RVT70AQFFWN01 V2

LCD TFT Datasheet

Rev.1.0

2021-04-12

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally white	/
Size	7.0	Inch
Viewing Direction	12:00 (without image inversion)	O' Clock
Gray Scale Inversion Direction	6:00	O' Clock
LCM (W × H × D)	165.60 ×100.60 × 10.20	mm^3
Active Area (W × H)	155.08 × 85.92	mm^2
Dot Pitch (W × H)	0.1926 × 0.179	mm^2
Number of Dots	800 (RGB) × 480	/
Driver IC	FT812	/
Backlight Type	30 LEDs	/
Surface Luminance	1000	cd/m^2
Interface Type	SPI/QSPI	/
Color Depth	16.7M	/
Pixel Arrangement	RGB Vertical Stripe	/
Surface Treatment	Anti-glare	
Input Voltage	3.3	V
With/Without TSP	Without Touch Panel	/
Weight	TBD	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

REVNO.	REVDATE	CONTENTS	REMARKS
1.0	2021-04-12	Due to the EOL of the RVT7.0A800480TNWN00 module, all modules combined are updated and marked with V2	

CONTENTS

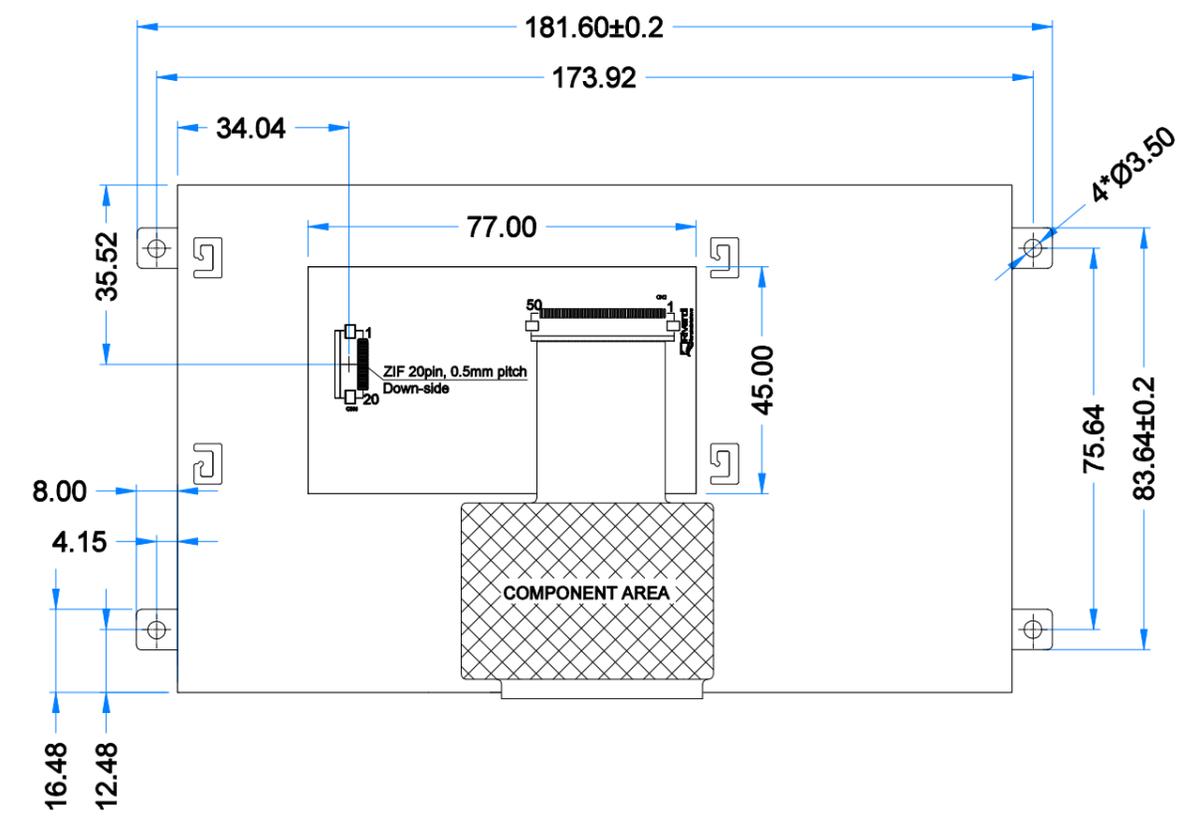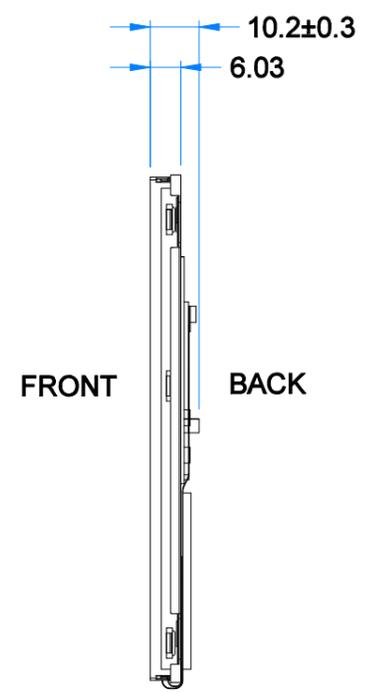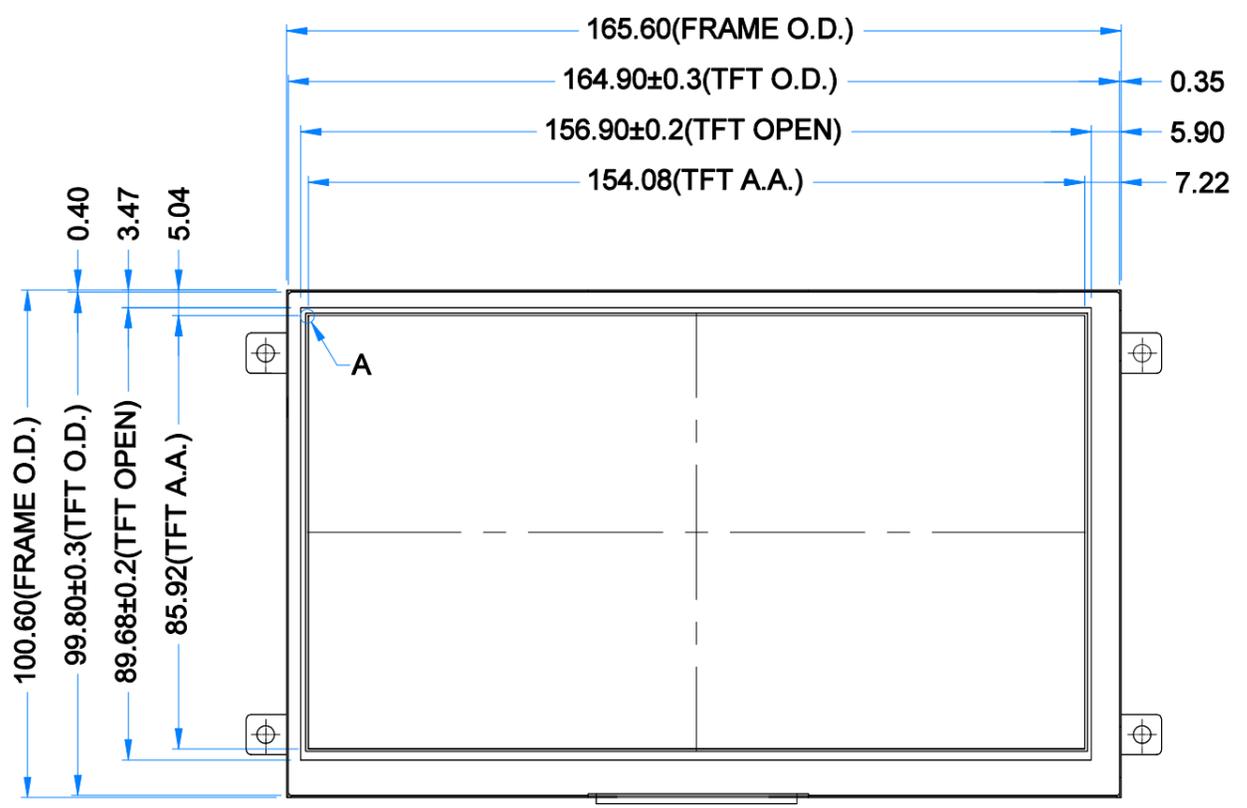## 1 MODULE CLASSIFICATION INFORMATION

RV	T	70	A	Q	F	F	W	N	01	V2
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.

1.	BRAND	**RV** – Riverdi
2.	PRODUCT TYPE	**T – TFT Standard** **F** – TFT Custom
3.	DISPLAY SIZE	**70 – 7.0"**
4.	MODEL SERIAL NO.	**A**(A-Z)
5.	RESOLUTION	**Q – 800x480 px**
6.	INTERFACE	**T** – TFT LCD, RGB **L** – TFT LCD, LVDS **S** – TFT + Controller SSD1963 **F – TFT + Controller FT812**
7.	FRAME	N – No Frame **F – Mounting Frame**
8.	BACKLIGHT TYPE	**W** – LED White
9.	TOUCH PANEL	**N – No Touch Panel** R – Resistive Touch Panel C – Capacitive Touch Panel
10.	VERSION	**01** (00-99)
11.	VERSION	**V2**

165.60(FRAME O.D.)
164.90±0.3(TFT O.D.)
156.90±0.2(TFT OPEN)
154.08(TFT A.A.)

0.35
5.90
7.22

0.40
3.47
5.04

100.60(FRAME O.D.)
99.80±0.3(TFT O.D.)
89.68±0.2(TFT OPEN)
85.92(TFT A.A.)

A

10.2±0.3
6.03

FRONT   BACK

181.60±0.2
173.92
34.04
77.00

35.52
45.00
75.64
83.64±0.2

4*Ø3.50

ZIF 20pin, 0.5mm pitch
Down-side

COMPONENT AREA

8.00
4.15
16.48
12.48

DETAIL A
SCALE 40:1

0.1926

R	G	B	R
R	G	B	R

0.1790

VLED+

VLED-
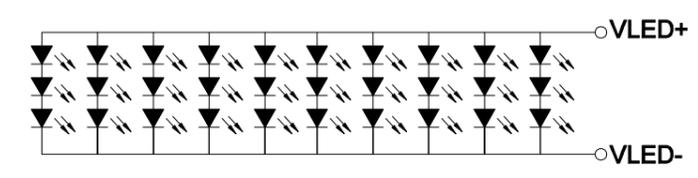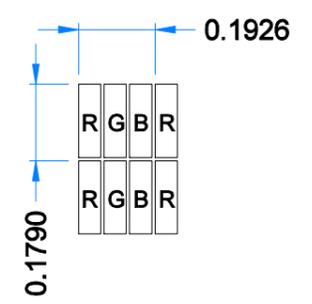
BACKLIGHT CIRCUIT DIAGRAM

PINOUT ON THE 2ND PAGE

TFT NOTES:
1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
2. OPERATING VOLTAGE: VDD=3.3V
3. VIEWING DIRECTION: 12 O'CLOCK
4. IC DRIVER: FT812
5. LED BACKLIGHT: 30-CHIP WHITE LED, I_f=250mA, V_f=9.2V
6. SURFACE LUMINANCE: 1000cdm^2

GENERAL NOTES:
1. OPERATING TEMPERATURE: -20°C ~ 70°C
2. STORAGE TEMPERATURE: -30°C ~ 80°C
3. WITHOUT INDIVIDUAL TOLERANCE: ±0.3mm
4. RoHS COMPLIANT

Riverdi

PN: RVT70AQFFWN00 V2		
SN:		
DRAWN: M.Natywa	2021.04.16	1:1.40
CHECKED: A.Demko-Karolczuk	2021.04.19	[mm]
APPR:	ISO A3	P. 1 of 1

4   ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage For Logic	VDD	-0.3	3.6	V
Input Voltage For Logic	VIN	-0.3	VDD	V
Input Voltage For LED Inverter	BLVDD	-0.3	7.0	V
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Humidity	RH	-	90% (Max 60°C)	RH

5   ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage For Module	VDD	3.0	3.3	3.6	V
Input Voltage for LED Inverter	BLVDD	2.8	5.0	5.5	V
Input Current (Exclude LED Backlight)	IDD	-	TBD	-	mA
LED Backlight Current	$IDD_{backlight}$ (@ 5V)	555	580	630	mA
Input Voltage ' H ' level	V_{IH}	0.7VDD	-	VDD	V
Input Voltage ' L ' level	V_{IL}	0	-	0.2VDD	V
LED Life Time	-	30000	50000	-	Hrs

Note: The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C

6   ELECTRO-OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time		Tr+Tf		-	20	35	ms	FIG 1.	4
Contrast Ratio		Cr	θ=0°	400	500	-	---	FIG 2.	1
Luminance Uniformity		δ WHITE	Ø=0° Ta=25	70	75	-	%	FIG 2.	3
Surface Luminance		Lv		-	1000	-	cd/m^2	FIG 2.	2
Viewing Angle Range		θ	Ø = 90°	40	50	-	deg	FIG 3.	6
			Ø = 270°	60	70	-	deg	FIG 3.	
			Ø = 0°	60	70	-	deg	FIG 3.	
			Ø = 180°	60	70	-	deg	FIG 3.	
CIE (x, y) Chromaticity	Red	x	θ=0° Ø=0° Ta=25	0.522	0.572	0.622	FIG 2.	5
		Y		0.300	0.350	0.400		
	Green	x		0.311	0.361	0.411		
		y		0.526	0.576	0.626		
	Blue	x		0.097	0.147	0.197		
		y		0.038	0.088	0.138		
	White	x		0.266	0.316	0.366		
		y		0.266	0.316	0.366		

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 the 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.
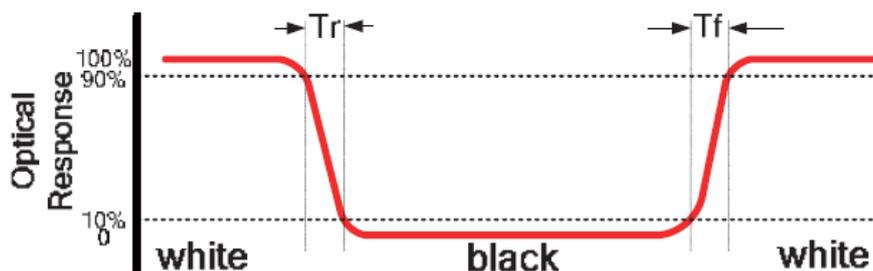
Figure 1. The definition of response time

Figure 2.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

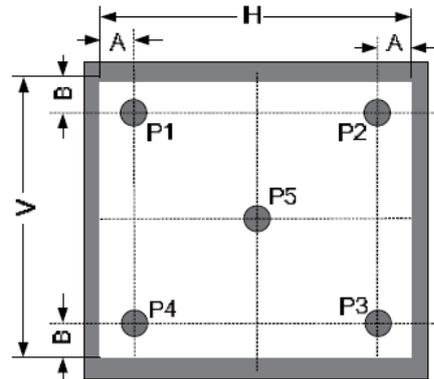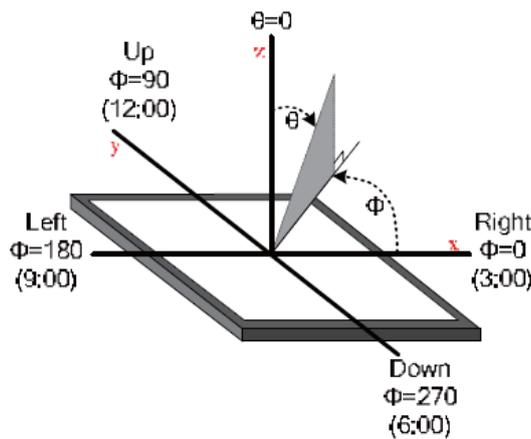*Figure 3.The definition of viewing angle*

7   INTERFACE DESCRIPTION

PIN NO.	SYMBOL	DESCRIPTION
1	VDD	Power Supply
2	GND	Ground
3	SPI_SCLK	SPI SCK Signal, Internally 47k Pull UP
4	MISO/ IO1	SPI MISO Signal / SPI Quad mode: SPI data line 1
5	MOSI/ IO0	SPI MOSI Signal / SPI Quad mode: SPI data line 0
6	CS	SPI Chip Select Signal , Internally 47k Pull UP
7	INT	Interrupt Signal, Active Low, Internally 47k Pull UP
8	PD	Power Down Signal, Active Low, Internally 47k Pull UP
9	NC	Not Connected
10	AUDIO_OUT	Audio Out Signal
11	GPIO0/IO2	SPI Single mode: General purpose IO0/ SPI Quad mode: SPI data line 2
12	GPIO1/IO3	SPI Single mode: General purpose IO1/ SPI Quad mode: SPI data line 3
13	GPIO2	General purpose IO2
14	GPIO3	General purpose IO3 or analog input for ADC
15	NC	Not Connected
16	NC	Not Connected
17	BLVDD	Backlight Power Supply, Can Be Connected to VDD
18	BLVDD	Backlight Power Supply, Can Be Connected to VDD
19	BLGND	Backlight Ground, Internally connected to GND
20	BLGND	Backlight Ground, Internally connected to GND

8   FT812 CONTROLLER SPECIFICATIONS

FT812 or EVE (Embedded Video Engine) simplifies the system architecture for advanced human machine interfaces (HMIs) by providing functionality for display, audio, and touch as well as an object oriented architecture approach that extends from display creation to the rendering of the graphics.

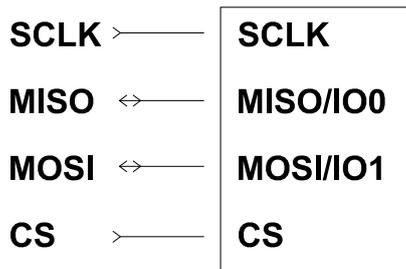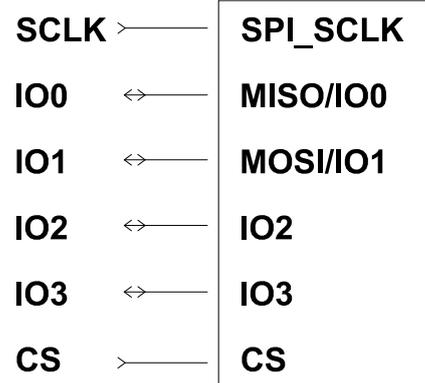## 8.1   Serial host interface

Figure 4.SPI interface connection   *Figure 5. QSPI interface connection*

SCLK	SCLK		SCLK	SPI_SCLK
MISO	MISO/IO0		IO0	MISO/IO0
MOSI	MOSI/IO1		IO1	MOSI/IO1
CS	CS		IO2	IO2
			IO3	IO3
			CS	CS

SPI Interface – the SPI slave interface operates up to 30MHz.
Only SPI mode 0 is supported. The SPI interface is selected by default (MODE pin is internally pulled low by 47k resistor).

QSPI Interface – the QSPI slave interface operates up to 30MHz. Only SPI mode 0 is supported. The QSPI can be configured as a SPI slave in SINGLE, DUAL or QUAD data bus modes.

By default the SPI slave operates in the SINGLE channel mode with MOSI as input from the master and MISO as output to the master. DUAL and QUAD channel modes can be configured through the SPI slave itself. To change the channel modes, write to register REG_SPI_WIDTH.

8.2 Block Diagram

Figure 6. FT812 Block diagram
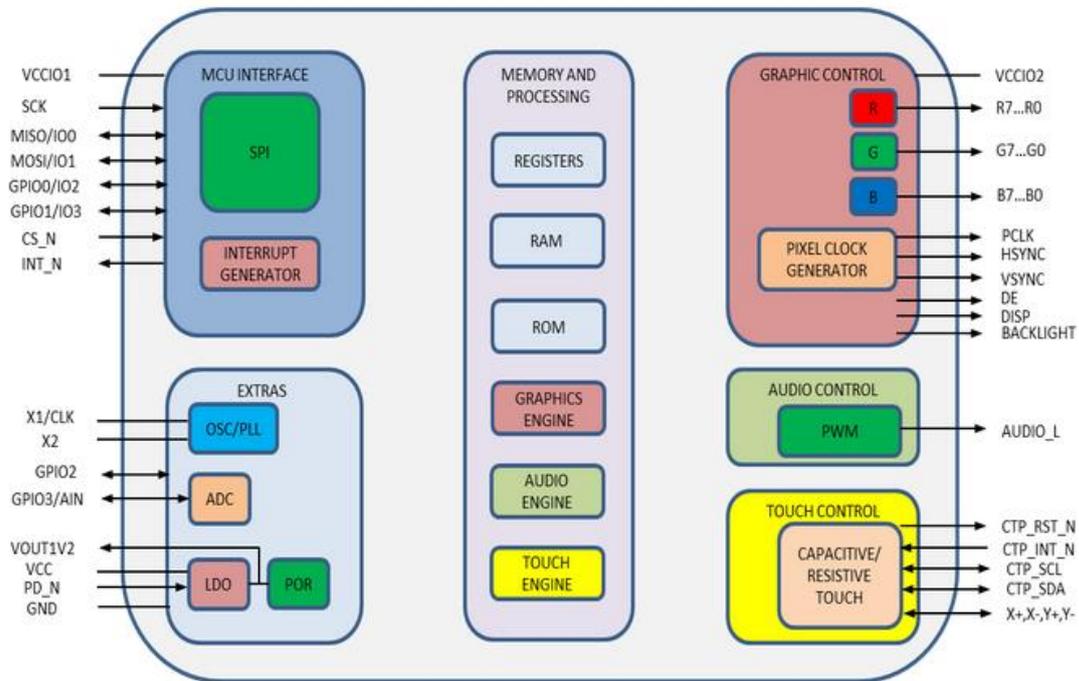
8.3 Host interface SPI mode 0

Figure 7. SPI timing diagram
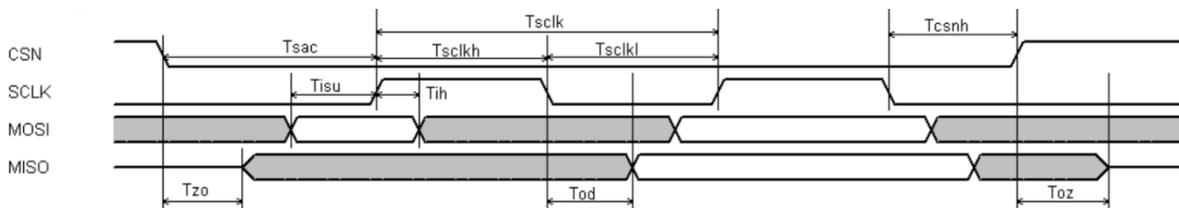
For more information about FT812 controller please go to official FT81x website.
http://www.ftdichip.com/Products/ICs/FT81X.html

8.4 Backlight driver block diagram

Backlight enable signal is internally connected to FT812 Backlight control pin. This pin is controlled by two FT812's registers. One of them specifies the PWM output frequency, second one specifies the duty cycle. Refer to FT812 datasheet for more information.

Figure 8. Backlight driver block diagram
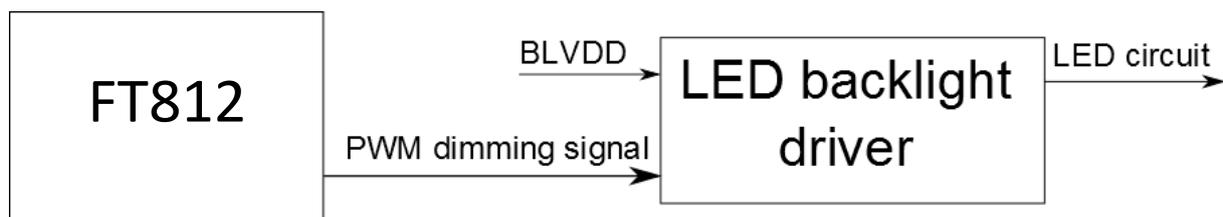
9   LCD TIMING CHARACTERISTICS

9.1   Clock and data input time diagram

Figure 9. Horizontal input timing diagram

Figure 10. Vertical input timing diagram
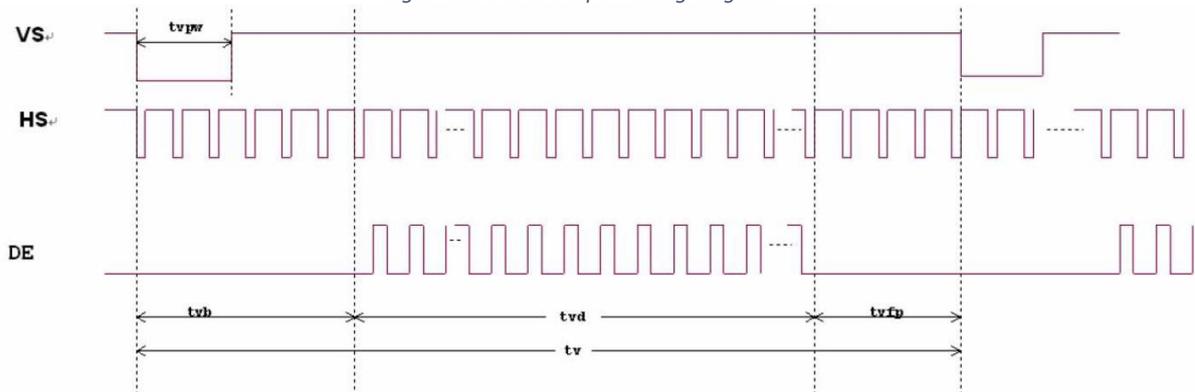
9.2   Parallel RGB input timing table

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
DCLK Frequency	Fclk	26	30	36	MHz
VSD Period Time	tv	515	525	535	TH
VSD Display Area	tvd		480		TH
VSD Blanking	tvb		10		TH
VSD Front Porch	tvfp	12	22	32	TH
VSD Pulse Width	tvpw	-	13	-	TH
HSD Pulse Width	thpw	-	30	-	DCLK
HSD Period Time	th	1026	1056	1086	DCLK
HSD Display Area	thd		800		DCLK
HSD Blanking	thb		16		DCLK
HSD Front Porch	thfp	180	210	240	DCLK

10 INSPECTION

Standard acceptance/rejection criteria for TFT module.

10.1 Inspection condition

Ambient conditions:

- Temperature: 25±°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°
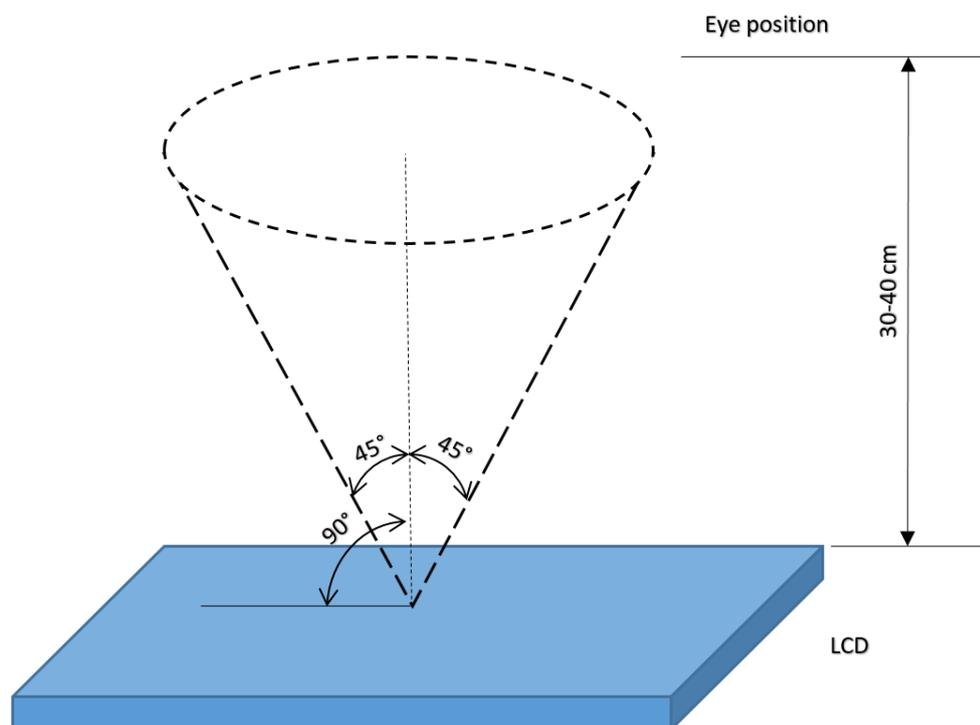
10.2 Inspection standard

Item	Criterion		
Black spots, white spots, light leakage, Foreign Particle (round Type)	$$D = \frac{(x + y)}{2}$$ *Spots density: 10 mm	(tables below)	
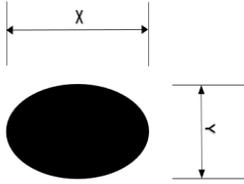
Size < 5"	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm ≤ D <0.3 mm	N≤4
0.3mm ≤ D <0.4 mm	N≤0
D ≥ 0.4 mm	0
Max quantity of the impurities :	4

5" ≤ size ≤ 13"	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm ≤ D <0.3 mm	N≤4
0.3mm ≤ D <0.4 mm	N≤1
D ≥ 0.4 mm	N=0
Max quantity of the impurities	4

size>13"	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm ≤ D <0.3 mm	N≤5
0.3mm ≤ D <0.4 mm	N≤2
D ≥ 0.4 mm	N≤1
Max quantity of the impurities	5

LCD black spots, white spots, light leakage (line Type)
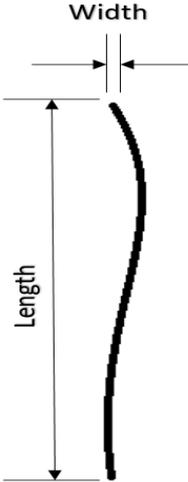
*Spots density: 10 mm

Size < 5"		
Length	Width	Qualified Qty
-	W< 0.02	Ignored
L < 3.0	0.02 < W <0.05	2
L < 2.5	0.05 < W <0.08	
-	0.08 < W	0

Size >= 5"		
Length	Width	Qualified Qty
-	W< 0.02	Ignored
L < 3.0	0.02 < W <0.05	4
L < 2.5	0.05 < W <0.08	
-	0.08 < W	0

Item	Criterion
Clear spots	

Size < 5"	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm < D < 0.3 mm	3
0.3 mm < D < 0.5 mm	2
0.5 mm < D	0

Size >= 5"	
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

Item	Criterion
Polarizer bubbles	

Size < 5"	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm < D < 0.5 mm	3
0.5 mm < D < 1 mm	2
1 mm < D	0
Total Q'ty	3

Size >= 5"	
Average Diameter	Qualified Qty
D<0.25 mm	Ignored
0.25 mm < D < 0.5 mm	3
0.5 mm < D	0

Item	Criterion
Electrical Dot Defect	

Size < 5"	
item	Qualified Qty
Black do defect	4
Bright dot defect	2
Total Dot	5

Size >= 5"	
item	Qualified Qty
Black do defect	5
Bright dot defect	2
Total Dot	5

Item	Criterion
Touch panel spot	

Size < 5"	
Average Diameter	Qualified Qty
D < 0.2 mm	Ignored
0.2 mm < D < 0.4 mm	5
0.4 mm < D < 0.5 mm	2
0.5 mm < D	0

Size >= 5"	
Average Diameter	Qualified Qty
D<0.25 mm	Ignored
0.25 mm < D < 0.5 mm	4
0.5 mm < D	0

Item	Criterion
Touch panel White Line Scratch	

Size < 5"		
Length	Width	Qualified Qty
-	W< 0.02	Ignored
L < 3.0	0.02 < W <0.05	2
L < 2.5	0.05 < W <0.08	
-	0.08 < W	0

Size >= 5"		
Length	Width	Qualified Qty
-	W< 0.03	Ignored
L < 5.0	0.03 < W <0.05	2
-	0.05 < W	0

11 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION
1	High Temperature Storage	80±2°C/240hours
2	Low Temperature Storage	-30±2°C/240hours
3	High Temperature Operating	70±2°C/240hours
4	Low Temperature Operating	-20±2°C/240hours
5	High Temperature and High Humidity Operation Test	60°C ±5°C × 90%RH/240hours
6	Thermal Shock Test (Non-operating)	-30±2°C~25~80±2°C × 20 cycles (30min.) (5min.) (30min.)
7	Vibration Test (Non- Operating Test)	Frequency 10Hz~55Hz Amplitude of vibration: 1.5mm Sweep Time: 11 mins Test Period: 6 cycles for X, Y, Z each direction.
8	Shock Test (Non- Operating Test)	100 G/ 6Ms. Direction: ±X, ±Y, ±Z Cycle: 3 Times
9	Package Drop Test	Height:60 cm 1 corner,3 edges,6 surfaces
10	ESD Test	R: 330Ω, C:150pF, 5points/panel Air: ±8KV, 5times; Contact: ±4KV, 5times; (Environment: 15°C~35°C, 30%~60%, 86Kpa~106Kpa)

11 RELIABILITY TEST

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