



湖南飞优特电子科技有限公司

Hunan Future Electronics Technology Co. Ltd

## 显示屏技术规格书

Product No.: FUT0500HD102H-A0

Customer : \_\_\_\_\_

Prepared by	Checked by	Approved by
Zhunenghui	liuzhizhong	Yaofuheng

<b>Customer Approval</b>	<p><input type="radio"/> Accept</p> <p><input type="radio"/> Reject</p> <p>Comment:</p>          <p style="text-align: right;">Approved by: _____</p>
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Your confirmation of this specification is very important! It's undoubted this attached specification will be regarded as your approval once you confirmed our LCM sample. Also, further mass production will subject to this specification .

Address: Block 3, Guide Industrial Area, Yaodu Avenue North, Jianghua County, Hunan Province, P.R. China

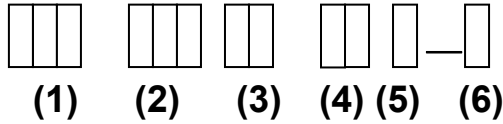
Website: <http://www.futurelcd.com>



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### 1. Numbering System



No	Definition	Specifications
(1)	TFT LCM Productor No.	FUT ---- FUTURE technology Co., Ltd
(2)	Display monitor opposite angle line size	Unit : inch
(3)	Product Resolution	... QQ: QQVGA 128*160 C: QCIF 186*220 Q: QVGA 240*320, H: HVGA320*480, WV:WVGA 480*800, QH:QHD 540*960 HD:720*1280, FHD1080*1920 ...
(4)	Product Development Series No.	By two figures characters expression from 01 to 99
(5)	LCD Type	A----AUO ; M----CMI ; C----CPT; B----BOE; G----LG; S---CTC; H----HSD; T----Tianma; Y----Hydis; I----INNOLUX; L---- IVO
(6)	Productor Development edition No.	By The English litters : A~ Z

## 2. Scope

This specification applies to the TFT LCD module which is designed and manufactured by LCM Factory of HUNAN FUTURE Technology Co. Ltd.

## 3. Normative Reference

GB/T4619-1996 《Liquid Crystal Display Test Method》

GB/T2424 《Basic environmental Testing Procedures for Electric and Electronic Products.》

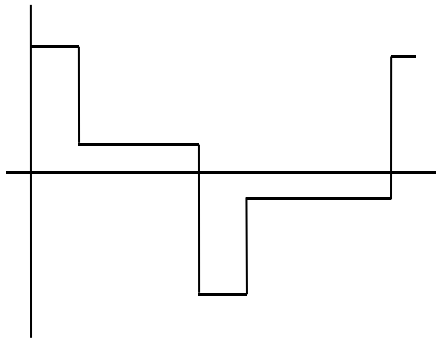
GB/T2423 《Basic Testing Procedures for Electric and Electronic Products》

IEC61747-1 《SIXTH PART GB2828`2829-87 《National Standard of PRC》

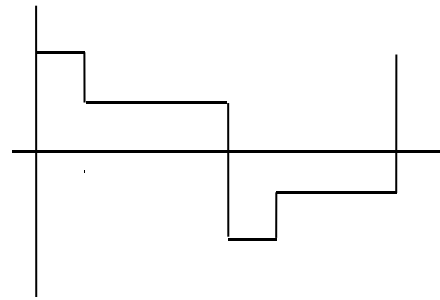
## 4. Definitions

### 4.1 Definitions of Vop

The definitions of threshold voltage Vth1, Vth2 the following typical waveforms are applied on liquid crystal by the method of equalized voltage for each duty and bias.



【 selected waveform 】



【 non-selected waveform 】

① Vth1: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of selected waveform

$$(f_r=80\text{Hz}, \Phi=10^\circ \theta=270^\circ \text{ at } 25^\circ\text{C})$$

② Vth2: The voltage which the brightness of segment indicates 50% of saturated value on the conditions of non-selected waveform

$$(f_r=80\text{Hz}, \Phi=10^\circ \theta=270^\circ \text{ at } 25^\circ\text{C})$$

$$\textcircled{3} \text{ Vop: } (V_{th1}(50\%)+V_{th2}(50\%))/2 \quad (f_r=80\text{Hz}, \Phi=10^\circ \theta=270^\circ \text{ at } 25^\circ\text{C})$$

### 4.2 Definition of Response Time Tr, Td

①Tr: The time required which the brightness of segment becomes 10% from 100% when waveform is switched to selected one from non-selected one. ( $f_r=80\text{Hz}, \Phi=10^\circ \theta=270^\circ \text{ at } 25^\circ\text{C}$ )

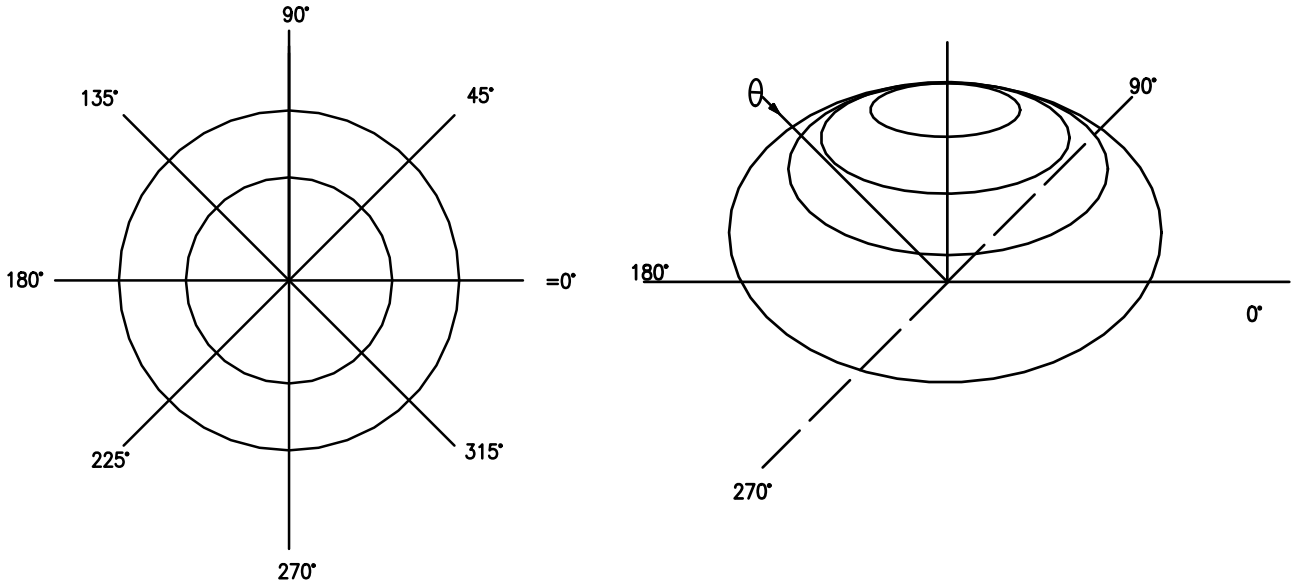
②Td: The time required which the brightness of segment becomes 90% from 10% when waveform is switched to selected one from selected one. ( $f_r=80\text{Hz}, \Phi=10^\circ \theta=270^\circ \text{ at } 25^\circ\text{C}$ )

### 4.3 Definition of Contrast Ratio Cr

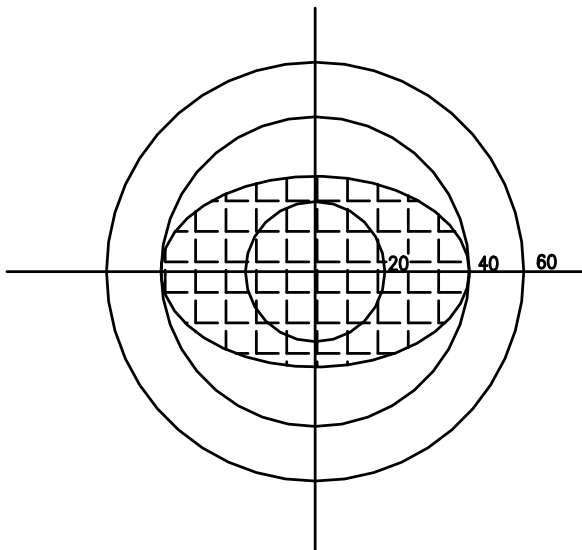
$$Cr=A/B$$

- ① A: Segments brightness in case of non-selected waveform
- ② B: Segments brightness in case of selected waveform

### 4.4 Definition of Angle and Viewing Range



Angular Graph: Constrast Ratio



Such as:  
Viewing Angle Range:  
80(Cr>2) Horizontal  
70(Cr>2) Vertical

## 5. Technology Specifications

### 5.1 Features

The LCD adopts one backlight with High brightness 12-lamps white LED.  
 Construction: 4.99" a-Si color TFT-LCD , White LED backlight and FPC .

### 5.2 General Specifications

No.	Item	Specification
1	LCD size	4.99 inch
2	Resolution	720(R.G.B)*1280
3	Display mode	Normally black
4	Pixel pitch	0.02875 (W) x 0.08625 (H) mm
5	Active area	62.1(W)* 110.4(H) mm
6	Module size	70.7(W)*130.2(H)*1.71(T)mm
7	Pixel arrangement	RGB-stripe
8	Interface	3-SPI-RGB24
9	Touch Panel	WITHOUT

### 5.3 Interface Pin Connection

#### 5.3.1 LCM Interface Pin Connection

Pin No	Symbol	Description
1	<b>GND</b>	<b>Ground.</b>
2	<b>SDA</b>	Serial interface DATA Input/Output.
3	<b>DOTCLK</b>	<b>Power Supply For LCD.</b> Dot clock signal for RGB interface operation.
4	<b>ENABLE</b>	Data enable pin for RGB interface operation
5	<b>HSYNC</b>	<b>Reset Signal input pin.</b> Horizontal synchronizing input signal for RGB interface operation.
6	<b>VSNC</b>	Vertical synchronizing input signal for RGB interface operation.
7	<b>SCL</b>	Serial interface Clock Input.
8	<b>CS</b>	Chip select signal for SPI interface operation
9	<b>RESET</b>	Global Reset Signal. Active Low.
10	<b>VCC 2.8V</b>	<b>Power Supply For LCD(2.8-3.3V)</b>
11	<b>IOVCC 1.8V</b>	<b>Power Supply For LCD(1.8-3.3V)</b>
12	<b>GND</b>	<b>Ground.</b>
13	<b>LEDK</b>	<b>Power Supply For LED Backlight Cathode Input.</b>
14	<b>LEDA</b>	<b>Power Supply For LED Backlight Anode Input.</b>
15	<b>GND</b>	<b>Ground.</b>
16-23	<b>B0-B7</b>	<b>RGB data</b>
24-31	<b>G0-G7</b>	<b>RGB data</b>
32-39	<b>R0-R7</b>	<b>RGB data</b>
40	<b>GND</b>	<b>Ground.</b>



5.4 Absolute Max. Rating

Item	Symbol	Values		Unit
		Min.	Max.	
Power Voltage	VDDI	-0.3	3.6	V
	VDD	-0.3	3.6	V
	VIN	-0.3	IOVCC+0.3	V
Backlight forward current	I <sub>LED</sub>	0	25	mA (For each LED)
Operation Temperature	T <sub>OP</sub>	-10	60	°C
Storage Temperature	T <sub>ST</sub>	-20	70	°C

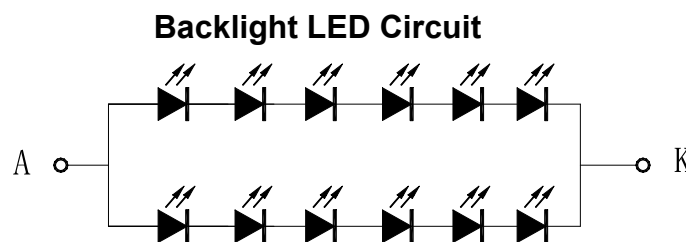
5.5 DC Characteristics

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Logic Supply Voltage	IOVCC	1.65	1.8/2.8	3.3	V	-
Analog Supply Voltage	VDD	2.6	2.8	3.3	V	-
VGL Voltage	VGL	-11.3	-10.3	-8.3	V	-
VGH Voltage	VGH	11.8	12.8	13.8	V	-
Input High Voltage	V <sub>IH</sub>	0.7VDD	-	VDD	V	Digital input pins
Input Low Voltage	V <sub>IL</sub>	GND	-	0.3VDD	mA	Digital input pins
Output High Voltage	V <sub>oH</sub>	0.8VDD	-	VDD	mA	Digital input pins
Output High Voltage	V <sub>oL</sub>	GND	-	0.2VCC	W	Digital input pins
(Panel+LSI) Power Consumption	Black Mode	-	-	50	mA	VCC=2.8V
	Sleeping Mode	-	-	150	uA	VCC=2.8V

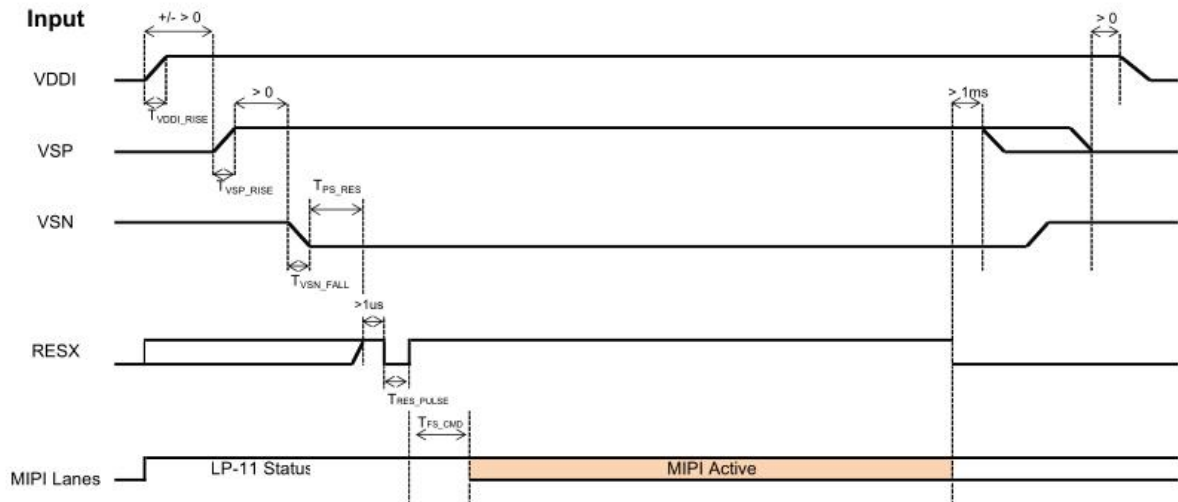
5.6 LED Back Light Specification (12 White Chips)

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V <sub>f</sub>	I <sub>f</sub> =40mA	-	19.2	-	V
Uniformity (with L/G)	Δ B <sub>p</sub>	I <sub>f</sub> =40mA	75	80	-	%
Luminance for LCM	/	I <sub>f</sub> =40mA	-	280	-	cd/m <sup>2</sup>
Backlight Power Consumption	WBL	I <sub>f</sub> =40mA	-	512	-	mW
Backlight Color	White					

Note:LED Circuit



### 5.7 Power Sequence



Symbol	Characteristics	Min.	Typ.	Max.	Units
$T_{VDDI\_RISE}$	VDDI Rise time	20	-	-	us
$T_{VSP\_RISE}$	VSP Rise time	200	-	-	us
$T_{VSN\_FALL}$	VSN Fall time	200	-	-	us
$T_{PS\_RES}$	VDDI/VSP on to Reset high	5	-	-	ms
$T_{RES\_PULSE}$	Reset low pulse time	10	-	-	us
$T_{FS\_CMD}$	Reset to first command	10	-	-	ms

## 5.8 Timing Characteristics

### 5.8.1 DC Characteristics for DSI HS mode

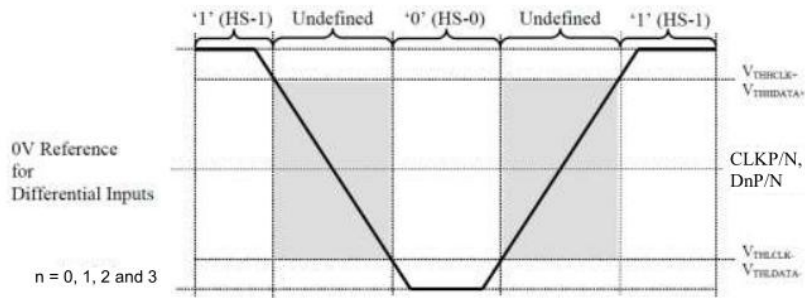
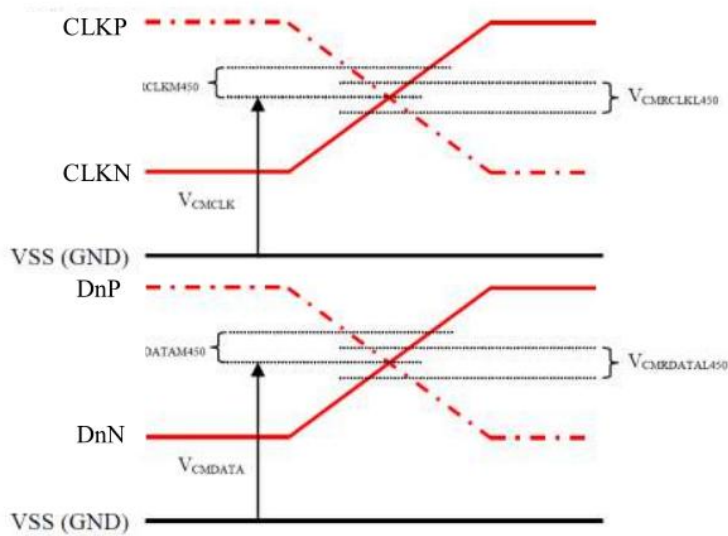


Figure 113: Differential Inputs Logical 0 and 1, Threshold High/Low, Differential Voltage Range



Note:  $n = 0, 1, 2$  and  $3$

Figure 114: Common Mode Voltage on Clock and Data Channels

### 5.8.2 AC Characteristics

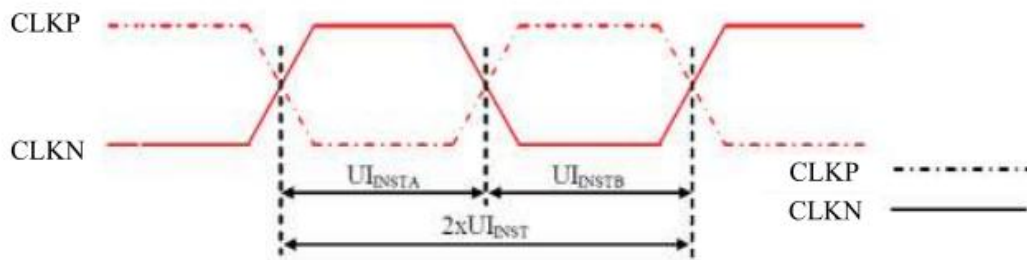


Figure 116: DSI Clock Channel Timing

Table 38: DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
CLKP/N	$2xU_{INST}$	Double UI instantaneous	Note 2	25	ns
CLKP/N	$U_{INSTA}, U_{INSTB}$ (Note 1)	UI instantaneous Half	Note 2	12.5	ns

### 5.9 Optical specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Transmittance (with Polarizer)	T (%)	Θ=0 Normal viewing angle	—	3.4	—	%	Measuring with Polarizer , Reference Only	
Transmittance (without Polarizer)	T (%)		—	10.7	—	%		
Contrast Ratio	CR		640	800	—	—	(1)(2)	
Response Time	Rising		T <sub>R</sub>	—	10	15	msec	(1)(3)
	Falling		T <sub>F</sub>	—	20	25		
Color Gamut	(%)		—	70	—	%	C-light	
Color Chromaticity (CIE1931)	White		W <sub>x</sub>	0.283	0.303	0.323	—	(1)(4) CF glass
			W <sub>y</sub>	0.303	0.323	0.343		
	Red		R <sub>x</sub>	0.634	0.654	0.674	—	
			R <sub>y</sub>	0.299	0.319	0.339		
	Green	G <sub>x</sub>	0.239	0.259	0.279	—		
		G <sub>y</sub>	0.554	0.574	0.594			
	Blue	B <sub>x</sub>	0.120	0.140	0.160	—		
		B <sub>y</sub>	0.064	0.084	0.104			
Viewing Angle	Hor.	Θ <sub>L</sub>	—	80	—	—	(1)(4) Measuring with Polarizer , Reference Only	
		Θ <sub>R</sub>	—	80	—			
	Ver.	Θ <sub>U</sub>	—	80	—			
		Θ <sub>D</sub>	—	80	—			
Optima View Direction	Free						(5)	

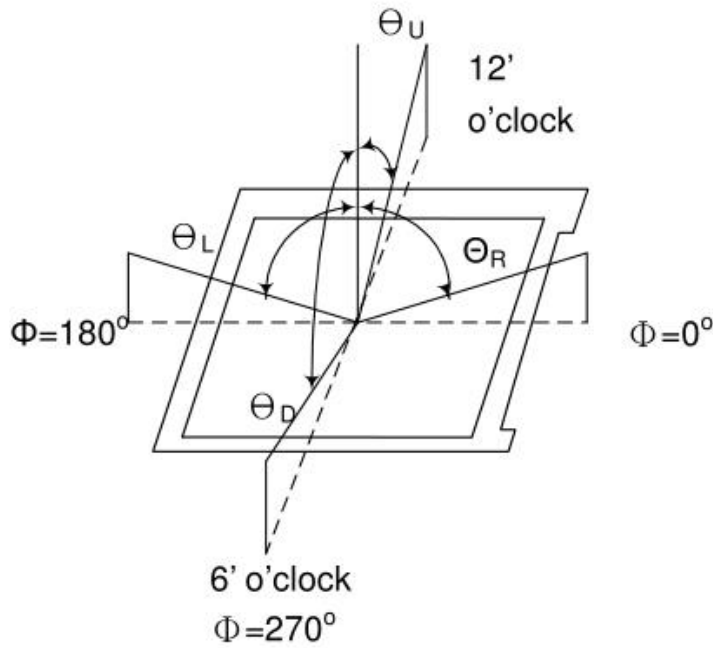
#### Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : 25±2°C
- 15min. warm-up time.

#### Measuring Equipment

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

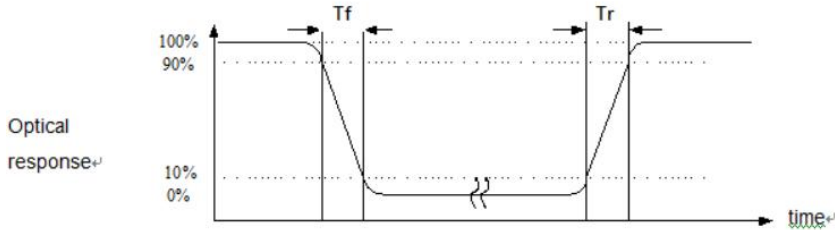
Note (1) Definition of Viewing Angle:



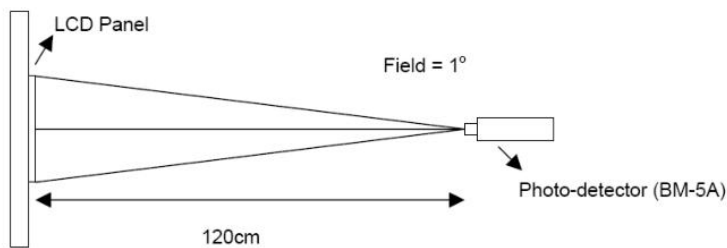
Note (2) Definition of Contrast Ratio (CR) :  
measured at the center point of panel

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

Note (3) Definition of Response Time: Sum of  $T_R$  and  $T_F$



Note (4) Definition of optical measurement setup



## 6. Reliability Test Conditions And Methods

Item	Test Conditions	Remark
High Temperature Storage	Ta = 80°C                      96 hrs	
Low Temperature Storage	Ta = -30°C                      96hrs	
High Temperature Operation	Ts = 70°C                      96hrs	
Low Temperature Operation	Ta = -20°C                      96hrs	
Operate at High Temperature and Humidity	60°C, 90%RH max.              96hrs	Operation
Thermal Shock	-20°C~ +70°C 10 cycles 1Hrs/cycle	Non-operation
Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5mm X,Y,Z direction for total 3hours (Packing Condition)	
Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)	
Electrostatic Discharge	Contact=±4KV, class B Air=±8KV, class B	

## 7. Handling Precautions

### 7.1 Mounting method

The LCD panel of FUTURE LCD module consists of two thin glass plates with polarizers 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.

### 7.2 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.

### 7.3 Caution against static charge

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

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

### 7.4 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 directly to sunshine or high temperature/humidity

### 7.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes 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 than 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.
- A 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.

## **7.6 storage**

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

## **7.7 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

## **8. Precaution for use**

### **8.1**

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.

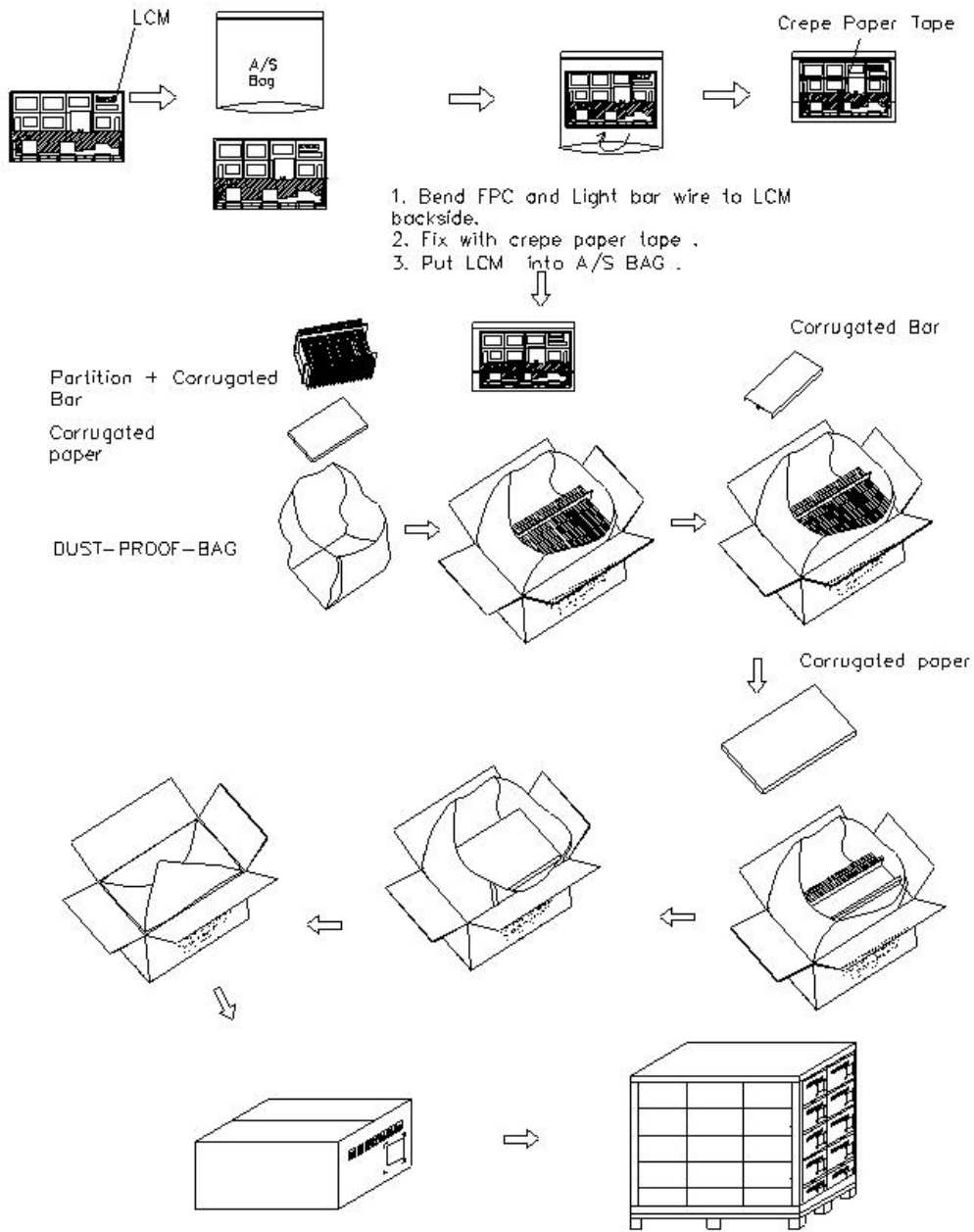
### **8.2**

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 FUTURE , 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.



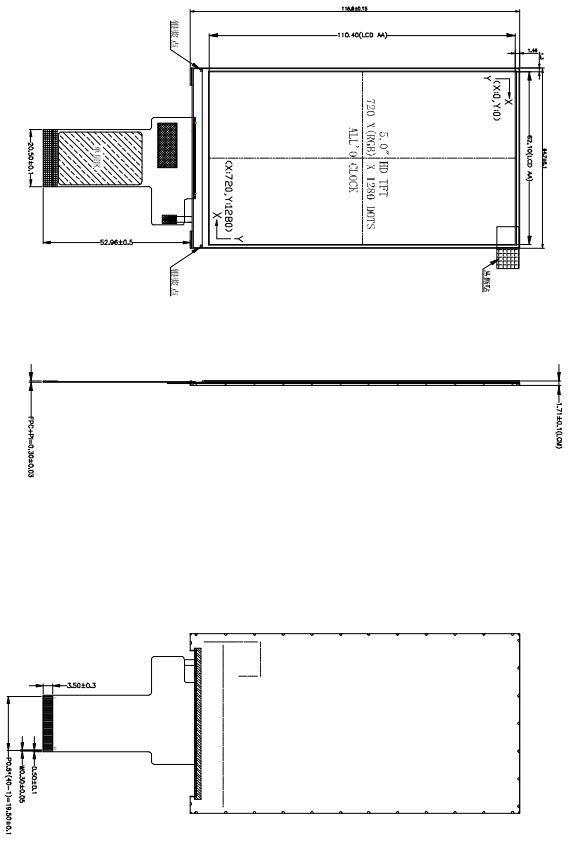
### 9. Package Drawing



### 10. Outline Dimension

Customer Approve By

REV	DESCRIPTION	MODIFY BY	DATE
A0	1 <sup>ST</sup> DESIGN	LZZ	2022-02-12




**Note: ROHS**

- 1. Display Mode: 5.0" TFT/IPS
- 2. Driving Condition: VDD=2.8V
- 3. Viewing Direction: ALL
- 4. Operating Temp: -20~+70° C
- Storage Temp: -30~+80° C
- 5. LCD: /
- 6. IC: NV3052C
- 7. Backlight: WHITE LED\*12
- 8. Unspecified tolerance is ±0.20mm
- 9. ROHS Request



FPC展开出货

 <p><b>湖南飞优特电子科技有限公司</b> Human Future Electronics Technology Co., Ltd.</p>		UNIT: MM SHEET: 1 OF 1	CD
LCM NO. : FUT0500HD102H	DWG NO. : FUT0500HD102H-LCM-A0		
DRAWN BY :	CHECKED BY :	APPROVED BY :	

REV	DESCRIPTION
1	000
2	001
3	002
4	003
5	004
6	005
7	006
8	007
9	008
10	009
11	010
12	011
13	012
14	013
15	014
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