

RGB 5"



This datasheet gives detailed information about the Riverdi 5" TFT displays with RGB interface. The displays come in different versions: with **capacitive, resistive, or no touchscreen**, with a decorative **cover glass**, as well as with or without a **metal mounting frame**

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Rev.1.0
2019-06-07

ITEM	CONTENTS	UNIT
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LCD Type		TFT/Transmissive/Normally white	/
Size		5.0	Inch
Viewing Direction		12:00 (without image inversion)	O' Clock
Gray Scale Inversion Direction		6:00	O' Clock
Number of Dots		800 x (RGB) × 480	/
Driver IC		HX8664B+HX8264D	/
Interface Type		24bit RGB	/
Brightness	no touch module	600	cd/m2
	CTP module	510	
	RTP module	480	
Color Depth		16.7M	/
Pixel Arrangement		RGB Vertical Stripe	/
Surface Treatment		Anti-glare / Clear (for CTP)	/
Input Voltage		3.3	V

Note 1: RoHS, REACH SVHC compliant

Note 2: LCM weight tolerance: ± 5%.

Revision Record

REV NO.	REVDATE	CONTENTS	REMARKS
1.0	2019-06-07	Initial Release	

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1. Module classification information

RV	T	50	x	Q	T	x	W	x	0x
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

1.	BRAND	RV – Riverdi
2.	PRODUCT TYPE	T – TFT Standard
3.	DISPLAY SIZE	50 – 5.0”
4.	MODEL SERIAL NO.	x (A-Z)
5.	RESOLUTION	Q– 800×480 px
6.	INTERFACE	T– LCD TFT
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	0x (00-99)

2. Assembly guide – integration



Three options of rear side adhesive tape are available: double side adhesive tape 0.2 mm with 3M 467MP glue, foam double side adhesive tape 0.5 mm with DST 3M 9495LE glue or without any tape.

There are also two versions of glass color: black and white.

Rear side adhesive tape options:

		
Double side adhesive tape with DST 3M 9495LE glue (total thickness 0.2mm)	Foam double side adhesive tape with 3M 9495LE glue (total thickness 0.5mm)	Without tape

Cover glass color options:

	
BLACK	WHITE

Product options:

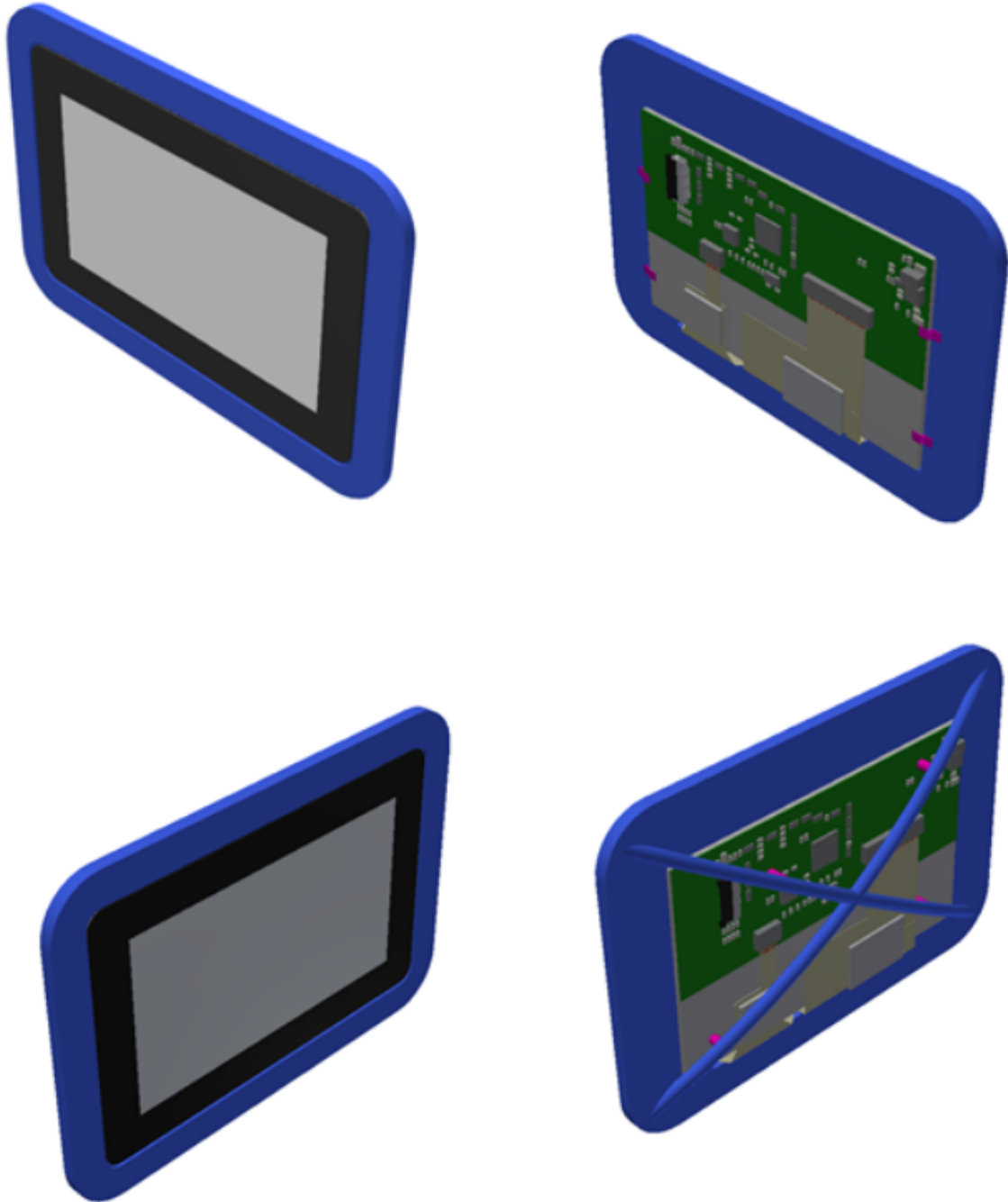
PART NUMBER	DESCRIPTION
RVT50UQTNWC00	RGB, CTP uxTouch, black cover glass, 0.2mm DST
RVT50UQTNWC01	RGB, CTP uxTouch, black cover glass, 0.5 mm DST
RVT50UQTNWC02	RGB, CTP uxTouch, black cover glass, no DST
RVT50UQTNWC03	RGB, CTP uxTouch, white cover glass, 0.2mm DST
RVT50UQTNWC04	RGB, CTP uxTouch, white cover glass, 0.5 mm DST
RVT50UQTNWC05	RGB, CTP uxTouch, white cover glass, no DST

2.1. UxTouch assembly

UxTouch are LCD TFT displays with specially designed projected capacitive touch panels. UxTouch display can be mounted without any hole 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" and 7.0" display sizes.

UxTouch models with double-side adhesive tape (PN with endings 00, 01, 03, 04) can be mounted by connecting the glass to the housing. Riverdi recommends to use 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 and Figure 2 below show examples of using support elements.

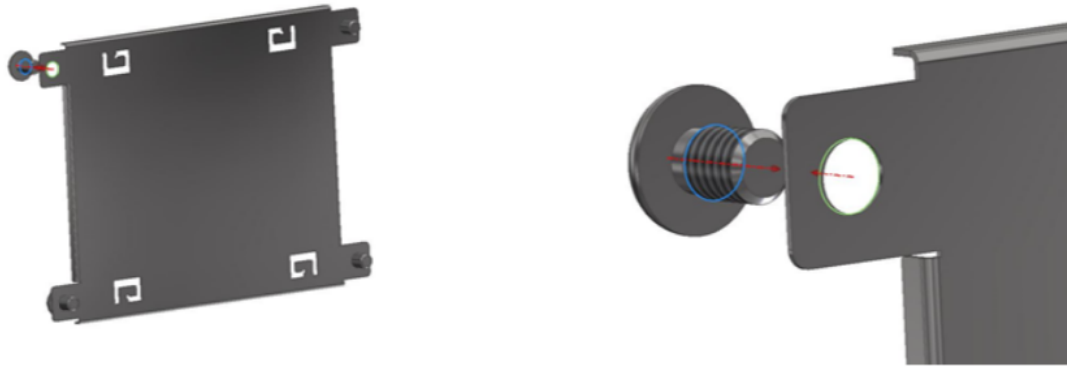
Figure 1. Example of using support brackets



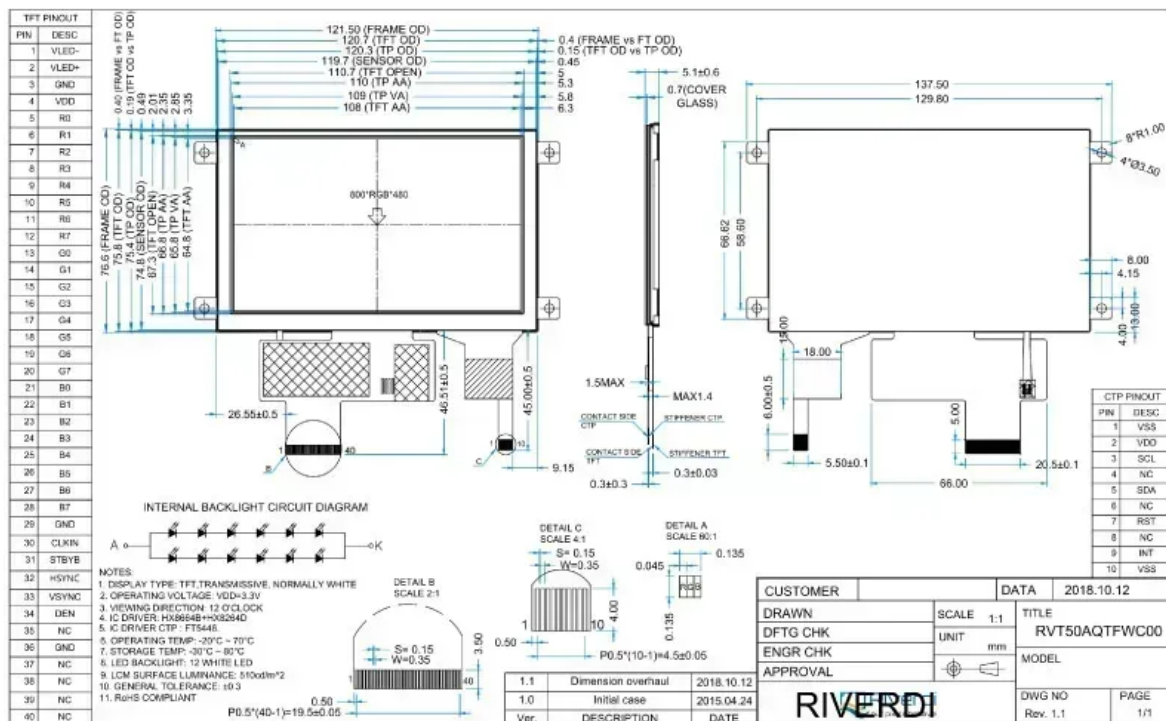
2.2. Mounting frame

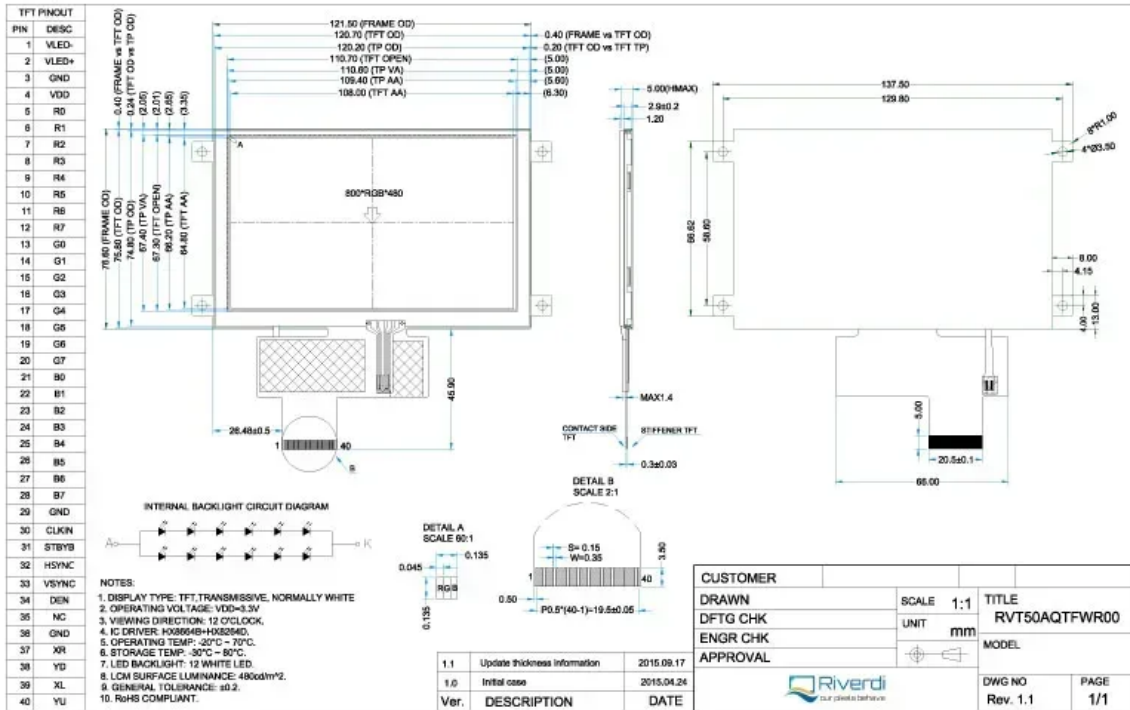
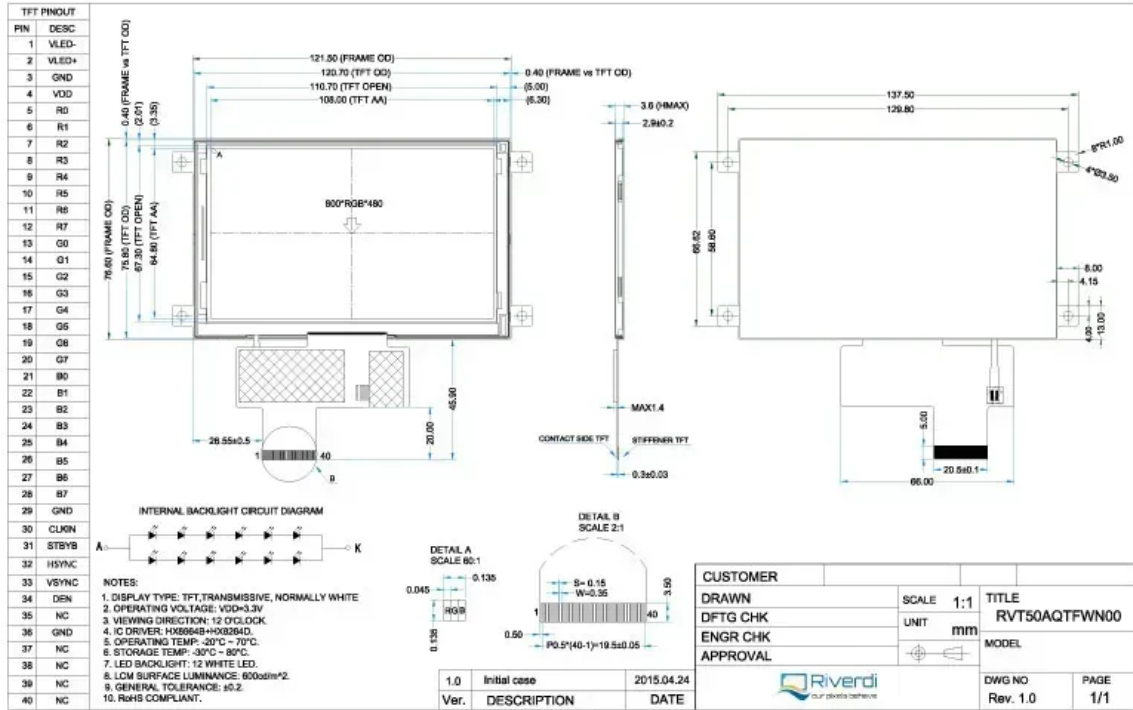
For dimensions 3.5", 4.3", 5.0" and 7.0" the product with mounting frame version is available. Thanks to the four catches attached to the side, frame provides strong assembly to the surface by mounting element (like the screw, see Figure 3). The frames are specially designed to fit Riverdi products perfectly. The diameter of the mounting hole is 3.5mm.

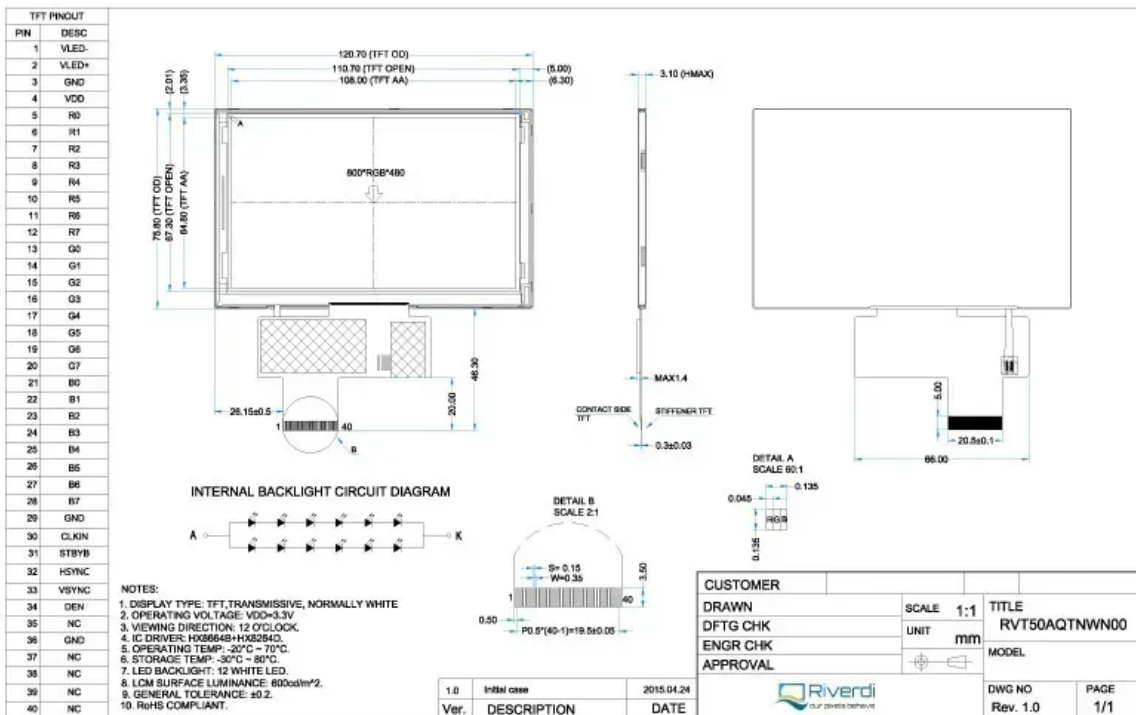
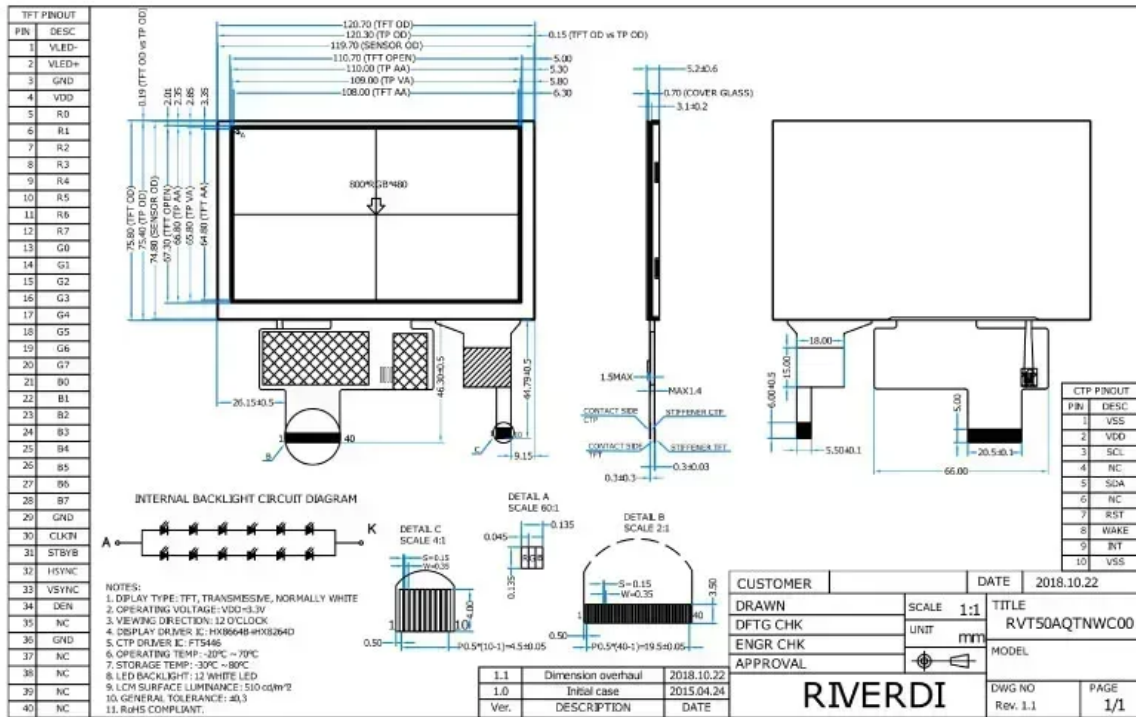
Figure 2. Mounting frame

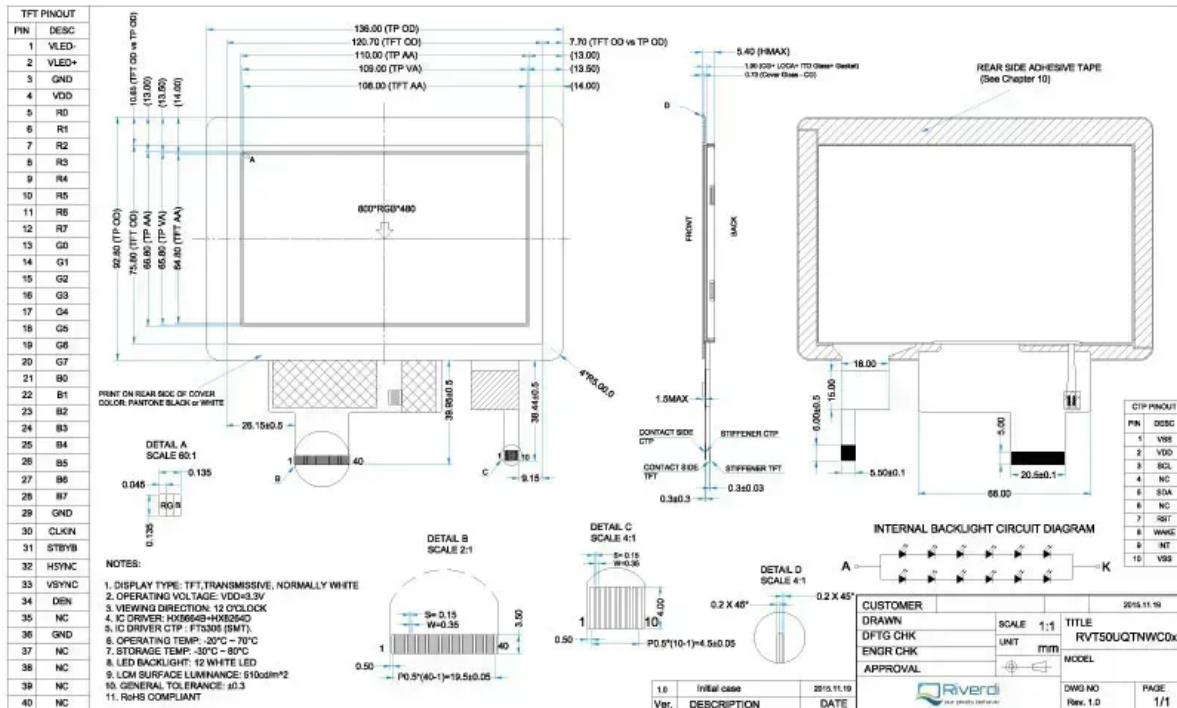
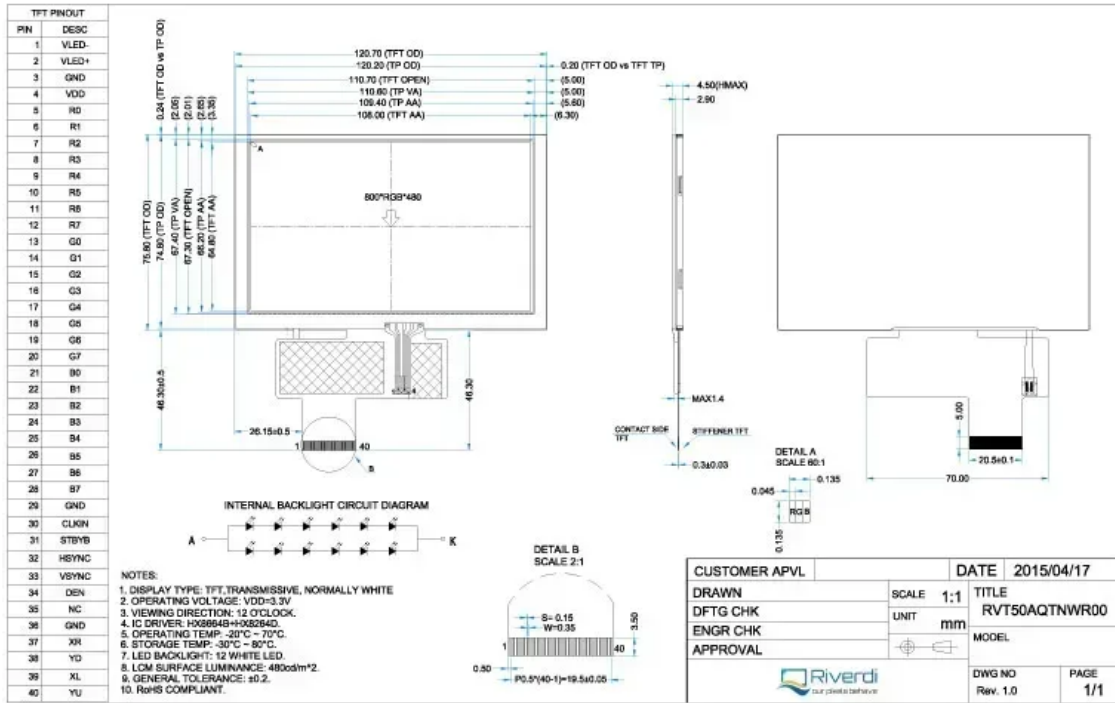


3. Drawings









4. Absolute maximum ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage for Logic	VDD	-0.3	4.0	V
Input Voltage for Logic	VIN	VSS-0.5	VDD+0.3	V
LED forward current	IF	–	60	mA
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Humidity	RH	–	90% (Max 60°C)	RH

5. Electrical characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Supply Voltage For Module	VDD	3.0	3.3	3.6	V	
Input Voltage 'H' level	Vih	0.8VDD	–	VDD	V	
Input Voltage 'L' level	Vil	-0.3	–	0.2VDD	V	
Voltage for LED backlight	Vi	17.4	18.3	19.6	V	
Current for LED backlight	Ii	30	40	50	mA	
Power consumption	Wbl	522	732	980	mW	
LED Life Time	–	30000	50000	–	Hrs	Note1

Note 1: 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	$\theta=0^\circ$ $\phi=0^\circ$ Ta=25	–	20	–	ms	Figure 4	4
Contrast Ratio	Cr		–	500	–	—	Figure 5	1
Luminance Uniformity	δ WHITE		75	80	–	%	Figure 5	3
Surface Luminance	TFT		540	600	–	cd/m2	Figure 5	2
	TFT+CTP		500	540	–			
	TFT+RTP		450	500	–			
Viewing Angle Range	θ	$\phi = 90^\circ$	40	50	–	deg	Figure	6
		$\phi = 270^\circ$	60	70	–	deg	Figure 6	
		$\phi = 0^\circ$	60	70	–	deg	Figure	
		$\phi = 180^\circ$	60	70	–	deg	Figure 6	

CIE (x, y) Chromaticity	Red	x	$\theta=0^\circ$ $\phi=0^\circ$ $T_a=25$	0.54	0.59	0.64	Figure 5	5
		y		0.3	0.35	0.4		
	Green	x		0.298	0.348	0.398		
		y		0.52	0.57	0.62		
	Blue	x		0.095	0.145	0.195		
		y		0.06	0.11	0.16		
	White	x		0.27	0.32	0.37		
		y		0.31	0.36	0.41		

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 .

$$L_v = \text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}$$

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 maximum luminance of 5 points luminance by minimum 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, T_r) and from black to white (Decay Time, T_f). For additional information see FIG 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 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.

Note 8. For TFT module, Gray scale reverse occurs in the direction of panel viewing angle.

Figure 3. The definition of response time

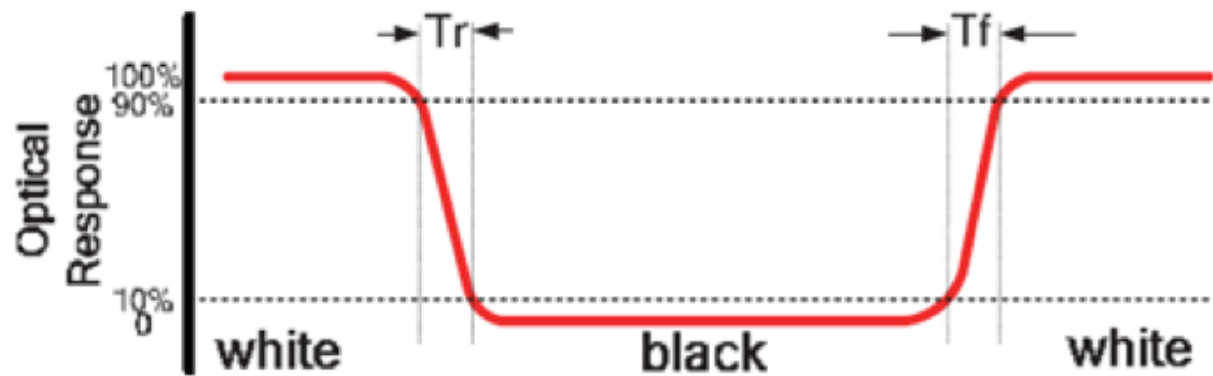


Figure 4. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

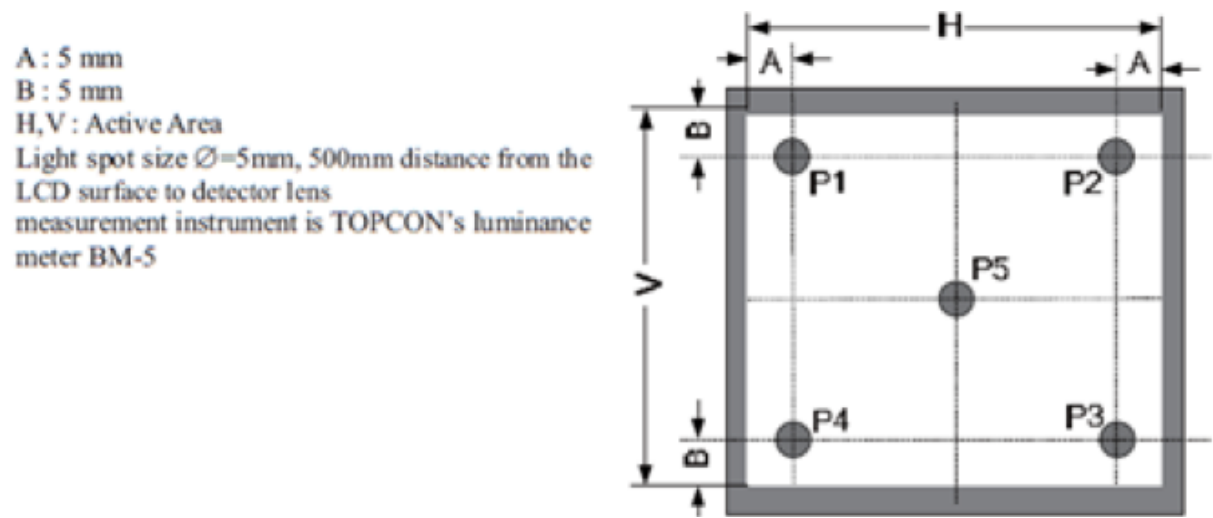
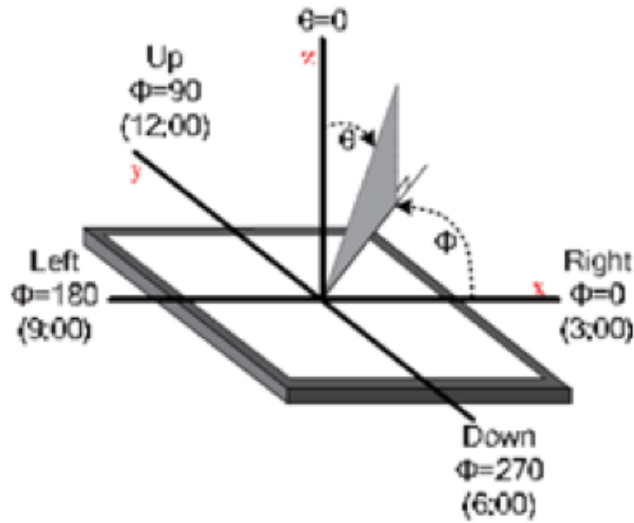


Figure 5. The definition of viewing angle

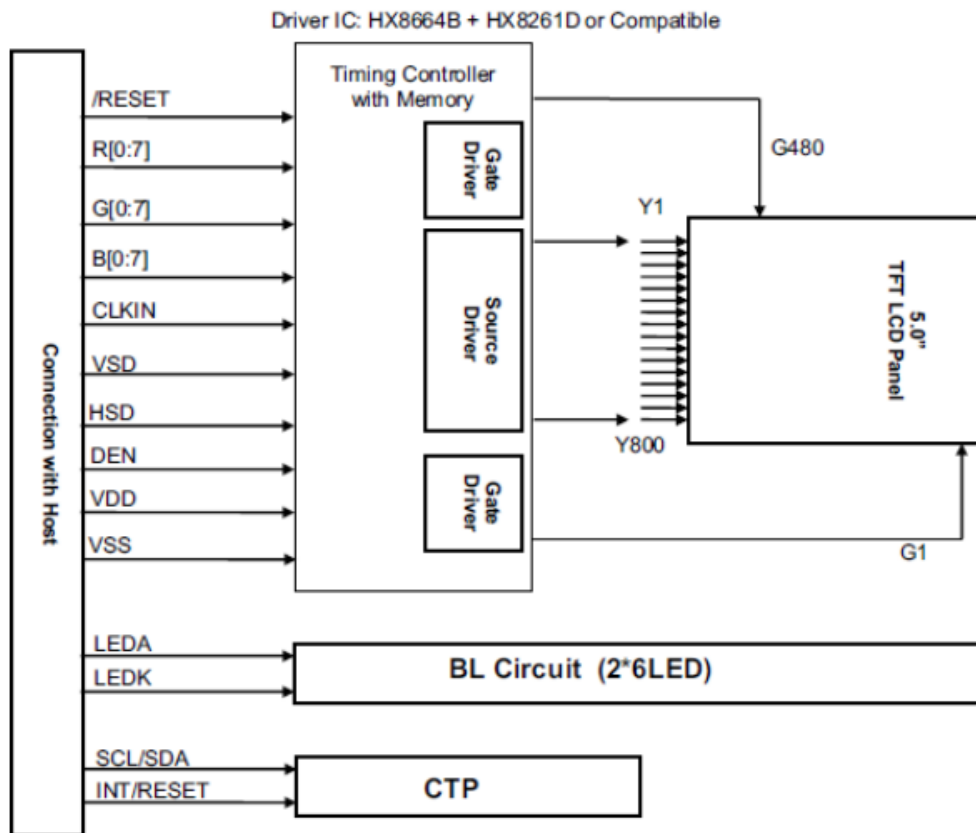


7. Interface description

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	VLED-	Back Light Power Ground	
2	VLED+	Back Light Power Supply	
3	GND	Power Ground	
4	VDD	Power Supply Voltage	
5-12	R0-R7	Red Data	
13-20	G0-G7	Green Data	
21-28	B0-B7	Blue Data	
29	GND	Power Ground	
30	CLKIN	Dot Clock Signal	
31	STBYB	Standby mode control pin	
32	HSYNC	Horizontal Synchronized Signal input	
33	VSYSN	Vertical Synchronized Signal input	
34	DEN	Data Enable	
35	NC	NC	
36	GND	Power Ground	
37	NC (for CTP and no touch module)	No connection	
	XR (for RTP module)	X-Right	
38	NC (for CTP and no touch module)	No connection	
	YD (for RTP module)	Y-Bottom	
39	NC (for CTP and no touch module)	No connection	
	XL (for RTP module)	X-Left	
40	NC (for CTP and no touch module)	No connection	

Note: For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If ENB signal is fixed low. SYNC mode is used. Otherwise, DEN+SYNC is used.

Figure 6. Block diagram



7.1. CTP interface

PIN NO.	SYMBOL	DESCRIPTION	REMARK
1	VSS	Power Ground	
2	VDD	Power for CTP	
3	SCL	I ² C SCL	
4	NC	No Connect	
5	SDA	I ² C SDA	
6	NC	No Connect	
7	/RST	Reset pin	
8	NC	No Connect	
9	/INT	Interrupt signal from CTP	
10	VSS	Power Ground	

8. Timing characteristics

8.1. LCD

8.1.1. Parallel RGB input timing table

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Horizontal Display Area	Thd	–	800	–	DCLK
DCLK Frequency	Fclk	–	30	50	MHz
One Horizontal Line	Th	889	928	1143	DCLK
HS pulse width	Thpw	1	48	255	DCLK
HS Blanking	Thb	–	88	–	DCLK
HS Front Porch	Thfp	1	40	255	DCLK
Vertical Display Area	Tvd	–	480	–	TH
VS period time	Tv	513	525	767	TH
VS pulse width	Tvpw	3	3	255	TH
VS Blanking	Tvb	–	32	–	TH
VS Front Porch	Tvfp	1	13	255	TH

8.1.2. Clock and data input time diagram

Figure 7. Clock and data input time diagram

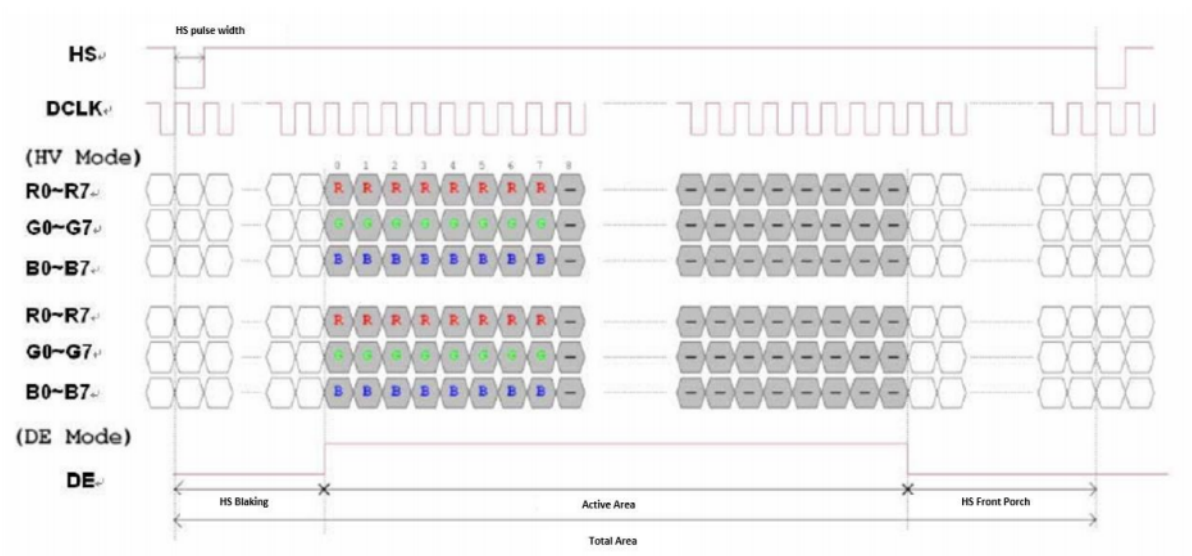
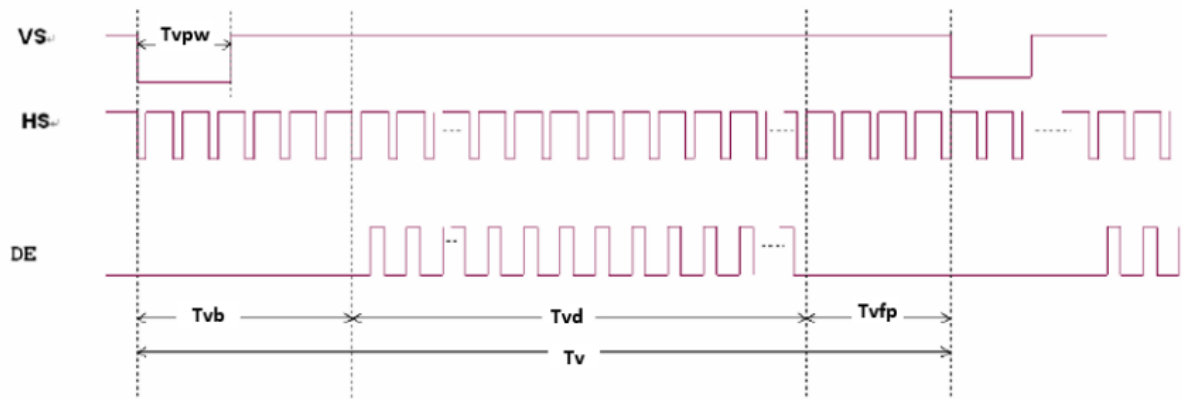


Figure 8. Vertical input timing diagram



8.1.3. AC electrical characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
HS setup time	T_{hst}	8	–	–	ns	
HS hold time	T_{hhd}	8	–	–	ns	
VS setup time	T_{vst}	8	–	–	ns	
VS hold time	T_{vhd}	8	–	–	ns	
Data setup time	T_{dsu}	8	–	–	ns	
Data hold time	T_{dhd}	8	–	–	ns	
DE setup time	T_{esu}	8	–	–	ns	
DE hold time	T_{ehd}	8	–	–	ns	
DV _{DD} Power On Slew rate	T_{POR}	–	–	20	ns	From 0 to 90% DV _{DD}
RESET pulse width	T_{Rst}	10	–	–	ns	
DCLK cycle time	T_{coh}	20	–	–	ns	
DCLK pulse duty	T_{cwh}	40	50	60	%	

8.2. CTP

8.2.1. CTP interface timing characteristics

PARAMETER	MIN	MAX	UNIT
SCL Frequency	0	400	kHz
Bus Free Time Between a STOP and START Condition	4.7	/	μ s
Hold Time (repeated) START Condition	4.0	/	μ s
Data Setup Time	250	/	ns
Setup Time for Repeated START Condition	4.7	/	μ s

Setup Time for STOP Condition	4.0	/	μ s
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8.2.2. CTP timing configuration

Figure 9. I2C Serial Data Transfer Format

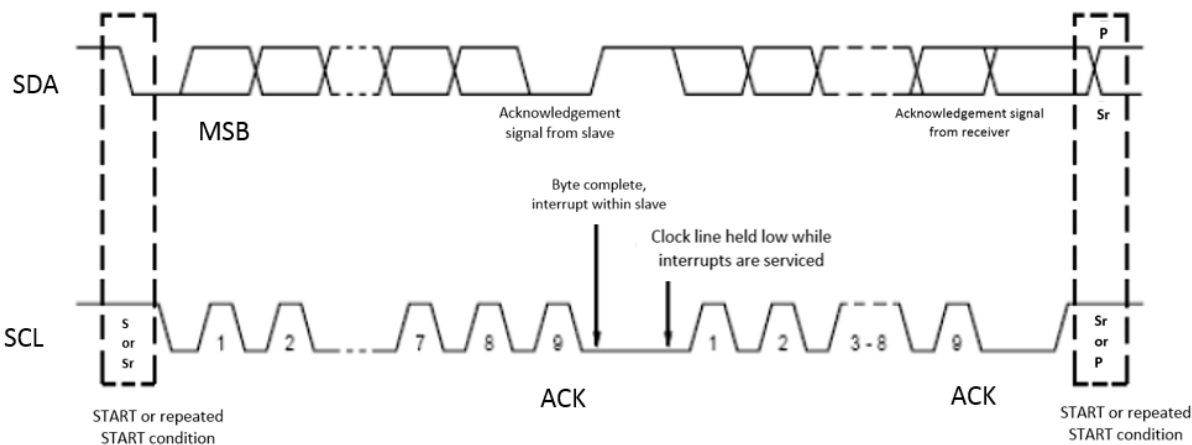


Figure 10. I2C master write, slave read

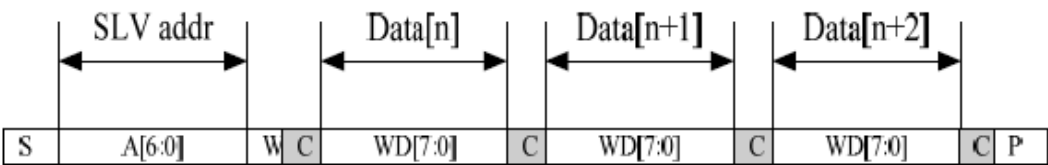
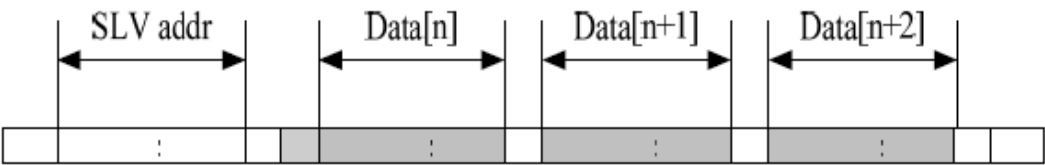


Figure 11. I2C master read, slave write



MNEMONICS	DESCRIPTION
S	I2C Start or I2C Restart
A [6:0]	Slave address
	A [6:4]: 3'b011

1Bh	TOUCH5_XH	5 th Event Flag		5 th Touch X Position[11:8]	R
1Ch	TOUCH5_XL	5 th Touch X Position[7:0]			R
1Dh	TOUCH5_YH	5 th Touch ID[3:0]		5 th Touch X Position[11:8]	R
1Eh	TOUCH5_YL	5 th Touch Y Position[7:0]			R

8.2.4 Data description

DEVICE_MODE

This register is the device mode register, configure it to determine the current mode of the chip.

ADRESS	BIT ADDRESS	REGISTER NAME	DESCRIPTION
00h	6:4	Device Mode [2:0]	000b Work Mode 100b Factory Mode – Read Raw Data

GEST_ID

This register describes the gesture of a valid touch.

ADDRESS	BIT ADDRESS	REGISTER NAME	DESCRIPTION
01h	7:0	Gesture ID [7:0]	Gesture ID 0x10 Move Up 0x14 Move Down 0x18 Move Right 0x48 Zoom In 0x49 Zoom Out 0x00 No Gesture

TD_STATUS

This register is the Touch Data status register.

ADDRESS	BIT ADDRESS	REGISTER NAME	DESCRIPTION
02h	3:0	Number of Touch Points [2:0]	How Many Points Detected 1-5 is Valid
	7:4		

TOUCHn_XH(n:1-10)

This register describes MSB of the X coordinate of the nth touch point and the corresponding event flag.

ADDRESS	BIT ADDRESS	REGISTER NAME	DESCRIPTION
03h	7:6	Event Flag	00b: Put Down

~ 39h			01b: Put Up 10b: Contact 11b: Reserved
	5:4		Reserved
	3:0	Touch X Position [11:8]	MSB of Touch X Position in Pixels

TOUCHn_XL(n:1-10)

This register describes LSB of the X coordinate of the nth touch point.

ADDRESS	BIT ADDRESS	REGISTER NAME	DESCRIPTION
04h ~ 3Ah	7:0	Touch X Position [7:0]	LSB of the Touch X Position in Pixels

TOUCHn_YH(n:1-10)

This register describes MSB of the Y coordinate of the nth touch point and corresponding touch ID.

ADDRESS	BIT ADDRESS	REGISTER NAME	DESCRIPTION
05h ~ 3Bh	7:4	Touch ID[3:0]	Touch ID of Touch Point
	3:0	Touch X Position [11:8]	MSB of Touch Y Position in Pixels

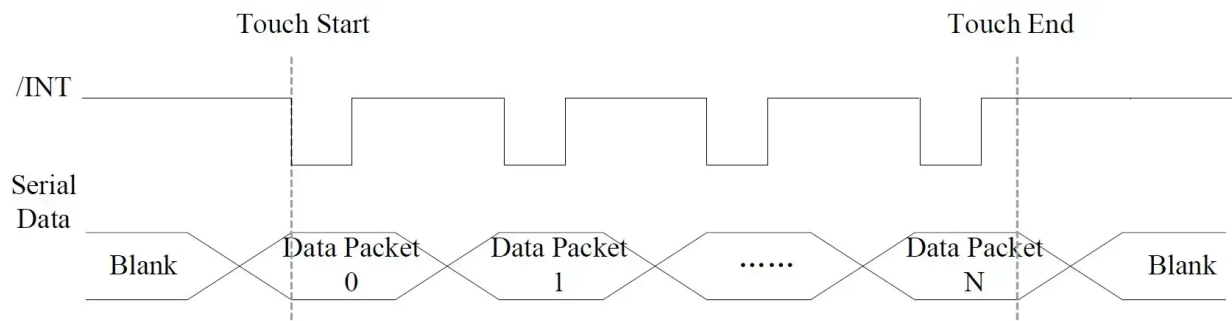
TOUCHn_YL(n:1-10)

This register describes LSB of the Y coordinate of the nth touch point.

ADDRESS	BIT ADDRESS	REGISTER NAME	DESCRIPTION
05h ~ 3Bh	7:0	Touch X Position [7:0]	LSB of the Touch Y Position in Pixels

8.2.5 Interrupt trigger mode

Figure 12. Interrupt trigger mode timing



9. Touch screen panel specification

9.1. Electrical characteristics

9.1.1. Capacitive touch panel

DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.3V
Power Consumption (IDD)	Active Mode	TBDmA
	Sleep Mode	TBDμA
Interface		I2C
Linearity		<1.5%
Controller		FT5446
I2C address		0x38 (7-bit address)
Resolution		800*480

9.1.2. Resistive touch panel

ITEM	VALUE			UNIT	REMARK
	Min.	Typ.	Max.		
Linearity	-1.5	–	1.5	%	Analog X and Y directions
Terminal Resistance	350	–	1000	Ω	X
	100	–	450	Ω	Y
Insulation Resistance	–	–	–	MΩ	DC 25V
Voltage	–	–	10	V	DC
Chattering	–	–	10	ms	100kΩ pull-up
Transparency	80	–	–	%	JIS K7105

Note: Avoid operating with hard or sharp material such as a ball point pen or a mechanical pencil except a polyacetal pen (tip R0.8mm or less) or a finger

9.2. Mechanical characteristic

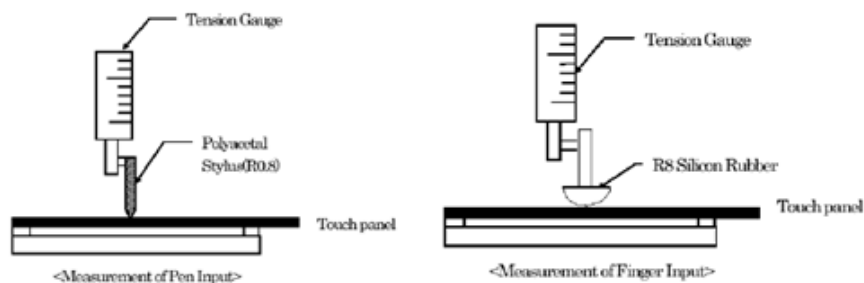
9.2.1. Capacitive touch panel

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	5.0 inch	
Outline Dimension (OD)	120.3mm x 75.4mm	Cover Lens Outline
Outline Dimension (OD) – UxTouch	136.0mm x 92.80mm	Cover Lens Outline
Product Thickness	1.9mm	
Glass Thickness	0.7mm	
Ink View Area	109.0mm x 65.8mm	
Sensor Active Area	110.0mm x 66.8mm	
Input Method	5 Finger	
Activation Force	Touch	
Surface Hardness	≥7H	

9.2.2. Resistive touch panel

ITEM	VALUE			UNIT	REMARK
	Min.	Typ.	Max.		
Activation Force	80	–	–	gf	Note 1
Durability-Surface Scratching	Write 100,000	–	–	characters	Note 2
Durability-Surface Pitting	1,000,000	–	–	touches	Note 3
Surface Hardness	3	–	–	H	JIS K5400

Note 1: Force test condition, Input DC 5V on X direction, Drop off Polyacetal Stylus (R0.8), until output voltage stabilize, then get the R8.0mm Silicon rubber and do finger Activation force test. Next step, 9 points.



Note 2: Measurement surface area conditions, Scratch 100,000 times straight line on the film with a stylus change every 20,000 times with Force: 250gf, Speed: 60mm/sec by R0.8 polaceteal stylus.

Note 3: Pitting test, Pit 1, 000, 000 times on the film with R0.8 silicon rubber with Force: 250gf and Speed: 2 times/sec.

10. Inspection

Standard acceptance/rejection criteria for TFT module.

10.1. Inspection condition

Ambient conditions:

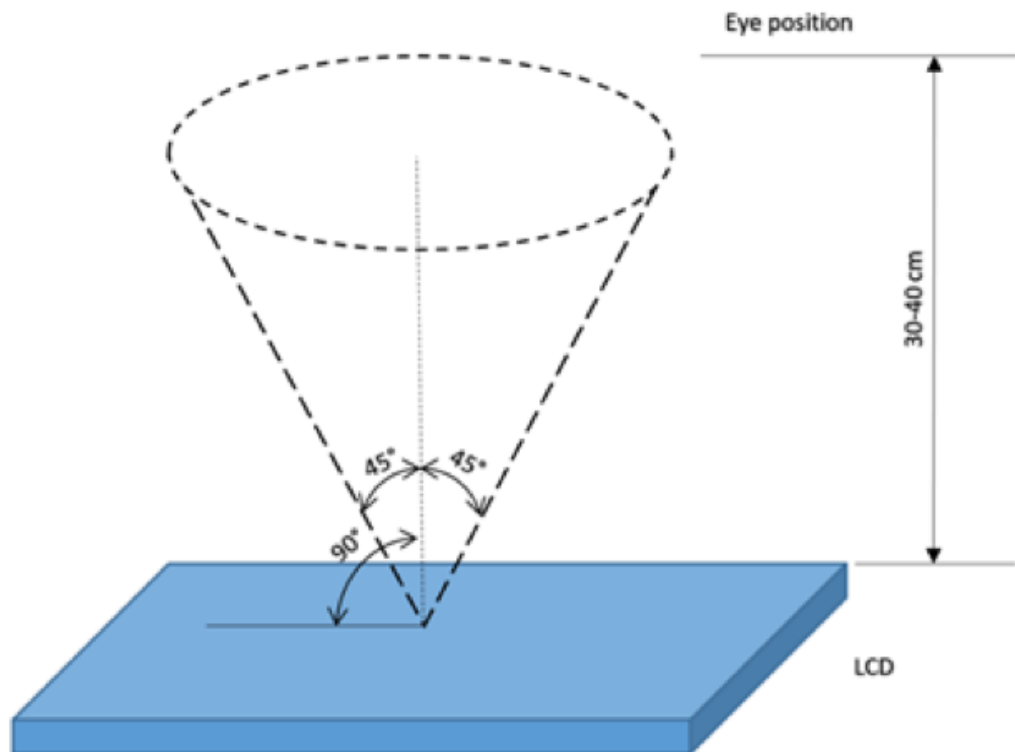
- Temperature: $25\pm^{\circ}\text{C}$
- Humidity: $(60\pm 10)\ \% \text{RH}$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

Viewing distance:

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

Viewing Angle:

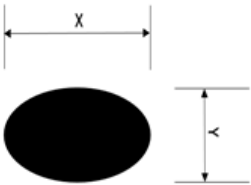
U/D: $45^{\circ}/45^{\circ}$, L/R $45^{\circ}/45^{\circ}$



10.2 Inspection standard

Item	Criterion
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Black spots, white spots, light leakage, Foreign Particle (round Type)

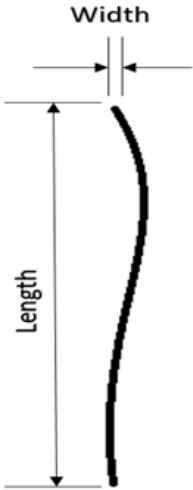


$$D = \frac{(x + y)}{2}$$

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

LCD black spots, white spots, light leakage (line Type)



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"	
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	<table><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>4</td></tr><tr><td>0.3 mm < D < 0.5 mm</td><td>2</td></tr><tr><td>0.5 mm < D</td><td>0</td></tr></table> <p>*Spots density: 10 mm</p>	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														
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Polarizer bubbles	<table><tr><td colspan="2">Size < 5”</td></tr><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 < 0.5 mm</td><td>3</td></tr><tr><td>0.5 mm < D < 1 mm</td><td>2</td></tr><tr><td>1 mm < D</td><td>0</td></tr><tr><td>Total Q’ty</td><td>3</td></tr></table> <table><tr><td colspan="2">Size >= 5”</td></tr><tr><td>Average Diameter</td><td>Qualified Qty</td></tr><tr><td>D<0.25 mm</td><td>Ignored</td></tr><tr><td>0.25 mm < D < 0.5 mm</td><td>3</td></tr><tr><td>0.5 mm < D</td><td>0</td></tr></table>	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
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	0.25 mm < D < 0.5 mm		4
	0.5 mm < D		0
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	Temperature Cycle	-30±2°C~25~80±2°C × 20 cycles (30min.) (5min.) (30min.)
6	Damp Proof Test	60°C ±5°C × 90%RH/240hours
7	Vibration Test	Frequency 10Hz~55Hz Amplitude of vibration : 1.5mm Sweep: 10Hz~55Hz~10Hz, 12min X, Y, Z 2 hours for each direction.
8	Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces
9	ESD Test	Air: ±4KV 150pF/330Ω 5 times Contact: ±2KV 150pF/330Ω 5 time



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Updated on April 30, 2020

← RGB 4.3"

RGB 7" →

Was this article helpful to you

Yes

No