




HDMI TFT Module Specification

MODEL: HA-121ZILCOGA8-V

<◆> PRELIMINARY SPECIFICATION

<◇> APPROVAL SPECIFICATION

CUSTOMER
APPROVED BY
DATE:

DESIGNED	CHECKED	APPROVED
		

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RECORD OF REVISION

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1. GENERAL DESCRIPTION

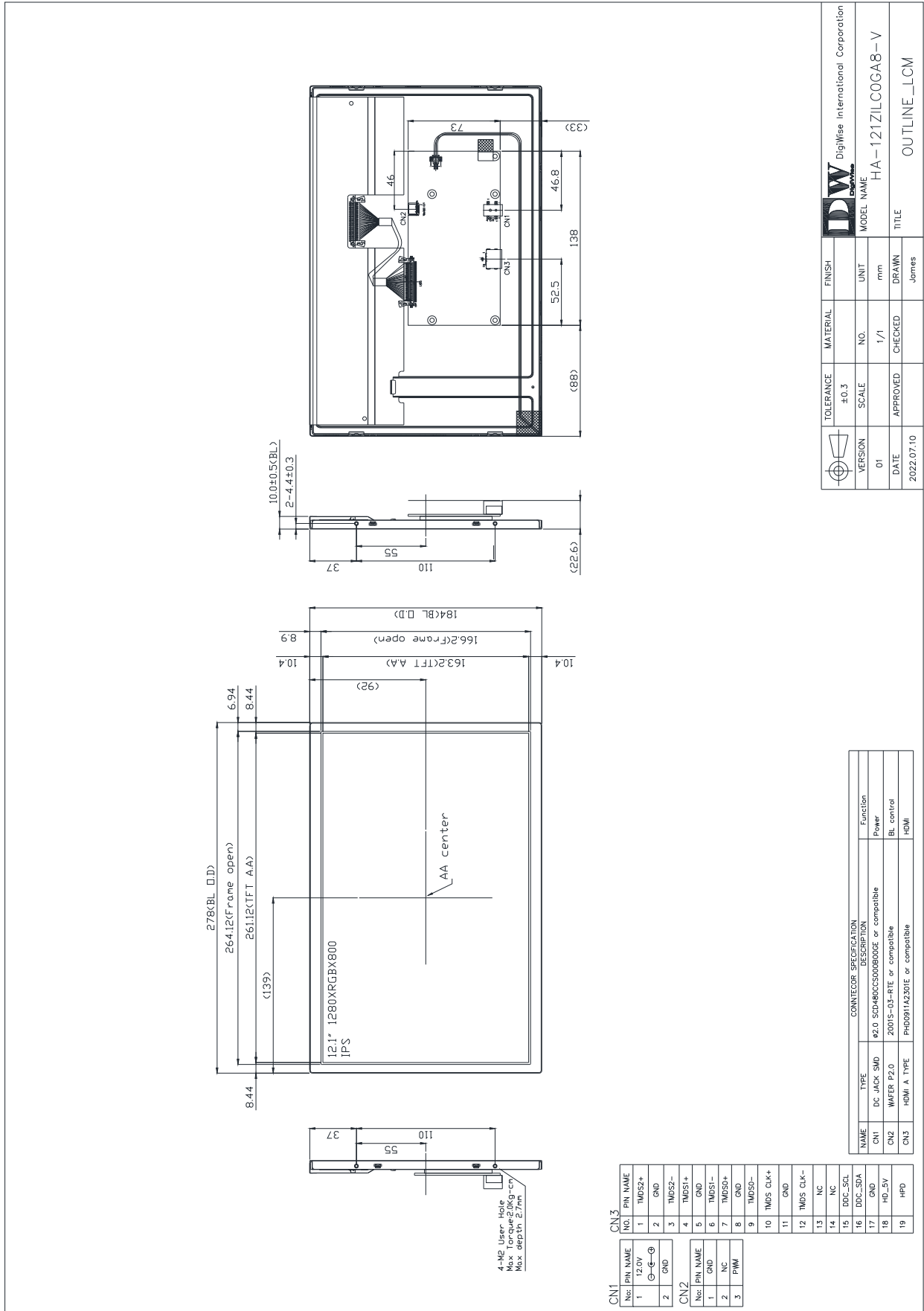
1.1 Description

HA-121ZILCOGA8-V is a 12.1 (16:10) inch diagonally measured active display with high resolution XGA 1280x800 display and high brightness. This model is composed of a TFT LCD panel, backlight system and HDMI . It is designed to make Raspberry Pi usage easy. You can simply use this TFT display with your Raspberry Pi, or also you can use this as computer display with any device which has HDMI output. This 12.1" TFT model comes in 1280x800 resolution that would be great for embedded computing usage too.

1.2 Features:


No.	Item	Specification	Unit
1	Panel Size	12.1"	Inch
2	Number of Pixels	1280 (W) x RGB x 800 (H)	Pixels
3	Active Area	261.12 (W) × 163.2 (H)	mm
4	Pixel Pitch	0.204 (W) x 0.204 (H)	mm
5	Outline Dimension	278 (W) × 184 (H) × 22.6(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	Anti-Glare (3H)	- -
11	Contrast Ratio	1000 (Typ.)	- -
12	Luminance (cd/m ²)	2000 (Typ.)	cd/m ²
13	Video Input Interface	HDMI (Compliance HDMI V1.4)	- -
14	Backlight	White LED	- -
15	Operation Temperature	-30 ~ 80	°C
16	Storage Temperature	-30 ~ 85	°C
17	Weight	(TBD)	g

2. MECHANICAL SPECIFICATION



3. PIN DESCRIPTION

3.1 Power Input(CN1) [DC JACK:SCD480CCS000B00GE or compatible]

Pin No.	Symbol	I/O	Function	Note
1	12V	P	Power Supply +12V	12.0V 
2	GND	P	Ground	

3.2 Back-light Control(CN2) [WAFER P2.0mm:2001S-03-RTE or compatible]

Pin No.	Symbol	I/O	Function	Note
1	GND	P	Ground	
2	N.C.	-	N.C.	
3	PWM	I	Back-light Dimming control (internal pull up to 3.3V)	*1

*1: When PWM not connected, back-light default is typical brightness.

3.3 HDMI (CN3) [HDMI A TYPE:PHD0911A2301E or compatible]

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	

4. ABSOLUTE MAXIMUM RATINGS

4.1 Electrical Absolute Rating

4.1.1 HDMI TFT LCD Module

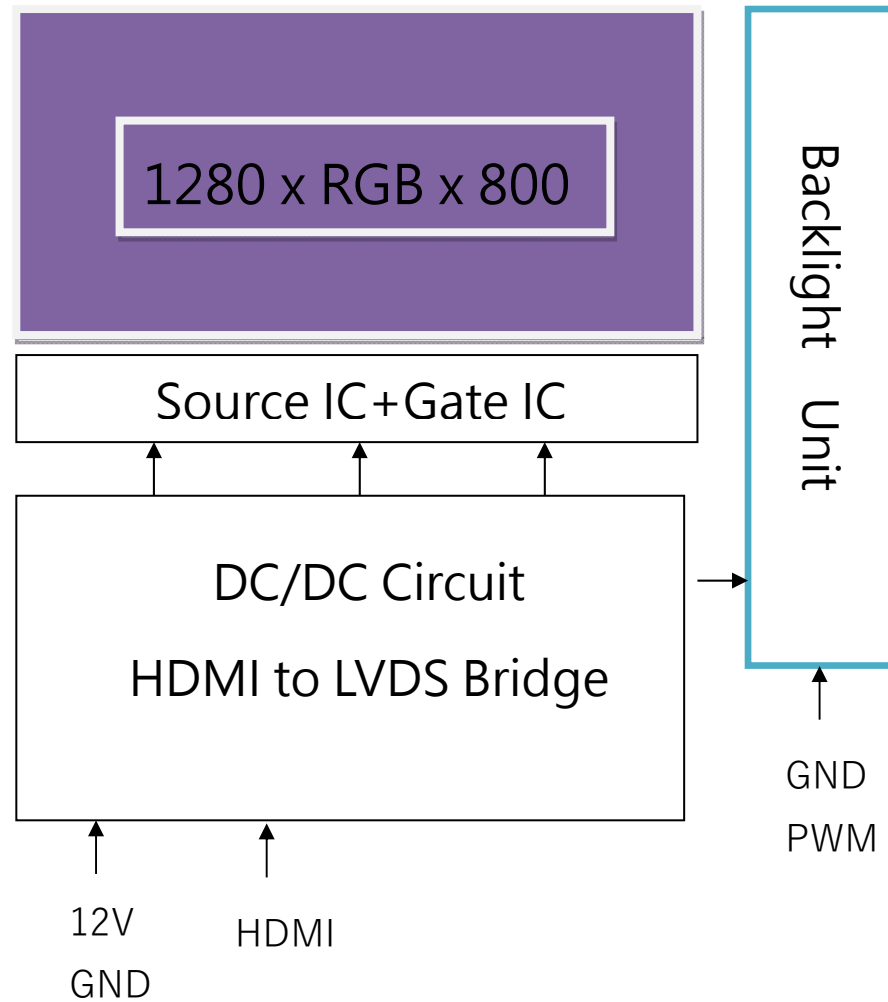
Item	Symbol	Values		Unit	Note
		Min	Max.		
Power supply voltage	12V	10	14	V	

4.1.2 Environment Absolute Rating

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

5. BLOCK DIAGRAM

5.1 TFT LCD Module



6. ELECTRICAL CHARACTERISTICS

6.1 HDMI TFT LCD Module

Item	Symbol	Values			Unit	Note
		Min	Typ.	Max.		
Supply Voltage	12V	11	12	13	V	
PWM frequency		100	-	10K	Hz	
PWM Duty		17	-	100	%	<17%=OFF
PWM Dimming Voltage	V _{PWM-IH}	3.3	-	8	V	
	V _{PWM-IL}	0	-	0.3	V	
Supply Current	ICC(12V)	-	TBD	-	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.

7. OPTICAL CHARACTERISTICS

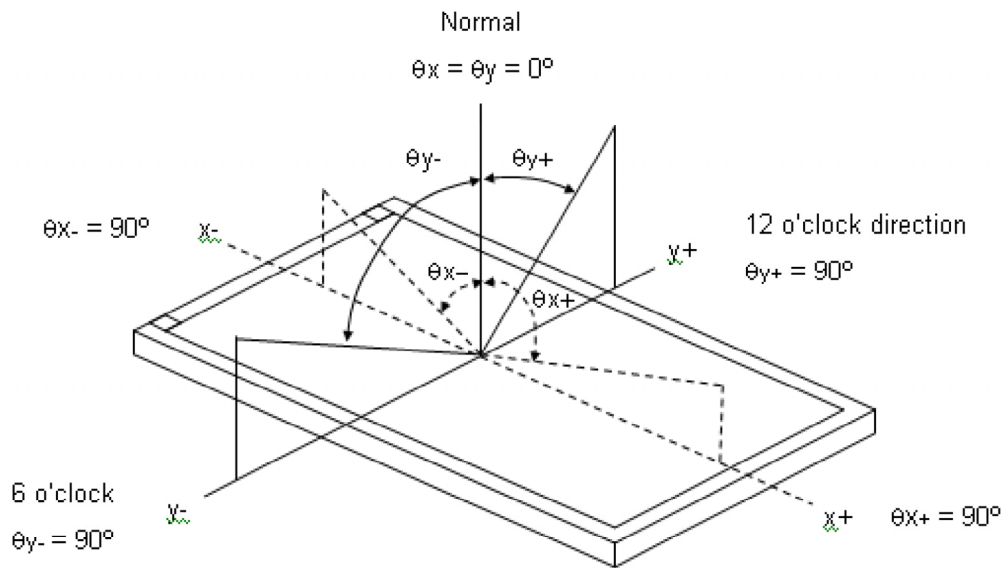
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Brightness	--	Note1, Note 3, ($\theta = 0^\circ$; Normal Viewing Angle)	1600	2000	--	cd/m2	(4)(5)	
Contrast Ratio	CR		800	1000	--	--	(2)(5)	
White Variation	δW		--	1.25	1.4	--	(5)(6)	
Response Time	Tr		--	12	17	ms	(3)	
	Tf		--	8	13	ms		
Color Chromaticity	White		Wx	0.263	0.313	0.363	--	(1)(5)
			Wy	0.279	0.329	0.379	--	
	Red		Rx	0.602	0.652	0.702	--	
			Ry	0.288	0.338	0.388	--	
	Green		Gx	0.276	0.326	0.376	--	
		Gy	0.558	0.608	0.658	--		
	Blue	Bx	0.100	0.150	0.200	--		
		By	0.003	0.053	0.103	--		
View angle	Horizontal	$\theta x+$	80	88	--	Deg	(1)(5)	
		$\theta x-$	80	88	--			
	Vertical	$\theta Y+$	80	88	--			
		$\theta Y-$	80	88	--			

Note :

TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V _{CC}	3.3	V
Convertor Voltage	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Convertor Duty			

Note (1) Definition of Viewing Angle (θ_x, θ_y):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

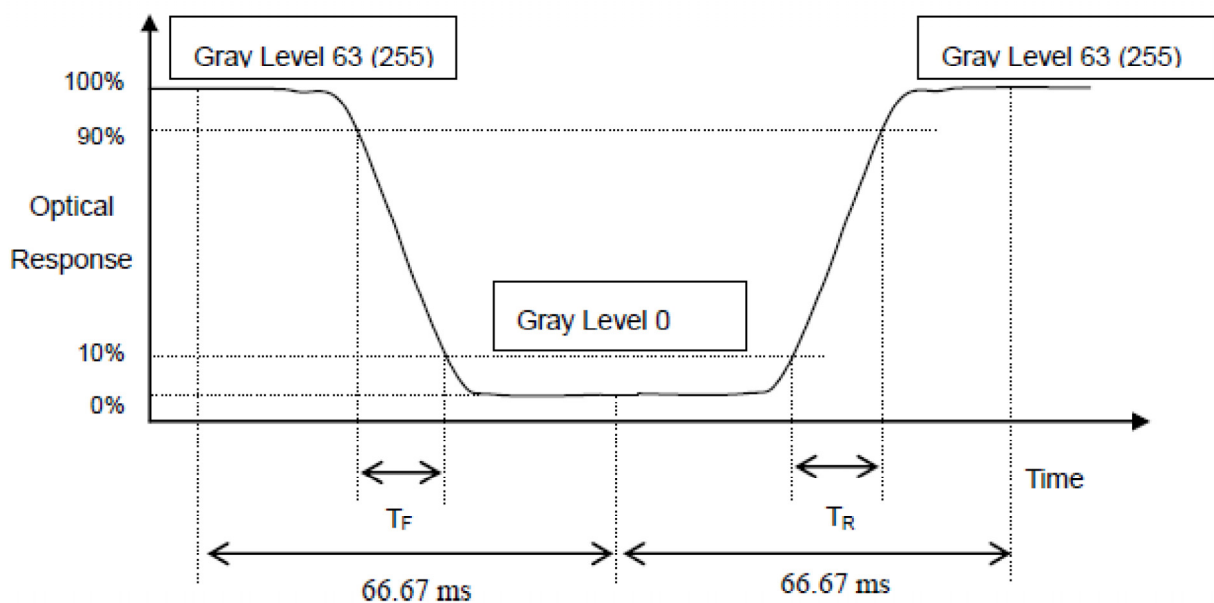
L63: Luminance of gray level 255

L 0: Luminance of gray level 0

$$\text{CR} = \text{CR} (5)$$

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Luminance of White (L_c):

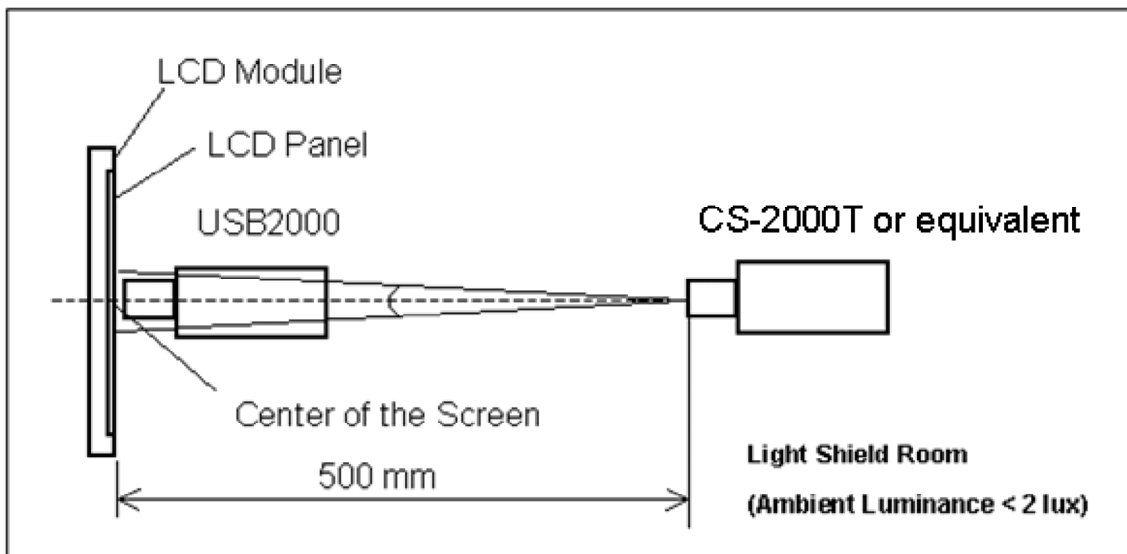
Measure the luminance of gray level 255 at center points

$L_c = L(5)$

$L(x)$ is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

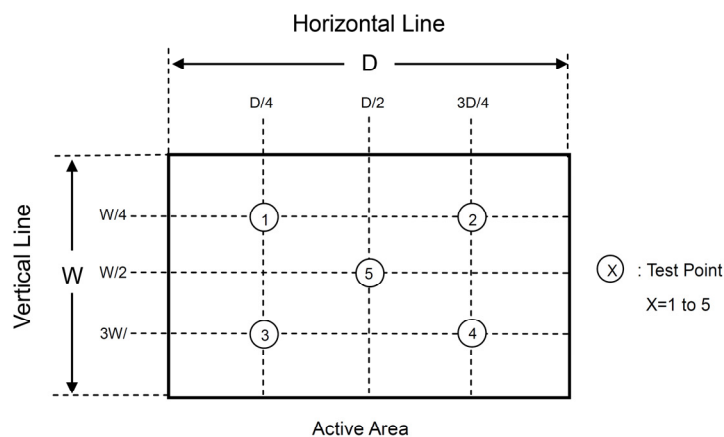
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

$$\delta W = \frac{\text{Maximum [L (1), L (2), L (3), L (4), L (5)]}}{\text{Minimum [L (1), L (2), L (3), L (4), L (5)]}}$$



8. RELIABILITY

Test Item	Test Condition	Note
High Temperature Storage Test	85°C, 240 hours	(1),(2) (4),(5)
Low Temperature Storage Test	-30°C, 240 hours	
Thermal Shock Storage Test	-30°C, 0.5hour \longleftrightarrow 85°C, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	80°C, 240 hours	
Low Temperature Operation Test	-30°C, 240 hours	
High Temperature & High Humidity Operation Test	60°C, 90%RH, 240hours	(1),(2) (4),(6)
Shock (Non-Operating)	200G,2ms, half sine wave, 1 time for $\pm X, \pm Y, \pm Z$.	(2)(3)
Vibration (Non-Operating)	1.5G / 10-500 Hz, Sine wave, 30 min/cycle, 1cycle for each X, Y, Z	(2)(3)

Note (1) There should be no condensation on the surface of panel during test.

Note (2) Temperature of panel display surface area should be 90 °C Max

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture

Note (4) In the standard conditions, there is no function failure issue occurred. All the cosmetic Specification is judged before reliability test.

Note (5) Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note (6) Before cosmetic and function test, the product must have enough recovery time, at least 24 hours at room temperature.

8.1 INCOMING INSPECTION STANDARDS

(1) Display Inspection standards when power on.

Items		Acceptable count
Full Bright dot	Random	$N \leq 2$
	2 dots adjacent	$N \leq 1$
	3 dots adjacent or more	$N \leq 0$
Full Dark dot	Random	$N \leq 3$
	2 dots adjacent	$N \leq 1$
	3 dots adjacent or more	$N \leq 0$
Total full bright and full dark dot		$N \leq 5$
Foreign Black/White/Bright Spot		$D \leq 0.15\text{mm}$, Ignore $0.15 < D \leq 0.5 \text{ mm}$, $N \leq 4$
Foreign Black/White/Bright Line		$W \leq 0.05\text{mm}$, Ignore $0.05 < W \leq 0.1 \text{ mm}$, $0.3 < L \leq 2.0 \text{ mm}$, $N \leq 4$
Polarizer	Scratches	$W \leq 0.05\text{mm}$, Ignore $0.05 < W \leq 0.1 \text{ mm}$, $0.3 < L \leq 2.0 \text{ mm}$, $N \leq 4$
	Dent /Bubble	Avg. $0.15 < D \leq 0.5 \text{ mm}$, $N \leq 4$
Distance	Minimum Distance Between Full Bright dots	$L \geq 10\text{mm}$
	Minimum Distance Between Full Dark dots	$L \geq 10\text{mm}$
Display failure (V-line/H-line/Cross line etc.)		Not allowable
Mura	Not visible through 6% ND filter in 50% gray or judge by limit sample if necessary	

(2) External Appearance Inspection Criteria (Power off)

Item	Contents	
Screw	Parts mounting, incomplete assembly, deformation, oxidized, crooked or rusty is not permitted.	
CCFL cable (For CCFL Model)	Cable not continuous 、 Break-off 、 Connector Burn-off /Break-off	
Metal frame (Bezel)	Scratch	*Noticeable scratch and exfoliation coating are not permitted. *The oxidized metal is not permitted.
	Incomplete assembly is not permitted.	
Backlight	Scratch	The scratch which may causes a problem in practical use is not permitted.
	Break-off	Breaking off is not permitted.
	Crack	The crack is not permitted.
Polarizer	Scratches	$W \leq 0.05\text{mm}$, Ignore $0.05 < W \leq 0.1 \text{ mm}$, $0.3 < L \leq 10.0 \text{ mm}$, $N \leq 4$
	Dent/Bubble	Avg. $0.15 < D \leq 0.5 \text{ mm}$, $N \leq 4$
	Stain	The stain on polarizer, which can't be wiped off, is not permitted.
Tape/Label	Incorrect position, missed label is not permitted.	
Connector	Oxidized/rusty connector is not permitted.	
Outline size	Spec. out is not permitted.	

(3) Classification of defects

Inspection Item	Criteria and Description	Defect type
Vertical line	Signal input, vertical line off or irregular V-line appears	major
Horizontal line	Signal input, horizontal line off or irregular H-line appears	major
Cross line	Pattern signal input, a correct display is not obtained	major
No display	Signal input, display is dead	major
Irregular display	Pattern signal input, a correct display is not obtained	major
Dots defect	Exceed specified standards	minor
Scratch and Dent on polarizer	Exceed specified standards	minor
Foreign material	Exceed specified standards	minor
Mura	Non-uniformity is appeared in display	minor
Polarizer bubble	Exceed specified standards	minor

Note1: Classification of defects

Defects are classified two types, major defect and minor defect according to the defect. And, the definition of defects is classified as below.

(1) Major defect

Any defect may result in functional failure, or reduce the usability of product for its purpose. For example, electrical failure, deformation and etc..

(2) Minor defect

A defect that is not to reduce the usability of product for its intended purpose and un-uniformity, dot defect and etc..

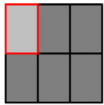
The criteria on major or minor judgment will be according with the classification of defects, and any defects out of active area, are not considered as a defect or counted

Note2: Definition of dot defect induced from the panel inside

(1) Definition of dot defect induced from the panel inside

- a) Bright dot : Dots appear bright and unchanged in size in which module is displaying under black pattern.
- b) Dark dot : Dots appear dark and unchanged in size in which module is displaying under pure red, green, blue, white picture.
- c) 2 Full dot adjacent = 1 pair.
- d) Picture :

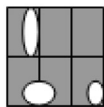
(a) Full dot



(b) 2 Full dot adjacent

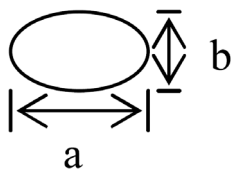


(c) Spot defect



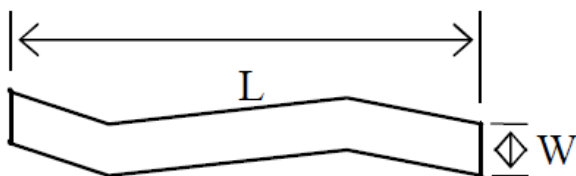
Note3:

$$D=(a+b)/2$$



Note4:

W: width, L : length



8.2 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

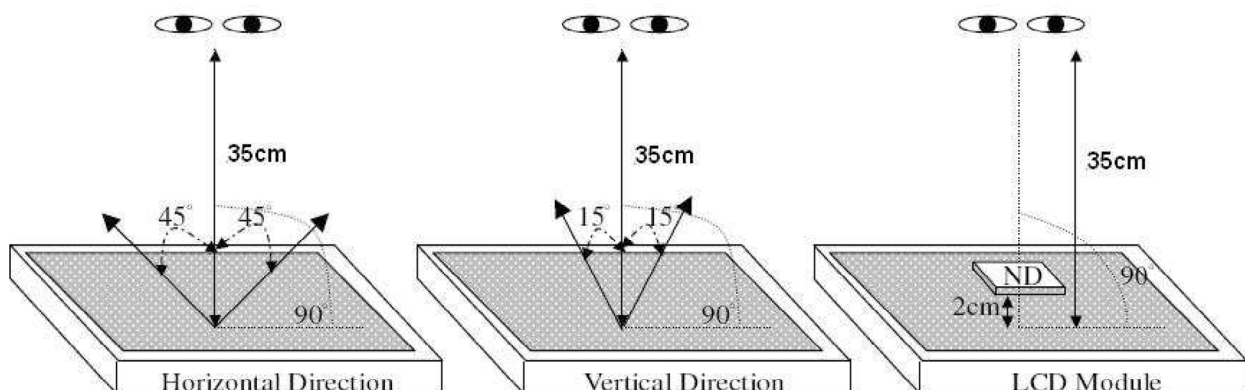
Sampling table: MIL-STD-105E

Inspection level: Level II

8.3 Inspection conditions

The environmental condition and visual inspection shall be conducted as below.

- (1) Ambient temperature : 15~25°C
- (2) Humidity : 25~75 %RH
- (3) External appearance inspection shall be conducted by using a single 20W fluorescent lamp or equivalent illumination.
- (4) Panel visual inspection on the operation condition for cosmetic shall be conducted at the distance 35cm or more between the LCD module and eyes of inspector.
Ambient Illumination : 300 ~ 500 Lux for external appearance inspection
Ambient Illumination : 100 ~ 200 Lux for light on inspection
- (5) The viewing angle :
 - a) 15 degree to the front surface of display panel in vertical direction.
 - b) 45 degree to the front surface of display panel in horizontal direction.
- (6) ND filter shall be conducted at the distance 2 cm to front surface of display panel and shall be conducted at the distance 35 cm between the LCD module and eyes of inspector by view angle 90 degree within 3 seconds.



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.**