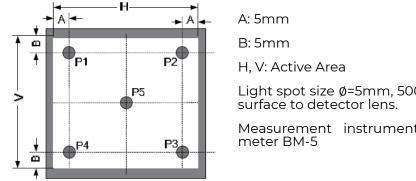


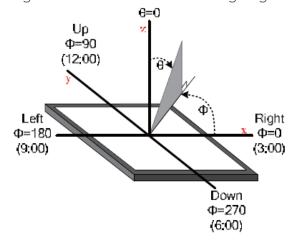
Figure 3. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity



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





## 9. INTERFACE DESCRIPTION

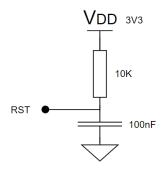
## 9.1 TFT assignment

PIN NO.	SYMBOL	I/O	DESCRIPTION	NOTE
1	NC	-	No connection	
2	VDD	Р	Power supply 3.3V	
3	VDD	Р	Power supply 3.3V	
4	NC	-	No connection	
5	RESET	I	Global reset pin. Active low to enter reset state.	NOTE 1
6	STBYB	I	Internally pull-up, STBYB=1, normal operation. STBYB=0, timing control, source driver will turn off	
7	GND	Р	Ground	
8	DON	I/O	Negative MIPI differential data input	
9	D0P	1/0	Positive MIPI differential data input	
10	GND	Р	Ground	
11	DIN	I/O	Negative MIPI differential data input	
12	DIP	1/0	Positive MIPI differential data input	
13	GND	Р	Ground	
14	D2N	1/0	Negative MIPI differential data input	
15	D2P	1/0	Positive MIPI differential data input	
16	GND	Р	Ground	
17	DCLKN	1/0	Negative MIPI differential clock input	
18	DCLKP	I/O	Positive MIPI differential clock input	
19	GND	Р	Ground	
20	D3N	1/0	Negative MIPI differential data input	
21	D3P	I/O	Positive MIPI differential data input	
22	GND	Р	Ground	
23	NC	-	No connection	
24	NC	-	No connection	
25	GND	Р	Ground	
26	NC	-	No connection	
27	NC	-	No connection	
28	NC	-	No connection	
29	NC	-	No connection	
30	GND	Р	Ground	
31	LED-	Р	LED Cathode	
32	LED-	Р	LED Cathode	
33	L/R	I	Left/Right display control, internally pull-up	NI-# O
34	U/D	I	Up/Down display control, internally pull down	Note 2
35	NC	-	No connection	
36	NC	-	No connection	
37	NC	-	No connection	
38	NC	-	No connection	
39	LED+	Р	LED Anode	
40	LED+	Р	LED Anode	

I: input, O: output, P: Power



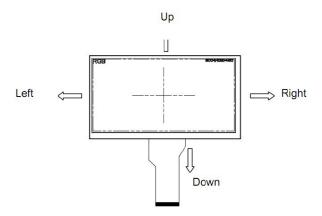
Note 1: Recommended Reset circuit:



**Note 2:** U/D (Pin 34) is internally pull-down, and R/L (Pin 33) is internally pull-up. The default scanning direction is up to down, left to right.

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

Definition of scanning direction, refer to the figure as below:



## 9.2 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	
8	I2C_SCL	I2C _Clock Input	Note 1
9	I2C_INT	I2C _Interrupt Signal from CTP, Active low	
10	I2C_SDA	I2C _Data Signal	

Note 1. External pull-up resistors are required.



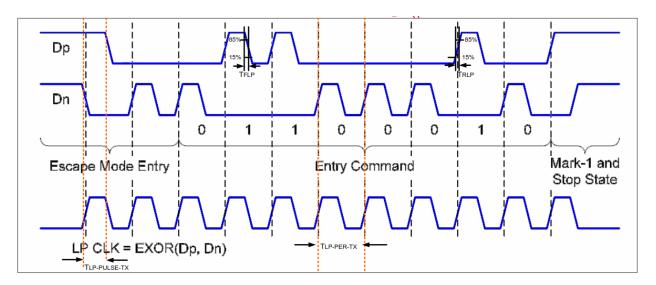
## 9.3 CON1 assignment

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

#### 10. TIMING CHARACTERISTICS

## 10.1 Low power transmitter AC characteristic

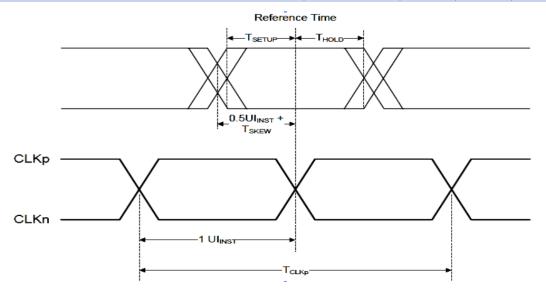
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	
15%~85% rising time	15%~85% rising time and falling time		-	-	25	
30%~85% rising tim	e and falling time	T <sub>REOT</sub>	-	-	35	
	First LP EXOR clock pulse					
Pulse width of LP	after STOP state or LAST		40	-	-	ns
exclusive -OR	pulse before stop state	T <sub>LP-PULSE-TX</sub>				
clock	All other pulses		20	-	-	
Period of the LP EXOR clock		T <sub>LP-PER-TX</sub>	90	-	-	
Slew Rate @CLOAD	Slew Rate @CLOAD =0pF		30	-	500	
Slew Rate @CLOAD =5pF		$\delta V/\delta t_{SR}$	30	-	200	mV/ns
Slew Rate @CLOAD =20pF			30	-	150	
Slew Rate @CLOAD =70pF			30	-	100	
Load Capacitance		$T_RLP$	-	-	70	рF





## 10.2 High speed transmission

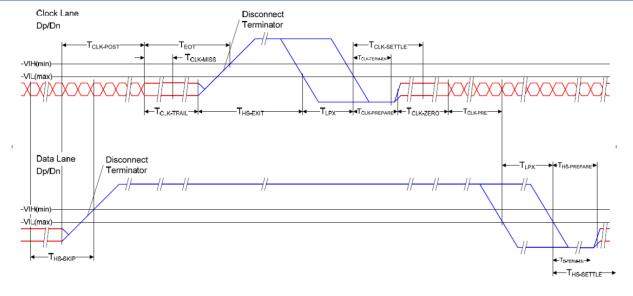
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
UI instantaneous	UI <sub>INST</sub>	2	-	12.5	ns
Data to Clock Skew (measured at transmitter)	T <sub>SKEW(TX)</sub>	-0.15	-	0.15	
Data to Clock Setup time (Measured at receiver)	T <sub>SETUP(RX)</sub>	0.15	-	-	UI <sub>INST</sub>
Data to Clock Hold time (Measured at receiver)	T <sub>HOLD(RX)</sub>	0.15	-		
20%~80% rising time and falling time	$T_{R}$ , $T_{F}$	150	-	-	ps
20/0-00/0 fishing time and familing time	IR, IF	-	-	0.3	UI <sub>INST</sub>





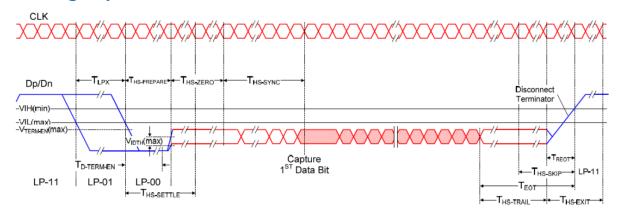
## 10.3 High speed clock transmission

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	T <sub>CLK-POST</sub>	60+52UI	-	-	
Detection time that the clock has stopped toggling	T <sub>CLK-MISS</sub>	-	-	60	
Time to drive LP-00 to prepare for HS clock transmission	T <sub>CLK-PREPARE</sub>	38	-	95	ns
Minimum lead HS-0 drive period before starting clock	T <sub>CLK-PREPARE+</sub> T <sub>CLK-ZERO</sub>	300	-	-	
Time to enable Clock Lane receiver line termination measured from when Dn cross V <sub>IL,MAX</sub>	T <sub>HS-TERM-EN</sub>	-	-	38	
Minimum time that the HS clock must be prior to any associated data lane beginning the transmission from LP to HS mode	T <sub>CLK-PRE</sub>	8	-	-	UI
Time to drive HS differential state after last payload clock bit of a HS transmission burst	T <sub>CLK</sub> -TRAIL	60	-	-	ns





## 10.4 High speed data transmission in bursts



## 11. CAPACITIVE TOUCH SCREEN PANEL SPECIFICATIONS

#### 11.1 Mechanical characteristics

DESCRIPTION	SPECIFICATION	REMARK
Touch Panel Size	7.0 inch	
Outline Dimension of CTP	164.70 mm x 99.80 mm	
Product Thickness	2.45 mm	
Glass Thickness	1.1 mm	aTouch
CTP View Area	155.01 mm x 86.72 mm	
Sensor Active Area	156.68 mm x 88.52 mm	
Structure type	Glass + Glass	
Surface Hardness	7H	

#### 11.2 Electrical characteristics

PARAMETER		SPECIFICATION	REMARK	
Operating Voltage		DC 5.0 V (USB)		
Operating Voltage		DC 3.3 V (I2C)		
Power	Active Mode	90 mA		
Consumption (IDD)	Sleep Mode	10 mA	aTouch	
Interface		USB / I2C /Optional UART	arouch	
Linearity		+/-1.5mm		
Controller		ILI2132A		
I2C address		0x82		
Resolution		1024 x 600		



#### 12. INITIALIZATION CODE

DCS\_Short\_Write\_NP(0x01); //Software Reset

Delay (120);

Generic\_Short\_Write\_1P(0x87,0x5A);

//Other commands will not work if this command is nor written

Generic\_Short\_Write\_1P(0xB2,0x70); //Set Channels 2LANE:0x50; 3LANE:0x60; 4LANE:0x70

Generic\_Short\_Write\_1P(0x80,0x4B); //Set Gamma voltage

Generic\_Short\_Write\_1P(0x81,0xFF); //Set Gamma voltage

Generic\_Short\_Write\_1P(0x82,0x1A); //Set Gamma voltage

Generic\_Short\_Write\_1P(0x83,0x88); //Set Gamma voltage

Generic\_Short\_Write\_1P(0x84,0x8F); //Set Gamma voltage

Generic\_Short\_Write\_1P(0x85,0x35); //Set Gamma voltage

Generic\_Short\_Write\_1P(0x86,0xB0); //Set Gamma voltage

DCS\_Short\_Write\_NP(0x11); //Exit Sleep Mode

Delay (120);

DCS\_Short\_Write\_NP(0x29); //Display on; 0x28 is display off

Delay (20);



#### 13.INSPECTION

Standard acceptance/rejection criteria for TFT module

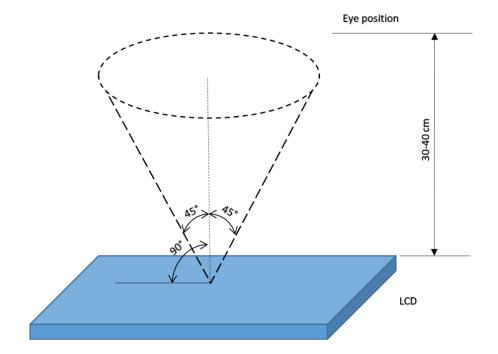
### 13.1 Inspection condition

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°





## 13.2 Inspection standard

ITEM		CRITE	RIOI	١		
		Size = 7"				
Black spots, white spots,	x	Average Diameter D ≤ 0.2 mm		Qualified Qty Ignored		
light leakage,	•	0.2 mm < D	≤ 0.3	mm	N≤3	
Foreign Particle (round Type)		0.5mm < D	0.5mm < D		Not allowed	
	D=(x+y)/2 Spot's density: 10 mm	0.5mm < D				
	Width	Size = 7"				
		Length Wid		Width		Qualified Qty
LCD black spots, white spots,		-		W ≤ 0.0	5	Ignored
light leakage (line Type)	Length	L ≤ 5.0		0.05 < W <u>s</u>	€ 0.1	3
( 13   5   5		5.0 < L		0.1 < W		Not allowed
	Size = 7"					
Bright/Dark	ltem			Qualified Qty		
Dots	Bright dots		N≤2			
Dots	Dark dots			N≤3		
	Total bright and dark dots			N≤4		
	Size = 7"					
	Average Diameter			Qualified Qty Ignored		
Clear spots	D < 0.2 mm			-		
'	0.2 mm < D < 0.3 mm				4	
	0.3 mm < D < 0.5 mm		2			
	0.5 mm < D		O			
	. 5:	Size = 7"		<u> </u>		
Polarizer	Average Diameter		Qualified Qty			
bubbles	D ≤ 0.2 mm		Ignored /			
	0.2 mm < D ≤ 0.5 mm		4			
	0.5 mm < D		0 ≥ ≥ 5"			
	Average Diame					
Touch panel	Average Diameter D < 0.25 mm		Qualified Qty Ignored			
spot	0.25 mm < D < 0.5 mm		ignored 4			
	0.23 Hill > D < 0.3 Hill 0.5 mm < D		0			
	0.51111111	Size	> 5"			
Touch panel	Length Width		Qualified Qty			
White line	- W < 0.03		Ignored			
Scratch	L < 5.0 0.03 < W < 0					
	-	0.05 < W		0	0	



### **14. 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°C, 90%RH, 120Hrs
		-20°C for 30min, 70°C for 30 min.
6	Thermal Cycling Test (No operation)	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
9	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 cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.



#### **15.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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