



## RiTFT – 70 series

### 7" High Brightness & High Resolution LCD TFT Datasheet

Rev.1.0

2019-03-21

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally black	/
Size	7.0	Inch
Viewing Direction	Full Angle	-
Active Area (W × H)	154.21 × 85.92	mm <sup>2</sup>
Dot Pitch (W × H)	0.1432 × 0.1506	mm <sup>2</sup>
Number Of Dots	1024 (RGB) × 600	/
Driver IC	EK79001HK+EK73215BCGA	/
Backlight Type	27 LEDs	/
Interface Type	RGB	/
Pixel Arrangement	RGB Vertical Stripe	/
Surface Treatment	Anti-glare / Clear (for CTP)	
Input Voltage	3.3	V
Weight	-	g

**Note 1:** RoHS compliant

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

## REVISION RECORD

REVNO.	REVDATE	CONTENTS	REMARKS
1.0.	2019-03-21	Initial Release	

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## 1 MODULE CLASSIFICATION INFORMATION

<b>RV</b>	<b>T</b>	<b>70</b>	<b>X</b>	<b>S</b>	<b>T</b>	<b>X</b>	<b>W</b>	<b>X</b>	<b>0X</b>
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

1.	<b>BRAND</b>	<b>RV – Riverdi</b>
2.	<b>PRODUCT TYPE</b>	<b>T – TFT Standard</b> F – TFT Custom
3.	<b>DISPLAY SIZE</b>	<b>70 – 7.0”</b>
4.	<b>MODEL SERIAL NO.</b>	A - (A-Z) U - UxTouch
5.	<b>RESOLUTION</b>	<b>S – 1024x600 px</b>
6.	<b>INTERFACE</b>	<b>T– RGB</b>
7.	<b>FRAME</b>	F – Frame N – No Frame
8.	<b>BACKLIGHT TYPE</b>	<b>W – LED White</b>
9.	<b>TOUCH PANEL</b>	N – No Touch Panel C – Capacitive Touch Panel
10.	<b>VERSION</b>	<b>0x (00-99)</b>

## 2 ASSEMBLY GUIDE - INTEGRATION


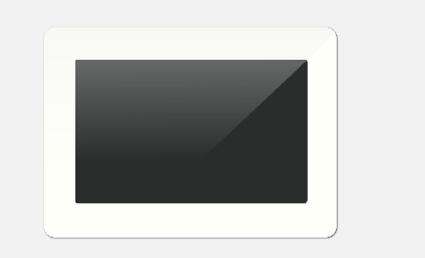
Three options of rear side adhesive tape are available: double side adhesive tape 0.2 mm with 3M 467MP glue, foam double side adhesive tape 0.5 mm with DST 3M 9495LE glue or without any tape.

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:

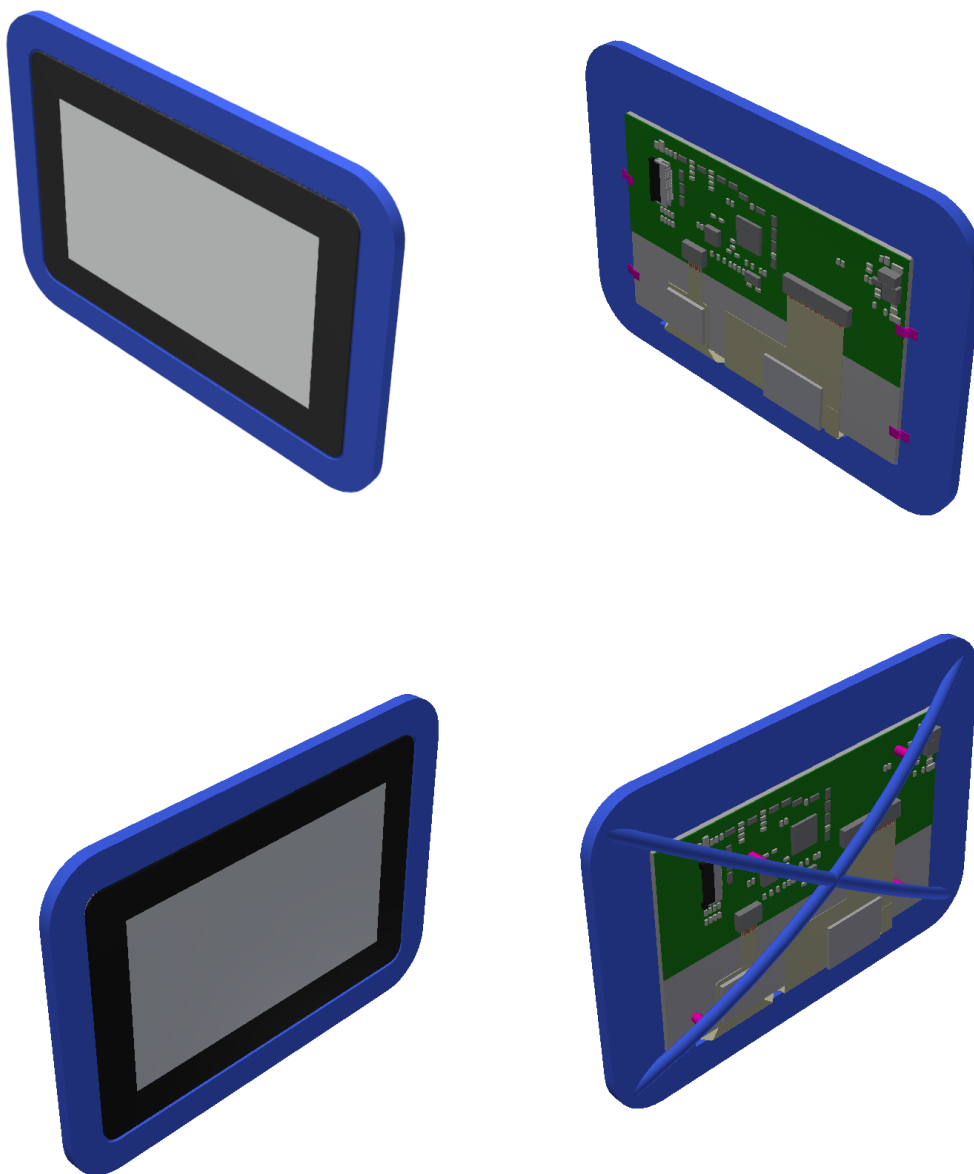
NAME OF THE PRODUCT	PART NUMBER	DESCRIPTION
<b>RiTFT-70H</b>	RVT70ASTNWN00	RGB
<b>RiTFT-70H-FR</b>	RVT70ASTFWN00	RGB, Frame
<b>RiTFT-70H- CAP</b>	RVT70ASTNWC00	RGB, CTP
<b>RiTFT-70H -CAP-FR</b>	RVT70ASTFWC00	RGB, CTP, Frame
<b>RiTFT-70H-CAP-UX</b>	RVT70USTNWC00	RGB, CTP uxTouch, black cover glass, 0.2mm DST
	RVT70USTNWC01	RGB, CTP uxTouch, black cover glass, 0.5 mm DST
	RVT70USTNWC02	RGB, CTP uxTouch, black cover glass, no DST
	RVT70USTNWC03	RGB, CTP uxTouch, white cover glass, 0.2mm DST
	RVT70USTNWC04	RGB, CTP uxTouch, white cover glass, 0.5mm DST
	RVT70USTNWC05	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.

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 below show examples of using support elements.

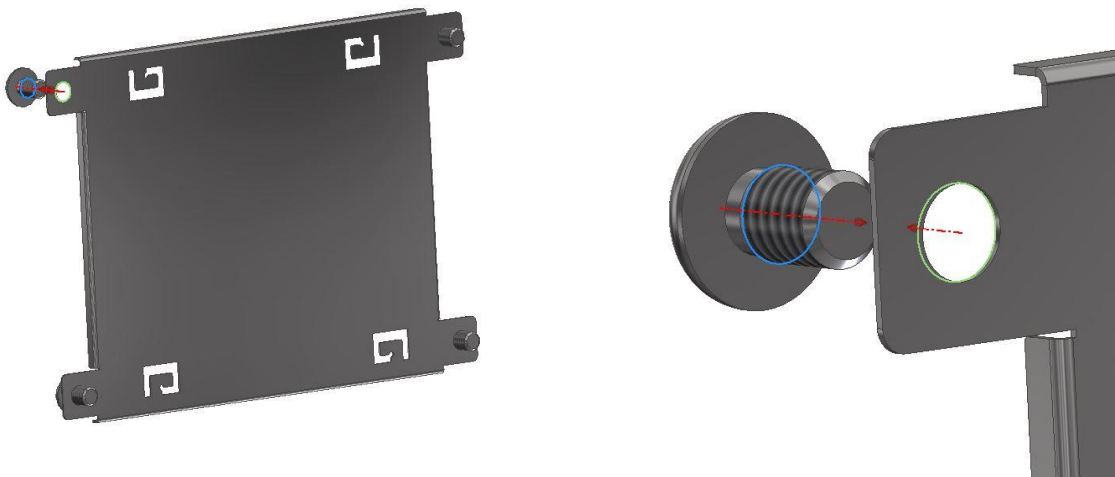
*Figure 1. Example of using support elements.*



## 2.2 Mounting frame

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.

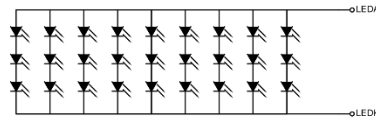
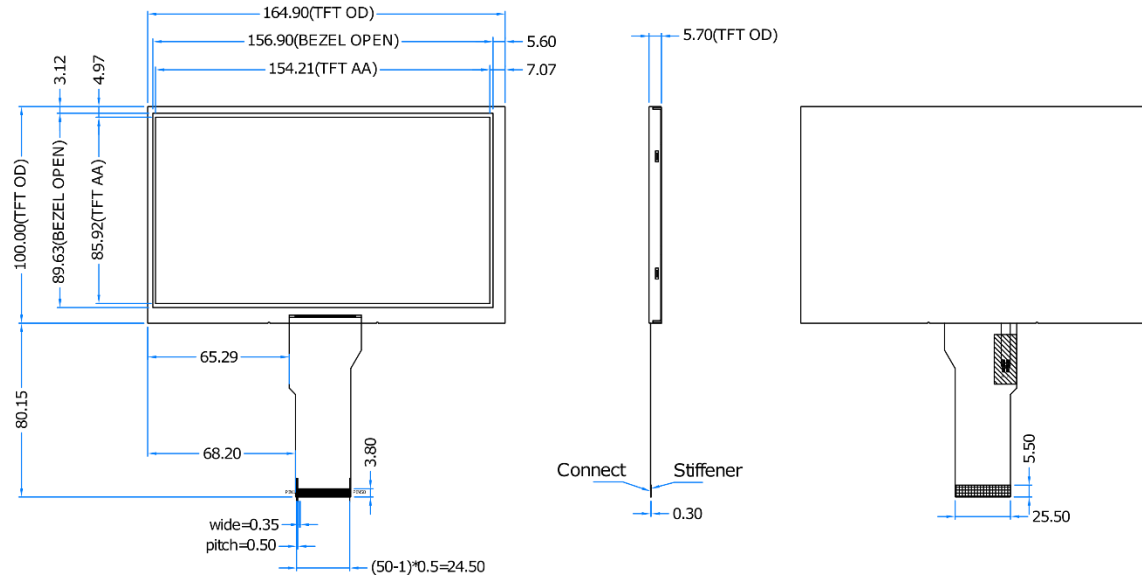
*Figure 3. Mounting frame*



# RiTFT-70H

3

Revision:	Changes:	Date:
1.0	Initial Case	2019.09.04



LED Diagram Circuit

LCD CONNECTOR			
Pin No.	Desc.	Pin No.	Desc.
1	VLED+	26	G1
2	VLED+	27	G0
3	VLED-	28	R7
4	VLED-	29	R6
5	GND	30	R5
6	VCOM	31	R4
7	DVDD	32	R3
8	MODE	33	R2
9	DE	34	R1
10	VS	35	R0
11	HS	36	GND
12	B7	37	DCLK
13	B6	38	GND
14	B5	39	L/R
15	B4	40	U/D
16	B3	41	VGH
17	B2	42	VGL
18	B1	43	AVDD
19	B0	44	RESET
20	G7	45	NC
21	G6	46	VCOM
22	G5	47	DITHB
23	G4	48	GND
24	G3	49	NC
25	G2	50	NC

**TFT NOTES:**  
 1. DISPLAY TYPE: TRANSMISSIVE, NORMALLY BLACK  
 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<sup>2</sup>  
 8. BACKLIGHT: 27PCS LED, V<sub>F</sub>=9.6V, I<sub>F</sub>=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

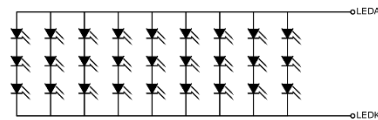
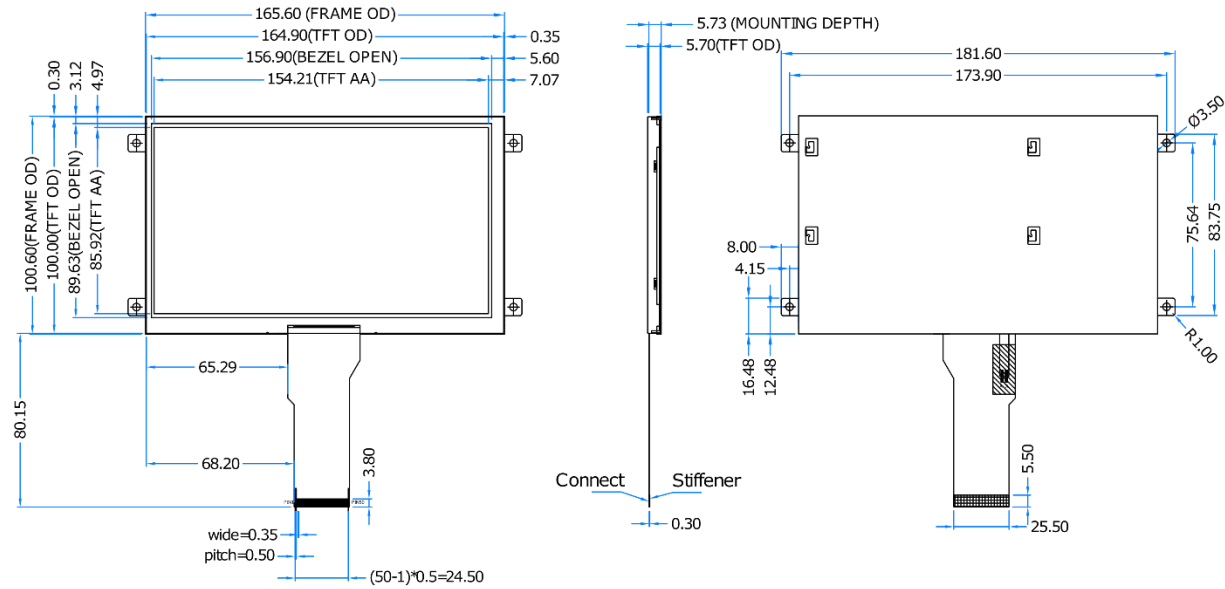
PN: RVT70ASTNWN00  
 SN: ####



DRAWN: PM	29.04.2019	1:2.00	
CHECKED:		[mm]	
APPR:		ISO A3	P. 1 of 1

# RiTFT-70H-FR

Revision:	Changes:	Date:
1.0	Initial Case	19.05.15



LED Diagram Circuit

**TFT NOTES:**

1. DISPLAY TYPE: TRANSMISSIVE, NORMALLY BLACK
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<sup>2</sup>
8. BACKLIGHT: 27PCS LED, V<sub>F</sub>=9.6V, I<sub>F</sub>=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

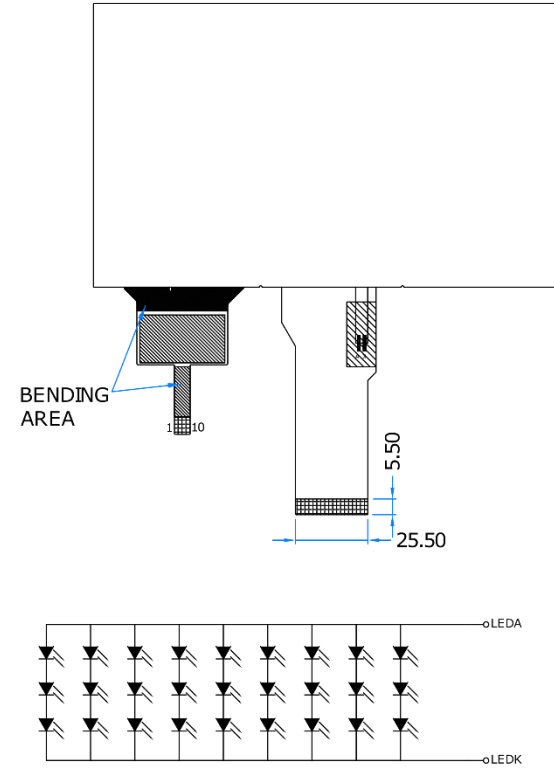
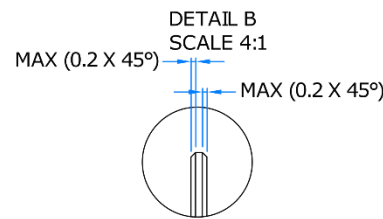
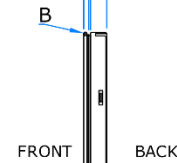
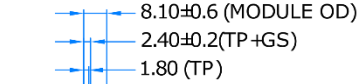
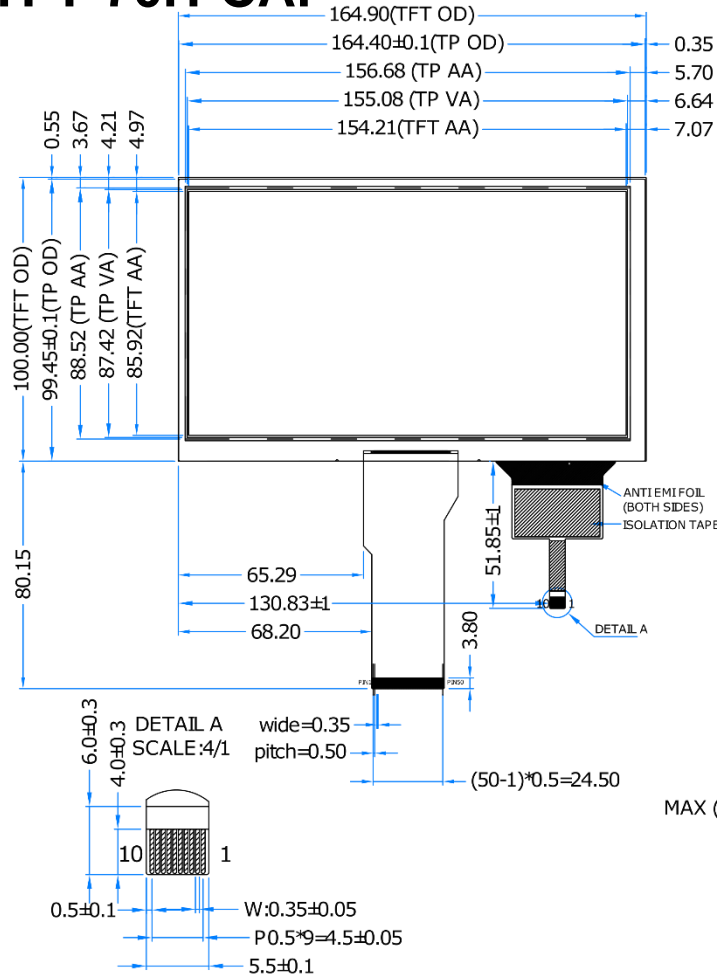
PN: RVT70ASTFWN00  
 SN: ###  
 DRAWN: ### 05/20/19 1:2.00  
 CHECKED: [mm]  
 APPR: ISO A3





# RiTFT-70H-CAP

Revision:	Changes:	Date:
1.0	Initial Case	19.05.16



LED Diagram Circuit

**TFT NOTES:**  
 1. DISPLAY TYPE: TRANSMISSIVE, NORMALLY BLACK  
 2. RESOLUTION: 1024x600  
 3. VIEWING ANGLE: FREE  
 4. INTERFACE: RGB  
 5. DRIVER IC: EK79001HK4EK73215BCGA  
 6. LOGIC VOLTAGE: 3.3V  
 7. SURFACE LUMINANCE: 900cd/m<sup>2</sup>  
 8. BACKLIGHT: 27PCS LED, V<sub>F</sub>V, I<sub>F</sub>=270mA

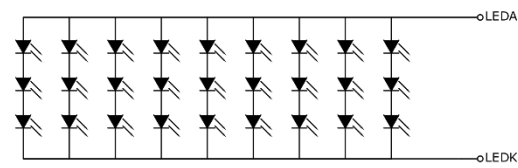
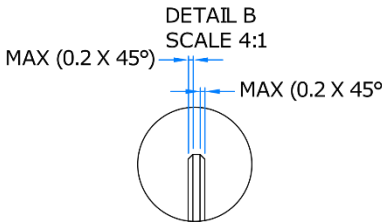
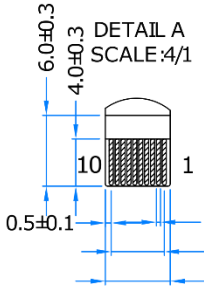
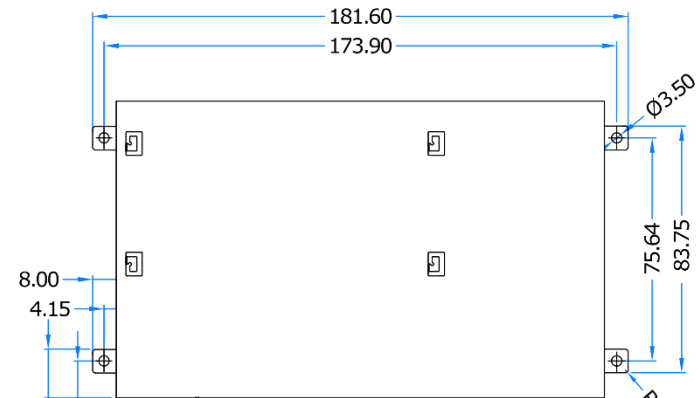
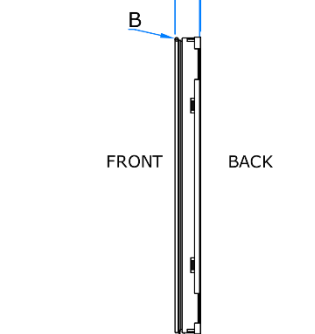
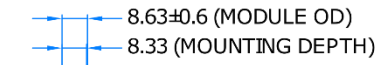
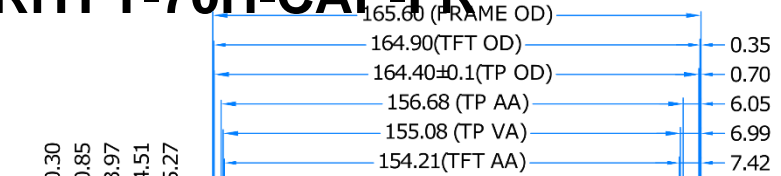
**TP NOTES:**  
 1. TP STRUCTURE: G+G  
 2. DRIVER IC: FT5426  
 3. OPERATING VOLTAGE: 3.3V  
 4. SURFACE HARDNESS: 7H  
 5. TRANSMITTANCE: ≥85%

**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

PN: RVT70ASTNWC00			
SN: ###			
DRAWN: P.M.	05/17/19	1:1.50	
CHECKED:		[mm]	
APPR:		ISO A3	

# RiTFT-70H-CAP-FR

Revision:	Changes:	Date:
1.0	Initial Case	19.05.16



LED Diagram Circuit

**TFT NOTES:**  
 1. DISPLAY TYPE: TRANSMISSIVE, NORMALLY BLACK  
 2. RESOLUTION: 1024x600  
 3. VIEWING ANGLE: FREE  
 4. INTERFACE: RGB  
 5. DRIVER IC: EK79001HK+EK73215BCGA  
 6. LOGIC VOLTAGE: 3.3V  
 7. SURFACE LUMINANCE: 900cd/m<sup>2</sup>  
 8. BACKLIGHT: 27PCS LED, V<sub>p</sub>V, I<sub>p</sub>=270mA

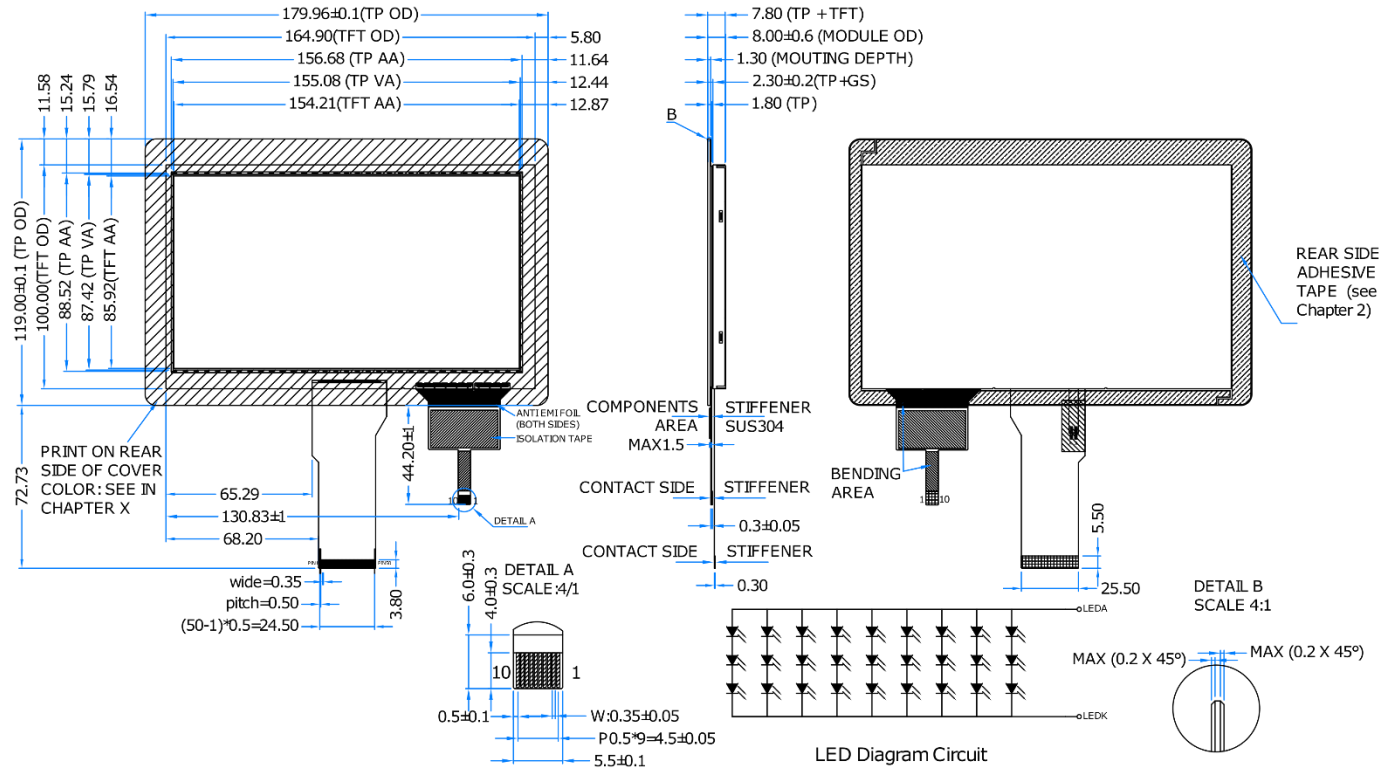
**TP NOTES:**  
 1. TP STRUCTURE: G+G  
 2. DRIVER IC: FT5426  
 3. OPERATING VOLTAGE: 3.3V  
 4. SURFACE HARDNESS: 7H  
 5. TRANSMITTANCE: ≥85%

**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

PN: RVT70ASTFWC00		
SN: #####		
DRAWN: P.M.	5/16/2019	1:1.50
CHECKED:		[mm]
APPR:		ISO A3

Revision:	Changes:	Date:
1.0	Initial Case	19.05.16

# RiTFT-70H-CAP-UX



**TFT NOTES:**

1. DISPLAY TYPE: TRANSMISSIVE, NORMALLY BLACK
2. RESOLUTION: 1024x600
3. VIEWING ANGLE: FREE
4. INTERFACE: RGB
5. LOGIC VOLTAGE: 3.3V
6. SURFACE LUMINANCE: 900cd/m<sup>2</sup>
7. BACKLIGHT: 27PCS LED, V<sub>f</sub>=9.6V, I<sub>f</sub>=270mA

**TP NOTES:**

1. TP STRUCTURE: G+G
2. DRIVER IC: FT5426
3. OPERATING VOLTAGE: 3.3V
4. SURFACE HARDNESS: 7H
5. TRANSMITTANCE: ≥85%

**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

PN: RVT70USTNWC0x

SN: ###

DRAWN: P.M.

5/16/2019

1:2.00

CHECKED:

[mm]

APPR:

ISO A3



P. 1 of 1

## 4 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 <sub>OP</sub>	-20	70	°C
Storage Temperature	T <sub>ST</sub>	-30	80	°C
Humidity	RH	10%(@ 25°C)	-	RH

## 5 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	
Video signal amplitude (VR, VG, VB)	VIA	-	-	AVDD-0.4	V	
	VIAC	-	-	-	V	AC component
	VIDC	-	AVDD/2	-	V	DC component
VCOM	VCAC	-	-	-	VP-P	AC component
	VCDC	-	-	-	V	DC component, Note1
Input Signal Voltage	VIH	0.7DVDD	-	DVDD	V	Note2
	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

Note1: The brightness of LCD panel could be changed by adjusting the AC component of VCOM.

Note2: STHL, STHR, OEH, L/R, CPH1~CPH3, STVD, STVU, OEV, CKV, U/D

## 6 DRIVING LED BACKLIGHT

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Backlight driving voltage	VF	9.0	9.6	10.2	V
Backlight driving current	IF	-	270	-	mA
Backlight Power Consumption	WBL	-	2592	-	mW
LED Life Time	-	-	30000	-	Hrs

Note: 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.

## 7 POWER CONSUMPTION

ITEM	SYMBOL	CONDITION	MIN	TYPE	MAX	UNIT
Gate on power current	IVGH	VGH=18V	-	0.5	1	mA
Gate off power current	IVGL	VGL=-6V	-	0.5	1	mA
Digital power current	IDVDD	DVDD=3.3V	-	30	45	mA
Analog power current	IAVDD	AVDD=9.6V	-	35	45	mA
Total power consumption	PC		-	447	604	mW

Note: Typ. Specification: Gray-level test pattern; Max Specification: Black test pattern



256 gray pattern



black pattern

## 8 ELECTRO-OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time	Tr+Tf	$\theta=0^\circ$	-	35	-	ms	FIG 1.	4
Contrast Ratio	Cr	$\theta=0^\circ$ Ta=25		800	-	---	FIG 2.	1
Surface Luminance no touch module	Lv		-	1000	-	cd/m <sup>2</sup>	FIG 2.	2
Surface Luminance CTP module			-	900	-			
Viewing Angle Range	$\theta$	$\theta = 90^\circ$	-	85	-	deg	FIG 3.	6
		$\theta = 270^\circ$	-	85	-	deg	FIG 3.	
		$\theta = 0^\circ$	-	85	-	deg	FIG 3.	
		$\theta = 180^\circ$	-	85	-	deg	FIG 3.	
CIE (x, y) Chromaticity	Red	$\theta=0^\circ$ $\theta=0^\circ$ Ta=25	-	-	-	FIG 2.	5	
			y	-	-			-
	Green		x	-	-			-
			y	-	-			-
	Blue		x	-	-			-
			y	-	-			-
	White		x	0.27	0.31			0.35
			y	0.29	0.33			0.37

**Note 1.** Contrast Ratio(CR) is defined mathematically as below, for more information see Figure 2.

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

**Note 2.** Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see Figure 3.

$L_v$  = 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 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 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 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.

Figure 2. The definition of response time

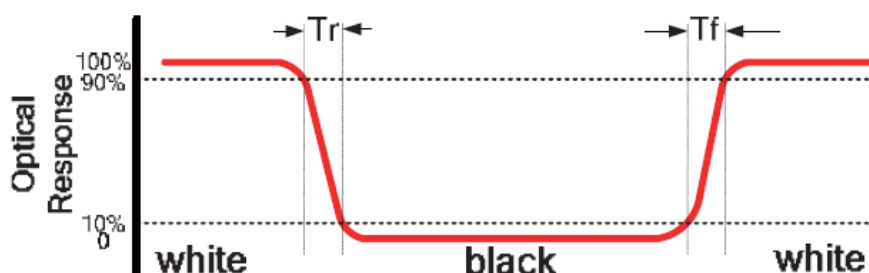
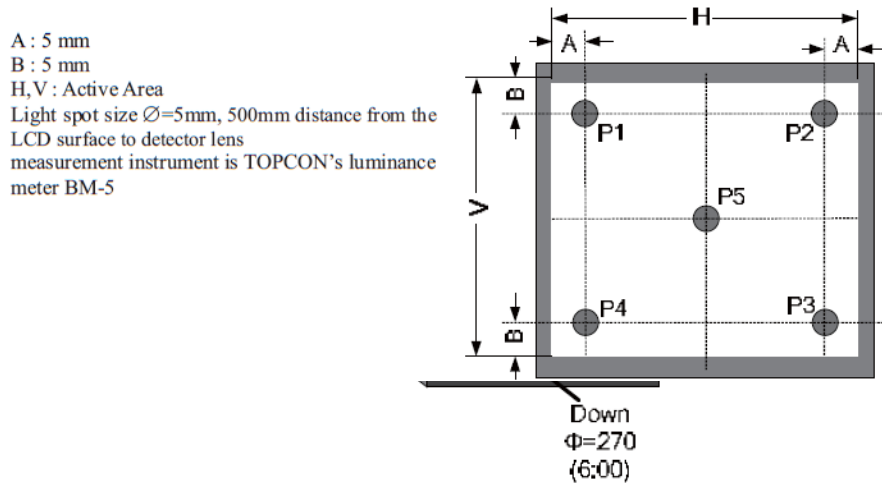


Figure 3.Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity



## 9 INTERFACE DESCRIPTION

### 9.1 TFT LCD Panel

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	Power 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	Power Ground	
37	DCLK	P	Sample Clock	
38	GND	P	Power 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	Power 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.

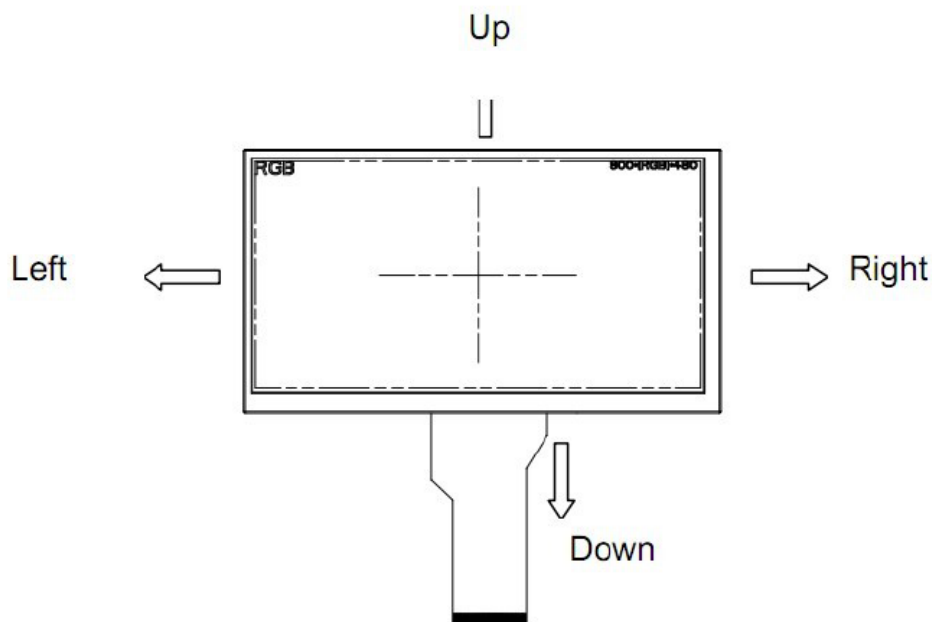
**Note 3.** Data shall be latched at the falling edge of DCLK.

**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:

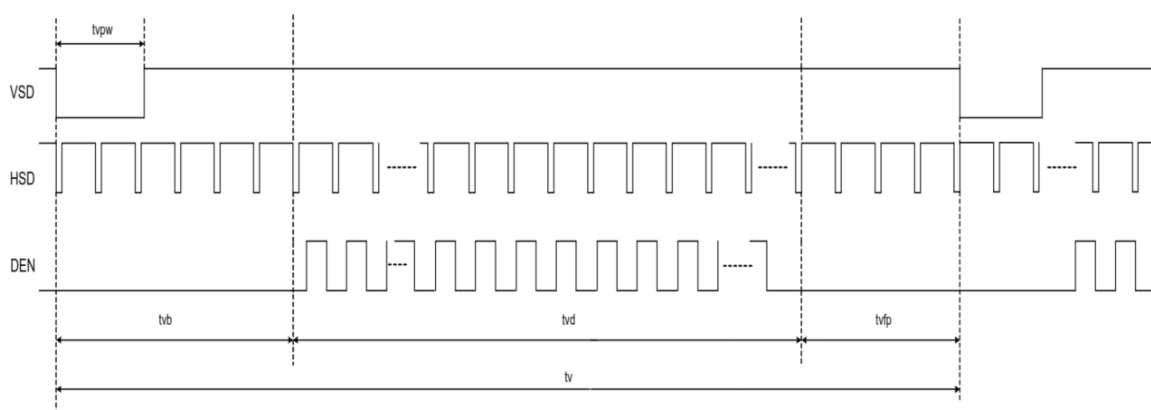


**Note 6.** Global reset pin. Active low to enter reset state, Suggest to connect with an RC reset circuit for stability. Normally pull high.

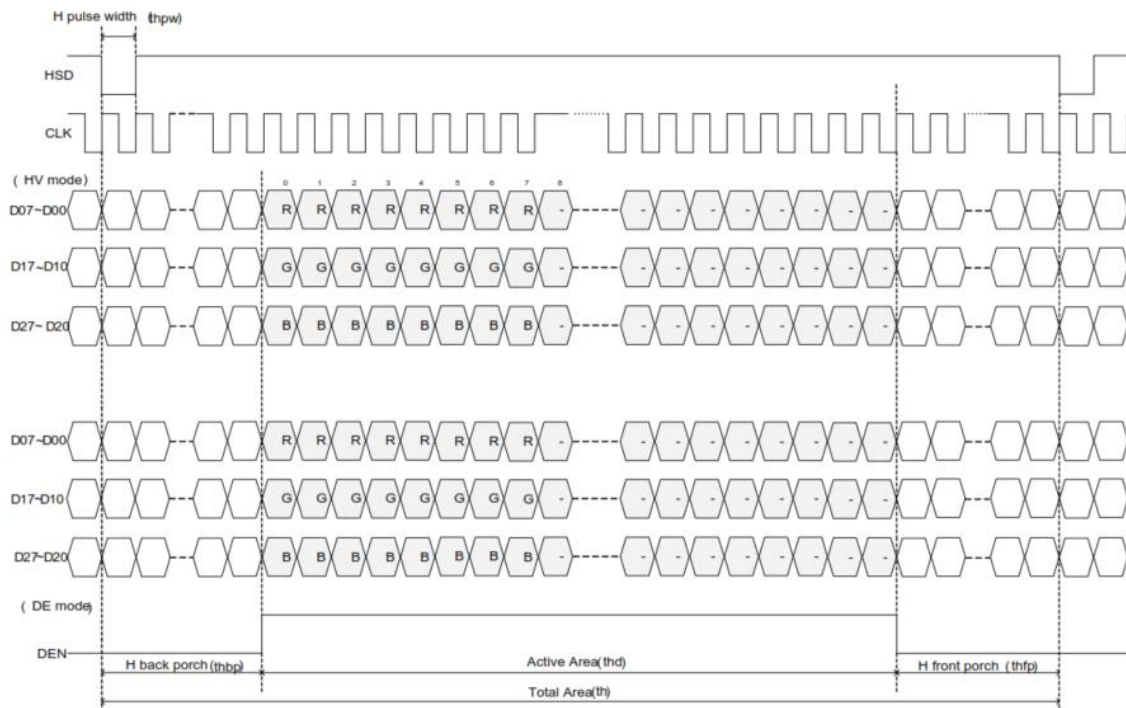
**Note 7.** Dithering function enable control, normally pull high.  
 When DITHUB="1", Disable internal dithering function,  
 When DITHUB="0", Enable internal dithering function.

## 10 TIMING CHARACTERISTICS

### 10.1 Vertical input timing



### 10.2 Horizontal 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

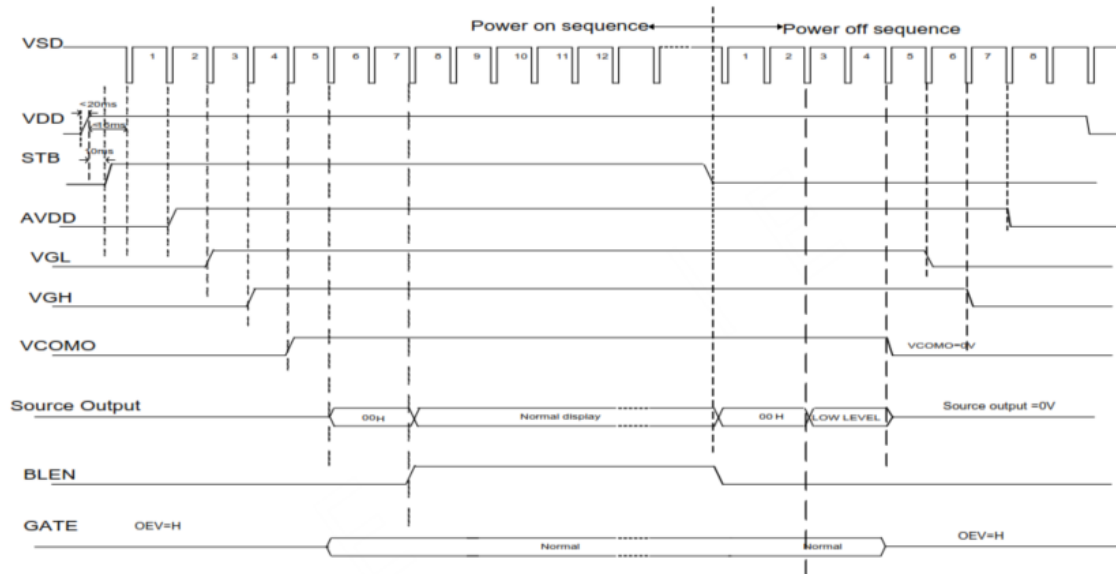
#### 10.3.2 HV MODE – horizontal input timing

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 CAPACITIVE TOUCH SCREEN PANEL SPECIFICATIONS

11.1 Mechanical characteristics

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	7 inch	
Product Thickness	2.3mm	
Glass Thickness	1.1mm	
Ink View Area	155.08mm x 87.42mm	
Sensor Active Area	156.68mm x 88.52mm	
Input Method	5 Finger	
Activation Force	Touch	
Surface Hardness	≥7H	

### 11.2 Electrical characteristics

DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.3V
Power Consumption (IDD)	Active Mode	10~18mA
	Sleep Mode	30~50µA
Interface		I <sup>2</sup> C
Linearity		<1.5%
Controller		FT5426
I2C address		0x38 (7 bit address)
Resolution		1792*1024

### 11.3 Interface description

PIN NO.	SYMBOL	DESCRIPTION	REMARK
1	VSS	Power Ground	
2	VDD	Power For CTP	
3	SCL	I2C SCL	
4	NC	-	
5	SDA	I2C SDA	
6	NC	-	
7	/RST	Reset pin	
8	NC	-	
9	/INT	Interrupt signal from CTP	
10	VSS	Power Ground	

### 11.4 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

### 11.5 I2C Read/Write Interface Description

Figure 5. Write N bytes to I2C slave

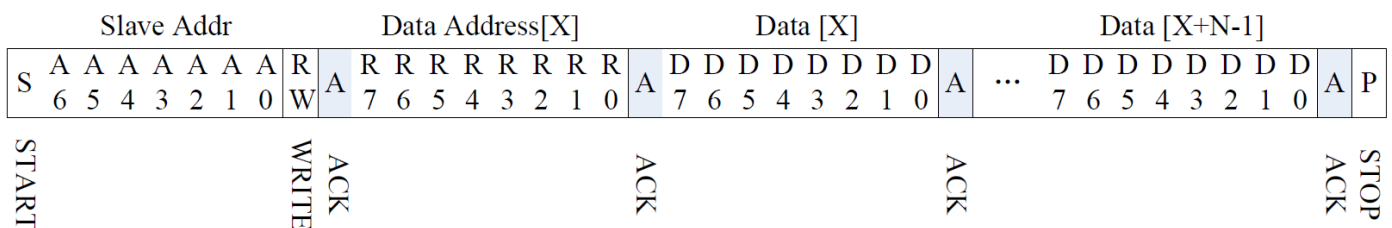


Figure 6. Set Data Address

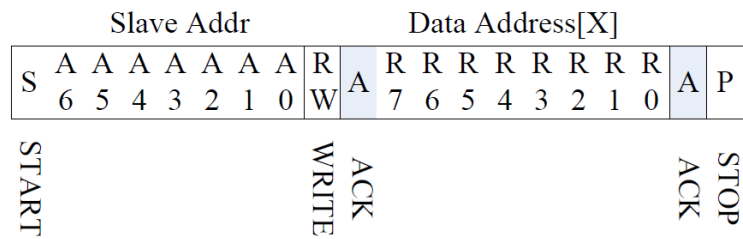
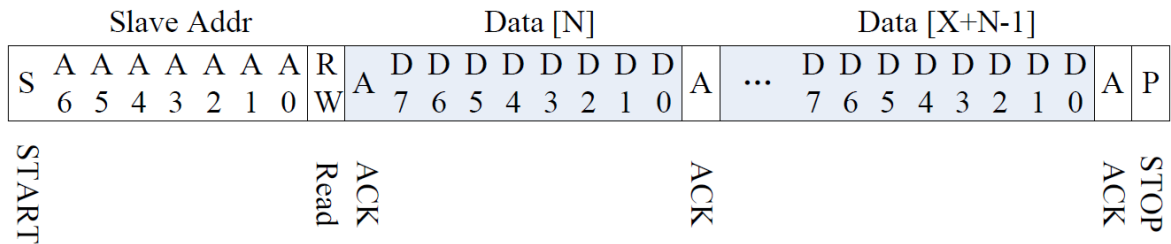
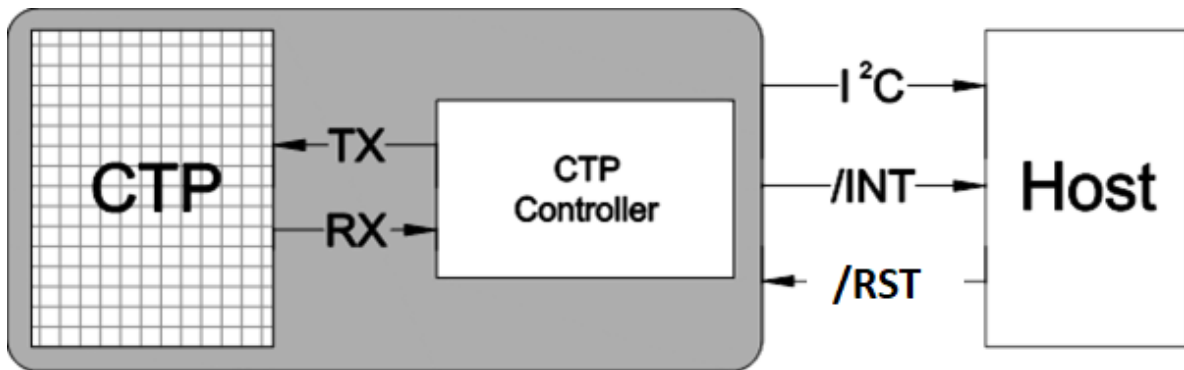


Figure 7. Read X bytes from I2C Slave



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

Figure 8. Communication of the I2C interface with Host



### 11.7 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

### 11.8 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
	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

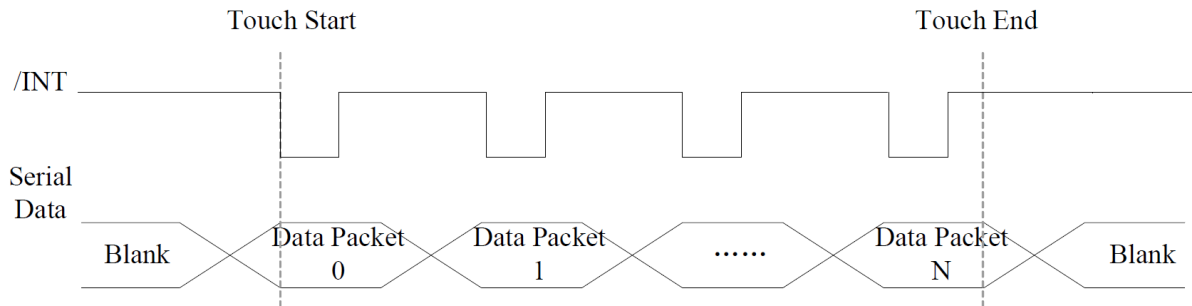
**TOUCHn\_YL(n:1-10)**

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

### 11.9 Interrupt Trigger Mode

Figure 9. Interrupt trigger mode timing



## 12 INSPECTION

Standard acceptance/rejection criteria for TFT module.

### 12.1 Inspection condition

Ambient conditions:

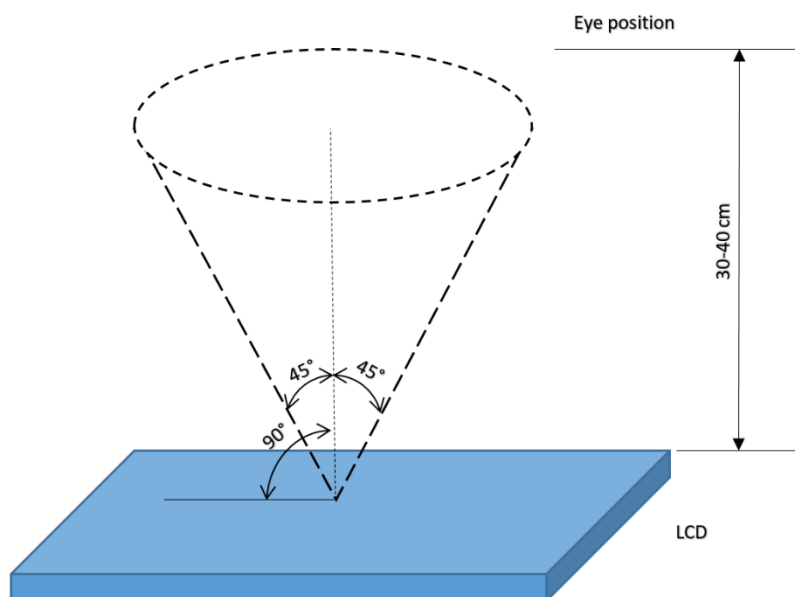
- Temperature:  $25 \pm 0.5^\circ\text{C}$
- Humidity:  $(60 \pm 10)\%RH$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

Viewing distance:

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

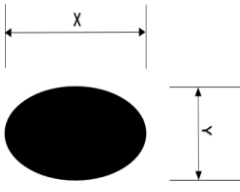
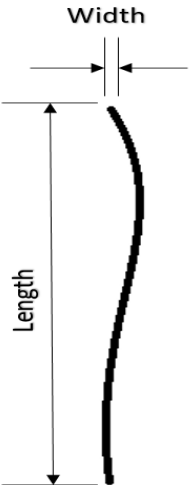
Viewing Angle:

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





12.2 Inspection standard

Item	Criterion																																		
<p><b>Black spots, white spots, light leakage, Foreign Particle (round Type)</b></p>	<div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="2">Size &lt; 5"</th> </tr> <tr> <th>Average Diameter</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>D &lt; 0.2 mm</td> <td>Ignored</td> </tr> <tr> <td>0.2 mm &lt; D &lt; 0.3 mm</td> <td>3</td> </tr> <tr> <td>0.3 mm &lt; D &lt; 0.5 mm</td> <td>2</td> </tr> <tr> <td>0.5 mm &lt; D</td> <td>0</td> </tr> </tbody> </table> </div> <div style="text-align: center; margin: 10px 0;"> <math display="block">D = \frac{(x + y)}{2}</math> </div> <p>*Spots density: 10 mm</p>	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	3																																		
0.3 mm < D < 0.5 mm	2																																		
0.5 mm < D	0																																		
<p><b>LCD black spots, white spots, light leakage (line Type)</b></p>	<div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="3">Size &lt; 5"</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>-</td> <td>W &lt; 0.02</td> <td>Ignored</td> </tr> <tr> <td>L &lt; 3.0</td> <td>0.02 &lt; W &lt; 0.05</td> <td rowspan="2">2</td> </tr> <tr> <td>L &lt; 2.5</td> <td>0.05 &lt; W &lt; 0.08</td> </tr> <tr> <td>-</td> <td>0.08 &lt; W</td> <td>0</td> </tr> </tbody> </table> </div> <div style="margin: 10px 0;"> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th colspan="3">Size &gt;= 5"</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>-</td> <td>W &lt; 0.02</td> <td>Ignored</td> </tr> <tr> <td>L &lt; 3.0</td> <td>0.02 &lt; W &lt; 0.05</td> <td rowspan="2">4</td> </tr> <tr> <td>L &lt; 2.5</td> <td>0.05 &lt; W &lt; 0.08</td> </tr> <tr> <td>-</td> <td>0.08 &lt; W</td> <td>0</td> </tr> </tbody> </table> </div> <p>*Spots density: 10 mm</p>	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
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"	
	<b>Average Diameter</b>	Qualified Qty
	<b>D &lt; 0.2 mm</b>	Ignored
	<b>0.2 mm &lt; D &lt; 0.3 mm</b>	3
	<b>0.3 mm &lt; D &lt; 0.5 mm</b>	2
	<b>0.5 mm &lt; D</b>	0
	Size >= 5"	
	<b>Average Diameter</b>	Qualified Qty
	<b>D&lt;0.2 mm</b>	Ignored
	<b>0.2 mm &lt; D &lt; 0.3 mm</b>	4
	<b>0.3 mm &lt; D &lt; 0.5 mm</b>	2
	<b>0.5 mm &lt; D</b>	0
	*Spots density: 10 mm	
	Polarizer bubbles	Size < 5"
<b>Average Diameter</b>		Qualified Qty
<b>D &lt; 0.2 mm</b>		Ignored
<b>0.2 mm &lt; D &lt; 0.5 mm</b>		3
<b>0.5 mm &lt; D &lt; 1 mm</b>		2
<b>1 mm &lt; D</b>		0
<b>Total Q'ty</b>		3
Size >= 5"		
<b>Average Diameter</b>		Qualified Qty
<b>D&lt;0.25 mm</b>		Ignored
<b>0.25 mm &lt; D &lt; 0.5 mm</b>		3
<b>0.5 mm &lt; D</b>		0
Electrical Dot Defect		Size < 5"
		<b>item</b>
	<b>Black do defect</b>	4
	<b>Bright dot defect</b>	2
	<b>Total Dot</b>	5
	Size >= 5"	
	<b>item</b>	Qualified Qty
	<b>Black do defect</b>	5
	<b>Bright dot defect</b>	2
	<b>Total Dot</b>	5

Item	Criterion		
Touch panel spot	<b>Size &lt; 5"</b>		
	<b>Average Diameter</b>	Qualified Qty	
	<b>D &lt; 0.2 mm</b>	Ignored	
	<b>0.2 mm &lt; D &lt; 0.4 mm</b>	5	
	<b>0.4 mm &lt; D &lt; 0.5 mm</b>	2	
	<b>0.5 mm &lt; D</b>	0	
	<b>Size &gt;= 5"</b>		
	<b>Average Diameter</b>	Qualified Qty	
	<b>D&lt;0.25 mm</b>	Ignored	
	<b>0.25 mm &lt; D &lt; 0.5 mm</b>	4	
<b>0.5 mm &lt; D</b>	0		
Touch panel White line Scratch	<b>Size &lt; 5"</b>		
	<b>Length</b>	<b>Width</b>	Qualified Qty
	-	W< 0.02	Ignored
	<b>L &lt; 3.0</b>	0.02 < W <0.05	2
	<b>L &lt; 2.5</b>	0.05 < W <0.08	
	-	0.08 < W	0
	<b>Size &gt;= 5"</b>		
	<b>Length</b>	<b>Width</b>	Qualified Qty
	-	W< 0.03	Ignored
	<b>L &lt; 5.0</b>	0.03 < W <0.05	2
-	0.05 < W	0	

## 13 RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION
1	High Temperature Storage	80°C/120hours
2	Low Temperature Storage	-30°C/120hours
3	High Temperature Operating	70°C/120hours
4	Low Temperature Operating	-20°C/120hours
5	High Temperature and High Humidity	40°C, 90%RH, 120hours
6	Thermal Cycling Test (No operation)	-20°C for 30min, 70°C for 30 min × 100 cycles. Then rest at room temperature after 1 hour
7	Vibration Test	Frequency:10~ 50Hz; Stroke: 1.5mm; Sweep: 10Hz~55Hz~10Hz; 2 hours for each direction of 6 hours total
8	Package Drop Test	Height:60 cm 1 corner,3 edges, 6 surfaces
9	Electro Static Discharge	±2KV, Human Body Mode 100pF/1500Ω

Note:

- 1) Sample quantity for each test item is 5-10 pcs
- 2) Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

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