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## RVT43ULFNWC0x

### LCD TFT Datasheet

Rev.1.1

2015-03-31

| ITEM                           | CONTENTS                         | UNIT              |
|--------------------------------|----------------------------------|-------------------|
| LCD Type                       | TFT/Transmissive/Normally white  | /                 |
| Size                           | 4.3                              | Inch              |
| Viewing Direction              | 12:00 (without image inversion)  | O' Clock          |
| Gray Scale Inversion Direction | 6:00                             | O' Clock          |
| LCM (W × H × D )               | 120.38 × 79.20 × 8.43            | mm <sup>3</sup>   |
| Active Area (W × H)            | 95.04 × 53.86                    | mm <sup>2</sup>   |
| Dot Pitch (W × H)              | 0.066×0.198                      | mm <sup>2</sup>   |
| Number Of Dots                 | 480 x (RGB) × 272                | /                 |
| Driver IC                      | FT801                            | /                 |
| Backlight Type                 | 10 LEDs                          | /                 |
| Surface Luminance              | 500                              | cd/m <sup>2</sup> |
| Interface Type                 | SPI/I2C                          | /                 |
| Color Depth                    | 262k                             | /                 |
| Pixel Arrangement              | RGB Vertical Stripe              | /                 |
| Surface Treatment              | Clear                            |                   |
| Input Voltage                  | 3.3                              | V                 |
| With/Without TSP               | Projected Capacitive Touch Panel | /                 |
| Weight                         | 78.14                            | g                 |

**Note 1:** RoHS compliant

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



## REVISION RECORD

| REVNO. | REVDATE    | CONTENTS                          | REMARKS |
|--------|------------|-----------------------------------|---------|
| 1.0    | 2015-02-17 | Initial Release                   |         |
| 1.1    | 2015-03-31 | Surface Treatment data correction |         |

## CONTENTS

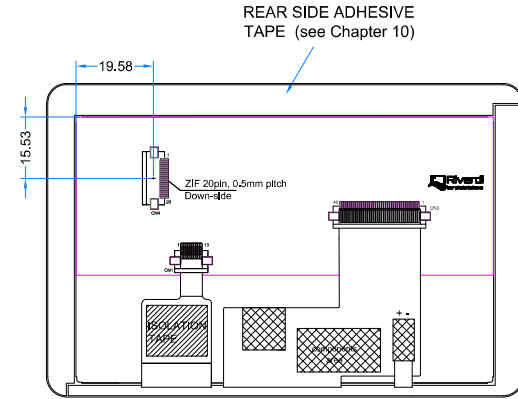
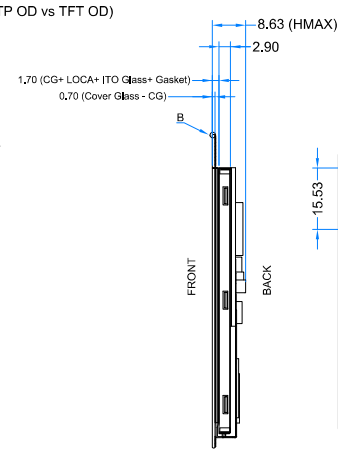
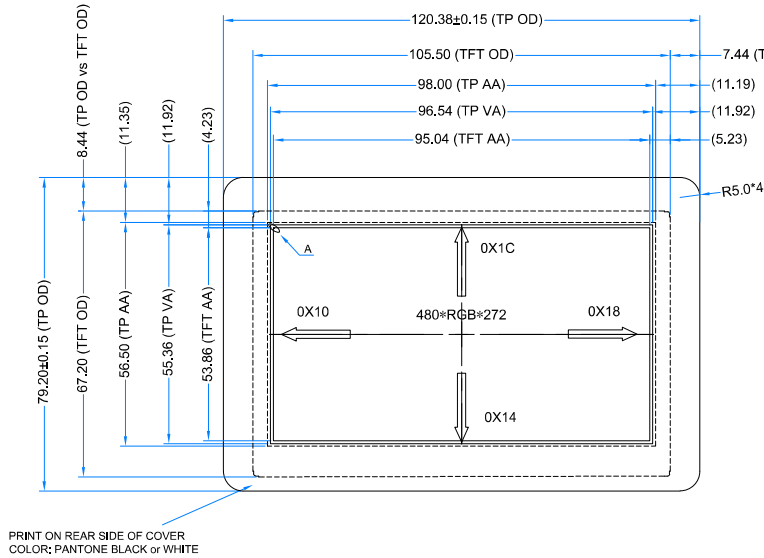
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## 1 MODULE CLASSIFICATION INFORMATION

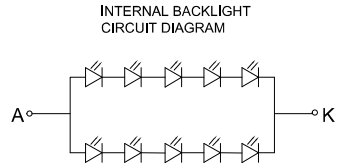
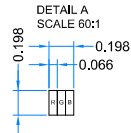
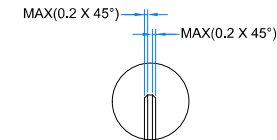
|           |          |           |          |          |          |          |          |          |           |
|-----------|----------|-----------|----------|----------|----------|----------|----------|----------|-----------|
| <b>RV</b> | <b>T</b> | <b>43</b> | <b>U</b> | <b>L</b> | <b>F</b> | <b>N</b> | <b>W</b> | <b>C</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><br><b>F – TFT Custom</b>  |
| 3.  | <b>DISPLAY SIZE</b>     | <b>35 – 3.5"</b><br><b>43 – 4.3"</b><br><b>57 – 5.7"</b><br><b>70 – 7.0"</b>  |
| 4.  | <b>MODEL SERIAL NO.</b> | <b>U (A-Z)</b>  |
| 5.  | <b>RESOLUTION</b>       | <b>L – 480x272 px</b>   |
| 6.  | <b>INTERFACE</b>        | <b>T – TFT LCD, RGB</b><br><b>L – TFT LCD, LVDS</b><br><b>S – TFT + Controller SSD1963</b><br><b>F – TFT + Controller FT801</b> |
| 7.  | <b>FRAME</b>            | <b>N – No Frame</b><br><b>F – Mounting Frame</b>  |
| 8.  | <b>BACKLIGHT TYPE</b>   | <b>W – LED White</b>  |
| 9.  | <b>TOUCH PANEL</b>      | <b>C – Capacitive Touch Panel</b>   |
| 10. | <b>VERSION</b>          | <b>0x (00, 01, 02, 03, 04, 05)</b>  |

| PIN | DESC                 |
|-----|----------------------|
| 1   | VDD                  |
| 2   | GND                  |
| 3   | SPI_SCLK/<br>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                |



DETAIL B  
SCALE 4:1



- NOTES:
1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
  2. 4.3 INCH PROJECTIVE CAPACITIVE TOUCH PANEL.
  3. OPERATION VOLTAGE: VDD=3.3V
  4. VIEWING DIRECTION: 12 O'CLOCK
  5. IC CONTROLLER: FT801
  6. CTP RESOLUTION: 1280 X 768 DOTS
  7. CTP IC DRIVER: FT5306
  8. CTP MULTI FINGER: UP TO 5
  9. OPERATING TEMP.: -20°C ~ 70°C
  10. STORAGE TEMP.: -30°C ~ 80°C
  11. LED BACKLIGHT: 10-LED WHITE, BUILT-IN INVERTER
  12. SURFACE LUMINANCE: 500 cd/m²
  13. GENERAL TOLERANCE: ±0.2
  14. RoHS COMPLIANT

|               |           |                     |  |
|---------------|-----------|---------------------|--|
| CUSTOMER APVL |           | DATE 2015/02/18     |  |
| DRAWN         | SCALE 1:1 | TITLE RVT43ULFNWC0x |  |
| DFTG CHK      | UNIT mm   | MODEL               |  |
| ENGR CHK      |           | DWG NO              |  |
| APPROVAL      |           | PAGE 1/1            |  |

### 3 ABSOLUTE MAXIMUM RATINGS

| PARAMETER                      | SYMBOL          | MIN  | MAX            | UNIT |
|--------------------------------|-----------------|------|----------------|------|
| Supply Voltage For Logic       | VDD             | -0.3 | 3.6            | V    |
| Input Voltage For Logic        | VIN             | -0.3 | VDD            | V    |
| Input Voltage For LED Inverter | BLVDD           | -0.3 | 7.0            | V    |
| Operating Temperature          | T <sub>OP</sub> | -20  | 70             | °C   |
| Storage Temperature            | T <sub>ST</sub> | -30  | 80             | °C   |
| Humidity                       | RH              | -    | 90% (Max 60°C) | RH   |

### 4 ELECTRICAL CHARACTERISTICS

| PARAMETER  | SYMBOL                   | MIN    | TYP   | MAX    | UNIT | NOTES      |
|--|--------------------------|--------|-------|--------|------|------------|
| Supply Voltage For Module                        | VDD                      | 3.0    | 3.3   | 3.6    | V    |            |
| Input Voltage for LED Inverter                   | BLVDD                    | 2.8    | 3.3   | 5.5    | V    |            |
| Input Voltage 'H' level for BL_E pin             | BL_EH                    | 1.5    | -     | 5.5    | V    |            |
| Input Voltage 'L' level for BL_E pin             | BL_EL                    | 0      | -     | 0.7    | V    | Note 2     |
| Input Current (Exclude LED Backlight)            | IDD                      | -      | 70    | 87     | mA   | VDD = 3.3V |
| LED Backlight Current                            | IDD <sub>backlight</sub> |        | 260   | 325    | mA   | BLVDD=3.3V |
| LED Backlight Current                            | IDD <sub>backlight</sub> |        | 150   | 187    | mA   | BLVDD=5V   |
| Total Input Current (Include LED Backlight 100%) | IDD <sub>total</sub>     | -      | 330   | 412    | mA   | BLVDD=3.3V |
| Input Voltage 'H' level                          | V <sub>IH</sub>          | 0.7VDD | -     | VDD    | V    |            |
| Input Voltage 'L' level                          | V <sub>IL</sub>          | 0      | -     | 0.2VDD | V    |            |
| LED Life Time                                    | -                        | 30000  | 50000 | -      | Hrs  | Note 1     |

**Note 1:** The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C.

**Note 2:** Voltage Inverter ground (BLGND) is internally connected to GND

### 5 ELECTRO-OPTICAL CHARACTERISTICS

| ITEM                    |       | SYMBOL         | CONDITION  | MIN   | TYP   | MAX   | UNIT              | REMARK   | NOTE |
|-------------------------|-------|----------------|--|-------|-------|-------|-------------------|----------|------|
| Response Time           |       | Tr+Tf          | $\theta=0^{\circ}$<br>$\varnothing=0^{\circ}$<br>Ta=25 | -     | 25    | 30    | ms                | Figure 1 | 4    |
| Contrast Ratio          |       | Cr             |  | 400   | 500   | -     | ---               | Figure 2 | 1    |
| Luminance Uniformity    |       | $\delta$ WHITE |  | 80    | -     | -     | %                 | Figure 2 | 3    |
| Surface Luminance       |       | Lv             |  | -     | 500   | -     | cd/m <sup>2</sup> | Figure 2 | 2    |
| Viewing Angle Range     |       | $\theta$       | $\varnothing = 90^{\circ}$                             | 40    | 50    | -     | deg               | Figure 3 | 6    |
|                         |       |                | $\varnothing = 270^{\circ}$                            | 60    | 70    | -     | deg               | Figure 3 |      |
|                         |       |                | $\varnothing = 0^{\circ}$                              | 60    | 70    | -     | deg               | Figure 3 |      |
|                         |       |                | $\varnothing = 180^{\circ}$                            | 60    | 70    | -     | deg               | Figure 3 |      |
| CIE (x, y) Chromaticity | Red   | x              | $\theta=0^{\circ}$<br>$\varnothing=0^{\circ}$<br>Ta=25 | 0.551 | 0.591 | 0.631 | Figure 2          | 5        |      |
|                         |       | y              |  | 0.270 | 0.310 | 0.350 |                   |          |      |
|                         | Green | x              |  | 0.302 | 0.342 | 0.382 |                   |          |      |
|                         |       | y              |  | 0.516 | 0.561 | 0.601 |                   |          |      |
|                         | Blue  | x              |  | 0.105 | 0.145 | 0.185 |                   |          |      |
|                         |       | y              |  | 0.047 | 0.087 | 0.127 |                   |          |      |
|                         | White | x              |  | 0.250 | 0.290 | 0.330 |                   |          |      |
|                         |       | y              |  | 0.300 | 0.340 | 0.380 |                   |          |      |

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

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

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

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

**Note 3.** The uniformity in surface luminance  $\delta$  WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see Figure 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

**Note 4.** Response time is the time required for the display to transition from white to black (Rise Time,  $T_r$ ) and from black to white (Decay Time,  $T_f$ ). For additional information see FIG 1. The test equipment is Autronic-Melchers's ConoScope series.

**Note 5.** CIE (x, y) chromaticity, the x, y value is determined by measuring luminance at each test position 1 through 5, and then make average value.

**Note 6.** Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Figure 3.

**Note 7.** For viewing angle and response time testing, the testing data is based on Autronic-Melchers's ConoScope series. Instruments for Contrast Ratio, Surface Luminance, Luminance Uniformity, CIE the test data is based on TOPCON's BM-5 photo detector.

Figure 1. The definition of response time

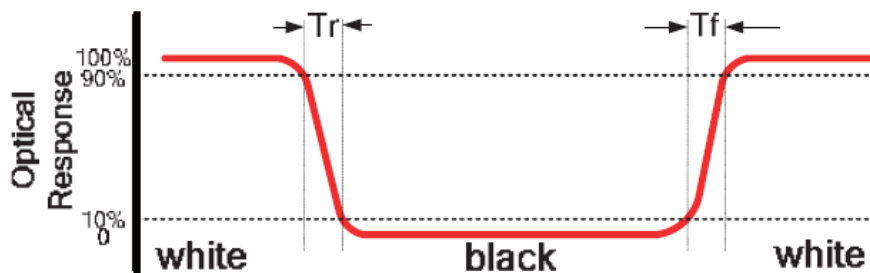


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

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

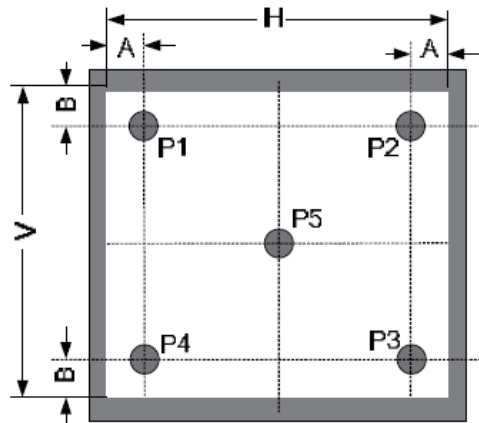
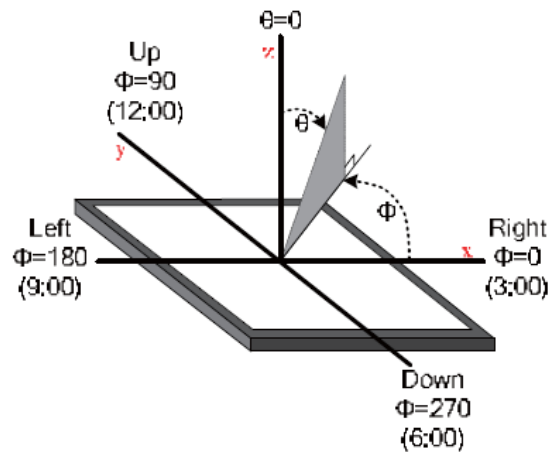


Figure 3. The definition of viewing angle



## 6 INTERFACE DESCRIPTION

| PIN NO. | SYMBOL               | DESCRIPTION  |
|---------|----------------------|--|
| 1       | VDD                  | Power Supply   |
| 2       | GND                  | Ground   |
| 3       | SPI_SCLK/<br>I2C_SCL | SPI SCK Signal / I2C SCL Signal, Internally 47k Pull UP                                  |
| 4       | MISO/<br>I2C_SDA     | SPI MISO Signal / I2C SDA Signal, Internally 47k Pull UP                                 |
| 5       | MOSI/<br>I2C_SA0     | SPI MOSI Signal / I2C Slave Address Bit 0, Internally 47k Pull UP                        |
| 6       | CS/I2C_SA1           | SPI Chip Select Signal / I2C Slave Address Bit 1, Internally 47k Pull UP                 |
| 7       | INT                  | Interrupt Signal, Active Low, Internally 47k Pull UP                                     |
| 8       | PD                   | Power Down Signal, Active Low, Internally 47k Pull UP                                    |
| 9       | MODE                 | Host Interface SPI(Pull Low) or I2C(Pull Up) Mode Select Input, Internally 10k Pull DOWN |
| 10      | AUDIO_OUT            | Audio Out Signal   |
| 11      | NC                   | Not Connected  |
| 12      | NC                   | Not Connected  |

|    |       |   |
|----|-------|---|
| 13 | NC    | Not Connected                                   |
| 14 | NC    | Not Connected                                   |
| 15 | NC    | Not Connected                                   |
| 16 | NC    | Not Connected                                   |
| 17 | BLVDD | Backlight Power Supply, Can Be Connected to VDD |
| 18 | BLVDD | Backlight Power Supply, Can Be Connected to VDD |
| 19 | BLGND | Backlight Ground, Internally connected to GND   |
| 20 | BLGND | Backlight Ground, Internally connected to GND   |

## 7 FT801 CONTROLLER SPECIFICATIONS

FT801 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.

### 7.1 Serial host interface

Figure 4. SPI interface connection

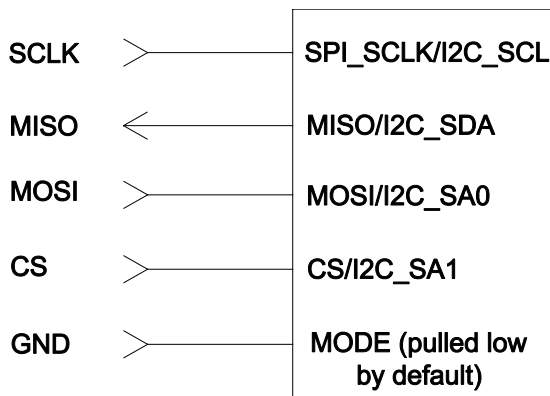
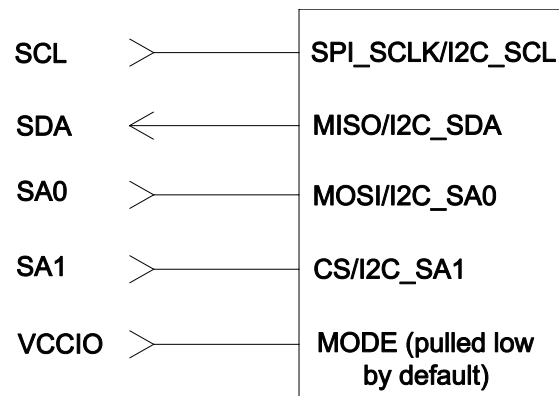


Figure 5. I2C interface connection



**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.

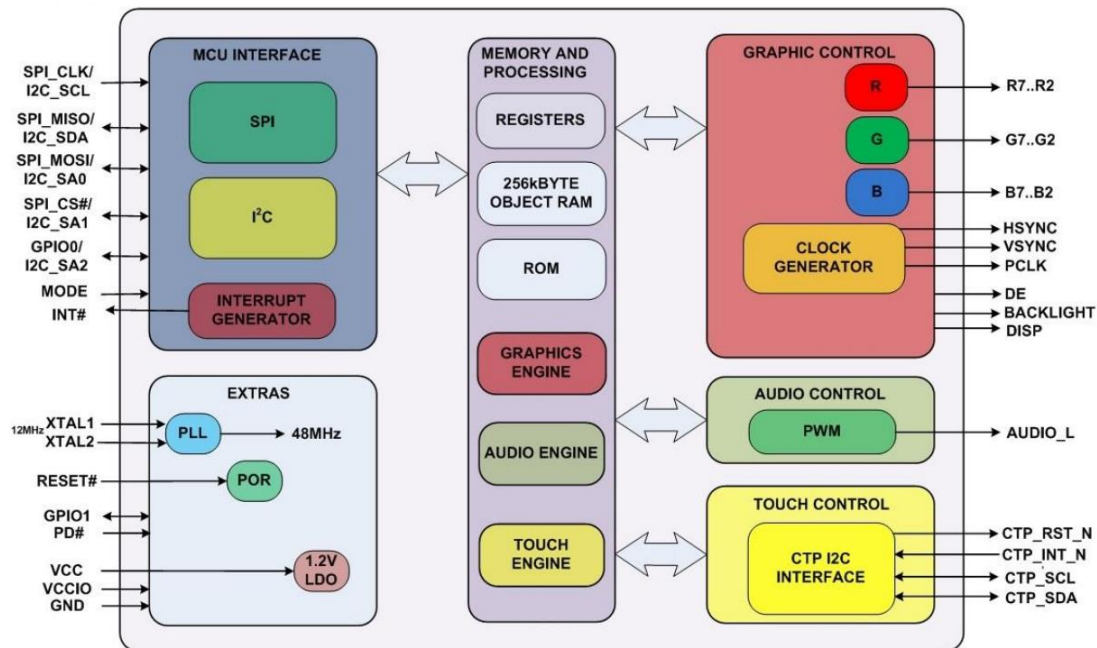
The I<sup>2</sup>C device address is configurable between 20h to 23h depending on the I<sup>2</sup>C\_SA[1:0] pin setting, i.e. the 7-bit I<sup>2</sup>C slave address is 0b'01000A1A0.

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



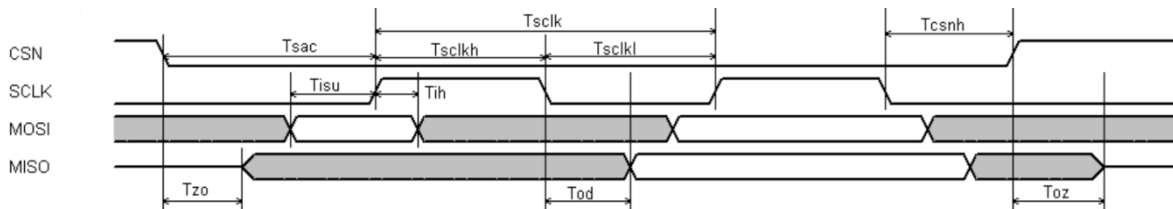
## 7.2 Block Diagram

Figure 6. FT801 Block diagram



## 7.3 Host interface SPI mode 0

Figure 7. SPI timing diagram



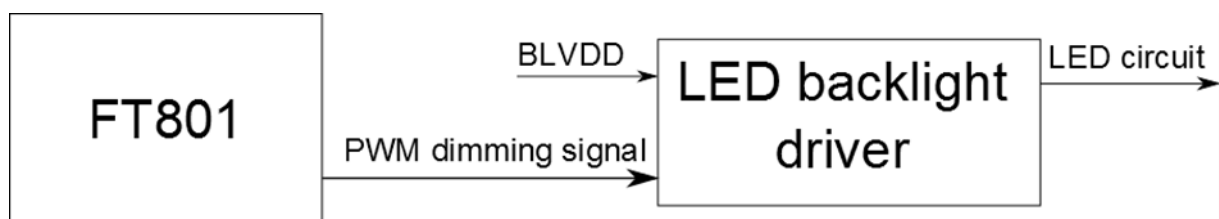
For more information about FT801 controller please go to official FT801 Datasheet.

[http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS\\_FT801.pdf](http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT801.pdf)

## 7.4 Backlight driver block diagram

Backlight enable signal is internally connected to FT801 Backlight control pin. This pin is controlled by two FT801's registers. One of them specifies the PWM output frequency, second one specifies the duty cycle. Refer to FT801 datasheet for more information.

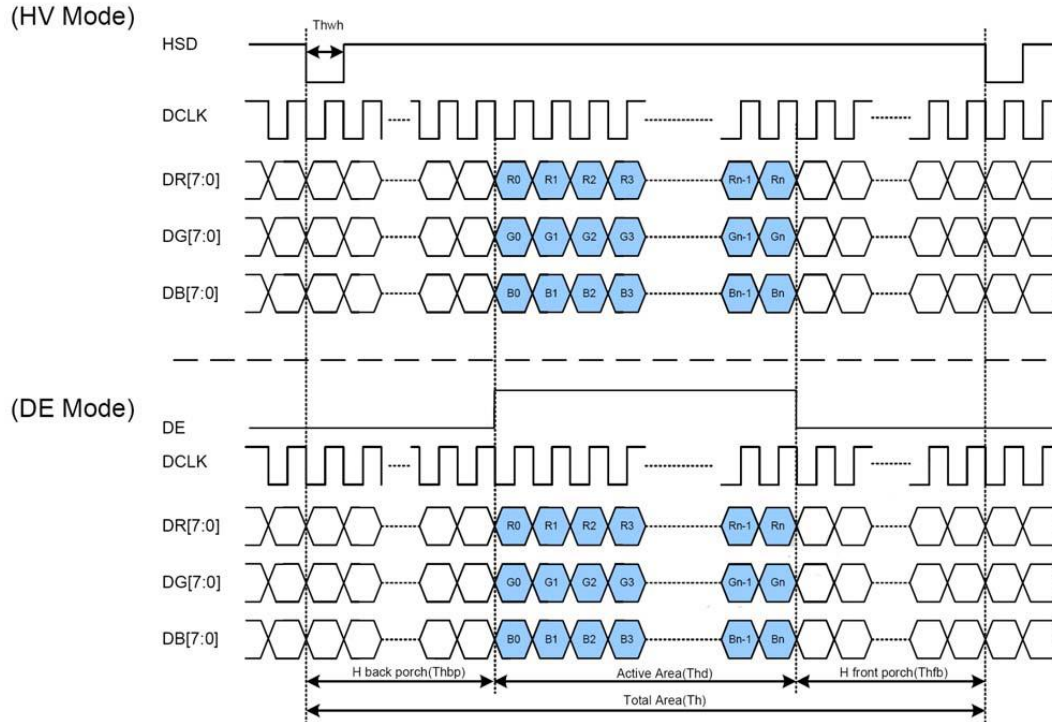
Figure 8. Backlight driver block diagram



## 8 LCD TIMING CHARACTERISTICS

### 8.1 Clock and data input time diagram

Figure 9. Clock and data input time diagram



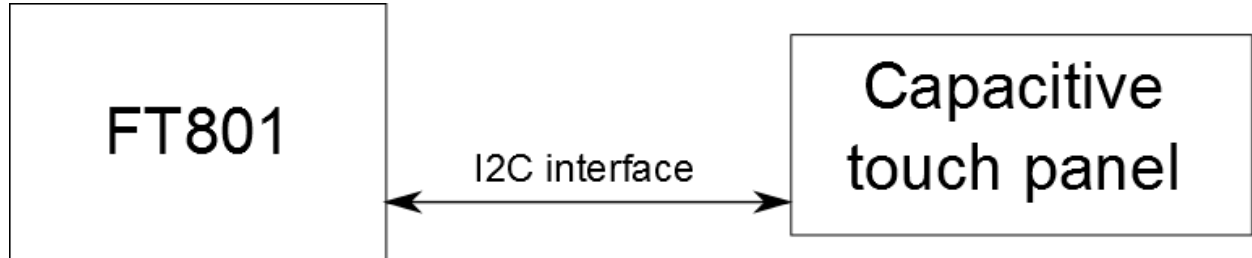
### 8.2 Parallel RGB input timing table

| PARAMETER        | SYMBOL | MIN | TYP | MAX | UNIT |
|------------------|--------|-----|-----|-----|------|
| DCLK Frequency   | Fclk   | 5   | 9   | 12  | MZH  |
| VSD Period Time  | Tv     | 277 | 288 | 400 | H    |
| VSD Display Area | Tvd    |     | 272 |     | H    |
| VSD Back Porch   | Tvb    | 3   | 8   | 31  | H    |
| VSD Front Porch  | Tvfp   | 2   | 8   | 97  | H    |
| HSD Period Time  | Th     | 520 | 525 | 800 | DCLK |
| HSD Display Area | Thd    |     | 480 |     | DCLK |
| HSD Back Porch   | Thbp   | 36  | 40  | 255 | DCLK |
| HSD Front Porch  | Thfp   | 4   | 5   | 65  | DCLK |

## 9 CAPACITIVE TOUCH SCREEN PANEL SPECIFICATIONS

Capacitive Touch Panel is directly connected to FT801 module. Therefore communication with Capacitive touch panel is simplified to read registers of FT801.

Figure 10. Capacitive Touch Panel Connection



### 9.1 Mechanical characteristics

| DESCRIPTION            | INL SPECIFICATION  | REMARK             |
|------------------------|--------------------|--------------------|
| Touch Panel Size       | 4.3 inch           |                    |
| Outline Dimension (OD) | 120.38mm x 79.20mm | Cover Lens Outline |
| Product Thickness      | 1.70mm             |                    |
| Glass Thickness        | 0.70mm             |                    |
| Ink View Area          | 96.54mm x 55.36mm  |                    |
| Sensor Active Area     | 98.00mm x 56.50mm  |                    |
| Input Method           | 5 Finger           |                    |
| Activation Force       | Touch              |                    |
| Surface Hardness       | ≥7H                |                    |
|                        |                    |                    |

### 9.2 Electrical characteristics

| DESCRIPTION             | SPECIFICATION |                      |
|-------------------------|---------------|----------------------|
| Operating Voltage       |               | DC 2.8~3.3V          |
| Power Consumption (IDD) | Active Mode   | 10~18mA              |
|                         | Sleep Mode    | 30~50μA              |
| Interface               |               | I <sup>2</sup> C     |
| Linearity               |               | <1.5%                |
| Controller              |               | FT5306               |
| I2C address             |               | 0x38 (7 bit address) |
| Resolution              |               | 1280*768             |

## 10 ORDERING INFORMATION

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 3M 467MP 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 3M 467MP glue (total thickness 0.2mm)              | Foam double side adhesive tape with 3M 467MP glue (total thickness 0.5mm)          | Without tape  |

Cover glass color options:

|  |   |
|--|---|
|  |  |
| BLACK  | WHITE   |

Product options:

| PN            | DESCRIPTION   |
|---------------|---|
| RVT43ULFNWC00 | <ul style="list-style-type: none"> <li>Double side adhesive tape with 3M 467MP glue (total thickness 0.2mm)</li> <li>Cover glass color- black</li> </ul>      |
| RVT43ULFNWC01 | <ul style="list-style-type: none"> <li>Foam double side adhesive tape with 3M 467MP glue (total thickness 0.5mm)</li> <li>Cover glass - black</li> </ul>      |
| RVT43ULFNWC02 | <ul style="list-style-type: none"> <li>Without tape</li> <li>Cover glass color- black</li> </ul>  |
| RVT43ULFNWC03 | <ul style="list-style-type: none"> <li>Double side adhesive tape with 3M 467MP glue (total thickness 0.2mm)</li> <li>Cover glass color- white</li> </ul>      |
| RVT43ULFNWC04 | <ul style="list-style-type: none"> <li>Foam double side adhesive tape with 3M 467MP glue (total thickness 0.5mm)</li> <li>Cover glass color- white</li> </ul> |
| RVT43ULFNWC05 | <ul style="list-style-type: none"> <li>Without tape</li> <li>Cover glass color- white</li> </ul>  |

## 11 CUSTOMIZATION LEVEL

Beside standard product (**BASIC LEVEL**), there are two levels of product customization available:

1. **ADVANCED LEVEL**
2. **PROFESSIONAL LEVEL**

**Basic level** - standard version of product with black or white cover glass color.

**Advanced level**- product with modified cover glass color, company logo or with special transparent spots for diodes.



**Professional level**- product with changed panel parameters including glass dimension and shapes.



For more information go to <http://riverdi.com/uxtouch/>.

## 12 RELIABILITY TEST

| NO. | TEST ITEM                  | TEST CONDITION  |
|-----|----------------------------|---|
| 1   | High Temperature Storage   | 80±2°C/240hours   |
| 2   | Low Temperature Storage    | -30±2°C/240hours  |
| 3   | High Temperature Operating | 70±2°C/240hours   |
| 4   | Low Temperature Operating  | -20±2°C/240hours  |
| 5   | Temperature Cycle          | -30±2°C~25~80±2°C × 20 cycles<br>(30min.) (5min.) (30min.)  |
| 6   | Damp Proof Test            | 60°C ±5°C × 90%RH/240hours  |
| 7   | Vibration Test             | Frequency 10Hz~55Hz<br>Amplitude of vibration : 1.5mm<br>Sweep: 10Hz~55Hz~10Hz<br>X, Y, Z 2 hours for each direction. |
| 8   | Package Drop Test          | Height:60 cm<br>1 corner,3 edges,6 surfaces   |
| 9   | ESD Test                   | Air: ±4KV 150pF/330Ω 5 times<br>Contact: ±2KV 150pF/330Ω 5 time   |

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