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CERT. No.: 282Q19070712006



CERT. No.: 282E19070712007

## Product Specification

**Model: TTC070TRS-01**

**7.0 "TFT Display Module(1080\*1080)**

This module uses RoHS material

Tailor Pixels Technology Co., Ltd.

[www.tailorpixels.com](http://www.tailorpixels.com)

[tailor@tailorpixels.com](mailto:tailor@tailorpixels.com)

Ph: 86-755-8821 2653

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## 2.General Specifications

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180° shift.

Note 2: ROHS compliant.

Item	Specification	Unit
LCD size	7.0	inch
Display Mode	Normally Black	--
Resolution	1080(RGB)x1080	Pixel
Pixel pitch	0.1644x0.1644	mm
Pixel Arrangement	RGB Vertical Stripe	
Viewing Angle	85/85/85/85	-
Module outline dimension	186.15(H)*247.7(V)*4.8(D)	mm
LCD AA	177.552(H)x177.552	mm
Driver IC	FL5893	-
Interface	SPI+LVDS/LVDS	--
Backlight	White LED	--
Operating Temperature	-20°C~ +70°C	--
Storage Temperature	-30°C~ +80°C	--

### 3.Pin Assignment

PIN	Symbol	Description	Remark
1-2	LEDA	LED ANODE	
2-4	LEDK	LED CATHODE	
5-6	VDD	External Power Supply Voltage 3.3V	
7	GND	Ground	
8	RESET	This signal will reset the device	
9	STBYB	Standby mode / Normal mode	
10	GND	Ground	
11	D0N	Input pin for LVDS display data	
12	D0P		
13	GND	Ground	
14	D1N	Input pin for LVDS display data	
15	D1P		
16	GND	Ground	
17	CLKN	Input pin for LVDS display data	
18	CLKP		
19	GND	Ground	
20	D2N	Input pin for LVDS display data	
21	D2P		
22	GND	Ground	
23	D3N	Input pin for LVDS display data	
24	D3P		
25	GND	Ground	
26	CSB	Chip select signal for SPI interface	
27	SCL	Clock signal for SPI interface	
28	SDAI	Serial data input for SPI interface	
29	SDAO	Serial data output for SPI interface	
30	VDD-OTP	External power supply during the initialization of the firmware	
31	GND	Ground	
32-36	NC	NC	
37-40	GND	Ground	

## 4. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Power Voltage	VDD	3.0	3.6	V	
Operating Temperature	Top	-20.0	70.0	°C	
Storage Temperature	T <sub>st</sub>	-30.0	80.0	°C	
Operating and Storage Humidity	H <sub>stg</sub>	10%	90%	%(RH)	

## 5. Electrical Characteristics

### 5.1 Recommended Operating Condition

V<sub>CI</sub>=3.3V, GND=0V, T<sub>a</sub> = 25°C

Item	Symbol	Condition	Min	TYP.	Max.	Unit
Operating Voltage	VDDI	External Supply	3.0	3.3	3.6	V
	VDD-OTP		8.0	8.25	8.5	V
	VSP		5.1	/	6.6	V
	VSN		-5.1	/	-6.6	V
	VGH	Built-In Power Supply	7.0	/	22.5	V
	VGL		-7	/	-15	V
	VCOM		-2	/	0.55	V
Differential input high threshold voltage	RxVTH	RxVCM = 1.2V	/	/	0.1	V
Differential input low threshold voltage	RxVTL		-0.1	/	/	V

## 5.2 Backlight Unit Driving Condition

Item	Symbol	Min.	TYP.	Max.	Unit	Remark
Forward Current	IF	/	160	/	Ma	Fourteen LED lights
Forward Voltage	VF	/	21	22.4	V	
Operating Life Time	--	30000	--	--	hrs	Note 2, Note 3

Note1: The LED driving condition is defined for each module.

Note2: When LCM is operated, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: Optical performance should be evaluated at Ta=25°C When LED is driven at high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Note4: The LED driving condition is defined for each LED module.

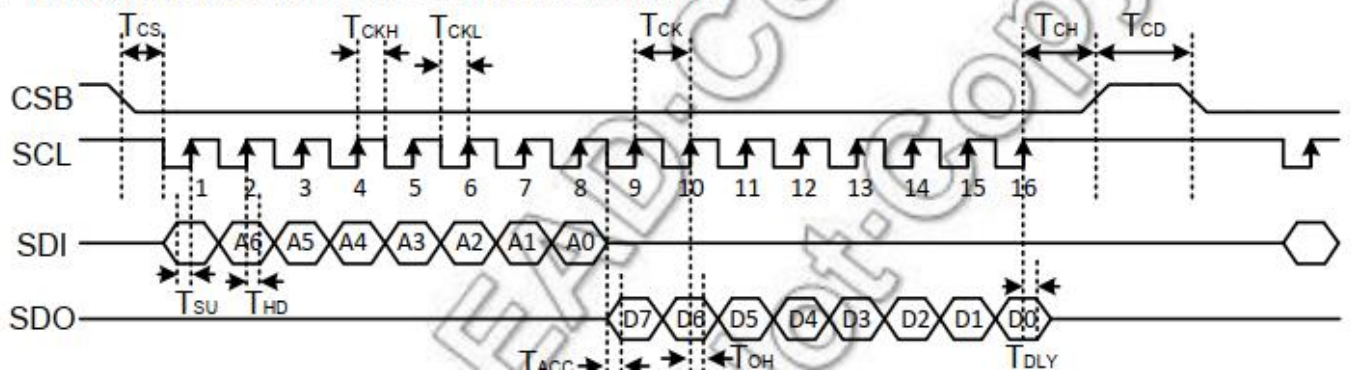
## 6.Controller Interface

### 6.1 4-Wire Serial Peripheral Interface Timing

Parameter	Signal	Symbol	Min	Typ.	Max.	Unit	Condition
Serial clock period (Write)	SCL	T <sub>CK</sub>	250	-	-	ns	
Serial clock period (Read)			250	-	-		
SCL "H" pulse width (Write)		T <sub>CKH</sub>	125	-	-		
SCL "H" pulse width (Read)			125	-	-		
SCL "L" pulse width (Write)		T <sub>CKL</sub>	125	-	-		
SCL "L" pulse width (Read)			125	-	-		
Write data input setup time	SDI SDO	T <sub>SU</sub>	100	-	-		
Write data input hold time		T <sub>HD</sub>	100	-	-		
Read Data access time		T <sub>ACC</sub>	-	-	100		
Read Data output disable time		T <sub>OH</sub>	20	-	-		
SCL-SDO output delay time		T <sub>DLY</sub>	-	-	T <sub>CKH</sub>		
CSB-SCL time	CSB	T <sub>CS</sub>	330	-	-		
CSB-SCL time		T <sub>CH</sub>	250	-	-		
CSB "H" pulse width		T <sub>CD</sub>	1000	-	-		

Note:

1. The input signal rise and fall time (tr, tf) are specified at 15ns or less.
2. All timing is specified using 20% and 80% of VDDI as the standard.



Write mode

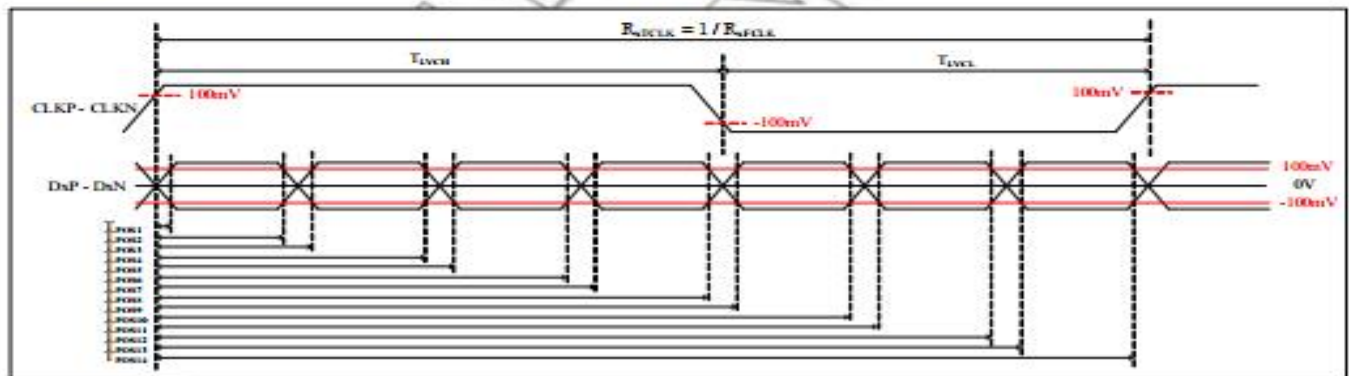
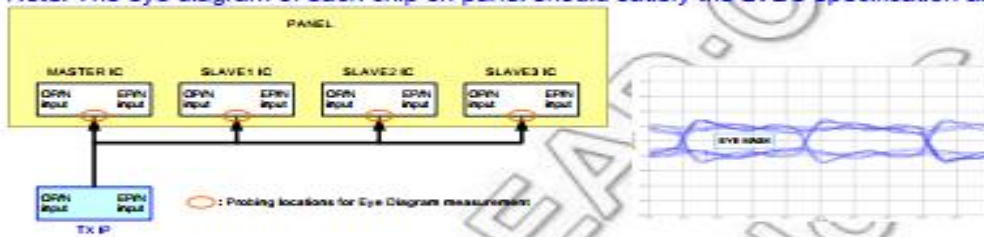
This chip supports serial peripheral interface (SPI) to set internal registers. Under write operation, R/W bit equals to “0,” and the external controller sends the address and data to the chip by SPI\_SDAI. Under read operation, R/W bit equals to “1,” and the external controller sends the address to the chip by SPI\_SDAI. Then the chip will return the data value by SPI\_SDAO. The returned data should be latched at the rising edge of SPI\_SCL from the external controller.

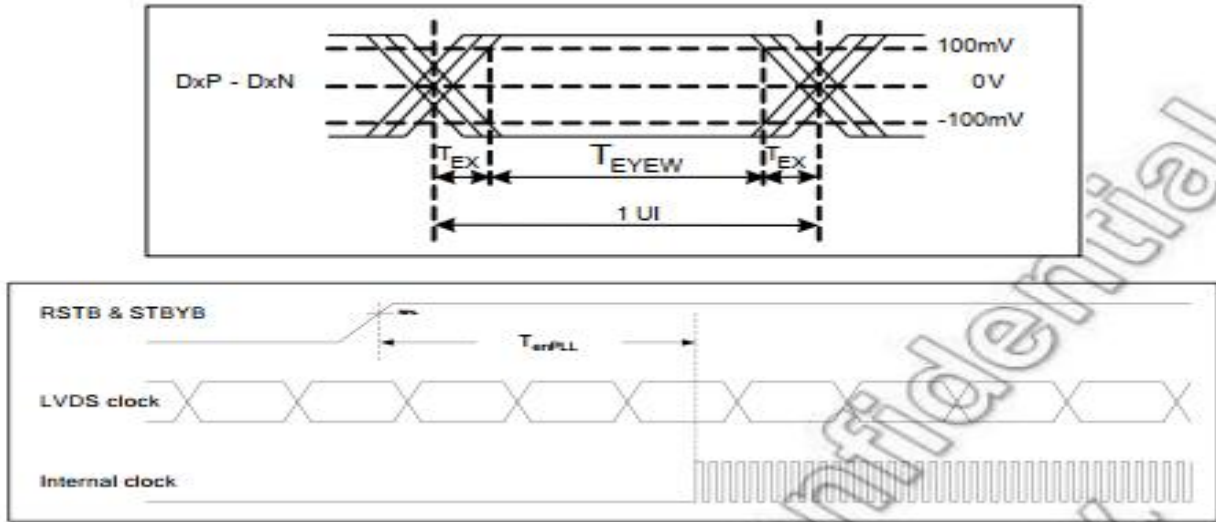
6.2 LVDS Interface Timing  
 1-Port LVDS VESA Data Mapping  
 8BIT Mode



Item	Signal	Symbol	Rating			Unit
			Min.	Typ.	Max.	
Clock Frequency	CLK	$R_{FCLK}$	20	-	100	MHz
Clock Period	CLK	$R_{TCLK}$	10	-	50	ns
1 data bit time		UI	-	1/7	-	$R_{TCLK}$
Clock high time	CLK	$T_{LVCH}$	-	4	-	UI
Clock low time	CLK	$T_{LVCL}$	-	3	-	UI
Position 1	DATA	$T_{POS1}$	-0.25	0	0.25	UI
Position 2		$T_{POS2}$	0.75	-	1.25	
Position 3		$T_{POS3}$	0.75	1	1.25	
Position 4		$T_{POS4}$	1.75	-	2.25	
Position 5		$T_{POS5}$	1.75	2	2.25	
Position 6		$T_{POS6}$	2.75	-	3.25	
Position 7		$T_{POS7}$	2.75	3	3.25	
Position 8		$T_{POS8}$	3.75	-	4.25	
Position 9		$T_{POS9}$	3.75	4	4.25	
Position 10		$T_{POS10}$	4.75	-	5.25	
Position 11		$T_{POS11}$	4.75	5	5.25	
Position 12		$T_{POS12}$	5.75	-	6.25	
Position 13		$T_{POS13}$	5.75	6	6.25	
Position 14		$T_{POS14}$	6.75	-	7.25	
Input eye width		$T_{EYEW}$	0.5	-	-	
Input eye border		$T_{EX}$	-	-	0.25	
PLL wake-up time		TenPLL	-	-	150	us

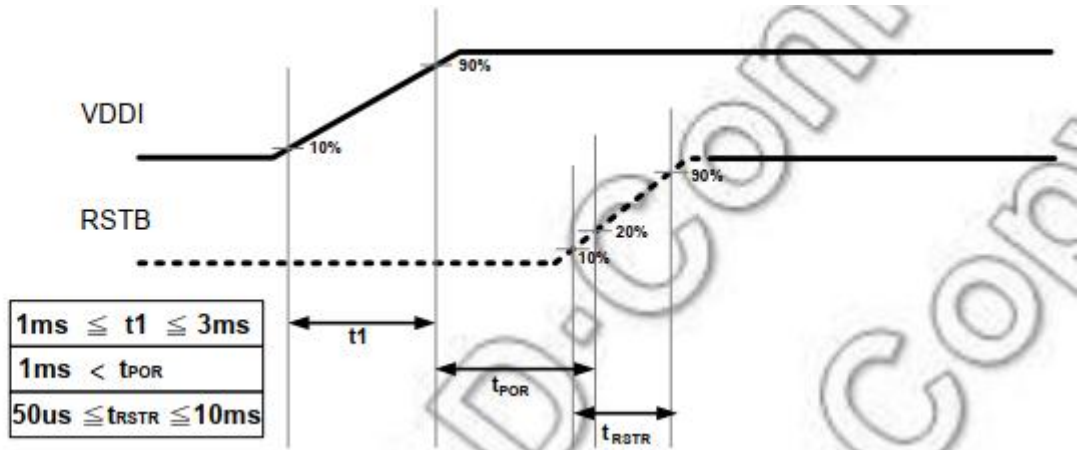
Note: The eye diagram of each chip on panel should satisfy the LVDS specification above.





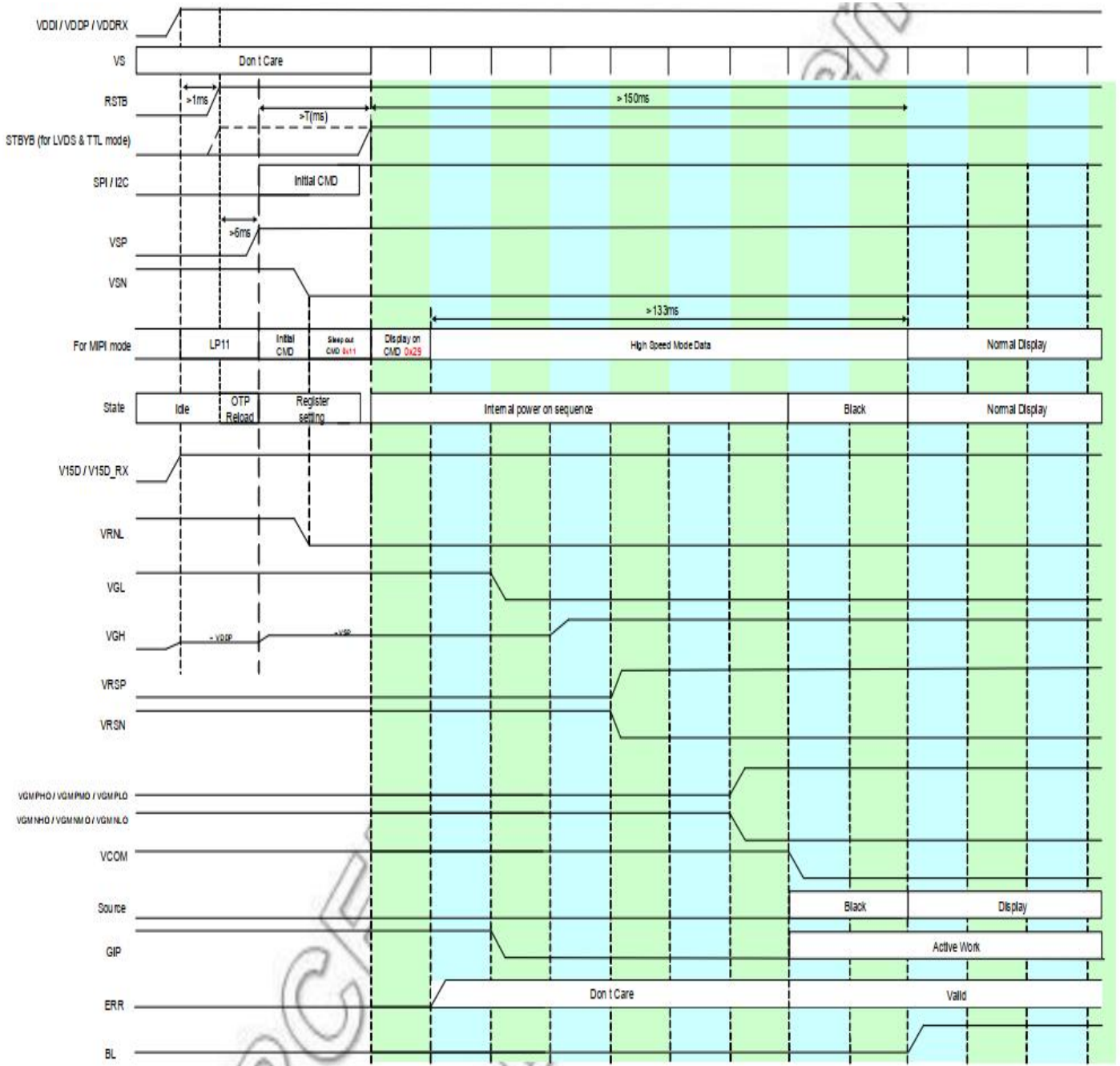
### 6.3 reset timing

Recommend power on reset timing is shown as below

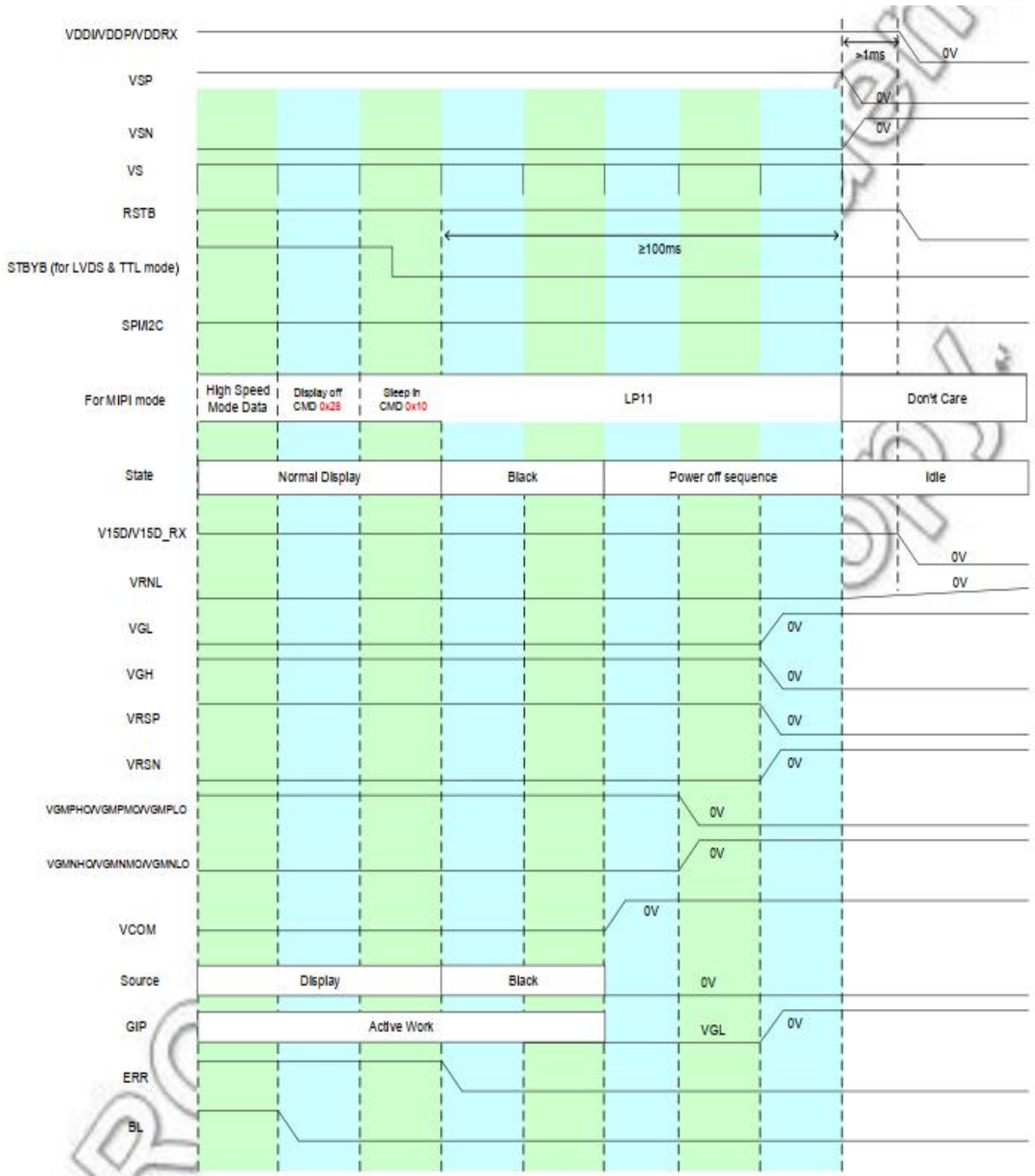


## 7. Power On /OFF Sequence

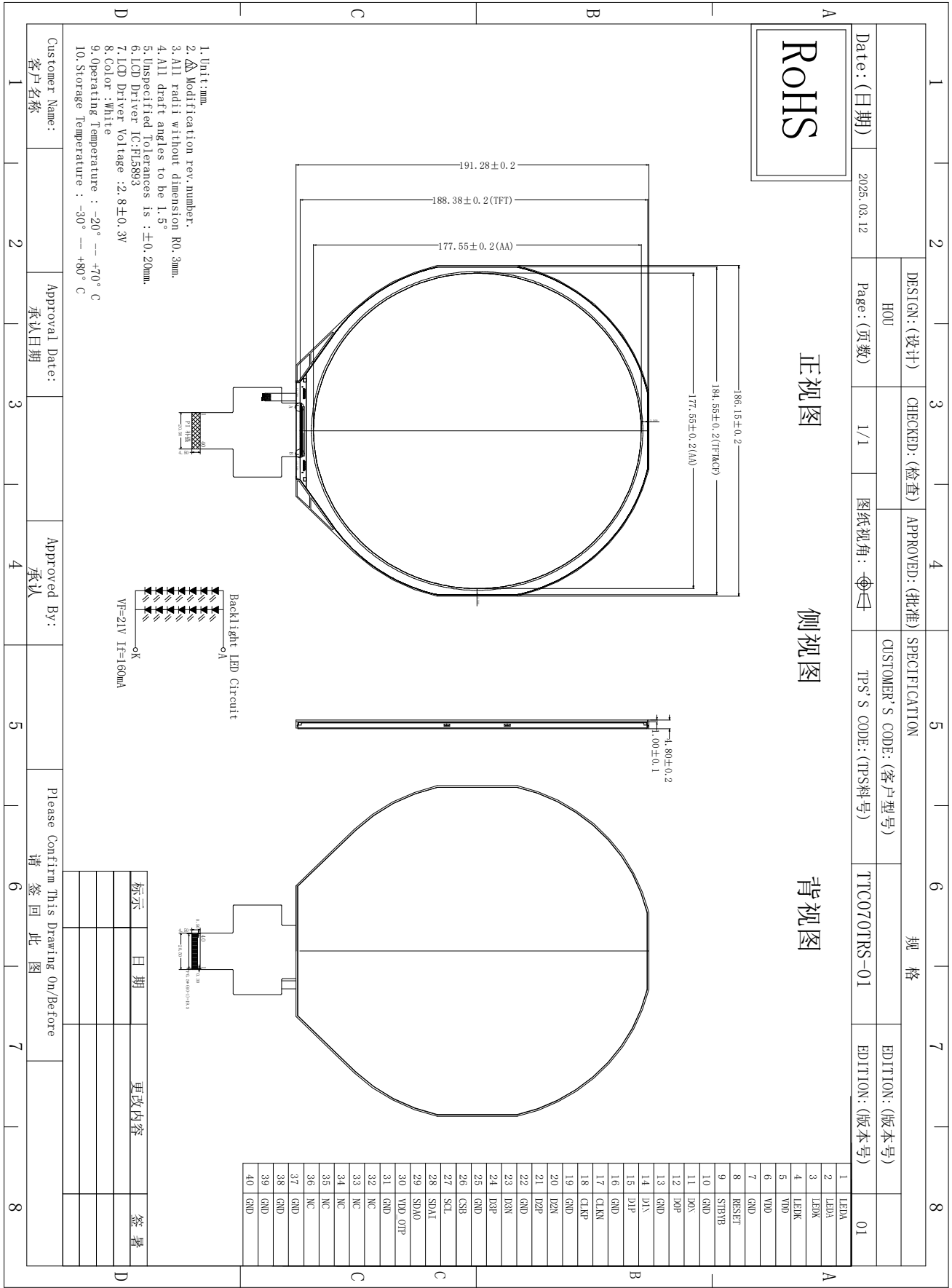
### Power on Sequence



### Power-off Sequence



8. Mechanical Drawing



## 9.Optical Characteristics

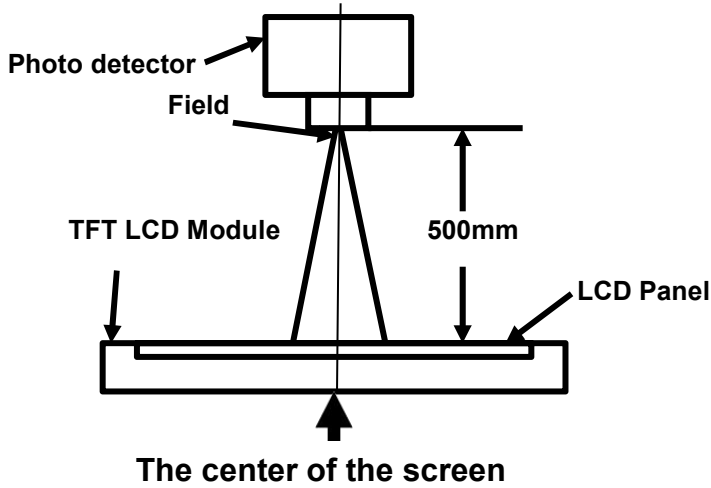
Item	Symbol	Condition	Min.	TYP.	Max	Unit	Remark
View Angles	$\theta T$	$CR \geq 10$	75	85	-	Degree	Note 2, 3
	$\theta B$		75	85	-		
	$\theta L$		75	85	-		
	$\theta R$		75	85	-		
Contrast Ratio	CR	$\theta=0^\circ$	900	1200	-		Note3
Response Time	$T_{ON}$	$25^\circ C$		25	30	ms	Note4
	$T_{OFF}$						
Chromaticity	White	Backlight is on	-	TBD	-		Note1 Note5
			-	TBD	-		
Transmittance	U		3.54	4.17		%	
Uniformity	U		85	90	-	%	Note1 Note6
NTSC			65	70	-	%	Note 5
Luminance	L		-	400	-	CD/m <sup>2</sup>	Note1 Note7

Test Conditions:

- 1.IF= 160 Ma, VF=21 V and the ambient temperature is  $25 \pm 2^\circ C$ .humidity is  $65 \pm 7\%$
- 2.The test systems refer to Note 1 and Note 2.

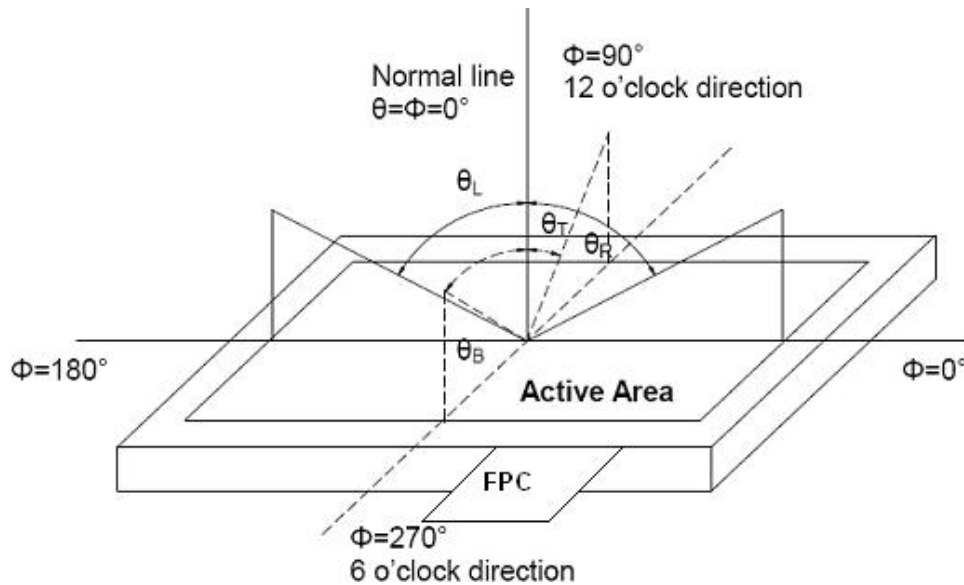
**Note 1: Definition of optical measurement system.**

Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



**Note 2: Definition of viewing angle range and measurement system.**

Viewing angle is measured at the center point of the LCD by CONOSCOPE(ergo-80).

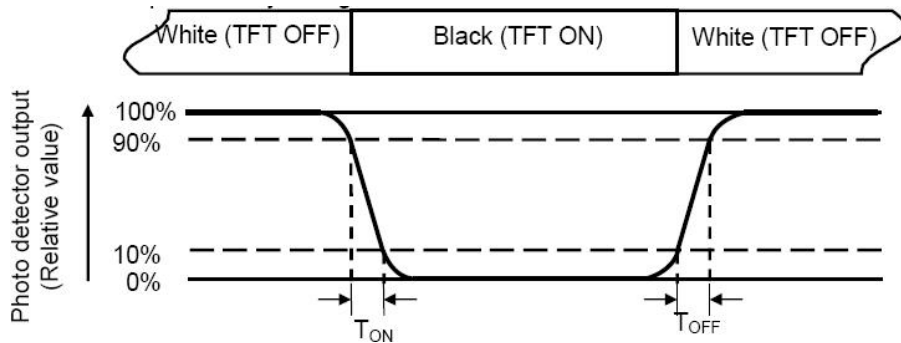


**Note 3: Definition of contrast ratio**

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

**Note 4: Definition of response time**

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time ( $T_{ON}$ ) is the time between photo detector output intensity changed from 90% to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.



to 10%. And fall time ( $T_{OFF}$ ) is the time between photo detector output intensity changed from 10% to 90%.

**Note 5: Definition of color chromaticity (CIE1931)**

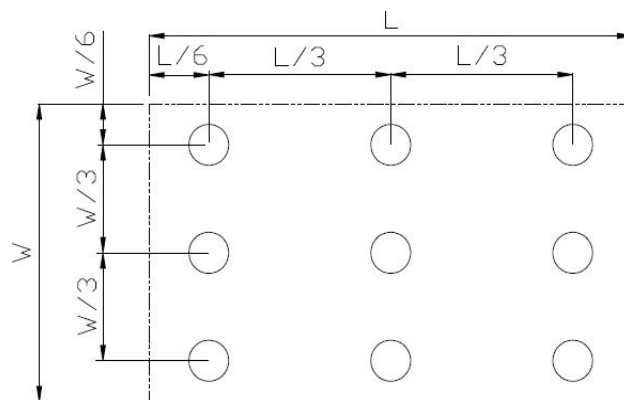
Color coordinates measured at center point of LCD.

**Note 6: Definition of luminance uniformity**

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity ( $U$ ) = Luminance min / Luminance max

L-----Active area length W-----Active area width



Luminance max: The measured Maximum luminance of all measurement position. Luminance min: The measured Minimum luminance of all measurement position.

**Note 7: Definition of luminance:**

Measure the luminance of white state at center point

## 10.Environmental / Reliability Test

No.	Items	Condition	Inspection after test
1	High Temperature Storage	$T = 80^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 120 hr	Inspection after 4 hours storage at room temperature, the sample shall 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.
2	Low Temperature Storage	$T = -30^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 120 hr	
3	High Temperature Operating	$T = 70^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 120 hr	
4	Low Temperature Operating	$T = -20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 120 hr (But no condensation of dew)	
5	High Temp. and High Humidity Operating	$T = 60^{\circ}\text{C} \pm 5^{\circ}\text{C}$ /90% for 96 hr (But no condensation dew)	
6	Thermal Shock	$-20 \pm 2^{\circ}\text{C} \sim 25 \sim 70 \pm 2^{\circ}\text{C} \times 10$ cycles (30min.) (5min.) (30min.)	
7	ESD	Voltage: $\pm 2\text{KV}$ R: $330\Omega$ C: $150\text{pF}$ Air discharge, 10time	

Note1:  $T_s$  is the temperature of panel's surface.

Note2:  $T_a$  is the ambient temperature of samples

## 11. Precautions for Use of LCD Modules Handling Precautions

### 11.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The Polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this Polarizer carefully.

10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the Polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Module.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Modules.

Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.2 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.3 The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

### 11.2 Storage Precautions

10.2.1 When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is: Temperature : 0°C ~ 40°C Relatively humidity: ≤80%

10.2.3 The LCD modules should be stored in the room without acid, alkali and harmful gas.

### 11.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.