PRODUCT SPECIFICATION

■ Tentative Specification
☐ Preliminary Specification
☐ Approval Specification

MODELNAME:YH101MF4002

Version:MA01

Customer: Common

APPROVED BY **SIGNATURE**

Name / Title _____ _____

Note

_____

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By

Revision Notice	Description	Page	Rev. Date
0.0	First revision (Tentative)	--	2019/08/13

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1. GENERAL DESCRIPTION

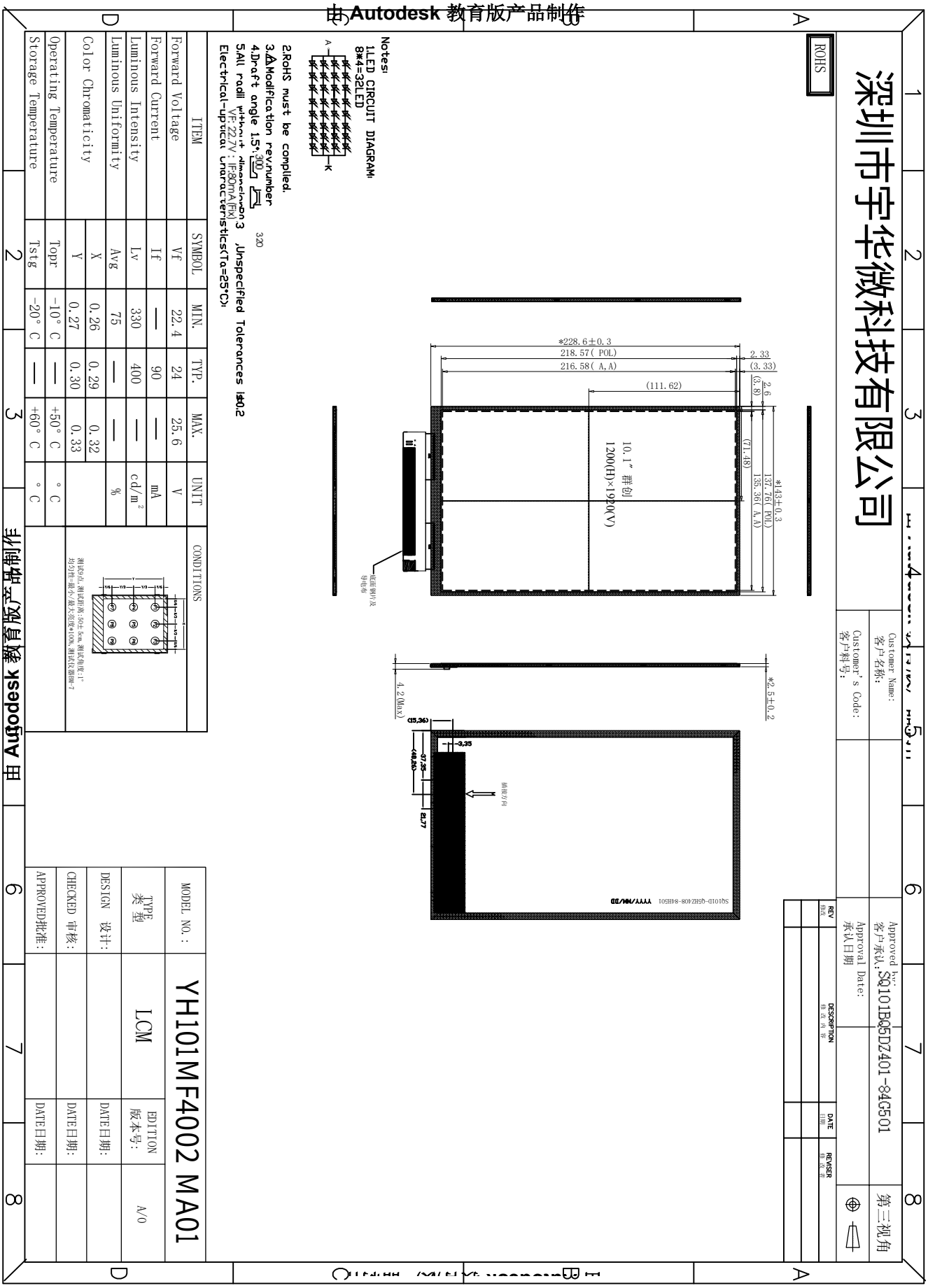
1.1 DESCRIPTION

YH101MF4002 MA01 is a color active matrix thin film transistor (TFT) IPS liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, Driver IC ,FPC and Backlight.

1.2 FEATURES:

No.	Item	Specification	Unit
1	Panel Size	10.1”	inch
2	Number of Pixels	1200x3(RGB) x 1920	pixels
3	Active Area	135.360(W)x216.576(H)	mm
4	Pixel Pitch	0.1128*0.1128	mm
5	OutlineDimension	228.6(W) x 143(H) x2.50(D) mm	
6	Number of Colors	16.7M	-
7	Display Mode	Normally Black	-
8	ViewingDirection	IPS	
9	Pixel Arrangement	RGB vertical stripe	-
10	Luminance (cd/m^2)	400(TYP.)	nit
11	Contrast Ratio	800(TYP.)	
12	Surface Treatment	Anti-glare	-
13	Interface	MIPI	-
14	Backlight	White LED	-
15	Operation Temperature	-10~50	℃
16	Storage Temperature	-20~60	℃
17	IC	HX8279	

2. MECHANICAL SPECIFICATION



3. PIN DESCRIPTION

PIN NO.	Symbol	Description
1	NC	No connection
2	VDD	3.3V
3	VDD	3.3V
4	GND	Ground
5	Reset	Global reset pin 3.3V
6	NC	No connection
7	GND	Ground
8	MIPI_0N	-MIPI differential data input
9	MIPI_0P	+MIPI differential data input
10	GND	Ground
11	MIPI_1N	-MIPI differential data input
12	MIPI_1P	+MIPI differential data input
13	GND	Ground
14	MIPI_CKN	-MIPI differential clock input
15	MIPI_CKP	+MIPI differential clock input
16	GND	Ground
17	MIPI_2N	-MIPI differential data input
18	MIPI_2P	+MIPI differential data input
19	GND	Ground
20	MIPI_3N	-MIPI differential data input
21	MIPI_3P	+MIPI differential data input
22	GND	Ground
23	NC	No connection
24	NC	No connection
25	GND	Ground
26	NC	No connection
27	PWMO	PWM control signal for LED driver(CABC)
28	NC	No connection
29	NC	No connection
30	GND	Ground

31	LED-	LED Cathode
32	LED-	LED Cathode
33	NC	No connection
34	NC	No connection
35	NC	No connection
36	NC	No connection
37	NC	No connection
38	NC	No connection
39	LED+	LED Anode
40	LED+	LED Anode

4. Absolute Max. Rating

Item	Symbol	Values		Unit
		Min.	Max.	
Power Voltage	VCC	-0.3	+5.0	V
Backlight forward current	I_{LED}	0	25	mA(For each LED)
Input Signal Voltage	V_I	-0.3	VCC	V
Operation Temperature	T_{OP}	-10	50	℃
Storage Temperature	T_{ST}	-20	60	℃

4.1 Typical Operation Conditions

Item	Symbol	Values			Unit
		Min.	Typ.	Max.	
Power Voltage	VCC	2.7	3.3	3.6	V
Current Consumption	I_{VCC}	-	--	TBD	mA
	I_{LED}	--			

4.2 LED Back Light Specification (24 White Chips)

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	Vf	If=90mA	22.4	24	25.6	
Uniformity (with L/G)	ΔB_p	If=90mA	70	75	-	%
Luminance for LCM	/			400		cd/m^2

4.3 Input Timing Table

1200RGBx1920 (4 Data Lanes)

Parameter	Symbol	Min.	Typ.	Max.	Unit
MIPI data frequency	FDATA	955	999	1000	Mbps
Horizontal display area	THD		1200		pixel
HS period time	TH	1275	1341	1342	pixel
HS pulse width	THPW	1	1	1	pixel
HS back porch	THBP	32	60	60	pixel
HS front porch	THFP	42	80	81	pixel
Vertical display area	TVD		1920		H
VS period time	TV	1981	1981	1982	H
VS pulse width	TVPW	1	1	1	H
VS back porch	TVBP		25		H
VS front porch	TVFP	35	35	36	H

5. ELECTRICAL SPECIFICATION

Item	Symbol	Specification			Unit
		Min.	Typ.	Max.	
TFT gate on voltage	VGH		(21)		V
TFT gate on voltage	VGL		(-7)		V
TFT common electrode voltage	Vcom(DC)		3.57		V

Note: (1) Vcom must be adjusted to optimize display quality: cross-talk, contrast ratio and etc.

(2) VGH is TFT gate operating voltage

(3) VGL is TFT gate operating voltage

(4) Environmental condition: 25±5

(5) Reference waveform for panel light on is as below: (release after sample output)

	White	Black	G25%	G50%	G75%
V_H	4.5V	0.3V	1.2V	2.1V	3.3V
V_L	-4.5V	-0.3V	-1.2V	-2.1V	-3.3V

Vcom 0.3V

STV 21V~ -7V

Reset 21V~ -7V

CK# 21V~ -7V

VDD1 -7V

VDD2 21V

VSSA -7V

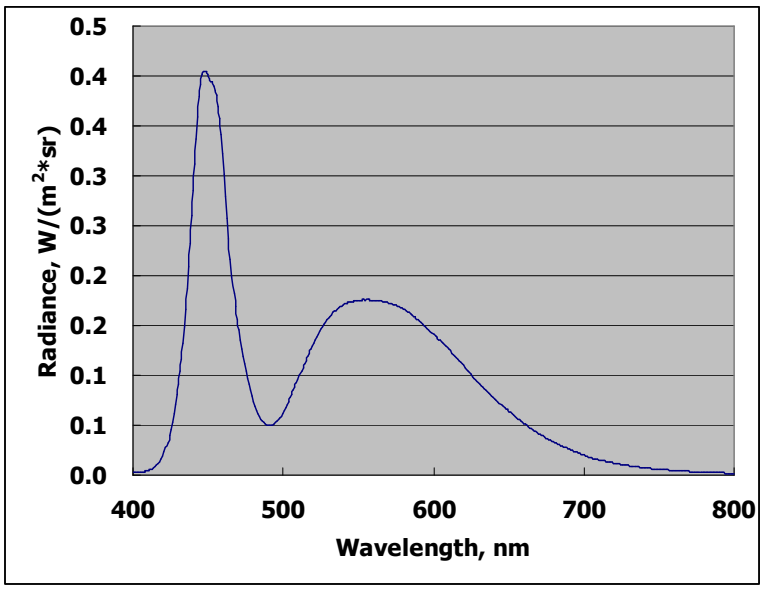
VSSG -7V

VGG 30V

6. OPTICAL SPECIFICATION

Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Transmittance (w/o APCF)		T%	Viewing normal angle $\theta_X = \theta_Y = 0°$	3.53%	4.04%		%	All left side data are based on INX's following condition – 1.LC : AAS . 2.CF : CG 70% CF. 3.Light Source : INX LED BLU. 4.Polarizer : CF:SRW062APN1LT4 TFT:SRW062AWL2/APFV3 5.Machine : DMS 803, (ConoScope for View Angle). 6. VLC dark ≦ 0.3 V, VLC white ≧ 4.1 V 7.Back light structure: Diffuser+BEF+BEF+ Diffuse
Contrast Ratio		CR		800	1000		--	
Response Time		$T_{on} + T_{off}$			25		ms	
Viewing Angle	Hor.	θ_{X+}		80	85		deg.	
		θ_{X-}		80	85			
	Ver.	θ_{Y+}		80	85			
		θ_{Y-}		80	85			
CF only Color Chromaticity (CIE 1931)	Red	Rx	Viewing normal angle $\theta_X = \theta_Y = 0°$	0.631	0.651	0.671	-	Under C light Simulation
		Ry		0.311	0.331	0.351	-	
	Green	Gx		0.255	0.275	0.295	-	
		Gy		0.54	0.56	0.58	-	
	Blue	Bx		0.12	0.14	0.16	-	
		By		0.075	0.095	0.115	-	
	White	Wx		0.28	0.3	0.32	-	
		Wy		0.305	0.325	0.345	-	
	Color Gamut				65			

*Note(1) INX LED BLU Spectrum:



*Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

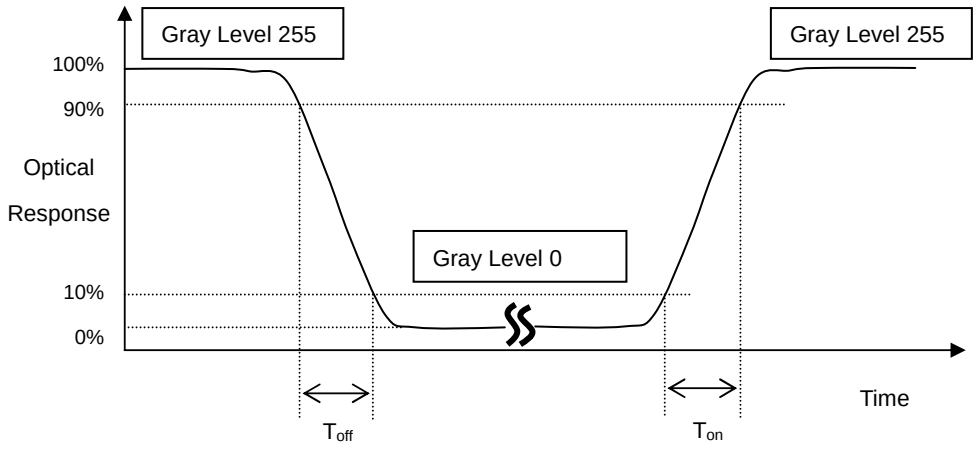
L63: Luminance of gray level 63

L 0: Luminance of gray level 0

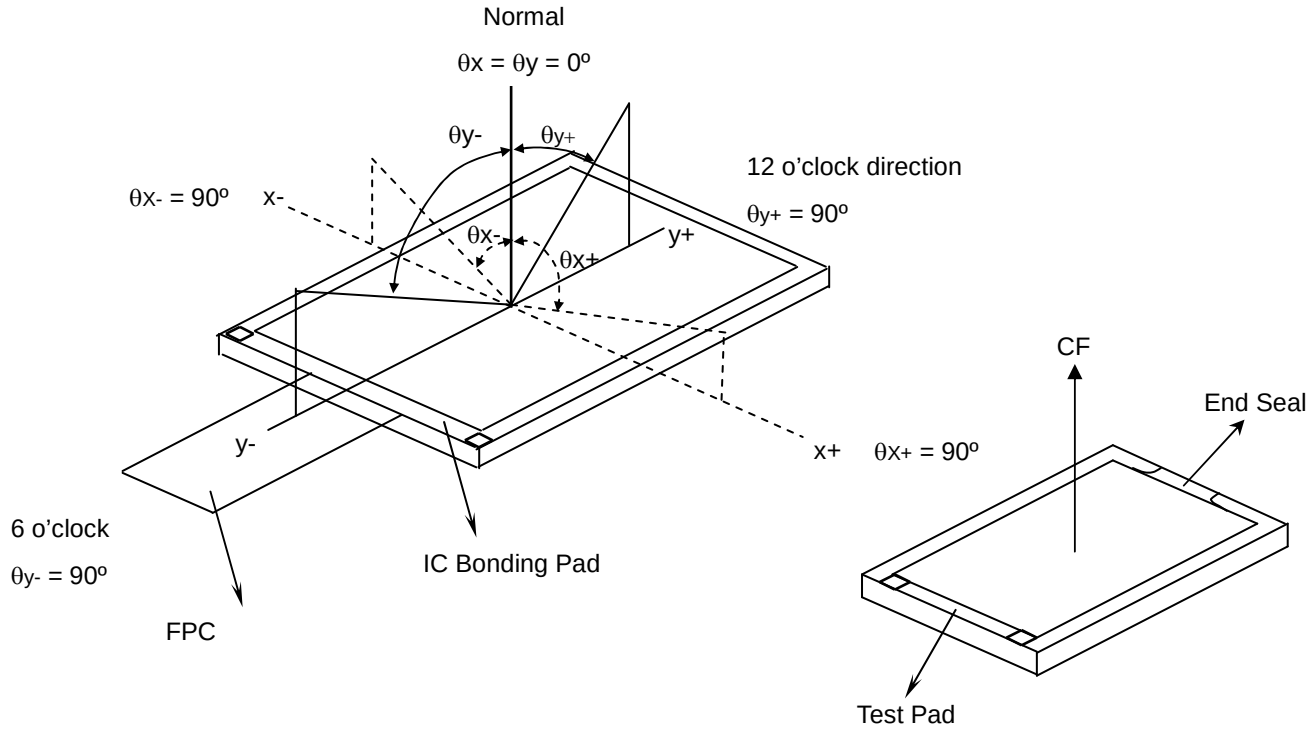
CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (3) Definition of Response Time (T_{on}, T_{off}):

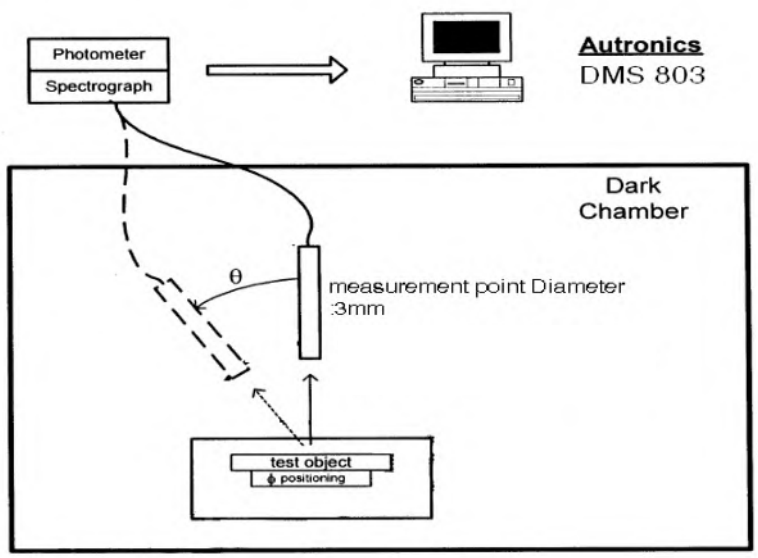


*Note(4) Definition of Viewing Angle



*Note (5) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



Note 6: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 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.)

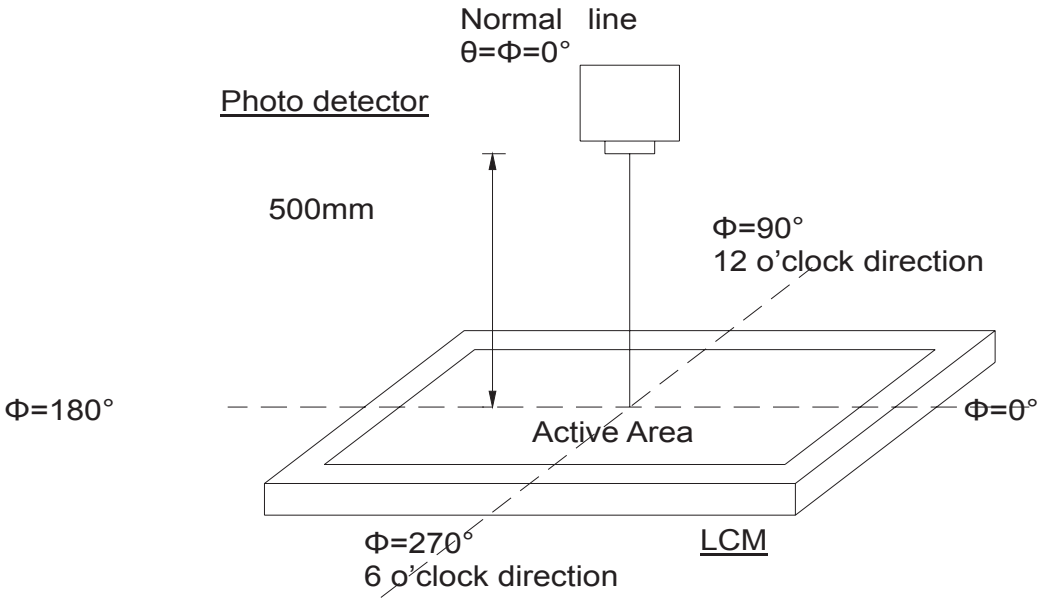


Fig. 4-2 Optical measurement system setup

Note 7: 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%.

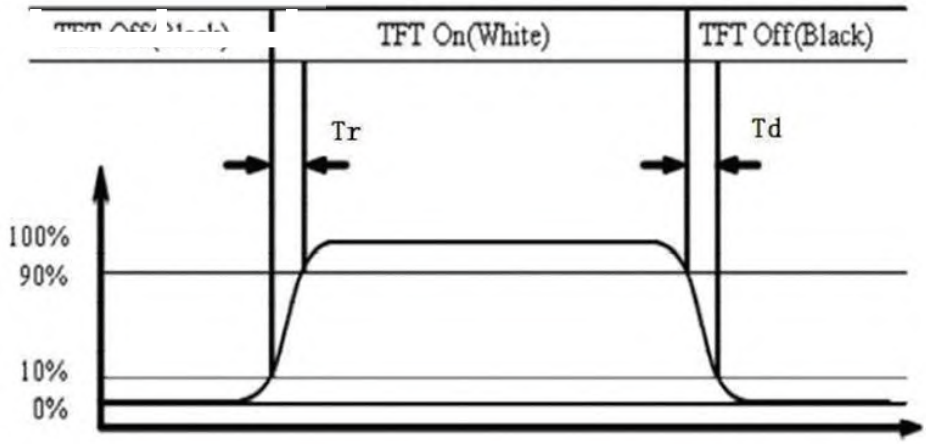


Fig. 4-3 Definition of response time

Note 8: 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 9: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.

Note 10: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is I_{LED}=140mA.

Note 11: 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.

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

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

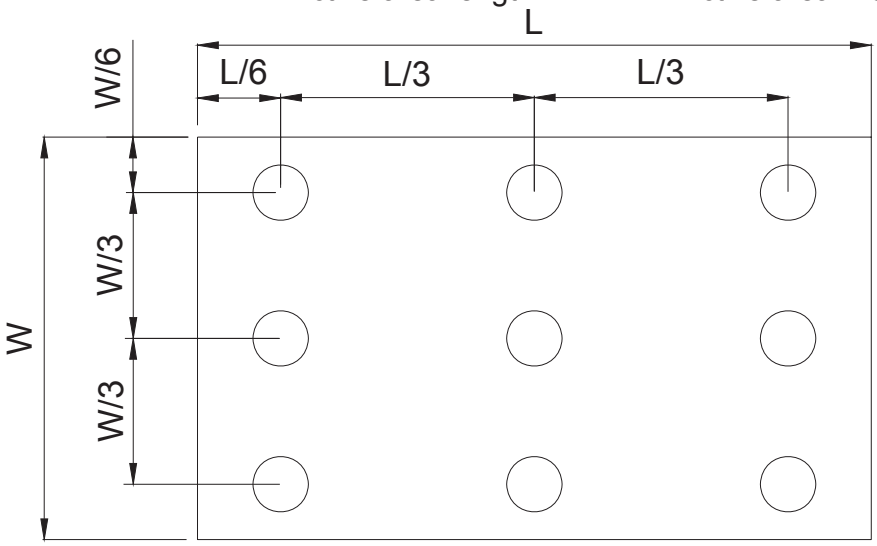


Fig. 4-4 Definition of measuring points

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

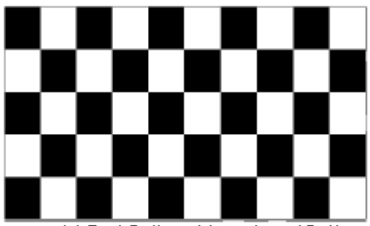
7.0 RELIABILITY SPECIFICATION

7.1 TEMPERATURE AND HUMIDITY

Test Item	Test Condition	Remark
High Temperature Storage	Ta=60℃; 72hrs	IEC60068-2-1：2007 GB2423.2-2008
Low Temperature Storage	Ta=-20℃; 72hrs	IEC60068-2-1：2007 GB2423.1-2008
High Temperature Operation	Ta=50℃; 72hrs	IEC60068-2-1：2007 GB2423.2-2008
Low Temperature Operation	Ta=-10℃; 72hrs	IEC60068-2-1：2007 GB2423.1-2008
High Temperature High Humidity Operation	Ta=50℃，90%RH， 72Hrs(no condensation)	IEC60068-2-78：2001 GB/T2423.3-2006
Thermal Shock	-20℃(0.5h) ~ 60℃(0.5h) / 10cycles	Start with cold temperature， End with high temperature， IEC60068-2-14:1984,GB2423.22-2002
Image Sticking	25℃ ; 2hrs	Note1

Note1:Condition of image sticking test :25℃±2℃

Operation with test pattern sustained for 2hrs,then change to gray pattern immediately.after5 mins,themura must be disappeared completely



(a) Test Pattern (chess board Pattern)

(b) Gray Pattern

7.2ESD

Test item	Conditions	Remark	
Electro Static Discharge Test (non-operation)	150pF，330Ω， Contact:±3KV,Air:±8KV	1	IEC61000-4-2：2001 GB/T17626.2-2006
	200pF，0Ω，±200V contact test	2	

Note: Measure point :

1. LCD glass and metal bezel
2. IF connector pins

8. NOTICE

8.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life threatening or otherwise catastrophic.

8.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

8.3 Breakage of LCD Panel

8.3.1.If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

8.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

8.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

8.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

8.4 Electric Shock

8.4.1. Disconnect power supply before handling LCD module.

8.4.2. Do not pull or fold the LED cable.

8.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

8.5 Absolute Maximum Ratings and Power Protection Circuit

8.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged. 9.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time. 11.5.3. It's recommended to employ protection circuit for power supply.

8.6 Operation

8.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

8.6.2 Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

8.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
8.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
8.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

8.7 Mechanism

Please mount LCD module by using mouting holes arranged in four corners tightly.

8.8 Static Electricity

8.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
8.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

8.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

8.10 Disposal

When disposing LCD module, obey the local environmental regulations.

9 Quality level

9.1 Classification of defects

Major defects (MA): A major defect refers to a defect that may substantially degrade usability for product applications, including all functional defects(such as no display, abnormal display, open or missing segment, short circuit, missing component), outline dimension beyond the drawing, progressive defects and those affecting reliability.

Minor defects (MI): A minor defect refers to a defect which is not considered to be able to substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation, such as black spot, white spot, bright spot, pinhole, black line, white line, contrast variation, glass defect, polarizer defect, etc.

9.2 Definition of inspection range

For dot defect of TFT LCD which is not smaller than 3 inches, dividing three areas to make a judgment (according to figure 1).

A area : center of viewing area
B area : periphery of viewing area
C area : Outside viewing area

For other defects, dividing two areas to make a judgment (according figure 2).

A zone : Inside Viewing area
B zone : Outside Viewing area
X1(A.A~V.A): 2mm X2(A.A~V.A): 2mm
Y1(A.A~V.A): 2mm Y2(A.A~V.A): 2mm

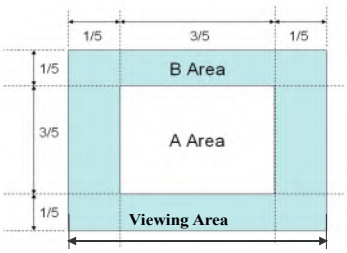


Figure 1

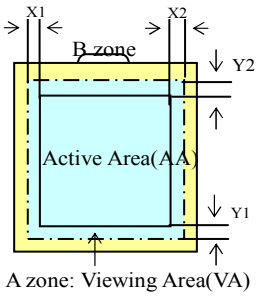


Figure 2

9.3 Inspection items and general notes

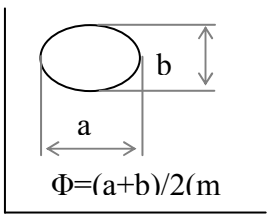
General notes	1.Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer and TIANMA. 2.Viewing area should be the area which TIANMA guarantees. 3.Limit sample should be prior to this Inspection standard. 4.Viewing judgment should be under static pattern. 5.Inspection conditions Inspection distance: 250 mm (from the sample) Temperature : 25±5 ºC Inspection angle : 45 degrees in 6 o′clock direction (all defects in viewing area should be inspected from this direction)

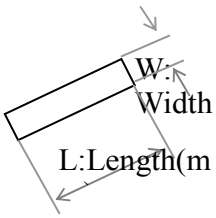
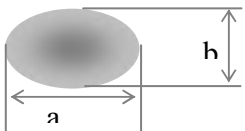
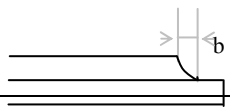
Inspection items	Pinhole, Bright spot, Black spot, White spot, Black line, White Line, Foreign particle, Bubble	The color of a small area is different from the remainder. The phenomenon doesn't change with voltage
	Contrast variation	The color of a small area is different from the remainder. The phenomenon changes with voltage
	Polarizer defect	Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass
	Dot defect (TFT LCD)	The pixel appears bright or dark abnormally when display
	Functional defect	No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction
	Glass defect	Glass crack, Shaved corner of glass, Surplus glass
	PCB defect	Components assembly defect

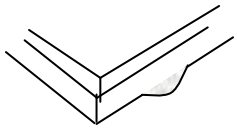
9.4 Outgoing Inspection level

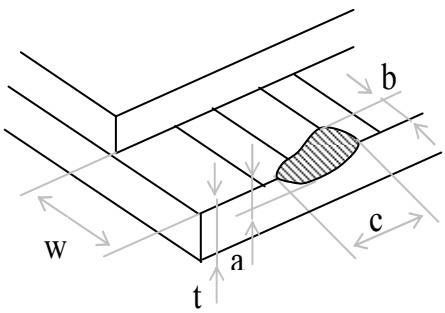
Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 8.3 general notes	See 8.5			II	0.065
Minor Defects	See 8.3 general notes	See 8.5			II	0.065
Note：Sampling standard conforms to GB2828						

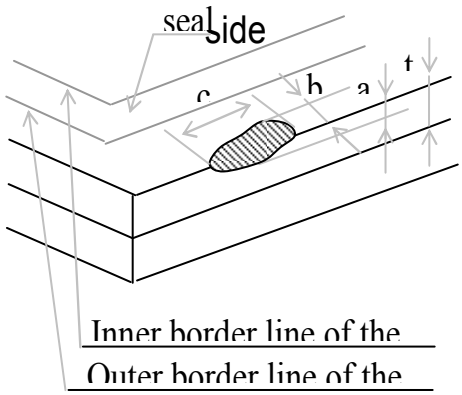
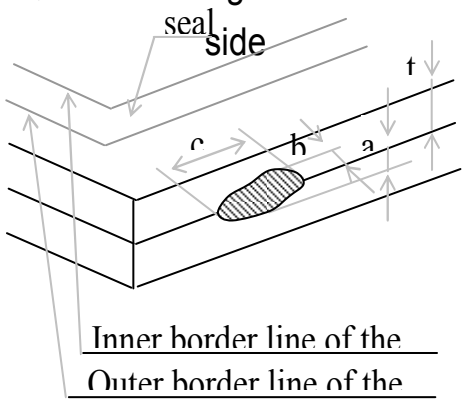
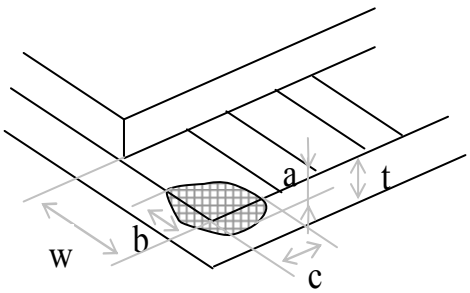
9.5 Inspection Items and Criteria

Inspection items			Judgment standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass		A	Φ<=0.20	Neglected	Neglected
			B	0.20<Φ<=0.25	3	Neglected
			C	0.25<Φ<=0.3	2	Neglected
			D	0.3<Φ<=0.4	1	3
			E	0.4<Φ<=0.5	0	2

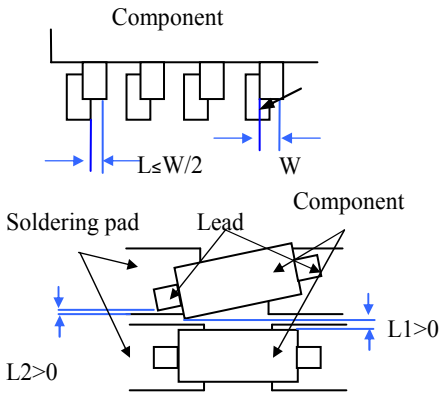
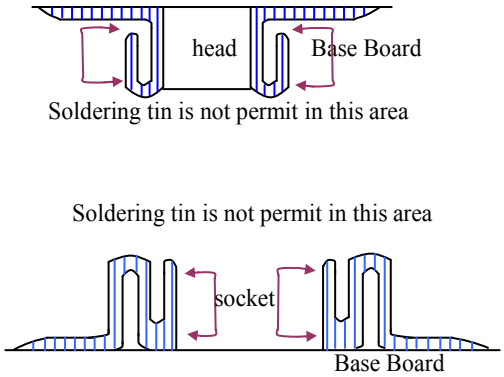
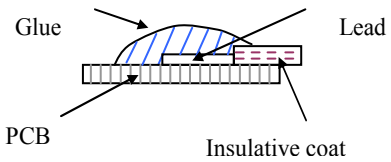
		(a/b<2.5)	Total defective point(B,C)		1	-
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass	 L/W>=2.5	A	W<=0.03	Neglected	Neglected
			B	0.03<W<=0.05 L<=3.0	3	Neglected
			C	0.05<W<=0.1 L<=3.0	2	Neglected
			D	0.05<W<=0.1 L<=4.0	1	3
			E	W>0.1 L>4.0	0	2
			Total defective point(B,C)		1	-
3	Bright spot		any size		none	none
4	Contrast variation	 Φ=(a+b)/2(mm	A	Φ<0.2	Neglected	Neglected
			B	0.2<Φ<=0.3	2	
			C	0.3<Φ<=0.4	1	
			D	0.4<Φ	0	
			Total defective point(B,C)		3	
5	Bubble inside cell		any size		none	none
6	Polarizer defect (if Polarizer is used)	Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.	Refer to item 1 and item 2.			
		Bubble, dent and convex	A	Φ<=0.1	Neglected	Neglected
			B	0.1 <Φ<=0.2	2	Neglected
			C	0.2 <Φ<=0.3	1	2
7	Surplus glass	Stage surplus glass 	B<=0.3mm			

		Surrounding surplus glass 	Should not influence outline dimension and assembling.
8	Open segment or open common		Not permitted
9	Short circuit		Not permitted
10	False viewing direction		Not permitted
11	Contrast ratio uneven		According to the limit specimen
12	Crosstalk		According to the limit specimen
13	Black /White spot(display)		Refer to item 1
14	Black /White line(display)		Refer to item 2

Inspection items			Judgment standard		
			Category(application: B zone)		Acceptable number
15	Glass defect crack	i) The front of lead terminals 	A	a≤ t, b≤1/5W, c≤3mm	Max.3 defects allowed
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark	

		ii) Surrounding crack-non-contact 	b < Inner borderline of the seal		
		iii) Surrounding crack- contact 	b < Outer borderline of the seal		
		iv) Corner 	A	a <= t, b <= 3.0, c <= 3.0	
			B	Glass crack should not cover patterns u and alignment mark and patterns.	

Inspection items	Judgment standard
	Category(application: B zone)

16	PCB defect	Component soldering: No cold soldering、short、open circuit、burr、tin ball The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1)； the sheet component deviation: Pin deviates from the pad and contact with the near components is not permitted（Pic.2）	
		lead defect: The lead lack must be less than 1/3 of its width; The lead burr must be less than 1/3 of the seam; Impurities connect with the near leads is not permitted	
		Connector soldering: Soldering tin is at contact position of the plug and socket is not permitted No foundation is scald Serious cave distortion on plug and socket contact pin is not permitted	
		Glue on root of the speaker receiver and motor lead: The insulative coat of the lead must join into the PCB; the protected glue must envelop to the insulative coat.	

10. Precautions for Use of LCD Modules

10.1 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.

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

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

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

d. 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.

10.2 Storage precautions

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

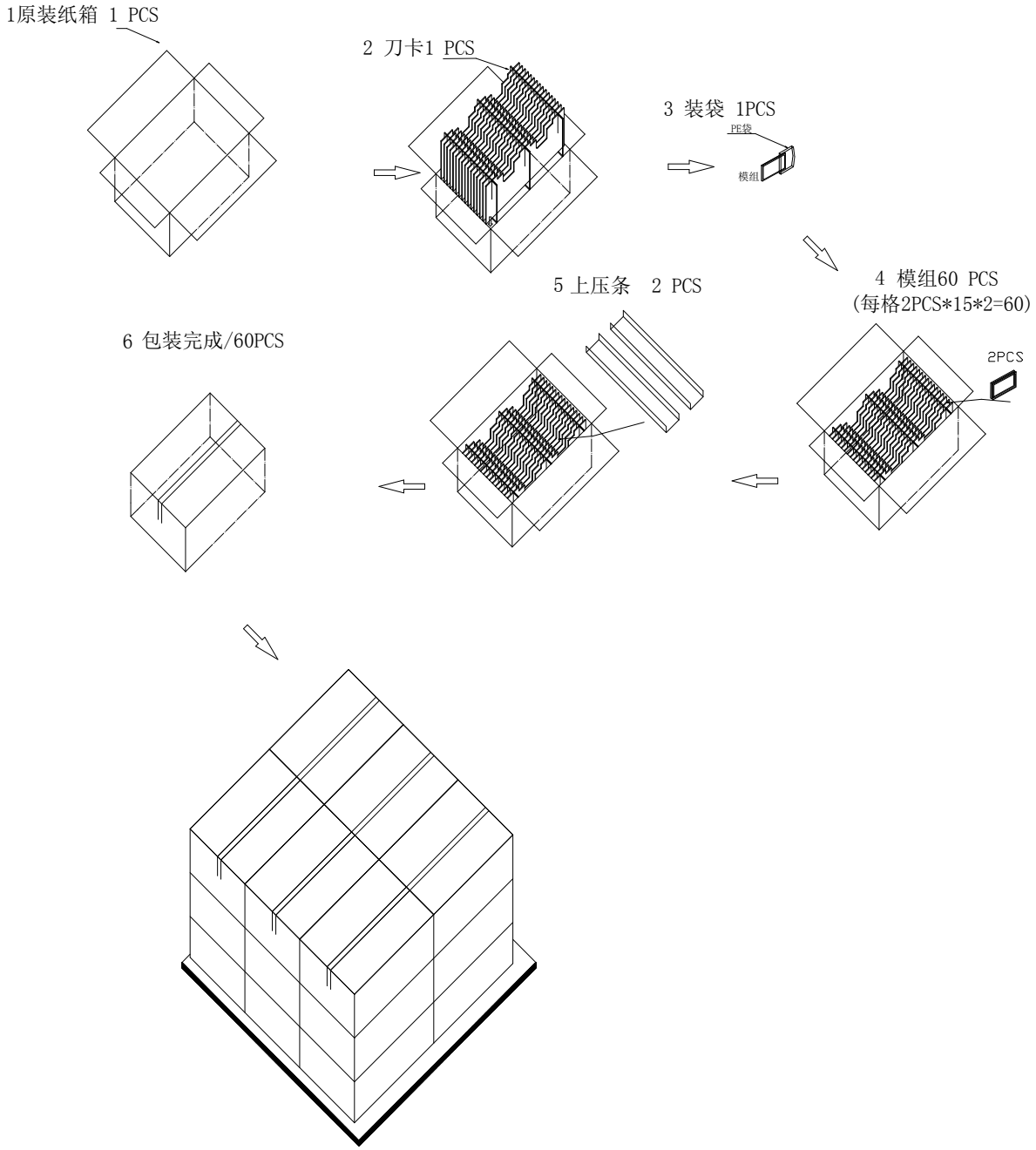
10.2.2 The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0℃ ～ 40℃

Relatively humidity: ≤80%

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

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

11.PACKAGE DRAWING

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