



深圳市中有科技有限公司

- ☒ Tentative Specification
☐ Preliminary Specification
☐ Approval Specification

Customer: _____

Product Model: _____ RS070WS221 _____

Version : _____ A0 _____

CUSTOMER APPROVED		
Designed by	Checked by	Approved by

APPROVED		
Prepared by	Checked by	Approved by

[illegible]



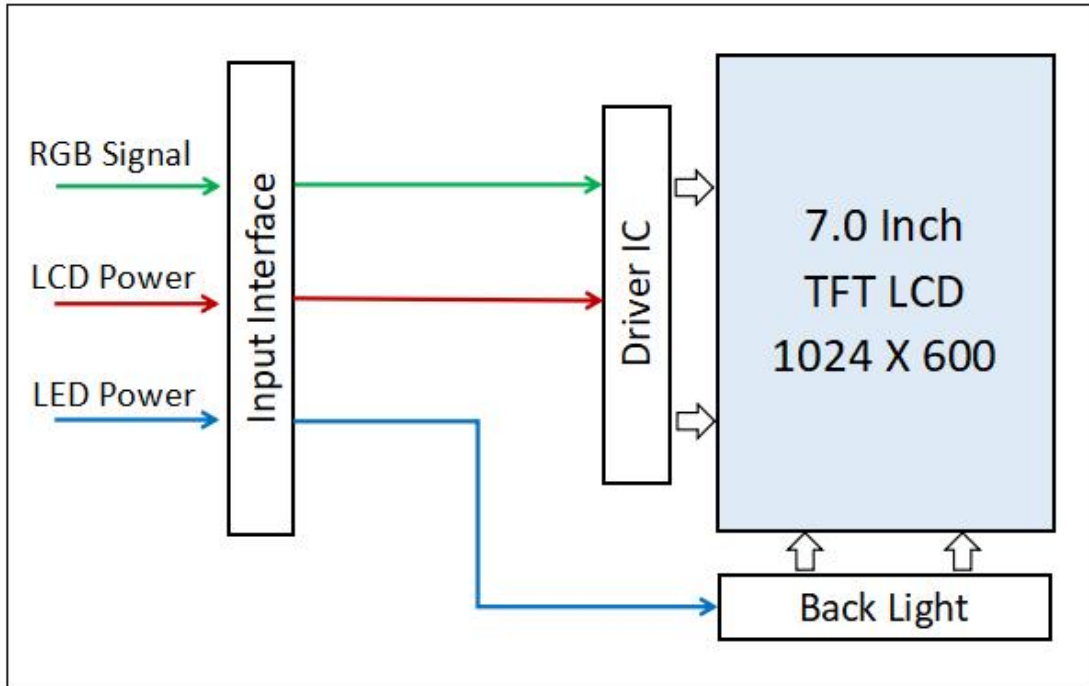
Contents

No.	Item	Page
1	General Description	4
2	General Specifications	4
3	Outline Dimension	5
4	Interface Definition	6
5	Operation Specifications	8
6	Signal Timing Characteristics	10
7	Optical Specifications	10
8	Reliability Test Items	14
9	Packing and Label Format	14
10	Precautions	15



1.General Description

The **LCM-RS070WS221-A0** is a Color Active Matrix Liquid Crystal Display adopts one integral backlight with High brightness 27-lamps white LED. This LCD has 7 inches diagonally measured active display area with 1024*600 resolution. With a 8bit bit gray scale signal for each dot and 16.7M colors,With BOE Cell.



2. Technology Features

No.	Item	Specification
1	LCD size	7.0 inch
2	Resolution	1024(RGB)X600
3	Display mode	Normally Black
4	Pixel pitch	0.0502(H) X RGB X 0.1432(V) mm
5	Active area	154.21(H)X85.92 (V) mm
6	Module size	164.9 (H)X100.00(V)X3.5(T)mm
7	Pixel arrangement	RGB-stripe
8	Surface Treatment	AG
9	Interface	TTL
10	Viewing Direction	Full Viewing
11	NTSC	50%
12	Backlight	White LED
13	Panel power consumption	TBD
14	LCD Driver IC	JD9165BA

[illegible]



4.Interface Definition

Pin No.	Symbol	Description	Remark
1	LEDA	LED anode	
2	LEDA	LED anode	
3	LEDK	LED cathode	
4	LEDK	LED cathode	
5	GND	Ground	
6	VCOM	Common Voltage	
7	DVDD	Power for Digital Circuit(3.3V)	
8	MODE	DE/SYNC mode select	
9	DE	Data Input Enable	
10	VS	Vertical Sync Input	
11	HS	Horizontal Sync Input	
12	B7	Blue data	
13	B6	Blue data	
14	B5	Blue data	
15	B4	Blue data	
16	B3	Blue data	
17	B2	Blue data	
18	B1	Blue data	
19	B0	Blue data	
20	G7	Green data	
21	G6	Green data	
22	G5	Green data	
23	G4	Green data	
24	G3	Green data	
25	G2	Green data	
26	G1	Green data	
27	G0	Green data	
28	R7	Red data	
29	R6	Red data	
30	R5	Red data	
31	R4	Red data	
32	R3	Red data	
33	R2	Red data	
34	R1	Red data	
35	R0	Red data	
36	GND	Ground	
37	DCLK	Sample clock	
38	GND	Ground	
39	L/R	Left / right selection	
40	U/D	Up/down selection	
41	VGH	Gate ON Voltage	
42	VGL	Gate OFF Voltage	



43	AVDD	Power for Analog Circuit	
44	RESET	Global reset pin.(H=3.3V)	
45	NC	No connection	
46	VCOM	Common Voltage	
47	DITHB	Dithering function	
48	GND	Ground	
49	NC	No connection	
50	NC	No connection	

Note 1: DE/SYNC mode select. Normally pull high.

When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE="0", DE must be grounded.

Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

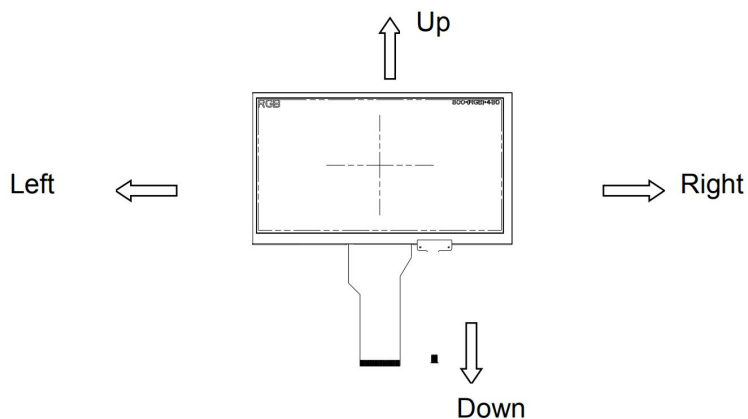
Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Setting of scan control input	Scanning direction	Scanning direction
U/D	L/R	
GND	DVDD	Up to down, left to right
DVDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
DVDD	DVDD	Down to up, left to right

Note 5: Definition of scanning direction.

Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.

When DITHB="0",Disable internal dithering function.

When DITHB="1",Enable internal dithering function.



5. Operation Specifications

5.1 Absolute Max. Rating

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min.	TYP	Max.	Unit
Supply power voltage	VDD	-0.3	-	3.96	V
I/O power voltage	VDDIO	-0.3	-	3.96	V
AVDD input power	AVDD	-0.3	-	12	V
Gate On Power Supply Voltage	VGH	-0.3	-	VGL+32	V
Gate Off Power Supply Voltage	VGL	VGH-32	-	0.3	V
VMID voltage	VMID	-0.3	-	6.6	V
Common Power Supply Voltage	VCOM_OP	-0.3	-	5.43	V
VOTP (OTP power)	VOTP	-	-	9	V
Operating Temperature	TOPR	-10	-	60	°C
Storage temperature	TSTG	-20	-	70	°C

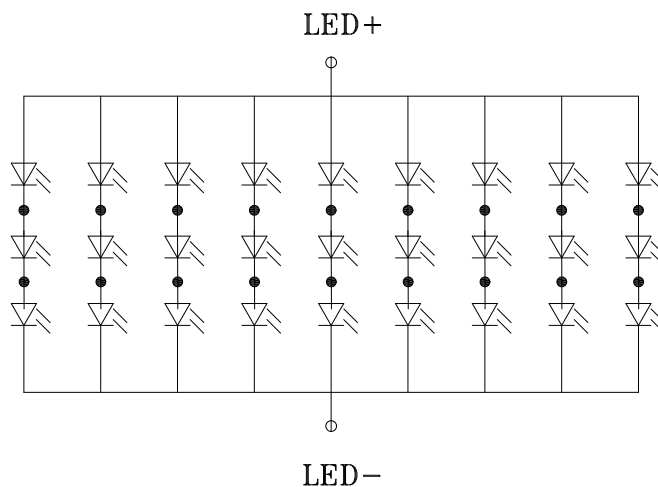
5.2 Typical Operation Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply power voltage	VDD	3.0	3.3	3.6	V
I/O power voltage	VDDIO	3.0	3.3	3.3	V
AVDD input power	AVDD		9.8		V
Gate On Power Supply Voltage	VGH	18		20	V
Gate Off Power Supply Voltage	VGL	-8.5		-7.5	V
Common Power Supply Voltage	VCOM	-	3.5	-	V

1. The measuring position is the connector of LCM and the test conditions are under 25°C, Frame Rate=60Hz
2. Vcom must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc.. The value is just the reference value. The customer can optimize the setting value by the different D-IC.

5.3 LED Back Light Specification

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LED Current	ILED		180		mA	Total LED
Forward Voltage	VF	8.1	9.0	9.9	V	IF=180mA
LED life time	Hr	20000		-	Hour	

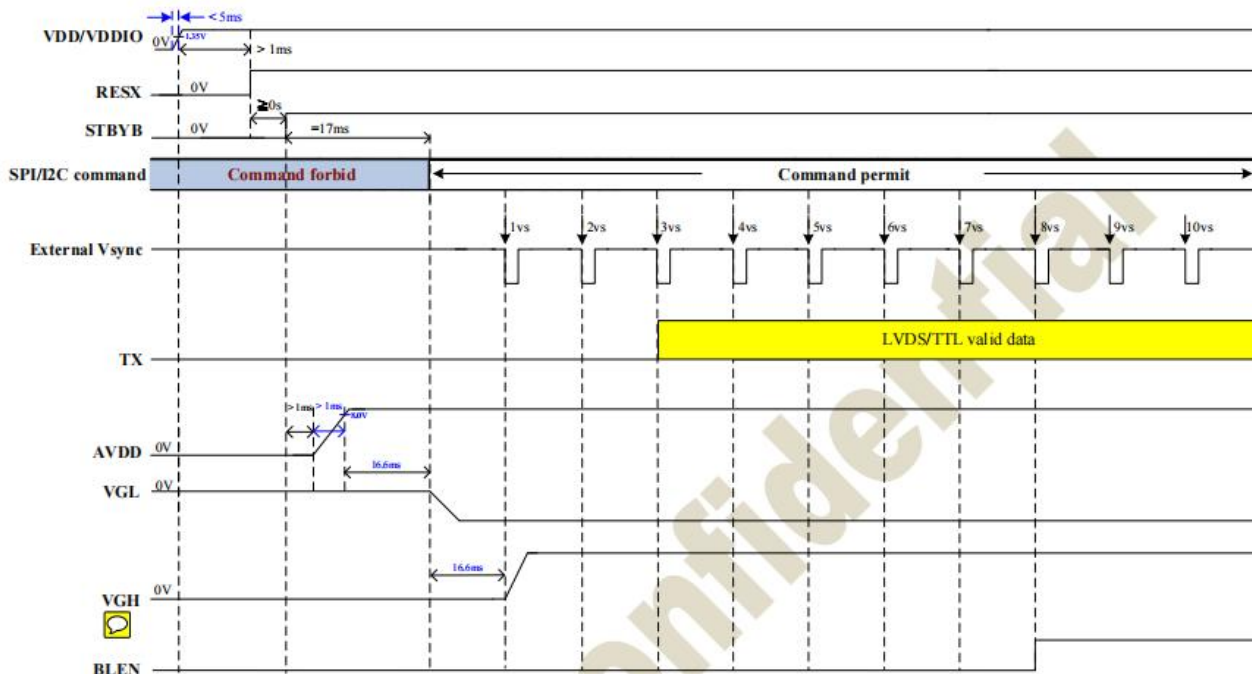


3串9并, $3 \times 3.3 = 9.9V (MAX)$, $20 \times 9 = 180mA$

5.4 Power On/Off Sequence

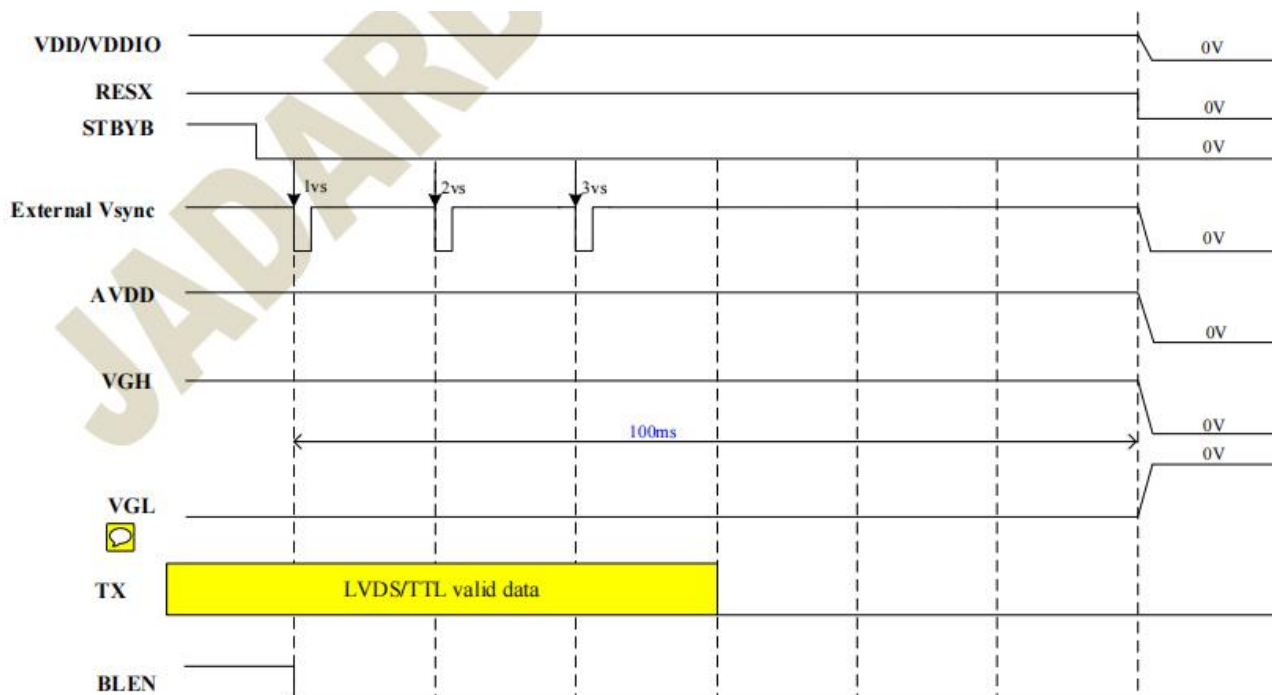
To prevent the device damage from latch up, the power on/off sequence shown below must be followed.

a. Power on





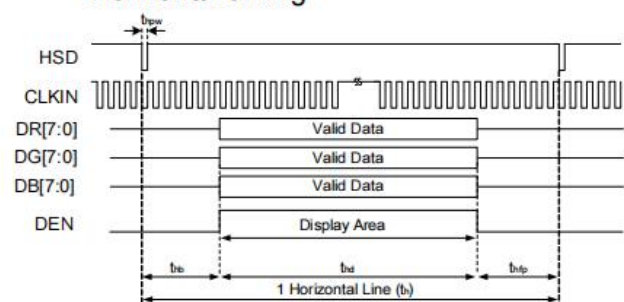
b. Power off



6.Signal Timing Characteristics

6.1 Signal Electrical Characteristics

• Horizontal timing



• Vertical timing

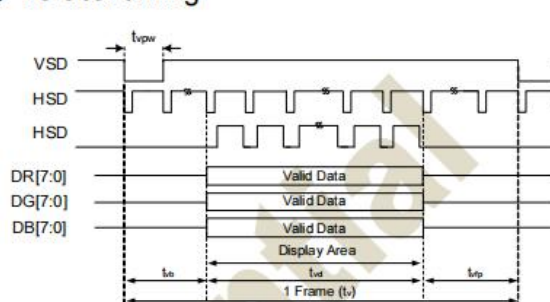


Figure 6.1: 24-bit parallel RGB mode horizontal/vertical input timing



6.2 Timing Setting Table

Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		/	-	60	-	Hz
Clock frequency		1/Tclock	40.8	51.2	67.2	MHz
Horizontal Section	Period	Tht	1114	1344	1400	Tclock
	Active	T _H DISP	1024			
	Blanking	T _H F _P	30	160	216	
		T _H B _P	60	160	160	
		T _H S	1	24	HBP-1	
Vertical Section	Period	Tvt	610	635	800	Tline
	Active	T _V DISP	600			
	Blanking	T _V F _P	2	12	100	
		T _V B _P	8	23	100	
		T _V S	1	2	VBP-1	

7. Optical specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 5 minutes in a dark environment at 25°C.

Item		Symb ol	Min.	Typ.	Max.	Unit	Remark
Contrast Ratio		CR		800	-		Note 1 Note 4
Luminance(Center)		L		500		cd/m2	Note 1 Note 6 Note 7
Luminance Uniformity(9P)		LU	75		-	%	
Color Gamuu			-	50	-	%	
Response Time		T _{RT}	-	30	40	ms	Note 3
Color Chromaticity	White	x	Typ-0.05	0.280	Typ+0.05		Note5
		y		0.290			
	Red	x		0.599			
		y		0.362			
	Green	x		0.312			
		y		0.570			
	Blue	x		0.149			
		y		0.101			
Viewing Angle range	Horizontal	Θ _R	-	85	-	Deg.	Note 2
		Θ _L	-	85	-	Deg.	
	Vertical	Θ _T	-	85	-	Deg.	
		Θ _B	-	85	-	Deg.	



Note 1: Definition of viewing angle range

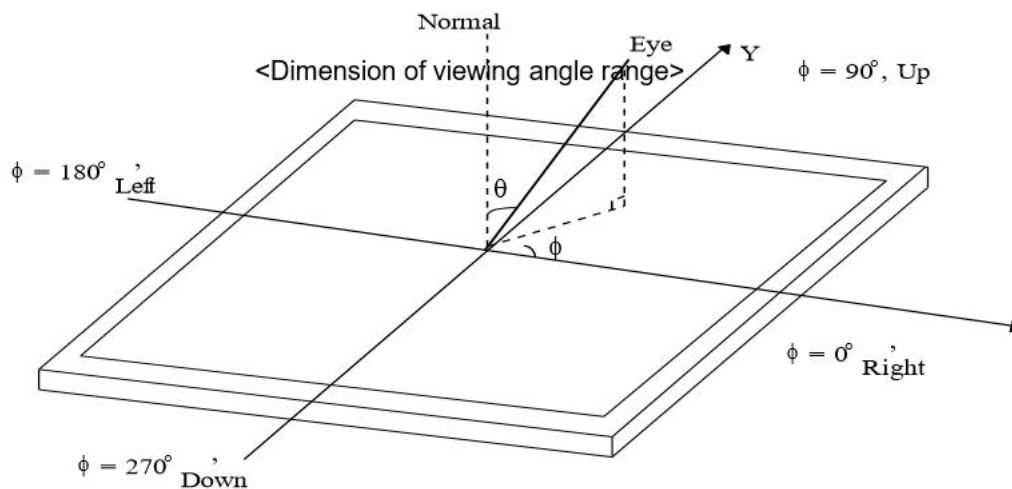


Fig. 4-1 Definition of viewing angle

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm ,Response time is measured by Photo detector TOPCON BM-5A, other items are measured by BM-7A/Field of view: 1° /Height: 500mm.)

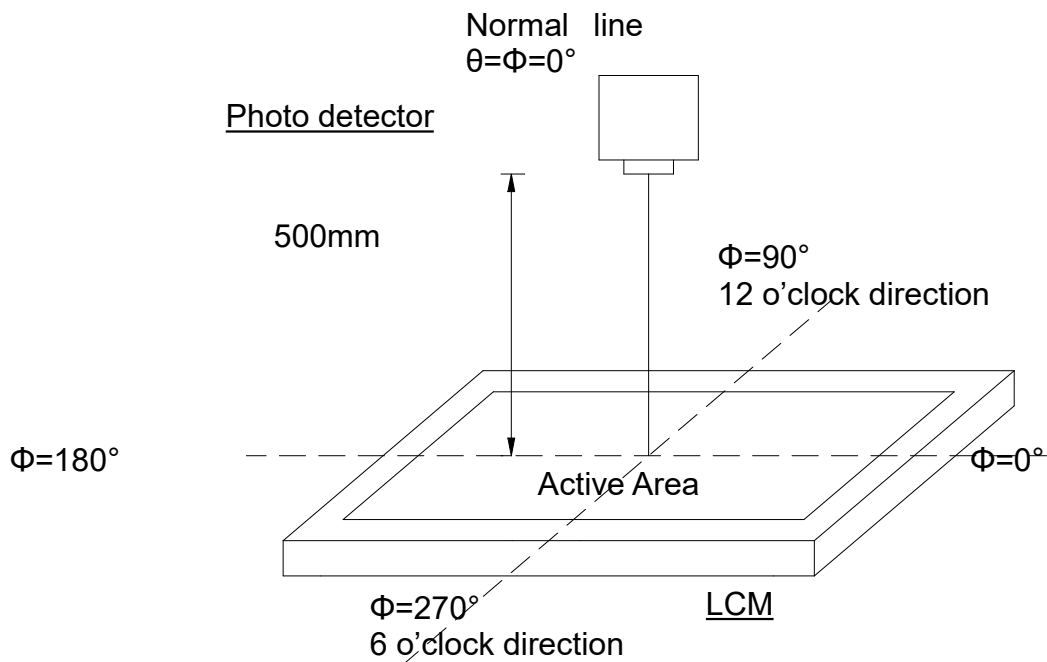


Fig. 4-2 Optical measurement system setup

Note 3: 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%.

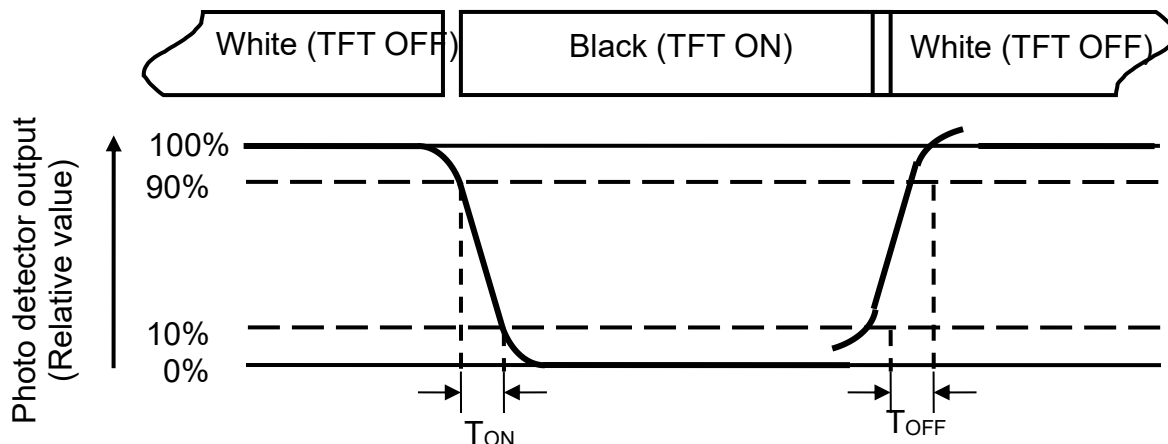


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

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

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is $I_{LED}=120\text{mA}$.

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

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

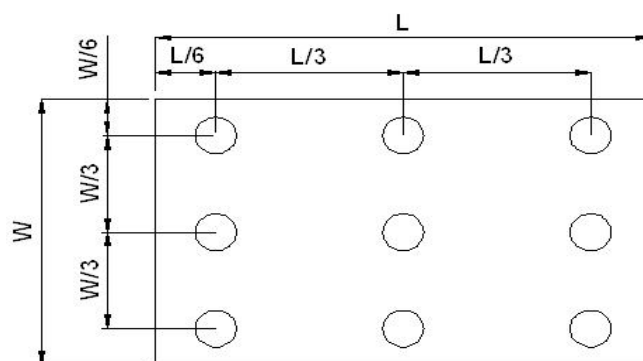


Fig. 4-4 Definition of measuring points

B_{max} : The measured maximum luminance of all measurement position.

B_{min} : The measured minimum luminance of all measurement position.



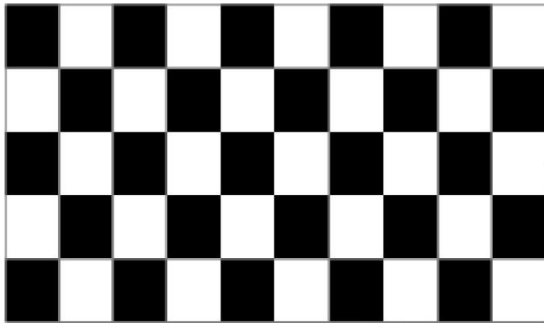
8. Reliability Test Conditions And Methods

Item	Test Conditions		Remark
High Temperature Storage	Ta = 70℃	48 hrs	
Low Temperature Storage	Ta = -20℃	48 hrs	
High Temperature Operation	Ts = 60℃	48 hrs	
Low Temperature Operation	Ta = -10℃	48 hrs	
Operate at High Temperature and Humidity	60℃, 90%RH max.	48 hrs	Operation
Thermal Shock	-20℃~+60℃ 10cycles	1 Hrs/cycle	Non-operation
Electrostatic Discharge	Contact=±4KV, class B Air=±8KV, class B		
Image Sticking	25℃ ; 1hrs		Note3

Note1: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note2: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

Note3: Condition of image sticking test :25℃ ± 2℃ , Operation with test pattern sustained for 1hour,then change to gray pattern immediately. after 10 mins, the mura must be disappeared completely.



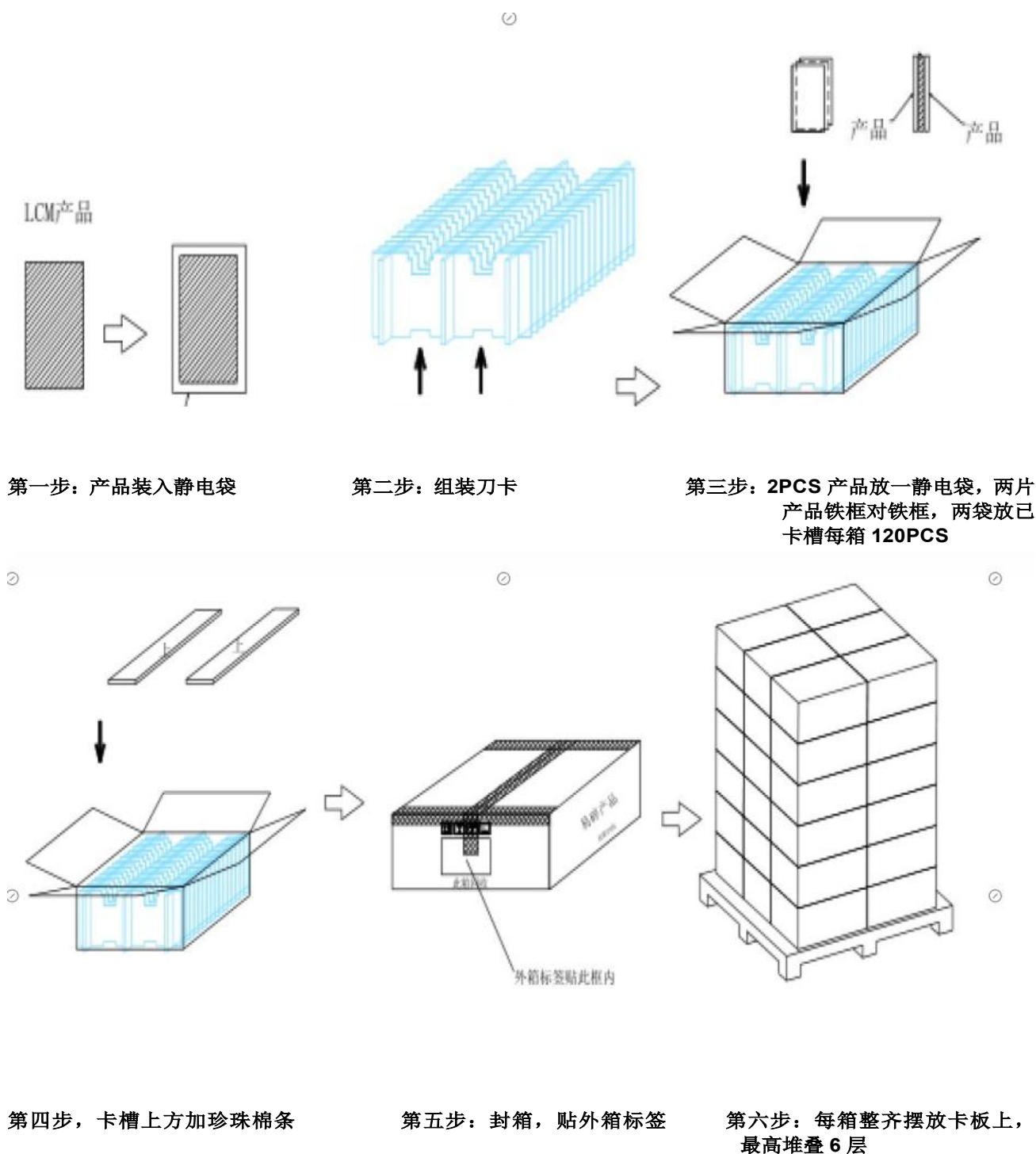
(a) Test Pattern (chess board Pattern)



(b) Gray Pattern (127)



9. Package Drawing





10. Precautions

Please pay attention to the followings when you use this TFT LCD module

10.1 Mounting Precautions

- (1) You must mount a module using holes arranged in four corners or four sides.
- (2) You should consider the mounting structure so that uneven force is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module
- (3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to resist external force.
- (4) You should adopt heat radiation structure to satisfy the temperature specification.
- (5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction
- (6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth.
- (7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzene. Normal-hexane is recommended for cleaning the adhesives used to attach front or rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
- (8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (9) Do not open the case because inside circuits do not have sufficient strength
- (10) When handling the LCD module, it needs to handle with care not to give mechanical stress to the PCB and Mounting Hole area."

10.2 Operating Precautions

- (1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage : $V = \pm 200\text{mV}$ (Over and under shoot voltage)
- (2) Response time depends on the temperature. (In lower temperature, it becomes longer.)
- (3) Brightness depends on the temperature. (In lower temperature, it becomes lower.) And in lower temperature, response time (required time that brightness is stable after turned on) becomes longer.
- (4) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
- (5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
- (6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.



10.3 Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly..

10.4 Storage

When storing modules as spares for a long time, the following precautions are necessary.

- (1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between $25 \pm 5^{\circ}\text{C}$ at normal humidity.
- (2) The polarizer surface should not come in contact with any other object. it is recommended that they be stored in the container in which they were shipped.

10.5 Handling Precautions For Protection Film

- (1) When the protection film is peeled off, static electricity is generated between the film and polarizer. This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
- (2) The protection film is attached to the polarizer with a small amount of glue. If some stress is applied to rub the protection film against the polarizer during the time you peel off the film, the glue is apt to remain on the polarizer. Please carefully peel off the protection film without rubbing it against the polarizer.
- (3) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the polarizer after the protection film is peeled off.
- (4) You can remove the glue easily. When the glue remains on the polarizer surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

10.6 Safety

- (1) For the crash damaged or unnecessary LCD, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.
- (2) In the case the LCD is broken, watch out whether liquid crystal leaks out or not. If your hands touch the liquid crystal, wash your hands cleanly with water and soap as soon as possible.
- (3) If you accidentally swallow liquid crystal, first, wash your mouth thoroughly with water, then drink a lot of water and induce vomiting, and then, consult a physician.
- (4) If the liquid crystal gets in your eyes, flush your eyes with running water for at least fifteen minutes.
- (5) If the liquid crystal touches your skin or clothes, remove it and wash the affected part of your skin or clothes with soap and running water.