



## RiTFT – 70H – LV 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	LVDS	/
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>L</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>L – TFT LCD, LVDS</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:

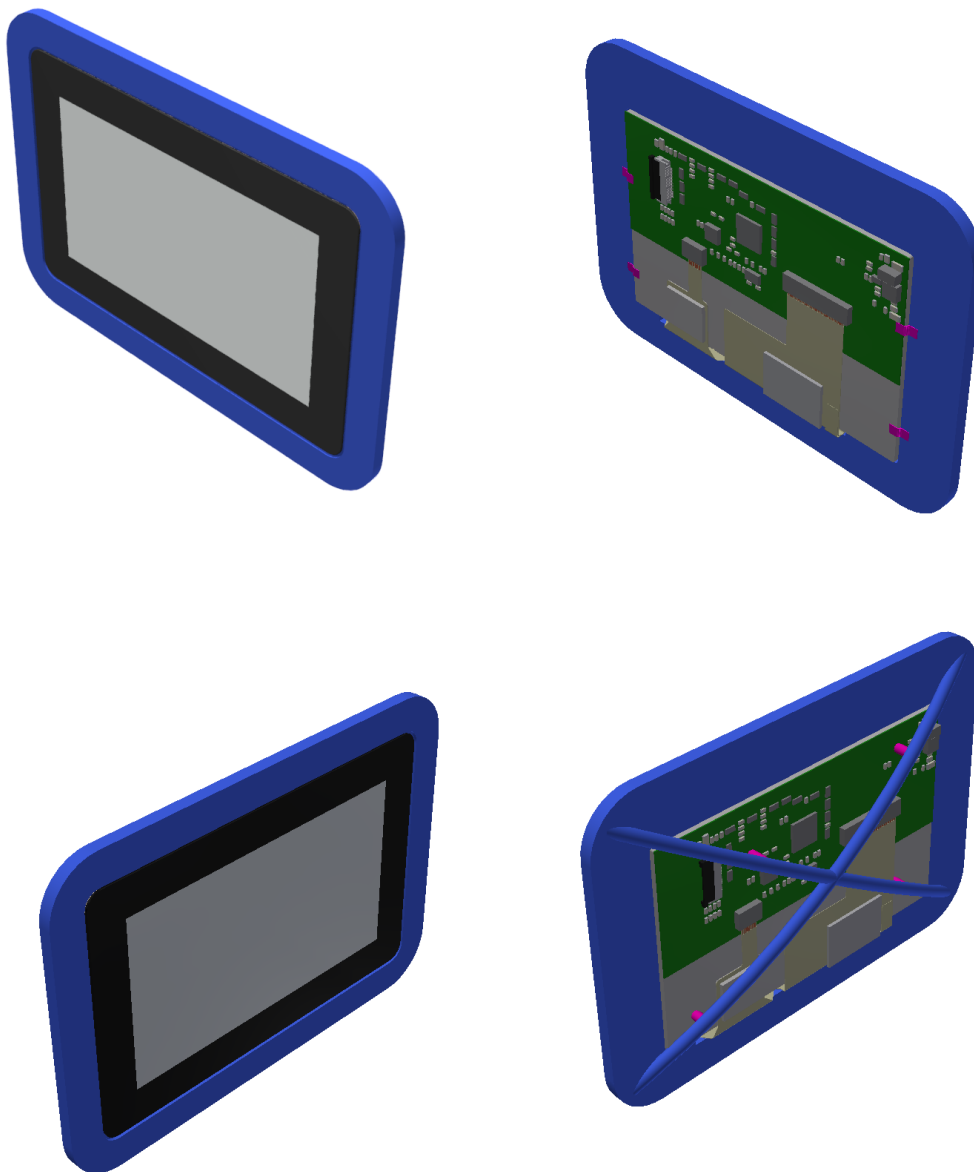
NAME OF THE PRODUCT	PART NUMBER	DESCRIPTION
<b>RiTFT-70H-LV</b>	RVT70ASLNWN00	LVDS
<b>RiTFT-70H-LV-FR</b>	RVT70ASLFWN00	LVDS, Frame
<b>RiTFT-70H-LV-CAP</b>	RVT70ASLNWC00	LVDS, CTP
<b>RiTFT-70H-LV-CAP-FR</b>	RVT70ASLFWC00	LVDS, CTP, Frame
<b>RiTFT-70H-LV-CAP-UX</b>	RVT70USLNWC00	LVDS, CTP uxTouch, black cover glass, 0.2mm DST
	RVT70USLNWC01	LVDS, CTP uxTouch, black cover glass, 0.5 mm DST
	RVT70USLNWC02	LVDS, CTP uxTouch, black cover glass, no DST
	RVT70USLNWC03	LVDS, CTP uxTouch, white cover glass, 0.2mm DST
	RVT70USLNWC04	LVDS, CTP uxTouch, white cover glass, 0.5mm DST
	RVT70USLNWC05	LVDS, 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.

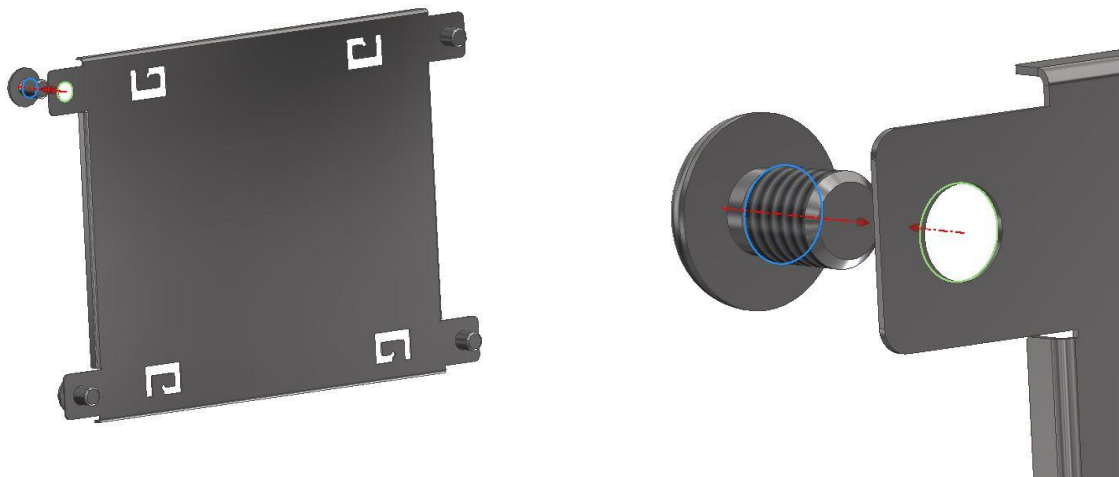
*Figure 1. Example of using support elements.*

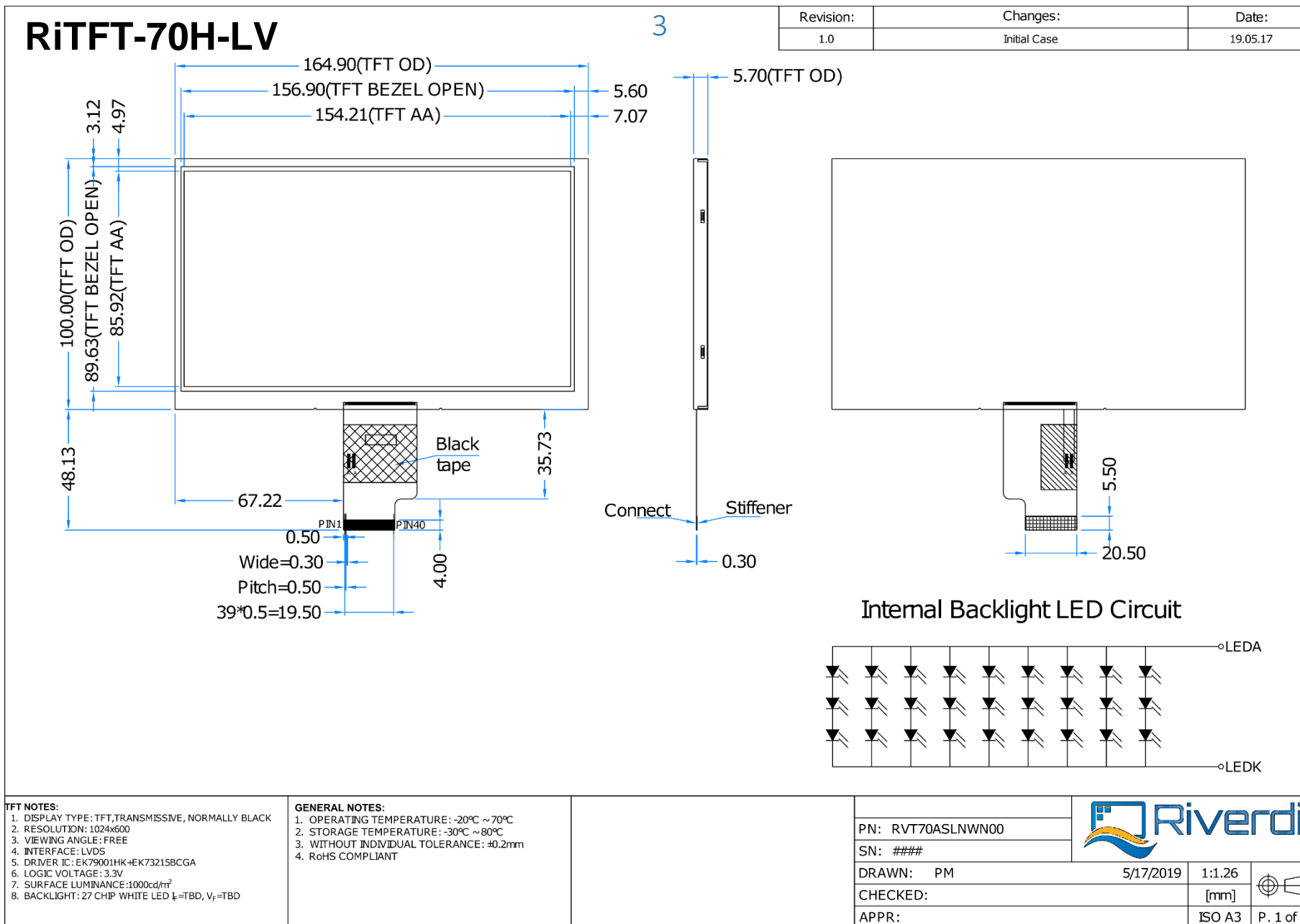


## 2.2 Mounting frame

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.

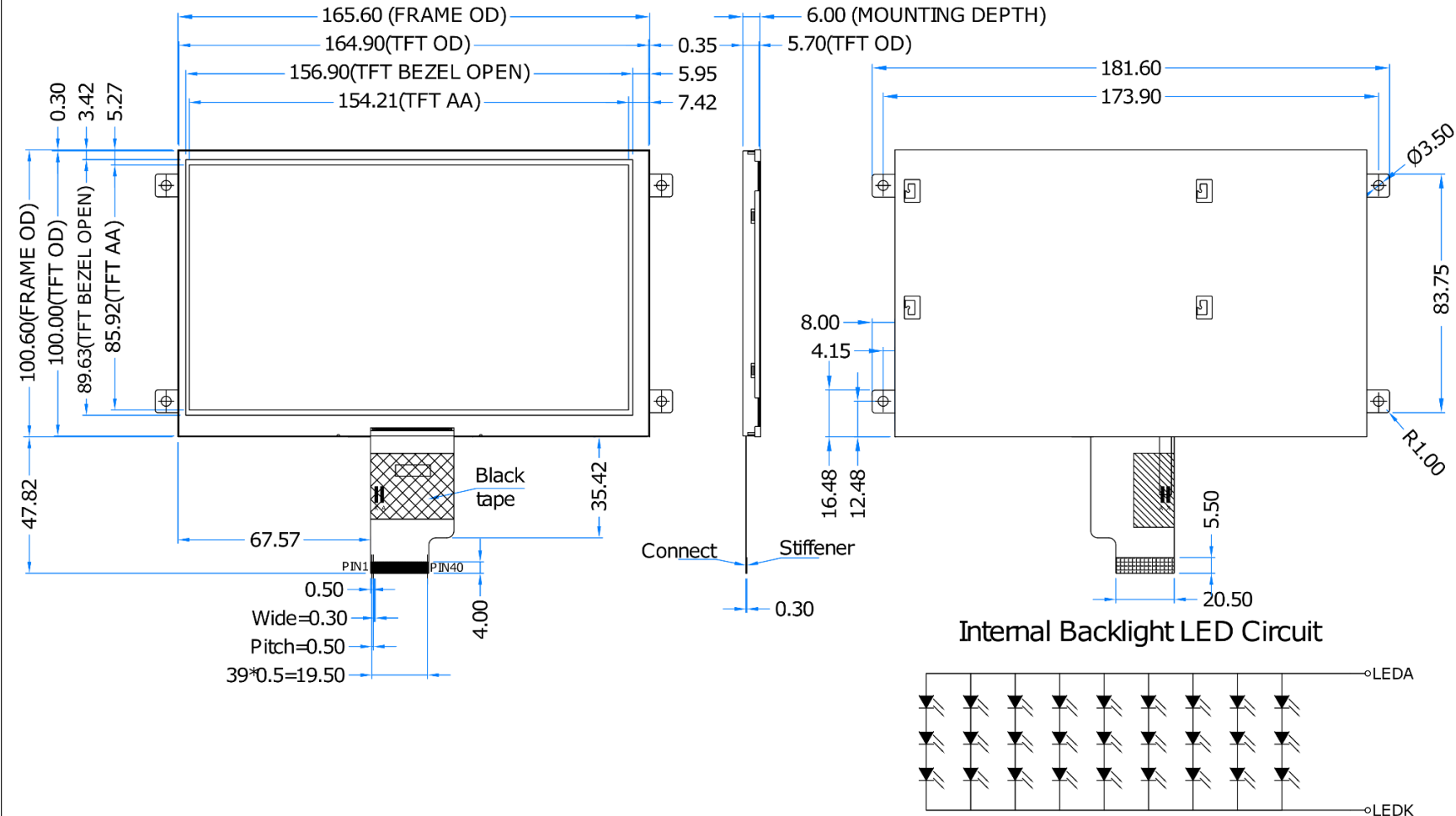
*Figure 3. Mounting frame*





# RiTFT-70H-LV-FR

Revision:	Changes:	Date:
1.0	Initial Case	19.05.17



**TFT NOTES:**

1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY BLACK
2. RESOLUTION: 1024x600
3. VIEWING ANGLE: FREE
4. INTERFACE: LVDS
5. DRIVER IC: EK79001HK-EK73215BCGA
6. LOGIC VOLTAGE: 3.3V
7. SURFACE LUMINANCE: 1000cd/m<sup>2</sup>
8. BACKLIGHT: 27 CHIP WHITE LED  $I_f$ =TBD,  $V_f$ =TBD

**GENERAL NOTES:**

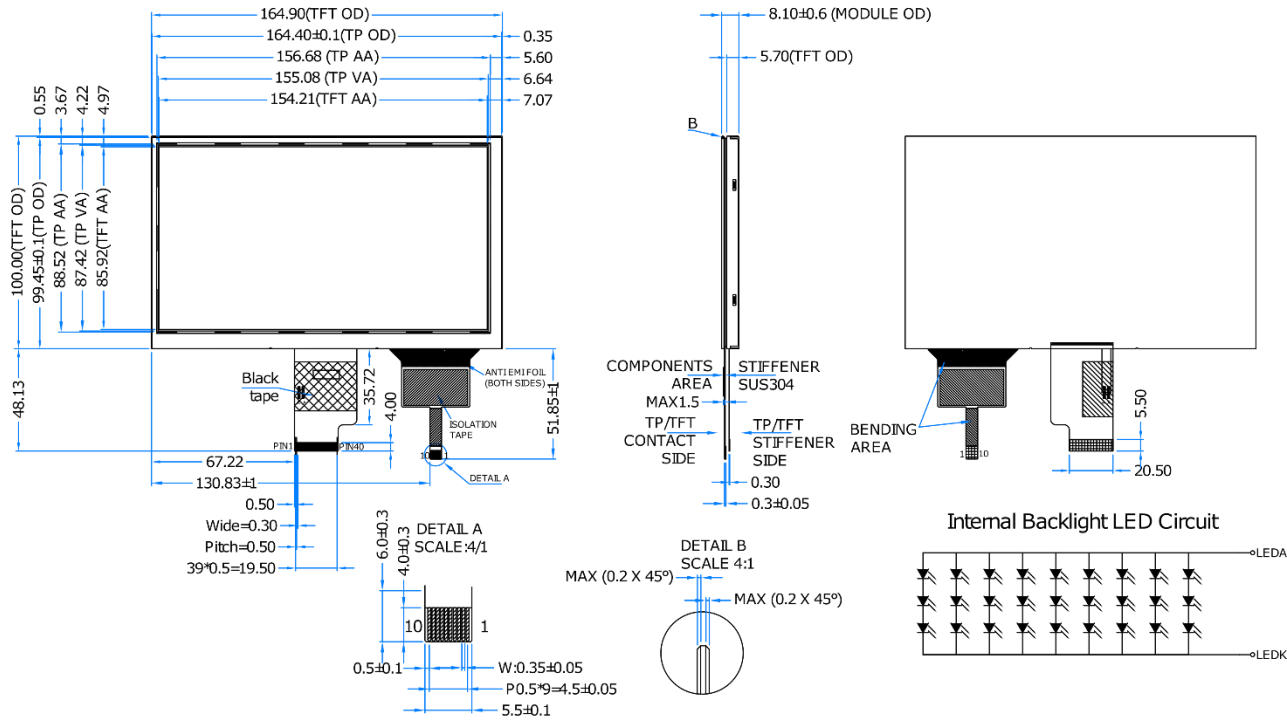
1. OPERATING TEMPERATURE: -20°C ~ 70°C
2. STORAGE TEMPERATURE: -30°C ~ 80°C
3. WITHOUT INDIVIDUAL TOLERANCE: ±0.2mm
4. RoHS COMPLIANT

PN: RVT70ASLFWN00			
SN: #####			
DRAWN: PM	5/17/2019	1:1.26	
CHECKED:		[mm]	
APPR:		ISO A3	



Revision:	Changes:	Date:
1.0	Initial Case	19.05.19

# RiTFT-70H-LV-CAP



**TFT NOTES:**

1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY BLACK
2. RESOLUTION: 1024x600
3. VIEWING ANGLE: FREE
4. INTERFACE: LVDS
5. DRIVER IC: EK79001HK+EK73215BCGA
6. LOGIC VOLTAGE: 3.3V
7. SURFACE LUMINANCE: 900cd/m<sup>2</sup>
8. BACKLIGHT: 27 CHIP WHITE LED  $\eta$ =TBD,  $V_f$ =TBD

**TP NOTES:**

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

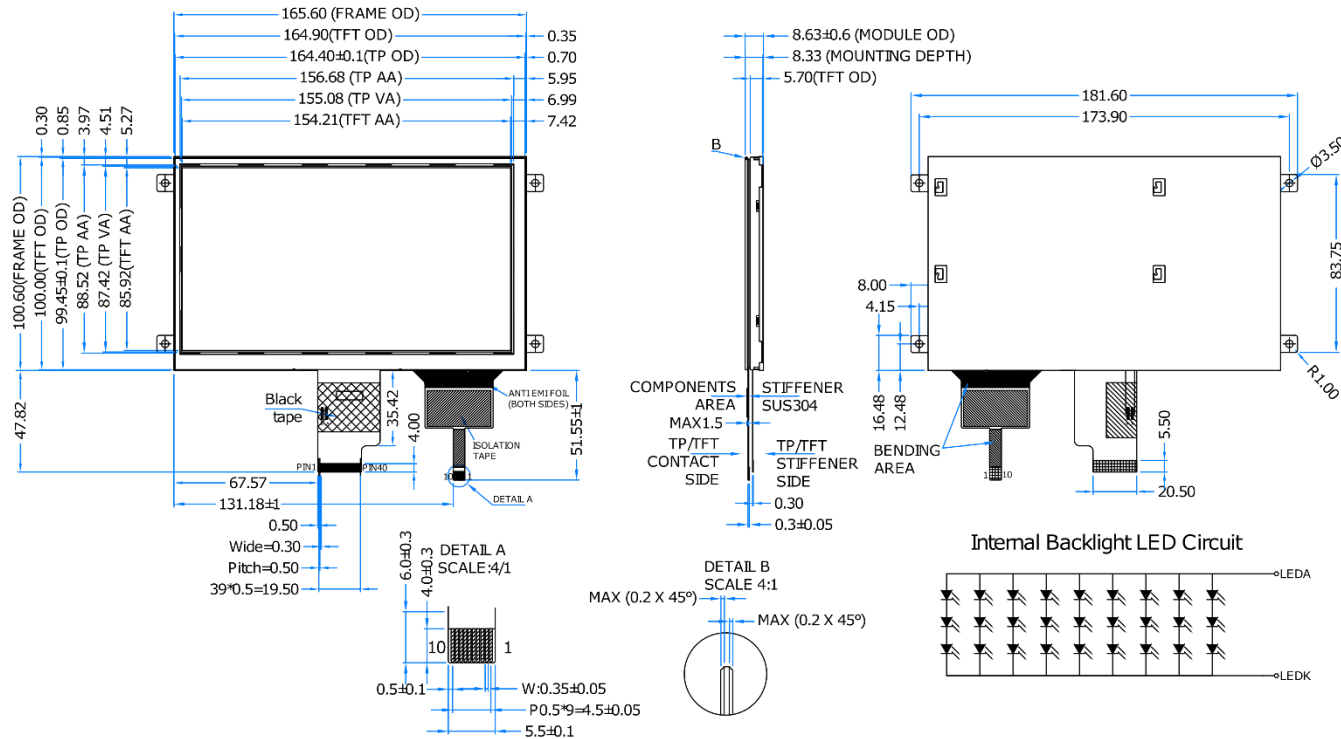
**GENERAL NOTES:**

1. OPERATING TEMPERATURE: -20°C ~ 70°C
2. STORAGE TEMPERATURE: -30°C ~ 80°C
3. WITHOUT INDIVIDUAL TOLERANCE: ±0.2mm
4. RoHS COMPLIANT

PN: RVT70ASLNWC00		
SN: #####		
DRAWN: PM	5/17/2019	1:2.00
CHECKED:		[mm]
APPR:		ISO A3 P. 1 of 1

Revision:	Changes:	Date:
1.0	Initial Case	19.05.19

# RiTFT-70H-LV-CAP-FR



**TFT NOTES:**

1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY BLACK
2. RESOLUTION: 1024x600
3. VIEWING ANGLE: FREE
4. INTERFACE: LVDS
5. DRIVER IC: EK79001HK+EK73215BCGA
6. LOGIC VOLTAGE: 3.3V
7. SURFACE LUMINANCE: 900cd/m<sup>2</sup>
8. BACKLIGHT: 27 CHIP WHITE LED I<sub>b</sub>=TBD, V<sub>f</sub>=TBD

**TP NOTES:**

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

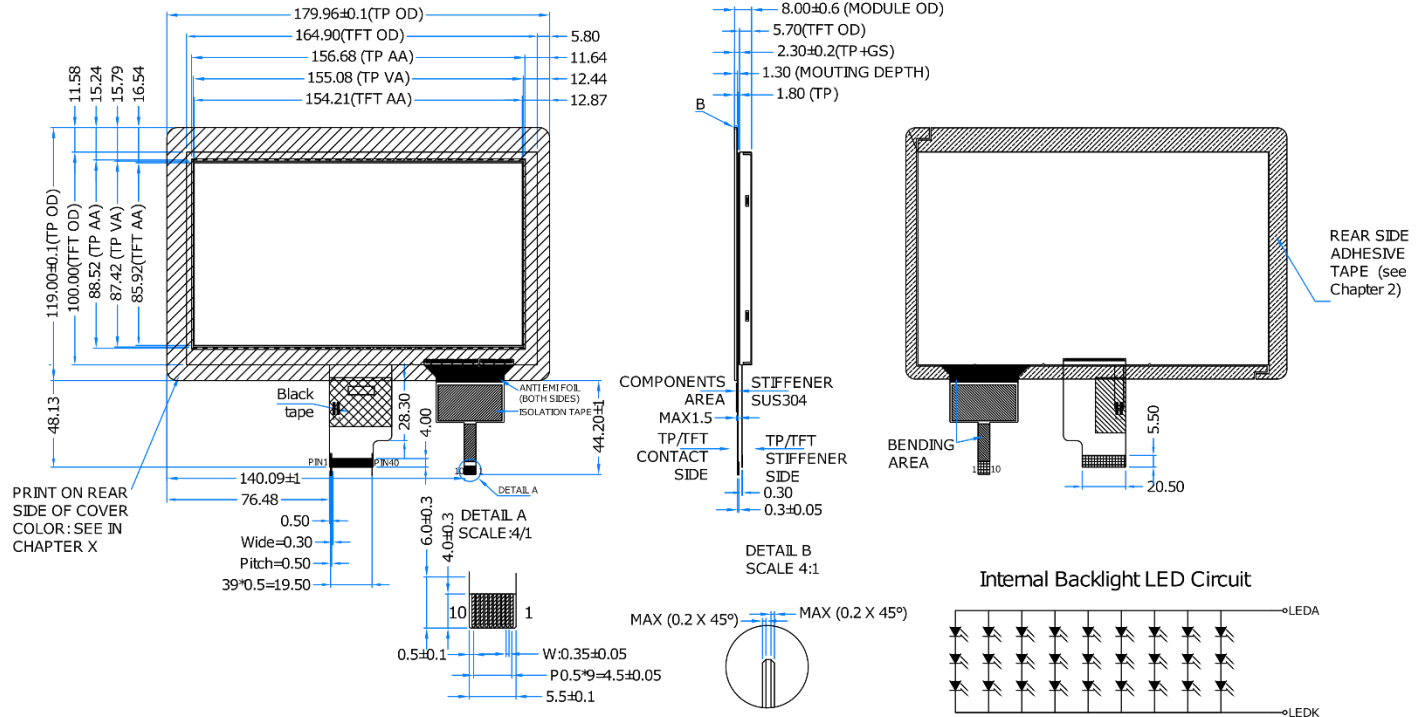
**GENERAL NOTES:**

1. OPERATING TEMPERATURE: -20°C ~ 70°C
2. STORAGE TEMPERATURE: -30°C ~ 80°C
3. WITHOUT INDIVIDUAL TOLERANCE: ±0.2mm
4. RoHS COMPLIANT

		PN: RVT70ASLFWC00		
		SN: ###		
DRAWN: PM	20.05.2019	1:2.00		
CHECKED:		[mm]		
APPR:		ISO A3		

Revision:	Changes:	Date:
1.0	Initial Case	19.05.17

# RiTFT-70H-LV-CAP-UX



**TFT NOTES:**

1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY BLACK
2. COLOR DEPTH: TBD
3. RESOLUTION: 1024x600
4. VIEWING ANGLE: FREE
5. INTERFACE: LVDS
6. DRIVER IC: TBD
7. LOGIC VOLTAGE: 3.3V
8. SURFACE LUMINANCE: 900cd/m<sup>2</sup>
9. BACKLIGHT: 27 CHIP WHITE LED I<sub>b</sub>=TBD, V<sub>f</sub>=TBD

**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: RVT70USLWNC0x  
SN: ###



DRAWN: PM	05/20/19	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	NOTE
Backlight driving voltage	VF	9.0	9.6	10.2	V	
Backlight driving current	IF	-	270	-	mA	
Backlight Power Consumption	WBL	-	2592	-	mW	
Life Time	-	-	30000	-		Note

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.

Lv = 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, Tr) and from black to white (Decay Time, Tf). 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

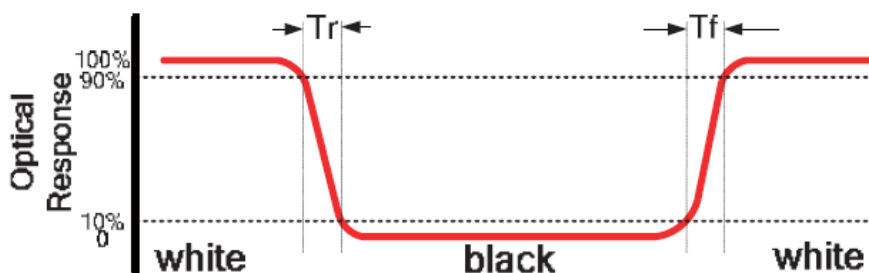
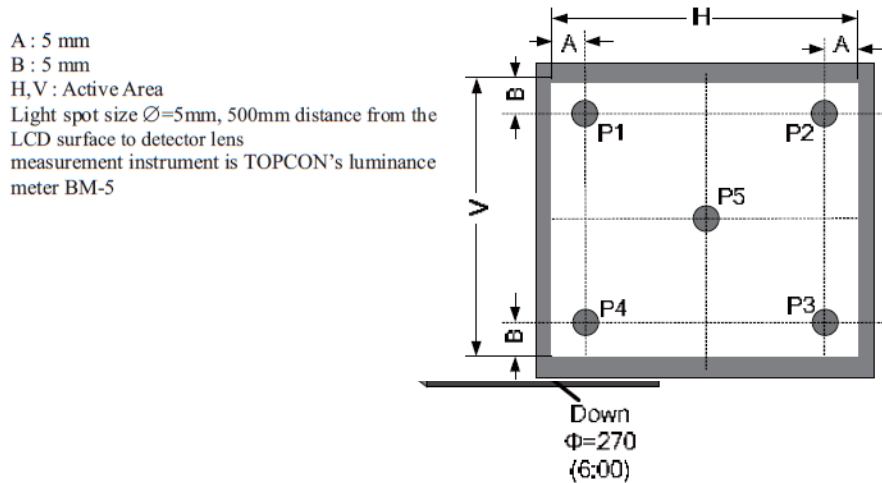


Figure 3.Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity



## 9 INTERFACE DESCRIPTION

### 9.1 TFT LCD Panel

PIN NO.	SYMBOL	I/O	DESCRIPTION
1	VCOM	P	Common Voltage
2	VDD	P	Power Voltage for digital circuit
3	VDD	P	Power Voltage for digital circuit
4	NC	-	No Connection
5	Reset	I	Global reset pin
6	STBYB	I	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0" timing controller, source driver will turn off, all output are High-Z.
7	GND	P	Ground
8	RXIN0-	I	-LVDS differential data input
9	RXIN0+	I	+LVDS differential data input
10	GND	P	Ground
11	RXIN1-	I	-LVDS differential data input
12	RXIN1+	I	+LVDS differential data input
13	GND	P	Ground
14	RXIN2-	I	-LVDS differential data input
15	RXIN2+	I	+LVDS differential data input
16	GND	P	Ground
17	RXCLKIN-	I	-LVDS differential clock input
18	RXCLKIN+	I	+LVDS differential clock input
19	GND	P	Ground
20	RXIN3-	I	-LVDS differential data input
21	RXIN3+	I	+LVDS differential data input
22	GND	P	Ground

23	NC	-	No Connection
24	NC	-	No Connection
25	GND	P	Ground
26	NC	-	No Connection
27	NC	-	No Connection
28	SELB	I	6bit/8bit mode select
29	AVDD	P	Power for analog circuit
30	GND	P	Ground
31	LED-	P	LED Cathode
32	LED-	P	LED Cathode
33	L/R	I	Horizontal inversion
34	U/D	I	Vertical Inversion
35	VGL	P	Gate OFF voltage
36	NC		No Connection
37	NC		No Connection
38	VGH	P	Gate ON Voltage
39	LED+	P	LED Anode
40	LED+	P	LED Anode

I: input, O:output, P:Power

**Note 1.** If LVDS input data is 6 bits, SELB must be set to High;  
If LVDS input data is 8 bits, SELB must be set to Low.

**Note 2.** When CABC\_EN = "00", CABC OFF.  
When CABC\_EN = "01", user interface image.  
When CABC\_EN = "10", still picture.  
When CABC\_EN = "11", moving image.  
When CABC off, don't connect DIMO, else connect it to backlight.

**Note 3.** When L/R = "0", set right to left scan direction.  
When L/R = "1", set left to right scan direction.  
When U/D = "0", set top to bottom scan direction.

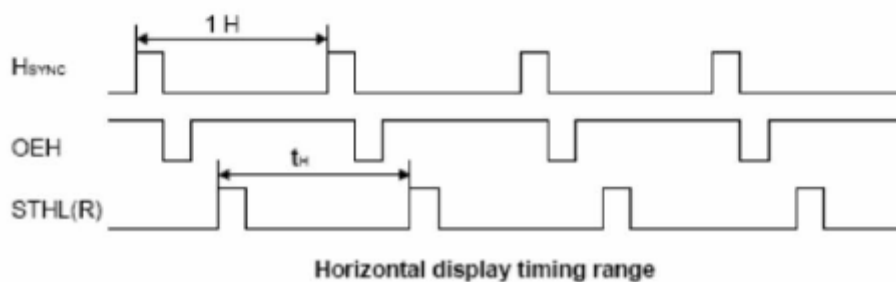
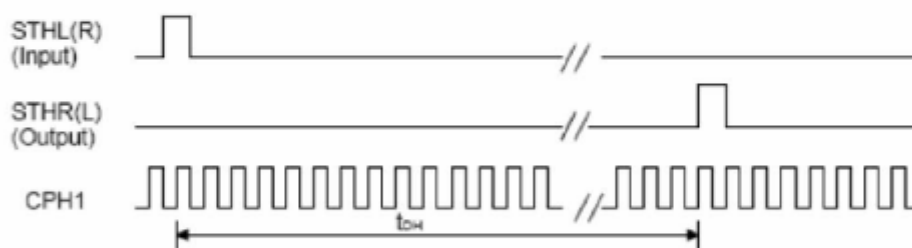
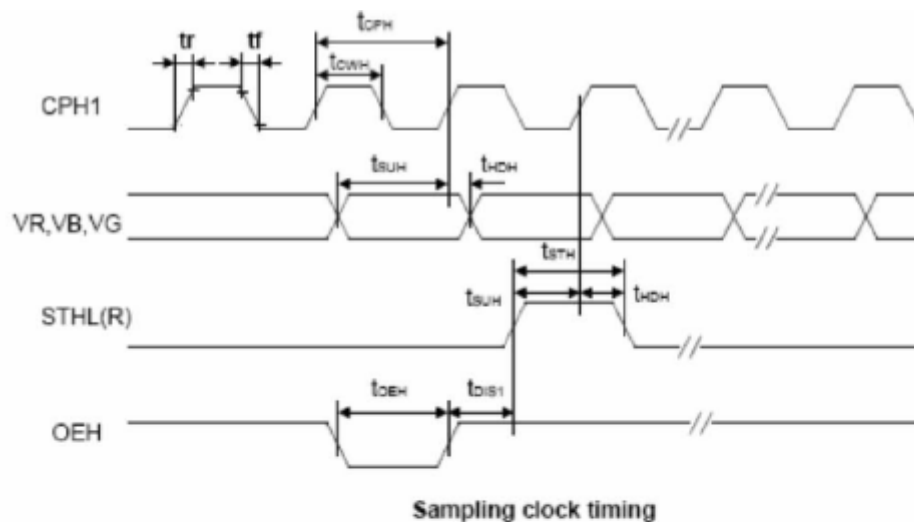
## 9.2 U/D R/L Function Description

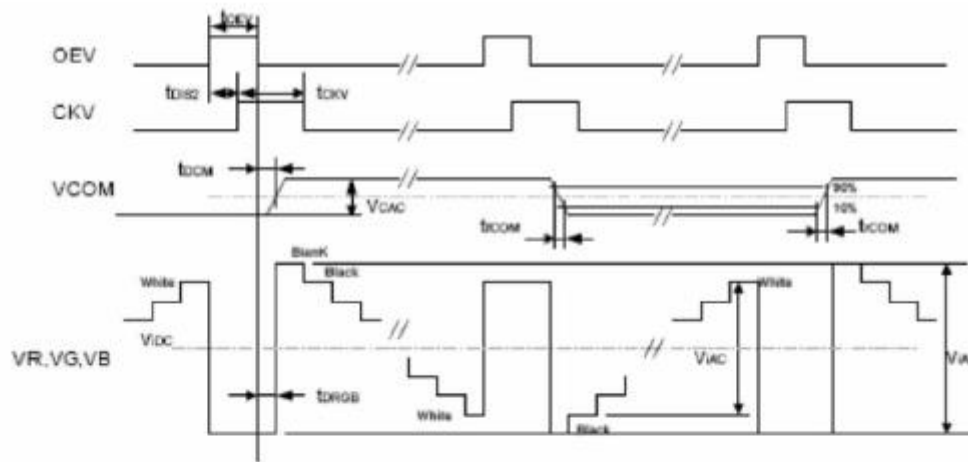
Scan control Input UPDN	Scan control Input SHLR	Scanning Direction
GND	VDD	Up to Down, Left to Right
VDD	GND	Down to Up, Right to left
GND	GND	Up to Down, Right to Left
VDD	VDD	Down to Up, Left to Right



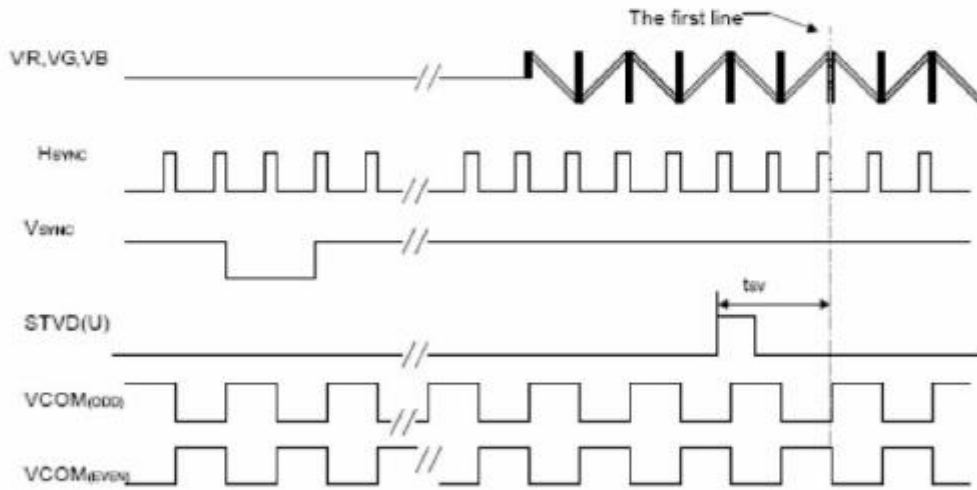
## 10 TIMING CHARACTERISTICS

### 10.1 Timing Diagram of Interface Signal

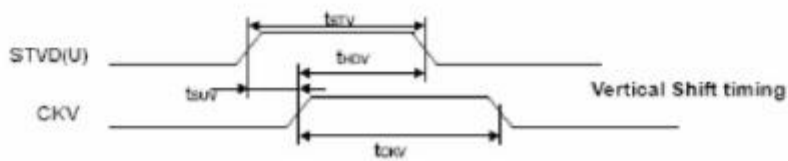




Detail Horizontal timing



Vertical timing



Vertical Shift timing

	ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
<b>DE MODE</b>	Dot Clock	1/tCLK	45	51.2	57	MHz	
	DCLK pulse duty	Tcwh	40	50	60	%	
	Horizontal total Time	tH	1324	1344	1364	tCLK	
	Horizontal effective Time	tHA		1024		tCLK	
	Horizontal Blank Time	tHB	300	320	340	tCLK	
	Vertical total Time	tV	625	635	645	tH	
	Vertical effective Time	tVA		600		tH	
<b>SYNC MODE</b>	Horizontal total Time	TH	1324	1344	1364	tCLK	
	Horizontal Pulse Width	Thpw		20	-	tCLK	thb+ thpw =160DCLK is fixed
	Horizontal Back Porch	Thb		140	-	tCLK	
	Horizontal Front Porch	Thfp	140	160	180	tCLK	
	Horizontal effective Time	THA		1024		tCLK	
	Vertical total Time	TV	625	635	645	tH	
	Vertical Pulse Width	Tvpw		3	-	th	tpw+ tvb =23th is fixed
	Vertical Back Porch	Tvb	-	20	-	th	
	Vertical Front Porch	Tvfp	2	12	22	th	
Vertical Valid	Tvd		600		th		

## 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	No Connection	
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

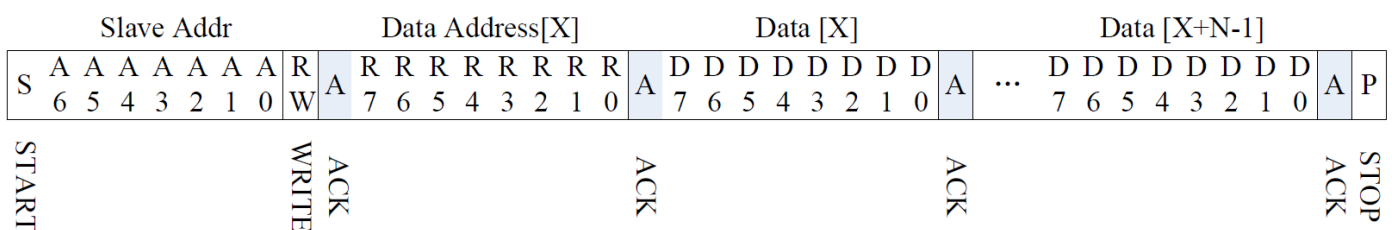


Figure 6. Set Data Address

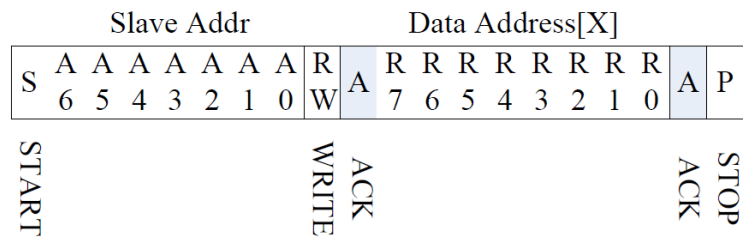
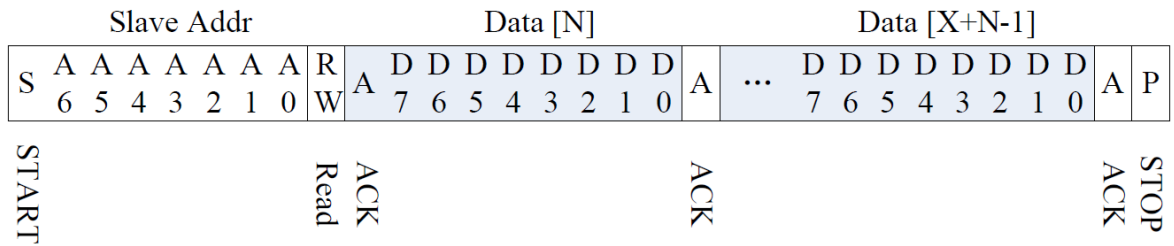
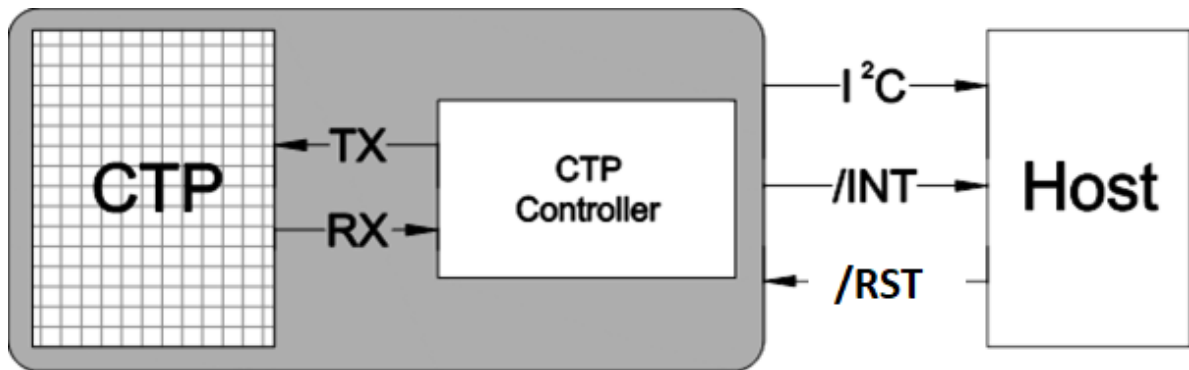


Figure 7. Read X bytes from I2C Slave



### 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 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

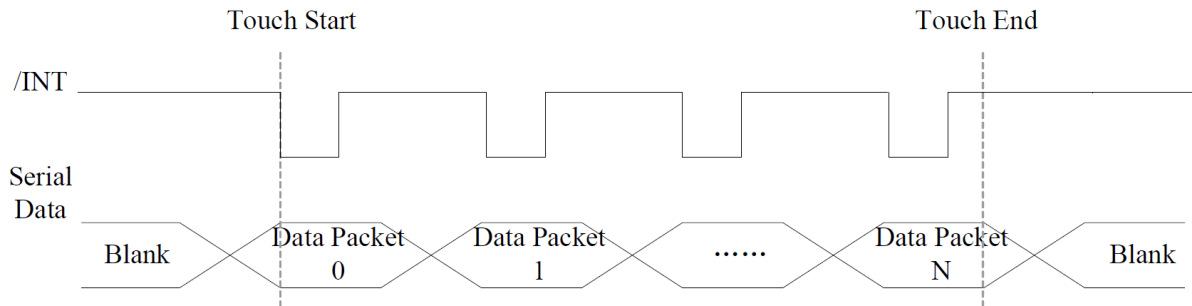
**TOUCHn\_YL(n:1-10)**

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

### 11.9 Interrupt Trigger Mode

Figure 9. Interrupt trigger mode timing



## 10 INSPECTION

Standard acceptance/rejection criteria for TFT module.

### 10.1 Inspection condition

Ambient conditions:

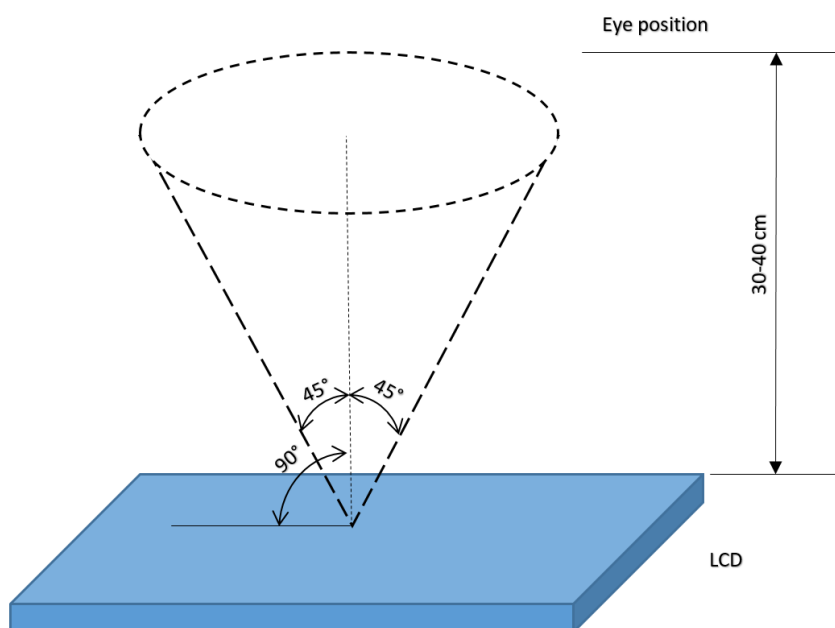
- Temperature:  $25 \pm 1^\circ\text{C}$
- Humidity:  $(60 \pm 10)\% \text{RH}$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

Viewing distance:

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

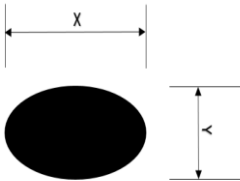
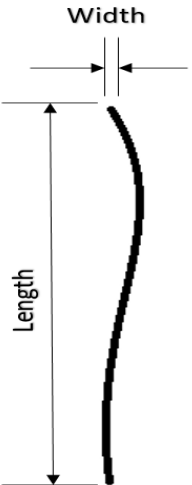
Viewing Angle:

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





10.2 Inspection standard

Item	Criterion																																		
<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> $D = \frac{(x + y)}{2}$ <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> <table border="1" style="margin-left: 20px; margin-top: 10px;"> <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> <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																																	
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-	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	Size < 5"		
	<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	
	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>	4	
	<b>0.5 mm &lt; D</b>	0	
	Touch panel White line Scratch	Size < 5"	
<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
Size >= 5"			
<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

## 11 RELIABILITY TEST

NO	TEST ITEM	TEST CONDITION	REMARK
1	High Temperature Storage	80°C/120hours	Note
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 Humidity	40°C, 90%RH, 120Hr	
6	Peeling Off (Storage)	≥500gf/cm	
7	FPC Bending Test	≥6000 times, 2/sec	
6	Vibration Test (Storage)	50Hz, 30 min., Amplitude 2cm, X, Y, Z directions	
8	Drop Test	Height:60 cm 3 corner,8 face/1 cycle	

## Note:

- 1) The test samples should be applied to only one test item.
- 2) Sample size for each test item is 5~10pcs
- 3) For Damp Proof Test, pure Water (Resistance>1MΩ) should be used.
- 4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part
- 5) EL evaluation should be expected from reliability test with humidity and temperature: some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
- 6) After the reliability test, the test samples should be inspected after 2 hours at least.
- 7) Functional test is OK. Missing segment, shorts, unclear segment, non display, display abnormally, liquid crystal leak are not allowed.
- 8) After testing, the current IDD should be within initial value ±20%
- 9) No low temperature bubbles, end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test

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