Microtips Technology

Innovative Solutions. Your Vision. Our Goal.

TFT Module Specification

MODEL: AWL-2801424T70N01

This module uses ROHS material

CUSTOMER
APPROVED BY
DATE:

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Revision Record

Rev No.	Rev Date	Contents	Note
A	2024/05/08	New issue.	

Table of Contents

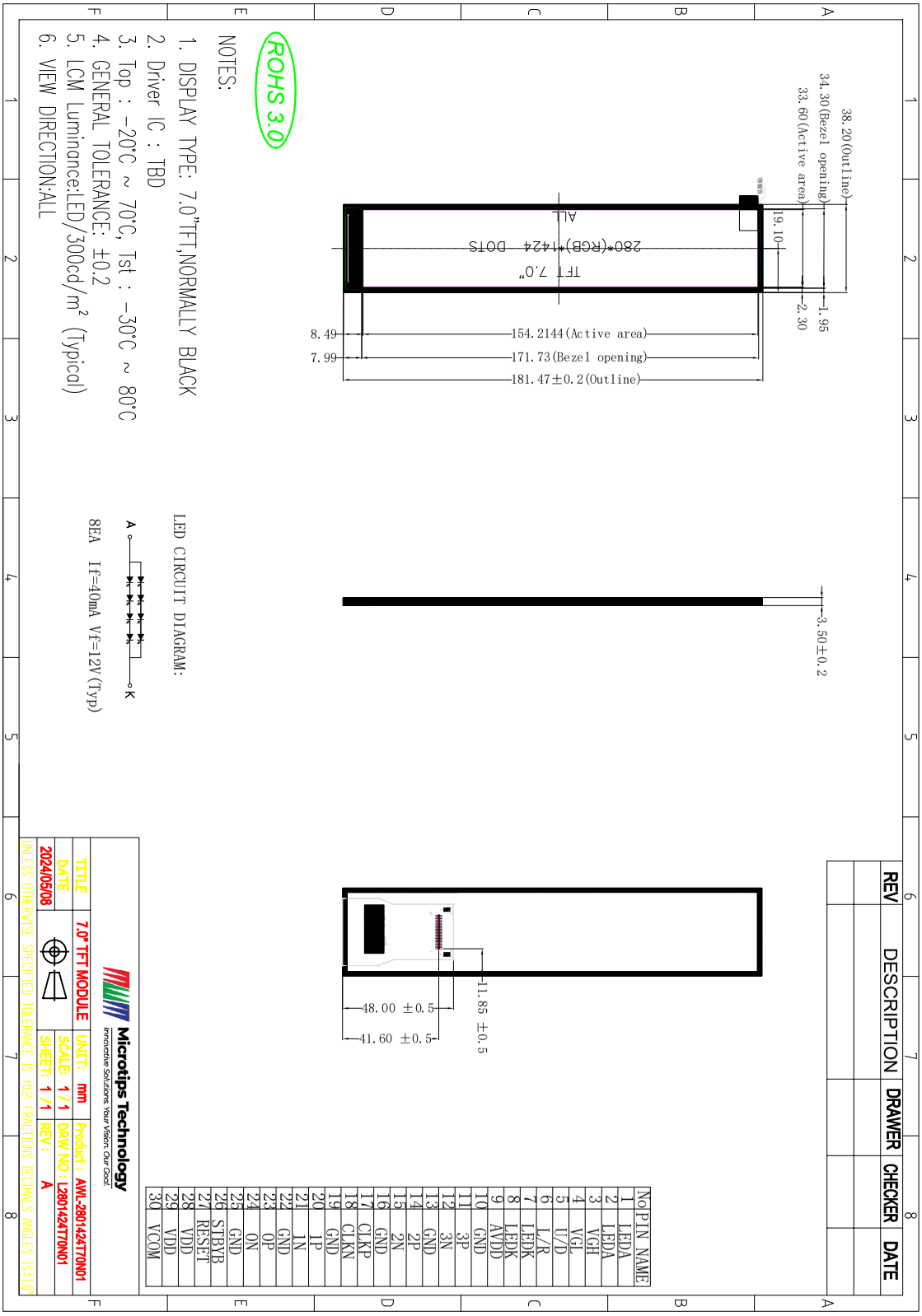
1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by Micotips Technology. If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution

1. 2. General Information

Item	Standard Values	Units
LCD type	7.0''TFT	--
Dot arrangement	280×1424	dots
Color filter array	RGB vertical stripe	--
Display mode	IPS / Normally Black	-
Eyes Viewing Direction	ALL	--
Driver IC	--	--
Module size	38.20(W)×181.47(H)×3.50(T)	mm
Active area	33.60(W)×170.88(H)	mm
Dot pitch	0.12(W)×0.12(H)	mm
Interface	MIPI	--
Operating temperature	-20 ~ +70	℃
Storage temperature	-30 ~ +80	℃
Back Light	8 White LEDS	--
Weight	TBD	g

3. External Dimensions



4. Interface Description

Pin	Pin Name	Description
1~2	LEDA	LED back light(Anode)
3	VGH	Gate on Voltage
4	VGL	Negative power for TFT
5	U/D	Vertical inversion
6	L/R	Horizontal inversion
7~8	LEDK	LED back light(Cathode)
9	AVDD	Power for analog circuit
10	GND	Connect to Ground.
11	3P	Positive polarity of low voltage differential data signal(Data lane 3).
12	3N	Negative polarity of low voltage differential data signal(Data lane 3).
13	GND	Connect to Ground.
14	2P	Positive polarity of low voltage differential data signal(Data lane 2).
15	2N	Negative polarity of low voltage differential data signal(Data lane 2).
16	GND	Connect to Ground.
17	CLKP	Positive polarity of low voltage differential clock signal.
18	CLKN	Negative polarity of low voltage differential clock signal.
19	GND	Connect to Ground.
20	1P	Positive polarity of low voltage differential data signal(Data lane 1).
21	1N	Negative polarity of low voltage differential data signal(Data lane 1).
22	GND	Connect to Ground.
23	0P	Positive polarity of low voltage differential data signal(Data lane 0).
24	0N	Negative polarity of low voltage differential data signal(Data lane 0).
25	GND	Connect to Ground.
26	STBYB	Standby mode control pin
27	RESET	Global reset signal input pin
28~29	VDD	Analog or digital supply voltage
30	VCOM	Common voltage

5. Absolute Maximum Ratings

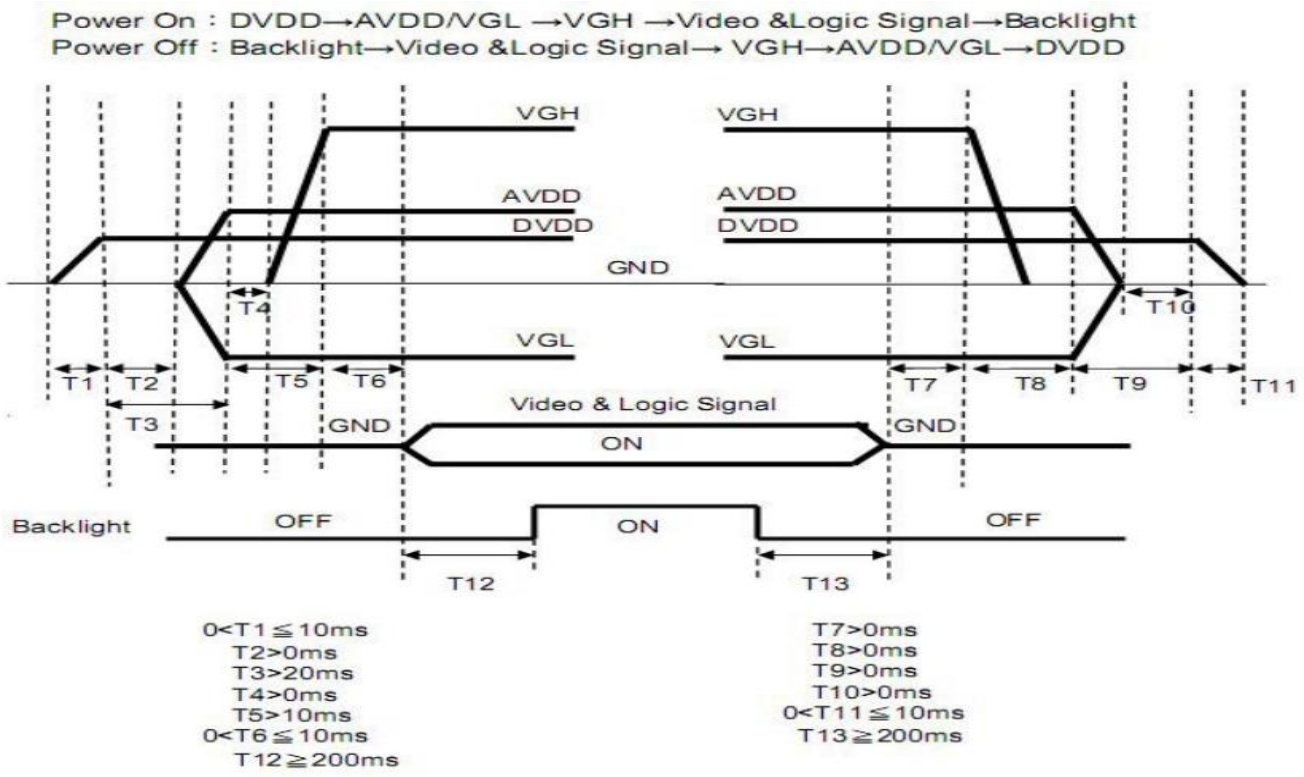
Item	Symbol	Min.	Max.	Unit
Power supply voltage	VDD	-0.3	5.0	V
Operating Temperature	TOP	-30	85	°C
Storage Temperature	TST	-30	85	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply voltage	VDD	3.0	3.3	3.6	V	-
Power supply Current	IVCC	-	8.6	-	mA	-
Gate on Power	VGH	-	15	-	V	-
Gate off Power	VGL	-	-10	-	V	
Power for analog circuit	AVDD	TBD	TBD	TBD	V	
Common voltage	VCOM	TBD	TBD	TBD		

7. Timing Characteristics

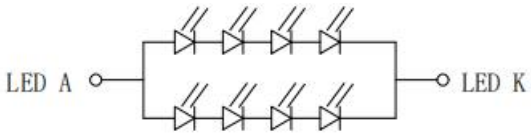
7.1 Power Sequence



7.2 Resolution

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
MIPI(4 lane)		-	386	-	Mbps	
MIPI(3 lane)		-	515	-	Mbps	
DCLK Frequency	fclk	-	64.4	-	MHz	
HSYNC Period time	Th	-	1200	-	DCLK	
Horizontal display area	Thd	-	280	-	DCLK	
HSYNC pulse width	Thpw	-	24	-	DCLK	
HSYNC back porch	Thbp	-	160	-	DCLK	
HSYNC front porch	Tfbp	-	160	-	DCLK	
VSYNC Period time	Th	-	1920	-	H	
Vertical display area	Tvd	-	1424	-	H	
VSYNC pulse width	Tvpw	-	2	-	H	
VSYNC back porch	Tvbp	-	10	-	H	
VSYNC front porch	Tvfp	-	10	-	H	

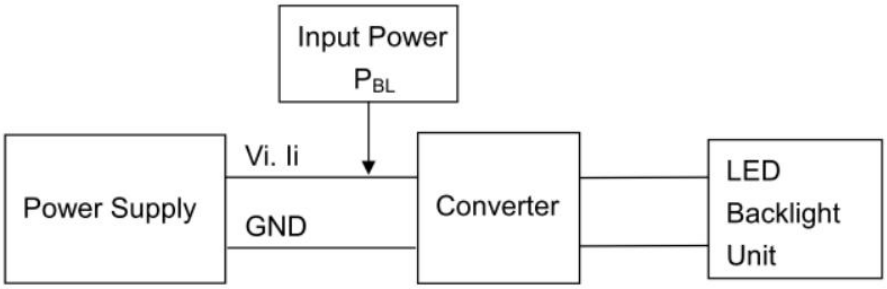
8. Backlight Characteristic



Item	Symbol	MIN	TYP	MAX	UNIT	Remark
Supply Voltage	Vf	10.4	12	14	V	Note 1
Supply Current	If	-	40	-	mA	Note 2
Life Time	-	25000	-	-	Hr	Note 3,4
Backlight Color	White					

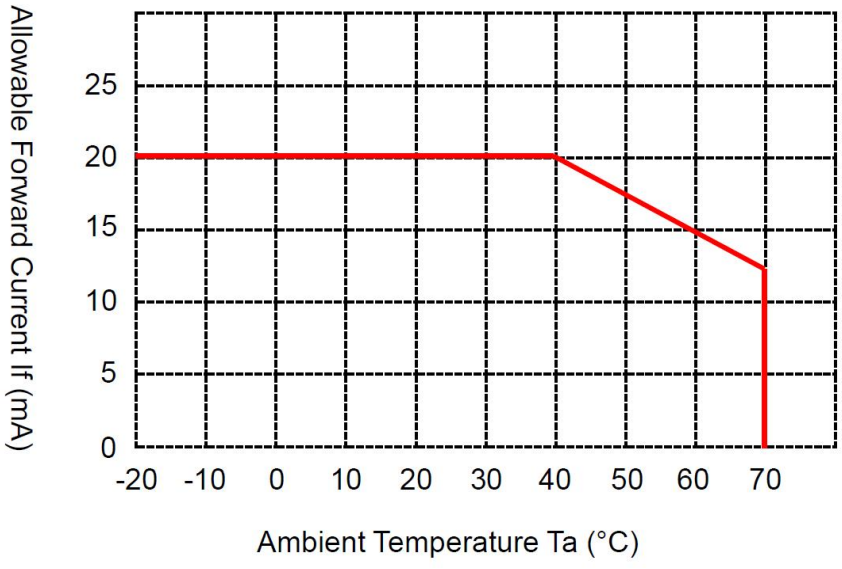
Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and If =40mA.

Note 2: LED current is measured by utilizing a high frequency current meter as shown below:



Note 3: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and If =40mA. The LED lifetime could be decreased if operating If is larger than 40mA.

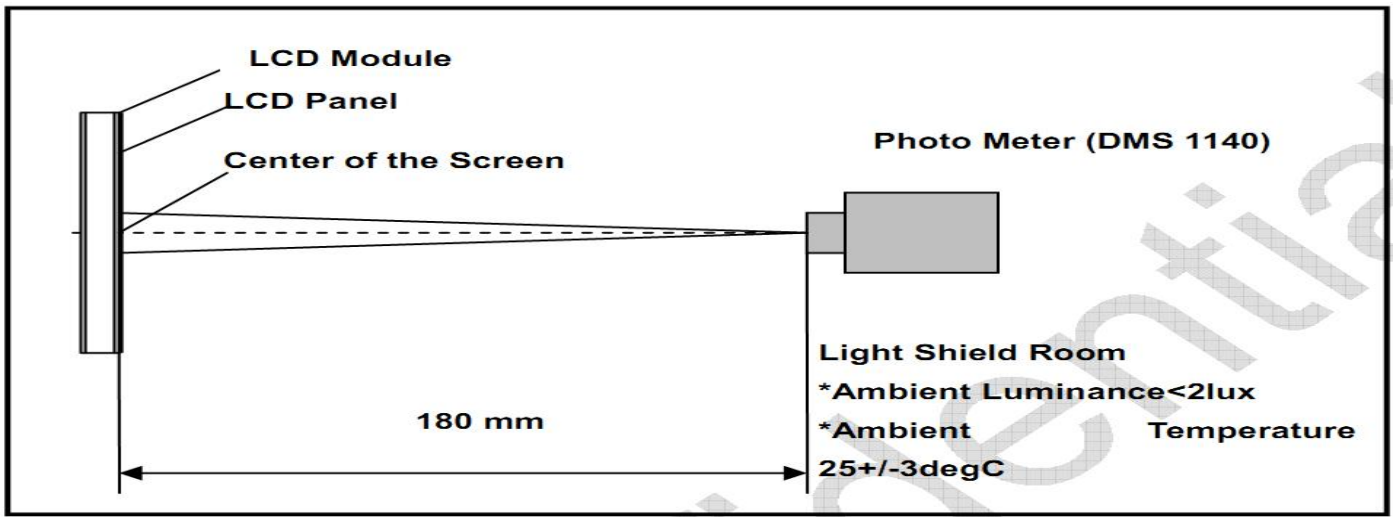
Note 4: LED light bar circuit:



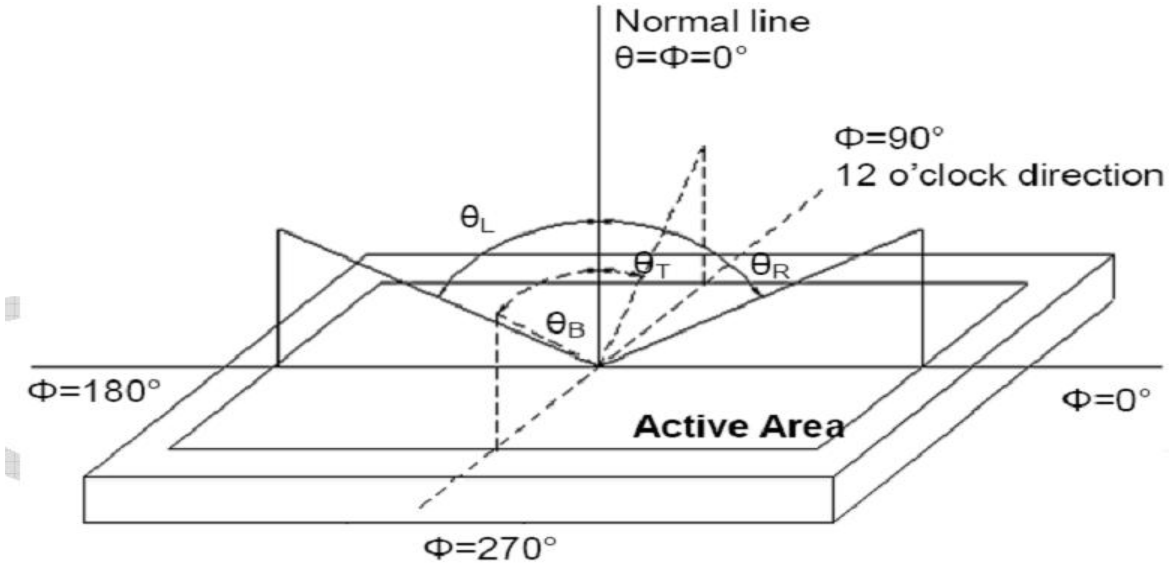
9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	75	80	-	degree	(1),(2),(6)
		θR	75	80	-		
	Vertical	θT	75	80	-		
		θB	75	80	-		
Luminous Intensity for LCM	-		250	300	-	cd/m2	If=40mA
Uniformity for LCM	-		80	-	-	%	If=40mA
Contrast Ratio	Center		800	1000	-	1000	(1),(3),(6)
Response Time	Rising		-	30	40	ms	(1),(4),(6)
	Falling		-	30	40		
CF Color Chromaticity (CIE1931)	White x		0.269	0.319	0.369	-	(1), (6)
	White y		0.293	0.343	0.393	-	
	Red x		0.594	0.644	0.694	-	
	Red y		0.282	0.332	0.382	-	
	Green x		0.274	0.324	0.374	-	
	Green y		0.516	0.566	0.616	-	
	Blue x		0.087	0.137	0.187	-	
	Blue y		0.075	0.125	0.175	-	

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note (2) Definition of Viewing Angle



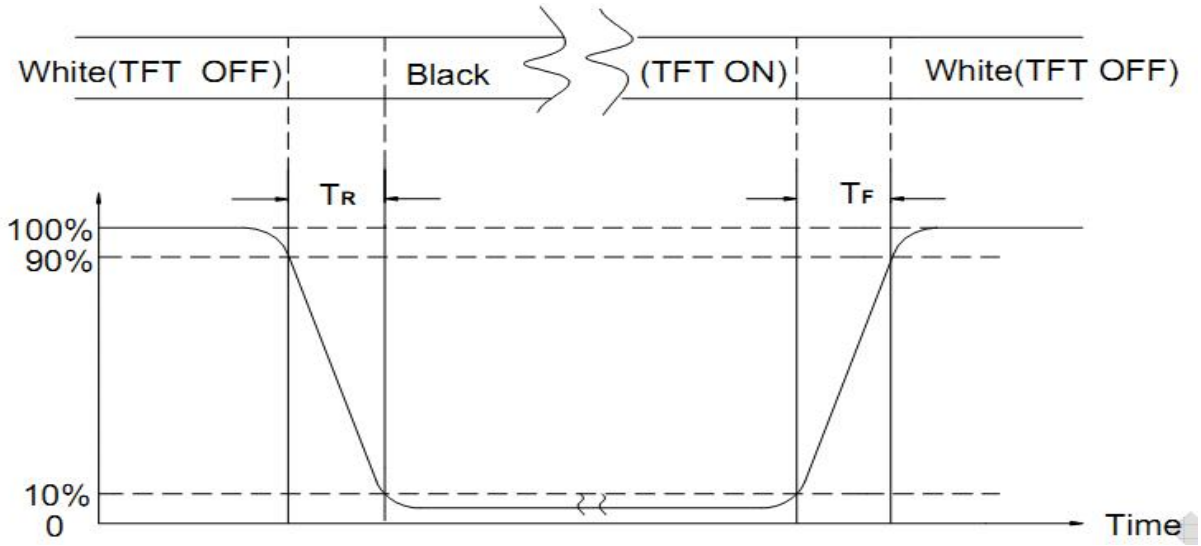
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255, L0: Luminance of gray level 0

Note (4) Definition of response time



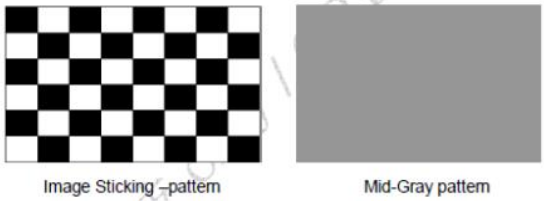
Note (5) Definition of Transmittance (Module is without signal input)

Transmittance = Center Luminance of LCD / Center Luminance of Back Light x 100%

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD

10. Reliability Test Conditions and Methods

No.	Test Items	Test Condition	Inspection After Test
1	High Temperature Storage	85°C±2°C×96Hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects: 1, Air bubble in the LCD. 2, Seal leak. 3, Non-display. 4, Missing segments. 5, Glass crack. 6, Current IDD is twice higher than initial value. 7, The surface shall be free from damage. 8, The electric characteristic requirements shall be satisfied.
2	Low Temperature Storage	-30°C±2°C×96Hours	
3	High Temperature Operating	85°C±2°C×96Hours	
4	Low Temperature Operating	-30°C±2°C×96Hours	
5	Temperature Cycle(Storage)	-20°C (30min) ⇔ 25°C (5min) ⇔ 60°C (30min) 1cycle Total 10cycle	
6	Damp Proof Test (Storage)	50°C±5°C×90%RH×96Hours	
7	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5mm X,Y,Z direction for total 3hours (packing condition test will be tested by a carton)	
8	Drooping Test	Drop to the ground from 1M height one time every side of carton. (packing condition test will be tested by a carton)	
9	ESD Test	Voltage:±6KV,R:330Ω,C:150PF,Air Mode,10times	
10	Image Sticking Test	25 ± 2°C Operation with test pattern sustained for 2 hrs, then change to gray pattern immediately. After 5 mins, the mura must be disappeared completely  Image Sticking –pattern Mid-Gray pattern	

REMARK:
1, The Test samples should be applied to only one test item.
2, Sample side for each test item is 5~10pcs.
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 judge as a good part.
5, EL evaluation should be accepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11. Inspection Standard

11.1 Scope

Specifications contain

11.1.1 Display Quality Evaluation

11.1.2 Mechanics Specification

11.2 Sampling Plan

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E.

11.2.1 Lot size: Quantity per shipment as one lot (different model as different lot).

11.2.2 Sampling type: Normal inspection, single sampling.

11.2.3 Sampling level: Level II.

11.2.4 AQL: Acceptable Quality Level

Major defect: AQL=0.65

Minor defect: AQL=1.5

11.3 Panel Inspection Condition

11.3.1 Environment:

Room Temperature: 25±5°C.

Humidity: 65±5% RH.

Illumination: 300 ~ 700 Lux.

11.3.2 Inspection Distance:

35±5 cm

11.3.3 Inspection Angle:

The vision of inspector should be perpendicular to the surface of the Module.

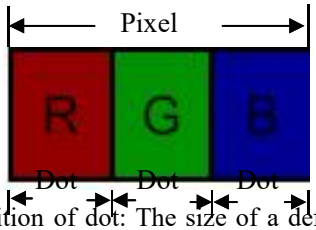
11.3.4 Inspection time：

Perceptibility Test Time: 20 seconds max.

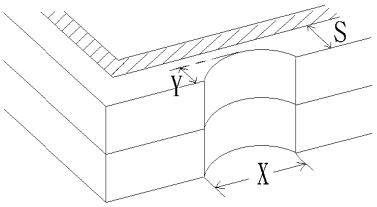
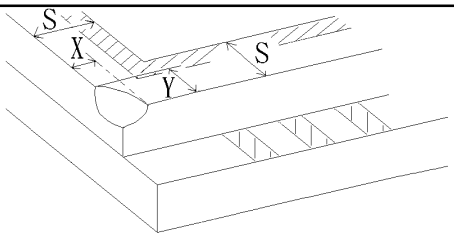
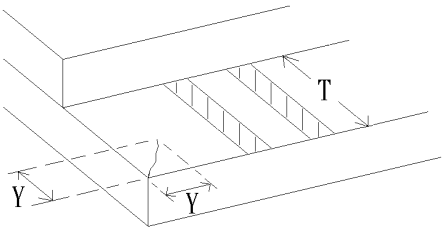
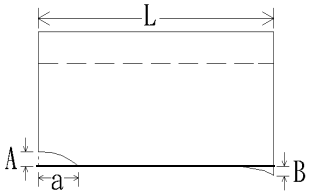
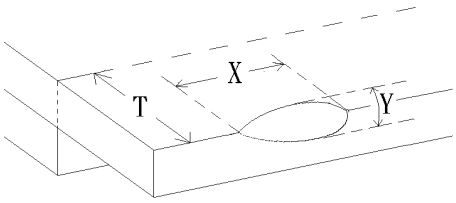
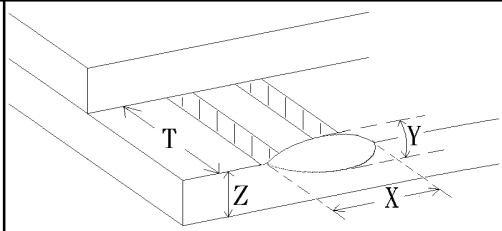
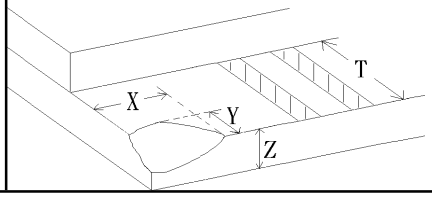
11.4 Inspection Plan

Class	Item	Judgment	Class
Packing & Indicate	1. Outside and inside package.	"MODEL NO.", "LOT NO." and "QUANTITY" should indicate on the package.	Minor
	2. Model mixed and quantity.	Other model mixed Quantity short or over	Major
	3. Product indication.	"MODEL NO." should indicate on the product.	Major
Assembly	4. Dimension, LCD glass scratch and scribe defect.	According to specification or drawing.	Major
Appearance	5. Viewing area.	Polarizer edge or LCD's sealing line is visible in the viewing area…….Rejected.	Minor
	6. Blemish, black spot, white spot in the LCD and LCD glass cracks.	According to standard of visual inspection.(inside viewing area)	Minor
	7. Blemish, black spot, white spot and scratch on the polarizer.	According to standard of visual inspection.(inside viewing area)	Minor
	8. Bubble in polarizer.	According to standard of visual inspection.(inside viewing area)	Minor
	9. LCD's rainbow color.	Strong deviation color (or newton ring) of LCD…….....Rejected. Or according to limited sample.(if needed, and inside viewing area)	Minor
Electrical	10. Electrical and optical characteristics.(contrast Vop chromaticity….etc)	According to specification or drawing.(inside viewing area)	Major
	11. Missing line.	Missing dot line character	Major
	12.Short circuit. Wrong pattern display.	No display, wrong pattern display, current consumption. Out of specification	Major
	13. Dot defect.(for color and TFT)	According to standard of visual Inspection.	Minor

11.5 Standard Of Visual Inspection

<table>
<tr><th>No.</th><th>Class</th><th>Item</th><th>Judgment</th></tr>
<tr><td>11.5.1</td><td>Minor</td><td>Black and white spot.
Foreign materiel.
Dust.
Blemish.
Scratch.</td><td>(A) Round type: Unit: mm
<table>
<tr><th>Diameter (mm.)</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.2</td><td>Disregard</td></tr>
<tr><td>0.2 < Φ≦0.25</td><td>3(Distance>5mm)</td></tr>
<tr><td>0.25 < Φ</td><td>0</td></tr>
</table>
Note: Φ = (length+width)/2
(B) Linear type: Unit: mm
<table>
<tr><th>Length</th><th>Width (mm.)</th><th>Acceptable Q'ty</th></tr>
<tr><td>--</td><td>W≦0.03</td><td>Disregard</td></tr>
<tr><td>L≦5.0</td><td>0.03< W≦0.07</td><td>2(Distance>5mm)</td></tr>
<tr><td>--</td><td>0.07 < W</td><td>FOLLOW ROUND TYPE</td></tr>
</table></td></tr>
<tr><td>11.5.2</td><td>Minor</td><td>Dent on polarizer.</td><td>Unit: mm.
<table>
<tr><th>Diameter</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.2</td><td>Disregard</td></tr>
<tr><td>0.2 < Φ≦0.5</td><td>2(Distance>5mm)</td></tr>
<tr><td>0.5 < Φ</td><td>0</td></tr>
</table></td></tr>
<tr><td>11.5.3</td><td>Minor</td><td>Bubble in polarizer.</td><td>Unit: mm.
<table>
<tr><th>Diameter</th><th>Acceptable Q'ty</th></tr>
<tr><td>Φ≦0.2</td><td>Disregard</td></tr>
<tr><td>0.2< Φ≦0.5</td><td>2(Distance>5mm)</td></tr>
<tr><td>0.5 < Φ</td><td>0</td></tr>
</table></td></tr>
<tr><td>11.5.4</td><td>Minor</td><td>Dot defect</td><td>
<table>
<tr><th>Items</th><th>Acceptable Q'ty</th></tr>
<tr><td>Bright dot</td><td>N ≦2(Distance>5mm)</td></tr>
<tr><td>Dark dot</td><td>N ≦2(Distance>5mm)</td></tr>
<tr><td>Total dot</td><td>N ≦4</td></tr>
</table>
Pixel define : 

Note1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
Note 3: The bright dot defect must be visible through 2% ND filter
Note 4: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern.</td></tr>
<tr><td>11.5.5</td><td>Minor</td><td>Mura</td><td>ND 5% (In 50% gray screen)</td></tr>
</table>

No.	Class	Item	Judgment
11.5.6	Minor	LCD glass chipping.	 Y>S Reject
11.5.7	Minor	LCD glass chipping.	 X or Y>S Reject
11.5.8	Major	LCD glass crack.	 Y>(1/2) T Reject
11.5.9	Major	LCD glass scribe defect.	 1. a>L/3, A>1.5mm Reject 2. B : According to dimension
11.5.10	Minor	LCD glass chipping. (on the terminal area)	 Φ = (x+y)/2>2.5mm Reject
11.5.11	Minor	LCD glass chipping. (on the terminal surface)	 Y>(1/3)T Reject
11.5.12	Minor	LCD glass chipping.	 Y>T Reject

12. Handling Precautions

12.1 Mounting Method

The LCD panel of MTUSATFT module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

12.2 Caution of LCD Handling And Cleaning

When cleaning the display surface, Use soft cloth with solvent

[Recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (CI), Sulfur (S) from customer, Responsibility is on customer.

12.3 Caution Against Static Charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to power or ground, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

12.4 Packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

12.5 Caution for operation

It is an indispensable condition to drive LCD's within the specified voltage limit since the higher

- voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

12.6 Storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.

[It is recommended to store them as they have been contained in the inner container at the time of delivery from us

12.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water

13. Precaution for Use

13.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

13.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to Microtips TFT , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer’s operating set for sample evaluation in the customer site.