SPECIFICATIONS FOR TFT-LCD MODULE

Model Name:GZ70202-DTT070WV

Version：	0	

■ Approved For Specifications

□ Approved For Specifications & Sample

Model No.：	GZ70202-DTT070WV
Prepared by:	Bob
Checked by	Luck
Approved by:	Jack

Customer Model No.:	
Approved by:	
Date：	
Note：	

RECORD OF REVISION

Rev No.	Rev Date	Page	Contents	Editor
V0	2024/12/21		New issue.	Bob

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1. Scope

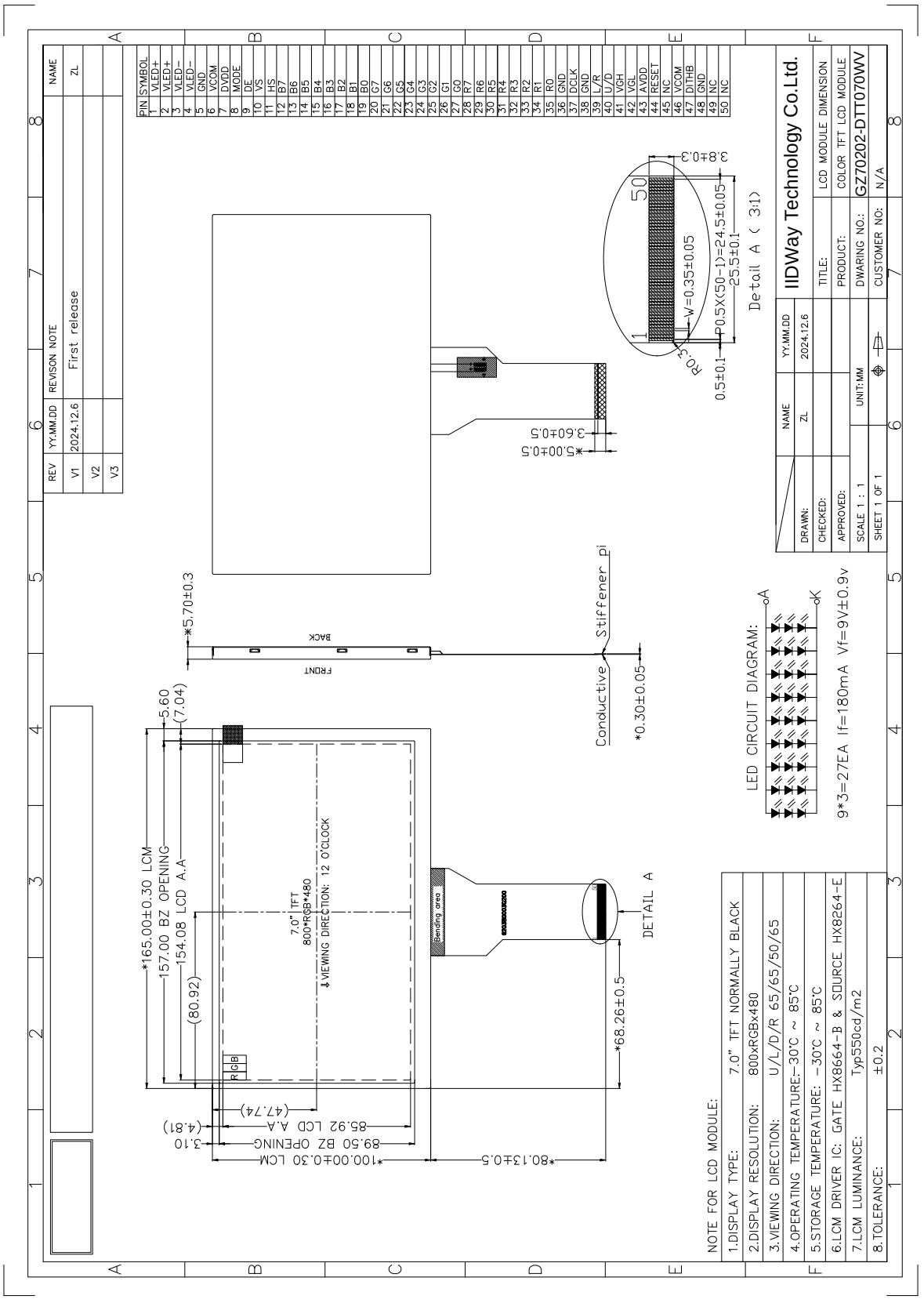
This specification defines general provisions as well as inspection standards for TFT module.If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

2. General Specifications

2.1 LCD Parameter

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display color	16.7		
Viewing Direction	12	O'Clock	
Grayscale inversion direction	6	O'Clock	
Operating temperature	-30~+85	℃	
Storage temperature	-30~+85	℃	
Module size	7.0	inch	
Active Area(W×H)	154.08x85.92	mm	
Number of Dots	800x480	dots	
Controller	HX8264E&HX8664B	-	
Power Supply Voltage	3.3	V	
Outline Dimensions	165.00x100.00x5.70	mm	
Backlight	3X9-LEDs (white)	pcs	
Weight	---	g	
Interface	24BIT RGB	-	

3.Outline Drawing



4.Interface Description

Pin No.	Symbol	I/O	Function
1-2	VLED +	P	LED back light(Anode).
3-4	VLED -	P	LED back light(Cathode).
5	GND	P	Ground.
6	NC(VCOM)	-	No Connection.
7	DVDD	P	Power supply.
8	MODE	I	DE/SYNC mode select.Normally pull high MODE=H:DE mode;MODE=L:SYNC mode.
9	DE	I	Data Input Enable.
10	VS	I	Vertical sync input signal.
11	HS	I	Horizontal sync input signal.
12-19	B7-B0	I	Blue data input .
20-27	G7-G0	I	Green data input .
28-35	R7-R0	I	Red data input.
36	GND	P	Ground.
37	DCLK	I	Clock for Input Data.
38	GND	P	Ground.
39	L/R	I	Source Driver internal shift register is controlled by this pin as shown below: Normally pull high. SHLR = “L”, S1←S2.....←S1536 SHLR = “H” , S1→S2.....→S1536
40	U/D	I	Gate Up or Down scan control. Normally pull low. UPDN = “L”, STV2 output vertical start pulse and UD pin output logical “0” to Gate driver. UPDN = “H”, STV1 output vertical start pulse and UD pin output logical “1” to Gate driver.
41	VGH	P	Power supply for Gate on output.
42	VGL	P	Power supply for Gate off output.
43	AVDD(10.3V)	P	Analog power.
44	RESET	I	Reset pin.
45	NC	-	No Connection.
46	NC(VCOM)	-	No Connection.
47	DITHB	I	Dithering function enable control.Normally pull low.
48	GND	P	Ground.
49-50	NC	-	No Connection.

5. Absolute Maximum Ratings(Ta=25℃)

5.1 Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25℃)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	DVDD	-0.5	5.0	V	1，2
	AVDD	6.5	13.5	V	
	VGH	-0.5	42.0	V	
	VGL	-20	0.3	V	
	VGH-VGL	-	40.0	V	

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.
2. V_{DD} >V_{SS} must be maintained.

5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30℃	85℃	-30℃	85℃	1,2
Humidity	-	-	-	-	3

1. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature.
   The phenomenon is reversible.
3. Ta<=40℃:85%RH MAX.
   Ta>=40℃:Absolute humidity must be lower than the humidity of 85%RH at 40℃.

6. Electrical Specifications and Instruction Code

6.1 Electrical characteristics(Vss=0V ,Ta=25℃

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		DVDD	Ta=25℃	3.0	3.3	3.6	V	
		AVDD	Ta=25℃	10.2	10.4	10.6	V	
		VGH	Ta=25℃	14.5	15.0	15.5	V	
		VGL	Ta=25℃	-10.5	-10.0	-9.5	V	
Intput signal voltage		VCOM	Ta=25℃	3.54	4.04	4.54	V	
Input voltage	'H'	V_{IH}	DVDD=3.3V	0.7*DVDD	-	DVDD	V	
	'L'	V_{IL}	DVDD=3.3V	0	-	0.3*DVDD	V	

Note:

1:When an optimum contrast is obtained in transmissive mode.

2: Tested in 1╳1 chessboard pattern.

7. Timing Characteristics

•Horizontal input timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd	-	800	-	DCLK
DCLK frequency	fclk	-	33.3	50	MHz
One Horizontal Line	th	862	1056	1200	DCLK
HS pulse width (Min.)	thpw		1		DCLK
HS pulse width (Typical.)	thpw		-		DCLK
HS pulse width (Max.)	thpw		40		DCLK
HS Back Porch (Blanking)	thb	46	46	46	DCLK
HS Front Porch	thfp	16	210	354	DCLK
DE mode Blanking	th-thd	45	256	400	DCLK

•Vertical input timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd		480		TH
VS period time	tv	510	525	650	TH
VS pulse width	tvpw	1	-	20	TH
VS Back Porch (Blanking)	tvb	23	23	23	TH
VS Front Porch	tvfp	7	22	147	TH
DE mode Blanking	tv-tvd	4	45	170	TH

7.1 AC Characteristics

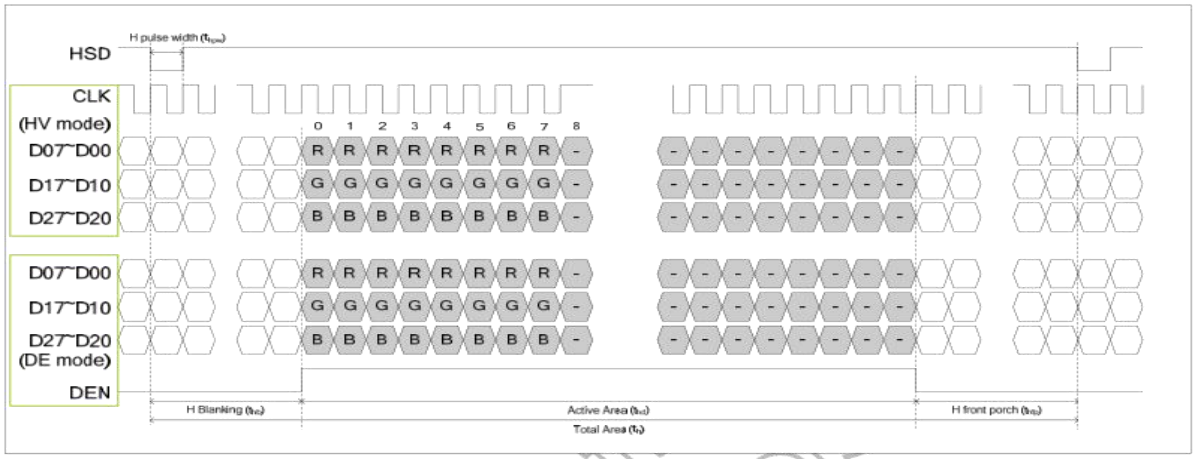
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	Thst	8	-	-	ns
HS hold time	Thhd	8	-	-	ns
VS setup time	Tvst	8	-	-	ns
VS hold time	Tvhd	8	-	-	ns
Data setup time	Tdsu	8	-	-	ns
Data hold time	Tdhd	8	-	-	ns
DE setup time	Tesu	8	-	-	ns
DE hold time	Tehd	8	-	-	ns
VDD Power On Slew rate	TPOR	-	-	20	ms
RSTB pulse width	TRst	10	-	-	µs
CLKIN cycle time	Tcph	20	-	-	ns
CLKIN pulse duty	Tcwh	40	50	60	%
Output stable time	Tsst	-	-	6	µs

7.1.1 parallel 24-bit RGB mode

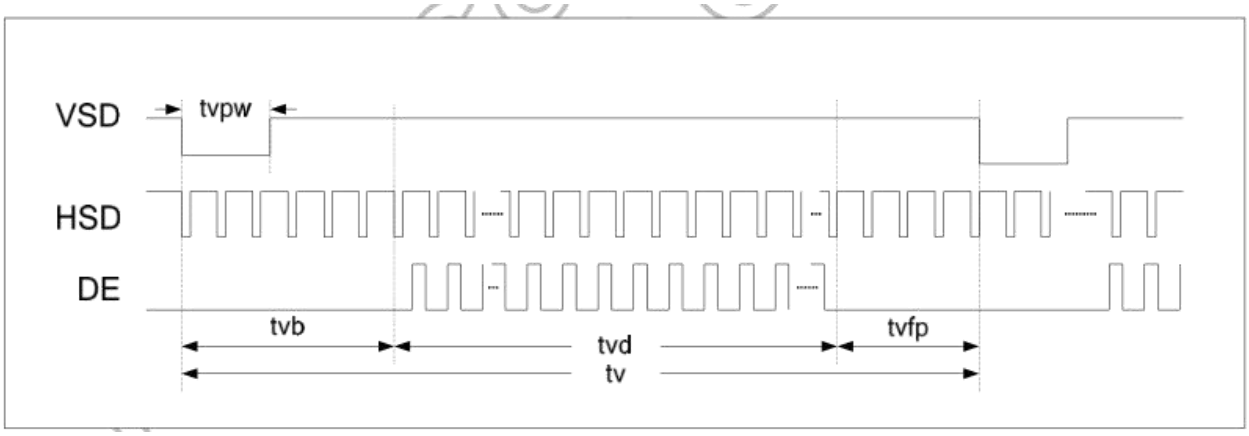
Parameter	Symbol	Spec.			Unit	Conditions
		Min.	Typ.	Max.		
CLKIN Frequency	Fclk	-	40	50	MHz	VDD = 3.0V ~ 3.6V
CLKIN Cycle Time	Tclk	20	25	-	ns	-
CLKIN Pulse Duty	Tcwh	40	50	60	%	Tclk
Time from HSD to Source Output	Thso	-	20	-	CLKIN	-
Time from HSD to LD	Thld	-	20	-	CLKIN	-
Time from HSD to STV	Thstv	-	2	-	CLKIN	-
Time from HSD to CKV	Thckv	-	20	-	CLKIN	-
Time from HSD to OEV	Thoev	-	4	-	CLKIN	-
LD Pulse Width	Twld	-	10	-	CLKIN	-
CKV Pulse Width	Twckv	-	66	-	CLKIN	-
OEV Pulse Width	Twoev	-	74	-	CLKIN	-

7.1.2 Data Input format

Horizontal Timing

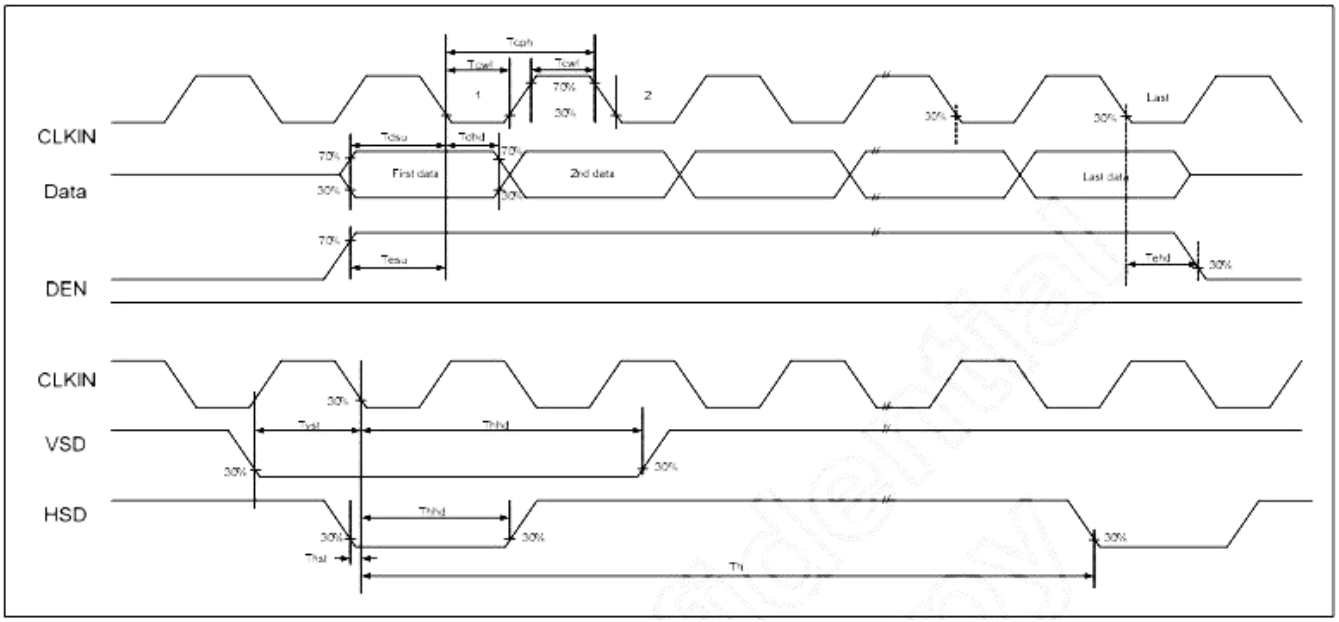


Vertical Timing

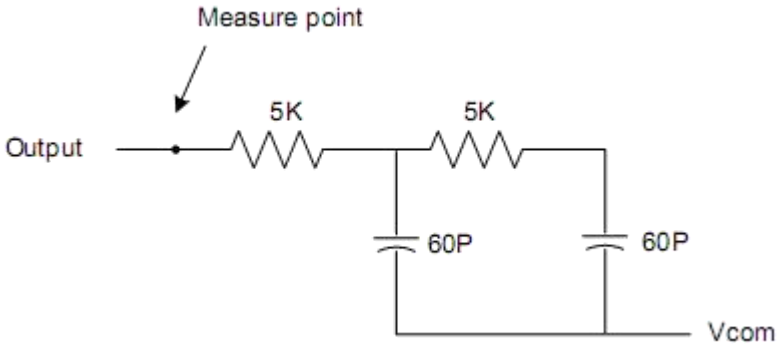


7.1.3 Timing diagram

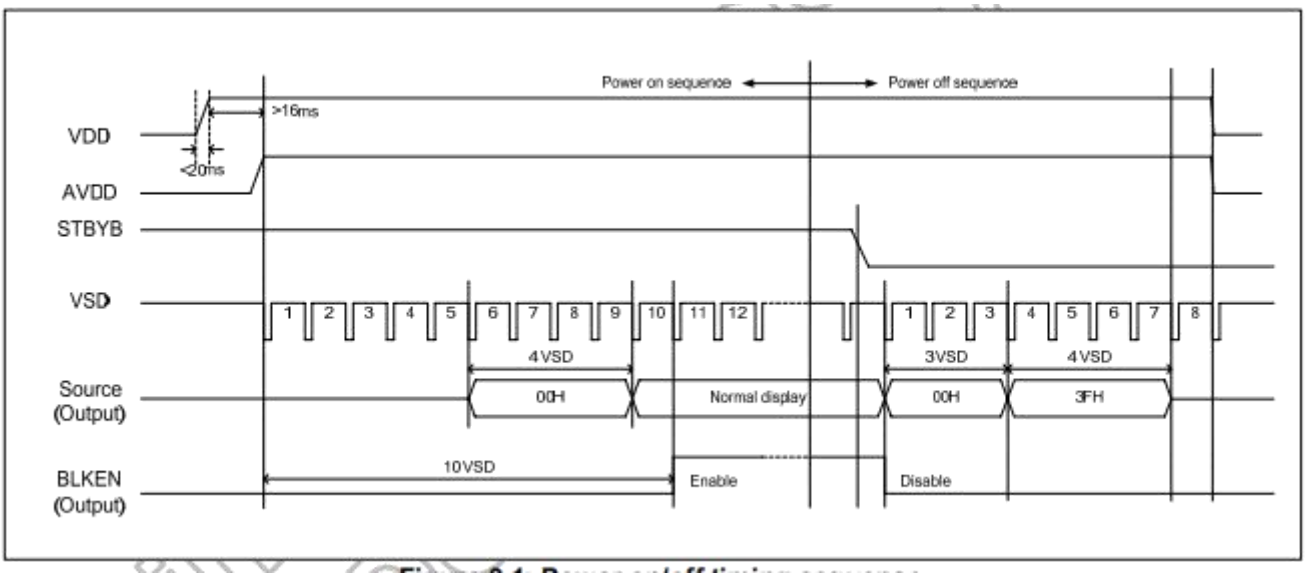
Input clock and data timing waveform



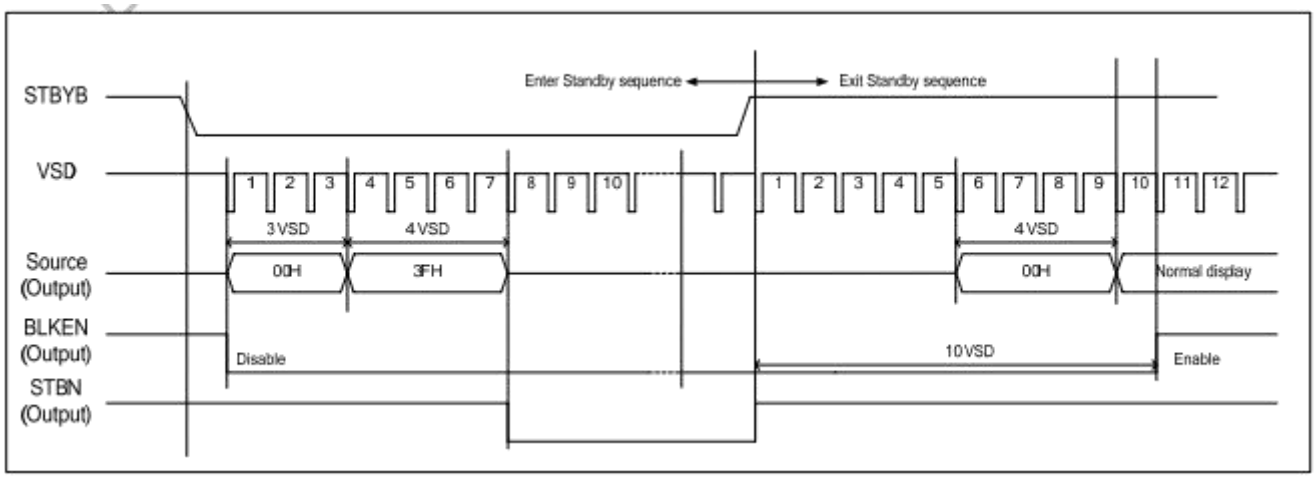
Output load condition



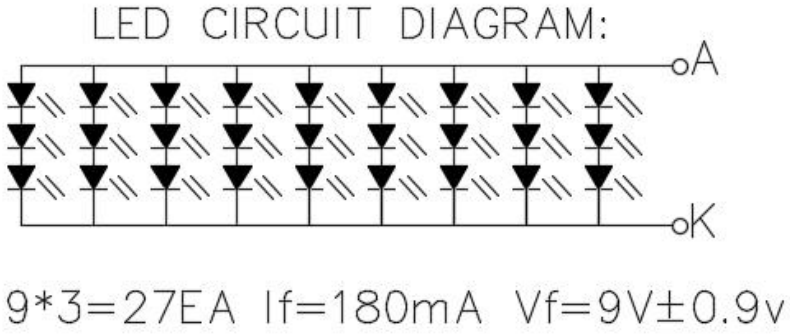
7.2 Power on/off control



Enter and exit standby mode sequence



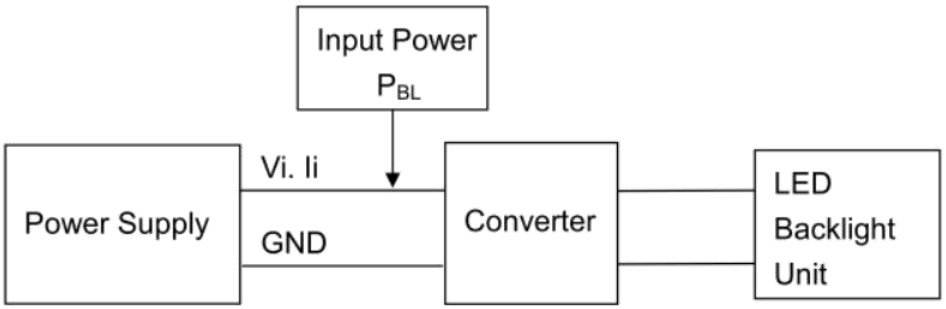
8.0 Backlight Characteristic



Item	Symbol	Min	Typ	Max	Unit	Test Condition
Supply Voltage	Vf	8.1	9.0	9.9	V	Note 1
Supply Current	If	-	180	-	mA	Note 2
Power dissipation	P_{BL}	-	1.62	-	W	
Life Time	-	30000	-	-	Hr	Note 3,4
Backlight Color	White					

Note 1: The LED Supply Voltage is defined by the number of LED at Ta=25℃ and If =160mA.

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 =160mA. The LED lifetime could be decreased if operating If is larger than 160mA.
Note 4: LED light bar circuit:

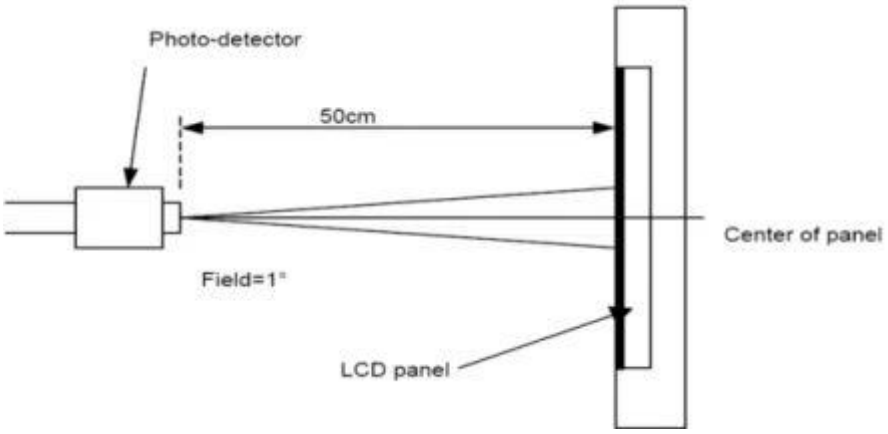
9. Optical Characteristics

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		If=160mA	-	550	-	Cd/m^2	1
Uniformity	⊿Bp			75	-	-	%	1,2
Viewing Angle	3:00		Cr≥10	-	65	-	Deg	1,2
	6:00			-	55	-		
	9:00			-	65	-		
	12:00			-	65	-		
Contrast Ratio	Cr		θ=0° Φ=0°	-	500	-	-	3,4
Response Time	T_r+T_f			-	25	50	ms	4,5
Color of CIE Coordinate	W	x	θ=0° Φ=0°	0.2568	0.3068	0.3568	-	1,6
		y		0.2728	0.3228	0.3728	-	
	R	x		0.4995	0.5495	0.5995	-	
		y		0.2755	0.3255	0.3755	-	
	G	x		0.2990	0.3490	0.3990	-	
		y		0.5464	0.5964	0.6464	-	
	B	x		0.0940	0.1440	0.1940	-	
		y		0.0203	0.0703	0.1203	-	
NTSC Ratio	S			-	50	-	%	

*The parameter is slightly changed by temperature, driving voltage and materiel

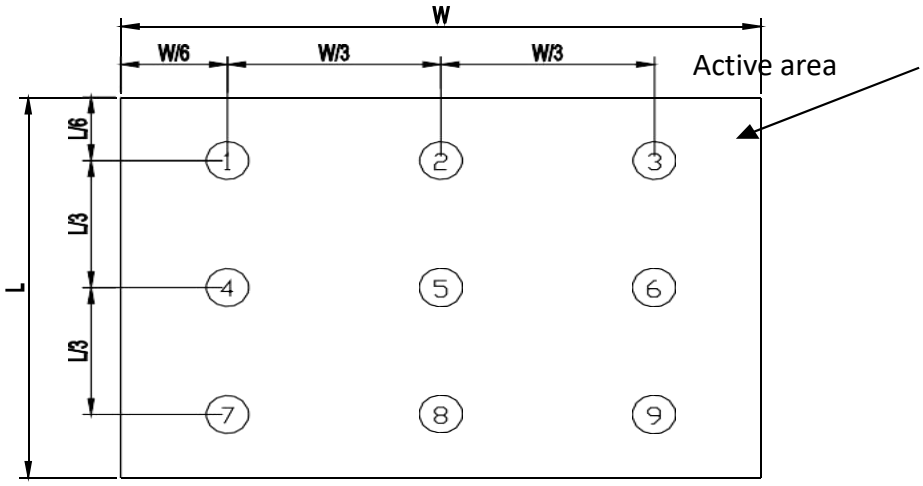
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment CA310 Measuring condition:-Measuring surroundings: Dark room.-Measuring temperature: Ta=25℃.-Adjust operating voltage to get optimum contrast at the center of the display.

The measured value is more than 5 minutes at the center point of the LCD panel, and the backlight is turned on at the same time.

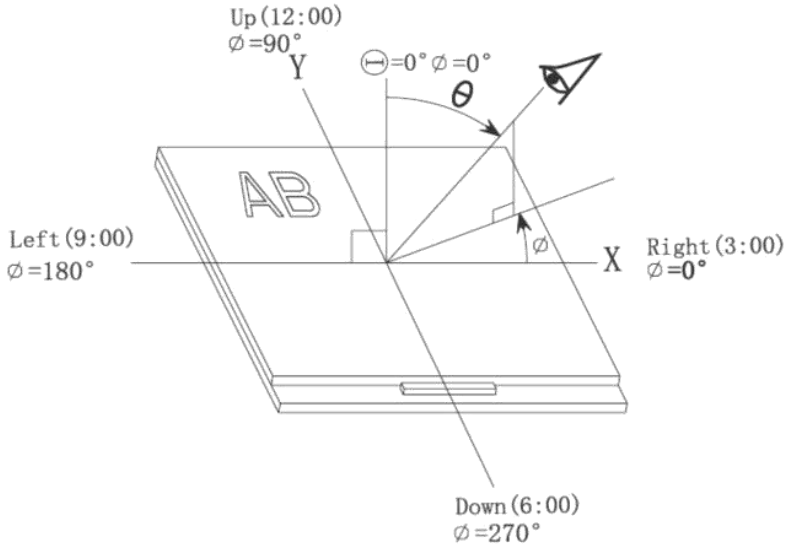


Note 2: The luminance uniformity is calculated by using following formula.

⊿Bp = Bp (Min.) / Bp (Max.)×100 (%);Bp (Max.) = Maximum brightness in 9 measured spots Bp (Min.) = Minimum brightness in 9 measured spots.



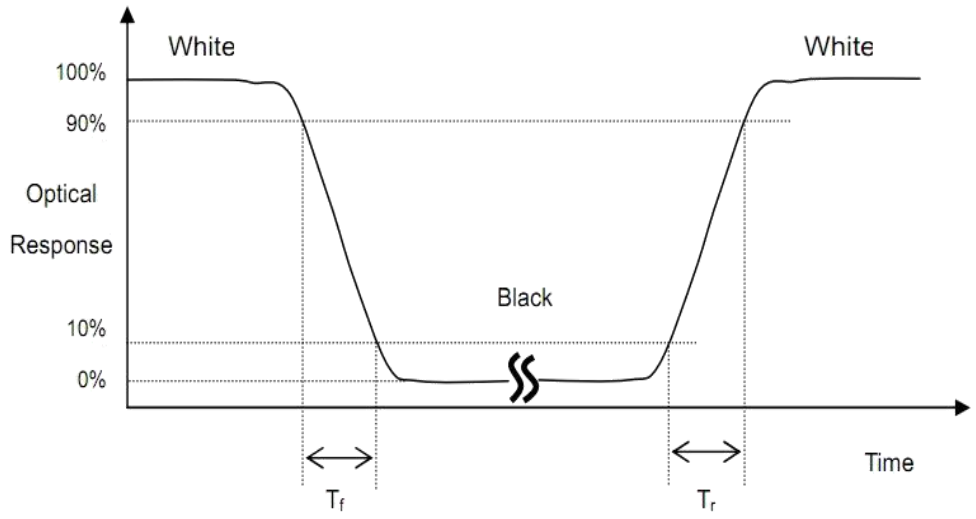
Note 3: The definition of viewing angle:Refer to the graph below marked by θ and Φ



Note 4: Definition of contrast ratio Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface.Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state.

$$\mathbf{CR} = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

Note 5: Definition of Response time The output signals of photo detector are measured when the input signals are changed from “white” to “black”(Tf) and from “black” to “white”(Tr), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



10. Reliability Test Conditions and Methods

No.	Test Items	Test Condition	Inspection After Test
①	High Temperature Storage	85°C±2°C×240Hours	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. 9.Brightness reduction more than 50%.
②	Low Temperature Storage	-30°C±2°C×240Hours	
③	High Temperature Operating	85°C±2°C×240Hours	
④	Low Temperature Operating	-30°C±2°C×240Hours	
⑤	Temperature Cycle(Storage)	-30°C ⇔ 80°C (30min) (5min) (30min) 1cycle Total 10cycle.	
⑥	Damp Proof Test (Storage)	60°C±5°C×90%RH×240Hours	

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≦0.5</td><td>2(Distance>10mm)</td></tr>
<tr><td>0.50 < 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≦0.05</td><td>Disregard</td></tr>
<tr><td>L≦3.0</td><td>0.05< W≦0.1</td><td>2(Distance>10mm)</td></tr>
<tr><td>--</td><td>0.1 < W</td><td>Not allow</td></tr>
</table></td></tr>
<tr><td>11.5.2</td><td>Minor</td><td>Dent on polarizer.</td><td>Unit: mm.
<table>
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<tr><td>Φ≦0.2</td><td>Disregard</td></tr>
<tr><td>0.2 < Φ≦0.5</td><td>2(Distance>10mm)</td></tr>
<tr><td>0.50 < Φ</td><td>0</td></tr>
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<tr><td>11.5.3</td><td>Minor</td><td>Bubble in polarizer.</td><td>Unit: mm.
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<tr><td>0.2 < Φ≦0.5</td><td>2(Distance>10mm)</td></tr>
<tr><td>0.50 < Φ</td><td>0</td></tr>
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<table>
<tr>
<td>11.5.4</td>
<td>Minor</td>
<td>Dot defect</td>
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<table>
<tr><th>Items</th><th>Acceptable Q'ty</th></tr>
<tr><td>Bright dot</td><td>N ≦3</td></tr>
<tr><td>Dark dot</td><td>N ≦3</td></tr>
<tr><td>Total dot</td><td>N ≦6</td></tr>
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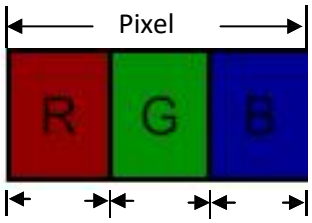
Pixel define :


Dot Dot Dot
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
</td>
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<tr>
<td>11.5.5</td>
<td>Minor</td>
<td>LCD glass chipping.</td>
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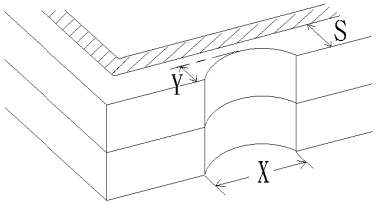

Y>S
Reject
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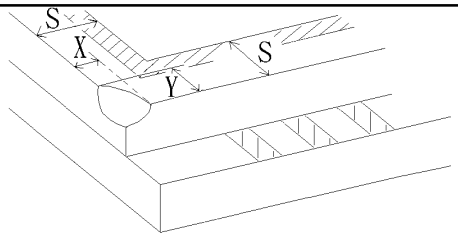

X or Y>S
Reject
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<tr>
<td>11.5.7</td>
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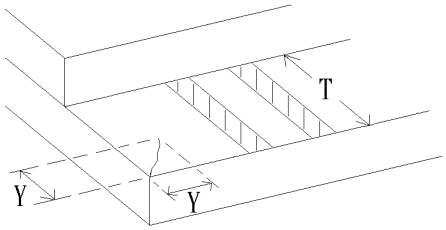
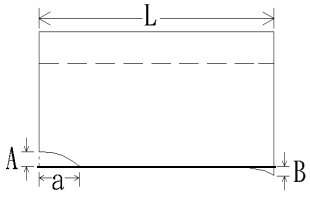
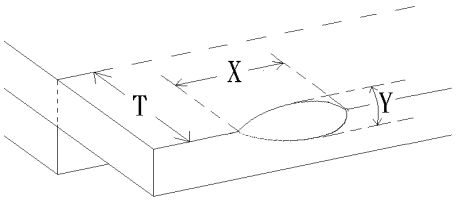
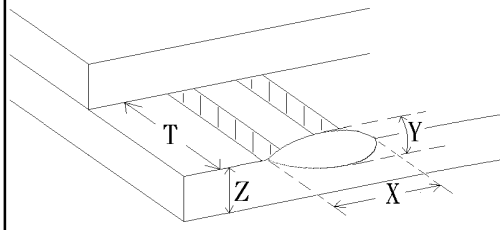
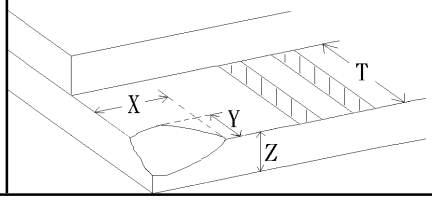
<td>LCD glass crack.</td>
<td>


Y>(1/2) T
Reject
</td>
</tr>
<tr>
<td>11.5.8</td>
<td>Major</td>
<td>LCD glass scribe defect.</td>
<td>


1. a>L/3, A>1.5mm Reject
2. B : According to dimension
</td>
</tr>
</table>

11.5.9	Minor	LCD glass chipping. (on the terminal area)		Φ = (x+y)/2>2.5mm Reject
11.5.10	Minor	LCD glass chipping. (on the terminal surface)		Y>(1/3)T Reject
11.5.11	Minor	LCD glass chipping.		Y>T Reject

12. Handling Precautions

12.1 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.

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 (Cl), 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 electro chemical 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 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.

- END