SPECIFICATIONS 产品规格书

MODULE NO.(产品型号): PV024QV-HFA3901

Customer Name: (客户名称)	
Customer P/N: (客户型号)	
Data: (日期)	2023-09-05
Version: (版本)	V1.0

Customer Approval(客户承认)

Prepare(制作)	Check(审核)	Approval(核准)

CONTENTS

Revision History(修订历史)

REV	REVISED DESCRIPTIONS (修订描述)	DATE (日期)
V1.0	Generation first version	2023-09-05

1. LCD MODULE PHYSICAL DATA

1.1. Features

Display Type	TFT
Viewing Direction	TBD
Connection Type	COG + FPC+BL
Driving IC	ST7789
MPU interface	MCU&&SPI
Backlight	4 pcs LED

Table 1.

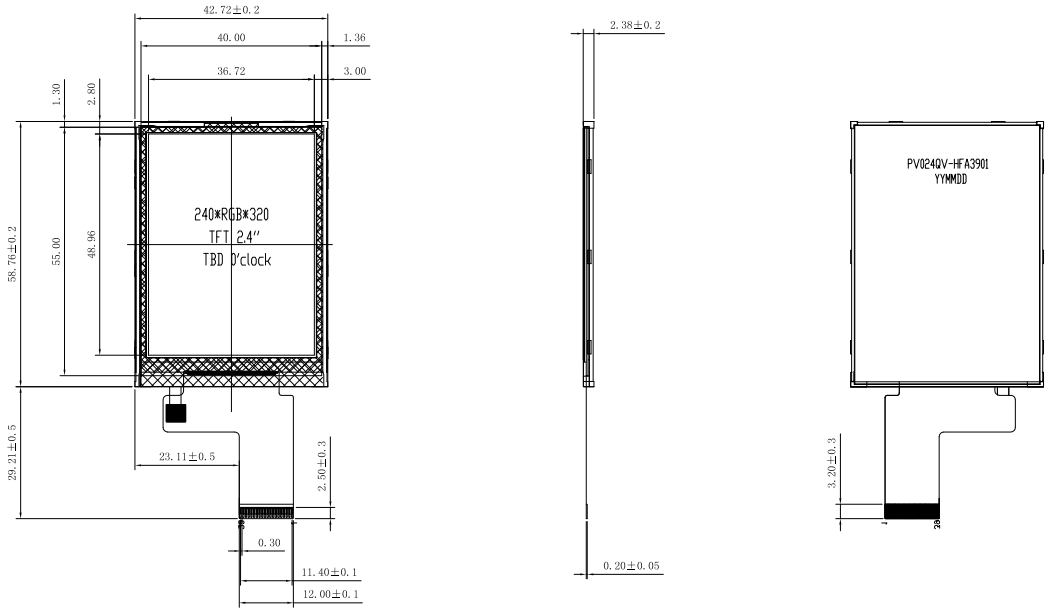
1.2. Mechanical Specification

Item	Standard Value	Unit
Screen size	2.41	inch
Number of dots	240RGB x 320 dots	pixel
LCM dimension	42.72(H) x58.76(V) x2.38(T)	mm
Active area	36.72(H) x48.96(V)	mm
Dot size	0.153(H) x 0.153(V)	mm
Approx. weight	TBD	g

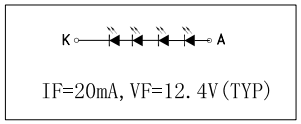
Table 2.

已确认此版本的所有图纸			
客户签名:		日期:	

REV	DESCRIPTION	DATE
1.0	首次设计;	2023-07-13



PIN	SYMBOL
1	VCC
2	IOVCC
3	IM0
4	IM1
5	IM2
6	IM3
7	GND
8	DB7
9	DB6
10	DB5
11	DB4
12	DB3
13	DB2
14	DB1
15	DB0
16	GND
17	RESET
18	RD
19	WR
20	RS
21	CS
22	SDA
23	SDO
24	GND
25	GND
26	LEDK
27	LEDK
28	LEDA
29	LEDA
30	GND
31	GND
32	GND
33	GND
34	GND
35	GND
36	GND
37	GND
38	GND
39	GND



IF=20mA, VF=12.4V(TYP)

Notes:
1.Display Mode:Normally Black
2.Viewing Angle: TBD
3.LCD Driver IC: ST7789V2
4.Operating Temp:-20°C ~ +70°C
5.Storage Temp:-30°C ~ +80°C
6.*:Critical Dimension,( ):Reference Dimension
7.Undefinition Tolerance:±0.2
8.Surface Luminance:TBD CD/M²(TYP)
9.Requirements on Environmental Protection:ROHS

Kingtech Group Co.,Ltd

TITLE:	ASSEMBLY	DO NOT SCALE THIS DRAWING, GENERAL TOLERANCE:±0.2			
PART NO.:	PV024QV-HFA3901				
DRAWN BY:		DATE:		SHEET 1 OF 1	
CHECKED BY:		DATE:		SCALE:N.T.S	UNIT: mm
APPROVED BY:		DATE:			

PROJECTION:

3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	CONDITION	STANDARD VALUE			UNIT
			MIN	TYP	MAX	
Supply Voltage	VCI	Ta= +25℃	-0.3	2.8	4.6	V
Interface Supply Voltage	IOVCC	Ta= +25℃	-0.3	1.8	4.6	V
Input Voltage	Vin	Ta=+25℃	-0.3	-	VDD+0.3	V

Table 3.

NOTE:

(1) If the module is used 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) LCM should be grounded during handing LCM.
(3) VDD>GND must be maintained.

4. ELECTRICAL CHARACTERISTICS

4.1. DC Characteristics

ITEM	SYMBOL	CONDITIONS	STANDARD VALUE			UNIT	Electric current	Power dissipation
			MIN	TYP	MAX			
Supply Voltage	VCI	Ta= +25℃	2.4	2.8	3.3	V	--mA	---
Interface Supply Voltage	IOVCC	Ta= +25℃	1.7	1.8	3.3	V	--mA	---
Input High Voltage for LCD	VIH	—	0.7Iovcc	—	Iovcc	V	—	—
Input Low Voltage for LCD	VIL	—	Vss	—	0.3 Iovcc	V	—	—
Output High Voltage for LCD	VOH	—	0.8Iovcc	—	Iovcc	V	—	—
Output Low Voltage for LCD	VOL	—	Vss	—	0.2 Iovcc	V	—	—

Table 4.

4.2. Back-Light unit

PARAMETER	SYMBOL	REMARK	STANDARD VALUE			UNIT	Electric current	Power dissipation
			MIN	TYP	MAX			
FORWARD VOLTAGE	VF	If =20mA	-	12.4	-	V	---	---
LCM LUMINOUS INTENSITY	Iv	If =20mA	-	TBD	-	cd/m2	—	—
LUMINOUS UNIFORMITY	Iv-m	(min/max)/100	80	-	-	%	—	—
CHROMATICITY COORDINATES	X	If =20mA	0.25	-	0.30		—	—
	Y		0.29	-	0.35		—	—
OPERATING	-20℃ ~ 70℃							
STORAGE TEMPERATURE	-30℃ ~ 80℃							
LED life	30000 H							

Table 5.

4.3. AC Characteristics

Refer to IC data sheet.

5. ELECTRO-OPTICAL CHARACTERISTICS

Paramete		Symbol	Condition	Min	Typ	Max	Unit	Remark
Threshold voltage		Vsat		2.7	3.3	3.3	V	Note 1
		Vth		1.2	1.5	1.8	V	
Viewing Angle range	Horizontal	Left(9')	CR > 10	-	55	-	Deg	Not 2
		Right(3')		-	55	-	Deg	
	Vertical	Up(12')		-	60	-	Deg	
		Down(6')		-	60	-	Deg	
Contrast ratio		C/R	Θ = 0°	-	15	-		Not 3
Transmittance		T(%)	Θ = 0°	-	2.19	-		Not 4
White Chromaticity		xw	Θ = 0°	-	-	-		Not 5 *Color Filter Glass
		yw		-	-	-		
Reproduction Of color	Red	xR	Θ= 0°	-	-	-		
		yR		-	-	-		
	Green	xG		-	-	-		
		yG		-	-	-		
	Blue	xB		-	-	-		
		yB		-	-	-		
Response Time		Tr+Tf	Θ= 0°		TBD		smec	Not 6

Table 6.

Note :

5.1. The definition of Vth & Vsat

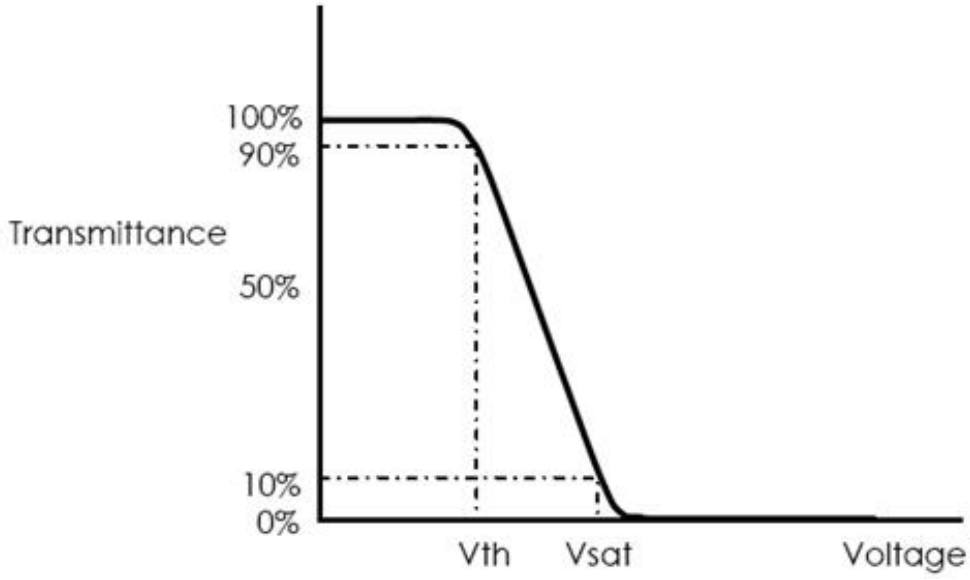


Figure 2. The definition of Vth & Vsat

5.2. Definition of Viewing Angle

Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.

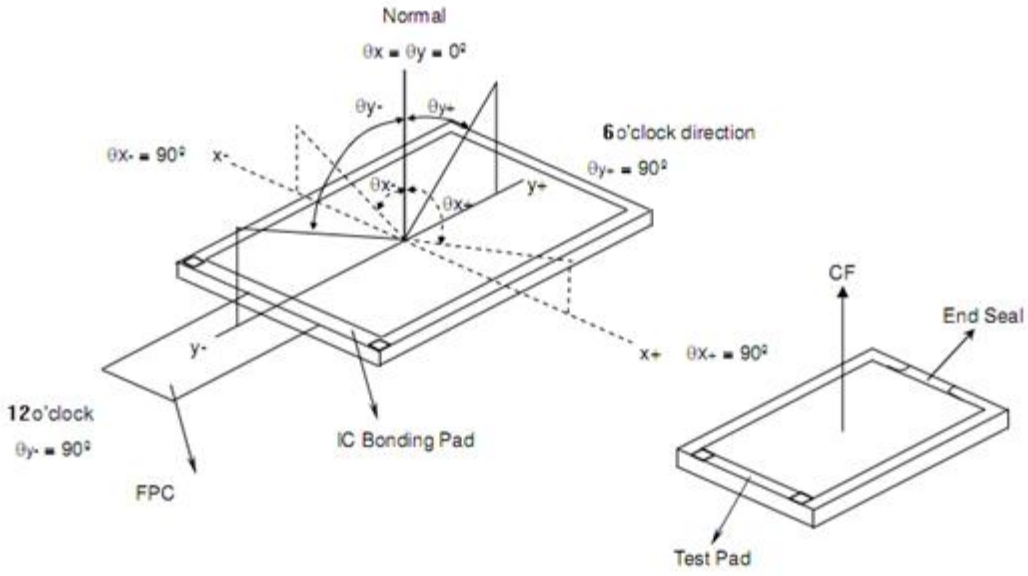


Figure 3.Definition of viewing angle

5.3. Definition of Contrast Ratio (CR) :

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.

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

Transmittance is the value with Polarizer.

5.4. Definition of optical measurement setup

The color chromaticity coordinates specified in Table 6. shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the C/F. Measurement condition is C - light source & Halogen Lamp.

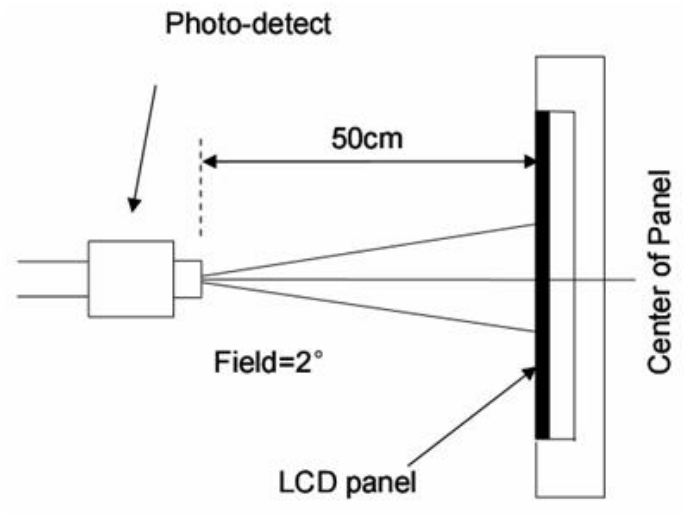


Figure 4 Optical test equipment.

5.5. Definition of Response Time : Sum of TR and TF

The electro-optical response time measurements shall be made as FIGURE 3 shown in Appendix by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td

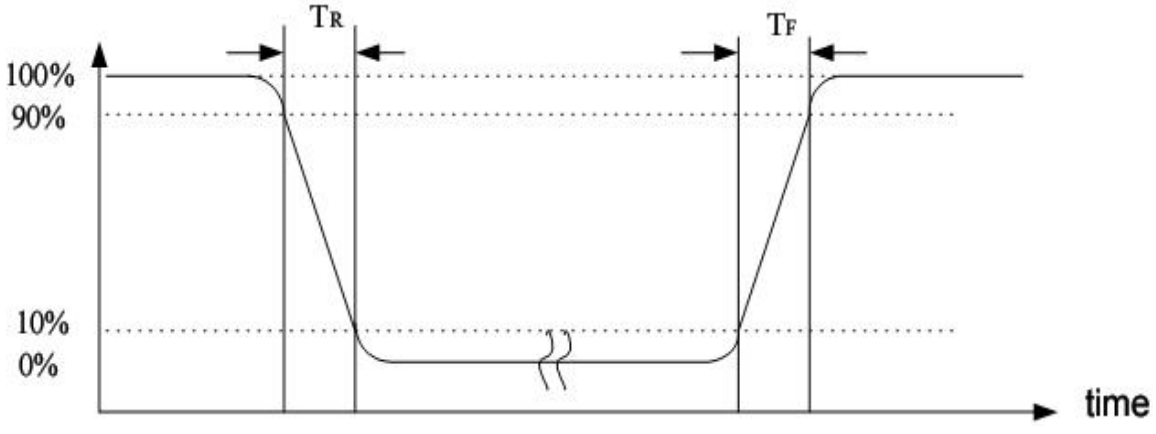


Figure 5.Definition of response time: Tr+Tf

6. INTERFACE PIN CONNECTIONS

PIN NO.	SYMBOL	FUNCTION DESCRIPTIONS
1	VCC	Supply Voltage
2	IOVCC	Interface Supply Voltage
3	IM0	
4	IM1	
5	IM2	
6	IM3	
7	GND	Ground
8-15	DB7-DB0	Data Bus
16	GND	Ground
17	RESET	RESET Signal
18	RD	-Read enable in 8080 MCU parallel interface. --If not used, please fix this pin at VDDI or DGND
19	WR	-Write enable in MCU parallel interface. - Display data/command selection pin in 4-line serial interface. - Second Data lane in 2 data lane serial interface. -If not used, please fix this pin at VDDI or DGND.
20	RS	-Display data/command selection pin in parallel interface. -This pin is used to be serial interface clock. -If not used, please fix this pin at VDDI or DGND.
21	CS	CS Signal
22	SDA	-When IM3: Low, SPI interface input/output pin. -When IM3: High, SPI interface input pin. -The data is latched on the rising edge of the SCL signal. -If not used, please fix this pin at VDDI or DGND level.
23	SDO	-SPI interface output pin. -The data is output on the falling edge of the SCL signal. -If not used, let this pin open.
24-25	GND	Ground
26-27	LEDK	Backlit negative
28-29	LEDA	Backlit positive
30-39	GND	Ground

IM0	IM1	IM2	IM3	MPU Interface Mode	Data pin
0	0	0	0	80-8bit parallel	DB[7:0]
0	1	0	1	3-line 9bit serial	SDA: in/out
				2 data lane serial	SDA: in/out WRX: in
0	1	1	0	4-line 8bit serial	SDA: in/out
1	1	0	1	3-line 9bit serial	SDA: in/SDO: out
1	1	1	0	4-line 8bit serial	SDA: in/SDO: out

Table 7.

7. SPECIFICATION OF QUALITY ASSURANCE

7.1. Summary

The customer should check and accept the products of Kingtech within one month after reception. This standard for Quality Assurance should affirm the quality of LCD products to supply to purchaser by Kingtech Group Co.,Ltd.
Entire process is controlled according to QS9000.

7.2. Standard for quality test

(1) Inspection
Before delivering, the supplier should take the following tests, and affirm the quality of product.
(2) Electro-Optical Characteristics
According to the individual specification to test the product.
(3) Test of Appearance Characteristics:
According to the individual specification to test the product.
(4) Test of Reliability Characteristics
According to the definition of reliability on specification for test product.
(5) Delivery Test
Before delivering, the supplier should take the delivery test
(6) Sampling Method: GB/T2828.1-2003, Level II
(7) The defects classify of AQL as following
Major defect: AQL=0.65
Minor defect: AQL=1.5

7.3. Nonconforming Analysis & Deal With Manners

☆Nonconforming Analysis
(1) Purchaser should supply the detail data of nonconforming sample and the non-suitable state.
(2) After accepting the detail data from purchaser ,the analysis of nonconforming should be finished in two weeks.
(3) If supplier can not finish analysis on time ,must announce purchaser before two weeks.
☆Disposition of nonconforming
(1) If find any supplier defect during assembly line, supplier must change the good product for every defect after recognition.
(2) Both supplier and customer should analysis the reason and discuss the disposition of nonconforming when the reason of nonconforming is not sure.

7.4. Agreement items.

Both sides should discuss together when the following problems happen:
(1) There is any problem of standard of quality assurance ,and both sides think that must be modifier.
(2) There is any argument item which does not record in the quality assurance.
(3) Any other special problem.

7.5. Standard of the Product Appearance Test

7.5.1. Manner of appearance test

(1) The test must be under 20W*2 or 40W fluorescent light ,and the distance of view must be at 30±5 cm.
(2) When test the model of Transmissive product must add the reflective plate.
(3) Definition of Area:
A. Area: Active area
B. Area: Viewing area
C. Area: Out of viewing area
D. Area: Seal area

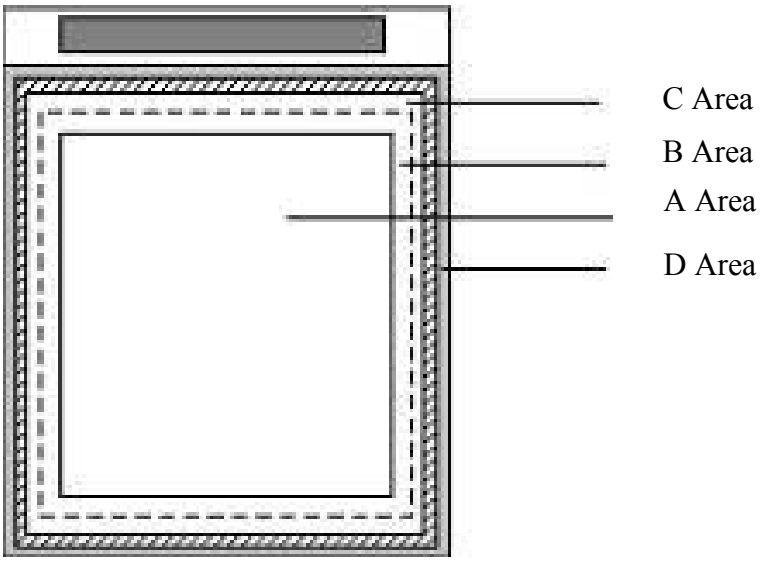


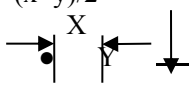
Figure7

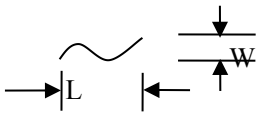
7.5.2. Basic principle:

(1) It will accord to the AQL when the standard can not be described.
(2) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.
(3) Must add new item on time when it is necessary.

7.6. Inspection specification

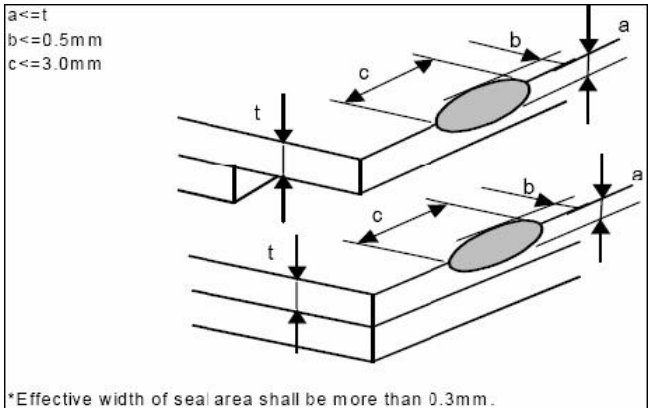
<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>1.1 Missing vertical, horizontal segment, segment contrast defect.
1.2 Missing character, dot or icon.
1.3 Display malfunction.
1.4 No function or no display.
1.5 Current consumption exceeds product specifications.
1.6 LCD viewing angle defect.
1.7 Contrast defect</td><td>0.65</td></tr>
<tr><td>02</td><td>LCD black spots, white spots, color

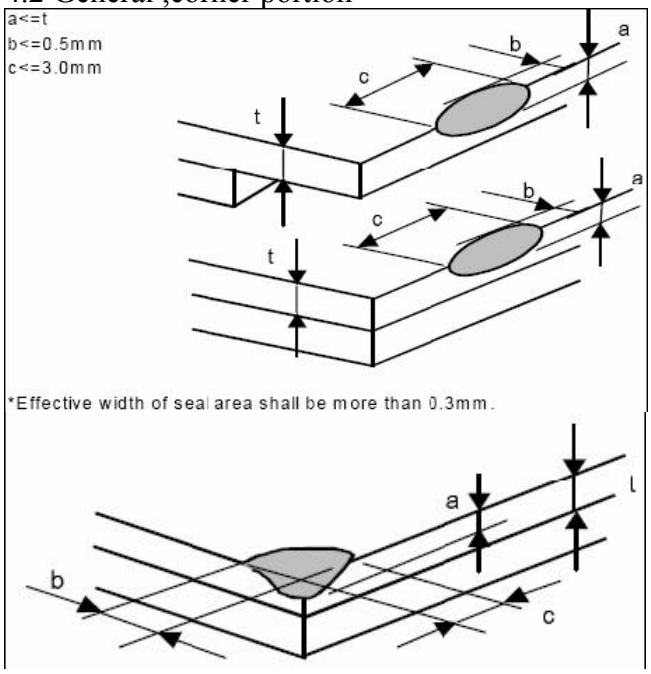
spots, contamination, scratches (display/non-display)</td><td>2.1Round type: As following drawing
φ=(x+y)/2
 

<table>
<tr><th rowspan="2">Size</th><th colspan="2">Acceptable QTY</th><th rowspan="2">Remark</th></tr>
<tr><th>A.A</th><th>V.A</th></tr>
<tr><td>φ≦0.10</td><td>Ignore</td><td>Ignore</td><td rowspan="6">No more than two spots within 5mm</td></tr>
<tr><td>0.10<φ≦0.15</td><td>2</td><td>3</td></tr>
<tr><td>0.15≦φ≦0.25</td><td>1</td><td>2</td></tr>
<tr><td>0.25<φ</td><td>0</td><td>0</td></tr>
<tr><td>Total</td><td>3</td><td>5</td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
2.2 Line Type: (As following drawing)
 

<table>
<tr><th>Length</th><th>Width</th><th colspan="2">Acceptable QTY</th><th>Remark</th></tr>
<tr><td></td><td></td><td>A.A</td><td>V.A</td><td></td></tr>
<tr><td>---</td><td>W≦0.03</td><td>Ignore</td><td>Ignore</td><td></td></tr>
<tr><td>L≦2.5</td><td>0.03<W≦0.05</td><td rowspan="2">3</td><td rowspan="2">4</td><td rowspan="2">No more than two lines within 5mm</td></tr>
<tr><td>L≦1.5</td><td>0.05<W≦0.08</td></tr>
<tr><td>---</td><td>0.08< W</td><td>0</td><td>0</td><td></td></tr>
</table></td><td>1.5</td></tr>
</table>

<table>
<tr>
<td>03</td>
<td>Polarizer bubbles
Ignore</td>
<td>If bubbles are visible, judge using black spot specification, not easy to find, must check in specify direction.

<table>
<tr><td>Size</td><td colspan="2">Acceptable QTY</td></tr>
<tr><td></td><td>A. A</td><td>V. A</td></tr>
<tr><td>φ≦0.15</td><td>Ignore</td><td>Ignore</td></tr>
<tr><td>0.15<φ≦0.25</td><td>2</td><td>3</td></tr>
<tr><td>0.25<φ</td><td>0</td><td>0</td></tr>
</table>
</td>
<td>1.5</td>
</tr>
<tr>
<td>04</td>
<td>Chipped glass</td>
<td>Symbols:
a: Chip length b: Chip width c: Chip thickness
t: Glass thickness
4.1 ITO electrode


4.2 General ,corner portion


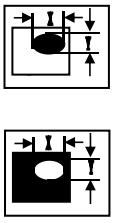
</td>
<td>1.5</td>
</tr>
</table>

05	Cracked glass	The LCD with extensive crack is not acceptable.	0.65
06	Backlight elements	6.1 Illumination source flickers when lit. 6.2 Spots or scratches that appear when lit must be judged using LCD spot, lines and contamination standards. 6.3 Backlight doesn't light or color is wrong	0.65 1.5 0.65
07	Soldering	7.1 No unmelted solder paste may be present on the PCB. 7.2 No cold solder joints, missing solder connections, oxidation or icicle. 7.3 No residue or solder balls on PCB. 7.4 No short circuits in components on PCB.	1.5 1.5 1.5 0.65
08	General appearance	8.1 No oxidation, contamination, curves or, bends on interface pin (OLB) of TCP. 8.2 No cracks on interface pin(OLB) of TCP 8.3 NO contamination, solder residue or solder balls on product. 8.4 The IC on the TCP may not be damaged, circuits. 8.5 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. 8.6 Sealant on top of the ITO circuit has not hardened 8.7 Pin type must match type in specification sheet. 8.8 LCD pin loose or missing pins. 8.9 Product packaging must the same as specified on packaging specification sheet. 8.10 Product dimension and structure must conform to product specification sheet.	1.5 0.65 1.5 0.65 1.5 1.5 0.65 0.65 0.65 0.65

Table 8.

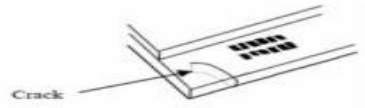
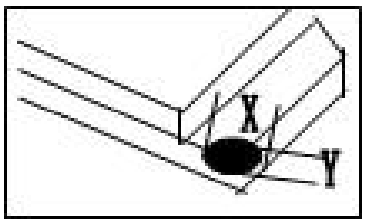
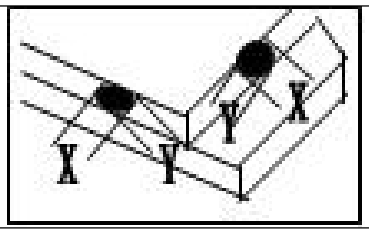
7.7. 检验内容

17.7.1. 电性检查（LCM/总成）

	Inspection items		Acceptance Criteria		Defect
1	Highlight dot		Not allowed		MIN
2	Dark dot		N＝1		MIN
3	Two connected points		N=0		MIN
4	Fragmented highlights		ND5% Invisible Acceptable		MIN
5	Black dot, white dot, color dot (include BL, TP, foreign objects for assembly,inside the cell and polarizer bonded	Image	Diameter（Φ）	Accepted QTY	MIN
			Φ≤0.1	Ignore; There must be no density.	
			0.1＜Φ≤0.15	N≤2	
			0.15<Φ≤0.20	N≤1	
			Φ>0.20	N≤0	
			Description：Φ=（a+b）/2, more than DS≥10mm；		
6	foreign objects for assembly,inside the cell and polarizer bonded、polarizer stick;Linear defect		W	L	Accepted QTY	MIN
			≤0.03	Ignore	Ignore	
			0.03<W≤0.05	≤2	N≤2	
			W>0.06	>2	N≤0	
			Description：More than DS≥10mm；			
10	Backlight check	N/A	LED light is not on, and it is not allowed for two types of LEDs to appear on the same backlight.		Major
			Lamp holes and light leaks are not allowed; Or control according to customer received samples.		Major
			The color should be close to the sample, and there should be no obvious differences in the fluctuation range between batches visually. If necessary, control according to the limit sample.		MIN
			Newton's rings, water ripples, and interference fringes are not allowed.		MIN
11	Function display	N/A	No display, display garbled code, multiple strokes, fewer strokes, fewer images, incorrect viewing angle, flickering shadows, high current, stripes, etc. are allowed.		Major
			For phenomena that cannot be described in text, develop limit templates for reference when necessary. For example, uneven display, display intensity, diagonal lines, etc;		Major
12	Electrostatic residue	N/A	Liquid crystal polarization is not allowed; It is acceptable for the film to disappear within 3 seconds after tearing.		Major
13	Mura	N/A	ND5% coverage is acceptable		MIN
14	Leakage	N/A	Not allowed		Major
15	TP function	N/A	No touch, broken touch, touch drift not allowed		Major
			Keys not sensitive slow response not allowed		Major
			The test value exceeds the normal range and is not allowed.		Major

7.7.2. LCM Appearance Inspection Standards

Item	Inspection items	Acceptance Criteria		Defect
1	Polarizer bumps, bubble	Φ≤0.1mm	Ignore	MIN
		0.1<Φ≤0.15	N≤2	MIN
		0.15<Φ≤0.2	N≤1	MIN
		Φ>0.20mm	N≤0	MIN
		Remarks: 1 Φ= (a+b)/2, DS ≥ 10mm or above; 2. The edge length should not exceed 5MM, and 1/2 of the LCD frame glue that has not entered can be accepted 3. Dents and gravure printing are fully adhered, invisible and acceptable.		
2	Scratches on polarizers	Sensory scratches are not allowed; The product is not visible and acceptable after full fitting;		MIN
3	Polarizer material	Consistent with the requirements of the samples and drawings;		MIN
4	Polarizer attachment position	Consistent with drawings and samples; Polarizer warping treated as bubbles.		MIN
5	Protective film	Puncture, adhere flat without deviation or bubbles; Minor dirt, polarizer imprints, seals, etc. are not included.		MIN
6	Pull tape	Not allowed if not attached according to the drawings or samples; Insufficient adhesion, unable to tear off protective film is not allowed.		MIN
7	Product Code/Barcode	The content of the product code does not meet the requirements of the document and the customer is not allowed.		MIN
		Unclear and unrecognizable ink-jet font not allowed		MIN
4	FPC check	Do not form sharp corners (dead folds), and do not allow indentation to pass through the protrusion on the back of the FPC for acceptance. Indentations do not affect functionality for acceptance;		MIN
		Creases/indentations must not expose nickel or copper.		MIN
		Fixed creases are allowed, and the limited degree shall be executed according to the sample limit standard.		MIN
		The detachment, deformation, and warping of the reinforcing plate are not allowed.		MIN
		Missing parts not allowed.		Major
		The range of damage in the non bending area shall not exceed 1/2 of the distance between the board edge and the nearest conductor or 1.0mm (whichever is the smallest); Tearing is not allowed.		MIN
		Excessive temperature or time during scalding welding may cause discoloration or bubbles in the PI layer, which is not allowed.		MIN
		False soldering and false soldering of components are not allowed.		Major
		Oxidation, breakage, adhesive, foreign objects, poor contact, and tin contamination of the golden finger are not allowed.		MIN
		Assembly deviation of the golden finger is not allowed.		MIN

		Dropping of double-sided adhesive, high-temperature adhesive, or release paper is not allowed.	MIN
		Components not fully covered with high-temperature adhesive are not allowed.	MIN
		Buckle warping, damage, detachment not allowed.	
5	Soldering	The position of the backlight FPC welding should not exceed 1/2 of the solder pad, and it is acceptable without affecting reliability.	MIN
		After welding the backlight AK foot, the height should be controlled, and the overall thickness of the FPC should be less than 0.4mm.	MIN
		Unsmooth solder joints and white or black residue on the surface are not allowed.	MIN
		Leakage of high-temperature adhesive at the welding pad position is not allowed.	MIN
6	BL	Loose or severely deformed iron frame is not allowed.	MIN
		Rust is not allowed.	MIN
		Front scratches are referenced according to linear standards, while back scratches are ignored.	MIN
7	FOG dispense	The surface adhesive should fully cover the entire PAD, and the height should not exceed the polarizer, and the polarizer should be applied.	MIN
8	Silver paste	Effective conduction of silver slurry upper and lower substrates.	MIN
9	LCD flaw	Image / Judgment criteria	
		 Not allowed	Major
10	PAD broken	 Front: X ≤ 0.3mm Y ≤ 0.15mm Z ≤ t; Does not harm the normal display of the circuit; Back: Does not affect the appearance and displays normally.	MIN
11	General edge collapse	 X ≤ 1.5mm, Y ≤ 0.3mm, Z ≤ T, N ignored, no damage to the line, normal display.	MIN

8.7.3 LCM+CTP Appearance Inspection Standards

Item	Inspection items	Judgment criteria		Defect
1	Newton's ring/interference line	Image	Judgment criteria	Major
			Diameter ≤ 5mm, allowed 1	

<table>
<tr><td></td><td></td><td>  </td><td>≤ 1/4 touch screen inspection area acceptance.</td><td></td></tr>
<tr><td>2</td><td>TP assembly deviation</td><td colspan="2">During TP assembly, it is not allowed to exceed the tolerance of the drawings and samples.</td><td>MIN</td></tr>
<tr><td>3</td><td>TP assembly lifting</td><td colspan="2">Insufficient adhesion of TP double-sided adhesive, causing warping not allowed.</td><td>MIN</td></tr>
<tr><td rowspan="3">4</td><td rowspan="3">TP surface</td><td colspan="2">Edge chipping and edge chipping of TP cover plate are not allowed.</td><td>MIN</td></tr>
<tr><td colspan="2">Fuzzy and incomplete screen printing of TP cover plate is not allowed.</td><td>MIN</td></tr>
<tr><td colspan="2">Severe scratches on the TP cover plate are not allowed; Refer to LCM appearance inspection standards.</td><td>MIN</td></tr>
<tr><td>5</td><td>TP Film：Fish eyes, white spots</td><td colspan="2"><table><tr><td>Diameter</td><td>Acceptance Criteria</td></tr><tr><td>Φ≤0.15</td><td>N≤2</td></tr><tr><td>0.2<Φ</td><td>Not allowed</td></tr></table>More than DS≥10mm；</td><td></td></tr>
<tr><td>6</td><td>TP bubble</td><td colspan="2">Surface and visible areas are not allowed.</td><td></td></tr>
</table>

7. Matters needing attention

(1) It is prohibited to disassemble products by oneself.

(2) Acids, alkalis, alcohol, etc., or direct hand contact can damage the product.

(3) Please take good precautions against static electricity, as static electricity can damage the product.

(4) Strong vibration, impact, twisting or bending can cause product damage.

(5) Long term display of the same image can cause image residue.

(6) Reaction time, brightness, and uniformity may vary depending on temperature.

8. RELIABILITY

NO..	Test Item	Description	Test Condition
1	High temperature storage	Endurance test applying the high storage temperature for a long time	80℃,96H
2	Low temperature storage	Endurance test applying the low storage temperature for a long time	-30℃,96H
3	High temperature operation	Endurance test applying the electric stress under high temperature for a long time	70℃,96H
4	Low temperature operation	Endurance test applying the electric stress under low temperature for a long time	-20℃,96H
5	High temperature /humidity storage	Endurance test applying the high temperature and high humidity storage for a long time	60℃， 90% R.H 96H
6	High temperature /humidity operation	Endurance test applying electric stress under high temperature and high humidity for a long time	40℃ 90% R.H 96H
7	Temperature Cycle	Endurance test applying the low and high temperature cycle -20℃ → 25℃ → 70℃ →25℃ 30min 5min 30min 5min one cycle	-20℃/70℃ 5 cycles
8	Vibration test	Endurance test applying the vibration during transportation and using	10Hz~50Hz Swing:0.75mm time:30min
9	Fall test	Endurance test dropping the LCM from a high place	600mm height
10	Static electricity test	Endurance test applying static electric stress to terminal	Contact discharge: ±2KV~4KV Air discharge: ±2KV~8KV

Table 9.

NOTE: TEST CONDITION
(1) Temperature and humidity: If no specification, temp. set at 25±2°C, humidity set at 60±5%RH.
(2) Operating state: Samples subject to the test shall be in “operating” conditio

9. USING LCD MODULES

9.1. LIQUID CRYSTAL DISPLAY MODULES

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

(1) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
(2) Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).
(3) N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.
(4) When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum benzin. Do not scrub hard to avoid damaging the display surface.
(5) Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.
(6) Avoid contacting oil and fats.
(7) Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
(8) Do not put or attach anything on the display area to avoid leaving marks on.
(9) Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).
(10) As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or rising.

9.2. PRECAUTION FOR HANDING LCD MODULES

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

(1) Do not alter, modify or change the the shape of the tab on the metal frame.
(2) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
(3) Do not damage or modify the pattern writing on the printed circuit board.
(4) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
(5) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
(6) Do not drop, bend or twist LCM.
(7) In order to avoid the cracking of the FPC,you should to pay attention to the area of FPC(R50mm) where the FPC was bent .the edge of coverlay;the area of surface of Ni-Au plating,the area of soldering land,the area of through hole.

9.3. ELECTRO-STATIC DISCHARGE CONTROL

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

(1) Make certain that you are grounded when handing LCM.
(2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
(3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
(4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
(5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
(6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 0%-60% is recommended.

9.4. PRECAUTIONS FOR OPERATION

(1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.
(2) Driving the LCD in the voltage above the limit shortens its life.
(3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
(4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
(5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.
(6) When turning the power on, input each signal after the positive/negative voltage becomes stable.

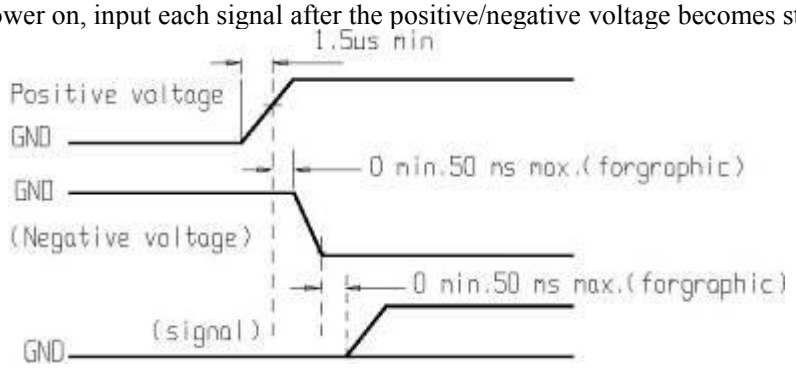


Figure 8.

9.5. STORAGE

When storing LCDs as spares for some years, the following precaution are necessary.
(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.
(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)
(4) Environmental conditions :
- Do not leave them for more than 160hrs. at 70°C.
- Should not be left for more than 48hrs. at -20°C.

9.6. SAFETY

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.
(2) If any liquid leakes out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and ater.

9.7. LIMITED WARRANTY

Unless agreed between Kingtech and customer, Kingtech will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Kingtech LCD modules acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to Kingtech within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of Kingtech limited to repair and/or replacement on the terms set forth above. Kingtech will not be responsible for any subsequent or consequential events.

9.8. RETURN LCM UNDER WARRANTY

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- Circuit modified in any way, including addition of components.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB's eyelet, conductors and terminals.

10.包装方式（PACKING MODE）仅供参考详情下单后再定

11. PACKING MODE

1. Packaging specifications

1.1 The packing method is shown in the "Packaging Method Diagram". The quantity of boxes is determined by the quantity of each suction tray. Each box is packed with a stack of 11 suction cups, with one suction cup on top not containing the product and placed in a cross layered manner. The top and bottom need to be fixed with cardboard and adhesive paper.

1.2 Inner box: The material is K3K, and the outer chamber size is 485 * 355 * 130mm.

1.3 Tray: PET anti-static or PS black anti-static material, with a thickness of 0.6MIN, external dimensions (based on the size of the blister disc provided by the backlight supplier), with a dosage of NPcs per box.

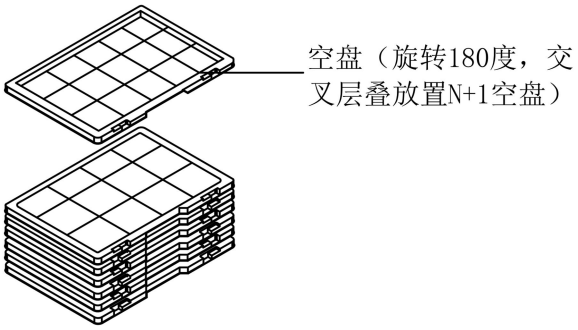
1.4 Cardboard or foam: Made of A-A corrugated cardboard, with a dosage of 2Pcs per box.

1.5 Calculation of packing quantity:

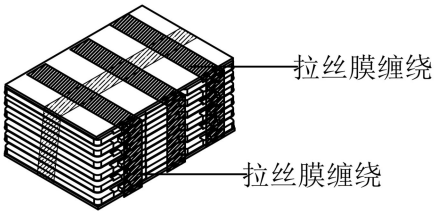
Quantity per blister box q * N (layer)

For example, each blister tray has a quantity of 10 products, and N trays are loaded with blisters. The packing quantity per box is 10* N =10N (Pcs) products.

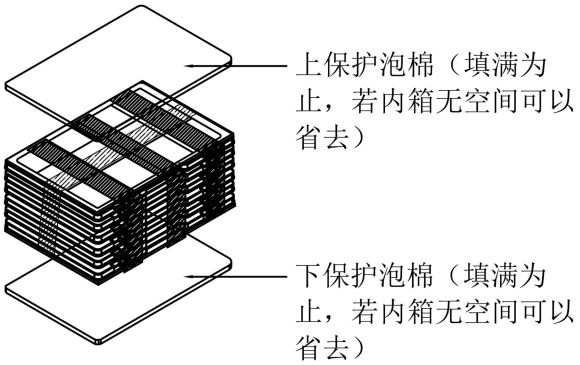
Schematic diagram of inner box packaging:



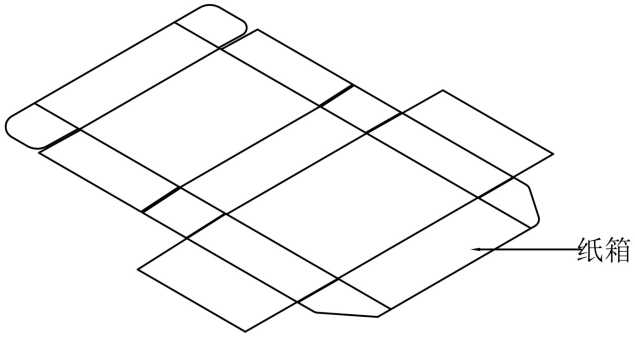
步骤一



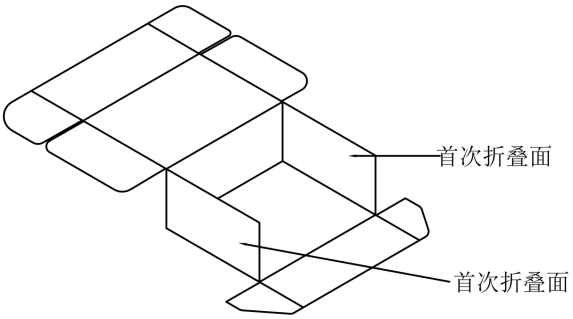
步骤二



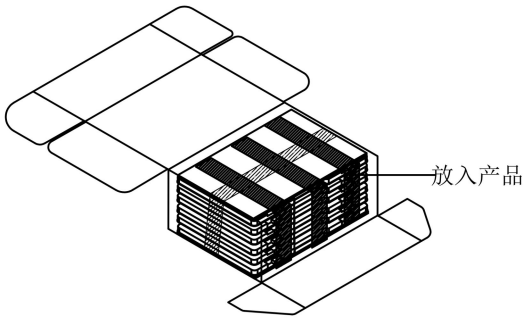
步骤三



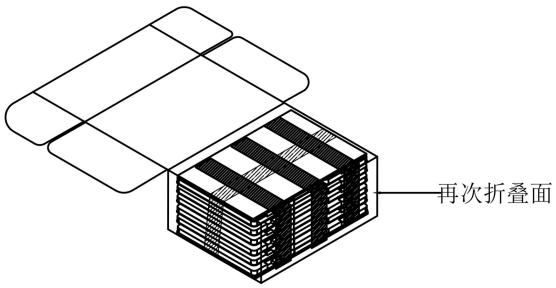
步骤四



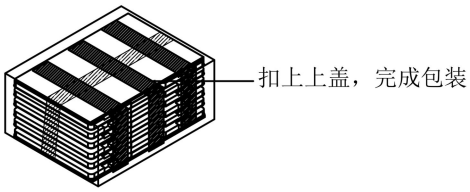
步骤五



步骤六



步骤七



步骤八

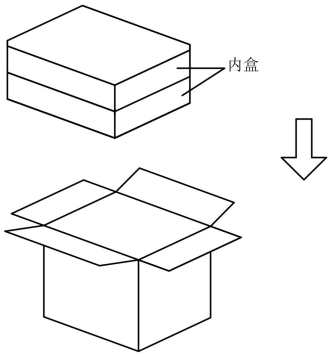
2. Label and stamp the PASS seal according to the product model and material number

Under normal circumstances, use a unified label. Some products are filled in according to the "Product Model and Customer Material Correspondence Table" with the customer's model or material number written on them. Special and specialized product labels, as well as packaging labels for products shipped or shipped by courier, shall be indicated according to the instructions provided by the tracking personnel.

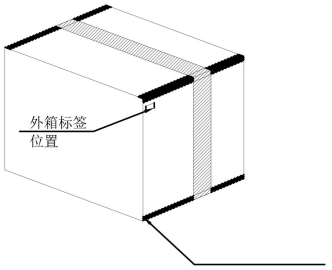
3. Outbound and express delivery products require an outer container

It is recommended to use large and small boxes for outbound and express delivery products, that is, two small boxes plus an outer box as shown.

两内箱一外箱；



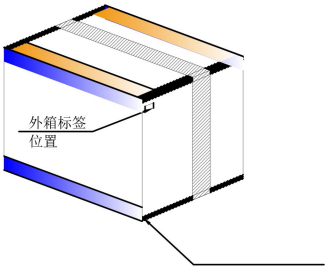
外箱规格：



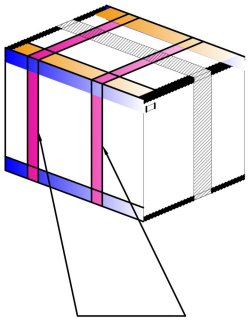
虚线填充为
封箱胶带

步骤九

步骤十



4条长棱包上
护角



尼龙打包装带

步骤十一

步骤十二

NO.	Item	Dimensions	Quantity	Remark
1	TRAY	One tray	10	
2	SMALL CARTON	One carton/11 tray	10N	
3	LARGE CARTON	One carton/2 small carton	20N	

4. Packaging process