

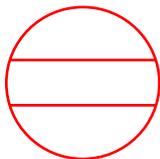
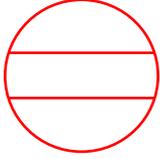
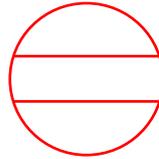
Open Frame Specification

MODEL: OF-121GDHBUAA0A1-S

< ◇ > PRELIMINARY SPECIFICATION

< ◆ > APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED
		

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RECORD OF REVISION

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V1.0	2022/02/25	--	First Issued
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TABLE OF CONTENTS

No.	Content	Page
	HDMI TFT Module Specification	1
	TABLE OF CONTENTS	3
1.	GENERAL DESCRIPTION	4
2.	MECHANICAL SPECIFICATION	5
3.	PIN DESCRIPTION	6
4.	ABSOLUTE MAXIMUM RATINGS	7
5.	ELECTRICAL CHARACTERISTICS	8
6.	PROJECTED CAPACITIVE TOUCH PANEL SPECIFICATION.....	8
7.	OPTICAL CHARACTERISTICS	9
8.	RELIABILITY.....	12
9.	PRECAUTION RELATING PRODUCT HANDLING	17

1. GENERAL DESCRIPTION

1.1 Description

OF-121GDHBUAA0A1-S is a 12.1 (4:3) inch diagonally measured active display with metal frame, high resolution for 1024x768 and high brightness.

This model is composed of a TFT LCD module, a projected capacitive touch, HDMI interface, audio line-out, automatic dimming with Ambient Light Sensor, and bracket.

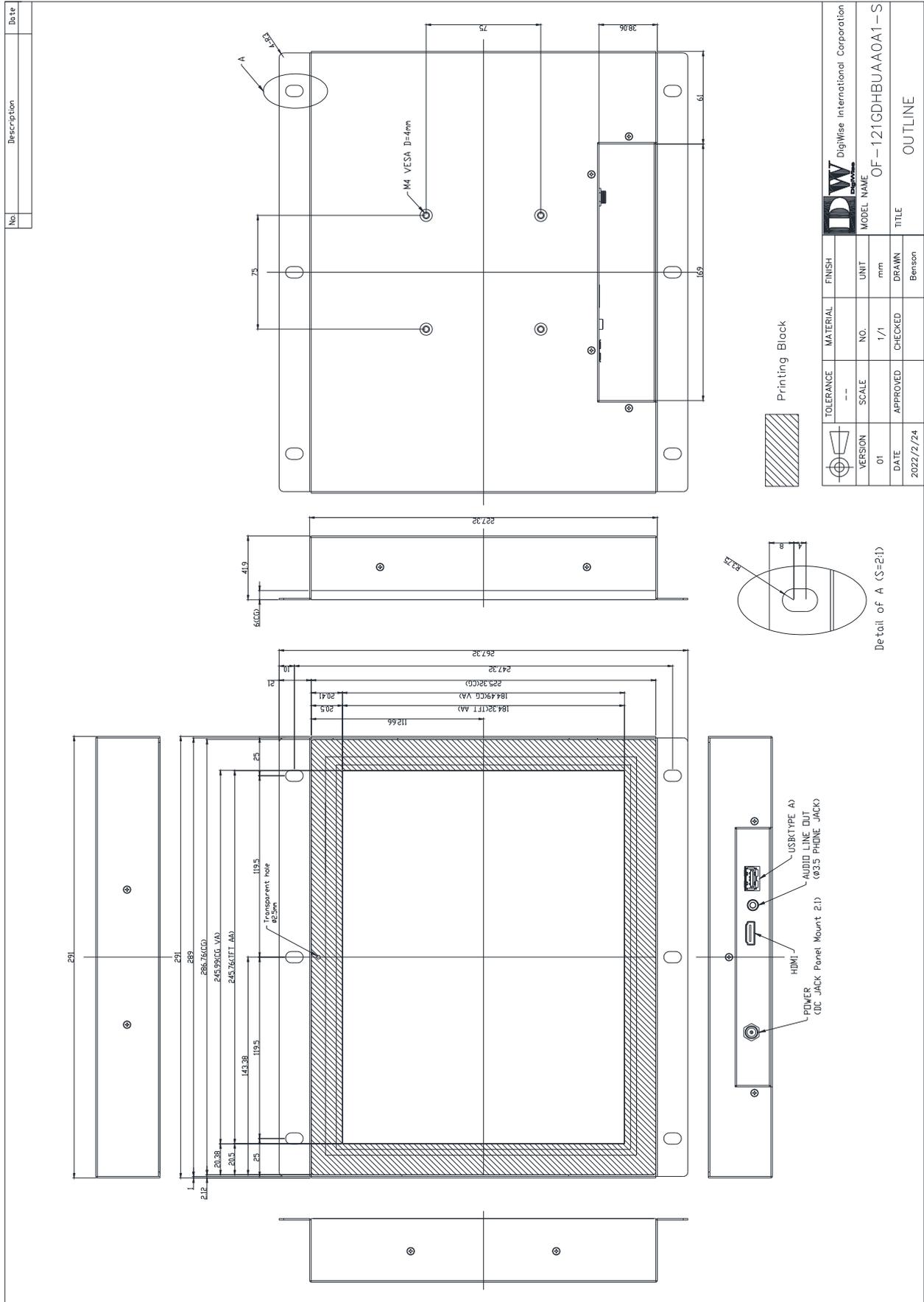
Easy use this TFT display with SBC, HMI, or as a computer display with any device which has HDMI output.

The model supports a Rear mount and VESA mount, which would be great for embedded applications.

1.2 Features:

No.	Item	Specification	Unit
1	Panel Size	12.1	Inch
2	Number of Pixels	1024 (W) x RGB x 768 (H)	Pixels
3	Active Area	245.76 (W) × 184.32 (H)	mm
4	Pixel Pitch	0.240 (W) x 0.240 (H)	mm
5	Outline Dimension	291.0 (W) × 267.32 (H) × 41.9 (T)	mm
6	Number of Colors	16.7M	- -
7	Display Mode	IPS / Normally Black / Transmissive	- -
8	View Direction	Free direction	- -
9	Display Format	RGB vertical stripe	- -
10	Surface Treatment	Clear (7H)	- -
11	Bonding	OCR (0.6)	- -
12	Contrast Ratio	900 (Typ.)	- -
13	Luminance (cd/m ²)	1300 (Typ.)	cd/m ²
14	Video Input Interface	HDMI (Compliance HDMI V1.4)	- -
15	Audio Output Interface	Analog Output	- -
16	Backlight	White LED	- -
17	Operation Temperature	-30 ~ 70	°C
18	Storage Temperature	-30 ~ 80	°C
19	Weight	(3110)	g

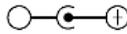
2. MECHANICAL SPECIFICATION



3. PIN DESCRIPTION

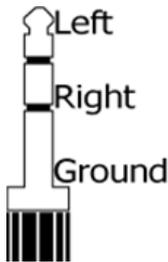
3.1 Power Input

[DC JACK \varnothing 2.0mm]

Symbol	I/O	Function	Note
12V	P	Power Supply +12V	+12.0V
GND	P	Ground	

3.2 Standard 3.5mm Phone Jack

HDMI Audio Analog Output



3.3 HDMI

[HDMI A TYPE]

Pin No.	Symbol	I/O	Function	Note
1	TMDS 2+	I	TMDS Data2+	
2	GND	P	TMDS Data2 Shield	
3	TMDS 2-	I	TMDS Data2-	
4	TMDS 1+	I	TMDS Data1+	
5	GND	P	TMDS Data1 Shield	
6	TMDS 1-	I	TMDS Data1-	
7	TMDS 0+	I	TMDS Data0+	
8	GND	P	TMDS Data0 Shield	
9	TMDS 0-	I	TMDS Data0-	
10	TMDS CLK+	I	TMDS Clock+	
11	GND	P	TMDS Clock Shield	
12	TMDS CLK-	I	TMDS Clock-	
13	N.C.	-	N.C.	
14	N.C.	-	N.C.	
15	DDC_SCL	I	IIC SCL to EDID ROM	
16	DDC_SDA	I/O	IIC SDA to EDID ROM	
17	GND	P	DDC/CEC Ground	
18	HD_5V	P	+5V Power	
19	HPD	O	Hot Plug Detect	

3.4 PCT Control:USB

[USB A TYPE]

Symbol	I/O	Function	Note
VBUS	P	Power supply for USB I/F	5V
D-	I/O	USB data -	
D+	I/O	USB data +	
GND	P	Power Ground for USB I/F	

4. ABSOLUTE MAXIMUM RATINGS

4.1 Electrical Absolute Rating

4.1.1 HDMI TFT LCD Module

Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	12V	10	14	V	

4.1.2 Environment Absolute Rating

Item	Symbol	Values			Unit	Note
		Min	Typ	Max.		
Operating Temperature	Top	-30	-	70	°C	Ambient temperature
Storage Temperature	Tst	-30	-	80	°C	

5. ELECTRICAL CHARACTERISTICS

5.1 HDMI TFT LCD Module

Item	Symbol	Values			Unit	Note
		Min	Typ.	Max.		
Supply Voltage	12V	11	12	13	V	
Supply Current	ICC(12V)	-	930	1050	mA	
LED life time		50000	-	-	Hr	(1)

Note 1:

The “LED life time” is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C 60% RH.

6. POROJECTED CAPACITIVE TOUCH PANEL SPECIFICATION

6.1 Main Feature

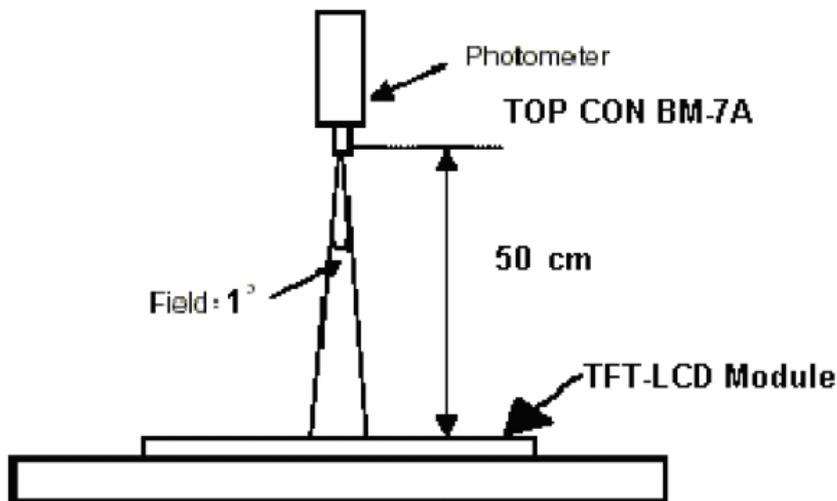
Item	Specification	Unit
Screen Size	12.1 inches	Diagonal
Type	Transparent Type Projected Capacitive Touch Panel	
Input Mode	Human’s Finger	
Interface	USB	
Touch number	1 points	
Cover glass pencil-hardness	7H	
Cover Glass Thickness	6mm	
Response time	≤25ms	ms
Controller IC	EE80H462938	

7. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Brightness	--	Note1, Note 3, ($\theta = 0^\circ$; Normal Viewing Angle)	1040	1300	--	cd/m ²	
Contrast Ratio	CR		600	900	--	--	
Response Time	Tr+ Tf		--	30	40	ms	
Color Chromaticity	White		Wx	0.232	0.282	0.332	--
			Wy	0.274	0.324	0.374	--
	Red		Rx	0.606	0.656	0.706	--
			Ry	0.274	0.324	0.374	--
	Green	Gx	0.236	0.286	0.336	--	
		Gy	0.590	0.640	0.690	--	
Blue	Bx	0.090	0.140	0.190	--		
	By	0.037	0.087	0.137	--		
View angle	Horizontal	$\theta x+$	80	85	--		
		$\theta x-$	80	85	--		
	Vertical	$\theta Y+$	80	85	--		
		$\theta Y-$	80	85	--		

Note : The following optical specifications shall be measured in a darkroom or equivalent state(ambient luminance ≤ 1 lux, and at room temperature). The operation temperature is $25^\circ\text{C} \pm 2^\circ\text{C}$. The measurement method is shown in Note1.

Note1: The method of optical measurement:

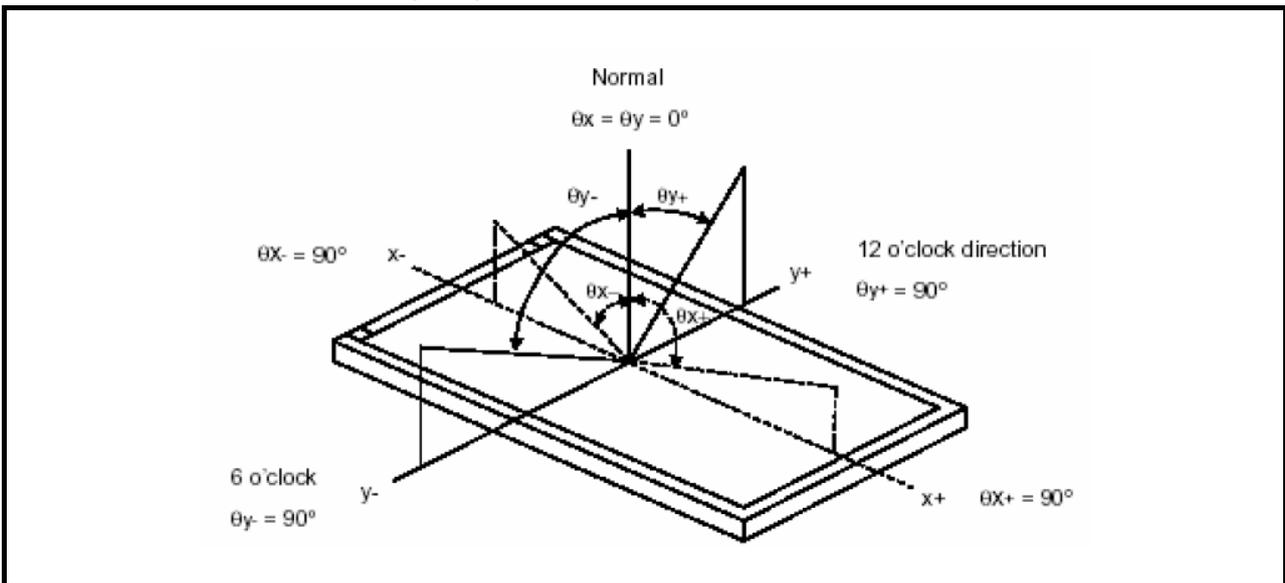


Note2: Measured at the center area of the panel and at the viewing angle of the $\theta_x = \theta_y = 0^\circ$

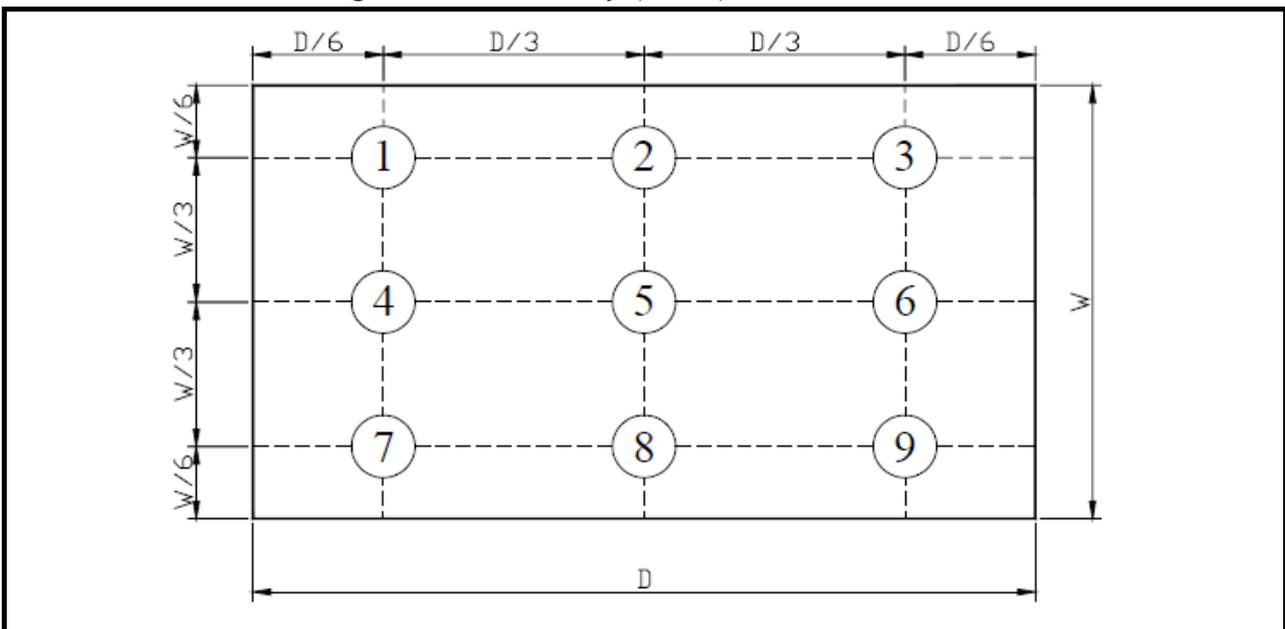
Note3: Definition of Contrast Ratio (CR):

CR = Luminance with all pixels in white state \div Luminance with all pixels in Black state

Note 4: Definition of Viewing Angle:



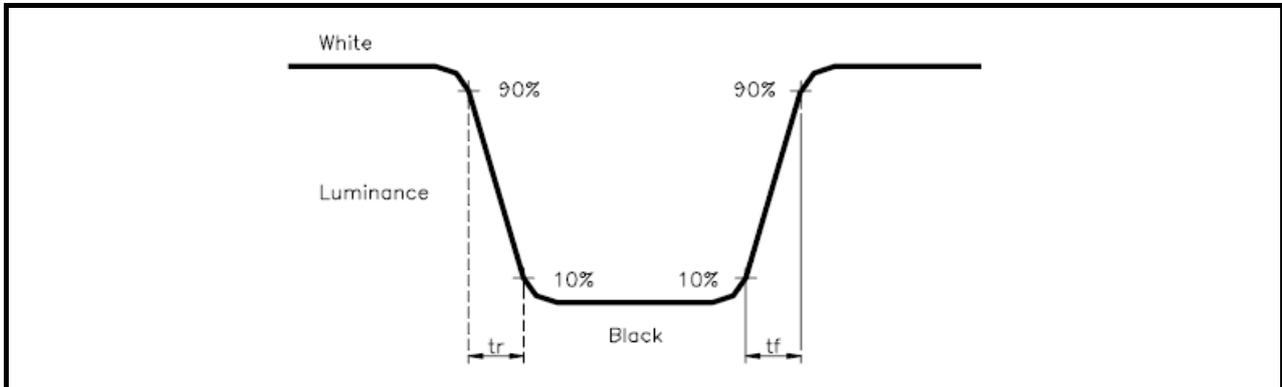
Note 5: Definition of Brightness Uniformity (B-uni):



B-uni = (Minimum luminance of 9 points \div Maximum luminance of 9 points) X 100%

Note 6: Definition of Response Time:

The Response Time is set initially by defining the “Rising Time (Tr)” and the “Falling Time (Tf)” respectively. Tr and Tf are defined as following figure



Note 7: Definition of Chromaticity:

The color coordinates (Wx,Wy),(Rx,Ry),(Gx,Gy),and (Bx,By) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

8. RELIABILITY

8.1 Test Condition

8.1.1 Temperature and Humidity(Ambient Temperature)

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

Humidity : $65 \pm 5\%$

8.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

8.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

8.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

8.2 TESTS

No.	ITEM	CONDITION CRITERION
1	High Temperature Storage	80°C, 120 hrs
2	Low Temperature Storage	-30°C, 120 hrs
3	High Temperature Operating	70°C, 120 hrs
4	Low Temperature Operating	-30°C, 120 hrs
5	High Temperature/Humidity Non-Operating	40°C, 90%RH, 120 hrs
6	Temperature Shock Non-Operating	-30°C \leftrightarrow 80°C (0.5hr each), 100 cycles
7	Vibration Test Non-Operating	Frequency:0 ~ 55 Hz Amplitude:1.5 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z
8	Electro-static Discharge	$\pm 2\text{KV}$, Human Body Mode, 100pF/1500 Ω

Note1: The test sample have recovery time for 24 hours at room temperature before the function check. In the standard conditions, there is no any touch panel function NG issue occurred.

8.3 JUDGMENT STANDARD

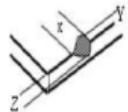
The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

8.4 INCOMING INSPECTION STANDARDS

No.	Parameter	Criteria														
1	Operating	Display function: No Display malfunction (Major)														
		Contrast ratio (Black, White): Does not meet specified range in the spec. (Major) (Note:3)														
		Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)														
		Point Defect : Active area ≤ 5 dots (Minor) (Note:1)														
		<table border="1"> <thead> <tr> <th rowspan="2">Item</th> <th>Acceptable number</th> <th rowspan="2">Total</th> </tr> <tr> <th>Active Area</th> </tr> </thead> <tbody> <tr> <td>Bright</td> <td>2</td> <td rowspan="2">6</td> </tr> <tr> <td>Dark</td> <td>4</td> </tr> </tbody> </table>	Item	Acceptable number	Total	Active Area	Bright	2	6	Dark	4					
Item	Acceptable number	Total														
	Active Area															
Bright	2	6														
Dark	4															
2	External Inspection (non-operating)	Non-uniformity: Visible through 5%ND filter. (Minor)														
		Foreign material in Black or White spots shape ($W > 1/4L$)														
		<table border="1"> <thead> <tr> <th>Zone Dimension</th> <th>Acceptable number</th> <th rowspan="3">Class Of Defects</th> <th rowspan="3">AQL Level</th> </tr> </thead> <tbody> <tr> <td>$D > 0.5$</td> <td>0</td> </tr> <tr> <td>$0.35 < D \leq 0.5$</td> <td>7</td> </tr> <tr> <td>$D \leq 0.35$</td> <td>*</td> <td>Minor</td> <td>1.5</td> </tr> </tbody> </table> <p>$D = (\text{Long} + \text{Short}) / 2$ * : Disregard</p>	Zone Dimension	Acceptable number	Class Of Defects	AQL Level	$D > 0.5$	0	$0.35 < D \leq 0.5$	7	$D \leq 0.35$	*	Minor	1.5		
		Zone Dimension	Acceptable number	Class Of Defects			AQL Level									
		$D > 0.5$	0													
$0.35 < D \leq 0.5$	7															
$D \leq 0.35$	*	Minor	1.5													
Foreign Material in Line or spiral shape ($W \leq 1/4L$) (Note: 4)																
<table border="1"> <thead> <tr> <th>L (mm)</th> <th>Zone W(mm)</th> <th>Acceptable number</th> <th rowspan="3">Class Of Defects</th> <th rowspan="3">AQL Level</th> </tr> </thead> <tbody> <tr> <td>$L > 15$</td> <td>$W > 0.35$</td> <td>0</td> </tr> <tr> <td>$L \leq 15$</td> <td>$0.15 < W \leq 0.35$</td> <td>7</td> </tr> <tr> <td>$L \leq 15$</td> <td>$W \leq 0.15$</td> <td>*</td> <td>Minor</td> <td>1.5</td> </tr> </tbody> </table> <p>L : Length W : Width * : Disregard</p>	L (mm)	Zone W(mm)	Acceptable number	Class Of Defects	AQL Level	$L > 15$	$W > 0.35$	0	$L \leq 15$	$0.15 < W \leq 0.35$	7	$L \leq 15$	$W \leq 0.15$	*	Minor	1.5
L (mm)	Zone W(mm)	Acceptable number	Class Of Defects			AQL Level										
$L > 15$	$W > 0.35$	0														
$L \leq 15$	$0.15 < W \leq 0.35$	7														
$L \leq 15$	$W \leq 0.15$	*	Minor	1.5												
2	External Inspection (non-operating)	Dimension: Outline (Major)														
		Bezel appearance: uneven (Minor)														
		Scratch on the polarize: (Note:2)														
		<table border="1"> <thead> <tr> <th>L (mm)</th> <th>Zone W(mm)</th> <th>Acceptable number</th> <th rowspan="3">Class Of Defects</th> <th rowspan="3">AQL Level</th> </tr> </thead> <tbody> <tr> <td>--</td> <td>$W > 0.2$</td> <td>0</td> </tr> <tr> <td>$L \leq 15$</td> <td>$W \leq 0.2$</td> <td>5</td> </tr> </tbody> </table> <p>L : Length W : Width * : Disregard</p>	L (mm)	Zone W(mm)	Acceptable number	Class Of Defects	AQL Level	--	$W > 0.2$	0	$L \leq 15$	$W \leq 0.2$	5			
		L (mm)	Zone W(mm)	Acceptable number	Class Of Defects			AQL Level								
--	$W > 0.2$	0														
$L \leq 15$	$W \leq 0.2$	5														
Dent or bubble on the polarize (Note:2)																
<table border="1"> <thead> <tr> <th>Zone Dimension</th> <th>Acceptable number</th> <th rowspan="3">Class Of Defects</th> <th rowspan="3">AQL Level</th> </tr> </thead> <tbody> <tr> <td>$D \leq 0.35$</td> <td>*</td> </tr> <tr> <td>$D \leq 0.5$</td> <td>5</td> </tr> </tbody> </table> <p>$D = (\text{Long} + \text{Short}) / 2$ * : Disregard</p>	Zone Dimension	Acceptable number	Class Of Defects	AQL Level	$D \leq 0.35$	*	$D \leq 0.5$	5								
Zone Dimension	Acceptable number	Class Of Defects			AQL Level											
$D \leq 0.35$	*															
$D \leq 0.5$	5															

No.	Parameter	Criteria
3	Breakage at side	1. $X \leq 3\text{mm}, Y \leq 2\text{mm}, Z \leq GT/2, N \leq 2$, Ignored → Pass 2. Others are not allowed X: Length ; Y: Width ; Z: Thickness 
	Breakage at edge	1. $X \leq 3\text{mm}, Y \leq 2\text{mm}, Z \leq GT/2, N \leq 2$, Ignored → Pass 2. Others are not allowed X: Length ; Y: Width ; Z: Thickness 
	Rack	1. Not allowed 

Class of defects		AQL	Definition
			Major Minor

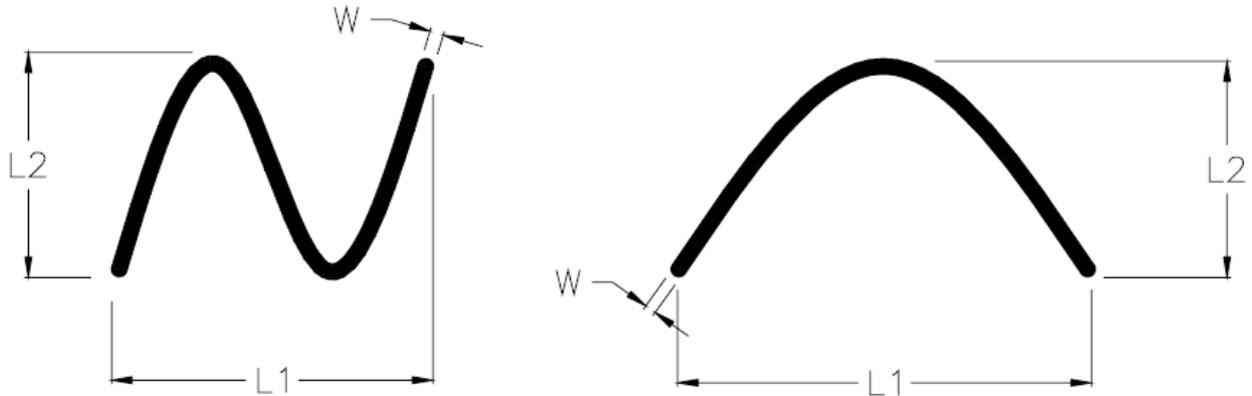
Note1:

- (a) Bright point defect is defined as point defect of R,G,B with area $> 1/2$ pixel respectively
- (b) Dark point defect is defined as visible in full white pattern.
- (c) Definition of distribution of point defect is as follows:
 - minimum separation between dark point defects should be larger than 5mm.
 - minimum separation between bright point defects should be larger than 10mm.
- (d) Definition of joined bright point defect and joined dark point defect are as follows:
 - Two or more joined bright point defects must be nil.
 - Three joined dark point defects must be nil.
 - Coupling of one dark and one bright point in junction is counted as one dark and bright spot with 1 pair maximum.
 - Two Joined dark point is counted as two dark points with 1 pair maximum.

Note2: The external inspection should be conducted at the distance $30 \pm 5\text{cm}$ between the eyes of inspector and the panel.

Note3: Luminance measurement for contrast ratio is at the distance $50 \pm 5\text{cm}$ between the detective head and the panel with ambient luminance less than 1 lux. Contrast ratio is obtained at optimum view angle.

Note4: W-Width in mm , L-length of Max.(L1,L2) in mm.



8.5 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.

Lot size: Quantity of shipment lot per model.

Sampling type: normal inspection, single sampling

Sampling table: MIL-STD-105E

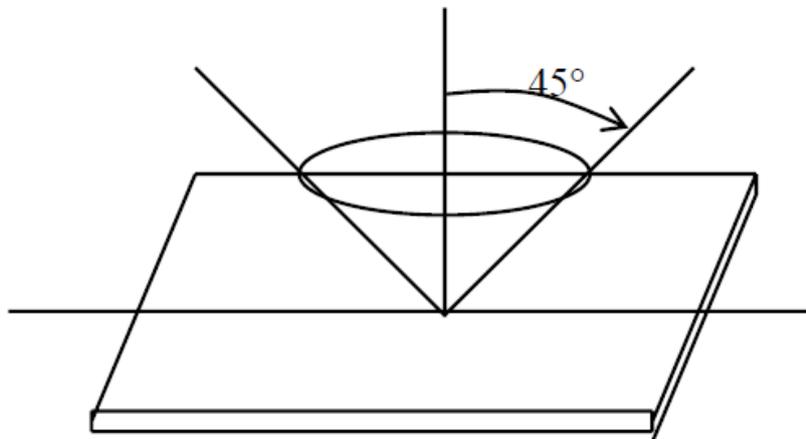
Inspection level: Level II

8.6 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light.

$\theta \leq 45^\circ$ inspection under non-operating condition.

$\theta \leq 5^\circ$ inspection under operating condition



9. PRECAUTION RELATING PRODUCT HANDLING

9.1 SAFETY

- 9.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.**
- 9.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.**

9.2 HANDLING

- 9.2.1 Avoid any strong mechanical shock which can break the glass.**
- 9.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module, be sure to ground your body and any electrical equipment you may be using.**
- 9.2.3 Do not remove the panel or frame from the module.**
- 9.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully, Do not touch, push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)**
- 9.2.5 Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.**
- 9.2.6 Do not touch the display area with bare hands , this will stain the display area.**
- 9.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.**
- 9.2.8 To control temperature and time of soldering is $280 \pm 10^{\circ}\text{C}$ and 3-5 sec.**
- 9.2.9 To avoid liquid (include organic solvent) stained on LCM.**

9.3 STORAGE

- 9.3.1 Store the panel or module in a dark place where the temperature is $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ and the humidity is below 65% RH.**
- 9.3.2 Do not place the module near organics solvents or corrosive gases.**
- 9.3.3 Do not crush, shake, or jolt the module.**