LCD TFT Module Specification

Riverdi
Display Solution Experts

RVT70HSTNWN00

IPS RGB 7.0” LCD TFT Datasheet

Rev.1.0

2020-08-05

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally Black/IPS	/
Size	7.0	Inch
Viewing Direction	Free	/
Outside Dimensions (W × H × D)	164.9x 100.0 x 5.7	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
LCD Interface Type	RGB	/
Color Depth	16.7 M	/
Pixel Arrangement	RGB Vertical Stripe	/
LCD Driver	EK79001+EK73215	/
With/Without Touch	Without Touch Panel	/
Surface Treatment	Anti-Glare	/
LCD Input Voltage	3.3	V
Weight	132	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

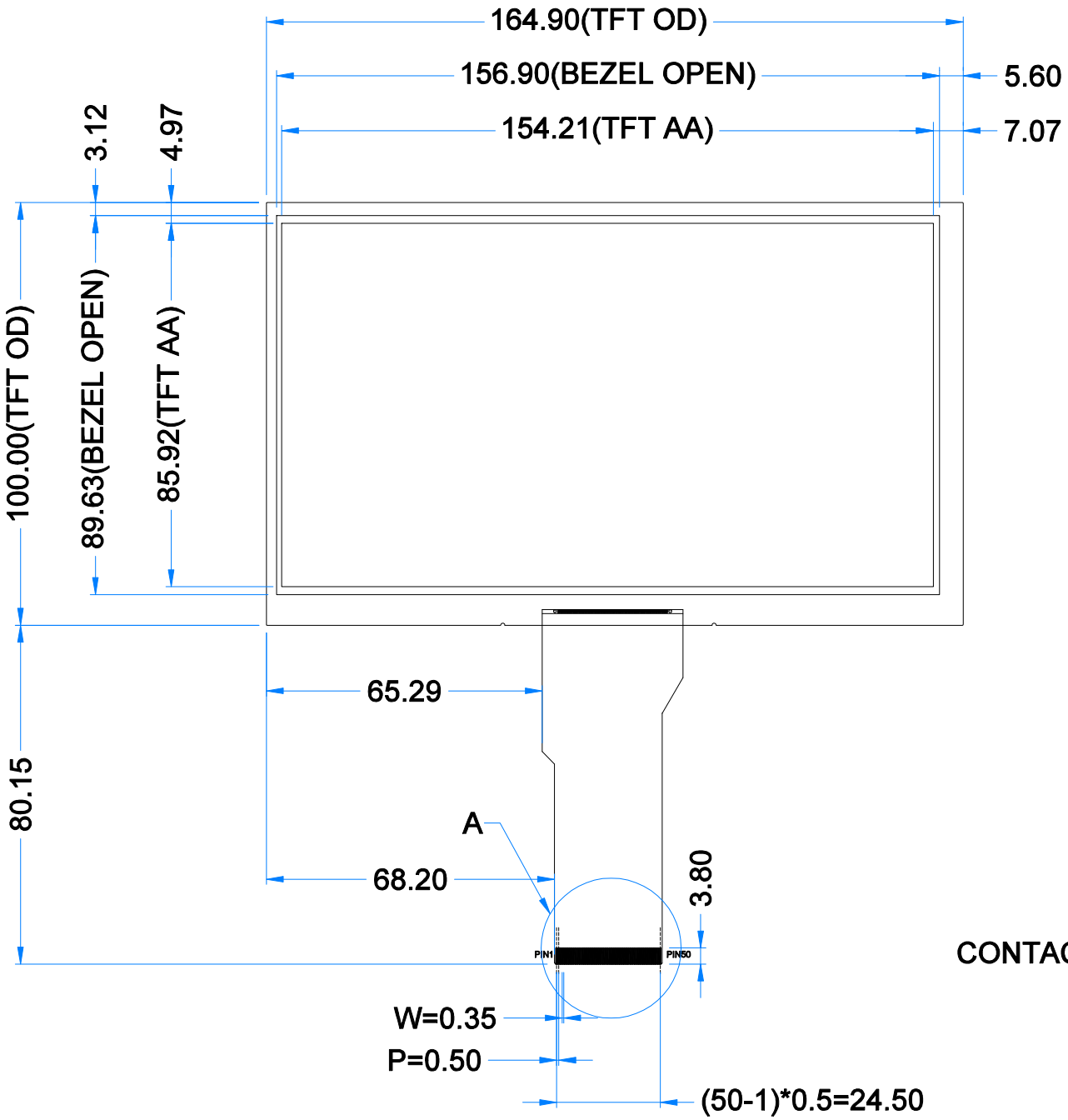
REVNO.	REVDATE	CONTENTS	REMARKS
1.0	2020-08-05	Initial Release	

CONTENTS

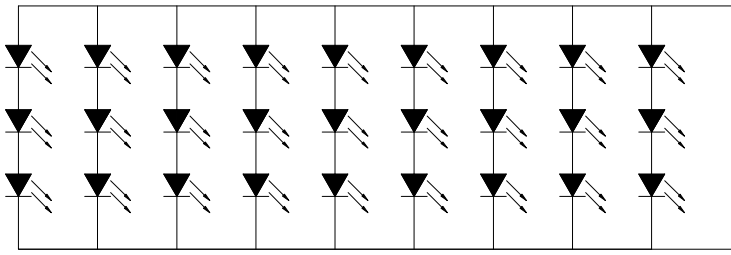
1 MODULE CLASSIFICATION INFORMATION

RV	T	70	H	S	T	N	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**	**T– TFT LCD, RGB**
7.	**FRAME**	**N – Without Frame**
8.	**BACKLIGHT TYPE**	**W – LED White**
9.	**TOUCH PANEL**	**N – Without Touch Panel**
10.	**VERSION**	**00 – (00-99)**



CONTACT S



LED Diagram Circuit

TFT NOTES:

1. LCD TYPE: TRANSMISSIVE, NORMALLY BLACK, IPS
2. RESOLUTION: 1024x600
3. VIEWING ANGLE: FREE
4. INTERFACE: RGB
5. DRIVER IC: EK79001HK+EK73215BCGA
6. LOGIC VOLTAGE: 3.3V
7. SURFACE LUMINANCE:1000cd/m^2
8. BACKLIGHT: 27PCS LED WHITE, V_F=9.6V, I_F=270mA

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

3 ABSOLUTE MAXIMUM RATINGS

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

Note. The following are maximum values. If exceeded it may cause operation or damage to the unit.

4 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	V	
	VGL	-6.6	-6.0	-5.4	V	
	AVDD	9.4	9.6	9.8	V	
	VCOM	3.6	3.8	4.0	V	
Input Signal Voltage	VIH	0.7DVDD	-	DVDD	V	Note 1
	VIL	0	-	0.3DVDD	V	
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

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

5 BACKLIGHT DRIVING CONDITIONS

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	
Life Time	-	-	50,000	-		Note 1

Note 1. If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

6 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=-6 V	-	0.5	1	mA	
Digital Power Current	IDVDD	DVDD=3.3V	-	30	45	mA	
Analog Power Current	IAVDD	AVDD=9.6 V	-	35	45	mA	
Total Power Consumption	PC		-	447	604	mW	

Note 1. Typ. Specification : Gray-level test Pattern
Max. Specification: Black test Pattern

256 gray pattern

Black Pattern

7 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 maximum luminance of 5 points luminance by minimum 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 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 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 2. The definition of response time

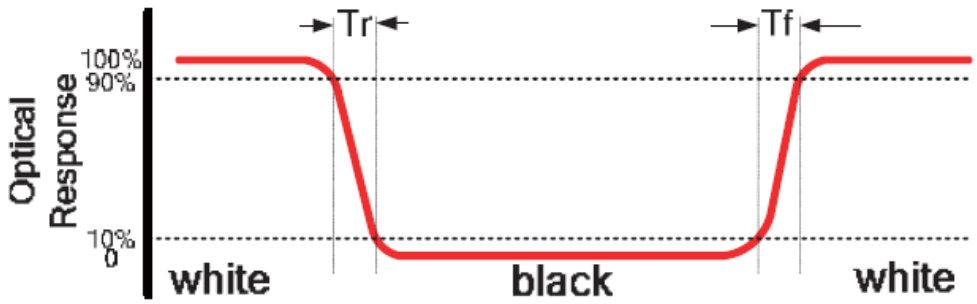


Figure 3. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

A : 5 mm
B : 5 mm
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

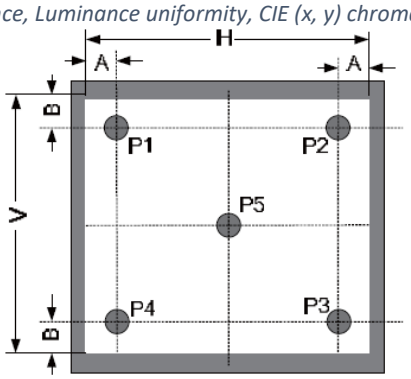
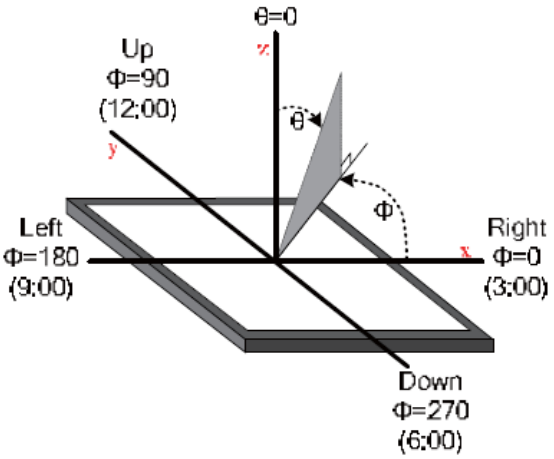
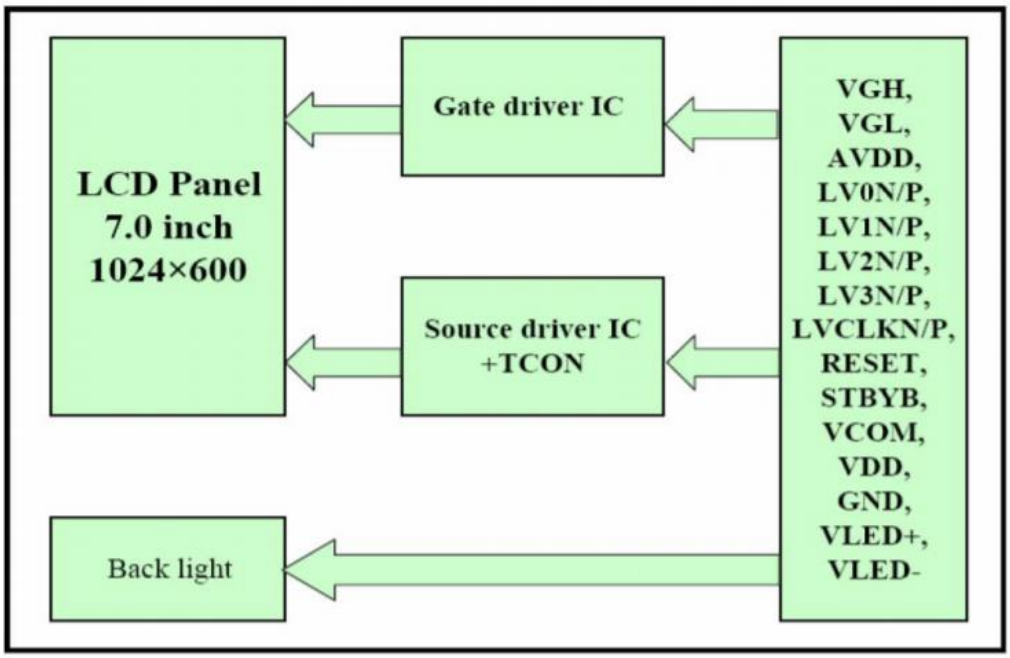


Figure 4.The definition of viewing angle



8 BLOCK DIAGRAM



9 INTERFACE DESCRIPTION

9.1 TFT assignment

PIN NO.	SYMBOL	I/O	DESCRIPTION	NOTES
1	VLED+	P	Power for LED Backlight (Anode)	
2	VLED+	P	Power for LED Backlight (Anode)	
3	VLED-	P	Power for LED Backlight (Cathode)	
4	VLED-	P	Power for LED Backlight (Cathode)	
5	GND	P	Ground	
6	VCOM	I	Common Voltage	
7	DVDD	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue Data (MSB)	
13	B6	I	Blue Data	
14	B5	I	Blue Data	
15	B4	I	Blue Data	
16	B3	I	Blue Data	
17	B2	I	Blue Data	
18	B1	I	Blue Data	Note 2
19	B0	I	Blue Data (LSB)	Note 2
20	G7	I	Green Data (MSB)	
21	G6	I	Green Data	
22	G5	I	Green Data	
23	G4	I	Green Data	
24	G3	I	Green Data	
25	G2	I	Green Data	
26	G1	I	Green Data	Note 2
27	G0	I	Green Data (LSB)	Note 2
28	R7	I	Red Data (MSB)	
29	R6	I	Red Data	
30	R5	I	Red Data	
31	R4	I	Red Data	
32	R3	I	Red Data	
33	R2	I	Red Data	
34	R1	I	Red Data	Note 2
35	R0	I	Red Data(LSB)	Note 2
36	GND	P	Ground	
37	DCLK	P	Sample Clock	
38	GND	P	Ground	
39	L/R	I	Left/Right Selection	Note 4,5
40	U/D	I	Up/Down Selection	Note 4,5
41	VGH	P	Gate ON Voltage	
42	VGL	P	Gate OFF Voltage	
43	AVDD	P	Power for Analog Circuit	

44	RESET	I	Global Reset Pin	Note 6
45	NC	-	No Connection	
46	VCOM	I	Common Voltage	
47	DITHUB	I	Dithering Function	Note 7
48	GND	I	Ground	
49	NC	-	No Connection	
50	NC	-	No Connection	

I: input, O:output, P:Power

Note 1. DE/SYNC mode select. Normally pull high.
When select DE mode, MODE="1", VS and HS must pull high.

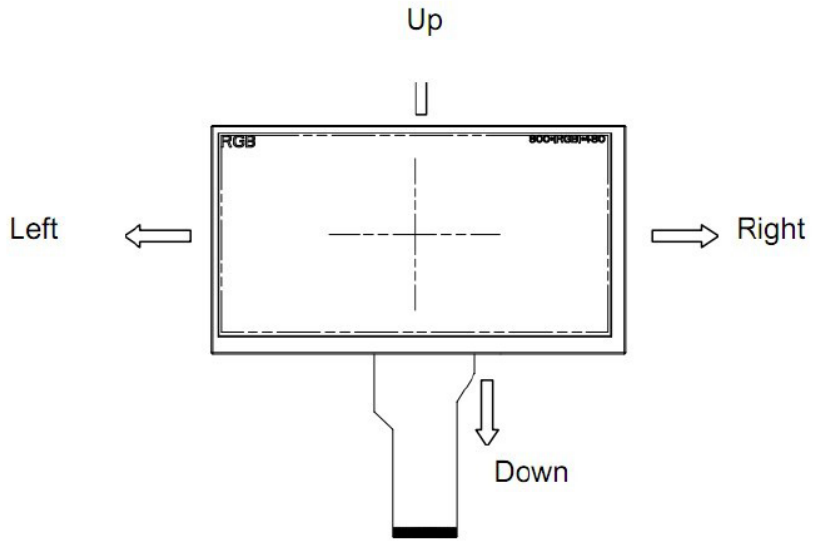
Note 2. When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note 3. Data shall be latched at the falling edge of DCLK.

Note 4. Selection of scanning mode:

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

Note 5. Definition of scanning direction, refer to the figure as below:

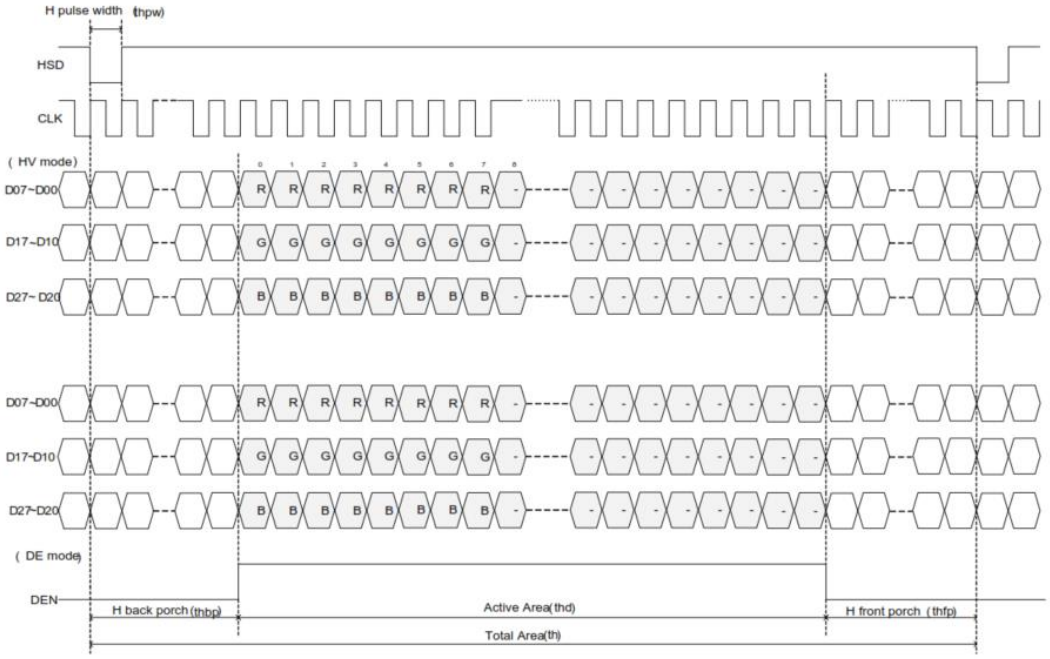


Note 6. Global reset pin. Active low to enter reset state, Suggest to connect with an RC reset circuit for stability. Normally pull high.

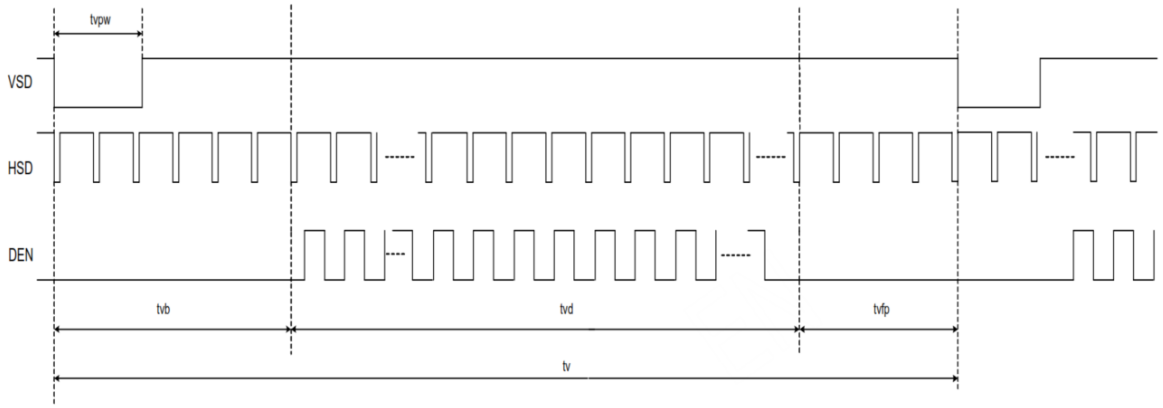
Note 7. Dithering function enable control, normally pull high.
When DITHUB="1", Disable internal dithering function.
When DITHUB="0", Enable internal dithering function.

10 TIMING CHARACTERISTIC

10.1 Horizontal input timing



10.2 Vertical input timing



10.3 Parallel RGB timing characteristic

10.3.1 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	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		600		H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	85	200	H

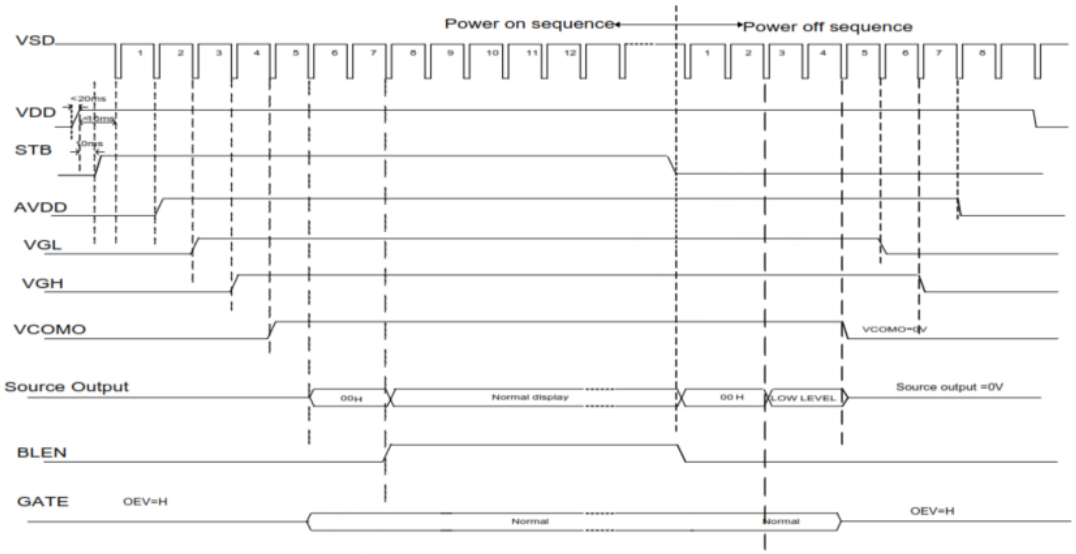
10.3.2 HV MODE – Horizontal input timing

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	DCLK
HSYNC back porch	thbp	160	160	160	DCLK
HSYNC front porch	thfp	16	160	216	DCLK

10.3.3 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	H
VSYNC pulse width	tvpw	1	-	20	H
VSYNC back porch	tvb	23	23	23	H
VSYNC front porch	tVfp	1	12	127	H

10.3.4 Power On/Off sequence



11 INSPECTION

Standard acceptance/rejection criteria for TFT module.

11.1 Inspection condition

Ambient conditions:

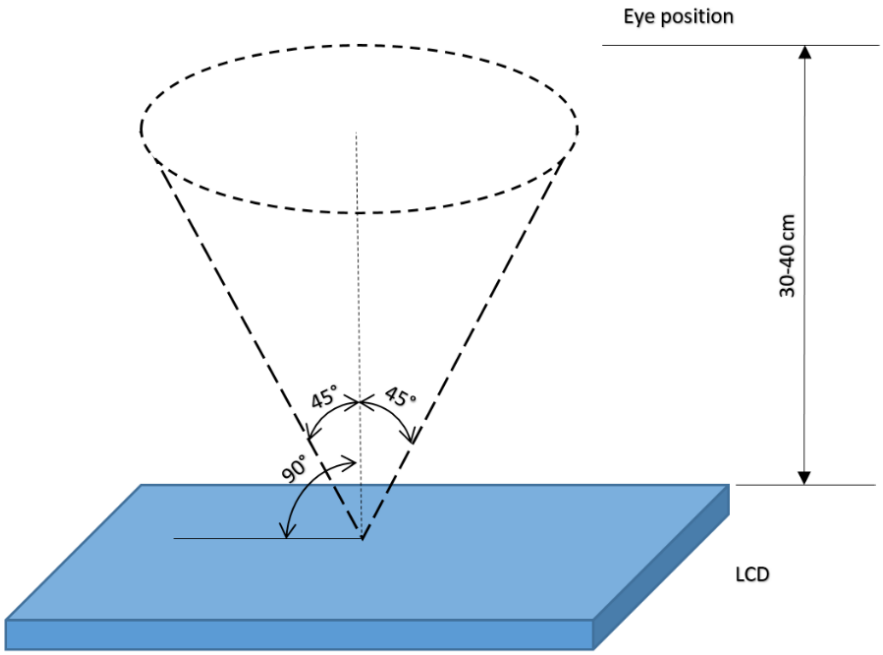
- Temperature: 25±2°C
- Humidity: (60±10)%RH
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

Viewing distance:

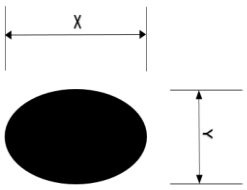
35±5cm between inspector bare eye and LCD.

Viewing Angle:

U/D: 45°/45°, L/R 45°/45°



11.2 Inspection standard

<table>
<tr><th>Item</th><th>Criterion</th></tr>
<tr><td>Black spots, white spots, light leakage, Foreign Particle (round Type)</td><td>


$$D = \frac{(x+y)}{2}$$
*Spots density: 10 mm
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<tr><th colspan="2">3.5” ≤ Size ≤ 5”</th></tr>
<tr><td>Average Diameter</td><td>Qualified Qty</td></tr>
<tr><td>D ≤ 0.15 mm</td><td>Ignored</td></tr>
<tr><td>0.15 mm < D ≤ 0.30 mm</td><td>N≤3</td></tr>
<tr><td>0.3mm < D</td><td>Not allowed</td></tr>
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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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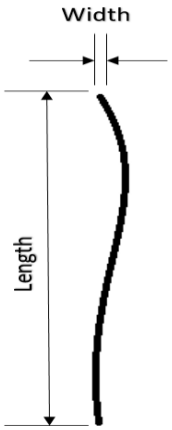
<tr><td>LCD black spots, white spots, light leakage (line Type)</td><td>


*Spots density: 10 mm
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<tr><td>Bright/Dark Dots</td><td>
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<tr><td>Dark Dots</td><td>N≤2</td></tr>
<tr><td>Total Bright and Dark Dots</td><td>N≤3</td></tr>
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<tr><td>0.3 mm < D < 0.5 mm</td><td>2</td></tr>
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*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>
<tr><td>0.2 mm < D ≤ 0.3 mm</td><td>2</td></tr>
<tr><td>0.3 mm < D ≤ 0.5mm</td><td>1</td></tr>
<tr><td>0.5 mm < D</td><td>0</td></tr>
<tr><td>Total Q’ty</td><td>3</td></tr>
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12 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	Damp Proof Test	40°C, 90%RH/120 hours
8	Vibration Test	Frequency :10~55 HZ; Stroke :1.5mm; Sweep:10HZ~55HZ~10HZ; 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 cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

13 LEGAL INFORMATION

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