

SPECIFICATION FOR

Module: ET015SQ05

Designed by	R&D Checked by	Quality Department by	Approved by

Approval by Customer:

OK

NG, Problem survey

Approved By _____



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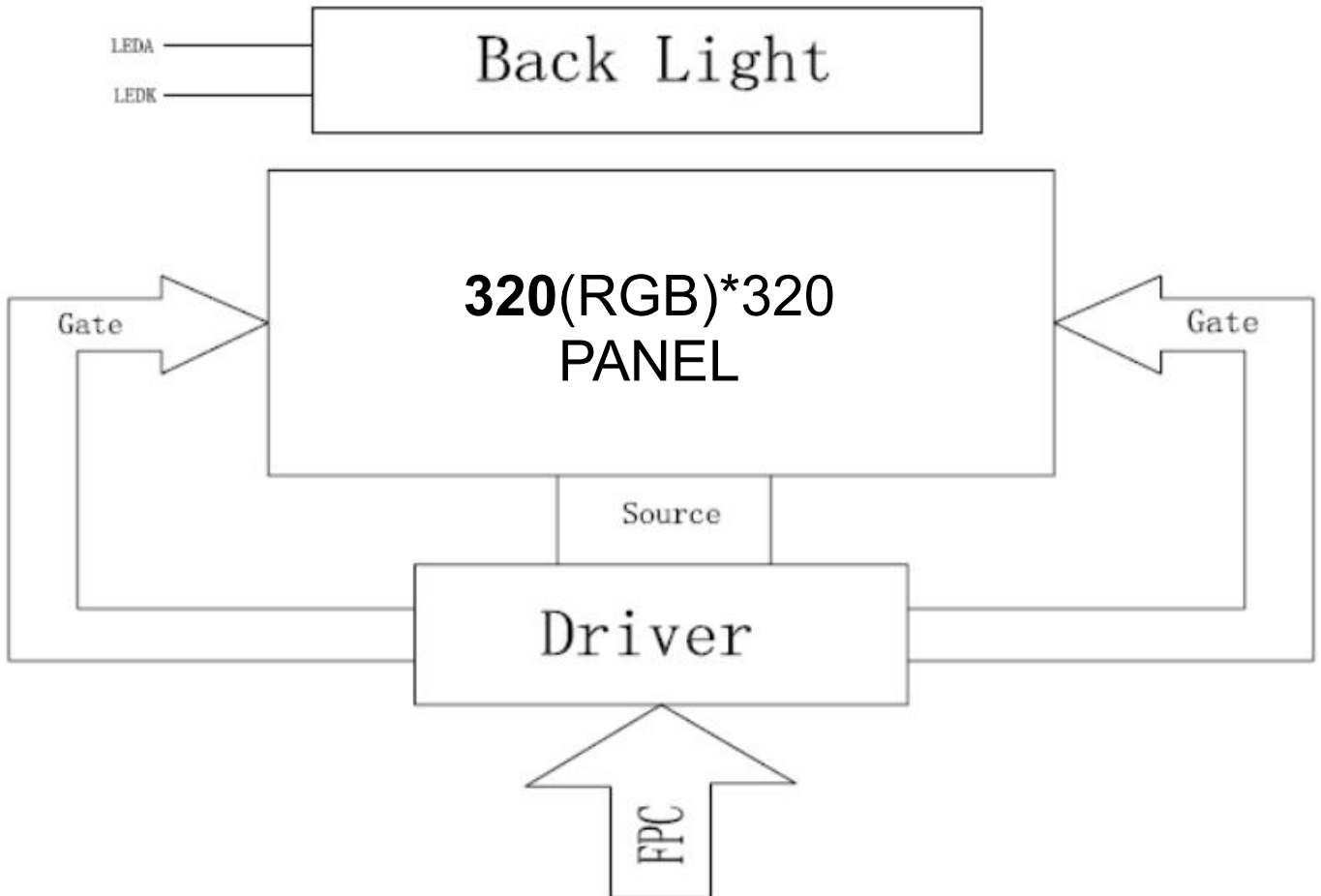


1. Technical parameters

ITEM	STANDARD VALUES	UNITS
LCD type	1.54TFT	--
Dot arrangement	320(RGB)×320	dots
Color filter array	RGB vertical stripe	--
Display mode	IPS/ Transmission / Normally Black	-
Eyes Viewing Direction	80/80/80/80	--
Driver IC	ST7796U	--
Module size	31.52(W)×33.72(H)×1.45(T)(Exclude FPC)	mm
Active area	27.74(W)×27.74(H)	mm
Interface	SPI4	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	White LED*3	--



2. Block Dimension



4. Input terminal Pin Assignment Description

PIN NO.	PIN NAME	DESCRIPTION
1	GND	System power ground.
2	RESET	Reset signal input terminal, active at 'L'.
3	NC	NC
4	NC	NC
5	GND	System power ground.
6-11	NC	NC
12	GND	System power ground.
13	SCL	This pin is used serial interface clock in SPI.
14	SDA	Serial input signal in SPI I/F.
15	SDO	1. Write enable pin I80 parallel bus system interface; 2. Display data/command selection pin in 4-line serial interface;
16	RS	Serves as command or parameter select.
17	CS	Chip select input pin ("Low" enable).
18	IOVCC1.8	IOVCC power input
19	TE	
20	VCC2.8	VCC power input
21	NC	NC
22	LEDA	Power supply for backlight anode input terminal.
23	LEDK	Power supply for backlight cathode input terminal.
24	NC	NC

4.2 TP Pin Description

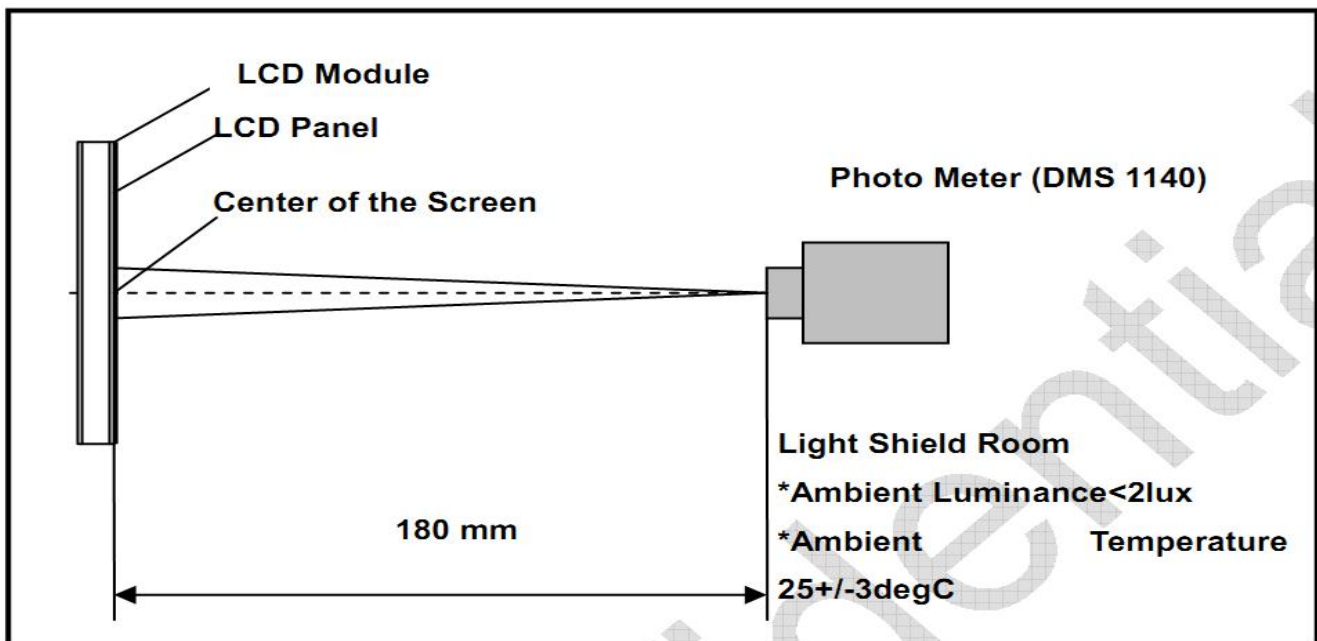
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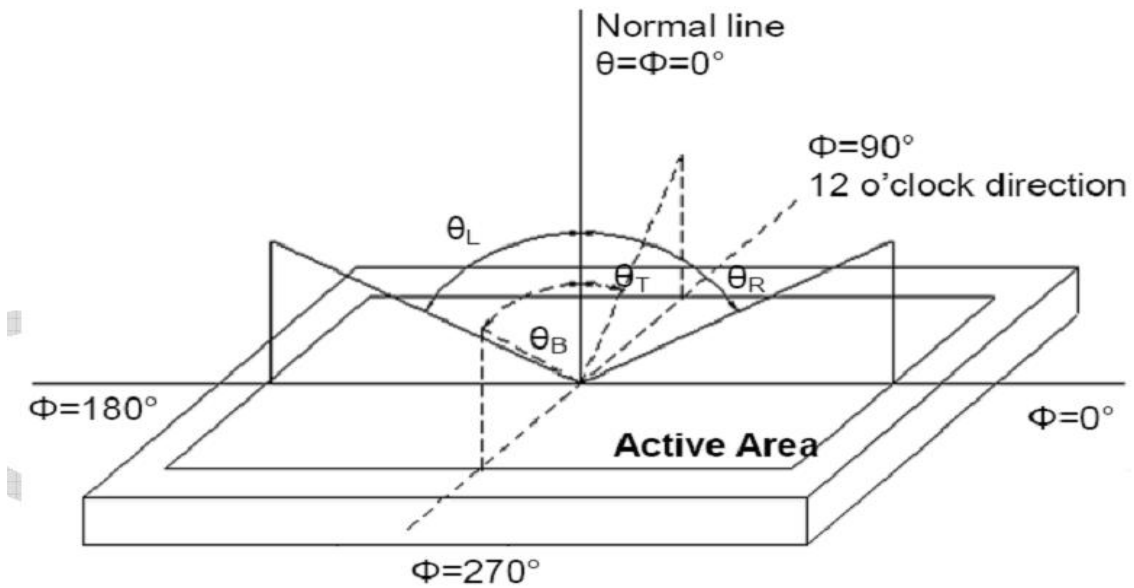
5. LCD Optical Characteristics

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Threshold Voltage		Vsat		4.1	4.3	4.5	V	Fig.1
		Vth		1.6	1.8	2.0	V	
Viewing Angle	Horizontal	Θ_3	CR>10		80		°	Note 1
		Θ_9			80		°	
	Vertical	Θ_{12}			80		°	
		Θ_6			80		°	
Contrast Ratio		CR	$\Theta = 0^\circ$		900			Note 2
Transmittance		T(%)	$\Theta = 0^\circ$		6.4			Note 3
NTSC		%	$\Theta = 0^\circ$		50			
Reproduction Of color	Red	Rx	$\Theta = 0^\circ$		TBD			Note 4 *CF glass
		Ry			TBD			
	Green	Gx			TBD			
		Gy			TBD			
	Blue	Bx			TBD			
		By			TBD			
White		Wx	$\Theta = 0^\circ$		TBD			
		Wy			TBD			
Response Time		Tr+Tf	$\Theta = 0^\circ$		35	50	ms	Note 5

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



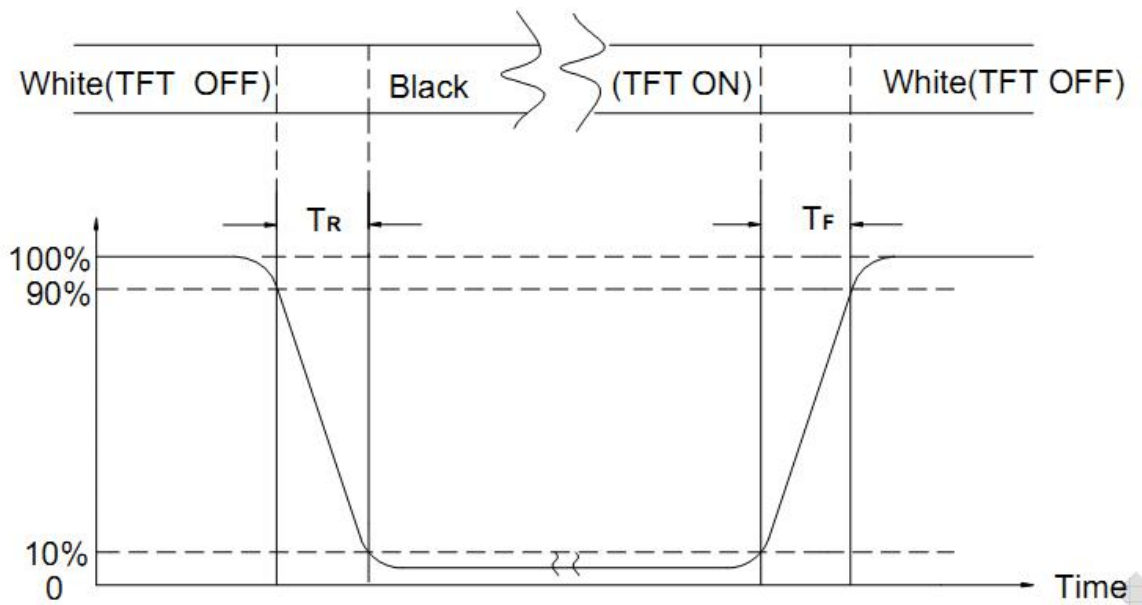
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

L63: Luminance of gray level 63, 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



6. TFT Electrical Characteristics

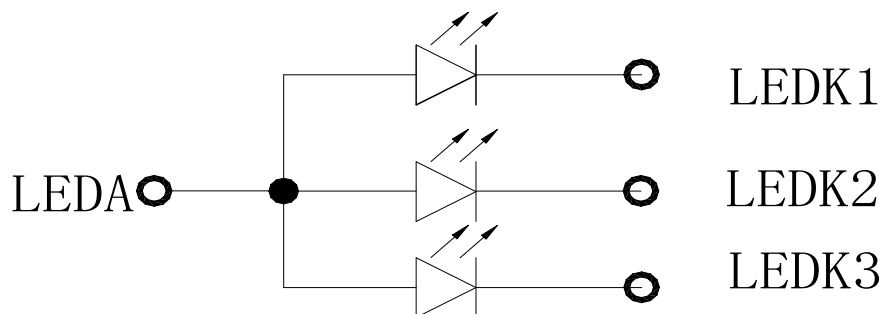
6.1 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Logic Supply Voltage	VDD	-0.3	4.0	V
Input Voltage	Vin	-0.3	VDD+0.3	V
Operating Temperature	T _{OP}	-20	70	°C
Storage Temperature	T _{ST}	-30	80	°C
Storage Humidity	HD	20	90	%RH

6.2 DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic Supply Voltage	VDD	2.5	2.8	3.6	V	-
Input High Voltage	V _{IH}	0.7VDD	-	VDD	V	-
Input Low Voltage	V _{IL}	GND	-	0.3 VDD	V	-
Output High Voltage	V _{OH}	0.8 VDD	-	VDD	V	-
Output Low Voltage	V _{OL}	GND	-	0.2 VDD	V	-
I/O Leak Current	I _{LI}	-1	-	1	uA	-
Supply Current	IDD	-	TBD	-	mA	-

6.3 LED Backlight Characteristics



Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	2.8	3.2	3.4	V	If=60mA
Supply Current	If	-	60	-	mA	-
Luminous Intensity for LCM	-	250	300	-	cd/m ²	If=60mA
Uniformity for LCM	-	-	60	-	%	If=60mA
Life Time	-	-	50000	-	Hr	If=60mA
Backlight Color	White					



7. Timing Characteristics

7.1 TFT Timing Characteristics

7.1.1 Display Serial Interface Timing Characteristics (RGB 8080 system)

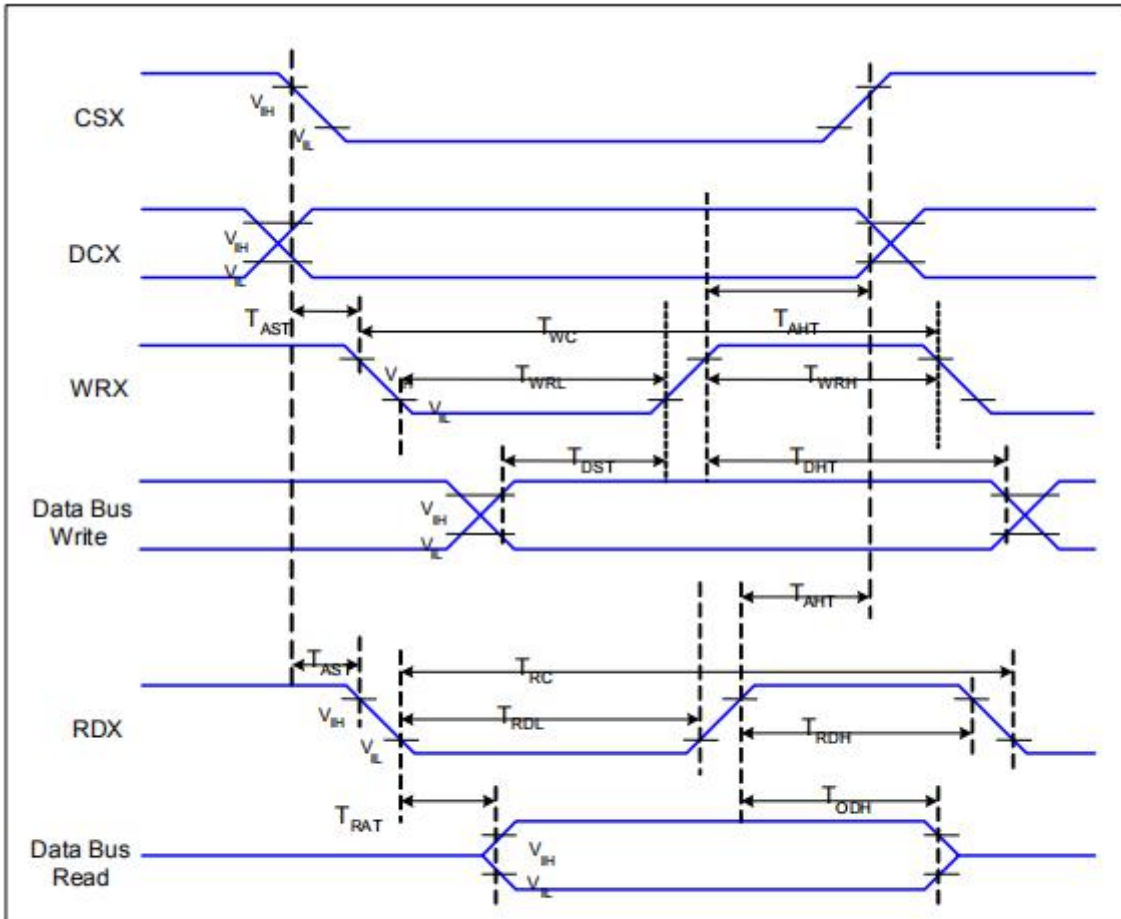
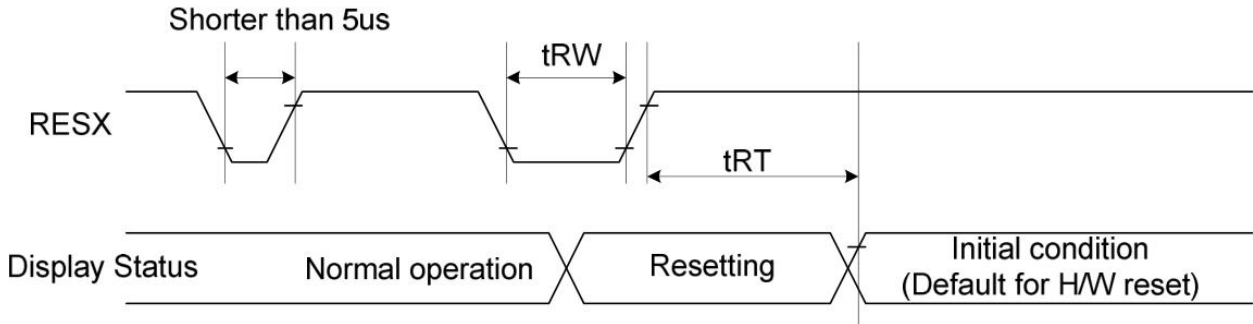


Figure 2 Parallel Interface Timing Characteristics (8080-Series MCU Interface)



7.1.2 Reset Timing Characteristics



7.1.3 Power on/off timing sequence check the IC datasheet!

7.2 TP Timing Characteristics

TBD



8. Inspection Standard

8.1 Incoming Inspection and Standard:

The below incoming inspection are applied to the TFT LCM Modules supplied by YOURITECH TECHNOLOGY CO.,LTD. The customers should inspect the LCM within 14 days after receiving the goods. The result of inspection should be notified to the Seller in the writing copy promptly, if the customer do not send them within 14 days, the seller has the right to judge as acceptance of goods. The inspection lot size is treated as the quantity per shipment and per model. The sampling plan shall be inspected under MIL-STD015E in Level II by single sampling. The acceptable quality level (AQL) are categorized as below grades:

CRITICAL= 0.4%, MAJOR= 0.65%, MINOR= 1.5%

8.2 Inspection condition and Warranty policy:

The delivered LCM should be stored properly, ideally under climate-controlled environment at 25 (± 5) degree Celsius as well as 60% (± 10) Relative Humidity. The LCM shall be inspected in the viewing angle of 45 degree from the four major angles (U/D/L/R) under the single fluorescent lamp of 20W (equal to 300 to 500 lux). For warranty, YOURITECH TECHNOLOGY CO.,LTD. will provide 12 months of warranty period as standard, and provide the new replacement for the defective products which belong to the Seller's responsibility verified by the quality department.

8.3 Inspection Criteria:

8.3.1 Critical defect

Item No.	Inspection content	Judgement
8.3.1.1	Functional defects	No display, abnormal display, short circuit, missing line, off-contrast and chromaticity, Touch Panel non-function
8.3.1.2	Model mixed	Other model mixed

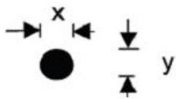
8.3.2 Major defect:

Item No.	Inspection content	Judgement
8.3.2.1	Product indication	Missing model no. and wrong model no. is indicated on the LCM.
8.3.2.2	Glass cracking	The LCD and touch panel glass crack or breakage

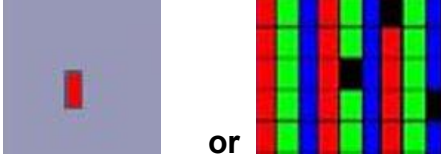
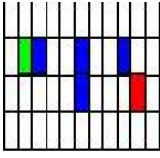
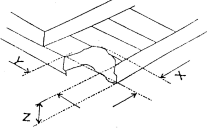
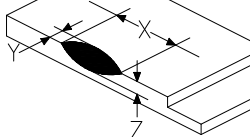


8.3.2.3	Missing component	The function component missing such as connector, cable, etc.
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8.3.3 Minor defect (LCD) :

Item No.	Inspection content	Judgement												
8.3.3.1	Black/White spot Foreign particles Dust in the cell	$\varphi = (x+y) / 2$  <table border="1" data-bbox="730 712 1441 943"> <thead> <tr> <th>Diameter (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td>Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.25$</td> <td>3 (Distance>5mm)</td> </tr> <tr> <td>$0.25 < \Phi$</td> <td>Not allowed</td> </tr> </tbody> </table>	Diameter (mm)	Acceptable Q'ty	$\Phi \leq 0.1$	Ignore	$0.1 < \Phi \leq 0.25$	3 (Distance>5mm)	$0.25 < \Phi$	Not allowed				
Diameter (mm)	Acceptable Q'ty													
$\Phi \leq 0.1$	Ignore													
$0.1 < \Phi \leq 0.25$	3 (Distance>5mm)													
$0.25 < \Phi$	Not allowed													
8.3.3.2	Linear defect Black/white line Black/white scratch	<table border="1" data-bbox="730 1010 1441 1240"> <thead> <tr> <th>Length(mm)</th> <th>Width (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td></td> <td>$W \leq 0.03$</td> <td>Ignore</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.03 < W \leq 0.07$</td> <td>3</td> </tr> <tr> <td></td> <td>$0.07 < W$</td> <td>Follow 8.3.3.1</td> </tr> </tbody> </table>	Length(mm)	Width (mm)	Acceptable Q'ty		$W \leq 0.03$	Ignore	$L \leq 5.0$	$0.03 < W \leq 0.07$	3		$0.07 < W$	Follow 8.3.3.1
Length(mm)	Width (mm)	Acceptable Q'ty												
	$W \leq 0.03$	Ignore												
$L \leq 5.0$	$0.03 < W \leq 0.07$	3												
	$0.07 < W$	Follow 8.3.3.1												
8.3.3.3	Polarizer Bubbles Dent on polarizer	<table border="1" data-bbox="730 1290 1441 1520"> <thead> <tr> <th>Diameter (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td>Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td>2 (Distance>5mm)</td> </tr> <tr> <td>$0.5 < \Phi$</td> <td>Not allowed</td> </tr> </tbody> </table>	Diameter (mm)	Acceptable Q'ty	$\Phi \leq 0.2$	Ignore	$0.2 < \Phi \leq 0.5$	2 (Distance>5mm)	$0.5 < \Phi$	Not allowed				
Diameter (mm)	Acceptable Q'ty													
$\Phi \leq 0.2$	Ignore													
$0.2 < \Phi \leq 0.5$	2 (Distance>5mm)													
$0.5 < \Phi$	Not allowed													

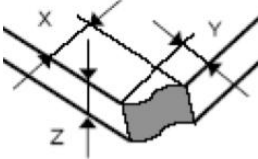


<p>8.3.3.4</p>	<p>Electrical Defect</p> <p>Dot</p>	<p>Bright dot and Dark dot definition:</p>  <p>or</p>  <p>(Two adjacent dot)</p> <p>Inspection pattern: black, white, red, green, and blue screen.</p> <table border="1" data-bbox="730 730 1441 913"> <thead> <tr> <th>Items</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>Bright dot</td> <td>$N \leq 4$ (Distance >5mm)</td> </tr> <tr> <td>Dark dot</td> <td>$N \leq 4$ (Distance >5mm)</td> </tr> </tbody> </table>	Items	Acceptable Q'ty	Bright dot	$N \leq 4$ (Distance >5mm)	Dark dot	$N \leq 4$ (Distance >5mm)
Items	Acceptable Q'ty							
Bright dot	$N \leq 4$ (Distance >5mm)							
Dark dot	$N \leq 4$ (Distance >5mm)							
<p>8.3.3.5</p>	<p>Glass Defect- Corner chipping</p>	 <table border="1" data-bbox="730 1104 1441 1377"> <thead> <tr> <th>Size(mm)</th> <th>Judgement</th> </tr> </thead> <tbody> <tr> <td> $X \leq 3\text{mm}, Y \leq S,$ $Z \leq T$ (S= ITO length, T=Single glass thickness) </td> <td>Accept</td> </tr> </tbody> </table>	Size(mm)	Judgement	$X \leq 3\text{mm}, Y \leq S,$ $Z \leq T$ (S= ITO length, T=Single glass thickness)	Accept		
Size(mm)	Judgement							
$X \leq 3\text{mm}, Y \leq S,$ $Z \leq T$ (S= ITO length, T=Single glass thickness)	Accept							
<p>8.3.3.6</p>	<p>Glass Defect- Side fragment</p>	 <table border="1" data-bbox="730 1574 1441 1787"> <thead> <tr> <th>Size(mm)</th> <th>Judgement</th> </tr> </thead> <tbody> <tr> <td> $X \leq 2 \text{ mm}, Y \leq \text{border edge}$ $Z \leq T$ (T= single glass thickness) </td> <td>Accept</td> </tr> </tbody> </table>	Size(mm)	Judgement	$X \leq 2 \text{ mm}, Y \leq \text{border edge}$ $Z \leq T$ (T= single glass thickness)	Accept		
Size(mm)	Judgement							
$X \leq 2 \text{ mm}, Y \leq \text{border edge}$ $Z \leq T$ (T= single glass thickness)	Accept							

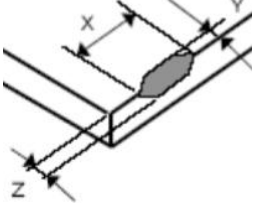
8.3.4 Minor defect (Touch Panel)

Item No.	Inspection content	Judgement
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8.3.4.1	Scratch, dust, particles, foreign materials in “linear type”	Size (mm)	Acceptable Q'ty
		$W \leq 0.05\text{mm}, L \leq 10\text{mm}$	Ignore
		$0.05\text{mm} < W \leq 0.07\text{mm}, L \leq 10\text{mm}$	3
		$W > 0.07\text{mm}$	Reject
8.3.4.2	Scratch, dust, particles, foreign materials in “round type”	Diameter (mm)	Acceptable Q'ty
		$\Phi \leq 0.25\text{mm}$	Ignore
		$0.25\text{mm} < \Phi \leq 0.35\text{mm}$	5
		$\Phi > 0.35\text{mm}$	Reject
8.3.4.3	Air bubbles	Diameter (mm)	Acceptable Q'ty
		$\Phi \leq 0.2\text{mm}$	Ignore
		$0.2\text{mm} < \Phi \leq 0.5\text{mm}$	3
		$\Phi > 0.5\text{mm}$	Reject
8.3.4.5	Scratch on printing area	Size (mm)	Acceptable Q'ty
		$W \leq 0.03\text{mm}, L \leq 5\text{mm}$	Ignore
		$0.03\text{mm} < W \leq 0.05\text{mm}, L \leq 5\text{mm}$	3
		$W > 0.05\text{mm}$ or $L > 5\text{mm}$	Reject
8.3.4.6	Corner chipping		
		Size(mm)	Judgement
		$X \leq 2\text{mm}, Y \leq 2\text{mm}$ $Z < 1/2T$ (T= single glass thickness)	Accept



<p>8.3.4.7</p>	<p>Edge chipping</p>	 <table border="1" data-bbox="737 488 1439 698"> <thead> <tr> <th data-bbox="737 488 1155 533">Size(mm)</th> <th data-bbox="1161 488 1439 533">Judgement</th> </tr> </thead> <tbody> <tr> <td data-bbox="737 542 1155 586"> $X \leq 3 \text{ mm}, Y \leq 3 \text{ mm}$ </td> <td data-bbox="1161 542 1439 586" rowspan="3"> <p>Accept</p> </td> </tr> <tr> <td data-bbox="737 595 1155 640"> $Z \leq 1/2 T$ </td> </tr> <tr> <td data-bbox="737 649 1155 694"> <p>(T= single glass thickness)</p> </td> </tr> </tbody> </table>	Size(mm)	Judgement	$X \leq 3 \text{ mm}, Y \leq 3 \text{ mm}$	<p>Accept</p>	$Z \leq 1/2 T$	<p>(T= single glass thickness)</p>
Size(mm)	Judgement							
$X \leq 3 \text{ mm}, Y \leq 3 \text{ mm}$	<p>Accept</p>							
$Z \leq 1/2 T$								
<p>(T= single glass thickness)</p>								



9. Reliability Test Conditions and Methods

9.1 Reliability Test Conditions and Methods:

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
①	High Temperature Storage	80°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	70°C±2°C×96Hours	
④	Low Temperature Operating	-20°C±2°C×96Hours	
⑤	Temperature Cycle(Storage)	-20°C ↔ 25°C ↔ 70°C (30min) ← (5min) → (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:±8KV,R:330Ω,C:150PF,Air Mode,10times	



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 $> 10M\Omega$) 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.



10. Cautions and Handling Precautions

10.1 Mounting method

The LCD panel of TFT 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.

10.2 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 (Cl), Sulfur (S) from customer, Responsibility is on customer.

10.3 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.



10.4 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

10.5 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.

10.6 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

10.7 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.

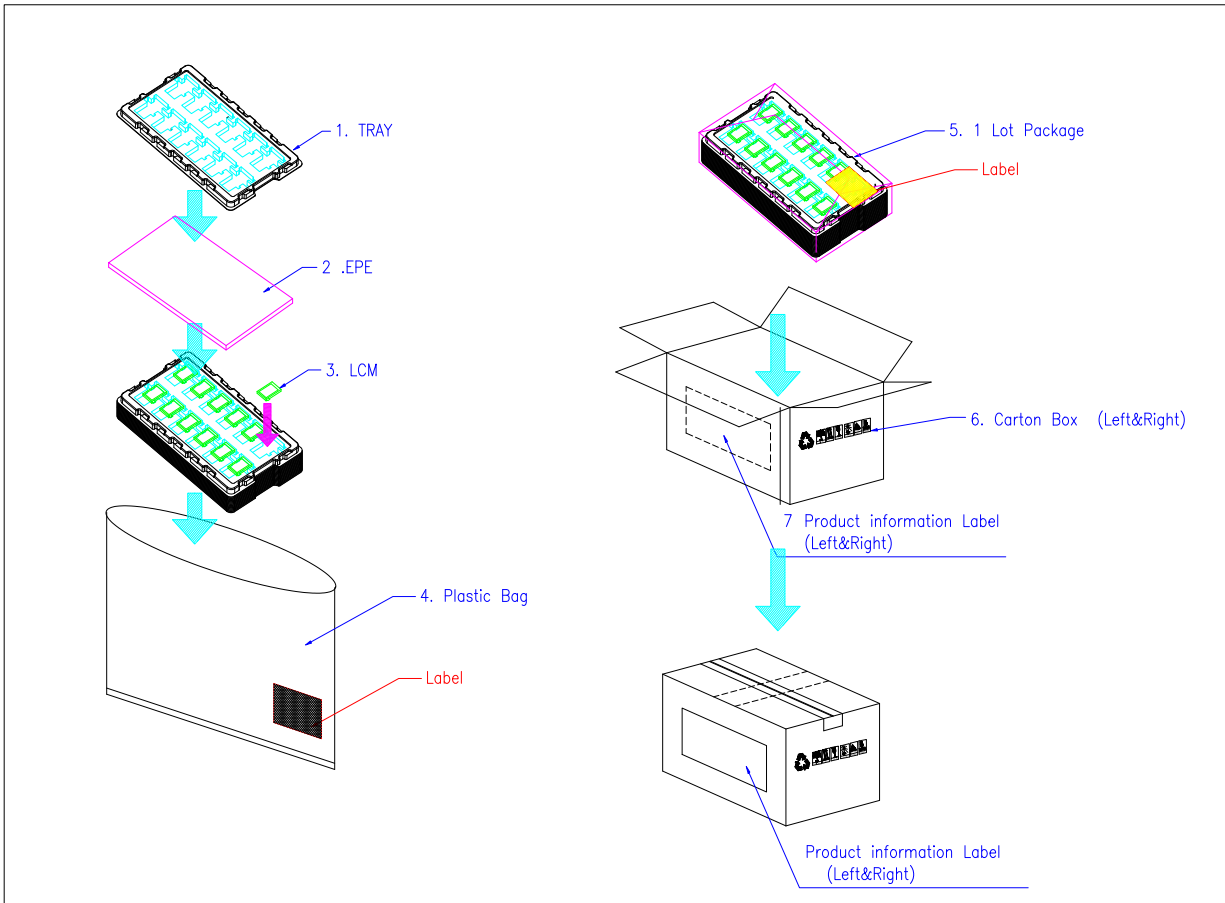


- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water



11. Packing Method

11.1 Method



11.2 Packing Label

TBD

