



## RVT50AQTNWC00

### LCD TFT Datasheet

Rev.1.0

2015-08-06

ITEM	CONTENTS	UNIT
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
LCM (W × H × D )	120.70 × 75.80 × 5.00	mm <sup>3</sup>
Active Area (W × H)	108.00 × 64.80	mm <sup>2</sup>
Dot Pitch (W × H)	0.045×0.135	mm <sup>2</sup>
Number Of Dots	800 x (RGB) × 480	/
Driver IC	HX8664B+HX8264D	/
Backlight Type	12 LEDs	/
Surface Luminance	510	cd/m <sup>2</sup>
Interface Type	24bit RGB	/
Color Depth	16.7M	/
Pixel Arrangement	RGB Vertical Stripe	/
Surface Treatment	Clear	
Input Voltage	3.3	V
With/Without TSP	Projected Capacitive Touch Panel	/
Weight	88.66	g

**Note 1:** RoHS compliant

**Note 2:** LCM weight tolerance: ± 5%.

## REVISION RECORD

REVNO.	REVDATE	CONTENTS	REMARKS
1.0	2015-08-06	Initial Release	

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## 1 MODULE CLASSIFICATION INFORMATION

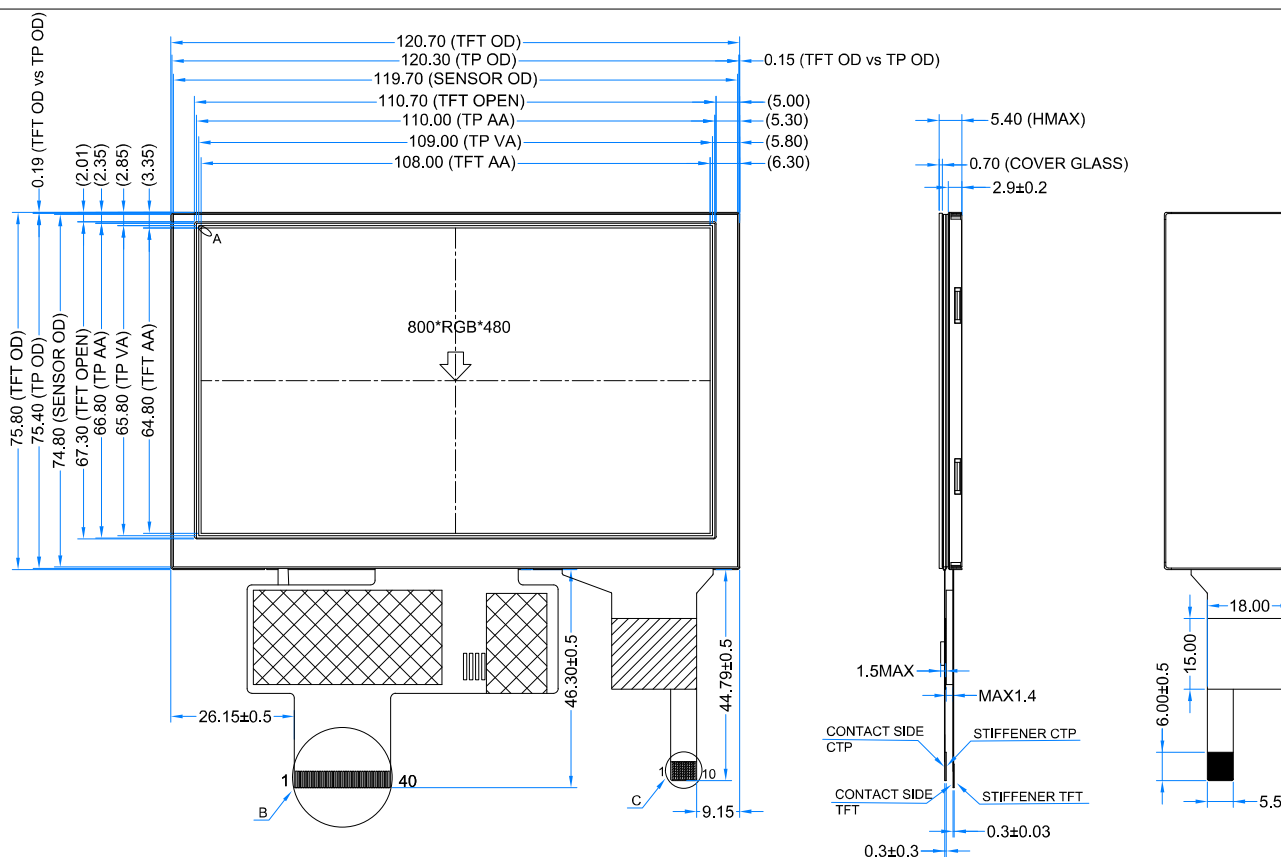
<b>RV</b>	<b>T</b>	<b>50</b>	<b>A</b>	<b>Q</b>	<b>T</b>	<b>N</b>	<b>W</b>	<b>C</b>	<b>00</b>
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

1.	<b>BRAND</b>	<b>RV</b> – Riverdi
2.	<b>PRODUCT TYPE</b>	<b>T – TFT Standard</b> F – TFT Custom
3.	<b>DISPLAY SIZE</b>	35 – 3.5” 43 – 4.3” <b>50 – 5.0”</b> 70 – 7.0”
4.	<b>MODEL SERIAL NO.</b>	<b>A (A-Z)</b>
5.	<b>RESOLUTION</b>	<b>Q– 800x480 px</b>
6.	<b>INTERFACE</b>	<b>T – TFT LCD, RGB</b> L – TFT LCD, LVDS C – TFT + Controller
7.	<b>FRAME</b>	<b>N – No Frame</b> F – Mounting Frame
8.	<b>BACKLIGHT TYPE</b>	<b>W – LED White</b>
9.	<b>TOUCH PANEL</b>	<b>N</b> – No Touch Panel R – Resistive Touch Panel <b>C – Capacitive Touch Panel</b>
10.	<b>VERSION</b>	<b>00 (00-99)</b>

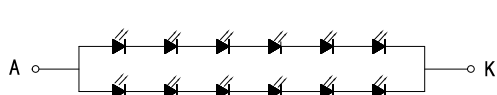
# LCD TFT Datasheet Rev.1.0

## RVT50AQTNWC00

TFT PINOUT	
PIN	DESC
1	VLED-
2	VLED+
3	GND
4	VDD
5	R0
6	R1
7	R2
8	R3
9	R4
10	R5
11	R6
12	R7
13	G0
14	G1
15	G2
16	G3
17	G4
18	G5
19	G6
20	G7
21	B0
22	B1
23	B2
24	B3
25	B4
26	B5
27	B6
28	B7
29	GND
30	CLKIN
31	STBYB
32	HSYNC
33	VSYNC
34	DEN
35	NC
36	GND
37	NC
38	NC
39	NC
40	NC

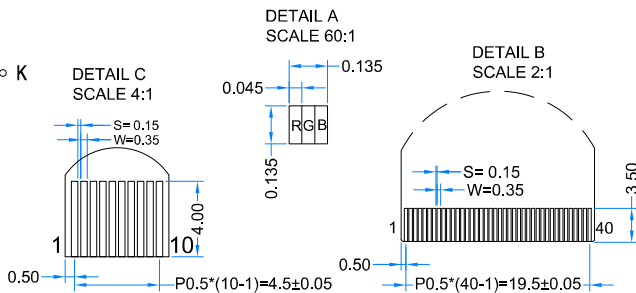


INTERNAL BACKLIGHT CIRCUIT DIAGRAM



NOTES:

1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
2. OPERATING VOLTAGE: VDD=3.3V
3. VIEWING DIRECTION: 12 O'CLOCK
4. IC DRIVER: HX8664B+HX8264D
5. IC DRIVER CTP : FT5306 (SMT).
6. OPERATING TEMP: -20°C ~ 70°C
7. STORAGE TEMP: -30°C ~ 80°C
8. LED BACKLIGHT: 12 WHITE LED
9. LCM SURFACE LUMINANCE: 510cd/m<sup>2</sup>
10. GENERAL TOLERANCE: ±0.3
11. RoHS COMPLIANT



1.0	Initial case	2015.04.24
Ver.	DESCRIPTION	DATE

CUSTOMER
DRAWN
DFTG CHK
ENGR CHK
APPROVAL



### 3 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 (each LED)	IF	-	60	mA
Operating Temperature	T <sub>OP</sub>	-20	70	°C
Storage Temperature	T <sub>ST</sub>	-30	80	°C
Humidity	RH	-	90% (Max 60°C)	RH

### 4 ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Supply Voltage For Module	VDD	3.0	3.3	3.6	V	
Input Leakage Current	I <sub>LKG</sub>	-	-	-	μA	
Input Voltage 'H' level	V <sub>IH</sub>	0.8VDD	-	VDD	V	
Input Voltage 'L' level	V <sub>IL</sub>	-0.3	-	0.2VDD	V	

### 5 BACKLIGHT CHARACTERISTICS

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	V <sub>I</sub>	17.4	18.3	19.6	V
Current for LED backlight	I <sub>I</sub>	30	40	50	mA
Power consumption	W <sub>BL</sub>	522	732	980	mW
LED Life Time	-	30000	50000	-	Hrs

**Note:**

The LED Supply Voltage is defined by the numbers of LED at Ta= 25±2°C and 60%RH±5%.

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

The LED time life will be reduced if LED is driven by high current, high humidity and temperature ambient conditions.

### 6 ELECTRO-OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time	Tr+Tf	θ=0° φ=0° Ta=25	-	20	-	ms	Figure 1	4
Contrast Ratio	Cr		-	500	-	---	Figure 2	1
Luminance Uniformity	δ WHITE		75	80	-	%	Figure 2	3
Surface Luminance	Lv		467	510	-	cd/m <sup>2</sup>	Figure 2	2
Viewing Angle Range	θ	φ = 90°	40	50	-	deg	Figure 3	6
		φ = 270°	60	70	-	deg	Figure 3	
		φ = 0°	60	70	-	deg	Figure 3	
		φ = 180°	60	70	-	deg	Figure 3	
CIE (x, y) Chromaticity	Red	θ=0° φ=0° Ta=25	x	0.540	0.590	0.640	Figure 2	5
			y	0.300	0.350	0.400		
	Green		x	0.298	0.348	0.398		
			y	0.520	0.570	0.620		
	Blue		x	0.095	0.145	0.195		
			y	0.060	0.110	0.160		
	White		x	0.270	0.320	0.370		
			y	0.310	0.360	0.410		

**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.

$L_v$  = 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 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,  $T_r$ ) 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 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.

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

Figure 1. The definition of response time

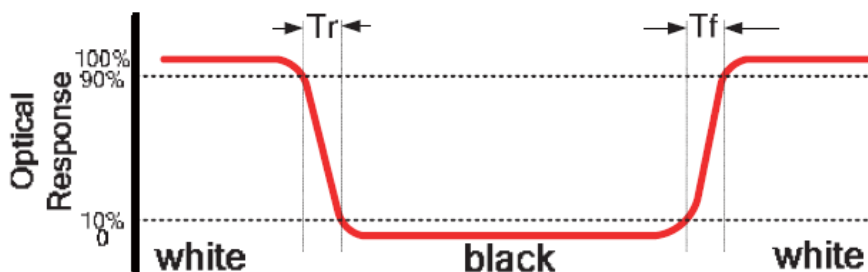


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

A : 5 mm  
 B : 5 mm  
 H, V : Active Area  
 Light spot size  $\varnothing=5\text{mm}$ , 500mm distance from the LCD surface to detector lens  
 measurement instrument is TOPCON's luminance meter BM-5

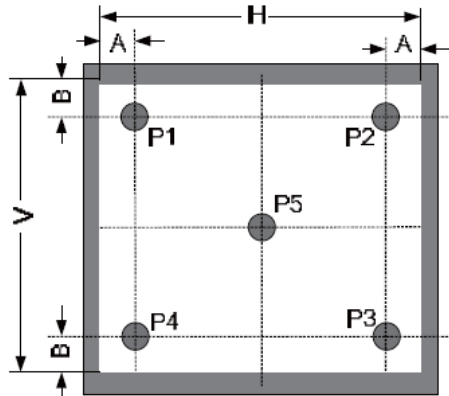
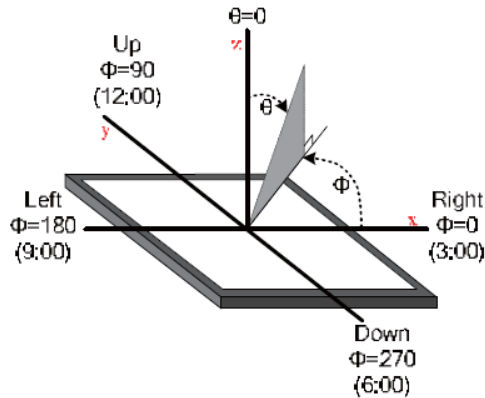


Figure 3. The definition of viewing angle

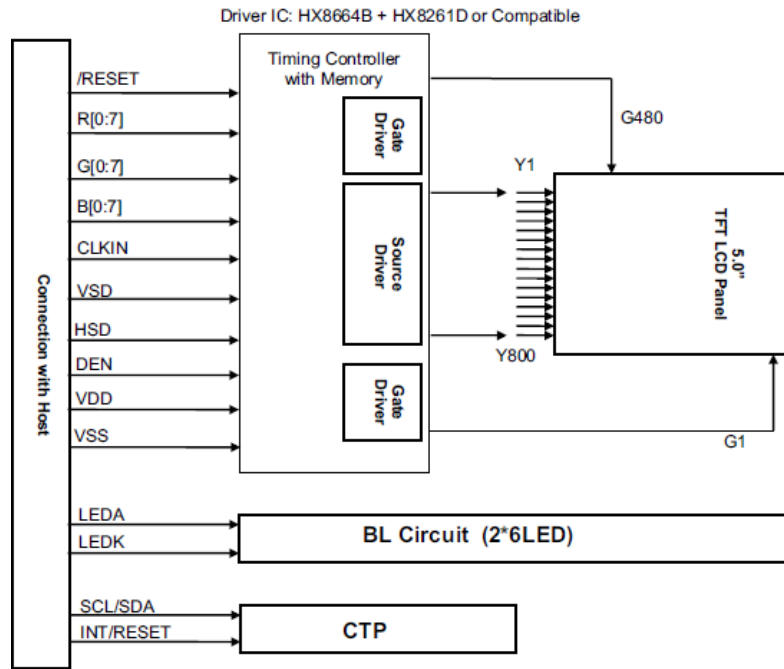


## 7 INTERFACE DESCRIPTION

PIN NO.	SYMBOL	DESCRIPTION	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	VSYNC	Vertical Synchronized Signal input	
34	DEN	Data Enable	
35	NC	NC	
36	GND	Power Ground	
37	NC	No Connect	
38	NC	No Connect	
39	NC	No Connect	
40	NC	No Connect	

**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 4 Block diagram



## 8 LCD TIMING CHARACTERISTICS

### 8.1 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 <sub>DD</sub> Power On Slew rate	$T_{POR}$	-	-	20	ns	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	10	-	-	ns	
DCLK cycle time	$T_{coh}$	20	-	-	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	

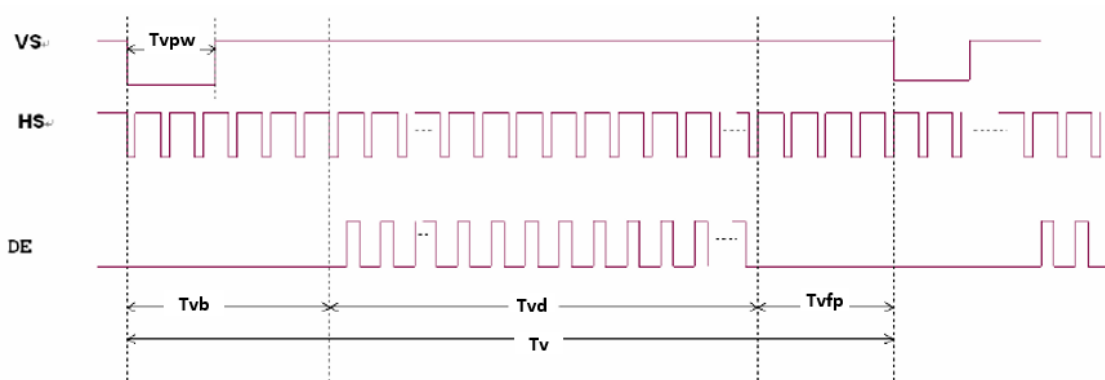


8.2 Clock and data input time diagram

Figure 5. Horizontal input timing diagram



Figure 6. Vertical input timing diagram



8.3 Parallel RGB 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

## 9 CAPACITIVE TOUCH SCREEN PANEL SPECIFICATIONS

### 9.1 Mechanical characteristics

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	5.0 inch	
Outline Dimension (OD)	120.3mm x 75.4mm	Cover Lens Outline
Product Thickness	1.9mm	
Glass Thickness	0.7mm	
Ink View Area	109.00mm x 65.80mm	
Sensor Active Area	110.0mm x 66.8mm	
Input Method	5 Finger	
Activation Force	Touch	
Surface Hardness	≥7H	

### 9.2 Electrical characteristics

DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.3V
Power Consumption (IDD)	Active Mode	TBD mA
	Sleep Mode	TBD $\mu$ A
Interface		I <sup>2</sup> C
Controller		FT5306
I2C address		0x38 (7 bit address)
Resolution		800*480

### 9.3 Interface description

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

9.4 CTP Interface timing characteristics

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

9.5 CTP timing configuration

Figure 7I2C Serial Data Transfer Format

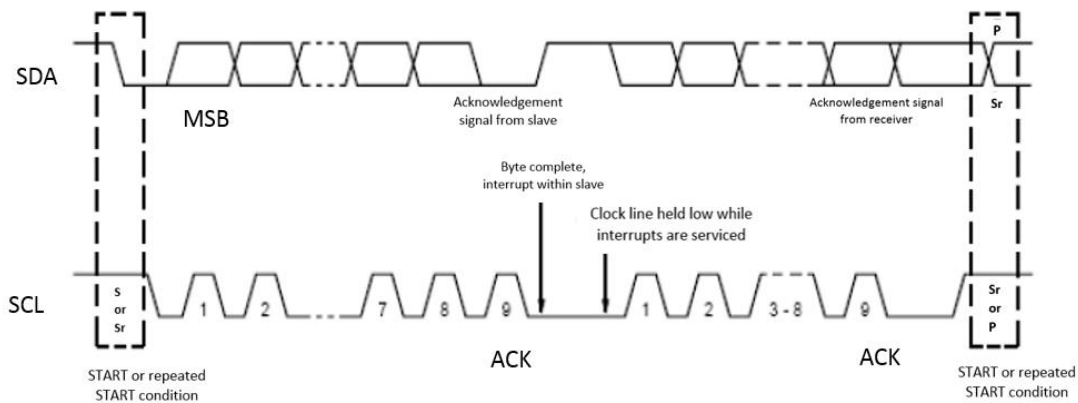


Figure 8. I2C master write, slave read

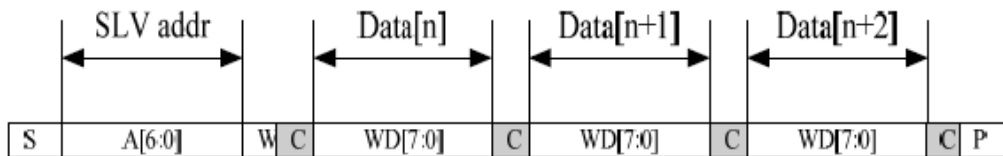
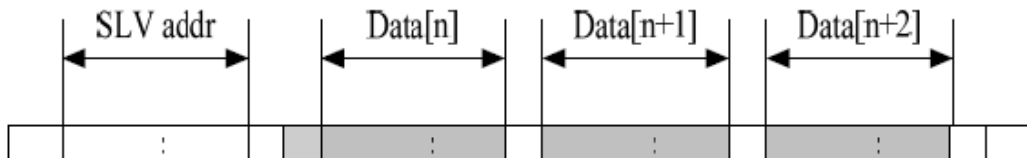


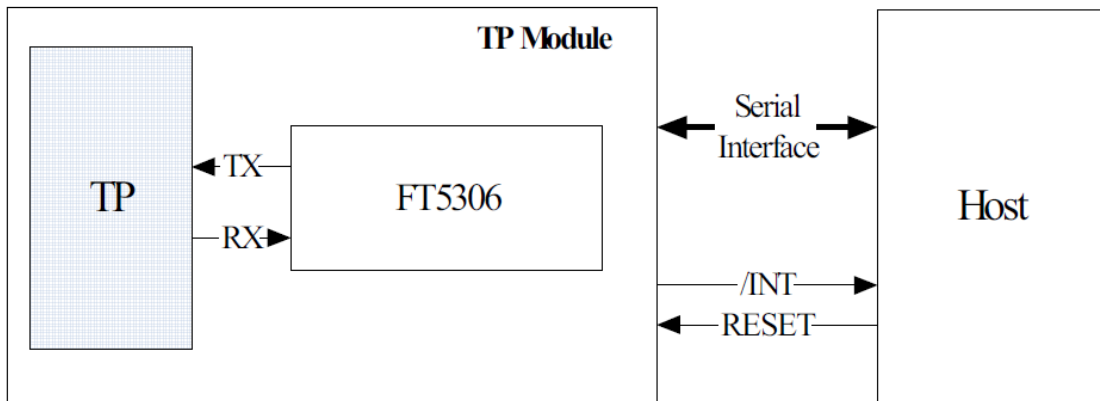
Figure 9. I2C master read, slave write



MNEMONICS	DESCRIPTIO
S	I2C Start or I2C Restart
A[6:0]	Slave address A[6:4]: 3'b011 A[3:0]: data bits are identical to those of I2CCON[7:4] register.
W	1'b0: Write
R	1'b0: Read
C	ACK
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

9.6 Communication of the I<sup>2</sup>C interface with Host

Figure 10 Communication of the I2C interface with Host



9.7 Touch data read protocol

ADDRESS	NAME	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0	HOST ACCESS
00h	DEVIDE_MODE	Device Mode[2:0]								RW
01h	GEST_ID	Gesture ID[7:0]								R
02h	TD_STATUS					Number of touch points[3:0]				R
03h	TOUCH1_XH	1 <sup>st</sup> Event Flag				1 <sup>st</sup> Touch X Position[11:8]				R
04h	TOUCH1_XL	1 <sup>st</sup> Touch X Position[7:0]								R
05h	TOUCH1_YH	1 <sup>st</sup> Touch ID[3:0]					1 <sup>st</sup> Touch X Position[11:8]			R
06h	TOUCH1_YL	1 <sup>st</sup> Touch Y Position[7:0]								R
07h										R
08h										R
09h	TOUCH2_XH	2 <sup>nd</sup> Event Flag				2 <sup>nd</sup> Touch X Position[11:8]				R
0Ah	TOUCH2_XL	2 <sup>nd</sup> Touch X Position[7:0]								R
0Bh	TOUCH2_YH	2 <sup>nd</sup> Touch ID[3:0]					2 <sup>nd</sup> Touch X Position[11:8]			R
0Ch	TOUCH2_YL	2 <sup>nd</sup> Touch Y Position[7:0]								R
0Dh										R
0Eh										R
0Fh	TOUCH3_XH	3 <sup>rd</sup> Event Flag				3 <sup>rd</sup> Touch X Position[11:8]				R
10h	TOUCH3_XL	3 <sup>rd</sup> Touch X Position[7:0]								R
11h	TOUCH3_YH	3 <sup>rd</sup> Touch ID[3:0]					3 <sup>rd</sup> Touch X Position[11:8]			R
12h	TOUCH3_YL	3 <sup>rd</sup> Touch Y Position[7:0]								R
13h										R
14h										R
15h	TOUCH4_XH	4 <sup>th</sup> Event Flag				4 <sup>th</sup> Touch X Position[11:8]				R
16h	TOUCH4_XL	4 <sup>th</sup> Touch X Position[7:0]								R
17h	TOUCH4_YH	4 <sup>th</sup> Touch ID[3:0]					4 <sup>th</sup> Touch X Position[11:8]			R
18h	TOUCH4_YL	4 <sup>th</sup> Touch Y Position[7:0]								R
19h										R
1Ah										R
1Bh	TOUCH5_XH	5 <sup>th</sup> Event Flag				5 <sup>th</sup> Touch X Position[11:8]				R
1Ch	TOUCH5_XL	5 <sup>th</sup> Touch X Position[7:0]								R
1Dh	TOUCH5_YH	5 <sup>th</sup> Touch ID[3:0]					5 <sup>th</sup> Touch X Position[11:8]			R
1Eh	TOUCH5_YL	5 <sup>th</sup> Touch Y Position[7:0]								R

## 9.8 Data description

**DEVICE\_MODE**

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

ADDRESS	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 ~ 39h	7:6	Event Flag	00b: Put Down 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	7:0	Touch X Position [7:0]	LSB of the Touch X Position in Pixels
~			
3Ah			

**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	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
3Bh			

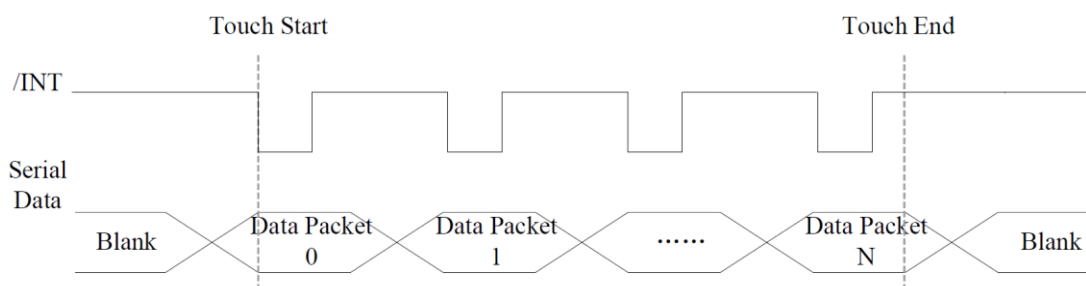
**TOUCHn\_YL(n:1-10)**

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

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

9.9 Interrupt Trigger Mode

Figure 11. Interrupt trigger mode timing



## 10 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 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

## 11 LEGAL INFORMATION

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