



## RVT50AQTNWR00

### 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 × 4.30	mm <sup>3</sup>
Active Area (W × H)	108.00 × 64.80	mm <sup>2</sup>
Dot Pitch (W × H)	0.045×0.135	mm <sup>2</sup>
Number of Dots	800 x (RGB) × 480	/
Driver IC	HX8664B+HX8264D	/
Backlight Type	12 LEDs	/
Surface Luminance	480	cd/m <sup>2</sup>
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	Resistive Touch Panel	/
Weight	76.65	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	

## CONTENTS

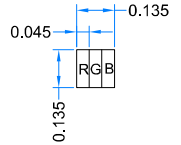
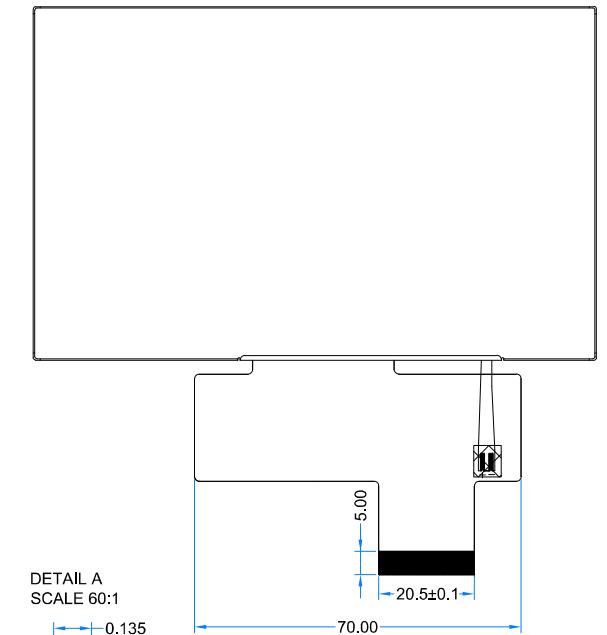
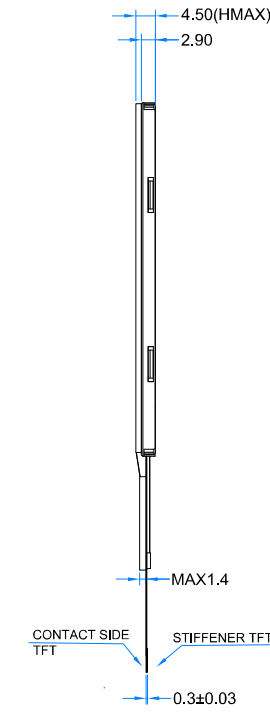
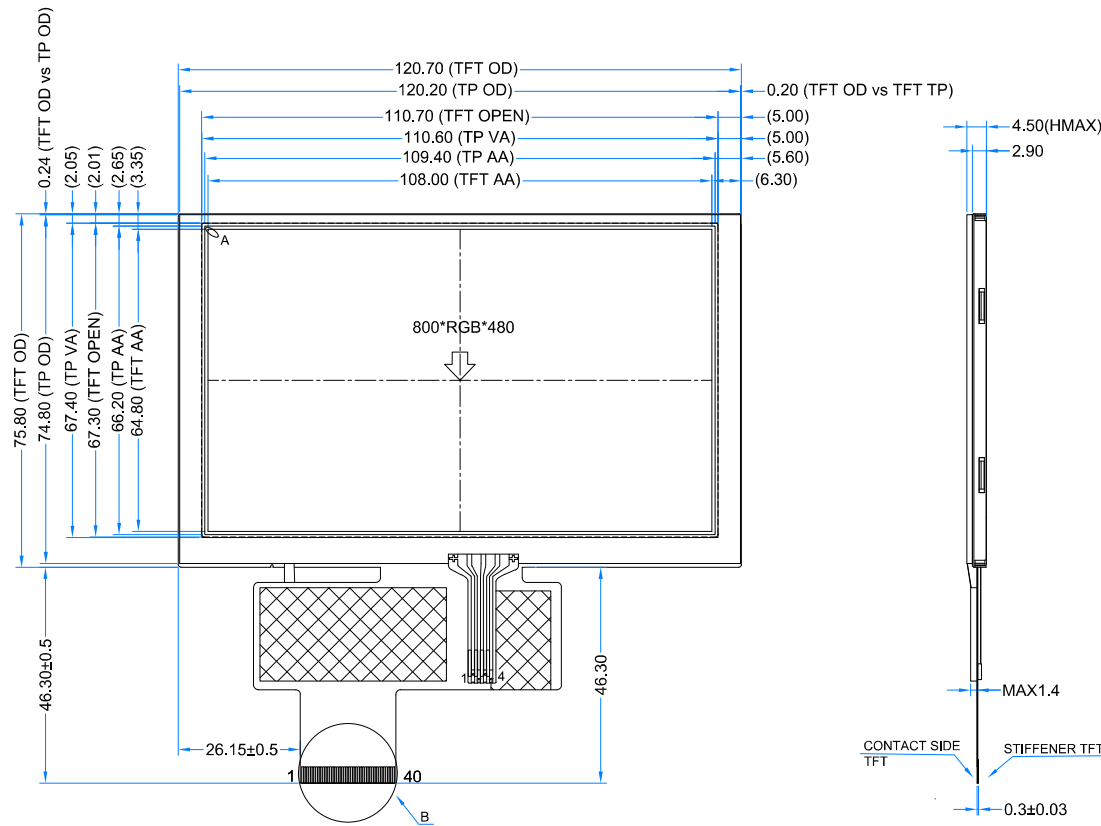
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## 1 MODULE CLASSIFICATION INFORMATION

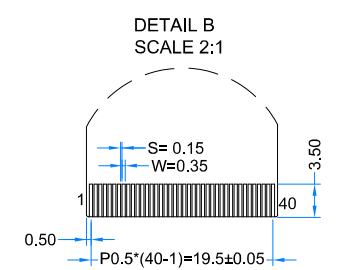
<b>RV</b>	<b>T</b>	<b>50</b>	<b>A</b>	<b>Q</b>	<b>T</b>	<b>N</b>	<b>W</b>	<b>R</b>	<b>00</b>
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

1.	<b>BRAND</b>	<b>RV – Riverdi</b>
2.	<b>PRODUCT TYPE</b>	<b>T – TFT Standard</b> F – TFT Custom
3.	<b>DISPLAY SIZE</b>	35 – 3.5” 43 – 4.3” <b>50 – 5.0”</b> 70 – 7.0”
4.	<b>MODEL SERIAL NO.</b>	<b>A (A-Z)</b>
5.	<b>RESOLUTION</b>	<b>Q– 800x480 px</b>
6.	<b>INTERFACE</b>	<b>T – TFT LCD, RGB</b> L – TFT LCD, LVDS C – TFT + Controller
7.	<b>FRAME</b>	<b>N – No Frame</b> F – Mounting Frame
8.	<b>BACKLIGHT TYPE</b>	<b>W – LED White</b>
9.	<b>TOUCH PANEL</b>	N – No Touch Panel <b>R – Resistive Touch Panel</b> C – Capacitive Touch Panel
10.	<b>VERSION</b>	<b>00 (00-99)</b>

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	XR
38	YD
39	XL
40	YU



- 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: 480cd/m<sup>2</sup>.
  9. GENERAL TOLERANCE: ±0.2.
  10. RoHS COMPLIANT.



CUSTOMER APVL		DATE	2015/04/17
DRAWN	SCALE	1:1	TITLE RVT50AQTNR00
DFTG CHK	UNIT	mm	
ENGR CHK			MODEL
APPROVAL			DWG NO
		Rev. 1.0	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 <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 Leakage Current	I <sub>LKG</sub>	-	-	-	μA	
Input Voltage 'H' level	V <sub>IH</sub>	0.8VDD	-	VDD	V	
Input Voltage 'L' level	V <sub>IL</sub>	-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 <sub>I</sub>	17.4	18.3	19.6	V
Current for LED backlight	I <sub>I</sub>	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<sub>L</sub>= 40mA.

### 6 ELECTRO-OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time	Tr+Tf	θ=0° φ=0° Ta=25	-	20	-	ms	Figure 1	4
Contrast Ratio	Cr		-	500	-	---	Figure 2	1
Luminance Uniformity	δ WHITE		75	80	-	%	Figure 2	3
Surface Luminance	Lv		440	480	-	cd/m <sup>2</sup>	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	θ=0° φ=0° Ta=25	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  $\delta$  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.

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

Figure 1. The definition of response time

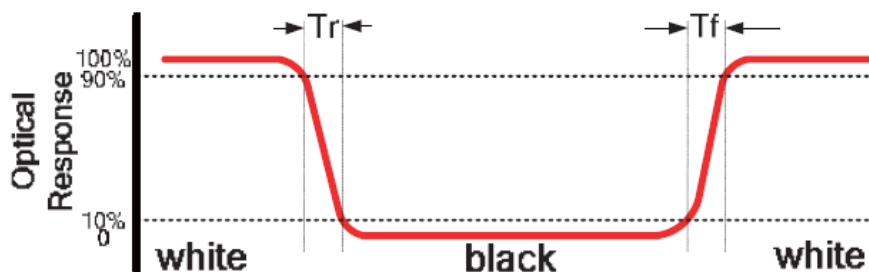


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

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

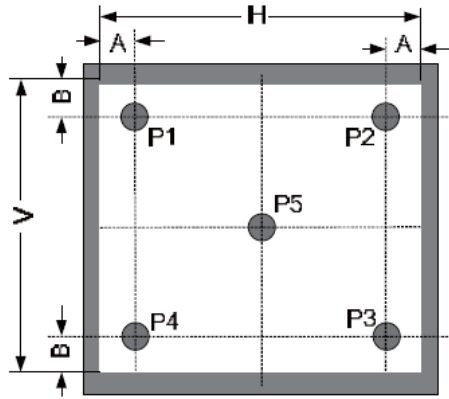
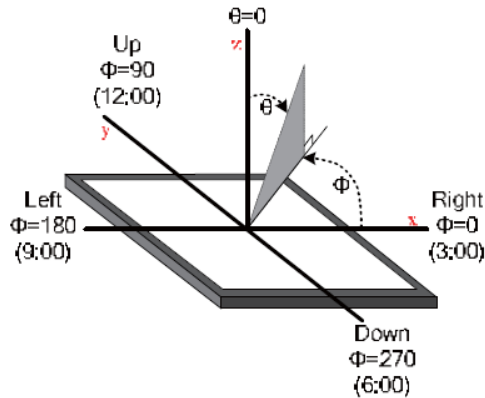


Figure 3. The definition of viewing angle



## 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	NC	
36	GND	Power Ground	
37	XR	X-Right	
38	YD	Y-Bottom	
39	XL	X-Left	
40	YU	Y-Up	

**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.

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 <sub>DD</sub> Power On Slew rate	$T_{POR}$	-	-	20	ns	From 0 to 90% DV <sub>DD</sub>
RESET pulse width	$T_{Rst}$	10	-	-	ns	
DCLK cycle time	$T_{coh}$	20	-	-	ns	
DCLK pulse duty	$T_{cwh}$	40	50	60	%	

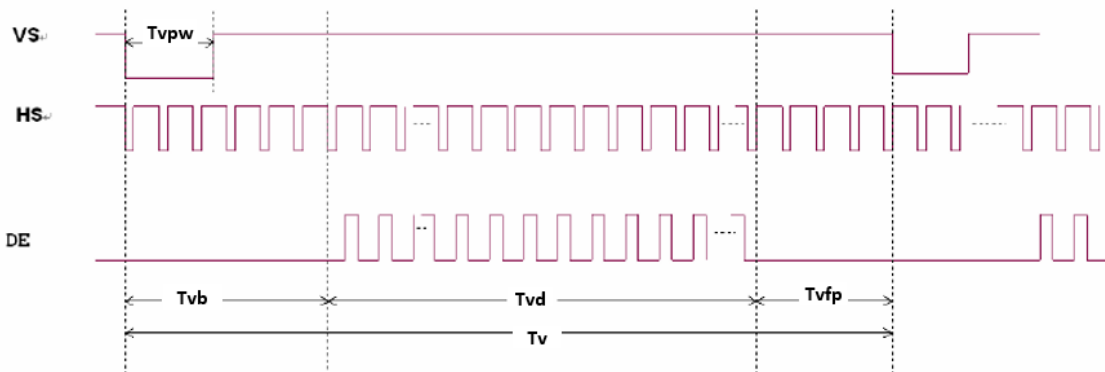
8 LCD TIMING CHARACTERISTICS

8.1 Clock and data input time diagram

Figure 4. Horizontal input timing diagram



Figure 5. Vertical input timing diagram





## 8.2 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

## 9 TOUCH SCREEN PANEL SPECIFICATIONS

### 9.1 Electrical characteristics

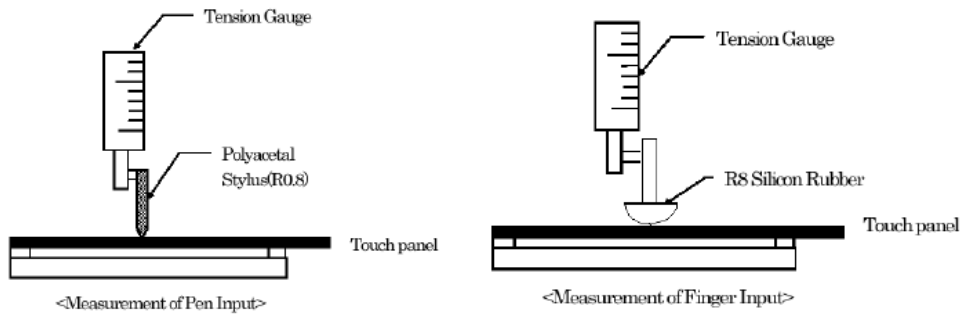
ITEM	VALUE			UNIT	REMARK
	Min.	Typ.	Max.		
Linearity	-1.5	-	1.5	%	Analog X and Y directions
Terminal Resistance	350	-	1000	$\Omega$	X
	100	-	450	$\Omega$	Y
Insulation Resistance	-	-	-	M $\Omega$	DC 25V
Voltage	-	-	10	V	DC
Chattering	-	-	10	ms	100k $\Omega$ pull-up
Transparency	80	-	-	%	JIS K7105

**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

### 9.2 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 polaceteal stylus.

**Note 3: Pitting test,** Pit 1, 000, 000 times on the film with R0.8 silicon rubber with Force: 250gf and Speed: 2 times/sec.

## 10 INSPECTION

Standard acceptance/rejection criteria for TFT module.

### 10.1 Inspection condition

*Ambient conditions:*

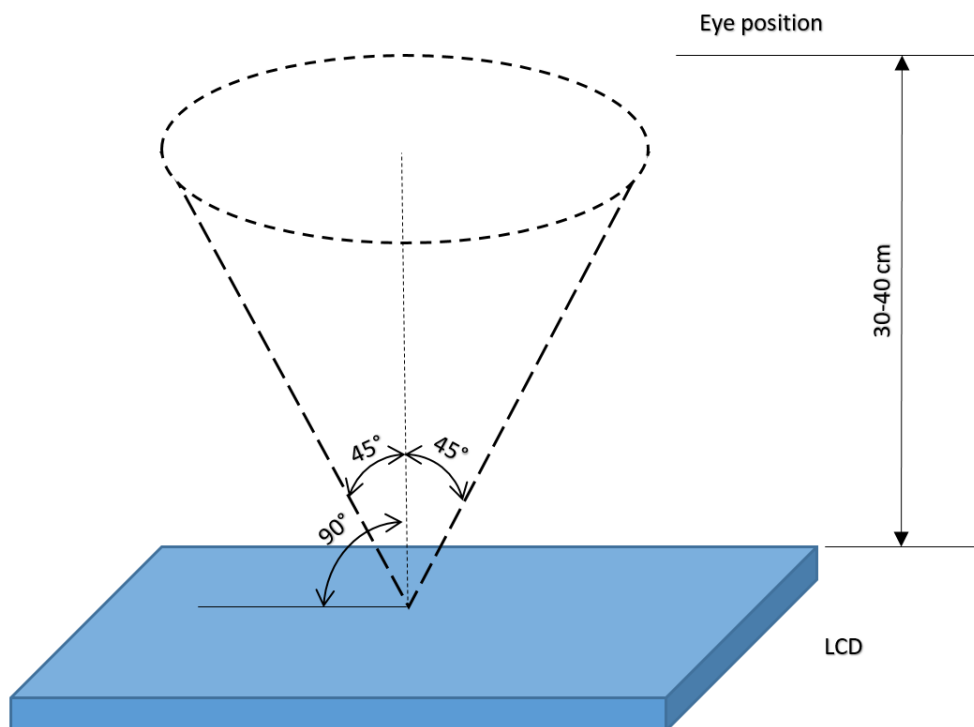
- Temperature:  $25\pm^{\circ}\text{C}$
- Humidity:  $(60\pm 10)\% \text{RH}$
- Illumination: Single fluorescent lamp non-directive (300 to 700 lux)

*Viewing distance:*

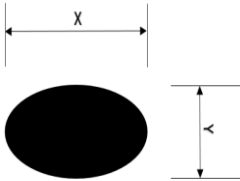
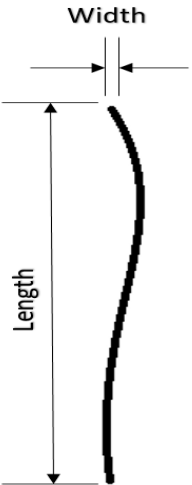
$35\pm 5\text{cm}$  between inspector bare eye and LCD.

*Viewing Angle:*

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



10.2 Inspection standard

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

Item	Criterion																																	
Touch panel spot	<table border="1"> <thead> <tr> <th colspan="3" data-bbox="470 259 1377 297">Size &lt; 5"</th> </tr> <tr> <th data-bbox="470 297 1166 336">Average Diameter</th> <th colspan="2" data-bbox="1166 297 1377 336">Qualified Qty</th> </tr> </thead> <tbody> <tr> <td data-bbox="470 336 1166 374"><b>D &lt; 0.2 mm</b></td> <td colspan="2" data-bbox="1166 336 1377 374">Ignored</td> </tr> <tr> <td data-bbox="470 374 1166 412"><b>0.2 mm &lt; D &lt; 0.4 mm</b></td> <td colspan="2" data-bbox="1166 374 1377 412">5</td> </tr> <tr> <td data-bbox="470 412 1166 450"><b>0.4 mm &lt; D &lt; 0.5 mm</b></td> <td colspan="2" data-bbox="1166 412 1377 450">2</td> </tr> <tr> <td data-bbox="470 450 1166 488"><b>0.5 mm &lt; D</b></td> <td colspan="2" data-bbox="1166 450 1377 488">0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="3" data-bbox="470 521 1377 560">Size &gt;= 5"</th> </tr> <tr> <th data-bbox="470 560 1166 598">Average Diameter</th> <th colspan="2" data-bbox="1166 560 1377 598">Qualified Qty</th> </tr> </thead> <tbody> <tr> <td data-bbox="470 598 1166 636"><b>D&lt;0.25 mm</b></td> <td colspan="2" data-bbox="1166 598 1377 636">Ignored</td> </tr> <tr> <td data-bbox="470 636 1166 674"><b>0.25 mm &lt; D &lt; 0.5 mm</b></td> <td colspan="2" data-bbox="1166 636 1377 674">4</td> </tr> <tr> <td data-bbox="470 674 1166 712"><b>0.5 mm &lt; D</b></td> <td colspan="2" data-bbox="1166 674 1377 712">0</td> </tr> </tbody> </table>	Size < 5"			Average Diameter	Qualified Qty		<b>D &lt; 0.2 mm</b>	Ignored		<b>0.2 mm &lt; D &lt; 0.4 mm</b>	5		<b>0.4 mm &lt; D &lt; 0.5 mm</b>	2		<b>0.5 mm &lt; D</b>	0		Size >= 5"			Average Diameter	Qualified Qty		<b>D&lt;0.25 mm</b>	Ignored		<b>0.25 mm &lt; D &lt; 0.5 mm</b>	4		<b>0.5 mm &lt; D</b>	0	
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## 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, 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

## 12 LEGAL INFORMATION

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