

Royal Display Co., Limited



Model: RYTW70NP03-16-2

Rev. No.

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SPECIFICATION

Model:RYTW70NP0-16-2

Customer Acceptance

Approved by	Checked by	Made by

Royal Display Co., Limited



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1. General Description and Features

RYTW70NP03-16-2 is a TM (Transmissive) type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module, a driver circuit and a back-light unit. The resolution of a 7.0" contains 1024RGBx600 dots. The following table describes the features of RYTW70NP03-16-2.

LCD Module

Item	Specification	Unit
Screen Size	7.0 inches	Diagonal
Display Resolution	1024RGB(H)x600(V)	Dot
Active Area	153.6(H) x 90.0(V)	mm
Outline Dimension	164.9(W) x 100(H) x 5.7 (D)	mm
Display Mode	Normally white/Transmissive	--
Pixel Arrangement	RGB-Vertical Stripe	--
TP	8WIRE -CTP	--
Gray scale inversion Direction	6 o'clock	
Viewing Direction	12 o'clock	--
Drive IC	--	--

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2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	164.9	--	mm	--
	Vertical (V)	--	100	--	mm	(1)
	Thickness (T)	--	5.7	--	mm	(2)
Weight		--	N/A	--	g	--

Note (1) Not include FPC.

Refer to the Outline Dimension for further information.

(2) Back-light unit are included.

3. Electrical Specifications

3.1 Absolute Max. Ratings

3.1.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

($T_a=25\pm 2^\circ\text{C}$, $V_{SS}=\text{GND}=0$)

Item	Symbol	Min.	Max.	Unit	Note
Storage temperature	T_{STG}	-30	80	$^\circ\text{C}$	(1)
Operating temperature	T_{OPR}	-20	70	$^\circ\text{C}$	(1,2,3)

Note (1) 95 % RH Max. ($40^\circ\text{C} \geq T_a$). Maximum wet-bulb temperature at 39°C or less. ($T_a > 40^\circ\text{C}$) No condensation.

Note (2) In case of below 0° , the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC's character

Note (3) Only operation is guaranteed at operating temperature. Contrast, response time, another display quality are evaluated at $+25^\circ\text{C}$.

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3.1.2 DC Electrical Characteristics of the TFT LCD

(Ta=25±2°C, V_{SS}=GND=0)

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply	VDD	3.0	3.3	3.6	V	
Input Voltage for logic	H Level	V _{IH}	0.7xVDD	-	VDD	V
	L Level	V _{IL}	0	-	0.3xVDD	V
Power Supply current	IDD	-	-	(200)	mA	Note 1

3.2 Electrical Absolute Rating

3.2.1 TFT-LCD Module

(Voltage Referenced to VSS)

Item	Symbol	Value		Unit	Condition
		Min.	Max.		
Digital Power Supply Voltage	VDD	VSS-0.3	5.0	V	--

3.2.2 Back-Light Unit

(Ta=25±2°C)

Item	Symbol	Min.	Max.	Unit	Note
Current(ILED)	I _f	--	30	mA	(1)
voltage	V _R	--	5.0	V	(1)

Note (1) 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.

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4 Electrical Characteristics

4.1 Backlight Unit

The back-light system is an edge-lighting type (Light Emitting Diode).

(Ta=25±2°C)

Item	Symbol	Value			Unit	Condition
		Min.	Typ.	Max.		
LED Voltage	V _F	8.4	9	9.9	V	
LED Current	I _F	-	180	-	mA	
Power Consumption	P _{BL}	-	-	-	mW	

Note (1) Where I_F = 180mA, V_F = 8.4-9.9V P_{BL} = V_F × I_F

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5 Input Terminal Pin Assignment

Pin No.	Symbol	I/O	Function	Remark
1	VCOM	P	Common Voltage	
2	VDD	P	Power Voltage for digital circuit	
3	VDD	P	Power Voltage for digital circuit	
4	NC	---	No connection	
5	Reset	I	Global reset pin	
6	STBYB	I	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0", timing controller, source driver will turn off, all output are High-Z	
7	GND	P	Ground	
8	RXIN0-	I	-LVDS differential data input	
9	RXIN0+	I	+ LVDS differential data input	
10	GND	P	Ground	
11	RXIN1-	I	-LVDS differential data input	
12	RXIN1+	I	+ LVDS differential data input	
13	GND	P	Ground	
14	RXIN2-	I	-LVDS differential data input	
15	RXIN2+	I	+ LVDS differential data input	
16	GND	P	Ground	
17	RXCLKIN-	I	-LVDS differential clock input	
18	RXCLKIN+	I	+ LVDS differential clock input	
19	GND	P	Ground	
20	RXIN3-	I	-LVDS differential data input	
21	RXIN3+	I	+ LVDS differential data input	
22	GND	P	Ground	

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23	NC	---	No connection	
24	NC	---	No connection	
25	GND	P	Ground	
26	NC	---	No connection	
27	DIMO	O	Backlight CABC controller signal output	
28	SELB	I	6bit/8bit mode select	Note1
29	AVDD	P	Power for Analog Circuit	
30	GND	P	Ground	
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	L/R	I	Horizontal inversion	Note3
34	U/D	I	Vertical inversion	Note3
35	VGL	P	Gate OFF Voltage	
36	CABCEN1	I	CABC H/W enable	Note2
37	CABCEN0	I	CABC H/W enable	Note2
38	VGH	P	Gate ON Voltage	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I: input, O: output, P: Power

Note1: If LVDS input data is 6 bits ,SELB must be set to High;

If LVDS input data is 8 bits ,SELB must be set to Low.

Note2: When CABC_EN="00", CABC OFF.

When CABC_EN="01", user interface image.

When CABC_EN="10", still picture.

When CABC_EN="11", moving image.

When CABC off, don't connect DIMO, else connect it to backlight.

Note3: When L/R="0", set right to left scan direction.

When L/R="1", set left to right scan direction.

When U/D="0", set top to bottom scan direction.

When U/D="1", set bottom to top scan direction.

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Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	3.0	3.3	3.6	V
	VGH	17	18	19	V
	VGL	-6.5	-6.0	-5.7	V
	AVDD	9.5	9.6	9.8	V
VCOM	VCOM	3.6	(3.85)	4.1	V

CTP IC:	SYMBOL	I/O/P	FUNCTION
PIN1	GND	P	GROUND
PIN2	SCL	-	IIC CLOCK SIGNAL
PIN3	SDA	-	IIC DATA SIGNAL
PIN4	INT	-	INTERRUPT SIGNAL
PIN5	RESET	-	RESET PIN
PIN6	NC	-	-
PIN7	VDD	P	SUPPLY VOLTAGE
PIN8	NC	-	-

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6 Optical Characteristics

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods.

Measuring equipment: BM-7A

Item	Symbol	Condition	Min	Type	Max	Unit	Note	
Brightness	B		240	280	--	cd/m ²		
Response time	T _r	θ=0°	-	3	6	ms	.	
	T _f		--	7	14	ms		
Contrast ratio	CR	At optimized viewing angle	480	600	--	--		
Luminance Uniformity	ΔL		70	80		%		
Color Chromaticity (CIE 1931)	White	θ=0° Normal Viewing Angle	W _x	0.277	0.307	0.337	--	BM-7A
			W _y	0.288	0.318	0.348		
Viewing Angle	Hor.	CR≥10	θ _R	65	75	--	Degree	
			θ _L	65	75	--		
	Ver.		θ _U	60	70	--		
			θ _D	50	60	--		

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

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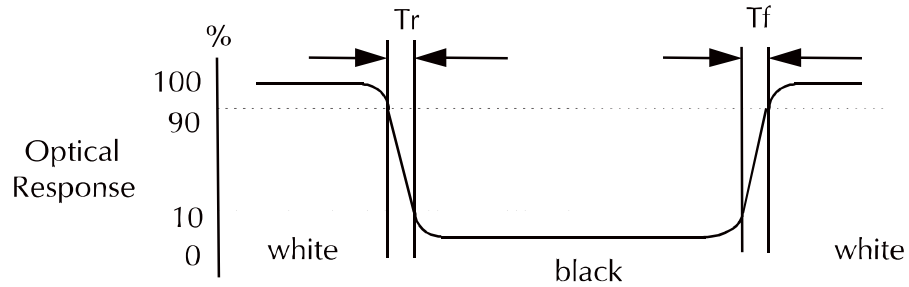
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c. Definition of contrast ratio:

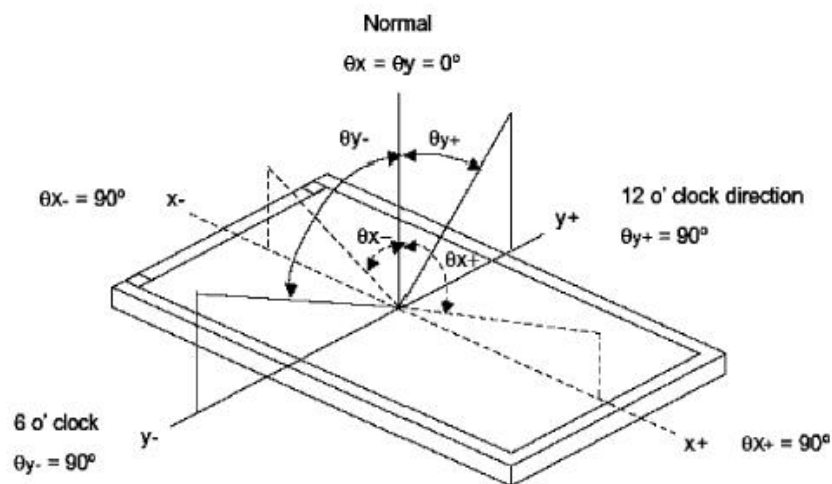
Brightness measured when LCD is at "white state"

Contrast Ratio (CR) =

Brightness measured when LCD is at "black state"

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 1 : Definition of Viewing Angle θ_x and θ_y :



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- e. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
---------------------------------	----------

- f. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

- g. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = (RGB Triangle Area / NTSC Triangle Area) x 100

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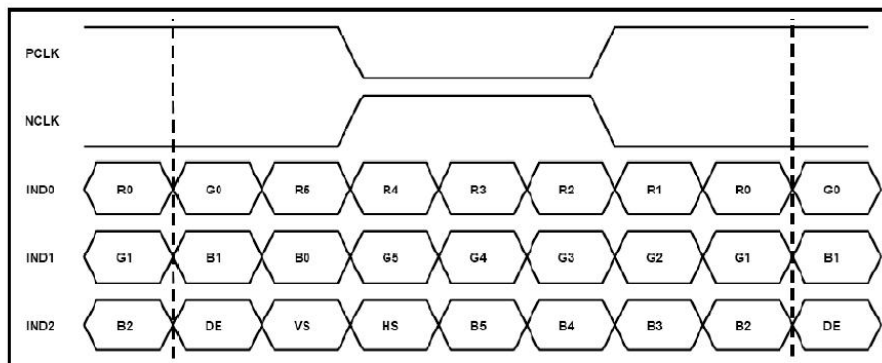
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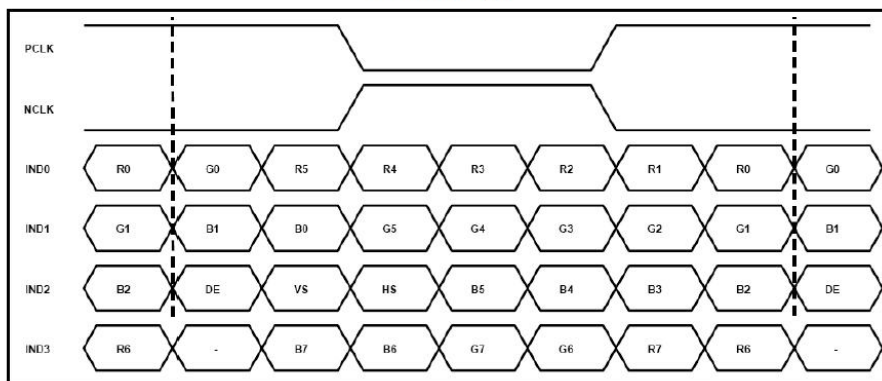
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7 Interface Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	fclk	40.8	51.2	67.2	MHz	Frame rate =60Hz
Horizontal display area	thd	1024			DCLK	
HS period time	th	1114	1344	1400	DCLK	
HS Blanking	thb	90	320	376	DCLK	
Vertical display area	tvd	600			H	
VS period time	tv	610	635	800	H	
VS Blanking	thb	10	35	200	H	



6-bit LVDS input



8-bit LVDS input

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8 Reliability Condition for LCD

No change on display and in operation under the following test condition.

Condition: Unless otherwise specified, tests will be conducted under the following condition.

Temperature: 20±5°C

Humidity: 65±5%RH

Tests will be not conducted under functioning state.

No.	Parameter	Condition	Notes
1	High Temperature Operating	70°C±2°C, 240hrs (Operation state)	--
2	Low Temperature Operating	-20°C±2°C, 240hrs (Operation state)	--
3	High Temperature Storage	80°C±2°C, 240hrs	--
4	Low Temperature Storage	-30°C±2°C, 240hrs	--
5	High Temperature and High Humidity Operation Test	60°C±2°C, 90%, 240hrs	--
6	Vibration Test	Total fixed amplitude: 1.5mm Vibration Frequency: 10~55Hz One cycle 60 seconds to 3 direction of X, Y, Z each 15 minutes.	--

7.	Drop Test	<p>To be measured after dropping from 60cm high on the concrete surface in packing state.</p> <p><i>Dropping method corner dropping</i> A corner: once <i>Edge dropping</i> B, C, D edge: once <i>Face dropping</i> E, F, G face: once</p> <p>Concrete Surface</p>	--
----	-----------	--	----

- Notes:
1. No dew condensation to be observed.
 2. The function test shall be conducted after 4 hours storage at the normal temperature and humidity after removed from the test chamber.
 3. Vibration test will be conducted to the product itself without putting it in a container.

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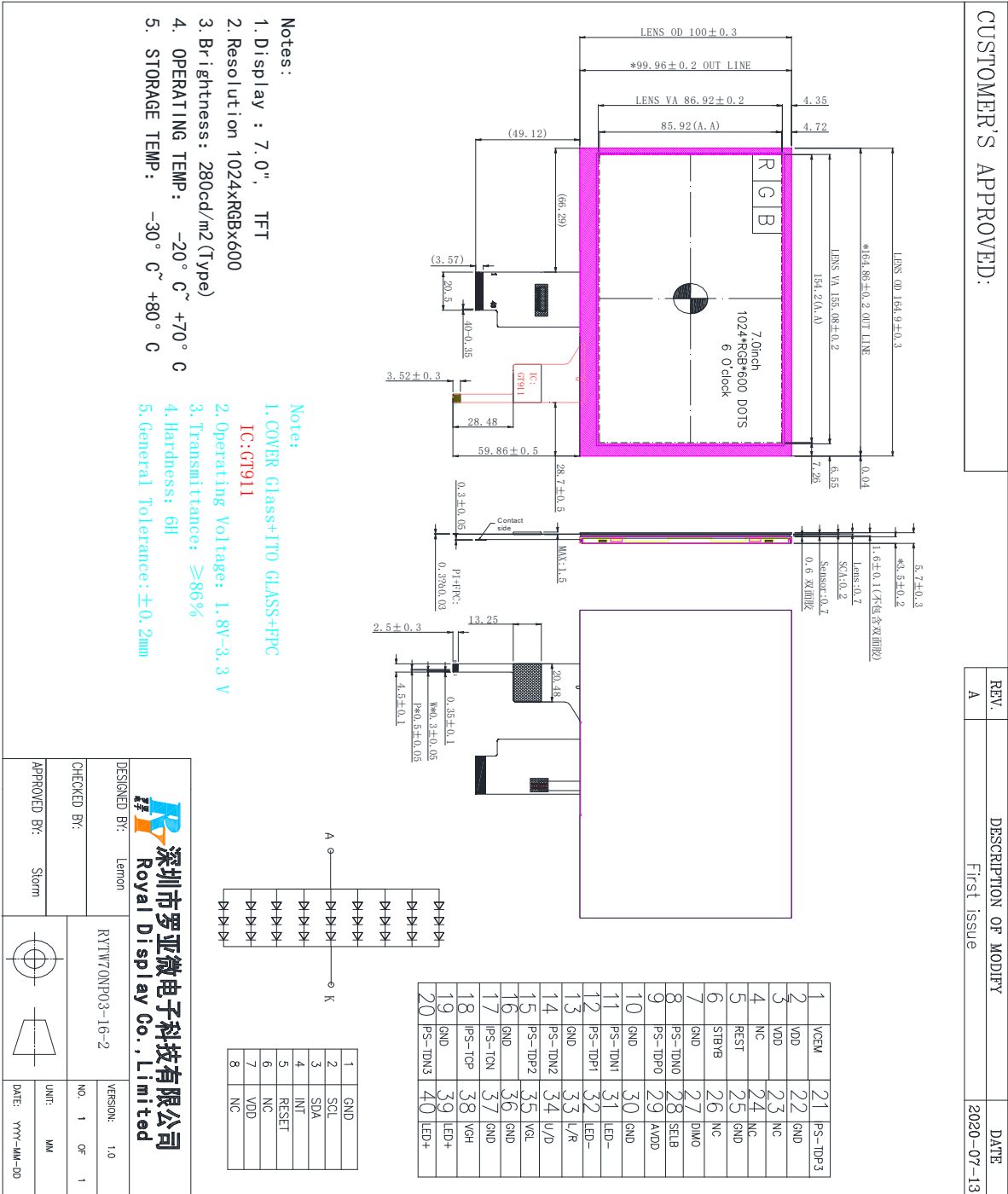
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9 Dimensional outlines



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10 Incoming Inspection Standards

10.1 VISUAL & FUNCTION INSPECTION STANDARD

10.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

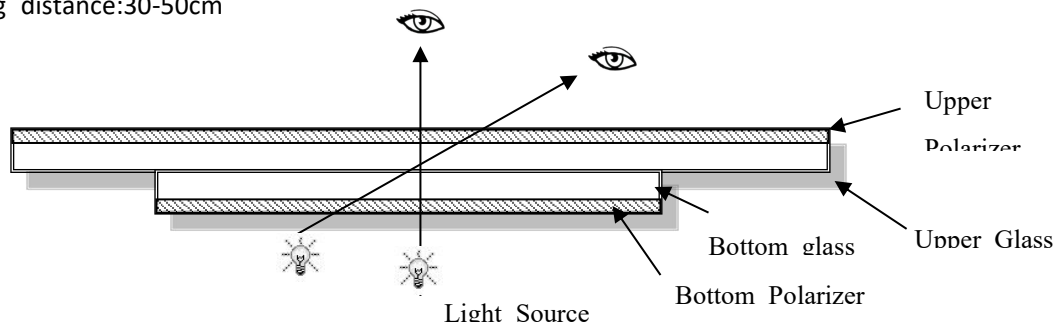
Temperature : $25\pm 5^{\circ}\text{C}$

Humidity : $65\%\pm 10\%\text{RH}$

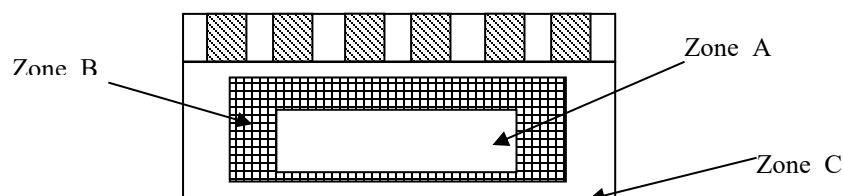
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



10.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function

or appearance after assembly by customer.

10.1.3 Sampling Plan

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According to GB/T 2828-2003 ; , normal inspection, Class II

AQL:

Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Soldering appearance	Good soldering , Peeling off is not allowed.	
6	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

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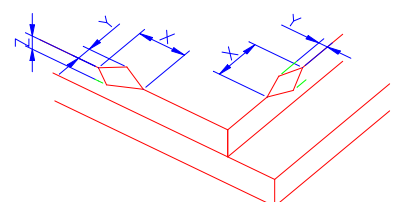
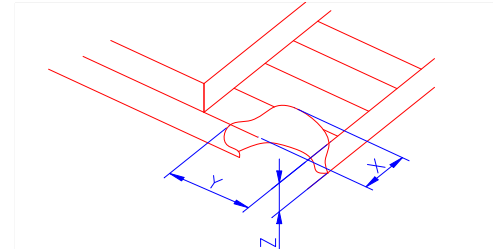
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10.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken	(1) The edge of LCD broken	 <table border="1" data-bbox="845 761 1388 918"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td><Inner border line of the seal</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
X	Y	Z						
≤3.0mm	<Inner border line of the seal	≤T						
NOTE: X: Length Y: Width Z: Height L: Length of ITO, T: Height of LCD	(2)LCD corner broken	 <table border="1" data-bbox="893 1254 1324 1355"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>≤L</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	≤L	≤T
X	Y	Z						
≤3.0mm	≤L	≤T						

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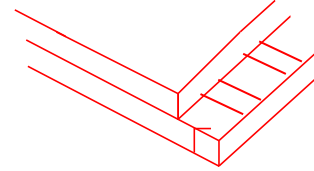
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(3) LCD crack



Crack
Not allowed

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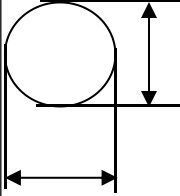
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Number	Items	Criteria (mm)																																																																				
2.0	Spot defect	<p>① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)</p> <div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 20px;"> <thead> <tr> <th style="text-align: center;">Zone</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">Size (mm)</th> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.10$</td> <td colspan="3" style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.10 < \Phi \leq 0.15$</td> <td colspan="3" style="text-align: center;">3(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td style="text-align: center;">$0.15 < \Phi \leq 0.2$</td> <td colspan="3" style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">$0.2 < \Phi$</td> <td colspan="3" style="text-align: center;">0</td> </tr> </tbody> </table> </div> <p style="margin-left: 100px;">Y</p> <p style="margin-left: 100px;">X</p> <p style="margin-left: 100px;">$\Phi = (X+Y)/2$</p> <p>② Dim spot (LCD/TP/Polarizer dim dot, light leakage、 dark spot)</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th style="text-align: center;">Zone</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">Size (mm)</th> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.1$</td> <td colspan="3" style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.1 < \Phi \leq 0.2$</td> <td colspan="3" style="text-align: center;">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td style="text-align: center;">$0.2 < \Phi \leq 0.3$</td> <td colspan="3" style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">$\Phi > 0.3$</td> <td colspan="3" style="text-align: center;">0</td> </tr> </tbody> </table> <p>③ Polarizer accidented spot</p> <table border="1" style="margin-left: 20px;"> <thead> <tr> <th style="text-align: center;">Zone</th> <th colspan="3" style="text-align: center;">Acceptable Qty</th> </tr> <tr> <th style="text-align: center;">Size (mm)</th> <th style="text-align: center;">A</th> <th style="text-align: center;">B</th> <th style="text-align: center;">C</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">$\Phi \leq 0.2$</td> <td colspan="3" style="text-align: center;">Ignore</td> </tr> <tr> <td style="text-align: center;">$0.2 < \Phi \leq 0.5$</td> <td colspan="3" style="text-align: center;">2(distance $\geq 10\text{mm}$)</td> </tr> <tr> <td style="text-align: center;">$\Phi > 0.5$</td> <td colspan="3" style="text-align: center;">0</td> </tr> </tbody> </table>	Zone	Acceptable Qty			Size (mm)	A	B	C	$\Phi \leq 0.10$	Ignore			$0.10 < \Phi \leq 0.15$	3(distance $\geq 10\text{mm}$)			$0.15 < \Phi \leq 0.2$	1			$0.2 < \Phi$	0			Zone	Acceptable Qty			Size (mm)	A	B	C	$\Phi \leq 0.1$	Ignore			$0.1 < \Phi \leq 0.2$	2(distance $\geq 10\text{mm}$)			$0.2 < \Phi \leq 0.3$	1			$\Phi > 0.3$	0			Zone	Acceptable Qty			Size (mm)	A	B	C	$\Phi \leq 0.2$	Ignore			$0.2 < \Phi \leq 0.5$	2(distance $\geq 10\text{mm}$)			$\Phi > 0.5$	0		
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	Line defect (LCD/TP /Polarizer bl ack/white li ne, scratch, stain)	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.03$</td> <td>Ignore</td> <td colspan="3">Ignore</td> </tr> <tr> <td>$0.03 < W \leq 0.05$</td> <td>$L \leq 3.0$</td> <td colspan="3">$N \leq 2$</td> </tr> <tr> <td>$0.05 < W \leq 0.08$</td> <td>$L \leq 2.0$</td> <td colspan="3">$N \leq 2$</td> </tr> <tr> <td>$0.08 < W$</td> <td colspan="4">Define as spot defect</td> </tr> </tbody> </table>	Width(mm)	Length(mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.03$	Ignore	Ignore			$0.03 < W \leq 0.05$	$L \leq 3.0$	$N \leq 2$			$0.05 < W \leq 0.08$	$L \leq 2.0$	$N \leq 2$			$0.08 < W$	Define as spot defect				
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4.0	SMT	According to IPC-A-610C class II standard . Function defect and missing part are major defect ,the others are minor defect.																													