



RVT50AQFFWR00

LCD TFT Datasheet

Rev.1.0

2015-10-06

| ITEM | CONTENTS | UNIT |
|--------------------------------|---------------------------------|-------------------|
| LCD Type | TFT/Transmissive/Normally white | / |
| Size | 5.0 | Inch |
| Viewing Direction | 12:00 (without image inversion) | O' Clock |
| Gray Scale Inversion Direction | 6:00 | O' Clock |
| LCM (W × H × D) | 121.50 x 76.60 x 9.00 | mm ³ |
| Active Area (W × H) | 108.00 × 64.80 | mm ² |
| Dot Pitch (W × H) | 0.045×0.135 | mm ² |
| Number Of Dots | 800 x (RGB) × 480 | / |
| Driver IC | FT812 | / |
| Backlight Type | 12 LEDs | / |
| Surface Luminance | 480 | cd/m ² |
| Interface Type | SPI/QSPI | / |
| Color Depth | 16.7M | / |
| Pixel Arrangement | RGB Vertical Stripe | / |
| Surface Treatment | Anti-glare | |
| Input Voltage | 3.3 | V |
| With/Without TSP | Resistive Touch Panel | / |
| Weight | TBD | g |

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

| REVNO. | REVDATE | CONTENTS | REMARKS |
|--------|------------|-----------------|---------|
| 1.0 | 2015-10-06 | Initial Release | |
| | | | |
| | | | |

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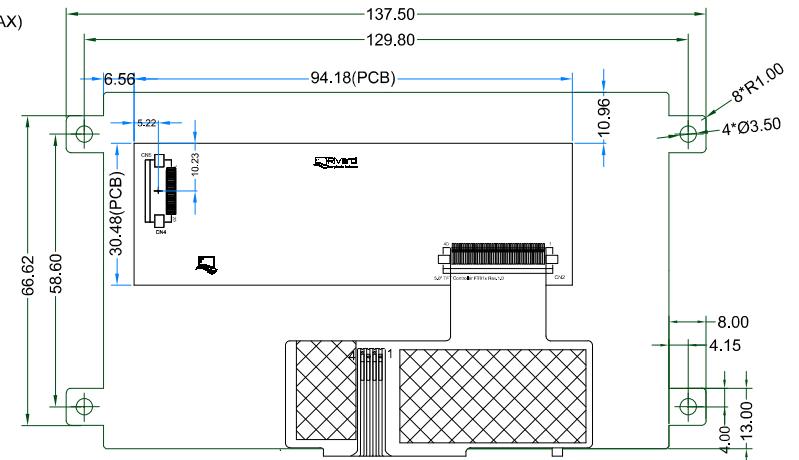
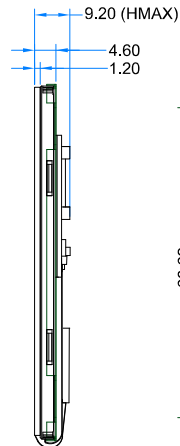
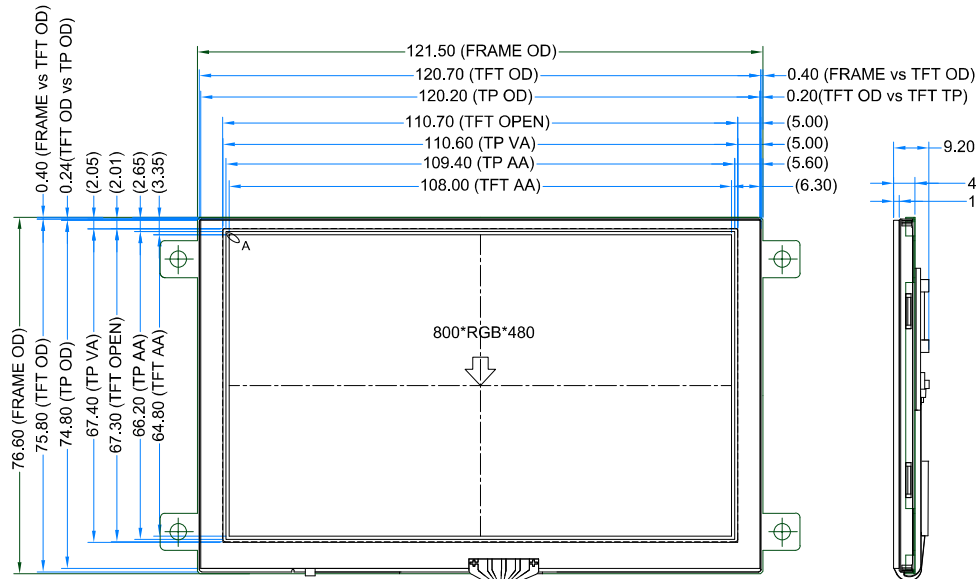
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1 MODULE CLASSIFICATION INFORMATION

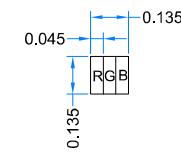
| | | | | | | | | | |
|-----------|----------|-----------|----------|----------|----------|----------|----------|----------|-----------|
| RV | T | 50 | A | Q | F | F | W | R | 00 |
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |

| | | |
|-----|-------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 1. | BRAND | RV – Riverdi |
| 2. | PRODUCT TYPE | T – TFT Standard F – TFT Custom |
| 3. | DISPLAY SIZE | 35 – 3.5” 43 – 4.3” 50 – 5.0” 70 – 7.0” |
| 4. | MODEL SERIAL NO. | A (A-Z) |
| 5. | RESOLUTION | Q– 800x480 px |
| 6. | INTERFACE | T – TFT LCD, RGB L – TFT LCD, LVDS S – TFT + Controller SSD1963 F – TFT + Controller FT812 |
| 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 | 00 (00-99) |

| TFT PINOUT | |
|------------|-----------|
| PIN | DESC |
| 1 | VDD |
| 2 | GND |
| 3 | SPI_SCLK |
| 4 | MISO/I/O0 |
| 5 | MOSI/I01 |
| 6 | CS |
| 7 | INT |
| 8 | PD |
| 9 | NC |
| 10 | AUDIO_OUT |
| 11 | GPIO0/I02 |
| 12 | GPIO1/I03 |
| 13 | GPIO2 |
| 14 | GPIO3 |
| 15 | NC |
| 16 | NC |
| 17 | BLVDD |
| 18 | BLVDD |
| 19 | BLGND |
| 20 | BLGND |



DETAIL A
SCALE 60:1



INTERNAL BACKLIGHT CIRCUIT DIAGRAM



NOTES:

1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
2. OPERATING VOLTAGE: VDD=3.3V
3. VIEWING DIRECTION: 12 O'CLOCK.
4. IC DRIVER: FT812
5. OPERATING TEMP: -20°C ~ 70°C.
6. STORAGE TEMP: -30°C ~ 80°C.
7. LED BACKLIGHT: 12 WHITE LED.
8. LCM SURFACE LUMINANCE: 480cd/m².
9. GENERAL TOLERANCE: ±0.2.
10. RoHS COMPLIANT.

| | | |
|------|--------------|------------|
| 1.0 | Initial case | 2015.10.06 |
| Ver. | DESCRIPTION | DATE |

| | | | |
|-----------------|-----------|---------------------|--|
| CUSTOMER | | 2015.10.06 | |
| DRAWN | SCALE 1:1 | TITLE RVT50AQFFWR00 | |
| DFTG CHK | UNIT mm | MODEL | |
| ENGR CHK | | | |
| APPROVAL | | | |
| DWG NO Rev. 1.0 | | PAGE 1/1 | |

3 ABSOLUTE MAXIMUM RATINGS

| PARAMETER | SYMBOL | MIN | MAX | UNIT |
|--------------------------------|-----------------|---------|----------------|------|
| Supply Voltage For Logic | VDD | -0.3 | 4.0 | V |
| Input Voltage For Logic | VIN | VSS-0.5 | VDD+0.3 | V |
| LED forward current (each LED) | IF | - | 60 | mA |
| 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 | NOTES |
|---------------------------|------------------|--------|-----|--------|------|-------|
| Supply Voltage For Module | VDD | 3.0 | 3.3 | 3.6 | V | |
| Input Leakage Current | I _{LKG} | - | - | - | μA | |
| Input Voltage 'H' level | V _{IH} | 0.8VDD | - | VDD | V | |
| Input Voltage 'L' level | V _{IL} | -0.3 | - | 0.2VDD | V | |

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

5 BACKLIGHT CHARACTERISTICS

| ITEM | SYMBOL | MIN | TYP | MAX | UNIT |
|---------------------------|----------------|-------|-------|------|------|
| Voltage for LED backlight | V _I | 17.4 | 18.3 | 19.6 | V |
| Current for LED backlight | I _I | 30 | 40 | 50 | mA |
| LED Life Time | - | 30000 | 50000 | - | Hrs |

Note: The LED Supply Voltage is defined by the numbers of LED at Ta=25°C and I_L= 40mA.

6 ELECTRO-OPTICAL CHARACTERISTICS

| ITEM | SYMBOL | CONDITION | MIN | TYP | MAX | UNIT | REMARK | NOTE |
|-------------------------|---------|---------------|-------|-------|-------|-------------------|----------|------|
| Response Time | Tr+Tf | | - | 20 | - | ms | Figure 1 | 4 |
| Contrast Ratio | Cr | θ=0° | - | 500 | - | --- | Figure 2 | 1 |
| Luminance Uniformity | δ WHITE | φ=0° Ta=25 | 75 | 80 | - | % | Figure 2 | 3 |
| Surface Luminance | Lv | | 440 | 480 | - | cd/m ² | Figure 2 | 2 |
| Viewing Angle Range | θ | φ = 90° | 40 | 50 | - | deg | Figure 3 | 6 |
| | | φ = 270° | 60 | 70 | - | deg | Figure 3 | |
| | | φ = 0° | 60 | 70 | - | deg | Figure 3 | |
| | | φ = 180° | 60 | 70 | - | deg | Figure 3 | |
| CIE (x, y) Chromaticity | Red | x | 0.540 | 0.590 | 0.640 | Figure 2 | 5 | |
| | | y | 0.300 | 0.350 | 0.400 | | | |
| | Green | x | 0.298 | 0.348 | 0.398 | | | |
| | | y | 0.520 | 0.570 | 0.620 | | | |
| | Blue | x | 0.095 | 0.145 | 0.195 | | | |
| | | y | 0.060 | 0.110 | 0.160 | | | |
| | White | x | 0.270 | 0.320 | 0.370 | | | |
| | | y | 0.310 | 0.360 | 0.410 | | | |

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 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, 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.

Note 8. For TFT module, Gray scale reverse occurs in the direction of panel viewing angle.

Figure 1. The definition of response time

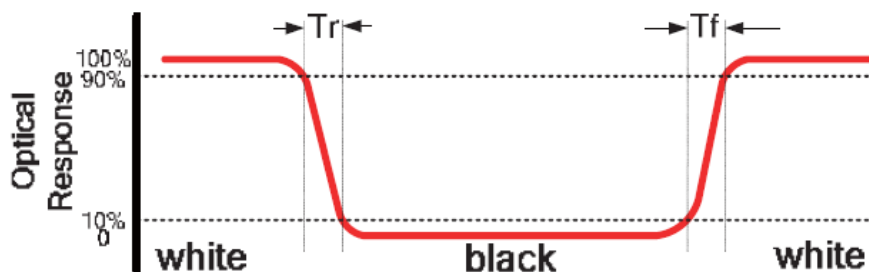


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

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

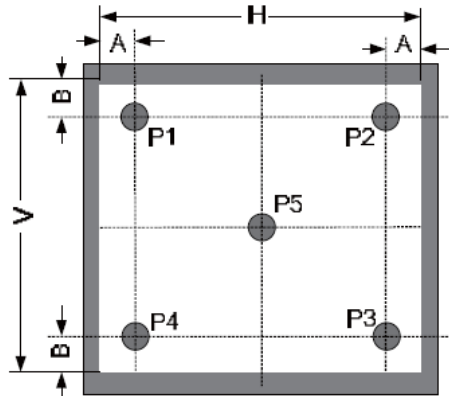
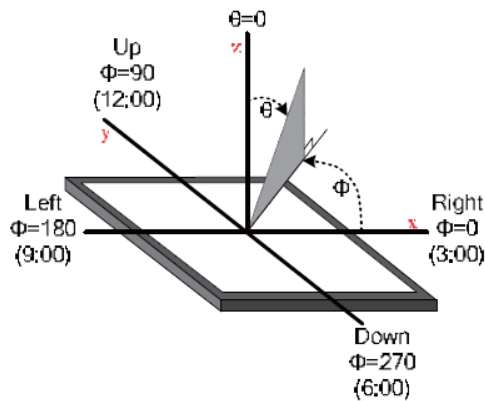


Figure 3. The definition of viewing angle



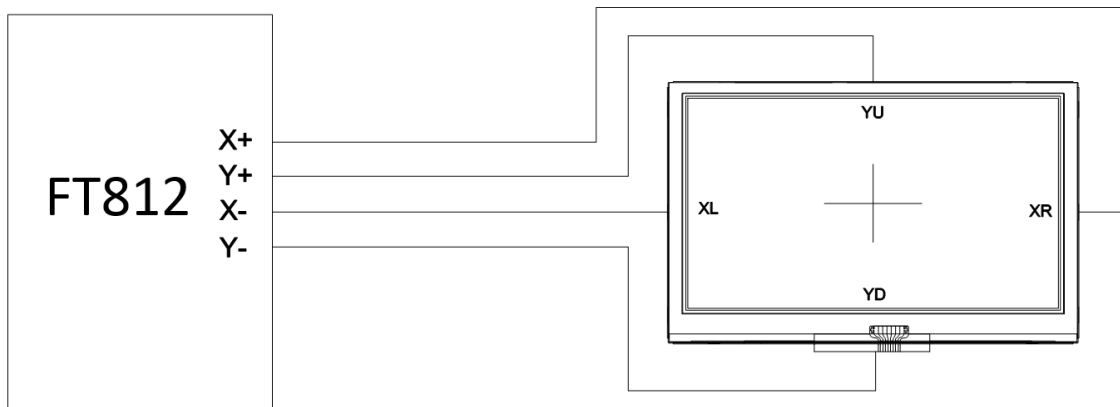
7 INTERFACE DESCRIPTION

| PIN NO. | SYMBOL | DESCRIPTION |
|---------|-----------|----------------------------------------------------------------------|
| 1 | VDD | Power Supply |
| 2 | GND | Ground |
| 3 | SPI_SCLK | SPI SCK Signal, Internally 47k Pull UP |
| 4 | MISO/ IO0 | SPI MISO Signal / IO0 Signal, Internally 47k Pull UP |
| 5 | MOSI/ IO1 | SPI MOSI Signal / IO1 Slave Address Bit 0, Internally 47k Pull UP |
| 6 | CS | SPI Chip Select Signal , 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 | NC | Not Connected |
| 10 | AUDIO_OUT | Audio Out Signal |
| 11 | GPIO0/IO2 | SPI Single mode: General purpose IO0/ SPI Quad mode: SPI data line 2 |
| 12 | GPIO1/IO3 | SPI Single mode: General purpose IO1/ SPI Quad mode: SPI data line 3 |
| 13 | GPIO2 | General purpose IO2 |
| 14 | GPIO3 | General purpose IO3 or analog input for ADC |
| 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 TOUCH SCREEN PANEL SPECIFICATION

Resistive Touch Panel is directly connected to FT812 module. Therefore communication with Resistive touch panel is simplified to read registers of FT812.

Figure 4. Resistive Touch Panel Connection



8.1 Electrical characteristics

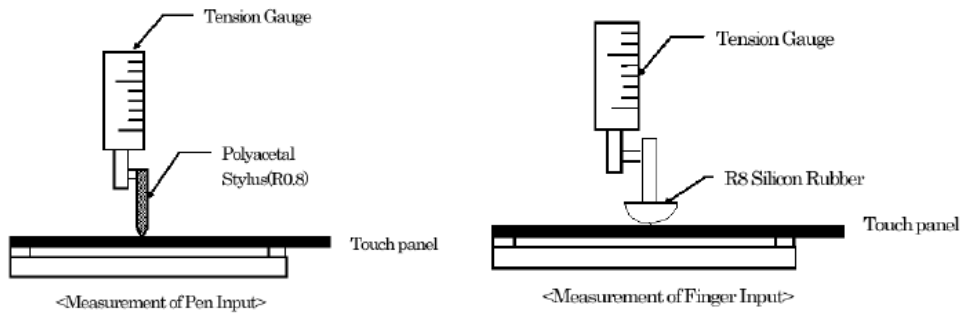
| ITEM | VALUE | | | UNIT | REMARK |
|-----------------------|-------|------|------|------|---------------------------|
| | Min. | Typ. | Max. | | |
| Linearity | -1.5 | - | 1.5 | % | Analog X and Y directions |
| Terminal Resistance | 350 | - | 1000 | Ω | X |
| | 100 | - | 450 | Ω | Y |
| Insulation Resistance | - | - | - | MΩ | DC 25V |
| Voltage | - | - | 10 | V | DC |
| Chattering | - | - | 10 | ms | 100kΩ pull-up |
| Transparency | 80 | - | - | % | JIS K7105 |

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

8.2 Mechanical characteristics

| ITEM | VALUE | | | UNIT | REMARK |
|-------------------------------|---------------|------|------|------------|-----------|
| | Min. | Typ. | Max. | | |
| Activation Force | 80 | - | - | 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 polacetal 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.

9 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 (30min.) (5min.) (30min.) |
| 6 | Damp Proof Test | 60°C ±5°C × 90%RH/240hours |
| 7 | Vibration Test | Frequency 10Hz~55Hz Amplitude of vibration : 1.5mm Sweep: 10Hz~55Hz~10Hz, 12min X, Y, Z 2 hours for each direction. |
| 8 | Package Drop Test | Height:60 cm 1 corner, 3 edges, 6 surfaces |
| 9 | ESD Test | Air: ±4KV 150pF/330Ω 5 times Contact: ±2KV 150pF/330Ω 5 time |

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