



RVT50AQTNWN00

LCD TFT Datasheet

Rev.1.1

2016-10-17

| 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) | 120.70 × 75.80 × 2.90 | 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 | HX8664B+HX8264D | / |
| Backlight Type | 12 LEDs | / |
| Surface Luminance | 600 | cd/m ² |
| Interface Type | 24bit RGB | / |
| Color Depth | 16.7M | / |
| Pixel Arrangement | RGB Vertical Stripe | / |
| Surface Treatment | Anti-glare | |
| Input Voltage | 3.3 | V |
| With/Without TSP | Without TSP | / |
| Weight | 57.34 | g |

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

| REVNO. | REVDATE | CONTENTS | REMARKS |
|--------|------------|----------------------------|---------|
| 1.0 | 2015-08-06 | Initial Release | |
| 1.1 | 2016-10-17 | Added Inspection Standards | |
| | | | |

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1 MODULE CLASSIFICATION INFORMATION

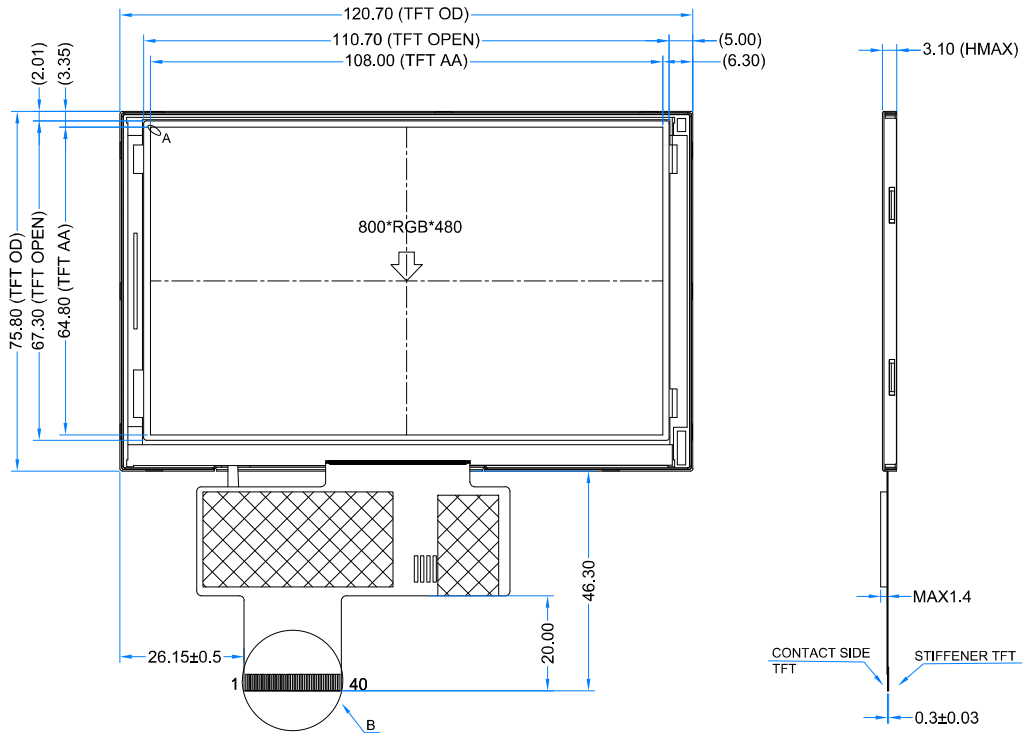
| RV | T | 50 | A | Q | T | N | W | N | 00 |
|-----------|----------|-----------|----------|----------|----------|----------|----------|----------|-----------|
| 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. |

| | | |
|-----|-------------------------|--|
| 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 C – TFT + Controller |
| 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) |

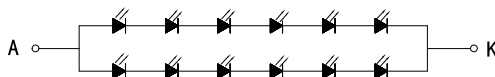
LCD TFT Datasheet Rev.1.1

RVT50AQTNWN00

| TFT PINOUT | |
|------------|-------|
| PIN | DESC |
| 1 | VLED- |
| 2 | VLED+ |
| 3 | GND |
| 4 | VDD |
| 5 | R0 |
| 6 | R1 |
| 7 | R2 |
| 8 | R3 |
| 9 | R4 |
| 10 | R5 |
| 11 | R6 |
| 12 | R7 |
| 13 | G0 |
| 14 | G1 |
| 15 | G2 |
| 16 | G3 |
| 17 | G4 |
| 18 | G5 |
| 19 | G6 |
| 20 | G7 |
| 21 | B0 |
| 22 | B1 |
| 23 | B2 |
| 24 | B3 |
| 25 | B4 |
| 26 | B5 |
| 27 | B6 |
| 28 | B7 |
| 29 | GND |
| 30 | CLKIN |
| 31 | STBYB |
| 32 | HSYNC |
| 33 | VSYNC |
| 34 | DEN |
| 35 | NC |
| 36 | GND |
| 37 | NC |
| 38 | NC |
| 39 | NC |
| 40 | NC |

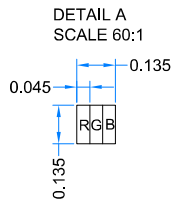
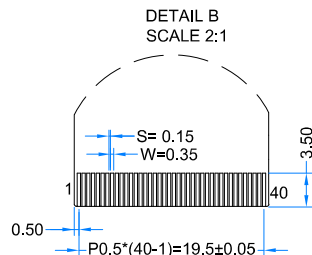


INTERNAL BACKLIGHT CIRCUIT DIAGRAM



NOTES:

1. DISPLAY TYPE: TFT, TRANSMISSIVE, NORMALLY WHITE
2. OPERATING VOLTAGE: VDD=3.3V
3. VIEWING DIRECTION: 12 O'CLOCK.
4. IC DRIVER: HX8664B+HX8264D.
5. OPERATING TEMP: -20°C ~ 70°C.
6. STORAGE TEMP: -30°C ~ 80°C.
7. LED BACKLIGHT: 12 WHITE LED.
8. LCM SURFACE LUMINANCE: 600cd/m².
9. GENERAL TOLERANCE: ±0.2.
10. RoHS COMPLIANT.



| |
|----------|
| CUSTOMER |
| DRAWN |
| DFTG CHK |
| ENGR CHK |
| APPROVAL |

| 1.0 | Initial case | 2015.04.24 |
|------|--------------|------------|
| Ver. | DESCRIPTION | DATE |



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 | | 550 | 600 | - | 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

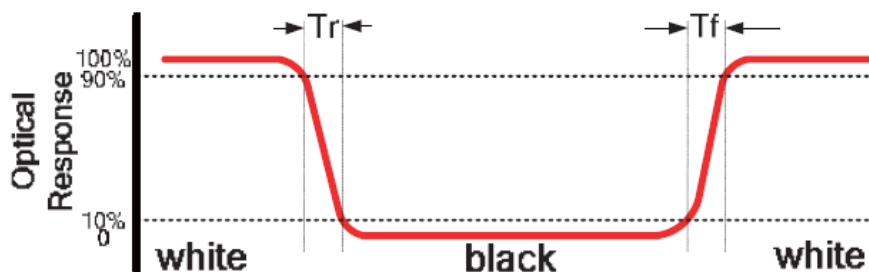


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

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

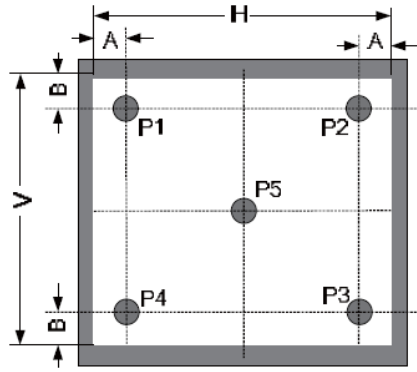
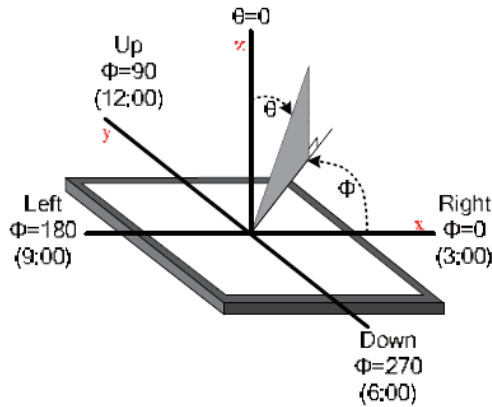


Figure 3. The definition of viewing angle

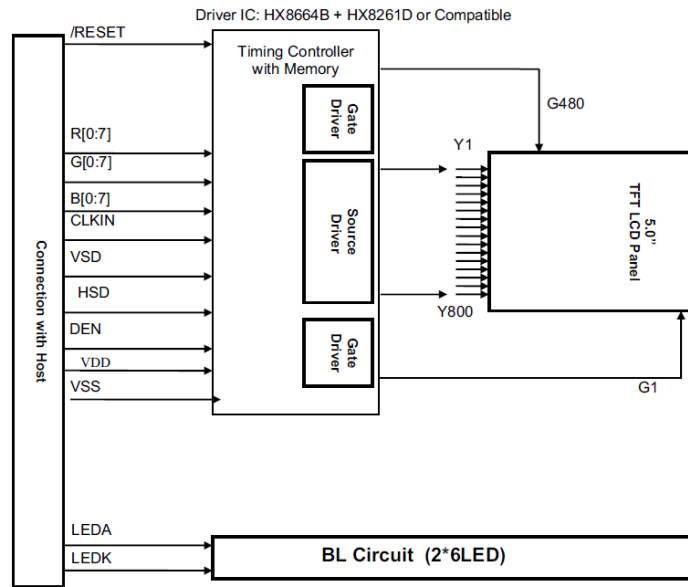


7 INTERFACE DESCRIPTION

| PIN NO. | SYMBOL | DESCRIPTION | NOTE |
|---------|--------|--------------------------------------|------|
| 1 | VLED- | Back Light Power Ground | |
| 2 | VLED+ | Back Light Power Supply | |
| 3 | GND | Power Ground | |
| 4 | VDD | Power Supply Voltage | |
| 5-12 | R0-R7 | Red Data | |
| 13-20 | G0-G7 | Green Data | |
| 21-28 | B0-B7 | Blue Data | |
| 29 | GND | Power Ground | |
| 30 | CLKIN | Dot Clock signal. | |
| 31 | STBYB | Standby mode control pin | |
| 32 | HSYNC | Horizontal Synchronized Signal input | |
| 33 | VSNC | Vertical Synchronized Signal input | |
| 34 | DEN | Data Enable | |
| 35 | NC | No Connect | |
| 36 | GND | Power Ground | |
| 37 | NC | No Connect | |
| 38 | NC | No Connect | |
| 39 | NC | No Connect | |
| 40 | NC | No Connect | |

Note: For digital RGB input data format, both SYNC mode and DE+SYNC mode are supported. If ENB signal is fixed low. SYNC mode is used. Otherwise, DEN+SYNC is used.

Figure 4. Block diagram



7.1 AC electrical characteristics

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT | NOTES |
|-------------------------------------|-----------|-----|-----|-----|------|--------------------------------|
| HS setup time | T_{hst} | 8 | - | - | ns | |
| HS hold time | T_{hhd} | 8 | - | - | ns | |
| VS setup time | T_{vst} | 8 | - | - | ns | |
| VS hold time | T_{vhd} | 8 | - | - | ns | |
| Data setup time | T_{dsu} | 8 | - | - | ns | |
| Data hold time | T_{dhd} | 8 | - | - | ns | |
| DE setup time | T_{esu} | 8 | - | - | ns | |
| DE hold time | T_{ehd} | 8 | - | - | ns | |
| DV _{DD} Power On Slew rate | T_{POR} | - | - | 20 | ns | From 0 to 90% DV _{DD} |
| RESET pulse width | T_{Rst} | 10 | - | - | ns | |
| DCLK cycle time | T_{coh} | 20 | - | - | ns | |
| DCLK pulse duty | T_{cwh} | 40 | 50 | 60 | % | |

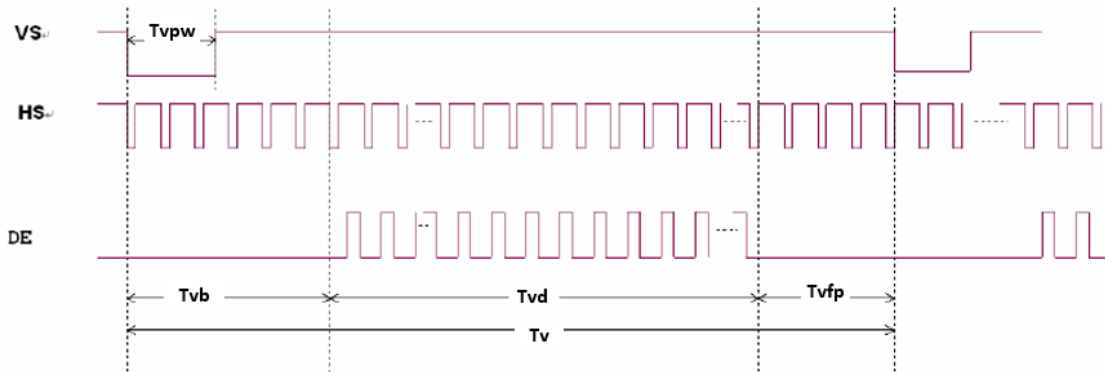
8 LCD TIMING CHARACTERISTICS

8.1 Clock and data input time diagram

Figure 5. Horizontal input timing diagram



Figure 6. Vertical input timing diagram



9 Parallel RGB input timing table

| PARAMETER | SYMBOL | MIN | TYP | MAX | UNIT |
|-------------------------|--------|-----|-----|------|------|
| Horizontal Display Area | Thd | - | 800 | - | DCLK |
| DCLK Frequency | Fclk | - | 30 | 50 | MHz |
| One Horizontal Line | Th | 889 | 928 | 1143 | DCLK |
| HS pulse width | Thpw | 1 | 48 | 255 | DCLK |
| HS Blanking | Thb | - | 88 | - | DCLK |
| HS Front Porch | Thfp | 1 | 40 | 255 | DCLK |
| Vertical Display Area | Tvd | - | 480 | - | TH |
| VS period time | Tv | 513 | 525 | 767 | TH |
| VS pulse width | Tvpw | 3 | 3 | 255 | TH |
| VS Blanking | Tvb | - | 32 | - | TH |
| VS Front Porch | Tvfp | 1 | 13 | 255 | TH |

10 INSPECTION

Standard acceptance/rejection criteria for TFT module.

10.1 Inspection condition

Ambient conditions:

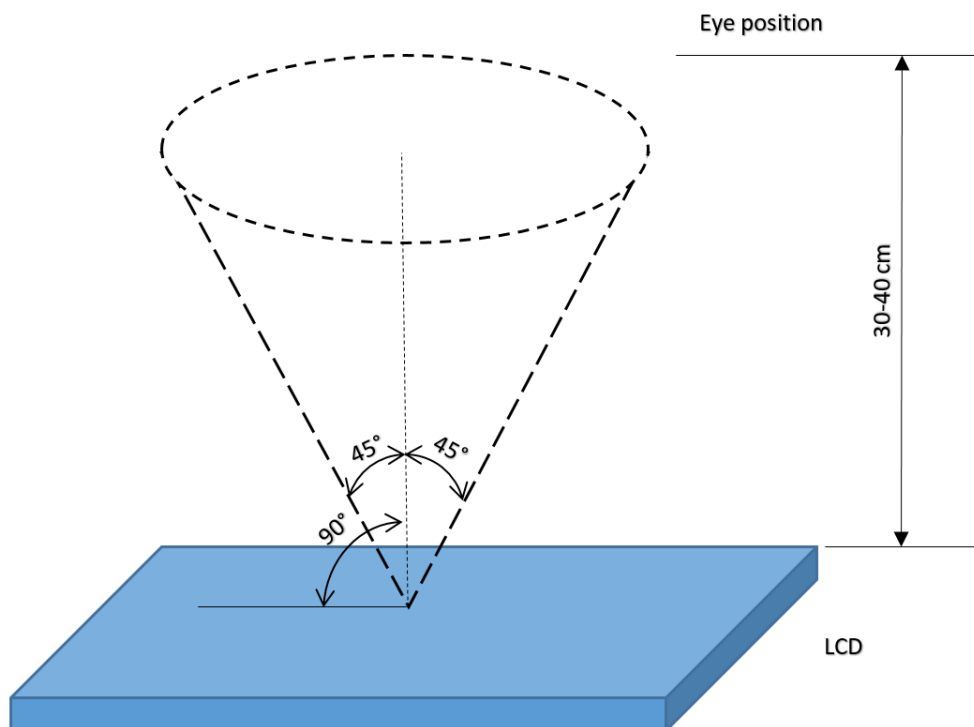
- Temperature: $25\pm^{\circ}\text{C}$
- Humidity: $(60\pm 10)\% \text{RH}$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

Viewing distance:

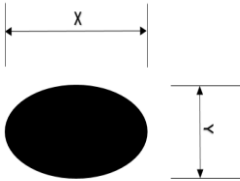
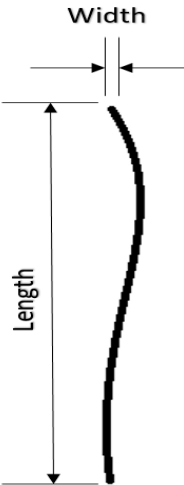
$35\pm 5\text{cm}$ between inspector bare eye and LCD.

Viewing Angle:

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



10.2 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 0 20px;"> <table border="1"> <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 | 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 | 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 | |

11 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 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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