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MDT0400FIH-HDMI-V2	480 x 480	HDMI Interface	TFT Module

Specification

Version: 2	Date: 15/10/2023

Revision

1	07/04/2023	First issue
2	13/10/2023	Updated

Display Features	
Display Size	4.00”
Resolution	480 x 480
Orientation	Square
Appearance	RGB
Logic Voltage	12V
Interface	HDMI
Brightness	1000 cd/m^2
Touchscreen	---
Module Size	77.00 x 80.00 x 17.75 mm
Operating Temperature	-10°C ~ +60°C
Pinout	---
Pitch	---

RoHS compliant

Box Quantity	Weight / Display
---	---

Display Accessories

Part Number	Description
MDIB-CC1	The MDIB-CC1 is a interconnect board for standard pitch pinouts to fine pitch wires. Ideal for prototyping of TFT and COG LCDs.

Optional Variants

Appearances	Voltage

Basic Specifications

* Description

This is a plug and play device, this is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit,back-light unit, HDMI adapter board. The resolution of a 4.0 " TFT-LCD contains 480x480 pixels, and can display up to 16.7M colors.

* Operating Instructions

This product supports the following operating systems:Windows 7/8/10,Android, Linux, Raspberry Pi.
1.Connect the DC-044 DC power.
2.Connect the HDMI cable to Windows 7/8/10 or Android or Linux or Raspberry Pi.
3.Connect the micro USB for touch panel, if this module supports it.

1. TFT Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	71.86(H)*70.18V) (4.0 inch)	mm	
Driver element	TFT active matrix	-	
Display colors	16.7M	colors	
Number of pixels	480(RGB)*480	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.1497(H)*0.1462(V)	mm	
Viewing angle	ALL	o'clock	
Display mode	Transmissive /Normally Black	-	
Operating temperature	-10～+60	℃	
Storage temperature	-20～+70	℃	

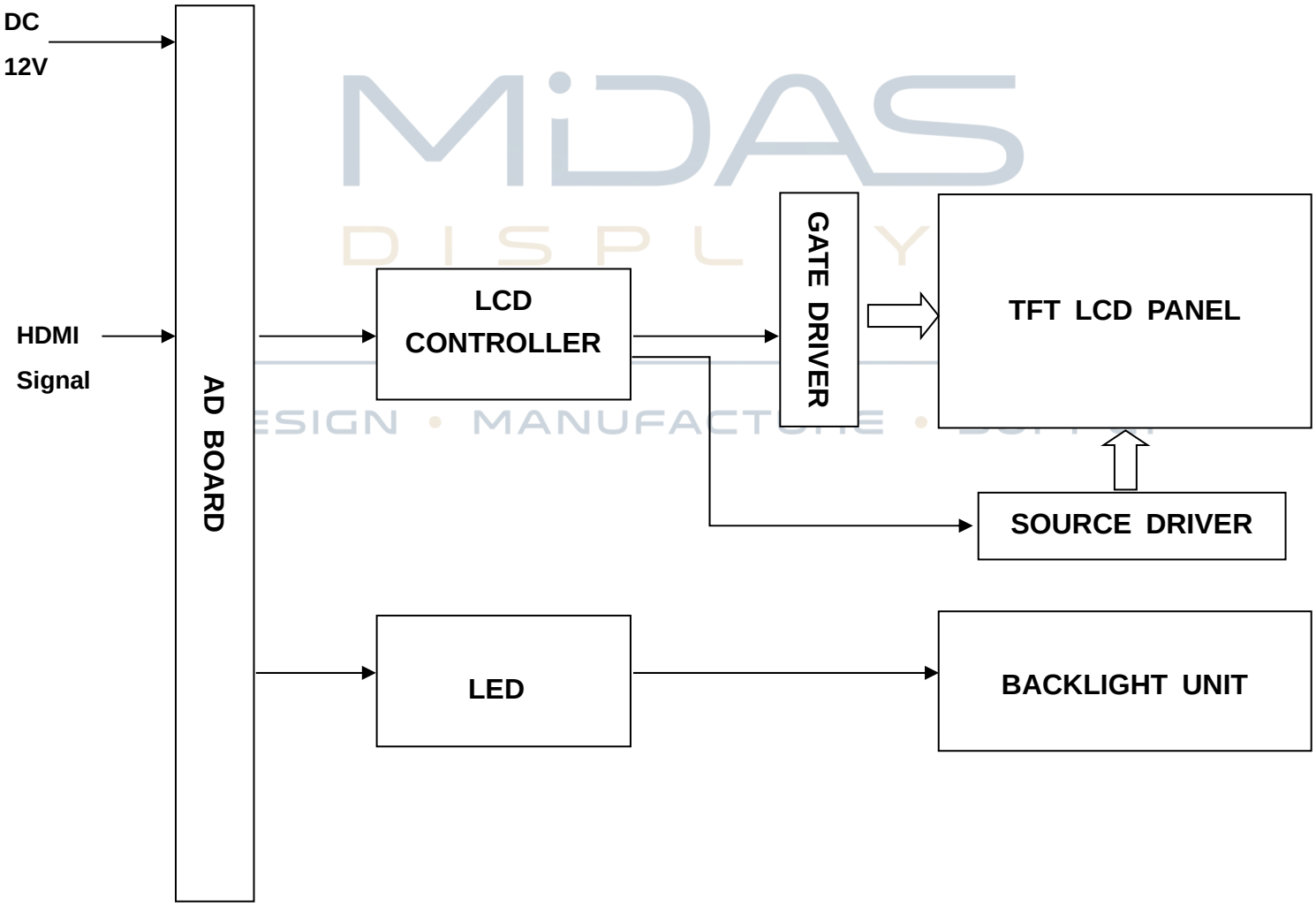
2. Module Features

General Information Items	Specification	Unit	Note
Display Interface	HDMI(Type A)	-	
Touch Interface	-	-	
Touch Type	-	-	
Touch Mode	-	-	
Power supply	DC-12V(DC-044)	-	

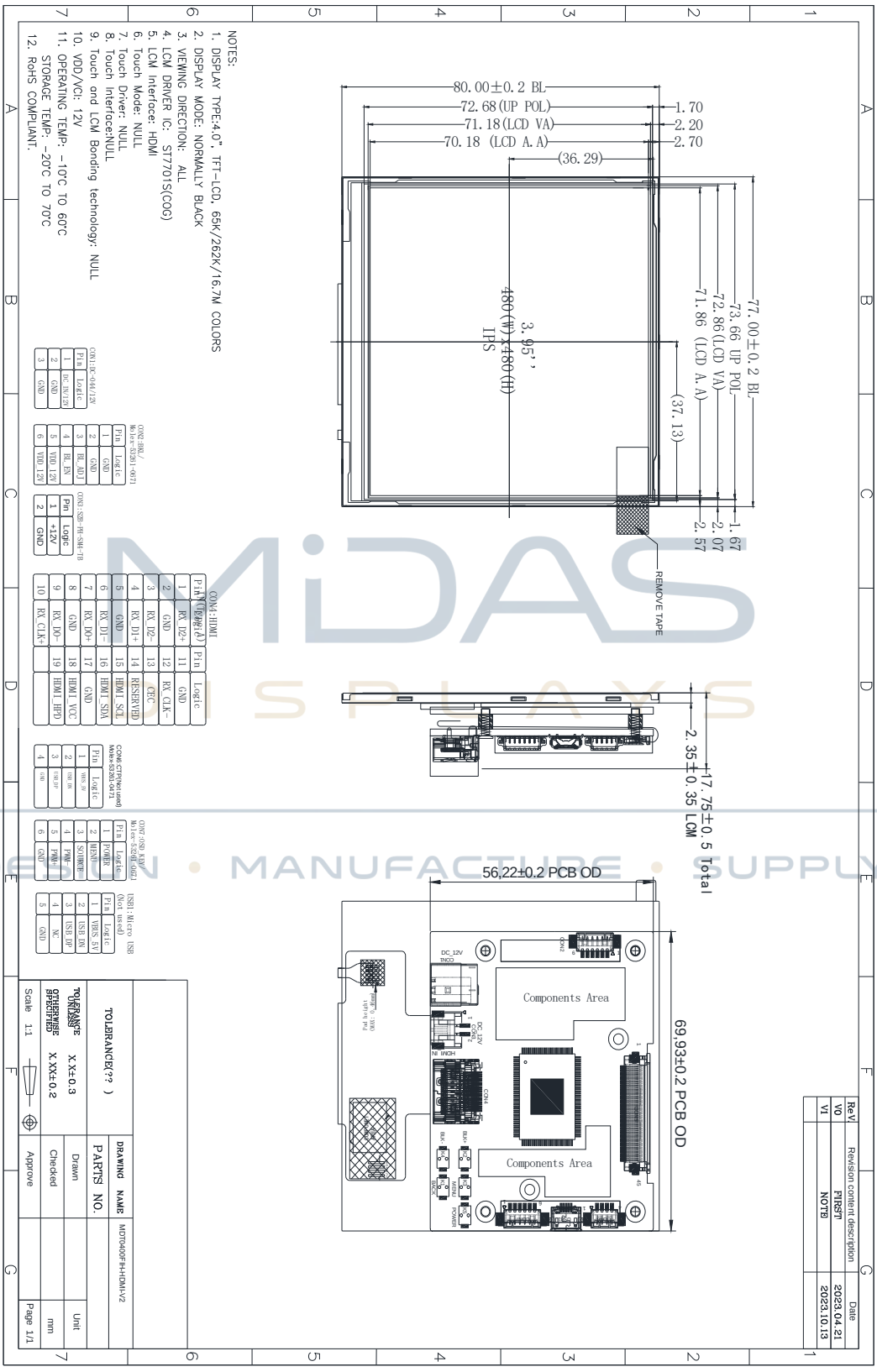
3. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	77	-	mm	
	Vertical(V)	-	80	-	mm	
	Depth(D)	-	17.75	-	mm	
Weight		-	TBD	-	g	

Block Diagram



Outline dimension



Pin Assignment

1. Power Input

CON1(DC-044 Socket)

NO.	SYMBOL	DISCRIPTION	I/O
1	DC_IN	Power supply (DC 12V).	P
2	GND	Ground	P
3	GND	Ground	P

Extension CON3(JST:S2B-PH-SM4-TB)

NO.	SYMBOL	DISCRIPTION	I/O
1	+12V	Power supply (DC 12V).	P
2	GND	Ground	P

2. Touch Input （not used）

USB1(Micro USB)

NO.	SYMBOL	DISCRIPTION	I/O
1	VBUS_5V	Supply voltage(5V).	P
2	USB_DN	USB- signal.	I/O
3	USB_DP	USB+ signal.	I/O
4	NC	No connection.	
5	GND	Ground.	P

Extension CON6(Molex:53261-0471)

NO.	SYMBOL	DISCRIPTION	I/O
1	VBUS_5V	Supply voltage(5V).	P
2	USB_DN	USB- signal.	I/O
3	USB_DP	USB+ signal.	I/O
4	GND	Ground.	P

3. HDMI Input

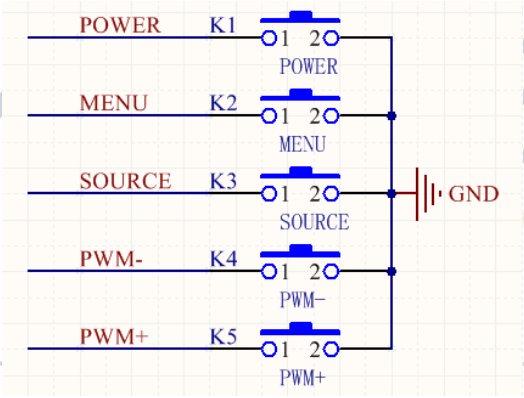
The type of HDMI connector is a type A.

NO.	SYMBOL	DISCRIPTION	I/O
1	RX_D2+	HDMI Receiver channel 2 positive analog input.	I/0
2	GND	Ground.	P
3	RX_D2-	HDMI Receiver channel 2 negative analog input.	I/0
4	RX_D1+	HDMI Receiver channel 1 positive analog input.	I/0
5	GND	Ground.	P
6	RX_D1-	HDMI Receiver channel 1 negative analog inpsut.	I/0
7	RX_D0+	HDMI Receiver channel 0 positive analog input.	I/0
8	GND	Ground.	P
9	RX_D0-	HDMI Receiver channel 0 negative analog input.	I/0
10	RX_CLK+	HDMI Receiver clock positive analog input.	I
11	GND	Ground.	P
12	RX_CLK-	HDMI Receiver clock negative analog input.	I
13	CEC/DET_HDMI	No connection.	
14	NC	No connection.	
15	HDMI_SCL	HDMI Receiver DDC data channel.	I
16	HDMI_SDA	HDMI Receiver DDC clock channel.	I/0
17	GND	Ground.	P
18	HDMI_5V	HDMI Supply voltage (5.0V).	P
19	HPD	HDMI Receiver hot plug detect output	O

4. OSD Key Output

CON7(Molex：53261-0671)

NO.	SYMBOL	DISCRIPTION	I/O
1	POWER	Power supply control.	I
2	MENU	Switch to the menu control. Note:It will be dummy, if the resolution is lower than 640x480.	I
3	SOURCE	Switch the input signal control, there is only HDMI signal, With return function in the menu interface.	I
4	PWM-	Reduce brightness of backlight.	I
5	PWM+	Increase brightness of backlight. Note: The brightness is configured for maximum after power on.	I
6	GND	Ground	P



Osd key circuit diagram

5. Extension Backlight Output

CON2(Molex：53261-0671)

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground.	P
2	GND	Ground.	P
3	BL_ADJ	PWM signal output.	O
4	BL_EN	Enable signal.	O
5	12V	Power supply.	P
6	12V	Power supply.	P

LCM Optical Characteristics

1. Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	Θ=0 Normal viewing angle	640	800	--		(1)(2)
Response time	Rising	$T_{R+}T_F$		--	25	35	msec	
	Falling			55	60	--	%	(1)(3)
Color Gamut		S(%)		640	800	--		
LCM Luminance		LV		800	1000	--	cd/m2	
Color Filter Chromacicity	White	W_X		-0.02	0.309	+0.02		(1)(4) CF glass
		W_Y			0.350			
	Red	R_X		-0.04	0.611	+0.04		
		R_Y			0.363			
	Green	G_X			0.317			
		G_Y			0.570			
	Blue	B_X			0.150			
		B_Y			0.100			
Viewing angle	Hor.	ΘL	CR>10	70	80	--		(1)(4)
		ΘR		70	80	--		
	Ver.	ΘU		70	80	--		
		ΘD		70	80	--		
Option View Direction		12 o'clock						

*The data comes from the LCD specification.

Measuring Condition

Measuring surrounding : dark room

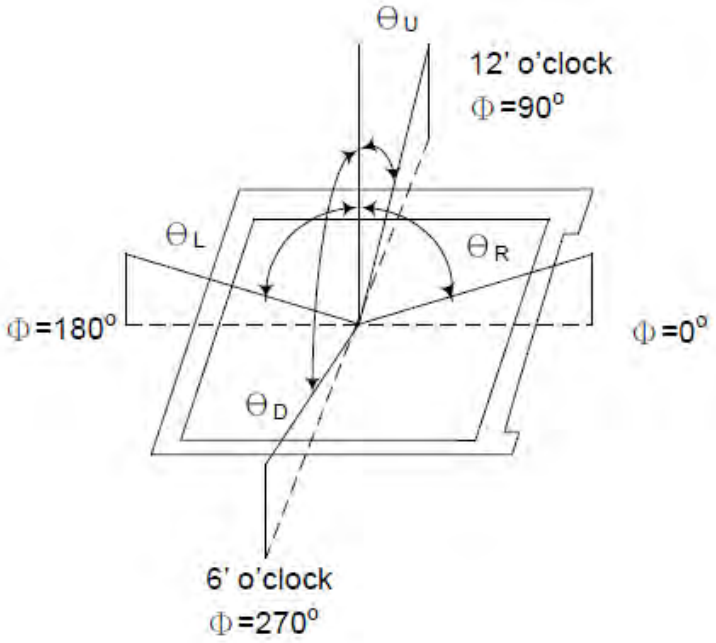
Ambient temperature : 25±2oC

15min. warm-up time.

Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

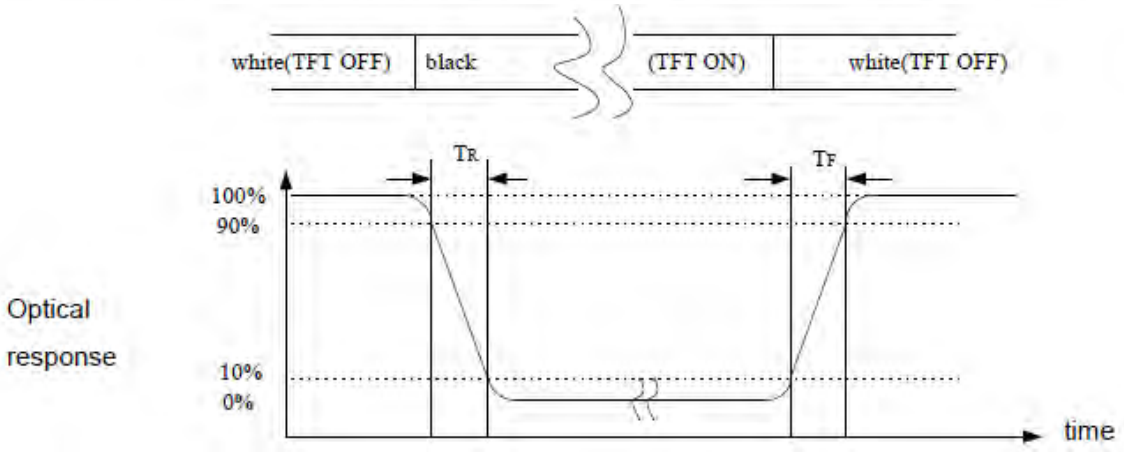
Note (1): Definition of Viewing Angle :



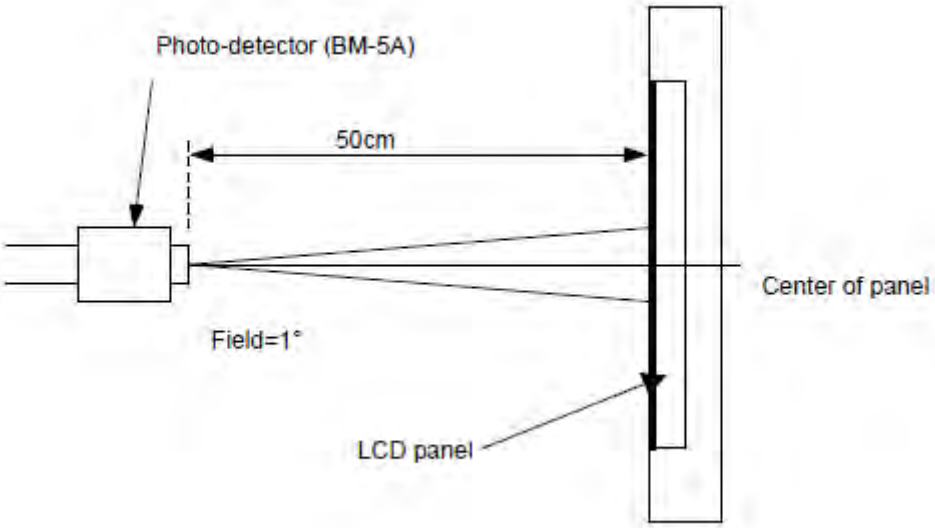
Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3): Response Time



Note (4): Definition of optical measurement setup



Electrical Characteristics

1. Absolute Maximum Rating

Characteristics	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	DC_IN	-0.5	16	V	Note1
Operating temperature	T_{OP}	-10	+60	℃	
Storage temperature	T_{ST}	-20	+70	℃	

NOTE1: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

2. DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage	DC_IN	9	12	16	V	
Normal mode Current consumption	I_{DC_IN}	--	200	--	mA	DC_IN=12V

LCM Module Out-Going Quality Level

1. VISUAL & FUNCTION INSPECTION STANDARD

1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

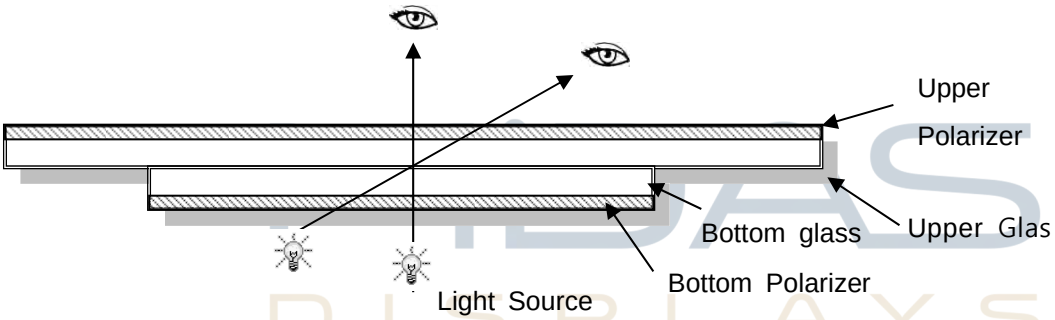
Temperature : 25±5℃

Humidity : 65%±10%RH

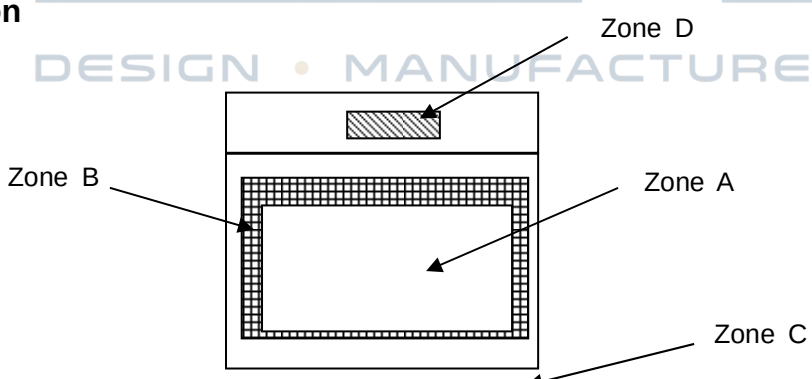
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



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 .)

Zone D : IC Bonding Area

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or ap pearance after assembly by customer

1.3 Sampling Plan

According to GB/T 2828.1-2003 ; , normal inspection, Class Ⅱ

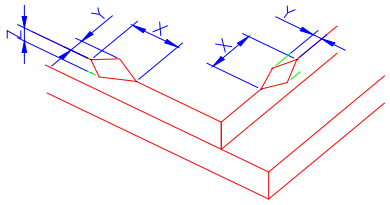
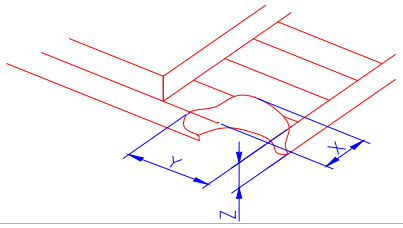
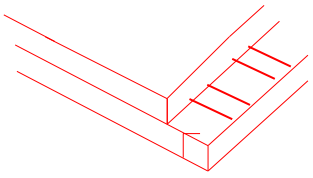
AQL:

Major defect	Minor defect
0.65	1.5

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

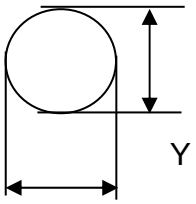
No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing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

1.4 Criteria (Visual)

<table>
<tr><th>Number</th><th>Items</th><th>Criteria(mm)</th></tr>
<tr><td rowspan="3">1.0 LCD Crack/Broken
NOTE:
X: Length
Y: Width
Z: Height
L: Length of ITO,
T: Height of LCD</td><td>(1) The edge of LCD broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table></td></tr>
<tr><td>(2)LCD corner broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table></td></tr>
<tr><td>(3) LCD crack</td><td> 
Crack
Not allowed</td></tr>
</table>

2.0

Spot defect



Φ=(X+Y)/2

① light dot (black/white spot , pinhole, stain，etc.)

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore	Ignore	
0.15<Φ≤0.25	3(distance≧10mm)		
0.25<Φ≤0.4	2(distance≧10mm)		
Φ>0.4	0		

② Dim spot (light leakage、dent、dark spot，etc)

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore	Ignore	
0.15<Φ≤0.25	3(distance≧10mm)		
0.25<Φ≤0.4	2(distance≧10mm)		
Φ>0.4	0		

③ Polarizer accidented spot

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.5	2(distance≧10mm)		
Φ>0.5	0		

④Polarizer Bubble

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.4	3(distance≧10mm)		
Φ>0.4	0		

3.0	LCD Pixel defect	Pixel bad points

Item	Zone A	Acceptable Qt
Bright dot	Random	N≤2
	2 dots adjacent	N≤0
	3 dots adjacent	N≤0
Dark dot	2 dots adjacent	N≤0
	3 dots adjacent	N≤0
Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm
Total bright and dark dot		N≤4

Note:

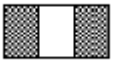
A) Bright dot：Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

B) Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.

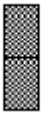
C) 2 dot adjacent = 1 pair = 2 dots

Picture:

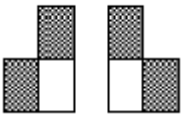
2 dot adjacent



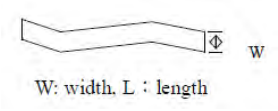
2 dot adjacent



2 dot adjacent (vertical)



2 dot adjacent (slant)

<table>
<tr>
<td>4.0</td>
<td>Line defect (LCD /Polarizer backlight black/white line, scratch, stain)
 

N : Count</td>
<td>
<table>
<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>
<tr><td>Φ≤0.05</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.05<W≤0.06</td><td>L≤4.0</td><td colspan="2">N≤3</td></tr>
<tr><td>0.06<W≤0.08</td><td>L≤3.0</td><td colspan="2">N≤2</td></tr>
<tr><td>W>0.08</td><td colspan="4">Define as spot defect</td></tr>
</table>
</td>
</tr>
<tr>
<td>5.0</td>
<td>Electronic Components SMT.</td>
<td>Not allow missing parts，solderless connection，cold solder joint，mis match，The positive and negative polarity opposite</td>
</tr>
<tr>
<td>6.0</td>
<td>Display color& Brightness.</td>
<td>1. Color：Measuring the color coordinates, The measurement standard according to the datasheet or samples.
2. Brightness：Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.</td>
</tr>
<tr>
<td>7.0</td>
<td>LCD Mura/Waving/ Hot spot</td>
<td>Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary.</td>
</tr>
</table>

<table>
<tr>
<td>8.0</td>
<td>CTP Related</td>
<td>CTP Cover sensor accidented black/white spot</td>
<td>
<table>
<tr><th rowspan="2">Size Φ(mm)</th><th colspan="3">Acceptable Qty</th></tr>
<tr><th>A</th><th>B</th><th>C</th></tr>
<tr><td>Φ≤0.1</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr>
<tr><td>0.1<Φ≤0.2</td><td colspan="2">3（distance≧10mm）</td></tr>
<tr><td>0.20<Φ≤0.25</td><td colspan="2">2（distance≧10mm）</td></tr>
<tr><td>Φ＞0.25</td><td colspan="2">0</td></tr>
</table>
</td>
</tr>
</table>

CTP Cover scratch

Width(mm)	Ignore (mm)	Acceptable Qty		
		A	B	C
Φ≤0.05	Ignore	Ignore		
0.05<W≤0.06	L≤4.0	N≤3		
0.06<W≤0.08	L≤3.0	N≤2		
0.08<W	Define as spot defect			

CTP Cover Pinhole/ Lack of ink

Zone / Size (mm)	Acceptable Qty
	C
Φ≤0.1	Ignore
0.1<Φ≤0.25	3(distance≧10mm)
0.25<Φ≤0.3	2(distance≧10mm)
Φ>0.3	0

CTP Bonding bubble/ accidented spot

Size Φ(mm)	Acceptable Qty	
	A	B
Φ≤0.1	Ignore	
0.1<Φ≤0.2	2(distance≧10mm)	
0.2<Φ≤0.25	2(distance≧10mm)	
Φ>0.25	0	

Assembly deflection

beyond the edge of backlight ≤0.2mm

CTP cover broken

X : length

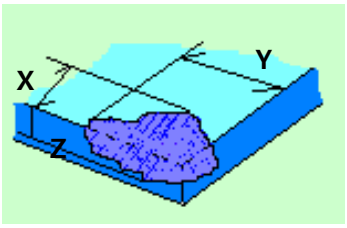
Y : width

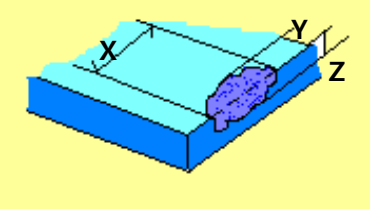
Z : height

X	Y	Z
X≤0.5mm	Y≤0.5mm	Z<cover thickness

*

Circuitry broken is not allowed.



		CTP cover broken X : length Y : width Z : height	X: X≤0.3mm; Y: Y≤0.3mm; Z: Z<cover thickness * Circuitry broken is not allowed.	

Criteria (functional items)

Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed

Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	60℃,96HR	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value.
Low Temperature Operating	-10℃, 96HR	
High Temperature Storage	70℃, 96HR	
Low Temperature Storage	-20℃, 96HR	
High Temperature & High Humidity Operating	+60℃, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-10℃,30 min ↔ 60℃,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15℃~35℃, 30%~60%).	
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces,80㎝(MEDIUM BOX)	

Remark:

1.The test samples should be applied to only one test item.

2.Sample size for each test item is 3~10pcs.

3.For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.

4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.

5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

Cautions and Handling Precautions

1. Handling and Operating the Module

(1) When the module is assembled, it should be attached to the system firmly.
Do not warp or twist the module during assembly work.
(2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
(3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
(4) Do not allow drops of water or chemicals to remain on the display surface.
If you have the droplets for a long time, staining and discoloration may occur.
(5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
(6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.
Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
(7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
(8) Protect the module from static; it may cause damage to the CMOS ICs.
(9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
(10) Do not disassemble the module.
(11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
(12) Pins of I/F connector shall not be touched directly with bare hands.
(13) Do not connect, disconnect the module in the “Power ON” condition.

2. Storage and Transportation.

(1) Do not leave the panel in high temperature, and high humidity for a long time.
It is highly recommended to store the module with temperature from 0 to 35 ℃ and relative humidity of less than 70%
(2) Do not store the TFT-LCD module in direct sunlight.
(3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
(4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.
In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.

(5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.