



RVT28UEFNWC0x

LCD TFT Datasheet

Rev.2.0

2016-10-13

| ITEM | CONTENTS | UNIT |
|--------------------------------|----------------------------------|----------|
| LCD Type | TFT/Transmissive/Normally white | / |
| Size | 2.83 | Inch |
| Viewing Direction | 6:00 (without image inversion) | O' Clock |
| Gray Scale Inversion Direction | 12:00 | O' Clock |
| LCM (W × H × D) | 67.6 × 82.0 × 8.00 | mm3 |
| Active Area (W × H) | 43.2 × 57.6 | mm2 |
| Dot Pitch (W × H) | 0.18 × 0.18 | mm2 |
| Number Of Dots | 240 × (RGB) × 320 | / |
| Driver IC | FT801 | / |
| Backlight Type | 4 LEDs | / |
| Surface Luminance | 255 | cd/m2 |
| Interface Type | SPI/I2C | / |
| Color Depth | 262k | / |
| Pixel Arrangement | RGB Vertical Stripe | / |
| Surface Treatment | Clear | |
| Input Voltage | 2.8 | V |
| With/Without TSP | Projected Capacitive Touch Panel | / |
| Weight | 47.10 | g |

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

| REVNO. | REVDATE | CONTENTS | REMARKS |
|--------|------------|---|---------|
| 1.0 | 2015-08-24 | Initial Release | |
| 1.1 | 2015-10-06 | Update PCB position in mechanical drawing | |
| 1.2 | 2016-10-12 | Added Inspection Standards | |
| 2.0 | 2016-10-13 | New PCT Controller | |

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1 MODULE CLASSIFICATION INFORMATION

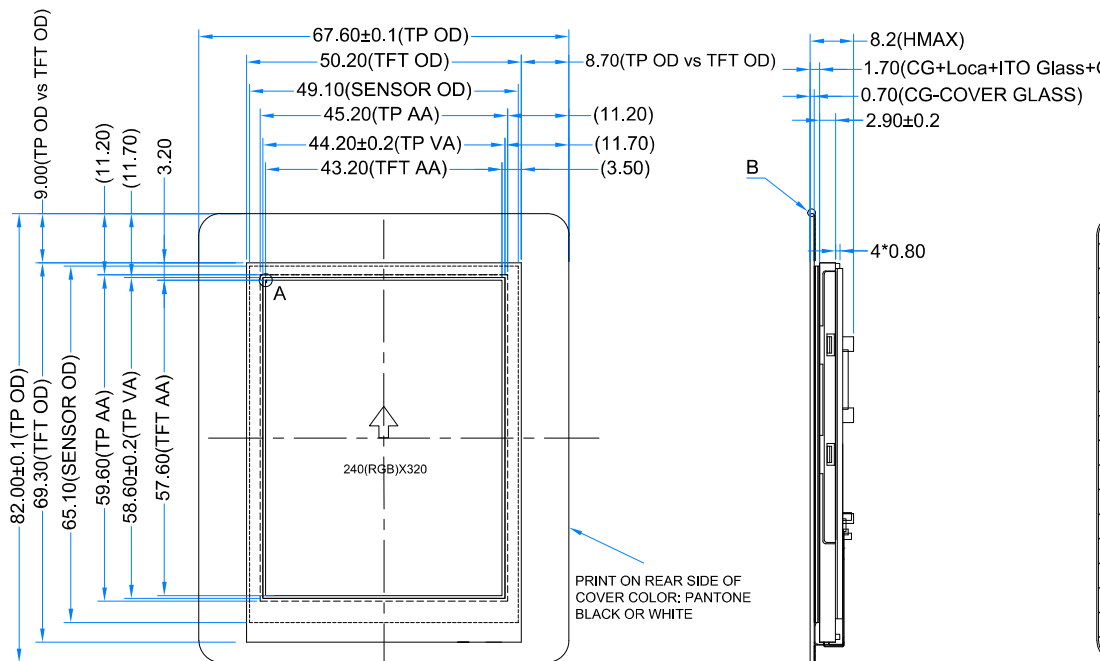
| RV | T | 28 | U | E | F | N | W | C | 0x |
|-----------|----------|-----------|----------|----------|----------|----------|----------|----------|-----------|
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |

| | | |
|-----|-------------------------|--|
| 1. | BRAND | RV – Riverdi |
| 2. | PRODUCT TYPE | T – TFT Standard F – TFT Custom |
| 3. | DISPLAY SIZE | 28 – 2.83” 35 – 3.5” 43 – 4.3” 70 – 7.0” |
| 4. | MODEL SERIAL NO. | U (A-Z) |
| 5. | RESOLUTION | E– 240x320 px |
| 6. | INTERFACE | T – TFT LCD, RGB L – TFT LCD, LVDS S – TFT + Controller SSD1963 F – TFT + Controller FT801 |
| 7. | FRAME | N – No Frame F – Mounting Frame |
| 8. | BACKLIGHT TYPE | W – LED White |
| 9. | TOUCH PANEL | N – No Touch Panel R – Resistive Touch Panel C – Capacitive Touch Panel |
| 10. | VERSION | 0x (00-99) |

LCD TFT Datasheet Rev.2.0

RVT28UEFNWC0x

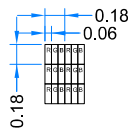
| PIN | DESC |
|-----|----------------------|
| 1 | VDD |
| 2 | GND |
| 3 | SPI_SCLK/ I2C_SCL |
| 4 | MISO/I2C_SDA |
| 5 | MOSI/I2C_SA0 |
| 6 | CS/I2C_SA1 |
| 7 | INT |
| 8 | PD |
| 9 | MODE |
| 10 | AUDIO_OUT |
| 11 | NC |
| 12 | NC |
| 13 | NC |
| 14 | NC |
| 15 | NC |
| 16 | NC |
| 17 | BLVDD |
|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



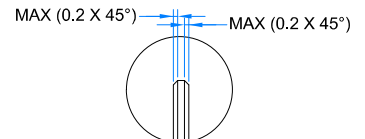
NOTES:

1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALY WHITE
2. 2.83 INCH CAPACITIVE TOUCH PANEL
3. VIEWING DIRECTION: 6 O'CLOCK
4. OPERATION VOLTAGE: VDD= 2.8V
5. IC CONTROLLER: FT801
6. CTP IC DRIVER: FT6206
7. CTP RESOLUTION 240x320 DOTS
8. CTP MULTIFINGER: UP TO 2- TOUCH GESTURE
9. LED BACKLIGHT: 4-LED WHITE, BUILT-IN INVERTER
10. SURFACE LUMINANCE: 255 cd/m²
11. OPERATING TEMP: -20°C ~ +70°C
12. STORAGE TEMP: -30°C ~ +80°C
13. GENERAL TOLERANCE: ±0.20
14. RoHS COMPLIANT

DETAIL A
SCALE 20:1



DETAIL B
SCALE 4:1



| | | |
|------|---------------------|------------|
| 1.1 | Update PCB position | 2015.10.06 |
| 1.0 | Intial case | 2015.08.21 |
| Rev. | DESCRIPTION | DATE |

| |
|----------|
| CUSTOMER |
| DRAWN |
| DFTG CH |
| ENGR CH |
| APPROV |

3 ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | MIN | MAX | UNIT |
|------------------------------|-----------------|------|----------------|------|
| Supply Voltage For LCD Logic | VDD | -0.3 | 4.6 | V |
| Logic signal voltage | VDD | -0.3 | 4.6 | V |
| Operating Temperature | T _{OP} | -20 | 70 | °C |
| Storage Temperature | T _{ST} | -30 | 80 | °C |
| Humidity | RH | - | 90% (Max 60°C) | RH |

4 ELECTRICAL CHARACTERISTICS

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|------------------------------------|-----------------|--------|-----|--------|------|
| Power Supply Voltage For LCD Logic | VDD | 2.5 | 2.8 | 3.3 | V |
| Supply Voltage For CTP Logic | VDD | 2.8 | 3.0 | 3.3 | V |
| Input Current | IDD | - | 22 | - | mA |
| Input Voltage ' H ' level | V _{IH} | 0.7VDD | - | VDD | V |
| Input Voltage ' L ' level | V _{IL} | GND | - | 0.3VDD | V |
| Output Voltage ' H ' level | V _{OH} | 0.8VDD | - | VDD | V |
| Output Voltage ' L ' level | V _{OL} | GND | - | 0.2VDD | V |

5 BACKLIGHT CHARACTERISTICS

| ITEM | SYMBOL | MIN | TYP | MAX | UNIT |
|---------------------------|----------------|-------|-------|-----|------|
| Voltage for LED backlight | V _f | - | 3.2 | 3.4 | V |
| Current for LED backlight | I _f | - | 89 | - | mA |
| LED Life Time | - | 30000 | 40000 | - | Hrs |

Note:

1. The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C, 60%RH ±5 %.
2. The life time of LED will be reduced if LED is driven by high current, high ambient temperature and humidity conditions.
3. Typical operating life time is an estimated data.
4. Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded. Functional operation should be restricted to the conditions described under normal operating conditions.

6 ELECTRO-OPTICAL CHARACTERISTICS

| ITEM | SYMBOL | CONDITION | MIN | TYP | MAX | UNIT | REMARK | NOTE |
|----------------------------|----------------|--|-----|--------|-----|-------------------|----------|------|
| Response Time | Tr+Tf | $\theta=0^\circ$ $\phi=0^\circ$ $T_a=25$ | - | 25 | 30 | ms | Figure 1 | 4 |
| Contrast Ratio | Cr | | - | 500 | - | --- | Figure 2 | 1 |
| Luminance Uniformity | δ WHITE | | 80 | 90 | - | % | Figure 2 | 3 |
| Surface Luminance | Lv | | - | 255 | - | cd/m ² | Figure 2 | 2 |
| Viewing Angle Range | θ | $\phi = 90^\circ$ | - | 70 | - | deg | Figure 3 | 6 |
| | | $\phi = 270^\circ$ | - | 57 | - | deg | Figure 3 | |
| | | $\phi = 0^\circ$ | - | 70 | - | deg | Figure 3 | |
| | | $\phi = 180^\circ$ | - | 70 | - | deg | Figure 3 | |
| CIE (x, y) Chromaticity | Red | x | - | 0.6368 | - | Figure 2 | 5 | |
| | | y | - | 0.3329 | - | | | |
| | Green | x | - | 0.3397 | - | | | |
| | | y | - | 0.6138 | - | | | |
| | Blue | x | - | 0.1433 | - | | | |
| | | y | - | 0.0807 | - | | | |
| | White | x | - | 0.2886 | - | | | |
| | | y | - | 0.3194 | - | | | |
| NTSC | - | S | - | 55 | 67 | - | % | - |

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.

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

Note 3. The uniformity in surface luminance δ 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, 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 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

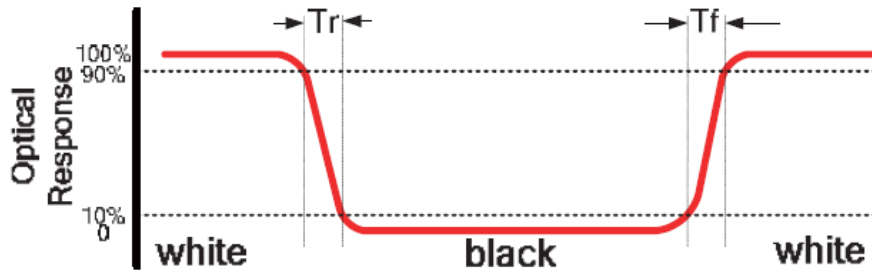


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

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

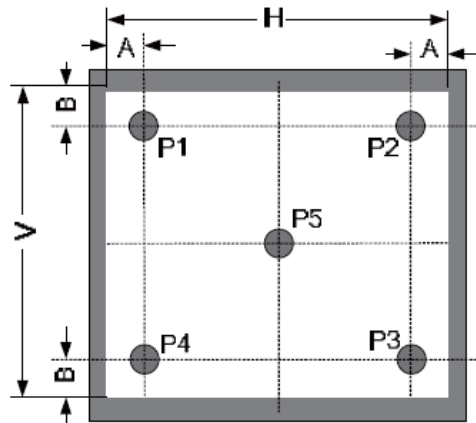
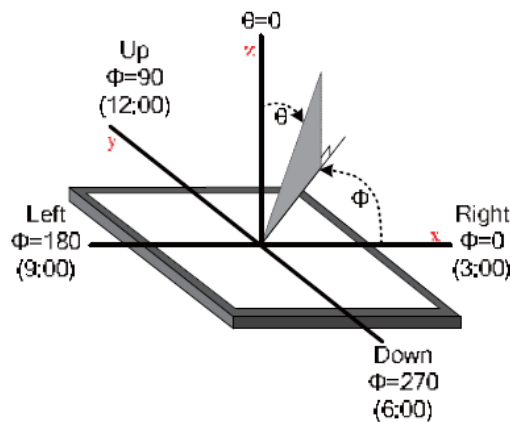


Figure 3. The definition of viewing angle



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, Internally 47k Pull UP |
| 4 | MISO/ I2C_SDA | SPI MISO Signal / I2C SDA Signal, Internally 47k Pull UP |
| 5 | MOSI/ 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 |

8 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.

8.1 Serial host interface

Figure 4. SPI interface connection

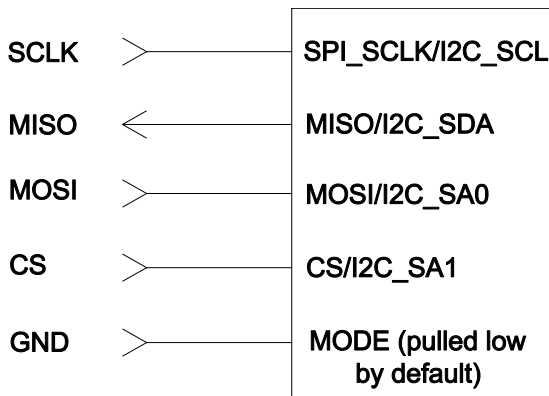
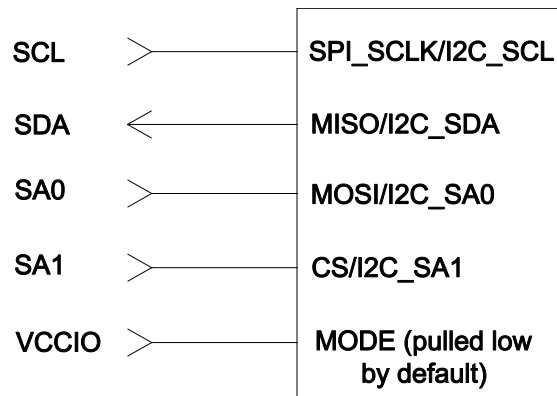


Figure 5. I2C interface connection



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).

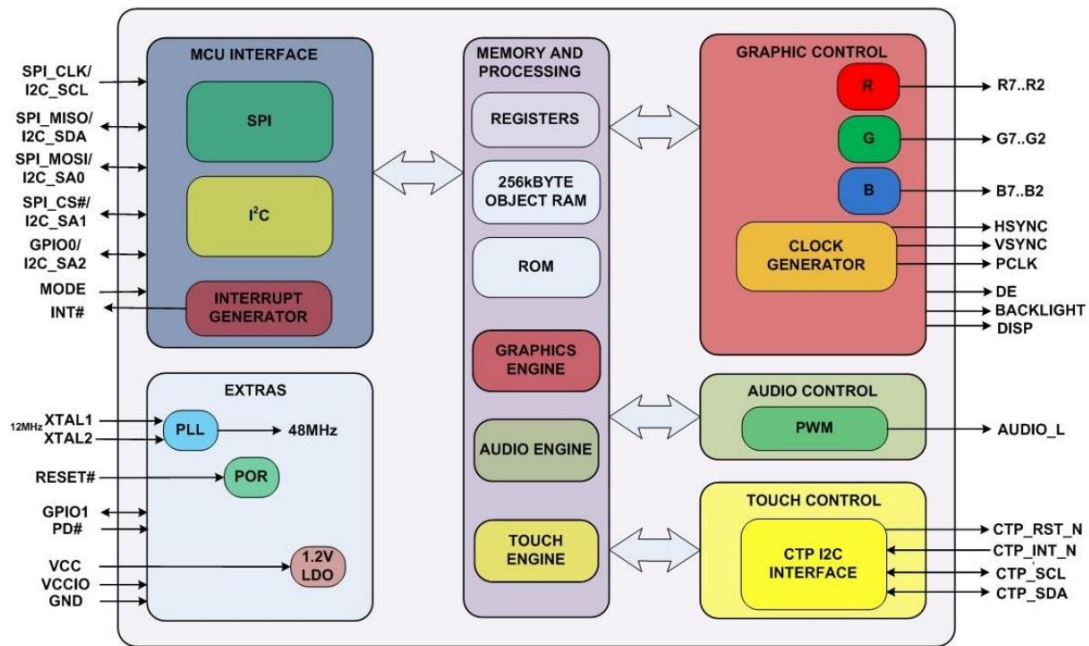
I²C Interface – the I²C slave interface operates up to 3.4MHz, supporting standard-mode, fast-mode, fast-mode plus and high-speed mode.

The I²C device address is configurable between 20h to 23h depending on the I²C_SA[1:0] pin setting, i.e. the 7-bit I²C slave address is 0b'01000A1A0.

The I²C interface is selected when the MODE pin is tied to VDDIO.

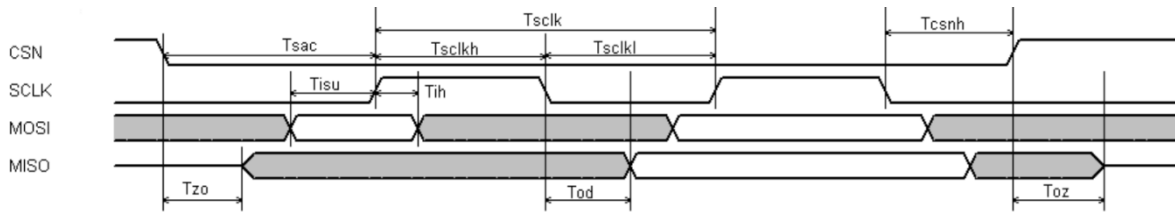
8.2 Block Diagram

Figure 6. FT801 Block diagram



8.3 Host interface SPI mode 0

Figure 7. SPI timing diagram

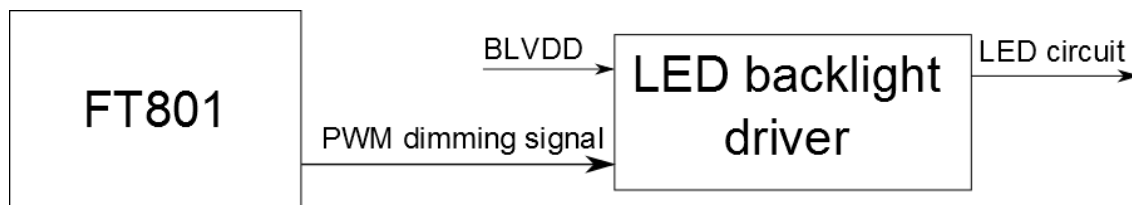


For more information about FT801 controller please go to official FT801 Datasheet. http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT801.pdf

8.4 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.

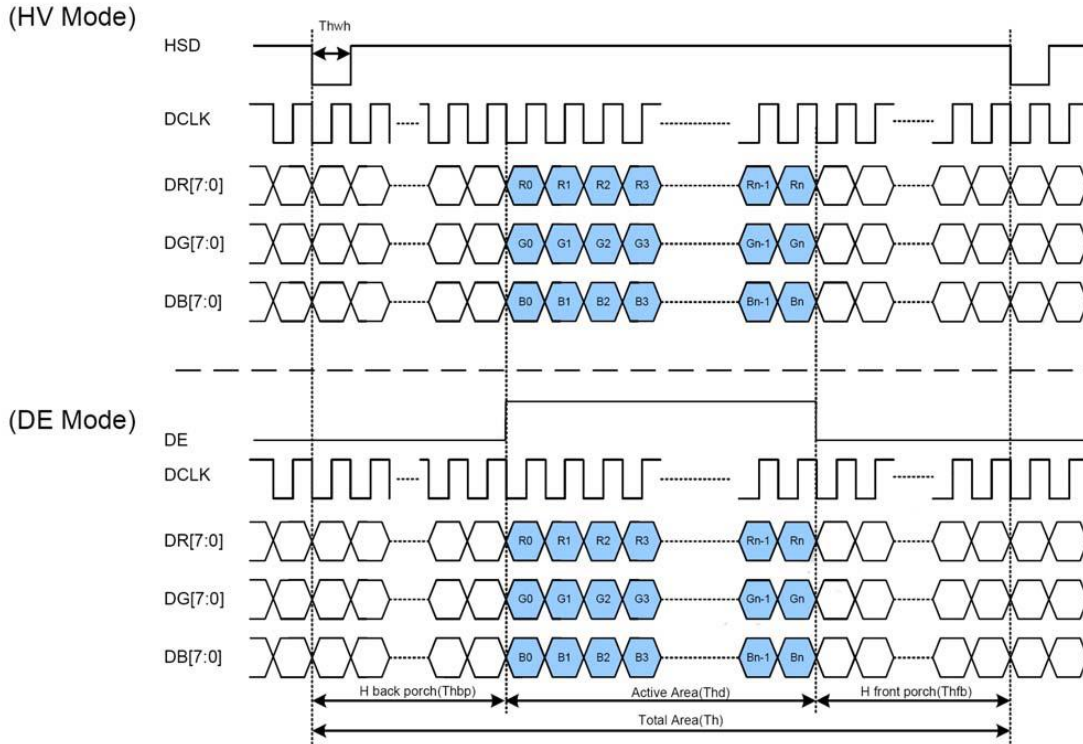
Figure 8. Backlight driver block diagram



9 LCD TIMING CHARACTERISTICS

9.1 Clock and data input time diagram

Figure 9. Clock and data input time diagram



9.2 Parallel RGB input timing table

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|------------------|--------|-----|------|-----|------|
| DCLK Frequency | Fclk | - | 6.35 | - | MZH |
| VSD Period Time | Tv | 324 | 326 | 320 | H |
| VSD Display Area | Tvd | | 320 | | H |
| VSD Back Porch | Tvb | 1 | 2 | - | H |
| VSD Front Porch | Tvfp | 3 | 4 | - | H |
| HSD Period Time | Th | 244 | 270 | 280 | DCLK |
| HSD Display Area | Thd | | 240 | | DCLK |
| HSD Back Porch | Thbp | 2 | 20 | 24 | DCLK |
| HSD Front Porch | Thfp | 2 | 10 | 16 | DCLK |

10 INITIAL CODE

```

#define REG_GPIO      1057936UL
#define REG_GPIO_DIR 1057932UL

//Function which sends SPI (8-bit) data to FT80X
void SPI_FT_Send(uint8_t data)

{
    unsigned char m=0x80;

    for(i=0;i<8;i++)
    {
        GPIO_WriteBit(CLK,0);
        if(data&m)
        {
            GPIO_WriteBit(SDO,1);
        }
        else
        {
            GPIO_WriteBit(SDO,0);
        }
        GPIO_WriteBit(CLK,1);

        m=m>>1;
        GPIO_WriteBit(CLK,0);
    }
}

//Function which sets the CS for ILI9341 through FT80X registers
void CS_ILI(uint8_t mode)

{
    switch (mode) {
        case 0:
            GPIO_WriteBit(FT_CS,0);

            SPI_FT_Send(((REG_GPIO >> 16) & 0xBF | 0x80));
            SPI_FT_Send((REG_GPIO & 0xFF00) >> 8);
            SPI_FT_Send((REG_GPIO & 0xFF));

            SPI_FT_Send(0x00);

            GPIO_WriteBit(FT_CS,1);
            break;
        case 1:
            GPIO_WriteBit(FT_CS,0);

            SPI_FT_Send(((REG_GPIO >> 16) & 0xBF | 0x80));
            SPI_FT_Send((REG_GPIO & 0xFF00) >> 8);
            SPI_FT_Send((REG_GPIO & 0xFF));

            SPI_FT_Send(0x83);

            GPIO_WriteBit(GPIOA,FT_CS,1);
            GPIO_WriteBit(SDO,0);
            GPIO_WriteBit(CLK,0);
            break;
    }
}

//Function which sends SPI (9-bit) data to ILI9341
void ILI_Send(DC type, uint8_t data)
{
    unsigned char m=0x80;
    uint8_t i, test;
    if(type == COMMAND)

```

```

    {
        GPIO_WriteBit(CLK, 0);
        GPIO_WriteBit(SDO, 0);
        GPIO_WriteBit(CLK, 1);
    }
    else if(type == DATA)
    {
        GPIO_WriteBit(CLK, 0);
        GPIO_WriteBit(SDO, 1);
        GPIO_WriteBit(CLK, 1);
    }
    for(i=0; i<8; i++)
    {
        GPIO_WriteBit(CLK, 0);
        if(data&m)
        {
            GPIO_WriteBit(SDO, 1);
        }
        else
        {
            GPIO_WriteBit(SDO, 0);
        }
        GPIO_WriteBit(CLK, 1);

        m=m>>1;
    }
    delay_ms(1);
}
void ILI_init()
{
    FT80X_init();           //FT80X initialization
    Ft_Gpu_Hal_Sleep(5000);
    CS_ILI(0);
    ILI_Send(COMMAND, 0x01); //software reset
    delay_ms(5);
    CS_ILI(1);

    CS_ILI(0);
    ILI_Send(COMMAND, 0x28); //display off
    CS_ILI(1);
//-----
    CS_ILI(0);
    ILI_Send(COMMAND, 0xcf);
    ILI_Send(DATA, 0x00);
    ILI_Send(DATA, 0x81);
    ILI_Send(DATA, 0x30);
    CS_ILI(1);

    CS_ILI(0);
    ILI_Send(COMMAND, 0xed);
    ILI_Send(DATA, 0x64);
    ILI_Send(DATA, 0x03);
    ILI_Send(DATA, 0x12);
    ILI_Send(DATA, 0x81);
    CS_ILI(1);

    CS_ILI(0);
    ILI_Send(COMMAND, 0xe8);
    ILI_Send(DATA, 0x85);
    ILI_Send(DATA, 0x01);
    ILI_Send(DATA, 0x79);
    CS_ILI(1);

    CS_ILI(0);
    ILI_Send(COMMAND, 0xcb);
    ILI_Send(DATA, 0x39);
    ILI_Send(DATA, 0x2c);
    ILI_Send(DATA, 0x00);

```

```

ILI_Send(DATA,0x34);
ILI_Send(DATA,0x02);
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0xF6); //Interface Control
ILI_Send(DATA,0x01);
ILI_Send(DATA,0x00);
ILI_Send(DATA,0x06);
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0xf7);
ILI_Send(DATA,0x20);
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0xea);
ILI_Send(DATA,0x06);
ILI_Send(DATA,0x00);
CS_ILI(1);
//-----power control-----

CS_ILI(0);
ILI_Send(COMMAND,0xc0); //power control
ILI_Send(DATA,0x26);
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0xc1); //power control
ILI_Send(DATA,0x11);
CS_ILI(1);
//-----VCOM -----

CS_ILI(0);
ILI_Send(COMMAND,0xc5); //vcom control
ILI_Send(DATA,0x35);
ILI_Send(DATA,0x3E);
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0xc7); //vcom control
ILI_Send(DATA,0xBE);
CS_ILI(1);
//-----memory access control-----

CS_ILI(0);
ILI_Send(COMMAND,0x36);
ILI_Send(DATA,0x40);
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0x3a); //pixel format set
ILI_Send(DATA,0x60); //18bit /pixel
CS_ILI(1);
//----- frame rate-----

CS_ILI(0);
ILI_Send(COMMAND,0xb0); //RGB Interface Signal Control
ILI_Send(DATA,0xc0); //0x1c0 DE mode
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0xb1); //frame rate
ILI_Send(DATA,0x00);
ILI_Send(DATA,0x1B);
CS_ILI(1);
//-----Gamma-----

```

```

CS_ILI(0);
ILI_Send(COMMAND,0xf2); //3Gamma Function Disable
ILI_Send(DATA,0x02);
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0x26);
ILI_Send(DATA,0x01); //gamma set 4 gamma curve 01/02/04/08
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0xE0); //positive gamma correction
ILI_Send(DATA,0x1f);
ILI_Send(DATA,0x1a);
ILI_Send(DATA,0x18);
ILI_Send(DATA,0x0a);
ILI_Send(DATA,0x0f);
ILI_Send(DATA,0x06);
ILI_Send(DATA,0x45);
ILI_Send(DATA,0x87);
ILI_Send(DATA,0x32);
ILI_Send(DATA,0x0a);
ILI_Send(DATA,0x07);
ILI_Send(DATA,0x02);
ILI_Send(DATA,0x07);
ILI_Send(DATA,0x05);
ILI_Send(DATA,0x00);
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0xE1); //negamma correction
ILI_Send(DATA,0x00);
ILI_Send(DATA,0x25);
ILI_Send(DATA,0x27);
ILI_Send(DATA,0x05);
ILI_Send(DATA,0x10);
ILI_Send(DATA,0x09);
ILI_Send(DATA,0x3a);
ILI_Send(DATA,0x78);
ILI_Send(DATA,0x4d);
ILI_Send(DATA,0x05);
ILI_Send(DATA,0x18);
ILI_Send(DATA,0x0d);
ILI_Send(DATA,0x38);
ILI_Send(DATA,0x3a);
ILI_Send(DATA,0x1f);
CS_ILI(1);

CS_ILI(0);
ILI_Send(COMMAND,0x11); //sleep out
delay_ms(100);
CS_ILI(1);

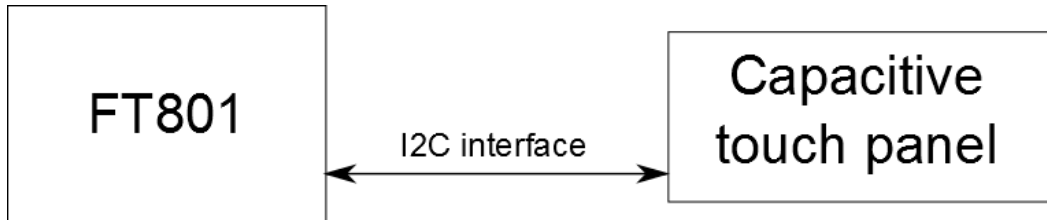
CS_ILI(0);
ILI_Send(COMMAND,0x29); //display on
delay_ms(50);
CS_ILI(1);
}

```

11 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



11.1 Mechanical characteristics

| DESCRIPTION | INL SPECIFICATION | REMARK |
|------------------------|-------------------|--------------------|
| Touch Panel Size | 2.83 inch | |
| Outline Dimension (OD) | 67.6mm x 82.0mm | Cover Lens Outline |
| Product Thickness | 1.70mm | |
| Glass Thickness | 0.70mm | |
| Ink View Area | 44.2mm x 58.6mm | |
| Sensor Active Area | 45.20mm x 59.60mm | |
| Input Method | 2 Finger | |
| Activation Force | Touch | |
| Surface Hardness | ≥6H | |

11.2 Electrical characteristics

| DESCRIPTION | SPECIFICATION | |
|-------------------------|----------------------|----------|
| Operating Voltage | DC 2.8~3.3V | |
| Power Consumption (IDD) | Active Mode | 12~4.5mA |
| | Sleep Mode | TBD |
| Interface | I ² C | |
| Controller | FT6236 | |
| I2C address | 0x38 (7-bit address) | |
| Resolution | 240*320 | |

12 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 |
|---------------|---|
| RVT28UEFNWC00 | <ul style="list-style-type: none"> • Double side adhesive tape with 3M 467MP glue (total thickness 0.2mm) • Cover glass color- black |
| RVT28UEFNWC01 | <ul style="list-style-type: none"> • Foam double side adhesive tape with 3M 467MP glue (total thickness 0.5mm) • Cover glass - black |
| RVT28UEFNWC02 | <ul style="list-style-type: none"> • Without tape • Cover glass color- black |
| RVT28UEFNWC03 | <ul style="list-style-type: none"> • Double side adhesive tape with 3M 467MP glue (total thickness 0.2mm) • Cover glass color- white |
| RVT28UEFNWC04 | <ul style="list-style-type: none"> • Foam double side adhesive tape with 3M 467MP glue (total thickness 0.5mm) • Cover glass color- white |
| RVT28UEFNWC05 | <ul style="list-style-type: none"> • Without tape • Cover glass color- white |

13 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/>

14 INSPECTION

Standard acceptance/rejection criteria for TFT module.

14.1 Inspection condition

Ambient conditions:

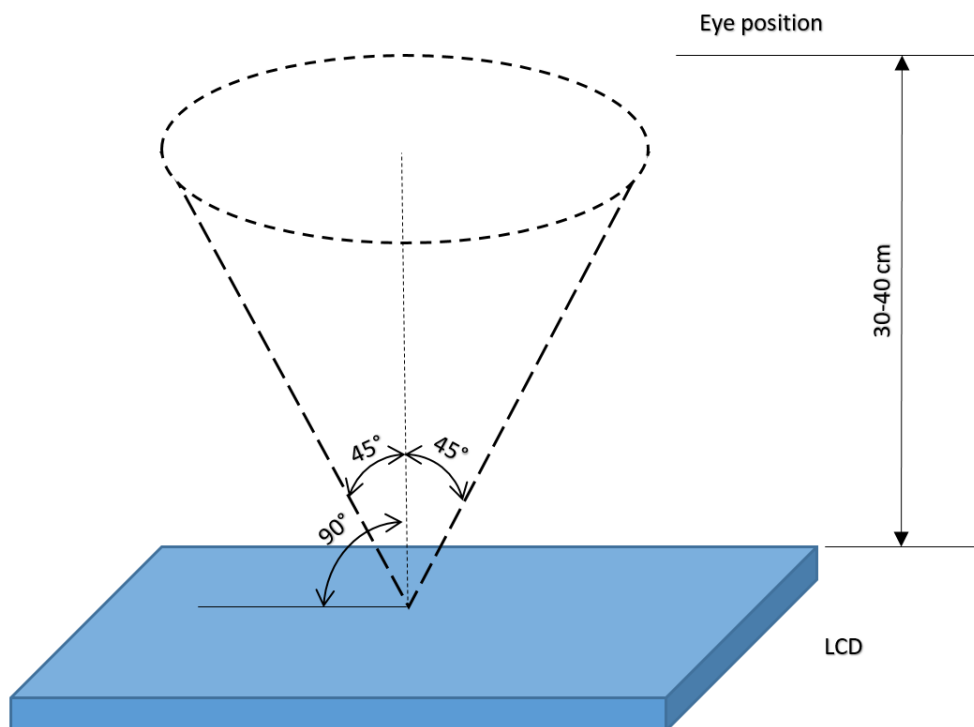
- Temperature: $25\pm^{\circ}\text{C}$
- Humidity: $(60\pm 10)\% \text{RH}$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

Viewing distance:

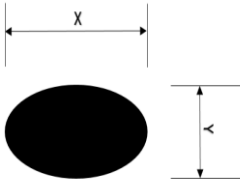
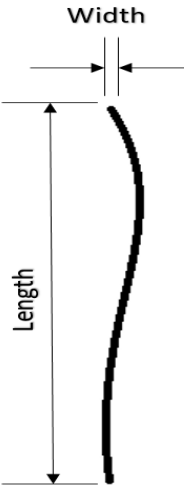
$35\pm 5\text{cm}$ between inspector bare eye and LCD.

Viewing Angle:

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



14.2 Inspection standard

| Item | Criterion | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|---------------|--|------------------|---------------|------------|---------------|---------------------|----------|---------------------|---------|-----------------|---|---------|-----------------|---|----------|---|------------|--|--|--------|-------|---------------|---|----------|---------|---------|-----------------|---|---------|-----------------|---|----------|---|
| <p>Black spots, white spots, light leakage, Foreign Particle (round Type)</p> | <div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="2" style="background-color: #cccccc;">Size < 5"</th> </tr> <tr> <th>Average Diameter</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>D < 0.2 mm</td> <td>Ignored</td> </tr> <tr> <td>0.2 mm < D < 0.3 mm</td> <td>3</td> </tr> <tr> <td>0.3 mm < D < 0.5 mm</td> <td>2</td> </tr> <tr> <td>0.5 mm < D</td> <td>0</td> </tr> </tbody> </table> </div> <div style="text-align: center; margin: 10px 0;"> $D = \frac{(x + y)}{2}$ </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>LCD black spots, white spots, light leakage (line Type)</p> | <div style="display: flex; align-items: center; justify-content: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th colspan="3" style="background-color: #cccccc;">Size < 5"</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>-</td> <td>W < 0.02</td> <td>Ignored</td> </tr> <tr> <td>L < 3.0</td> <td>0.02 < W < 0.05</td> <td rowspan="2">2</td> </tr> <tr> <td>L < 2.5</td> <td>0.05 < W < 0.08</td> </tr> <tr> <td>-</td> <td>0.08 < W</td> <td>0</td> </tr> </tbody> </table> </div> <div style="margin: 10px 0;"> <table border="1" style="width: 100%;"> <thead> <tr> <th colspan="3" style="background-color: #cccccc;">Size >= 5"</th> </tr> <tr> <th>Length</th> <th>Width</th> <th>Qualified Qty</th> </tr> </thead> <tbody> <tr> <td>-</td> <td>W < 0.02</td> <td>Ignored</td> </tr> <tr> <td>L < 3.0</td> <td>0.02 < W < 0.05</td> <td rowspan="2">4</td> </tr> <tr> <td>L < 2.5</td> <td>0.05 < W < 0.08</td> </tr> <tr> <td>-</td> <td>0.08 < 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" | |
| | 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 | 4 |
| | 0.3 mm < D < 0.5 mm | 2 |
| | 0.5 mm < D | 0 |
| | *Spots density: 10 mm | |
| | Polarizer bubbles | Size < 5" |
| Average Diameter | | Qualified Qty |
| D < 0.2 mm | | Ignored |
| 0.2 mm < D < 0.5 mm | | 3 |
| 0.5 mm < D < 1 mm | | 2 |
| 1 mm < D | | 0 |
| Total Q'ty | | 3 |
| Size >= 5" | | |
| Average Diameter | | Qualified Qty |
| D<0.25 mm | | Ignored |
| 0.25 mm < D < 0.5 mm | | 3 |
| 0.5 mm < D | | 0 |
| Electrical Dot Defect | | Size < 5" |
| | | item |
| | Black do defect | 4 |
| | Bright dot defect | 2 |
| | Total Dot | 5 |
| | Size >= 5" | |
| | item | Qualified Qty |
| | Black do defect | 5 |
| | Bright dot defect | 2 |
| | Total Dot | 5 |

| Item | Criterion | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------------------|---|----------------|---------------|--|------------------|---------------|---------------|----------------------|---------|---------|----------------------------------|----------------|---|----------------------------------|----------------|--|----------------------|----------|---|------------|--|--|------------------|---------------|---------------|---------------------|---------|---------|-----------------------------------|----------------|---|----------------------|----------|---|
| Touch panel spot | <table border="1"> <thead> <tr> <th colspan="3" data-bbox="470 259 1383 297">Size < 5"</th> </tr> <tr> <th data-bbox="470 297 1166 336">Average Diameter</th> <th colspan="2" data-bbox="1166 297 1383 336">Qualified Qty</th> </tr> </thead> <tbody> <tr> <td data-bbox="470 336 1166 374">D < 0.2 mm</td> <td colspan="2" data-bbox="1166 336 1383 374">Ignored</td> </tr> <tr> <td data-bbox="470 374 1166 412">0.2 mm < D < 0.4 mm</td> <td colspan="2" data-bbox="1166 374 1383 412">5</td> </tr> <tr> <td data-bbox="470 412 1166 450">0.4 mm < D < 0.5 mm</td> <td colspan="2" data-bbox="1166 412 1383 450">2</td> </tr> <tr> <td data-bbox="470 450 1166 488">0.5 mm < D</td> <td colspan="2" data-bbox="1166 450 1383 488">0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="3" data-bbox="470 521 1383 560">Size >= 5"</th> </tr> <tr> <th data-bbox="470 560 1166 598">Average Diameter</th> <th colspan="2" data-bbox="1166 560 1383 598">Qualified Qty</th> </tr> </thead> <tbody> <tr> <td data-bbox="470 598 1166 636">D<0.25 mm</td> <td colspan="2" data-bbox="1166 598 1383 636">Ignored</td> </tr> <tr> <td data-bbox="470 636 1166 674">0.25 mm < D < 0.5 mm</td> <td colspan="2" data-bbox="1166 636 1383 674">4</td> </tr> <tr> <td data-bbox="470 674 1166 712">0.5 mm < D</td> <td colspan="2" data-bbox="1166 674 1383 712">0</td> </tr> </tbody> </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 | |
| | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Touch panel White Line Scratch | <table border="1"> <thead> <tr> <th colspan="3" data-bbox="470 813 1383 851">Size < 5"</th> </tr> <tr> <th data-bbox="470 851 726 889">Length</th> <th data-bbox="726 851 1166 889">Width</th> <th data-bbox="1166 851 1383 889">Qualified Qty</th> </tr> </thead> <tbody> <tr> <td data-bbox="470 889 726 927">-</td> <td data-bbox="726 889 1166 927">W< 0.02</td> <td data-bbox="1166 889 1383 927">Ignored</td> </tr> <tr> <td data-bbox="470 927 726 965">L < 3.0</td> <td data-bbox="726 927 1166 965">0.02 < W <0.05</td> <td data-bbox="1166 927 1383 965">2</td> </tr> <tr> <td data-bbox="470 965 726 1003">L < 2.5</td> <td data-bbox="726 965 1166 1003">0.05 < W <0.08</td> <td data-bbox="1166 965 1383 1003"></td> </tr> <tr> <td data-bbox="470 1003 726 1041">-</td> <td data-bbox="726 1003 1166 1041">0.08 < W</td> <td data-bbox="1166 1003 1383 1041">0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="3" data-bbox="470 1075 1383 1113">Size >= 5"</th> </tr> <tr> <th data-bbox="470 1113 726 1151">Length</th> <th data-bbox="726 1113 1166 1151">Width</th> <th data-bbox="1166 1113 1383 1151">Qualified Qty</th> </tr> </thead> <tbody> <tr> <td data-bbox="470 1151 726 1189">-</td> <td data-bbox="726 1151 1166 1189">W< 0.03</td> <td data-bbox="1166 1151 1383 1189">Ignored</td> </tr> <tr> <td data-bbox="470 1189 726 1227">L < 5.0</td> <td data-bbox="726 1189 1166 1227">0.03 < W <0.05</td> <td data-bbox="1166 1189 1383 1227">2</td> </tr> <tr> <td data-bbox="470 1227 726 1265">-</td> <td data-bbox="726 1227 1166 1265">0.05 < W</td> <td data-bbox="1166 1227 1383 1265">0</td> </tr> </tbody> </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 |
| | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

15 RELIABILITY TEST

| NO. | TEST ITEM | TEST CONDITION | INSPECTION AFTER TEST |
|-----|------------------------------|--|--|
| 1 | High Temperature Storage | 80±2°C/96 hours | <p>Inspection after 2~4 hours storage at room temperature and humidity. The condensation is not accepted. The sample shall be free from defects:</p> <ol style="list-style-type: none"> 1. Air bubble in the LCD 2. Seal leak 3. Non-display 4. Missing segments 5. Glass crack |
| 2 | Low Temperature Storage | -30±2°C/96 hours | |
| 3 | High Temperature Operating | 70±2°C/96 hours | |
| 4 | Low Temperature Operating | -20±2°C/96 hours | |
| 5 | Temperature Cycle | -30±2°C ~ 25 ~ 80± 2°C × 10 cycles (30 min.) (5min.) (30min.) | |
| 6 | Damp Proof Test | 60°C ±5°C × 90%RH/96 hours | |
| 7 | Vibration Test | Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~150 Hz~10Hz 2 hours For each direction of X, Y, Z | |
| 8 | Shock Test | Half-sine, wave, 300m/s | |
| 9 | Packing Drop Test | Height: 80 cm 1 corner, concrete floor | |
| 11 | Electrostatic Discharge Test | C=150pF, R=330 Ω Air: ±8KV 150pF/330Ω 30 times Contact: ±4KV,20 times | |

16 INFORMATION

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[MAX20069EVKIT#](#) [KIT95000-3](#) [LCD-16396](#) [PIM370](#) [1109](#) [MCIMX-LVDS1](#) [MIKROE-2449](#) [MIKROE-2453](#) [131](#) [DEV-13628](#) [1590](#)
[MIKROE-2269](#) [1601](#) [1770](#) [1947](#) [1983](#) [1987](#) [2050](#) [2218](#) [2260](#) [2345](#) [2418](#) [2423](#) [2454](#) [2455](#) [2478](#) [2674](#) [SK-220RD-PI](#) [FIT0477](#) [333](#) [334](#)
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[TDP0500T800480PCAP](#)