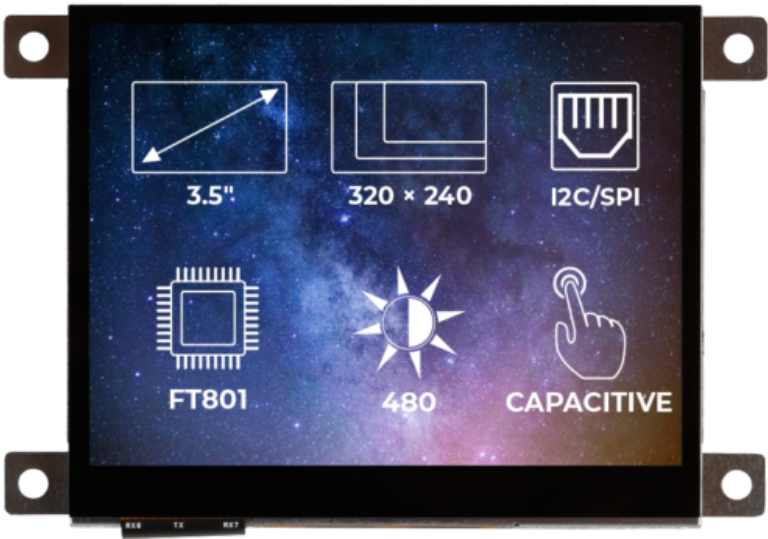


# EVE1 3.5"



This datasheet gives detailed information about the Riverdi 3.5" EVE1 displays. The displays come in different versions: with **capacitive, resistive, or no touchscreen**, and with or without a **metal mounting frame**.

ORDER NOW



Rev.1.0  
2019-06-07

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally white	/
Size	3.5	Inch
Viewing Direction	12:00 (without image inversion)	O' Clock
Gray Scale Inversion Direction	6:00	O' Clock

Number of Dots		320 x (RGB) × 240	/
Driver IC		FT80x	/
Interface Type		SPI/I2C	/
Brightness	no touch module	540	cd/m2
	CTP module	480	
	RTP module	450	
Color Depth		262k	/
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	35	A	320 240	C	X	W	x	0x
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

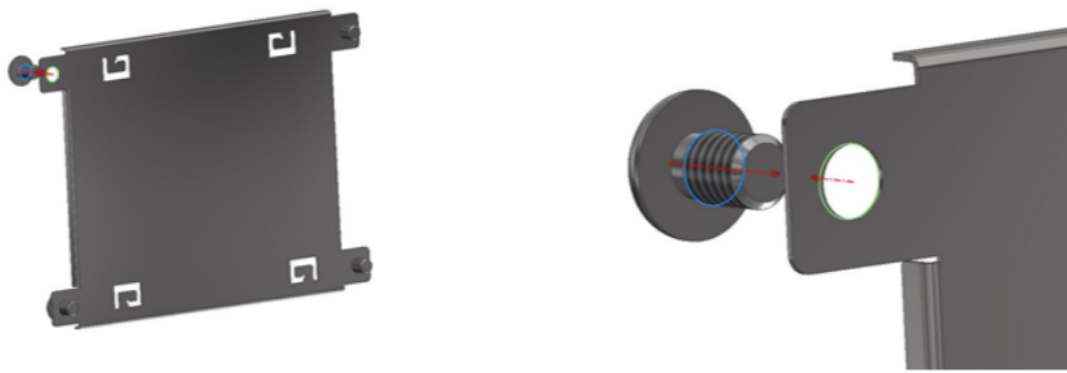
1.	<b>BRAND</b>	<b>RV – Riverdi</b>
2.	<b>PRODUCT TYPE</b>	<b>T – TFT Standard</b>
3.	<b>DISPLAY SIZE</b>	<b>35 – 3.5”</b>
4.	<b>MODEL SERIAL NO.</b>	A (A-Z)
5.	<b>RESOLUTION</b>	<b>320240– 320×240 px</b>
6.	<b>INTERFACE</b>	<b>C– TFT+controller FT8xx</b>
7.	<b>FRAME</b>	N – No Frame F – Mounting Frame
8.	<b>BACKLIGHT TYPE</b>	<b>W – LED White</b>
9.	<b>TOUCH PANEL</b>	N – No Touch Panel R – Resistive Touch Panel C – Capacitive Touch Panel
10.	<b>VERSION</b>	0x (00-99)

## 2. Assembly guide – integration

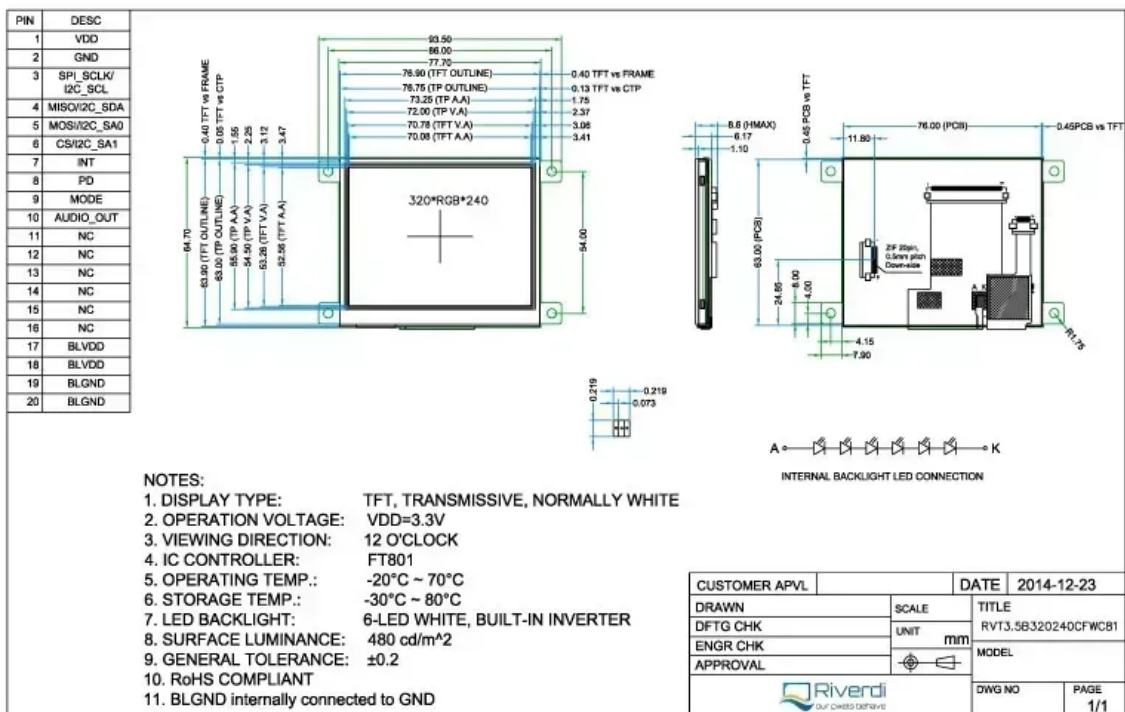
### 2.1. Mounting frame

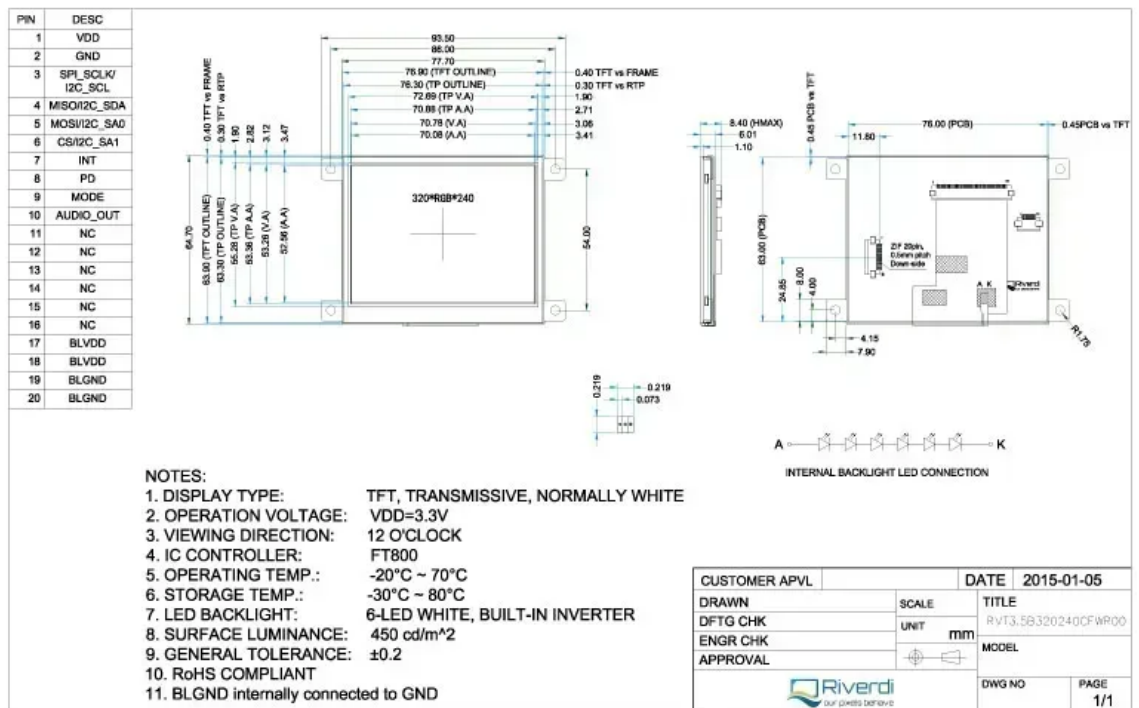
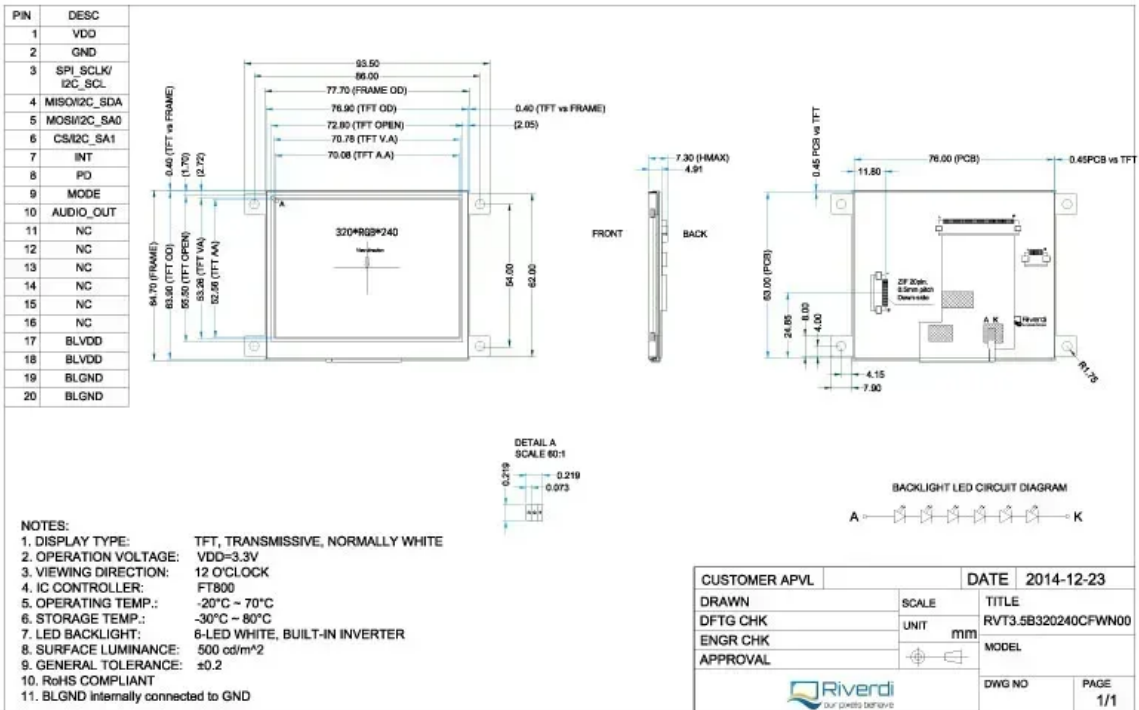
For dimensions 3.5”, 4.3”, 5.0” and 7.0” the product with mounting frame version is available. Thanks to the four catches attached to the side, frame provides strong assembly to the surface by mounting element (like the screw, see Figure 3). The frames are specially designed to fit Riverdi products perfectly.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

Figure 1. Mounting frame

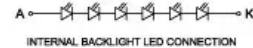
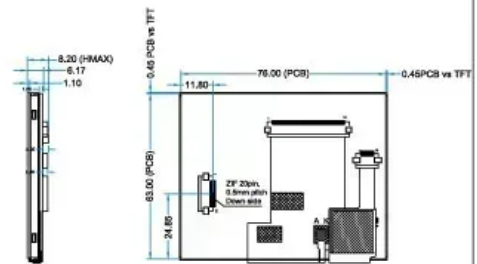
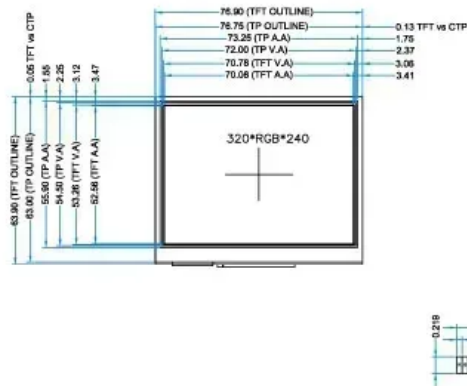


### 3. Drawings





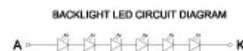
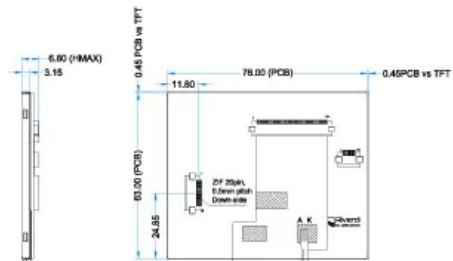
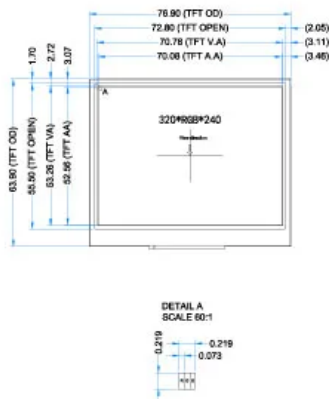
PIN	DESC
1	VDD
2	GND
3	SPI_SCLK/ I2C_SCL
4	MISO/I2C_SDA
5	MOSI/I2C_SA0
6	CS/I2C_SA1
7	INT
8	PD
9	MODE
10	AUDIO_OUT
11	NC
12	NC
13	NC
14	NC
15	NC
16	NC
17	BLVDD
18	BLVDD
19	BLGND
20	BLGND



- NOTES:
1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
  2. OPERATION VOLTAGE: VDD=3.3V
  3. VIEWING DIRECTION: 12 O'CLOCK
  4. IC CONTROLLER: FT801
  5. OPERATING TEMP.: -20°C ~ 70°C
  6. STORAGE TEMP.: -30°C ~ 80°C
  7. LED BACKLIGHT: 6-LED WHITE, BUILT-IN INVERTER
  8. SURFACE LUMINANCE: 480 cd/m<sup>2</sup>
  9. GENERAL TOLERANCE: ±0.2
  10. RoHS COMPLIANT
  11. BLGND internally connected to GND

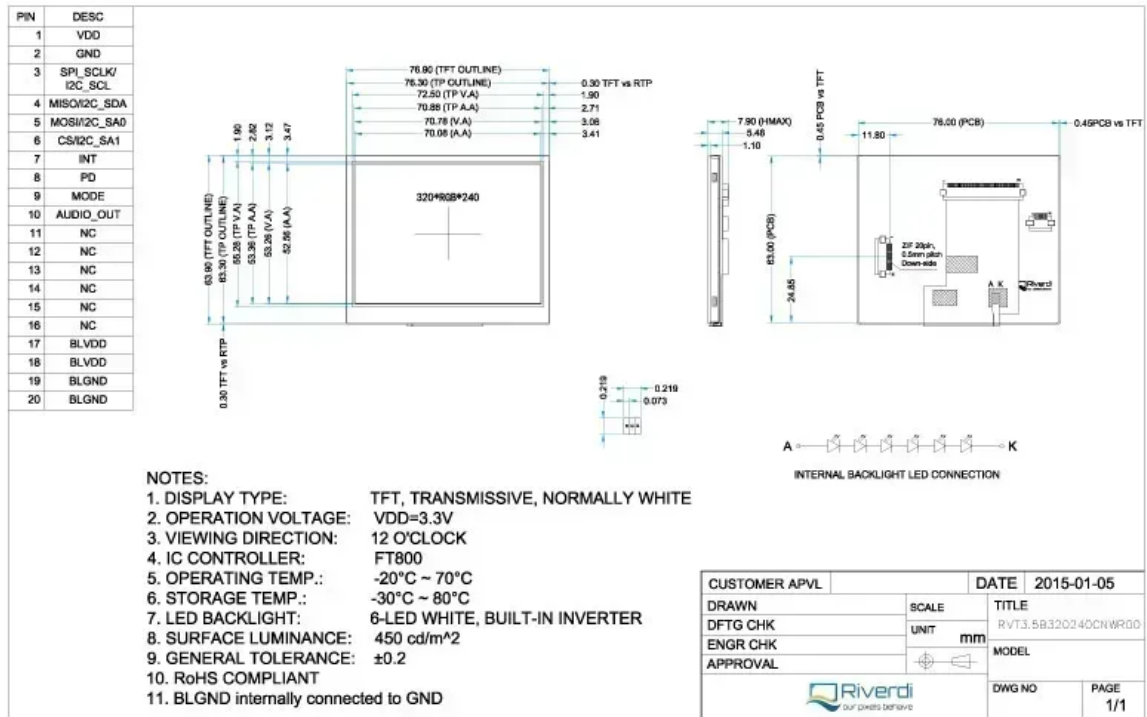
CUSTOMER APVL	DATE	2014-12-23
DRAWN	SCALE	TITLE
DFTG CHK	UNIT	RVT3.5B320240CNWC81
ENGR CHK	mm	MODEL
APPROVAL		DWG NO
		PAGE
		1/1

PIN	DESC
1	VDD
2	GND
3	SPI_SCLK/ I2C_SCL
4	MISO/I2C_SDA
5	MOSI/I2C_SA0
6	CS/I2C_SA1
7	INT
8	PD
9	MODE
10	AUDIO_OUT
11	NC
12	NC
13	NC
14	NC
15	NC
16	NC
17	BLVDD
18	BLVDD
19	BLGND
20	BLGND



- NOTES:
1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
  2. OPERATION VOLTAGE: VDD=3.3V
  3. VIEWING DIRECTION: 12 O'CLOCK
  4. IC CONTROLLER: FT800
  5. OPERATING TEMP.: -20°C ~ 70°C
  6. STORAGE TEMP.: -30°C ~ 80°C
  7. LED BACKLIGHT: 6-LED WHITE, BUILT-IN INVERTER
  8. SURFACE LUMINANCE: 500 cd/m<sup>2</sup>
  9. GENERAL TOLERANCE: ±0.2
  10. RoHS COMPLIANT
  11. BLGND internally connected to GND

CUSTOMER APVL	DATE	2014-12-23
DRAWN	SCALE	TITLE
DFTG CHK	UNIT	RVT3.5B320240CNWN00
ENGR CHK	mm	MODEL
APPROVAL		DWG NO
		PAGE
		1/1



## 4. Absolute maximum ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage for Logic (VDD pin)	VDD	0	4.0	V
Supply Voltage for Logic (BLVDD pins)	BLVDD	0	7.0	V
Input Voltage For Logic	VIN	GND	VDD	V
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 For LED inverter	BLVDD	2.8	3.3	5.5	V	
Input Current (Exclude LED Backlight)	IDD	–	55	69	mA	VDD=3.3V
LED Backlight Current	IDDbacklight	–	150	187	mA	BLVDD=3.3V
LED Backlight Current	IDDbacklight	–	93	117	mA	BLVDD=5V

Total Input current (Include LED Backlight 100%)	IDDtotal	–	205	257	mA	BLVDD=3.3V
Input Voltage ‘H’ level	Vih	0.7VDD	–	VDD	V	
Input Voltage ‘L’ level	Vil	GND	–	0.2VDD	V	
LED Life Time	–	40000	50000	–	Hrs	Note1

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

## 6. Electro-optical characteristics

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time		Tr+Tf	$\theta=0^{\circ}$ $\varnothing=0^{\circ}$ Ta=25°C	—	25	30	ms	Figure 1	4
Contrast Ratio		Cr		—	350	—	—	Figure 2	1
Luminance Uniformity		$\delta$ WHITE		75	80	—	%	Figure 2	3
Surface Luminance	TFT	Lv		—	540	—	cd/m2	Figure 2	2
	TFT+CTP			—	480	—			
	TFT+RTP			—	450	—			
Viewing Angle Range		$\theta$	$\varnothing = 90^{\circ}$	30	40	—	deg	Figure 3	6
			$\varnothing = 270^{\circ}$	50	60	—	deg	Figure 3	
			$\varnothing = 0^{\circ}$	50	60	—	deg	Figure 3	
			$\varnothing = 180^{\circ}$	50	60	—	deg	Figure 3	
CIE (x, y) Chromaticity	Red	x	$\theta=0^{\circ}$ $\varnothing=0^{\circ}$ Ta=25°C	0.574	0.624	0.674	Figure 2	5	
		y		0.318	0.368	0.418			
	Green	x		0.3	0.35	0.4			
		y		0.5	0.55	0.6			
	Blue	x		0.093	0.143	0.193			
		y		0.069	0.119	0.169			
	White	x		0.26	0.31	0.36			
		y		0.283	0.333	0.383			
NTSC	—	—	—	—	50	—	%	—	

**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<sub>v</sub> = 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 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 2. The definition of response time

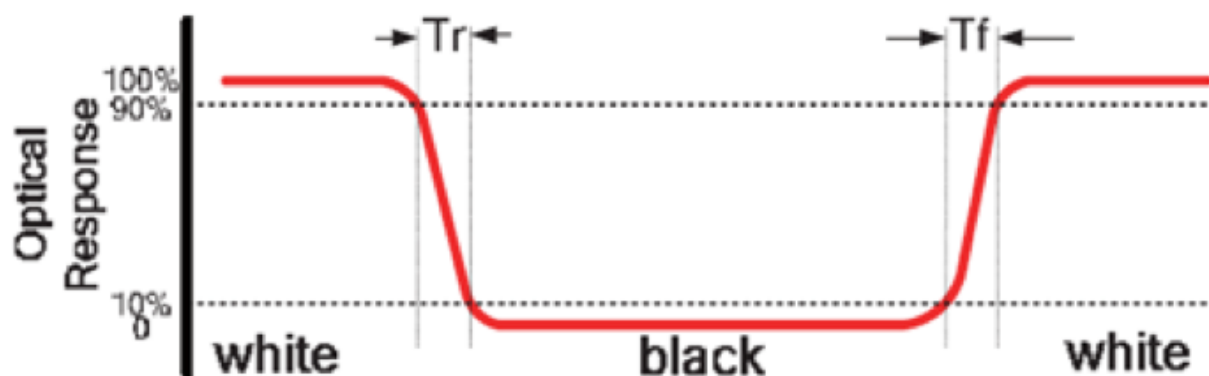


Figure 3. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

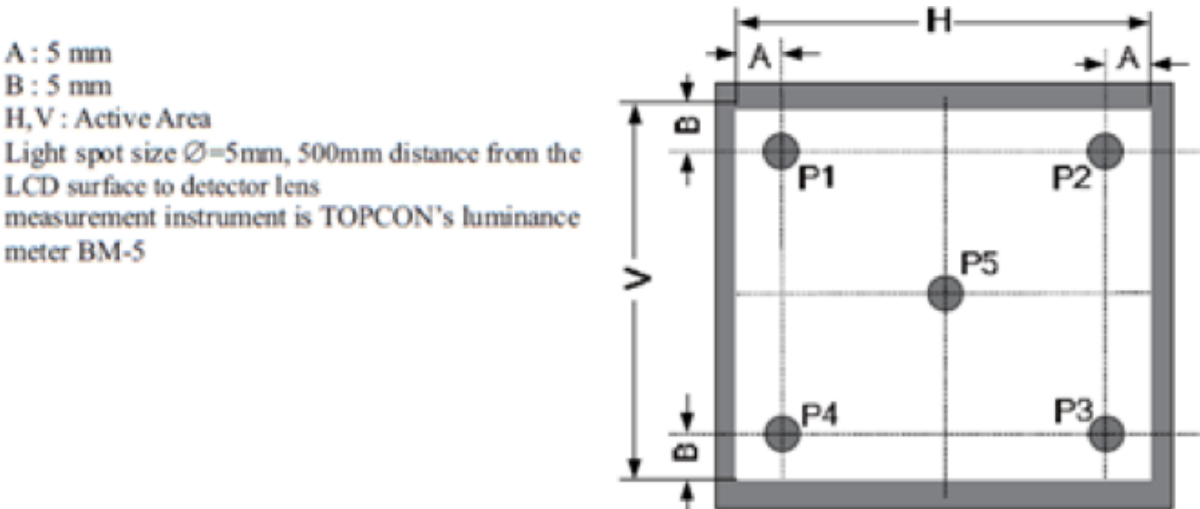
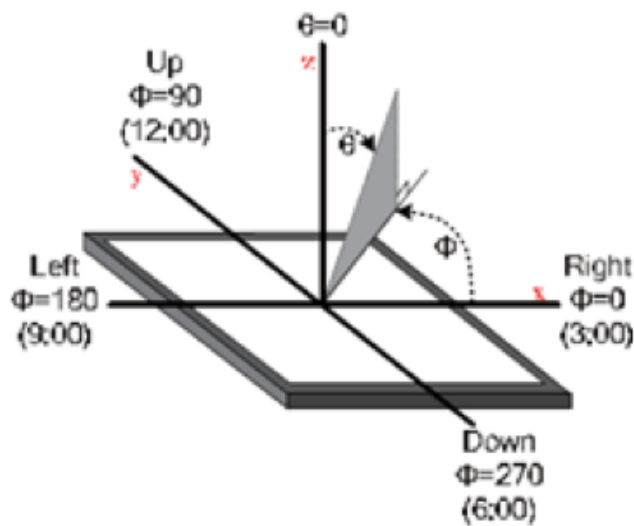


Figure 4.The definition of viewing angle



7. Interface description

PIN NO.	SYMBOL	DESCRIPTION
1	VDD	Power Supply
2	GND	Ground
3	SPI_SCLK/ I2C_SCL	SPI SCK Signal / I2C SCL Signal, Pulled Up Inside Display by 47k Resistor

<b>4</b>	MISO/ I2C_SDA	SPI MISO Signal / I2C SDA Signal, Pulled Up Inside Display by 47k Resistor
<b>5</b>	MOSI/ I2C_SA0	SPI MOSI Signal / I2C Slave Address Bit 0, Pulled Up Inside Display by 47k Resistor
<b>6</b>	CS/I2C_SA1	SPI Chip Select Signal / I2C Slave Address Bit 1, Pulled Up Inside Display by 47k Resistor
<b>7</b>	INT	Interrupt Signal, Active Low, Pulled Up Inside Display by 47k Resistor
<b>8</b>	PD	Power Down Signal, Active Low, Pulled Up Inside Display by 47k Resistor
<b>9</b>	MODE	Host Interface SPI(Pull Low) or I2C(Pull Up) Mode Select Input, By Default Pulled Low Inside Display by 47k Resistor
<b>10</b>	AUDIO_OUT	Audio Out Signal
<b>11</b>	NC	Not Connected
<b>12</b>	NC	Not Connected
<b>13</b>	NC	Not Connected
<b>14</b>	NC	Not Connected
<b>15</b>	NC	Not Connected
<b>16</b>	NC	Not Connected
<b>17</b>	BLVDD	Backlight Power Supply, Can Be Connected to VDD
<b>18</b>	BLVDD	Backlight Power Supply, Can Be Connected to VDD
<b>19</b>	BLGND	Backlight Ground, Internally connected to GND
<b>20</b>	BLGND	Backlight Ground, Internally connected to GND

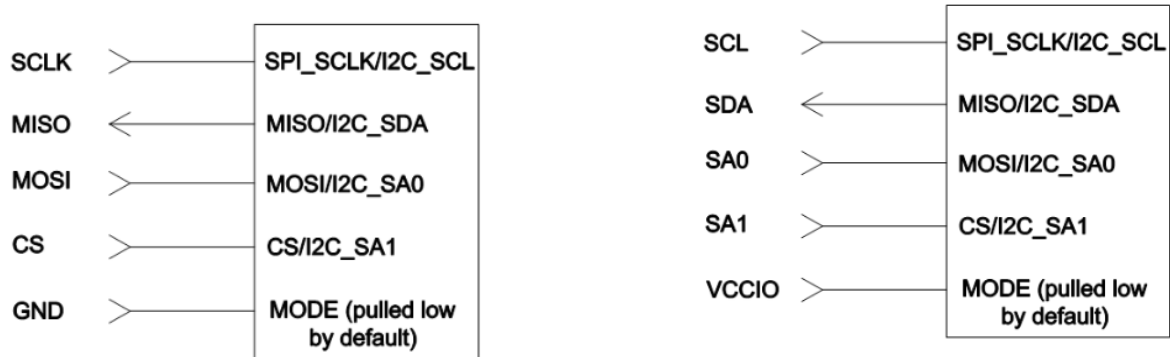
## 8. FT80x Controller specifications

FT80x or EVE (Embedded Video Engine) simplifies the system architecture for advanced human machine interfaces (HMIs) by providing functionality for display, audio, and touch as well as an object oriented architecture approach that extends from display creation to the rendering of the graphics.

### 8.1. Serial host interface

*Figure 5. SPI  
interface  
connection*

*Figure 6. I2C  
interface  
connection*



**SPI Interface** – the SPI slave interface operates up to 30MHz.

Only SPI mode 0 is supported. The SPI interface is selected by default (MODE pin is internally pulled low by 47k resistor).

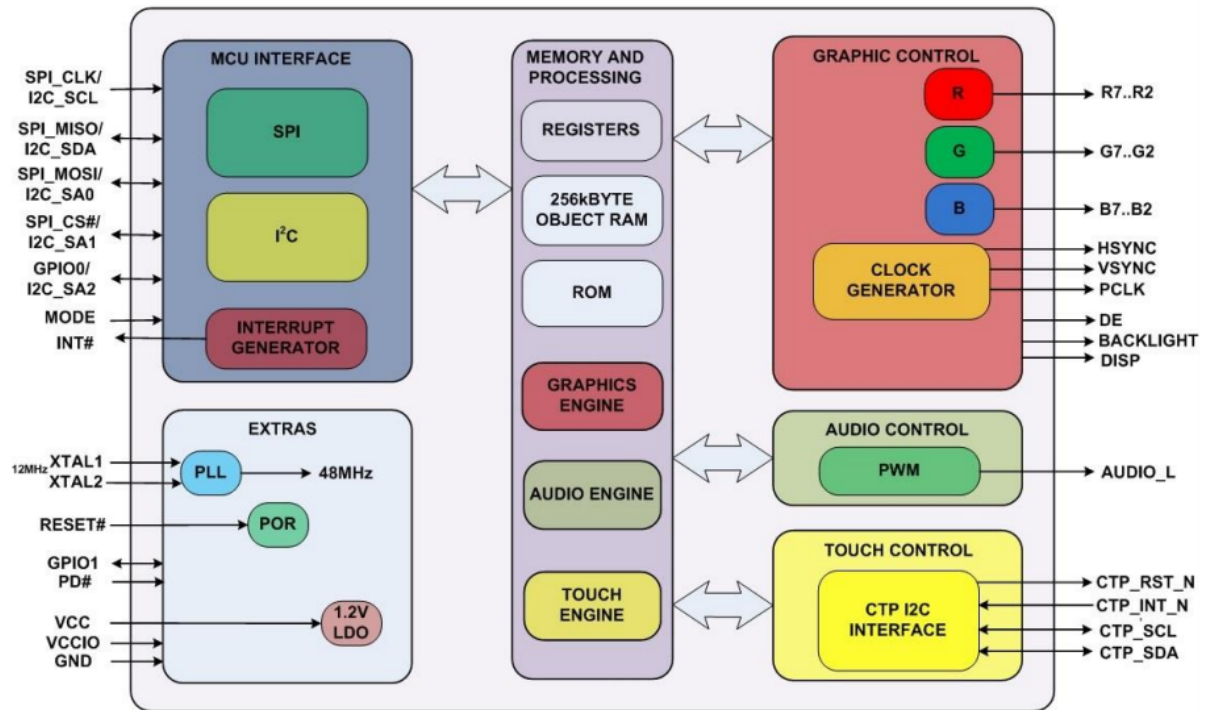
**I<sup>2</sup>C Interface** – the I<sup>2</sup>C slave interface operates up to 3.4MHz, supporting standard-mode, fast-mode, fast-mode plus and high-speed mode.

The I<sup>2</sup>C device address is configurable between 20h to 23h depending on the I<sup>2</sup>C\_SA[1:0] pin setting, i.e. the 7-bit I2C slave address is 0b'01000A1A0.

The I<sup>2</sup>C interface is selected when the MODE pin is tied to VDDIO.

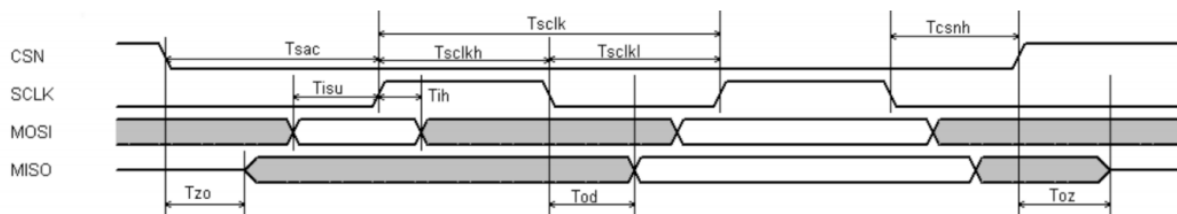
## 8.2. Block diagram

Figure 7. FT800 Block diagram



### 8.3. Host Interface SPI mode 0

Figure 8. SPI timing diagram



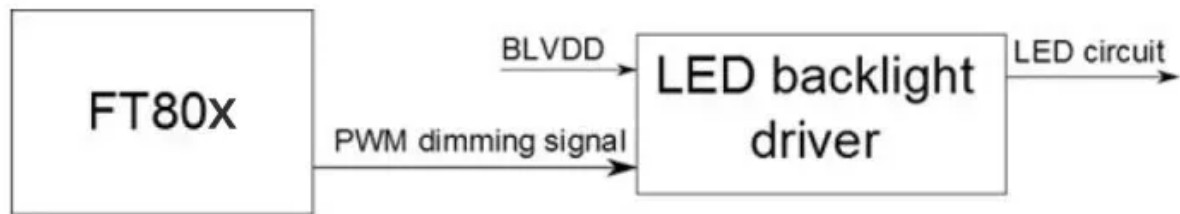
For more information about FT800 controller please go to official FT800 Datasheet.

[http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS\\_FT800.pdf](http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT800.pdf)

### 8.4. Backlight driver block diagram

Backlight enable signal is internally connected to FT80x Backlight control pin. This pin is controlled by two FT80x's registers. One of them specifies the PWM output frequency, second one specifies the duty cycle. Refer to FT80x datasheet for more information.

Figure 9. Backlight driver block diagram



## 9. LCD timing characteristics

### 9.1. Timing Chart

Timing parameter (VDD=3.3V, GND=0V, Ta=25°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
CLK Clock Time	Tclk	1/Max(FCLK)	–	1/Min(FCLK)	ns	–
CLK Pulse Duty	Tchw	40	50	60	%	TCLK
HSYNC to CLK	Thc	–	–	1	CLK	–
HSYNC Width	Thwh	1	–	–	CLK	–
VSYNC Width	Tvwh	1	–	–	ns	–
HSYNC Period Time	Th	60	63.56	67	ns	–
VSYNC Set-up Time	Tvst	12	–	–	ns	–
VSYNC Hold Time	Tvhd	12	–	–	ns	–
HSYNC Setup Time	Thst	12	–	–	ns	–
HSYNC Hold Time	Thhd	12	–	–	ns	–
Data Set-up Time	Tdsu	12	–	–	ns	D00~D23 to CLK
Data Hold Time	Tdhd	12	–	–	ns	D00~D23 to CLK
DEN Set-up Time	Tesu	12	–	–	ns	DEN to CLK

Figure 10. DE mode timing diagram

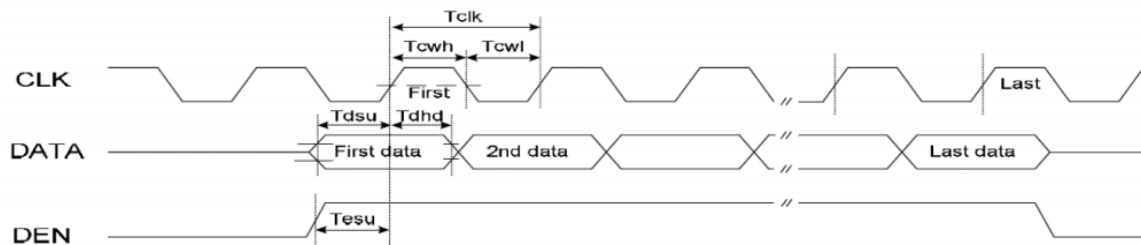


Figure 11. SYNC mode timing diagram

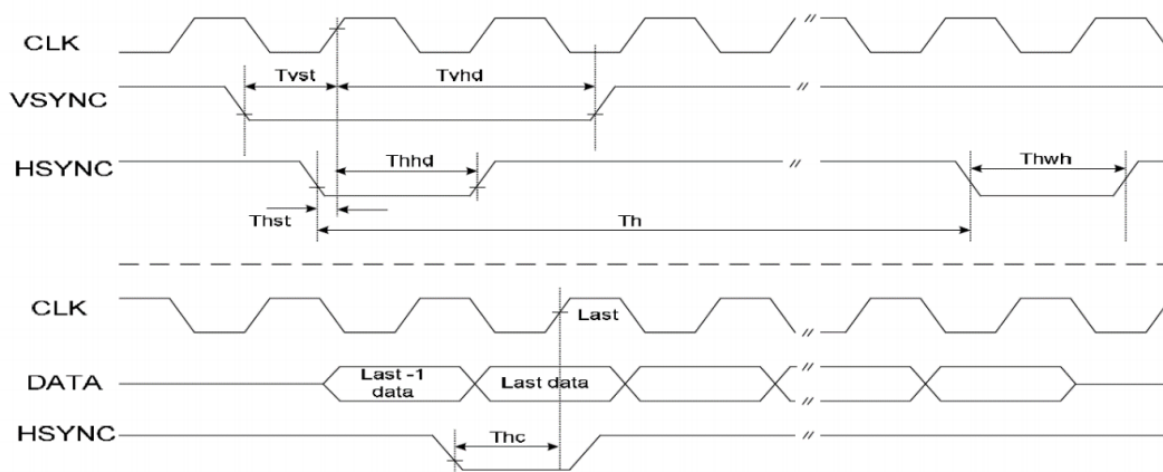
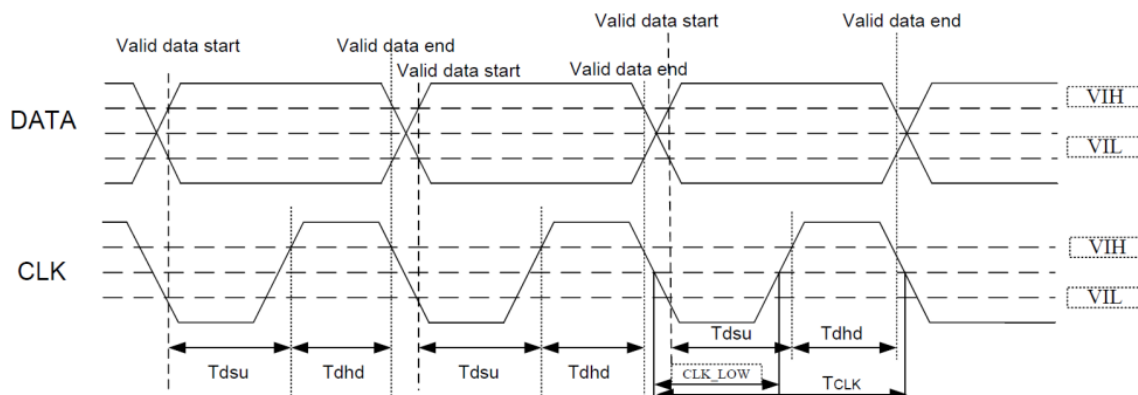


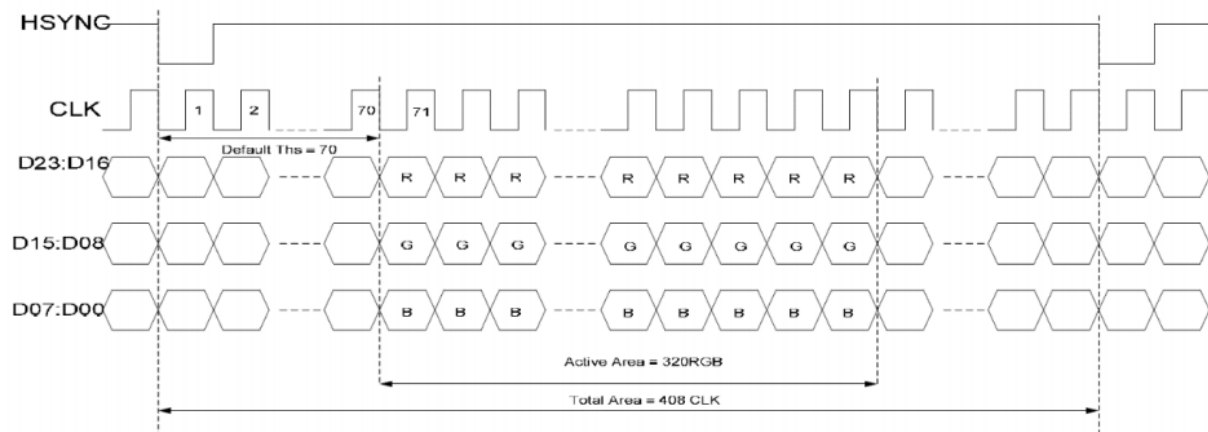
Figure 12. Timing diagram



## 9.2. 24Bit RGB Mode for 320 x RGB x 240

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
CLK Frequency	Fclk	7.0	8.0	9.0	MHz	VDD=3.0V~3.6V
CLK Cycle Time	Tclk	143	125	111	ns	–
CLK Pulse Duty	Tcwh	40	50	60	%	–
Time that HSYNC to 1st Data Input (NTSC)	Ths	40	70	255	CLK	DDLY=70 Offset=0(fixed)

Figure 13. 24 bit RGB SYNC mode timing



## 10. Touch screen panel specifications

### 10.1. Electrical characteristics

#### 10.1.1. For capacitive touch panel

DESCRIPTION		SPECIFICATION
Operating Voltage		DC 2.8~3.6V
Power Consumption (IDD)	Active Mode	10~18mA
	Sleep Mode	30~50μA
Interface		I2C
Linearity		<1.5%
Controller		FT5206
I2C address		0x38 (7 bit address)
Resolution		896*640



## 10.1.2. For resistive touch panel

ITEM	VALUE			UNIT	REMARK
	Min.	Typ.	Max.		
Linearity	–	–	1.5	%	Analog X and Y directions
Terminal Resistance	200	–	900	$\Omega$	X
	100	–	600	$\Omega$	Y
Insulation Resistance	20	–	–	M $\Omega$	DC 25V
Voltage	–	–	10	V	DC
Chattering	–	–	10	ms	100k $\Omega$ pull-up
Transparency	78	–	–	%	

**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

## 10.2. Mechanical characteristics

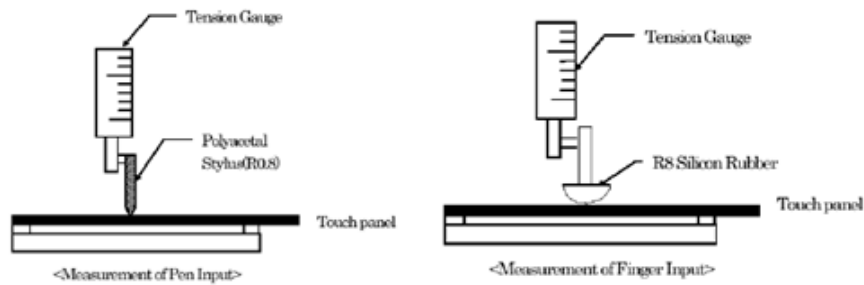
### 10.2.1 for capacitive touch panel

DESCRIPTION	INL SPECIFICATION	REMARK
Touch Panel Size	3.5 inch	
Outline Dimension (OD)	76.75 mm x 63.00mm	Cover Lens Outline
Product Thickness	1.26mm	
Glass Thickness	0.7 mm	
Ink View Area	72.00mm x 54.50mm	
Sensor Active Area	73.25mm x 55.90mm	
Input Method	5 Finger	
Activation Force	Touch	
Surface Hardness	≥7H	

### 10.2.2. For resistive touch panel

ITEM	VALUE			UNIT	REMARK
	Min.	Typ.	Max.		
Activation Force	20	–	100	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.

## 11. Inspection

Standard acceptance/rejection criteria for TFT module.

### 11.1. 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:

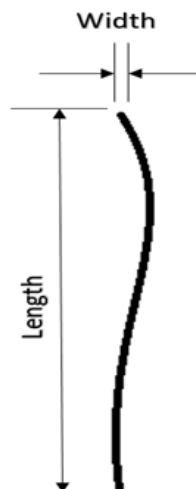
$35 \pm 5 \text{cm}$  between inspector bare eye and LCD.

Viewing Angle:

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



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



\*Spots density: 10 mm

Size < 5"		
Length	Width	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"		
Length	Width	Qualified Qty
–	W< 0.02	Ignored
<b>L &lt; 3.0</b>	0.02 < W < 0.05	4
<b>L &lt; 2.5</b>	0.05 < W < 0.08	
–	0.08 < W	0

Item	Criterion														
Clear spots	<table><tr><th colspan="2">Size &lt; 5"</th></tr><tr><td>Average Diameter</td><td>Qualified Qty</td></tr><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></table>	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													
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	<table><tr><th colspan="2">Size &gt;= 5"</th></tr><tr><td>Average Diameter</td><td>Qualified Qty</td></tr><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>4</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></table>	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		
	Size >= 5"														
	Average Diameter	Qualified Qty													
	D<0.2 mm	Ignored													
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*Spots density: 10 mm															
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	Size < 5"														
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	Average Diameter	Qualified Qty													

	<table><tr><td>D&lt;0.25 mm</td><td>Ignored</td></tr><tr><td>0.25 mm &lt; D &lt; 0.5 mm</td><td>3</td></tr><tr><td>0.5 mm &lt; D</td><td>0</td></tr></table>	D<0.25 mm	Ignored	0.25 mm < D < 0.5 mm	3	0.5 mm < D	0																										
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Touch panel spot	<table><tr><td colspan="2">Size &lt; 5"</td></tr><tr><td>Average Diameter</td><td>Qualified Qty</td></tr><tr><td>D &lt; 0.2 mm</td><td>Ignored</td></tr><tr><td>0.2 mm &lt; D &lt; 0.4 mm</td><td>5</td></tr><tr><td>0.4 mm &lt; D &lt; 0.5 mm</td><td>2</td></tr><tr><td>0.5 mm &lt; D</td><td>0</td></tr></table> <table><tr><td colspan="2">Size &gt;= 5"</td></tr><tr><td>Average Diameter</td><td>Qualified Qty</td></tr><tr><td>D&lt;0.25 mm</td><td>Ignored</td></tr><tr><td>0.25 mm &lt; D &lt; 0.5 mm</td><td>4</td></tr><tr><td>0.5 mm &lt; D</td><td>0</td></tr></table>	Size < 5"		Average Diameter	Qualified Qty	D < 0.2 mm	Ignored	0.2 mm < D < 0.4 mm	5	0.4 mm < D < 0.5 mm	2	0.5 mm < D	0	Size >= 5"		Average Diameter	Qualified Qty	D<0.25 mm	Ignored	0.25 mm < D < 0.5 mm	4	0.5 mm < D	0										
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Touch panel White Line Scratch	<table><tr><td colspan="2">Size &lt; 5"</td><td></td></tr><tr><td>Length</td><td>Width</td><td>Qualified Qty</td></tr><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></table> <table><tr><td colspan="2">Size &gt;= 5"</td><td></td></tr><tr><td>Length</td><td>Width</td><td>Qualified Qty</td></tr><tr><td>–</td><td>W&lt; 0.03</td><td>Ignored</td></tr><tr><td>L &lt; 5.0</td><td>0.03 &lt; W &lt;0.05</td><td>2</td></tr><tr><td>–</td><td>0.05 &lt; W</td><td>0</td></tr></table>	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
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## 12. Reliability test

NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	80±2°C/240 hours	<p>Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects:</p> <ol style="list-style-type: none"> <li>1. Air bubble in the LCD</li> <li>2. Seal leak</li> <li>3. Non-display</li> <li>4. Missing segments</li> <li>5. Glass crack</li> <li>6. Current Idd is twice higher than initial value</li> <li>7. The surface shall be free from damage</li> <li>8. Linearity must be no more than 1.5% by the linearity tester</li> <li>9. The Electric characteristics requirements shall be satisfied</li> </ol>
2	Low Temperature Storage	-30±2°C/240 hours	
3	High Temperature Operating	70±2°C/240 hours	
4	Low Temperature Operating	-20±2°C/240 hours	
5	Temperature Cycle	-30±2°C~25~70±2°C × 30 cycles	
6	Damp Proof Test	60°C ±5°C × 90%RH/160 hours	
7	Vibration Test	Frequency 10Hz~55Hz  Stroke: 1.5mm  Sweep: 10Hz~55Hz~10Hz 2 hours  For each direction of X, Y, Z  (6 hours for total)	
8	Mechanical Shock	60G 6ms, ± X, ± Y, ± Z 3 times for each direction	
9	Packing Drop Test	Height: 80 cm  1 corner, 3 edges, 6 surfaces	
10	Package Vibration Test	Random vibration:  0.015G <sup>2</sup> /Hz from 5-200Hz  -6dB/Octave from 200-500Hz  2 hours for each direction of X, Y, Z  (6 hours for total)	
11	Electrostatic Discharge	Air: ±8KV 150pF/330Ω 5 times  Contact: ±4KV 150pF/330Ω 5 times	

12	Hitting Test	<p>1,000,000 times in the same point</p> <p>Hitting pad: tip R3.75mm, Silicone rubber, Hardness: 40deg.</p> <p>Load: 2.45N</p> <p>Hitting speed: Twice/sec</p> <p>Electric load: none</p> <p>Test area should be at 1.8mm inside of insulation.</p>
13	Pen Sliding Durability Test	<p>100,000 times minimum</p> <p>Hitting pad: tip R0.8mm plastic pen</p> <p>Load: 1.47N</p> <p>Sliding speed: 60 mm/sec</p> <p>Electric load: none</p> <p>Test area should be at 1.8mm inside of insulation.</p>
<p>Remark:</p> <p>1. The test samples should be applied to only one test item.</p> <p>2. Sample size for each test item is 5~10pcs.</p> <p>3. For Damp Proof Test, Pure water (Resistance 10M<math>\Omega</math>) should be used.</p> <p>4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.</p> <p>5. EL evaluation should be excepted 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.</p> <p>6. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.</p>		

**Note 1:** Without water condensation.

**Note 2:** The function test shall be conducted after 2 hours storage at the room temperature and humidity after removed from the test chamber.



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[EVE1 4.3" →](#)

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