Specification for Liquid Crystal Display

CUSTOMER NAME：_____

FEXDA   MODEL：   FXD13253HPR-PN___

CUSTOMER MODEL：_____

SAMPLE   DATE：   2020-03-27_____

PREPARED BY	APPROVED BY
LIUGANG 2020-03-27	CHENZHIBIN 2020-03-27

Revision statues

FXD13253HPR-PN

DOCUMENT REVISION HISTORY

Date	Rev.	Amend summary	Remark
2020-03-27	A	Fist Issue	
2020-04-30	B	Modify the size of pull tape	

# Content

Construction

1. ITO Glass

Included the Glass and Electrode in chart

What is called ITO Glass is general glass which is covered by transparent electric film. The reason of LCD showing graphics is using transparent electric film on electric glass to make into special Electrode by etching.

2. Polarizer

The action of polarizer is allowing quiver light in the same direction, other quiver light in different direction will be hold up. The light through polarizer is called polarization ray, the direction where light through is called polarization axis.

Reflector – Glisten film is provided with metal glisten layer, it's made into reflector polarizer by fixing on the back polarizer directly, apply in reflector LCD

液晶层
3．Liquid Crystal

定向层 **4. Polymer**
偏光片 **2. Polarizer**
玻璃 **1. Glass**
电极 **1. Electrode**
封接框 **5. Seal**

过度电极
7．X′over

电极
1.Electrode

玻璃 **1. Glass**
偏光片 **2. Polarizer**
反射片 **2. Reflector**

衬垫树脂
6．Spacer
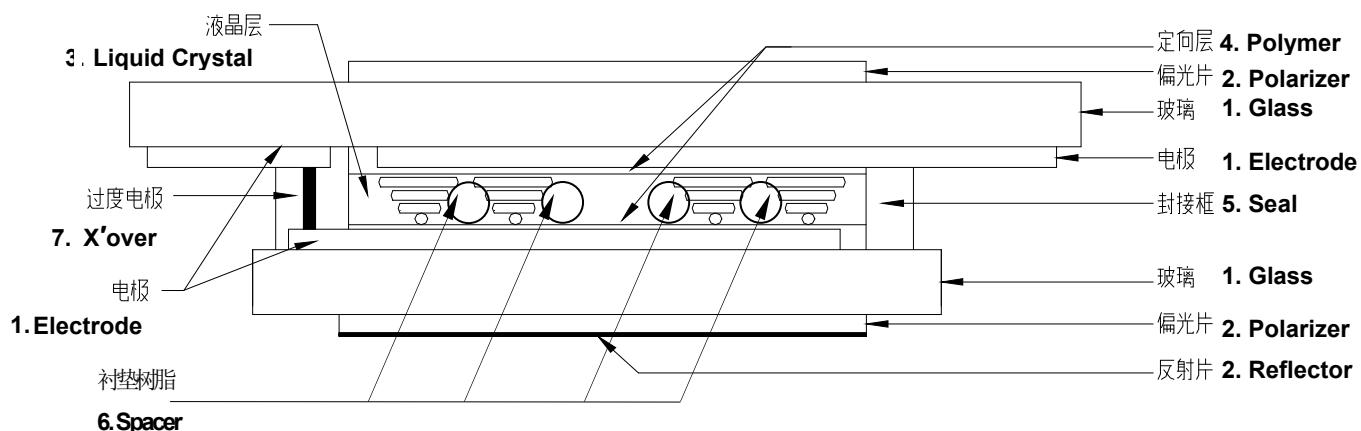
3. Liquid crystal

Liquid crystal is substance, which is different from mediocre solid, liquid, gaseity. It is provided with characteristic of liquid and crystal in the range of certain temperature, intervenient strict liquid and strict crystal. After two electric glass making into LCD case, and by loading proper voltage in electrode graphics, it may change array of crystal in LCD case, control the polarization direction of light, and make to change the light and shade of graphics.

Construction

4. Polymer

Polymer is substance which contact with liquid crystal directly in LCD case. It makes array of liquid crystal as special direction and angle in order.

5. Seal

The basic of seal is epoxy resin, which is gooey in fact, the action is agglutinated the front and back glasses, preventing leak of liquid crystal. In order to ensure to uniformity of clearance in LCD case, add proportion fiberglass to epoxy resin as a rule.

6. Spacer

In order to ensure the uniformity of clearance in liquid crystal, it must add some the same spacer in show area, commonly. It's globate resin of dot osculation.

7. X'over

In order to import telecom information for comment of back glass, generally, link by electric glue, which include much electric globosity resin on face, and ensure the capability of electric all right.

8. Others

Some of LCD have metal clip, for example metal PIN and heat seal connector.
And some of LCD has IC which integration on the surface of LCD, who called COG.

Product design

1. **Product drawing & Logic list**
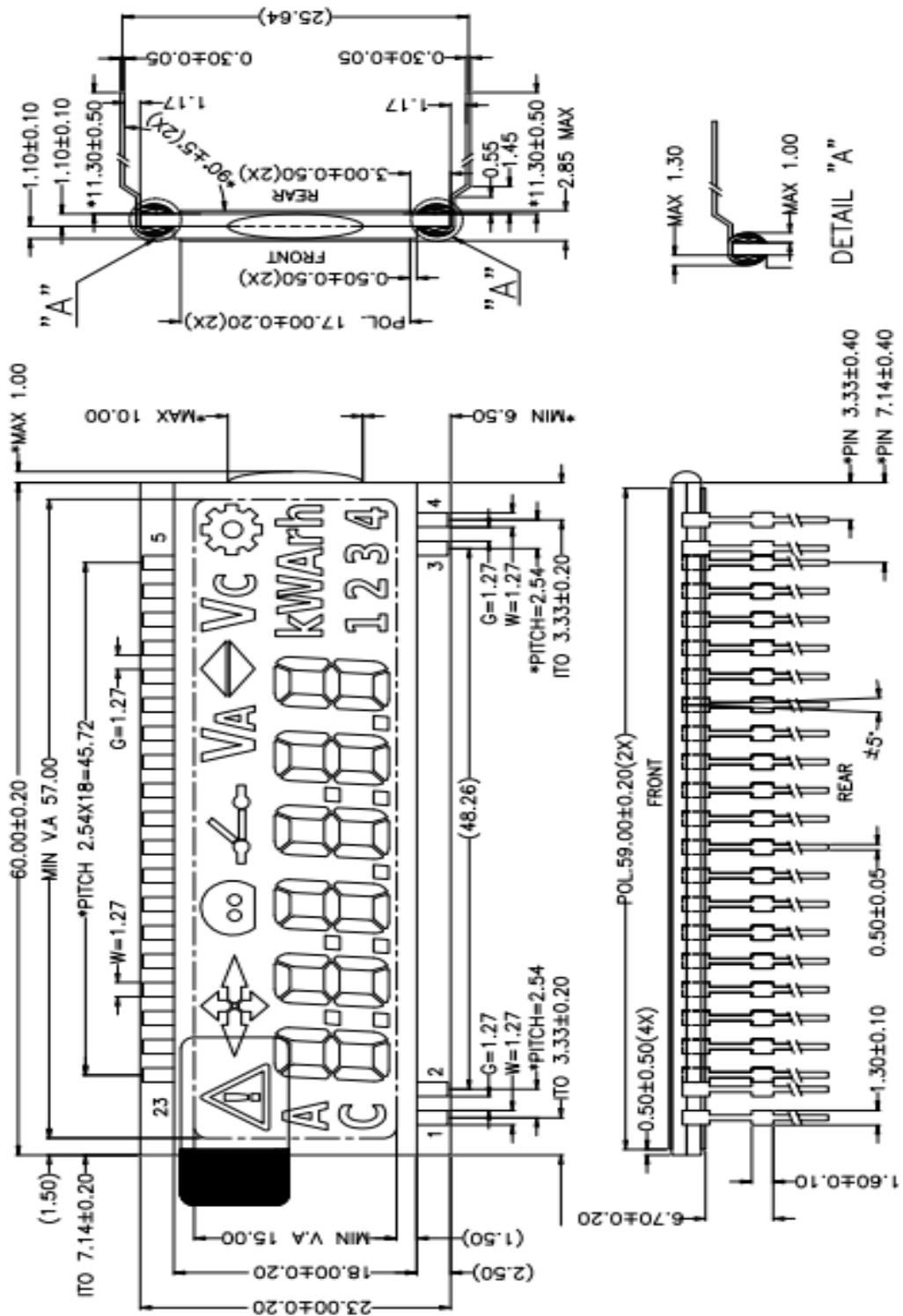
Product design

Product design

显示效果图

DRAWN	LH	MODEL NO.:	FXD13253HPR-PN		
CHECKED	CZB	DATE: 2019/12/04	SCALE: 1:1	REV: 1.0	PAGE: 1/3
APPROVED	WSL	UNMARK TOL.: ±0.2	UNIT: mm	3rd ANGLE	

FEXDA 江华飞信达科技有限公司 JIANGHUA FEXDA TECHNOLOGY LTD.
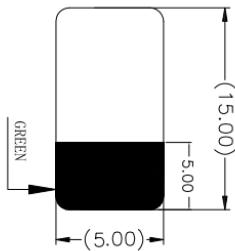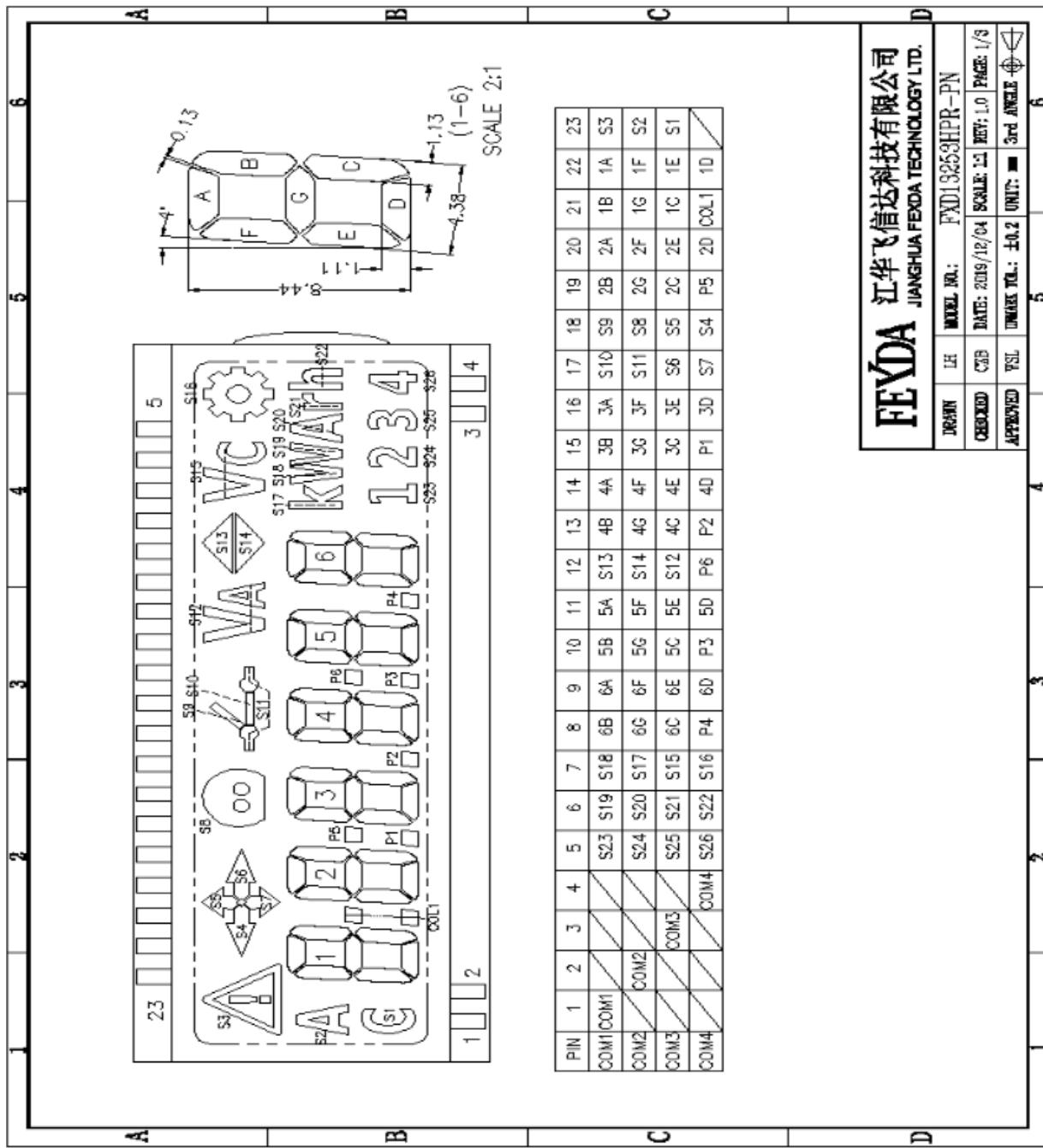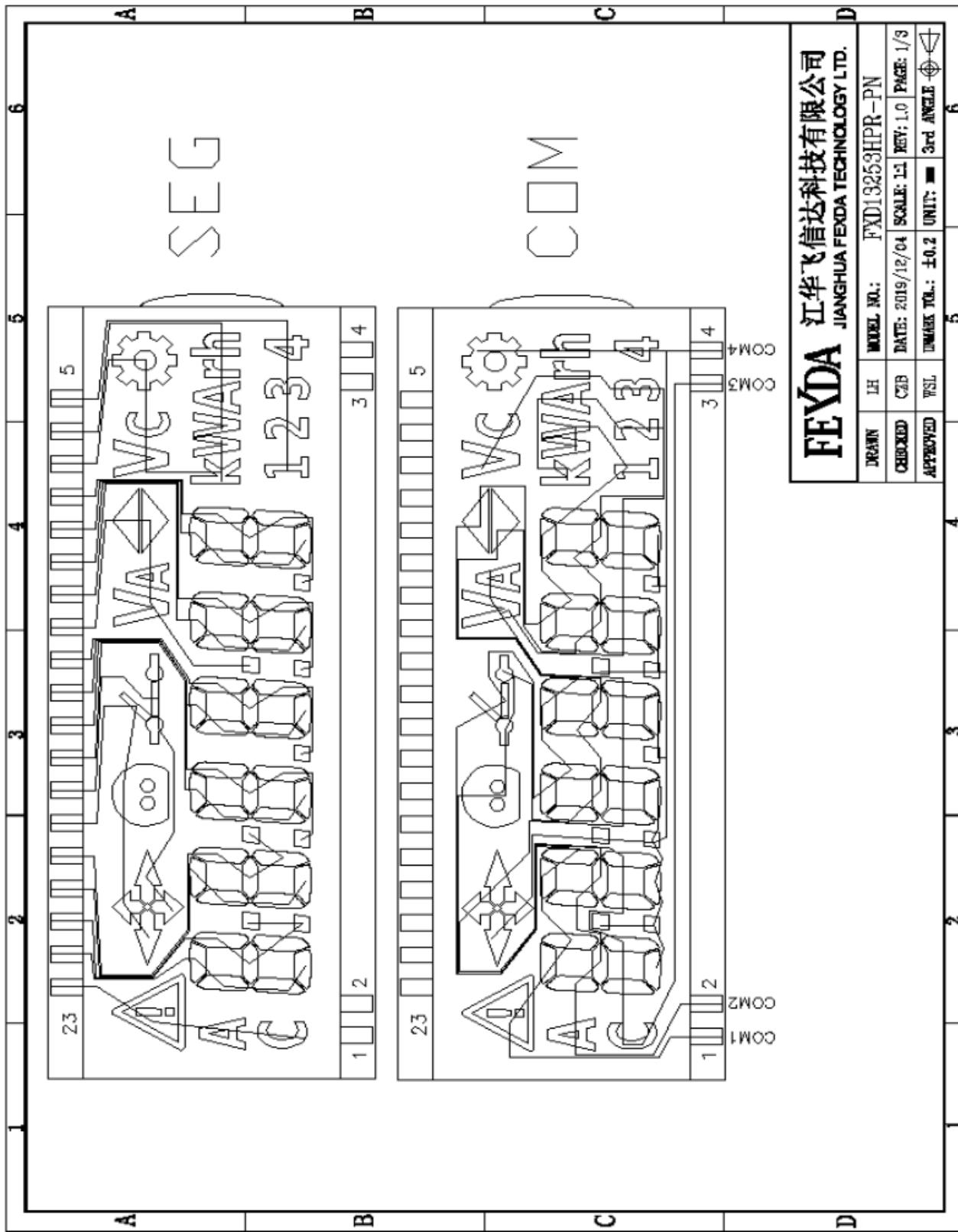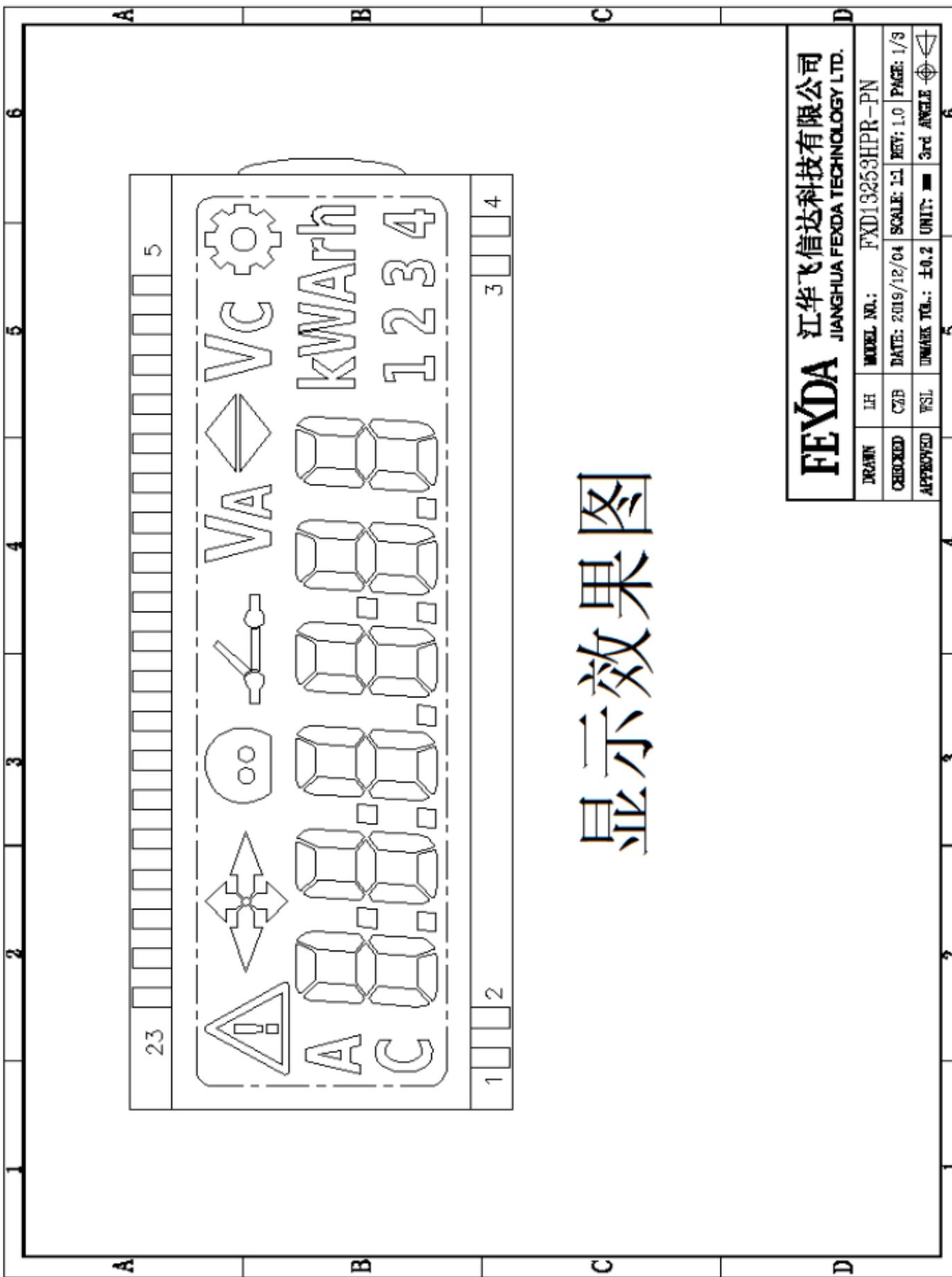
Electro-optic characteristics

1. Driving conditions

Duty	Bias	Vop	Von	Remark
1/4	1/3	3.0V	1.73V	Note.1

2. Maximum ratings

Item	MIN	MAX	Unit	Condition
Storage Temp	-40	+90	°C	
Operating Temp	-30	+80	°C	
AC Voltage		10	Vrms	1 hr
DC Voltage		5.0	V	10 hrs
Residual DC		20	mV	100 hrs

3. Electro-optical characteristics

NO	Item		symbol	Temp (℃)	Rating			Unit	Note
					Min	Typ	Max		
1	Operating Voltage		Vop	25	2.8	3.0	3.2	V	
2	Threshold Voltage		Vth	25		1.03		V	Note1
3	Saturation Voltage		Vsat	25		1.62		V	Note2
4	ResponseTime	Rise time	Tr	25		56	120	ms	Note3
		Fall time	Tf	25		90	140		
5	Viewing Angle (CR≧2)		θ	25	-10		+30	Deg	Note4
			φ	25	-20		+40		
6	Contrast Ratio		Cr	25		14			Note5
7	Current Consumption		Io	25		1.2	5	uA	Note6

※
This form is normal test conditions, if any request, in term of the customer's conditions.

Characteristics explain

[Note.1] Driving conditions

The improper bias ratio will lead to the LCD display uneven phenomenon

The best bias ratio is : $b = \dfrac{1}{\sqrt{N+1}}$, 其中 $b = Bias$ 、 $N = \dfrac{1}{Duty}$

[Note.2] Response time

Definition and Measurement Condition of Response Time

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Definition:
Rise  Time(Tr):   The time required for a LCD to get 90% contrast from 10% level

Decay Time(Tf):   The time in which contrast falls from 90% level to 10% level

Conditions:
  a) Temperature     : 25℃
  b)Frame Frequency  : 64Hz
  c)Viewing Angle    :  θ=10º, Φ90º
  d)Applied Voltage  : 5.0 V
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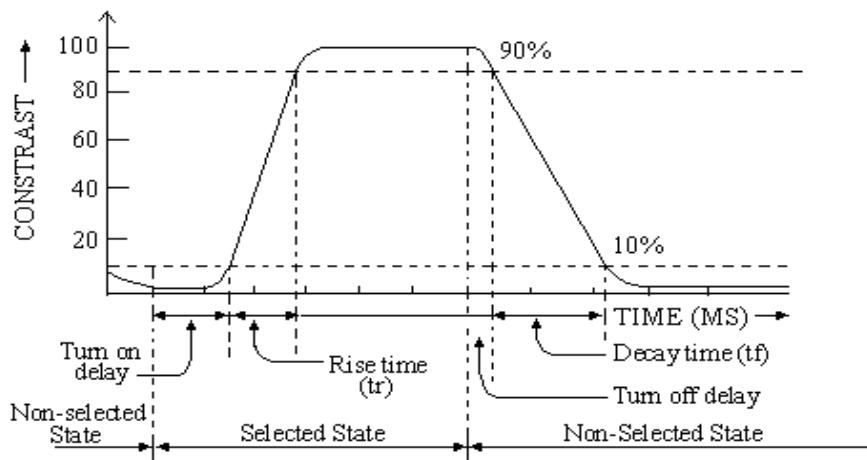

Fig.2

[Note.3] Frame frequency

Frame Frequency : 64 Hz

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Equipment  :
          LCD Tester  : RPG 2688
          Unltimeter  : Fluke 87
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Characteristics explain

[Note.4] View angle

Definition of viewing angle (θ) and viewing direction (Φ)
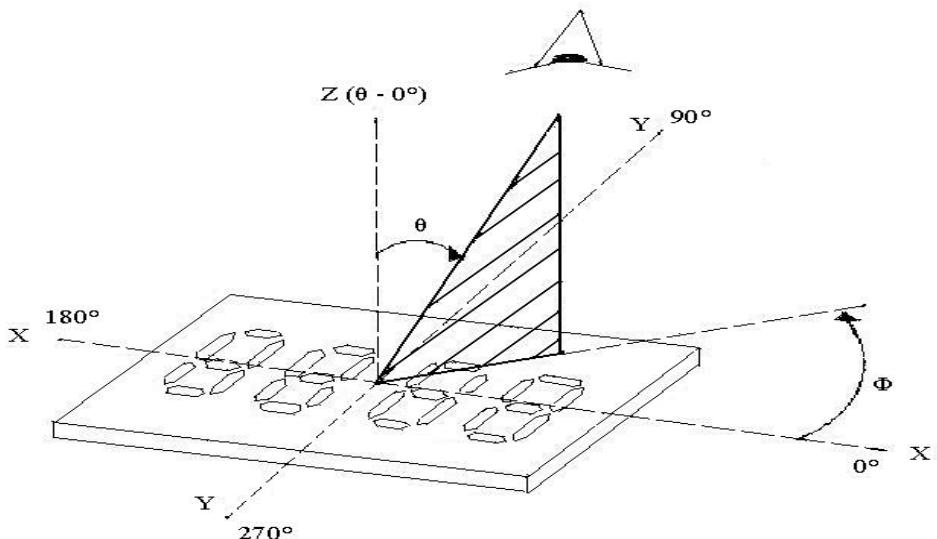
(1) Z is the normal line perpendicular to the LCD surface.

    (2) θ shows the viewing angle for LCD, starting from the normal line.

    (3) Φ shows the viewing direction for LCD.

        Viewing direction is at 12:00 o' clock if Φ=90°

        Viewing direction is at 6:00 o' clock if Φ=270°

        Viewing direction is at 3:00 o' clock if Φ=0°

        Viewing direction is at 9:00 o' clock if Φ=180°

[Note.5] Current consumption

    Definition and Measurement Condition of Current Consumption

    Definition:

    Current Consumption: The total maximum current that the LCD draws

      Equipment:

        LCD Tester: RPG 2688

[Note.6] Contrast ratio

    Definition and Measurement Condition of Contrast Ratio

    Definition:

    (Cr)/ Contrast Ratio= Brightness under non-selected wave form/Brightness under selected wave form

Inspection standard

1. **Purpose**

   Define the inspection standard of LCD and ensure the quality of product in control

2. **Scope**

   All the LCD manufactured and sold by FEXDA

3. **Normative references**

   3.1 Spec180110-02 LCD quality inspection standard

   3.2 Jianghua FEXDA technology co., LTD. Product design data, reliability test instructions

4. **Definition**

   4.1 BAND "H+ refers to standard of H+ BAND "H refers to standard of H

   BAND "A refers to standard of A

   4.2 Viewing angle
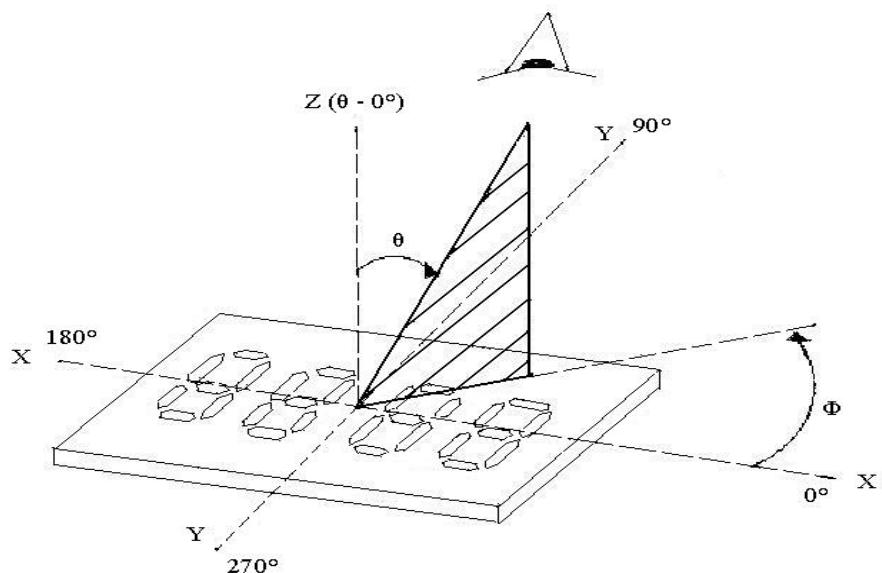
Inspection standard

4.3 Area
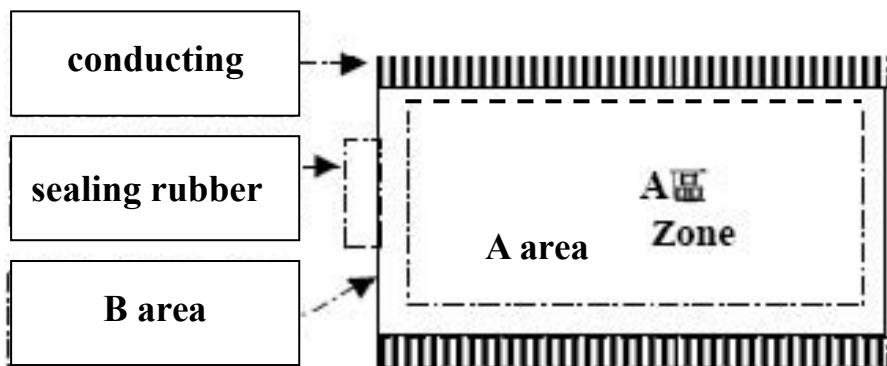
5. Responsibility

5.1

Engineering developing department have the duty for making the sample and data of product

5.2

QA department have the duty for establishing appearance standard which isn't referred in the documents of sample and product and send the inspection standard which coming from the customer to R&D .Checking the product according to the inspection standard.

5.3

Production department have the duty to executive the inspection standard in the progress of manufacture.

6. Program

6.1 Term for inspection

6.1.1

Intensity of illumination ≥ 800LUX

6.1.2

Normal eyesight

6.1.3

The distance between eyes and product ≥ 30cm in viewing angle

Inspection standard
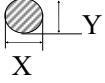
6.2 AQL   SPEC180110-02:

AQL	Critical	MAJ	MIN	MAJ + MIN
II	0	0.1	0.65	0.65

6.3 Electrical inspection failure

Defect	Define/description	Criteria
1. Open circuit (maj)	Circuit open	reject
2. Short circuit (maj)	Circuit short	reject
3. Dim(maj)	part of figures display dim than normal obviously	reject
4. All display dim（maj）	all the figure display dimmer than sample	Normally, ｜Vth,product-Vth,sample｜≤0.05V. if required strictly, refer to the signed sample limit.
5. Ghost(maj)	the figures in Voff state display	Normally, ｜Vth,product-Vth,sample｜≤0.05V. if required strictly, refer to the signed sample limit.
6. High power consumption(maj)	the power consumption bigger than the engineer SPEC.	Not exceed the engineer SPEC.
7. Response slow (maj)	the response time is longer than normal state obviously	Not allow the response time 1/3 longer than sample (or engineer spec.)

Inspection standard

Defect	Define/description	Criteria
8. Wrong viewing angle (maj)		Not allow the different viewing angle with the engineer spec.(or sample)
9. Twist segment(maj)	Some segments displaying the wrong viewing angle.	reject
10. Segment pervasion (maj)	The displaying segment pervasion like	reject
11. Extra lines (maj)	Displaying the extra lines than the engineer spec	reject

12. Spot fault Blackspot white Spot dirty (include **Polarizer attaching**) $\phi = (X+Y)/2$

Irregular spot defects longer than 0.4mm, by line defect identification

| Spot fault (mm) Size (mm)		reject					
		Area≤60cm			Area >60cm^2		
		H	A	B	H	A	B
φ<0.08		disregard			disregard		
0.08≤φ≤0.1	P	disregard			disregard		
	N		disregard	disregard	disregard	disregard	disregard
0.1<φ≤0.15	P	1	2	3	2	3	4
	N	1	2	3	1	2	4
0.15<φ≤0.2	P	0	1	2	1	2	4
	N	0	1	2	1	2	3
0.2<φ≤0.25	P	0	0	1	0	0	2
	N	0	0	0	0	0	2
0.25<φ≤0.3	P	0	0	0	0	0	0
	N	0	0	0	0	0	0
0.3<φ≤0.35	P	0	0	0	0	0	0
	N	0	0	0	0	0	0
0.35<φ≤0.5	P	0	0	0	0	0	0
	N	0	0	0	0	0	0
0.5<φ≤0.6	P	0	0	0	0	0	0
φ>0.6	N	0	0	0	0	0	0

P: Positive / N: Negative

Inspection standard
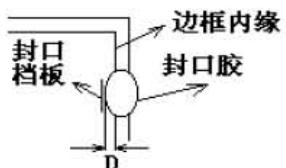
Defect	Define/description	Criteria

1.

Segment Pinhole　　count with black **spot**　　　　Lattice Pinhole

A−horizontal direction　B− Vertical direction

C：　No contact with other lattice　D：≤W/3

$\phi = (A+B)/2$

Product Type	Size(mm)	acceptance number	
		area≤60cm	area>60cm
H	Φ<0.08	disregard	disregard
	0.08 ≤ Φ ≤ 0.15	disregard	disregard
	0.15<Φ≤0.20	0	2
	Φ>0.20	0	0
A	Φ<0.08	disregard	disregard
	0.08 ≤ Φ ≤ 0.15	disregard	disregard
	0.15<Φ≤0.20	0	2
	0.20<Φ≤0.25	0	1
	Φ>0.25	0	0
B	Φ<0.1	disregard	disregard
	0.1≤Φ≤0.15	disregard	disregard
	0.15<Φ≤0.20	1	3
	0.20<Φ≤0.25	0	2
	0.25<Φ≤0.30	0	1
	Φ>0.30	0	0

Defect 15 — Profile Lack Trap

Inspection Standard

6.4   Appearance inspection

6.4.1

Area A :viewing area,   Area B: non-viewing area

Bad ITEM	Content	Judgment standards
1. leakage(maj)	LC in the cell leak out.	reject
2. cracks (maj)	ITO glass crack	any crack reject
3. malalignment	Different color from normal due to misalignment	Refer to the standard of spots and lines.
4. End sealant over height, over width (min)		According to engineering spec.
5. Permeating resin (min)		Baffle : not overstep baffle no baffle : D＞1.5mm reject
6. seal line larger (min)	The width of seal larger obvious than normal	a: greater than 4/3 width of average reject b: less than 1/3 width of average reject c: seal line enter into A area reject
7.rainbow (min)	Different color in one panel	according to the sample；if required strictly, sign the limited samples.
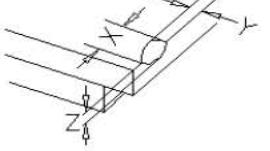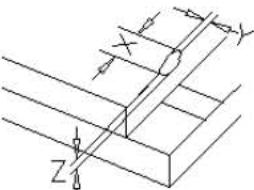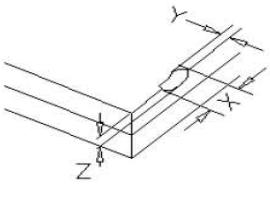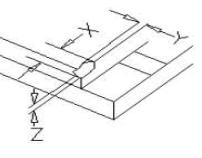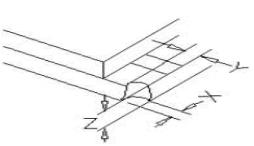
Inspection Standard

8. ITO lines appear（maj）	Design shows without voltage input	Refer to the sample
9. cutting defect（min）		Dimensions refer to engineering spec. Not allowed to damage the Epoxy. Glass damage refer the related spec.
10. Grind off edge defect（min）		according to the limited sample
11.Drilling(min)		Diameter and position according to engineering spec. . Not allow to damage Epoxy, and refer to related Spec.
12. Dirty spot of ITO glass (min)		a: outside seal expose, disregard b: inside seal epoxy, according to black spot
13. Back print（min）	Broken line; pinhole; convex; fuzz（min）	a： Broken line; pinhole; convex refer to item 6.4.2,6.4.3 b : fuzz of printing over 1/4 spec. reject
	printing missing; extra printing; wrong face; invert printing	reject
	Position and dimension(maj)	Refer to the engineer spec
14. Polarizer attaching	Wrong polarizertype (maj)	reject
	Attaching wrong face(maj)	reject
	polarizer damage (min)	Refer to the standard of spots and lines
	Polarizer slanting (min)	Polarizer should touch the sealing lines , not exceeding the glass side.
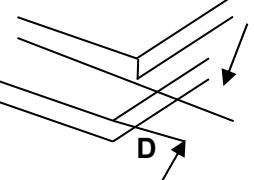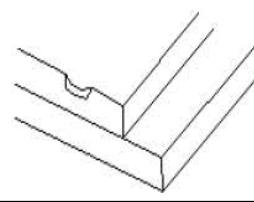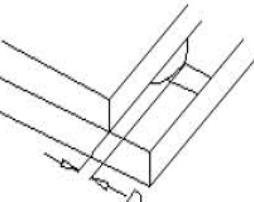
Inspection standard

|	dimensions	According to engineering spec.	
	Pin tilt	≥±5° reject	
	Not allow the number of metal pin more or less		
	pin glue permeates through polarizer and glass or polarizer is polluted by pin glue reject		
	The height of pin glue over the front polarizer reject		
	There is no glue between two pins reject		
15. Pin defect	UV GLUE: number of the pin which underparts has no glue≥2 reject		
	Normal glue: Number of the pin which underparts has no glue≥1 reject		
	Pitch of pins	Standard	Accept
		｜D-E｜＜1/6D	无视 disregard
	D Normal Pitch /spec	1/6D≤｜ D-E｜ ≤1/3D	2
	E Actual Pitch/actual	｜D-E｜＞1/3D	0

6.4.2　Standard for spot、line、cutting breaking defec

Bad ITEM	Picture	Judgment standard
1. LCD side damage (min) X:LENGTH Y:WIDTH Z:DEPTH K1:length of pin ito T:depth of glass The number of defects is not allowed to exceed two		X ≤2.0mm　Y ≤K1 /3　Z ≤T　　ACC NO.≤2 Products with pins disregard
		X ≤2.0mm Y ≤the outer edge of the border not reach the seal line Z ≤T　ACC NO.≤2
		X ≤2.0mm Y ≤the outer edge of the border　not reach the seal line Z ≤T
		Z: ≤T X: ≤2.0mm and not reach the common point Y: not allow common point appear outside.
2.Corner damage (min)				X	Y	Z			---	---	---			especially big	3	≤K1/3	≤T	No ITO pin　be damaged

Inspection standard

3. poor cutting(min)		1.D≤0.2mm & D ≤K1/4 2.according to engineering diagram
		according to engineering diagram
		1.D≤ 0.25 & D≤ K1/4 2.according to engineering diagram

4. Linear scratch (min)		L（mm）	W（mm）	A area	B area
			W≤0.02	disregard	disregard
		L≤3.0	W≤ 0.03	2	disregard
		L≤2.0	0.03<W≤0.05	2	disregard
		L>3.0	W≤0.03	0	2
		L>2.0	0.03<W≤0.05	0	2

5. Air bladder (min)		Size	Acceptable number
		Φ≤0.3 ㎜	disregard
		0.3 ㎜≤Φ≤0.5 ㎜	1
		0.5 ㎜＜Φ	0
		Φ ≤0.3mm	
		Φ =（L+W）/2 The above conditions can be ignored if it is outside the visual area	

6.5　Size of product
　　6.5.1　Refer to product drawing.
　　6.5.2　Tolerance of size is +/-0.20mm.

Reliability Test

1.
   Equipment: Temperature & humidity chamber, 2688 tester

2.
   Normal test conditions

	Item	Test Condition
1	Operating at high temperature	80±2℃ Operating For 96H
2	Operating at low temperature	-30±2℃ Operating For 96H
3	Storage at high temperature	90±2℃ Storage For 96H
4	Storage at low temperature	-40±2℃ Storage For 96H
5	High Temperature&Humidity Storage	40℃/90% REL Humidity ,96H

※
This form is normal test conditions, if any request, in term of the customer's conditions.

Testing method
Confirm the function of the LCD sample to be checked and appearance up to grade before testing.
Test finished, check the function and appearance after resuming for one hour at normal temperature.

Checking method
Check each LCD sample's current before testing and after testing when the voltage is 5.0V by 2688 tester.
Inform to product specification and checking standard, check the appearance and function of product if it is checked out.

Confirmation & Advice