



**Microtips Technology**

*Innovative Solutions. Your Vision. Our Goal.*

## TFT Module Specification

**MODEL: AWD-10801080T50N01**

This module uses ROHS material

CUSTOMER
APPROVED BY
DATE:

Approved by	Checked by		Made by
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## Revision Record

[illegible]



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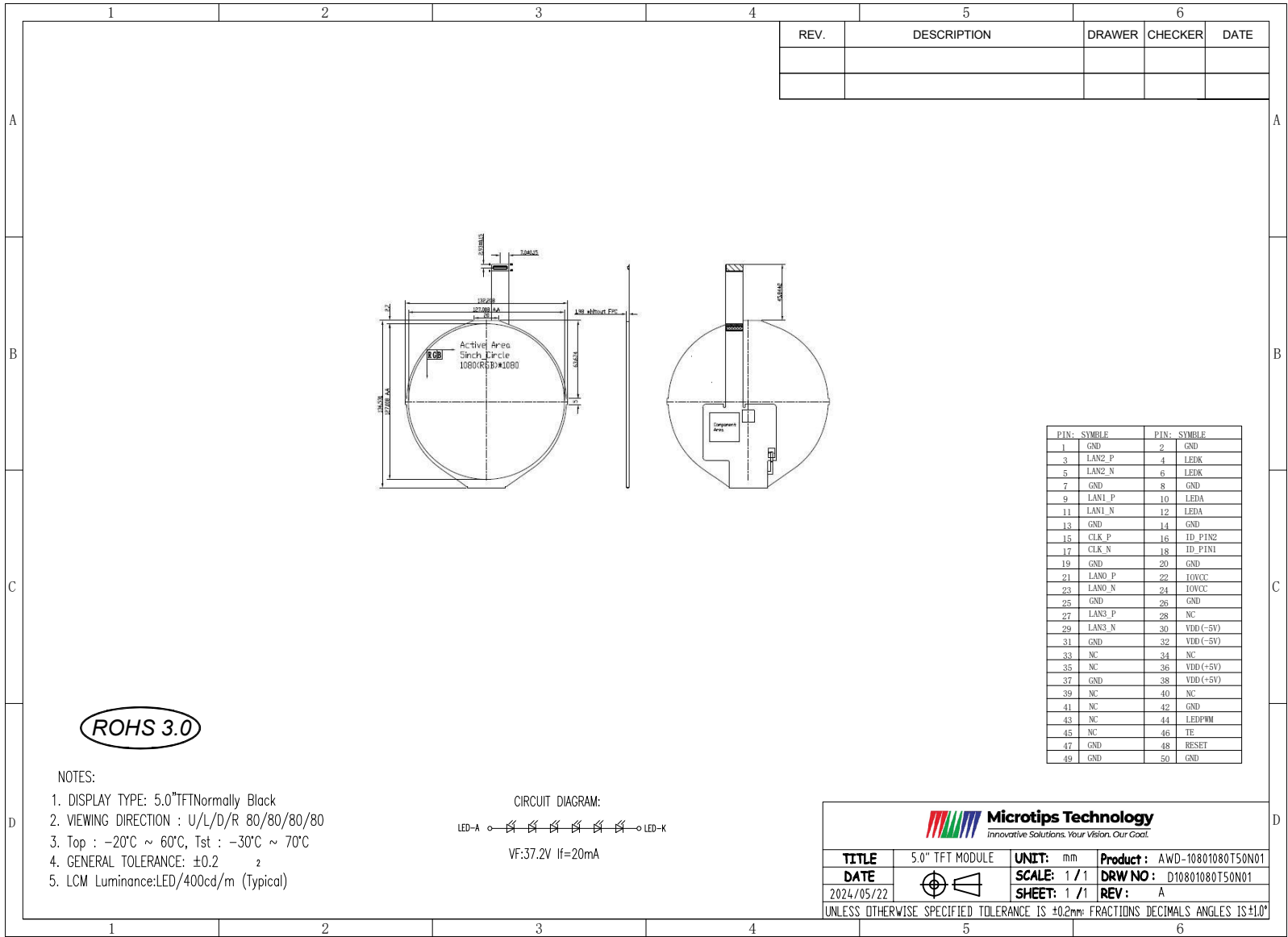
## 1. Scope

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	5.0" TFT	--
Dot arrangement	1080×1080	dots
Color filter array	RGB vertical stripe	--
Display mode	Normally Black	-
Viewing Direction	80/80/80/80 deg(U/D/L/R @ C/R>10)	--
Module size	136.531(W)×132.208(H)×1.98(T)	mm
Active area	127.008(W)×127.008(H)	mm
Dot pitch	0.1176(W)×0.1176(H)	mm
Interface	MIPI	--
Operating temperature	-20 ~ +60	°C
Storage temperature	-30 ~ +70	°C
Back Light	6 White LEDS	--

### 3. External Dimensions





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## 4. Interface Description

### Connector Model Number: DF40C-50DP-0.4V

Pin No.	Pin Name	Description
1~2	GND	Power ground
3	LAN2_P	MIPI DSI differential data pair
4	LEDK	LED backlight (Cathode).
5	LAN2_N	MIPI DSI differential data pair
6	LEDK	LED backlight (Cathode).
7~8	GND	Power ground
9	LAN1_P	MIPI DSI differential data pair
10	LEDA	LED backlight (Anode).
11	LAN1_N	MIPI DSI differential data pair
12	LEDA	LED backlight (Anode).
13~14	GND	Power ground
15	CLK_P	MIPI DSI differential clock pair
16	ID_PIN2	ID pd to GND
17	CLK_N	MIPI DSI differential clock pair
18	ID_PIN1	ID pd to GND
19~20	GND	Power ground
21	LAN0_P	MIPI DSI differential data pair
22	IOVCC	Disp digital power
23	LAN0_N	MIPI DSI differential data pair



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24	IOVCC	Disp digital power
25~26	GND	Power ground
27	LAN3_P	MIPI DSI differential data pair
28	NC	No connection
29	LAN3_N	MIPI DSI differential data pair
30	VDD(-5)	Display -5V analog rail
31	GND	Power ground
32	VDD(-5)	Display -5V analog rail
33~35	NC	No connection
36	VDD(+5)	Display +5V analog rail
37	GND	Power ground
38	VDD(+5)	Display +5V analog rail
39~41	NC	No connection
42	GND	Power ground
43	NC	No connection
44	LEDPWM	Backlight pwm output
45	NC	No connection
46	TE	Disp tearing effect out
47	GND	Power ground
48	RESET	Disp Reset
49~50	GND	Power ground



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## 5. Absolute Maximum Ratings

The absolute maximum ratings are list on table as follows. When used out of the absolute maximum ratings, the LSI may be permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are exceeded during normal operation, the LSI will malfunction and cause poor reliability.

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	IOVCC	-0.3	3.6	V
Analog Supply Voltage	VSP	-0.3	6.6	V
Analog Supply Voltage	VSN	-6.6	0	V
Operating Temperature	TOP	-20	60	°C
Storage Temperature	TST	-30	70	°C
Storage Humidity	HD	20	90	%RH

### Note:

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.

## 6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic Supply Voltage	IOVCC	1.65	1.8	3.3	V	-
Analog Positive Supply Voltage	VSP	4.8	5	6	V	-
Analog Negative Supply Voltage	VSN	-6	-5	-4.8	V	-
Input High Voltage	V <sub>IH</sub>	0.7IOVCC	-	IOVCC	V	-
Input Low Voltage	V <sub>IL</sub>	GND	-	0.3 IOVCC	V	-
Power Consumption	PD	-	-	-	W	Note
	PBL	-	0.744	0.768	W	-
	PTotal	-		-	W	-

### Note:

Frame rate=60HZ, Typ. Pattern White pattern, worst case pattern 1×1 checker 25°C.

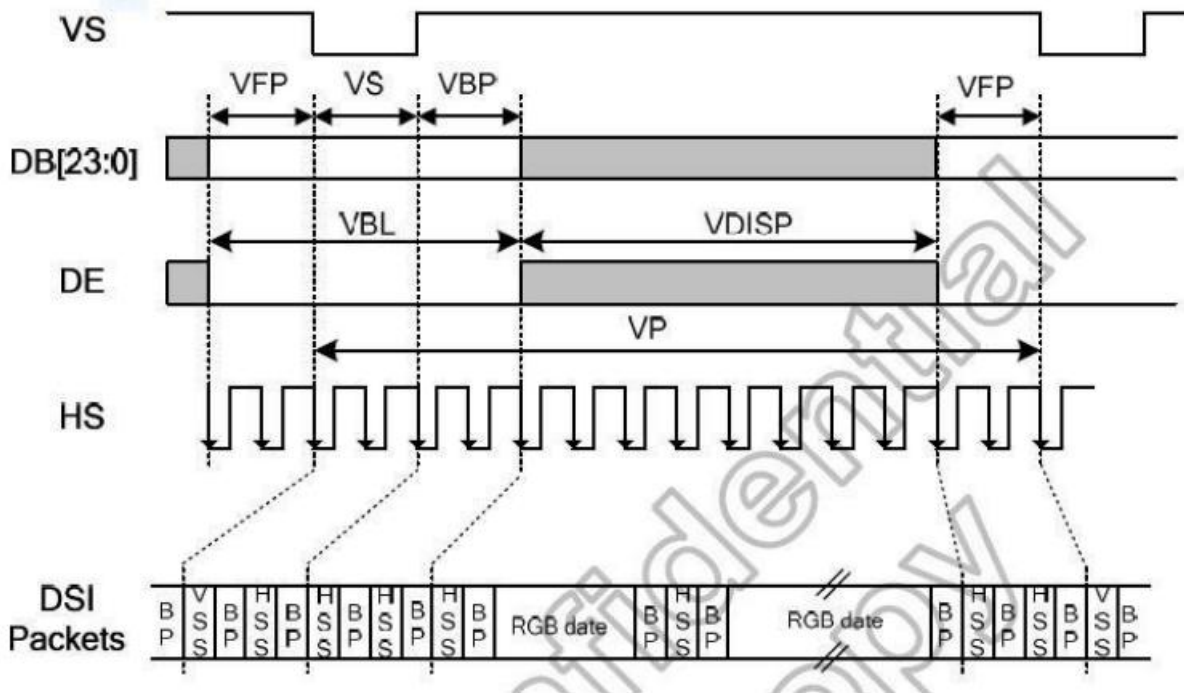




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## 7. Timing Characteristics

### 7.1 **SIGNAL TIMING SPECIFICATION** Vertical Timing



Vertical Resolution=528+8xNL (VSSA=0V, VDD1=1.8V, VDD3=2.8V, T<sub>A</sub>=25°C)

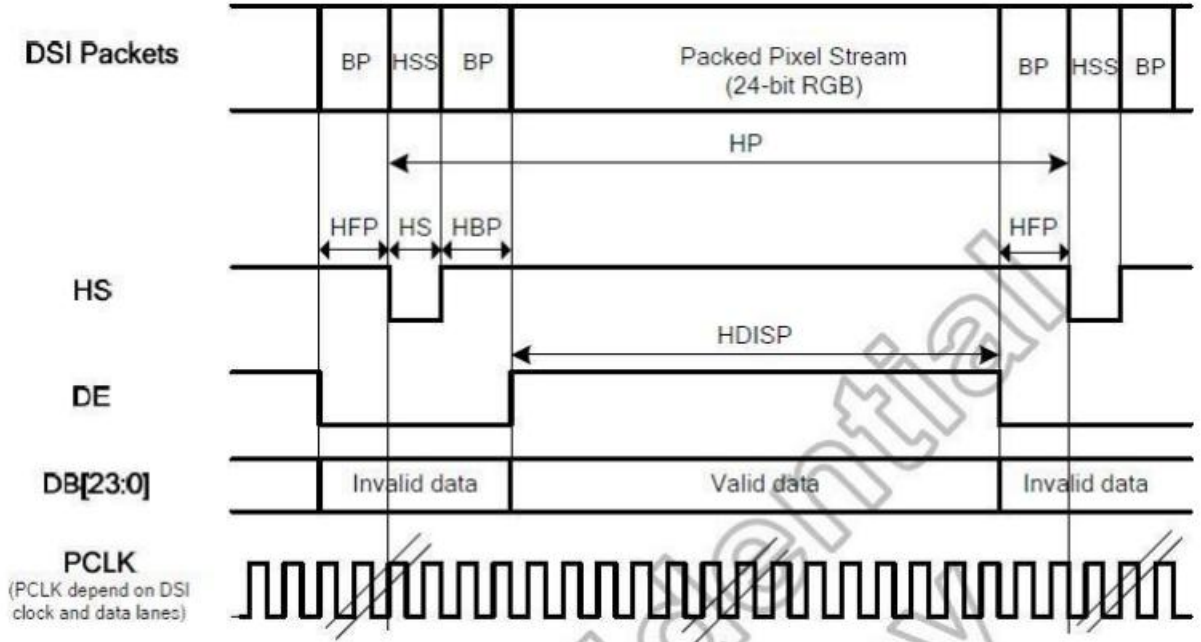
Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Vertical cycle	VP	-	534+8xNL	-	-	Line
Vertical low pulse width	VS	-	2	-	Note <sup>(1)</sup>	Line
Vertical front porch	VFP	-	2	-	-	Line
Vertical back porch	VBP	-	2	-	Note <sup>(1)</sup>	Line
Vertical data start point	-	VS+VBP	4	-	Note <sup>(1)</sup>	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	-	Line
Vertical active area	-	VDISP	-	528+8xNL	-	Line
Vertical Refresh rate	VRR	-	-	60	-	Hz

**Note:** (1) The VS and VBP pulse width are related to GSP and GCK timing. The GSP and GCK must be set at corresponding position for LCD normal display.



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## Horizontal Timing



Horizontal Resolution=H\_RES(1080/1024/960/900/800/720) (VSSA=0V, VDD1=1.8V, VDD3 = HS\_VCC =2.8V, T<sub>A</sub>=25°C)

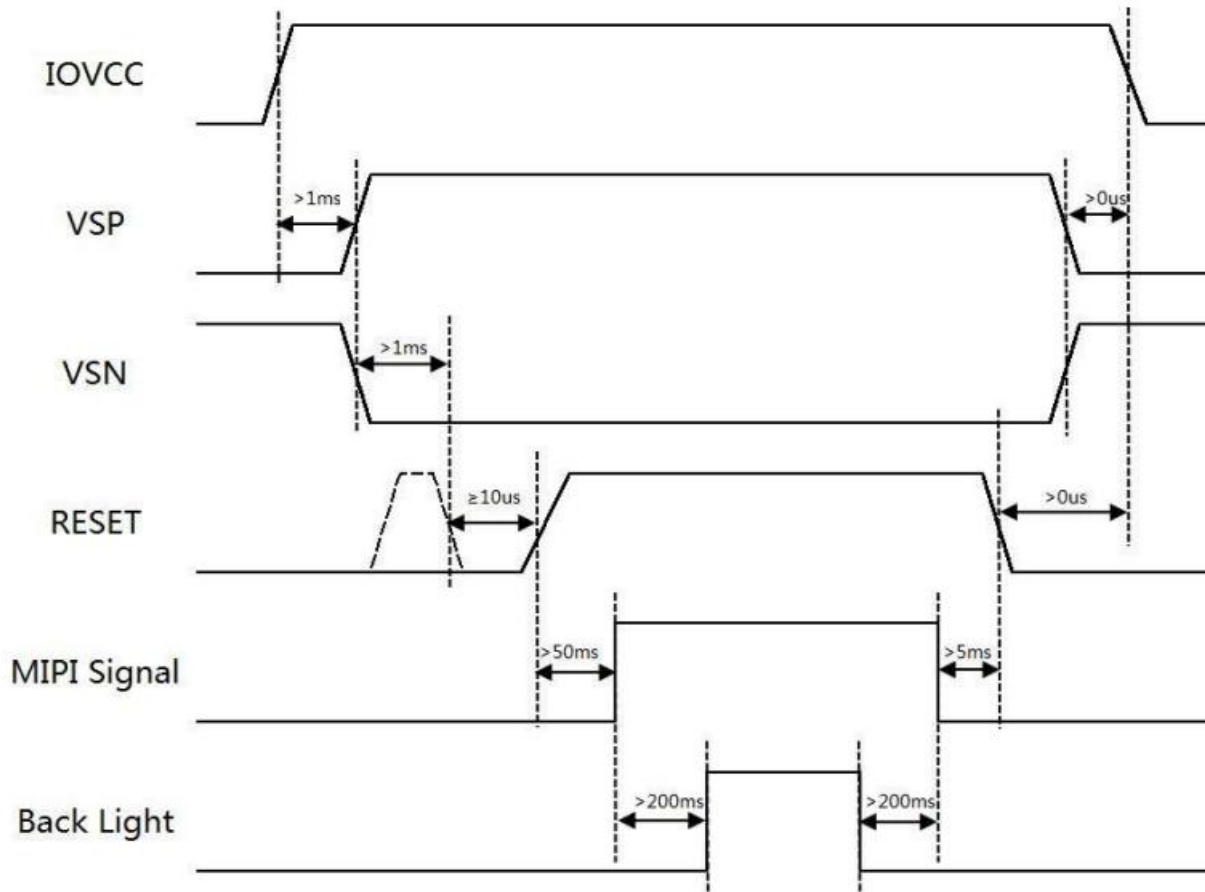
Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
HS cycle	HP	-	H_RES+66	-	-	DCK
HS low pulse width	HS	-	25	-	-	DCK
Horizontal back porch	HBP	-	25	-	-	DCK
Horizontal front porch	HFP	-	16	-	-	DCK
Horizontal data start point	-	HS+HBP	50 Note <sup>(1)</sup>	-	-	DCK
Horizontal blanking period	HBLK	HS+HBP+HFP	66	-	-	DCK
Horizontal active area	HDISP	-	-	H_RES	-	DCK

**Note:** (1) HS+HBP must larger than 50 PCLK.

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## 7.2 POWER ON/OFF SEQUENCE

### Power on/off Sequence



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## 8. Backlight Characteristic

Item	Symbol	MIN	TYP	MAX	UNIT	Remark
Supply Voltage	Vf	-	37.2	38.4	V	-
Supply Current	If	-	20	-	mA	-
LED Power consumption	PLED		0.744	0.768	W	Note 1
Life Time	-	20000		-	Hr	-
Backlight Color	White					

### Notes:

1. Calculator Value for reference  $I_{LED} \times V_{LED} \times LED \text{ Quantity} = P_{LED}$
2. The LED Life-time define as the estimated time to 50% 30000hrs degradation of initial luminous.

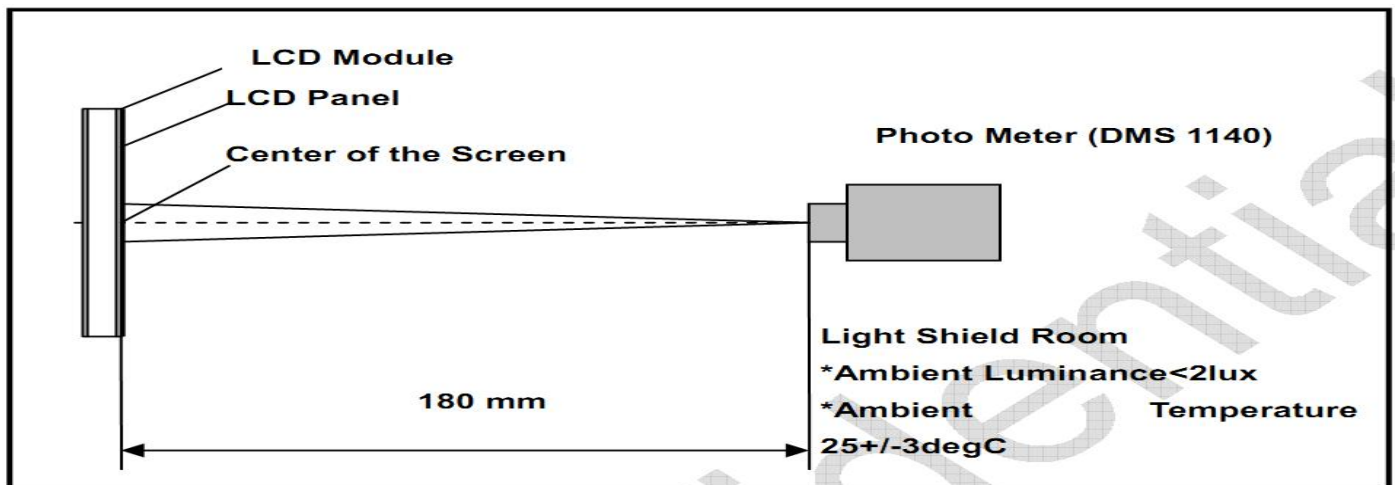


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## 9. Optical Characteristics

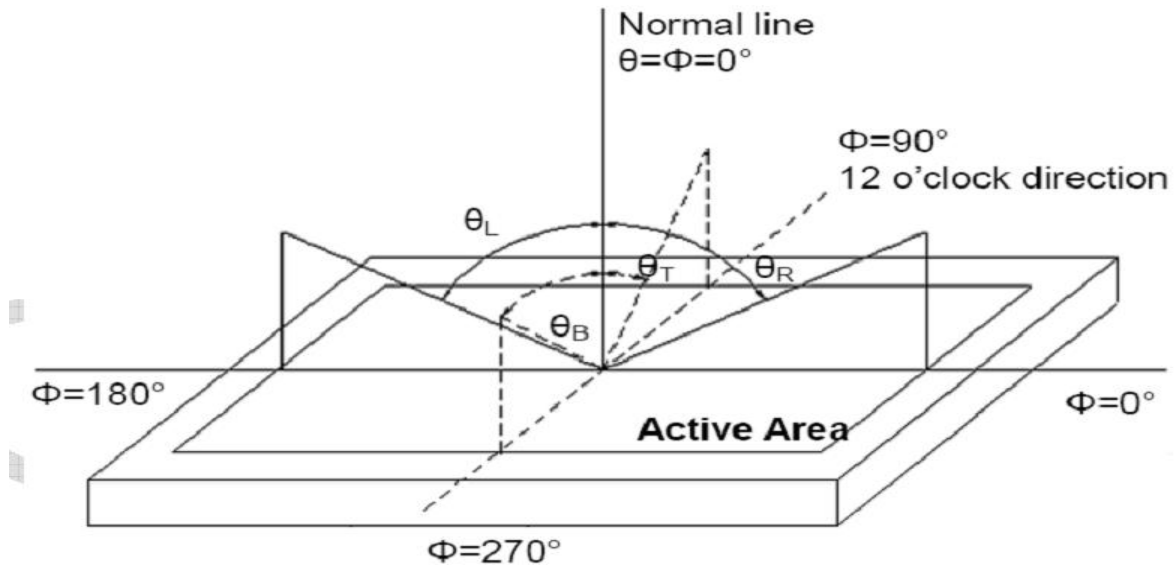
Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θL	70	80	-	degree	(1),(2),(6)
		θR	70	80	-		
	Vertical	θT	70	80	-		
		θB	70	80	-		
Luminous Intensity for LCM	-		350	400	-	cd/m2	If=20mA
Uniformity for LCM	-		70	-	-	%	If=20mA
Contrast Ratio	Center		800	1300	-	-	(1),(3),(6)
Response Time	Rising +Falling		-	-	40	ms	(1),(4),(6)
CF Color Chromaticity (CIE1931)	White x		0.256	0.306	0.356	-	(1), (6)
	White y		0.268	0.318	0.3678	-	
	Red x		0.636	0.686	0.736	-	
	Red y		0.254	0.304	0.354	-	
	Green x		0.214	0.264	0.314	-	
	Green y		0.579	0.629	0.679	-	
	Blue x		0.097	0.147	0.197	-	
	Blue y		-	0.047	0.097	-	
			65	70		%	

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.



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Note (2) Definition of Viewing Angle



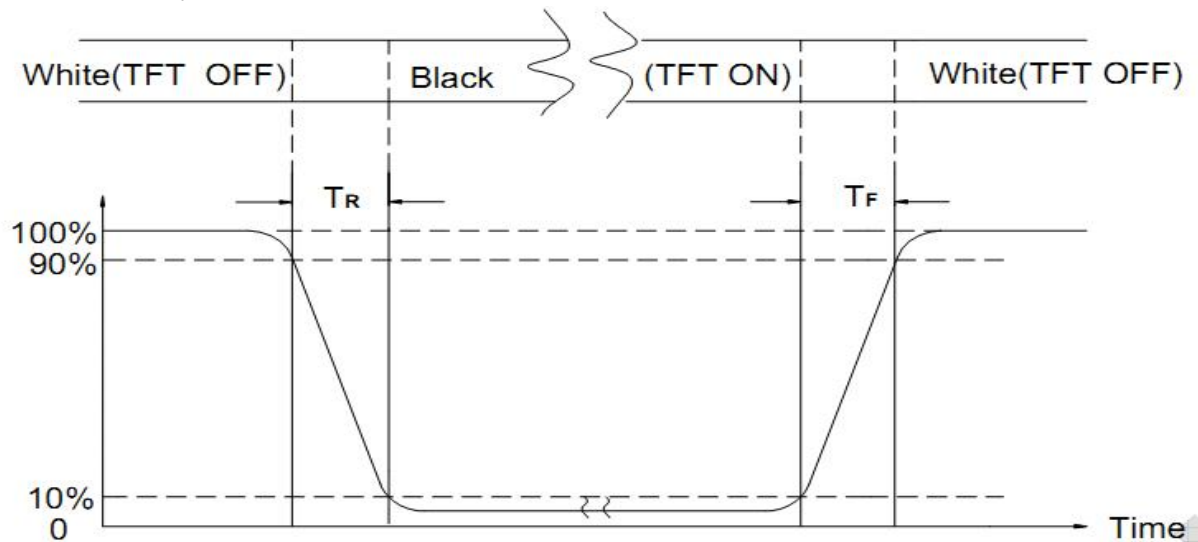
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

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

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)

$$\text{Transmittance} = \text{Center Luminance of LCD} / \text{Center Luminance of Back Light} \times 100\%$$

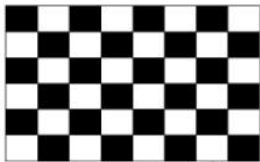

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD



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## 10. Reliability Test Conditions and Methods

No.	Test Items	Test Condition	Inspection After Test
1	High Temperature Storage	70°C±2°C×96Hours	<p>Inspection after 2~4hours storage at room temperature, the samples should be free from defects:</p> <ol style="list-style-type: none"> <li>1, Air bubble in the LCD.</li> <li>2, Seal leak.</li> <li>3, Non-display.</li> <li>4, Missing segments.</li> <li>5, Glass crack.</li> <li>6, Current IDD is twice higher than initial value.</li> <li>7, The surface shall be free from damage.</li> <li>8, The electric characteristic requirements shall be satisfied.</li> </ol>
2	Low Temperature Storage	-30°C±2°C×96Hours	
3	High Temperature Operating	60°C±2°C×96Hours	
4	Low Temperature Operating	-20°C±2°C×96Hours	
5	Temperature Cycle(Storage)	$  \begin{array}{c}  -20^{\circ}\text{C} \longleftrightarrow 25^{\circ}\text{C} \longleftrightarrow 60^{\circ}\text{C} \\  (30\text{min}) \quad (5\text{min}) \quad (30\text{min}) \\  \longleftarrow \text{1 cycle} \longrightarrow \\  \text{Total 10cycle}  \end{array}  $	
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.



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

Humidity:  $65\pm 5\%$  RH.

Illumination: 300 ~ 700 Lux.

11.3.2 Inspection Distance:

$35\pm 5$  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.





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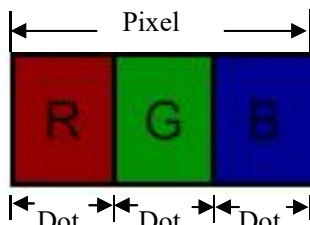
## 11.4 Inspection Plan

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 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



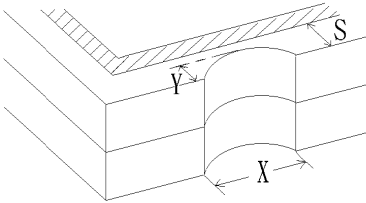
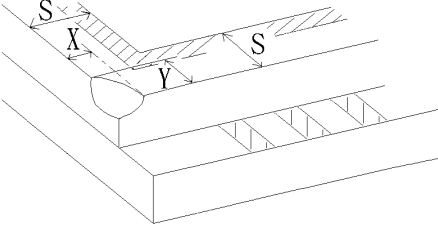
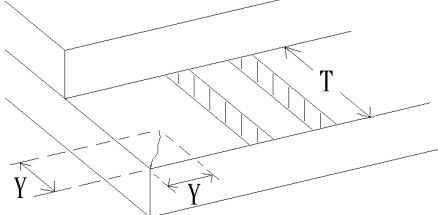
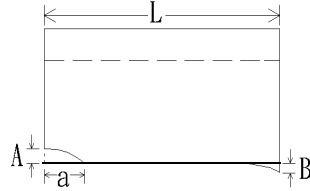
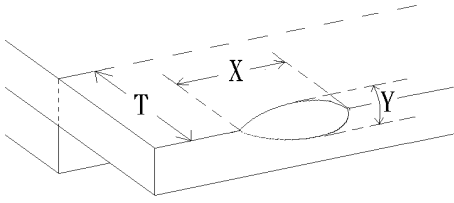
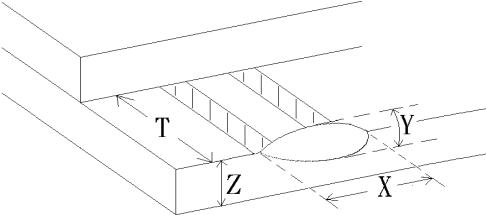
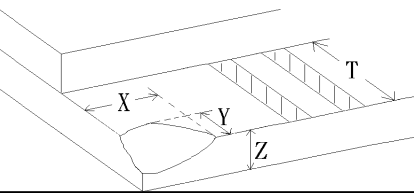
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### 11.5 Standard Of Visual Inspection

No.	Class	Item	Judgment																				
11.5.1	Minor	Black and white spot. Foreign materiel. Dust. Blemish. Scratch.	(A) Round type: Unit: mm <table><tr><td>Diameter (mm.)</td><td>Acceptable Q'ty</td></tr><tr><td><math>\Phi \leq 0.2</math></td><td>Disregard</td></tr><tr><td><math>0.2 &lt; \Phi \leq 0.3</math></td><td>3(Distance&gt;5mm)</td></tr><tr><td><math>0.3 &lt; \Phi</math></td><td>0</td></tr></table> <p>Note: <math>\Phi = (\text{length}+\text{width})/2</math></p> <p>(B) Linear type: Unit: mm <table><tr><td>Length</td><td>Width (mm.)</td><td>Acceptable Q'ty</td></tr><tr><td>--</td><td><math>W \leq 0.03</math></td><td>Disregard</td></tr><tr><td><math>L \leq 5.0</math></td><td><math>0.03 &lt; W \leq 0.07</math></td><td>2(Distance&gt;5mm)</td></tr><tr><td>--</td><td><math>0.07 &lt; W</math></td><td>FOLLOW ROUND TYPE</td></tr></table></p>	Diameter (mm.)	Acceptable Q'ty	$\Phi \leq 0.2$	Disregard	$0.2 < \Phi \leq 0.3$	3(Distance>5mm)	$0.3 < \Phi$	0	Length	Width (mm.)	Acceptable Q'ty	--	$W \leq 0.03$	Disregard	$L \leq 5.0$	$0.03 < W \leq 0.07$	2(Distance>5mm)	--	$0.07 < W$	FOLLOW ROUND TYPE
Diameter (mm.)	Acceptable Q'ty																						
$\Phi \leq 0.2$	Disregard																						
$0.2 < \Phi \leq 0.3$	3(Distance>5mm)																						
$0.3 < \Phi$	0																						
Length	Width (mm.)	Acceptable Q'ty																					
--	$W \leq 0.03$	Disregard																					
$L \leq 5.0$	$0.03 < W \leq 0.07$	2(Distance>5mm)																					
--	$0.07 < W$	FOLLOW ROUND TYPE																					
11.5.2	Minor	Dent on polarizer.	Unit: mm. <table><tr><td>Diameter</td><td>Acceptable Q'ty</td></tr><tr><td><math>\Phi \leq 0.2</math></td><td>Disregard</td></tr><tr><td><math>0.2 &lt; \Phi \leq 0.5</math></td><td>2(Distance&gt;5mm)</td></tr><tr><td><math>0.5 &lt; \Phi</math></td><td>0</td></tr></table>	Diameter	Acceptable Q'ty	$\Phi \leq 0.2$	Disregard	$0.2 < \Phi \leq 0.5$	2(Distance>5mm)	$0.5 < \Phi$	0												
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$0.5 < \Phi$	0																						
11.5.3	Minor	Bubble in polarizer.	Unit: mm. <table><tr><td>Diameter</td><td>Acceptable Q'ty</td></tr><tr><td><math>\Phi \leq 0.2</math></td><td>Disregard</td></tr><tr><td><math>0.2 &lt; \Phi \leq 0.5</math></td><td>2(Distance&gt;5mm)</td></tr><tr><td><math>0.5 &lt; \Phi</math></td><td>0</td></tr></table>	Diameter	Acceptable Q'ty	$\Phi \leq 0.2$	Disregard	$0.2 < \Phi \leq 0.5$	2(Distance>5mm)	$0.5 < \Phi$	0												
Diameter	Acceptable Q'ty																						
$\Phi \leq 0.2$	Disregard																						
$0.2 < \Phi \leq 0.5$	2(Distance>5mm)																						
$0.5 < \Phi$	0																						
11.5.4	Minor	Dot defect	<table><tr><td>Items</td><td>Acceptable Q'ty</td></tr><tr><td>Bright dot</td><td><math>N \leq 2</math></td></tr><tr><td>Dark dot</td><td><math>N \leq 3</math></td></tr><tr><td>Total dot</td><td><math>N \leq 4</math></td></tr></table> <p>Pixel define : </p> <p>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.</p>	Items	Acceptable Q'ty	Bright dot	$N \leq 2$	Dark dot	$N \leq 3$	Total dot	$N \leq 4$												
Items	Acceptable Q'ty																						
Bright dot	$N \leq 2$																						
Dark dot	$N \leq 3$																						
Total dot	$N \leq 4$																						
11.5.5	Minor	Mura	ND 5% (In 50% gray screen)																				



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No.	Class	Item	Judgment
11.5.6	Minor	LCD glass chipping.	 $Y > S$ Reject
11.5.7	Minor	LCD glass chipping.	 $X \text{ or } Y > S$ Reject
11.5.8	Major	LCD glass crack.	 $Y > (1/2) T$ Reject
11.5.9	Major	LCD glass scribe defect.	 <p>1. <math>a &gt; L/3</math>, <math>A &gt; 1.5\text{mm}</math>      Reject 2. B : According to dimension</p>
11.5.10	Minor	LCD glass chipping. (on the terminal area)	 $\Phi = (x+y)/2 > 2.5\text{mm}$ 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



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## 12. Handling Precautions

### 12.1 Mounting Method

The LCD panel of MT USA TFT module consists of two thin glass plates with polarizes which easily be damaged. And since the module is 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 happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

### 12.3 Caution Against Static Charge

The LCD module uses C-MOS LSI drivers, so we recommend 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

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- 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



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## 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.

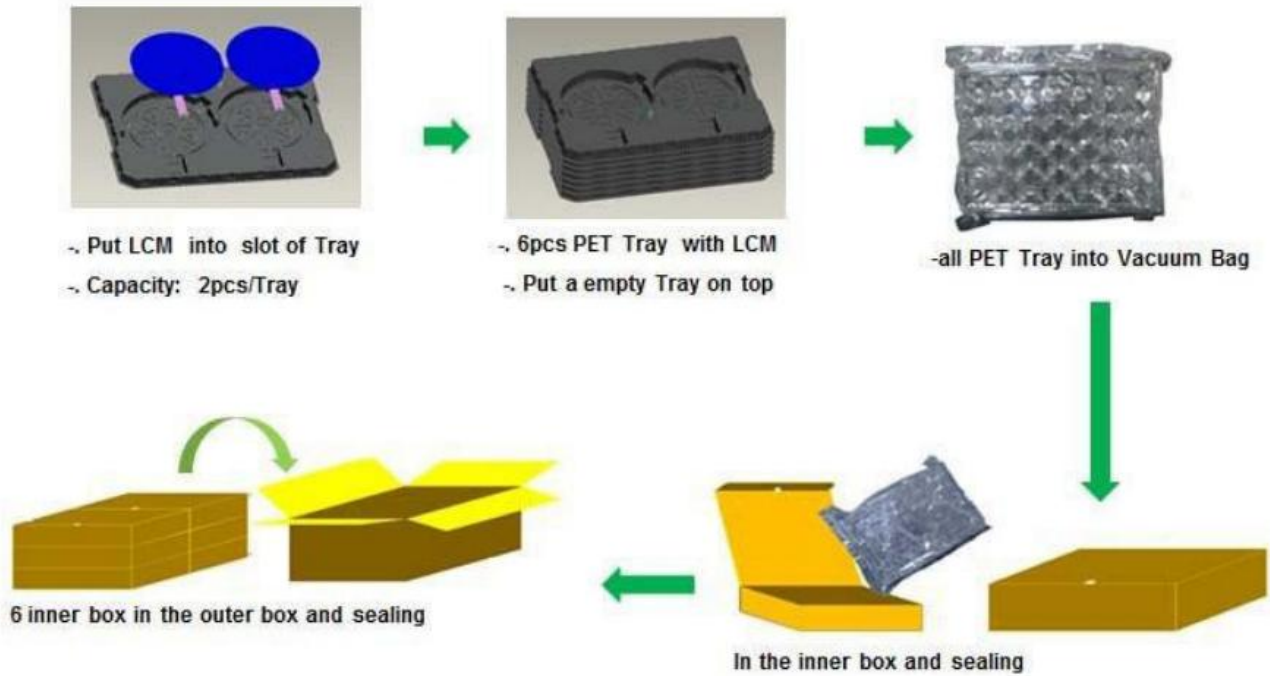
### 13.2

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.

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## 14. Packing



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