Shenzhen Leadtek Electronics Co.,Ltd

PRODUCT SPECIFICATION

TFT-LCD MODULE

Module No：LTK043HS40S-B-V1

Designed by	Checked by	Approved by
		

Final Approval by Customer

Approved by	Comment

※The specification of “TBD” should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

Contents

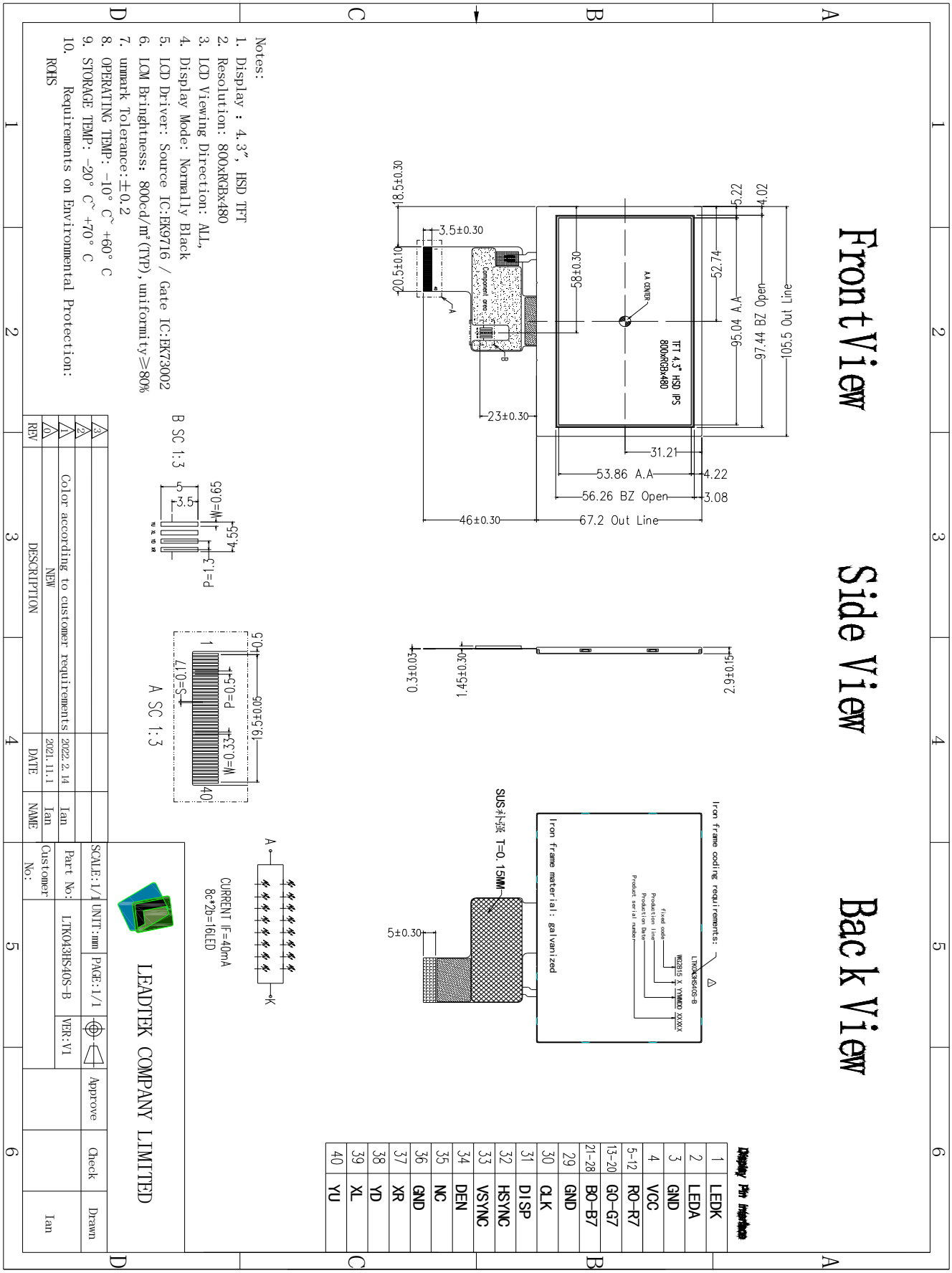
1.Document Revision History

Version	Contents	Date	Note
A0	Original	2022.2.18	

2. General Description

No	Item	Specification	Unit
1	Screen Size	4.3	inch
2	LCD Type	TFT	
3	LCD manufacturer	-	
4	Viewing Direction	ALL	Best Image
5	Display Mode	800RGB（H）X480 （V）	
6	Resolution	Normally Black	Pixel
7	Active Area	95.04（H）*53.86（V）	mm
8	Outline Dimension	105.5*67.2*2.9	mm
9	Driver IC	Source IC:EK9716 / Gate IC:EK73002	
10	Interface	RGB	
11	Back Light	White Led*16	
12	With or Without Touch Panel	Without	

3. Outline Dimension



4. Interface Specification

NO.	Symbol	Function	Remark
1	LEDK	Backlight LED Cathode	
2	LEDA	Backlight LED anode	
3	GND	System Ground	
4	VCC	Power supply for logic operation	
5~12	R0~R7	Data bus	
13~20	G0~G7	Data bus	
21~28	B0~B7	Data bus	
29	GND	System Ground	
30	CLK	Pixel clock signal	
31	DISP	Display on/off control	
32	HSYNC	Horizontal Sync signal	
33	VSYNC	Vertical Sync signal	
34	DEN	Data Enable	
35	NC	NC	
36	GND	System Ground	
37	XR	Touch Panel Control Pin	
38	YD	Touch Panel Control Pin	
39	XL	Touch Panel Control Pin	
40	YU	Touch Panel Control Pin	

5. Absolute Maximum Ratings

5.1 Electrical Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	DV_{DD}	-0.3	5	V	GND=0
Logic Signal Input Level	V_I	-0.3	DV_{DD} +0.3	V	

Note (1) Stresses above those listed under "Absolute Maximum Rating" may cause permanent damage to the device.

These are stress ratings only. Functional operation of this device at indicated in the operational sections(6.1) of this specification.

6.LED Backlight Specification

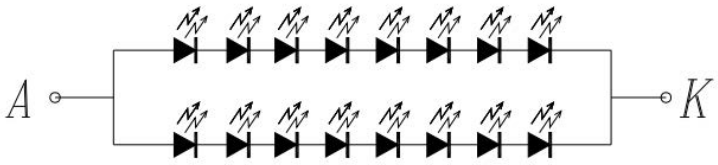
Item	Symbol	Min	Typ	Max	Unit	Test Condition	Note
LED Current	IF	-	40	–	mA	-	-
LED Voltage	VF	11.6	12.8	14	V	IF=40mA	-
Luminance	LV	750	800		cd/m2	IF=40mA	-
Life Time			25000	–	Hr.	IF 40mA	-
Color	WHITE						

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation

should be restricted to the conditions described under normal operating conditions.

(2)Ta=25±2℃

(3)Test condition: LED Current 40mA



CURRENT IF=40mA
8c*2b=16 LED

7.Optical Specification

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark
Response time	Tr+Tf	Θ=0O Ø=0o Ta=25˚C	-	30	-	ms	
Contrast ratio	Cr		640	800			
Color gamut	S（%）		-	-		%	
Luminance uniformity	WHITE		80			%	
Viewing angle range	Θx+	CR≧10 Ta=25˚C	70	80		deg	
	Θx-		70	80		deg	
	Θy+		70	70		deg	
	Θy-		70	80		deg	
LCM Luminance	LV	Θ=0o Ø=0o Ta=25˚C	-	800	-		
CIE(X,Y)Chromaticity	White(X)		0.285	0.325	0.365		
	White(Y)		0.305	0.345	0.385		

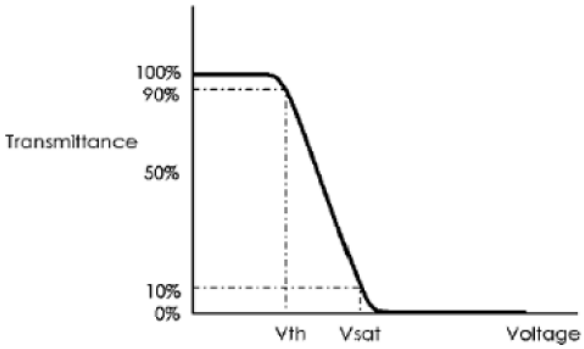
7.1 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : 25±2℃
- 30min. warm-up time.

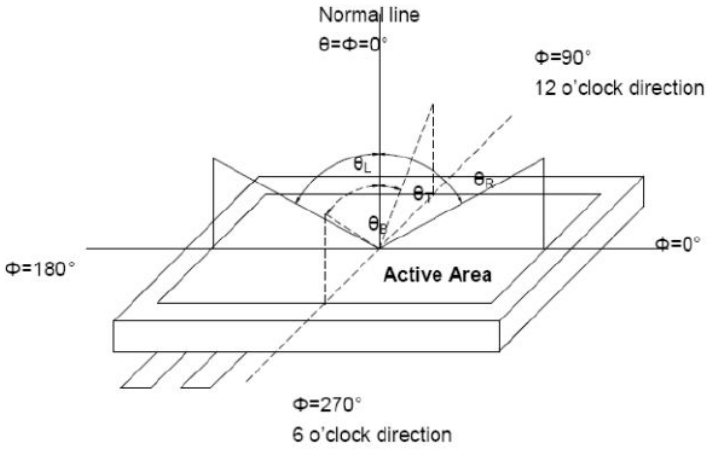
7.2 Measuring Equipment

- TOPCON BM-7
- Measuring spot size : field 2°

Note (1) Definition of Vsat and Vth (at 20℃)

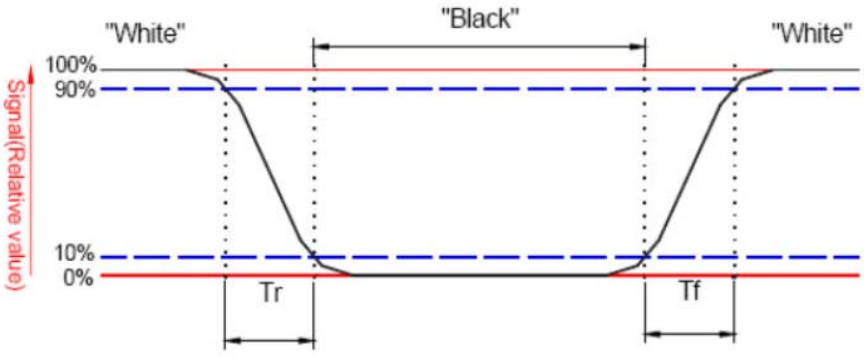


Note (2) Definition of Viewing Angle :



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 (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.



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Note 4: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

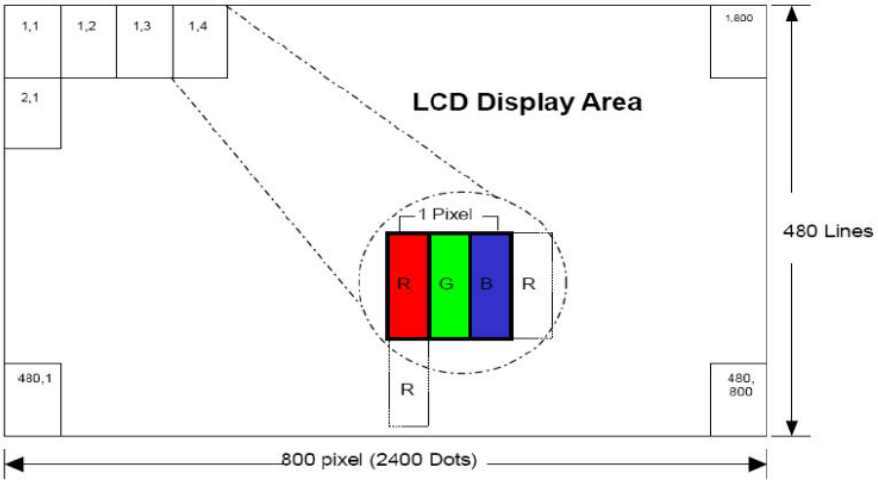
$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

Note 5: Definition of color chromaticity (CIE 1931)

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel.

7.3 Block Diagram

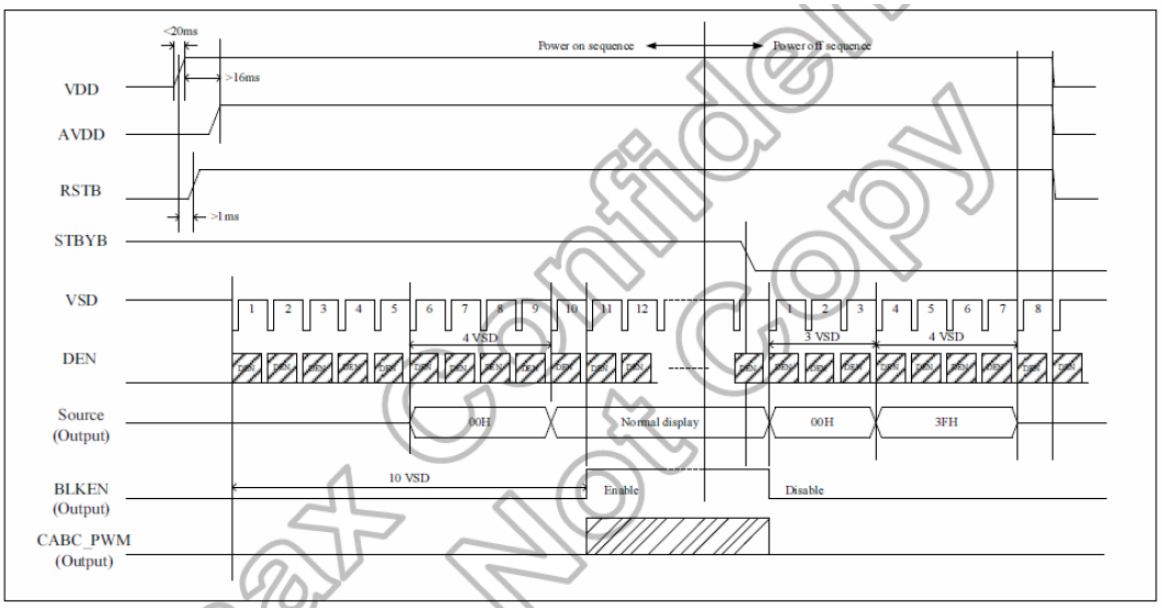
TFT-LCD Module



8. Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	DVDD	3.0	3.3	3.6	V	

8.1 TFT-LCD Power on/off Timing Sequence



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8.2 Timing Diagram of Interface Signal

AC Electrical Characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	T_{hst}	8	-	-	ns
HS hold time	T_{hhd}	8	-	-	ns
VS setup time	T_{vst}	8	-	-	ns
VS hold time	T_{vhd}	8	-	-	ns
Data setup time	T_{dsu}	8	-	-	ns
Data hold time	T_{dhd}	8	-	-	ns
DE setup time	T_{esu}	8	-	-	ns
DE hold time	T_{ehd}	8	-	-	ns
VDD Power On Slew rate	T_{POR}	-	-	20	ms
RSTB pulse width	T_{Rst}	10	-	-	us
CLKIN cycle time	T_{cph}	20	-	-	ns
CLKIN pulse duty	T_{cwh}	40	50	60	%
Output stable time	T_{sst}	-	-	6	us

8.3Data Input format

- **Horizontal timing**

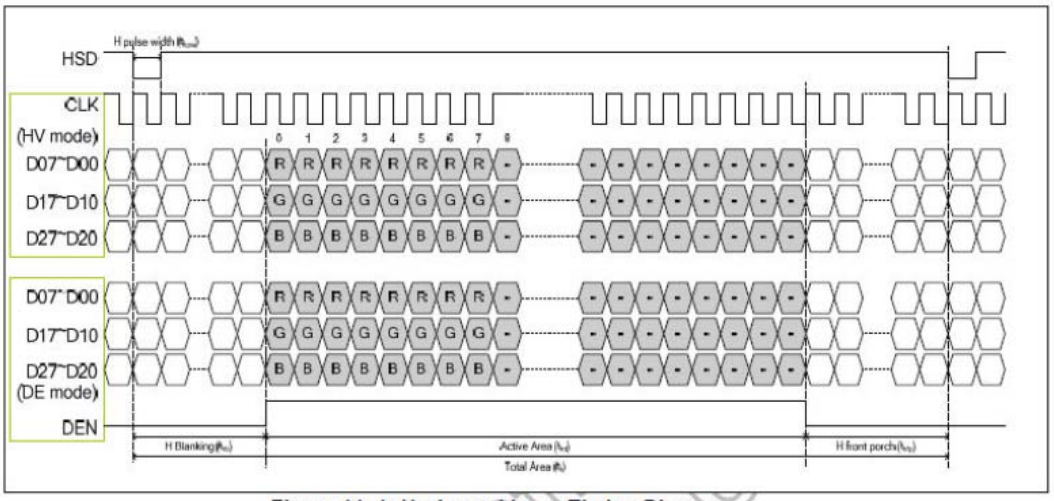

Figure 11. 1: Horizontal Input Timing Diagram

- **Vertical timing**

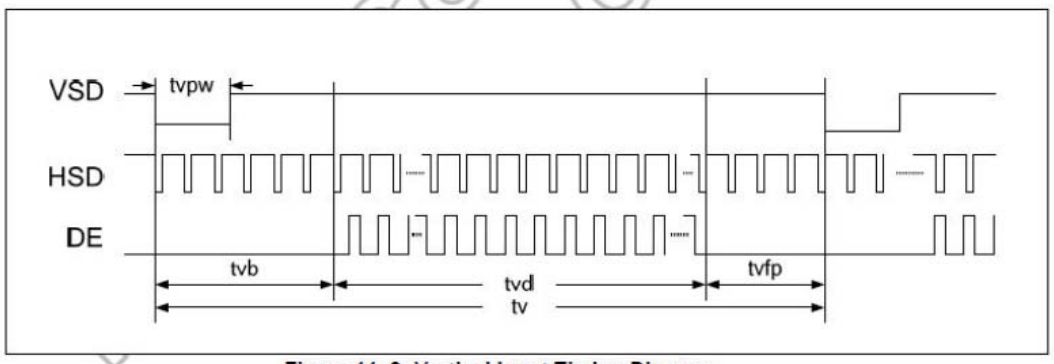

Figure 11. 2: Vertical Input Timing Diagram

8.4 Timing

- **Horizontal timing**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd		800		DCLK
DCLK frequency	fclk	-	30	50	MHz
One Horizontal Line	th	889	928	1143	DCLK
HS pulse width	thpw	1	48	255	DCLK
HS Back Porch (Blanking)	thb		88		DCLK
HS Front Porch	thfp	1	40	255	DCLK
DE mode Blanking	th-thd	85	128	512	DCLK

- **Vertical timing**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd		480		T_H
VS period time	tv	513	525	767	T_H
VS pulse width	tvpw	3	3	255	T_H
VS Back Porch (Blanking)	tvb		32		T_H
VS Front Porch	tvfp	1	13	255	T_H
DE mode Blanking	tv-tvd	4	45	255	T_H

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9.Reliability Test Items

Item	Test Condition	Criterion
High Temperature Operation	+50 ℃, 48 hrs	Note1，Note2
High Temperature Operation	-10 ℃, 48 hrs	
High Temperature Storage	-60 ℃, 48 hrs	
Low Temperature Storage	-20 ℃, 48 hrs	
High Temp. & High Humidity Storage	40 ℃, 90％ RH, 48hrs	
Thermal Shock (Static)	-20℃, 30 min /60℃, 30 min, 100 cycles	

Note1:Evaluation should be tested after storage at room temperature for two hours.

Note2:

Pass: Normal display image no line defect.

Fail: No display image, or line defects.

Partial transformation of the module parts should be ignored.

10.Precautions

Please pay attentions to the followings as using the LCD module.

Handling

(a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.

(b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display s urface with hard materials.

(c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.

(d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.

(e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean t he display surface. It might damage the touch panel surface permanently. The recommended solvents are water and Isopropyl alcohol.

(f) Wipe off water droplets or oil immediately.

(g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.

(h) Do not touch the output pins directly with bare hands.

(i) Do not disassemble the LCD module.

(j) Do not lift the FPC of Touch Panel.

Storage

(a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.

(b) Do not expose the LCD modules to sunlight directly.

(c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.

(d) Avoid condensation of water. It may cause improper operation.

(e) Please stack only up to the number stated on carton box for storage and transportation. Excessive w eight will cause deformation and damage of carton box.

Operation (a) When mounting or dismounting the LCD modules, turn the power off.

(b) Protect the LCD modules from electric shock.

(c) The Driver IC control algorithms stated above should always obeyed to avoid damaging the LSI an d electronic circuit.

(d) Be careful to avoid mixing up the polarity of power supply for backlight.

(e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cau se non-recoverable damage of electronic components or, nevertheless, burning.

(f) When a static image is displayed for a long time, remnant image is likely to occur.

(g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.

(h) Most of the touch screens have air vent to equalize the inside air pressure to the outside one. The air vent must be open and liquid contact must be avoided as the liquid may be absorbed if the liq uid is accumulated near the air vent.

(i) For the fragility of ITO film, it should avoid to use too tapering pen as the input material.

Touch Panel Mounting Notes

(a) If a cushion is used between bezel/housing and film must be choose as free as enough to absorb t he expansion and contraction to avoid the distortion of film.

(b) The cushion must be placed out of the Viewing Area.

(c) Bezel/Housing edge must be posited between Key Area and Viewing Area. The edge enters the Ke y Area may cause unexpected input if the gap is too narrow or foreign particles like dusts exist be tween Bezel/Housing and ITO film.

(d) Mounting example:

The corner part has conductivity. Do not touch any metal part after mounting.

Others

a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.

b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the di splay surface.

c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic c harge can be minimized

11.HSF Requirements

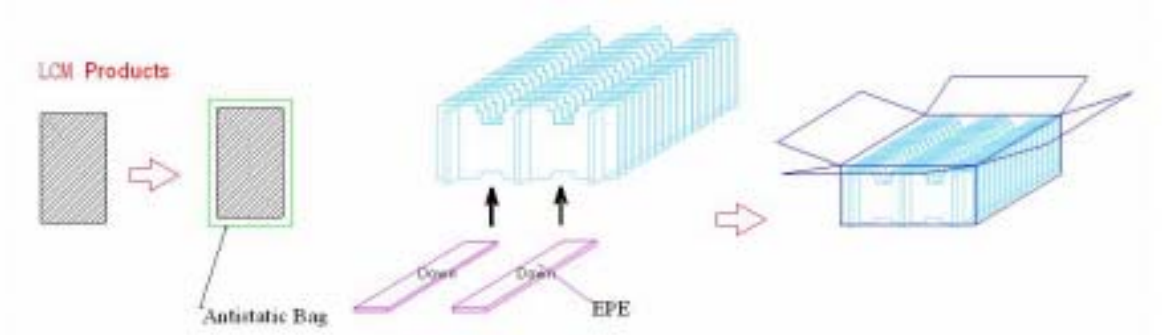
☑ RoHS(Restriction of the use of certain Hazardous Substances)

☐HF (Halogen Free)

☐REACH (Regulation the Registration, Evaluaton, Authorization and Restricton of Chemicals)

☐ Other regulations

12.Packaging diagram



第一步

将产品装入静电袋

第二步

把长卡、短卡组成卡阵（短卡朝向一致）形状和数量按照 BOM 实际物料，卡阵底部放对应的白色珍珠棉后装箱

第三步

每个卡槽内放两片产品，2 片产品显示面相对，中间粉色珍珠棉一起

First step

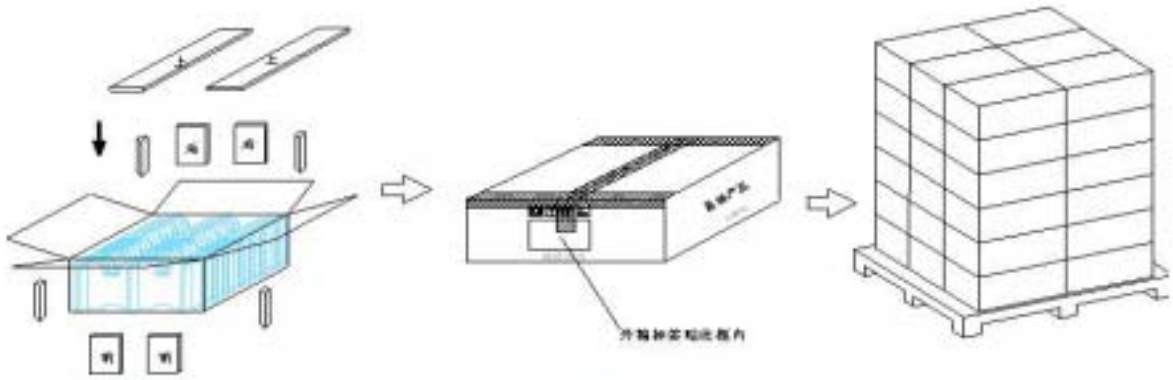
Putting every piece of LCM into anti-static bag.

Second step

Assemble a carton matrix with the right white EPE down below ,then place them into the carton.

Third step

Put a pink EPE between 2 pcs products(face to face) while insert all of them into the carton matrix.



第四步

装箱后，按照 BOM 实际物料在纸箱内侧与卡阵避空位置放白色泡棉

第五步

用胶带封箱，贴外箱标签

第六步

将箱子整齐的放在栈板上并包裹，最高可堆叠泡棉：6 层；

Fourth step

Insert all other white EPE into the right place of the carton matrix .

Fifth step

seal the carton with cellulose tape ;Stick on a carton label,

Sixth step

Place the boxes together on a pallet (6 layers at most),

13.IIS Standard

13. INSPECTION STANDARD

13.1. QUALITY :

THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.

13.1.1. THE METHOD OF PRESERVING GOODS

AFTER DELIVERY OF GOODS FROM CHENGHAO TO PURCHASER. PURCHASER SHALL CONTROL THE LCM AT -10 ℃ TO 40 ℃ ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.

13.1.2. INCOMING INSPECTION

(A) THE METHOD OF INSPECTION

IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.

(B) THE STANDARD OF QUALITY

ISO-2859-1 (SAME AS MIL-STD-105E) , LEVEL Ⅱ SINGLE PLAN.

CLASS	AQL(%)
CRITICAL	0.4 %
MAJOR	0.65 %
MINOR	1.5 %
TOTAL	1.5 %

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.

(C) MEASURE

IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.

13.1.3. WARRANTY POLICY

CHENGHAO WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. U.R.T. WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF CHENGHAO.

13.2. CHECKING CONDITION

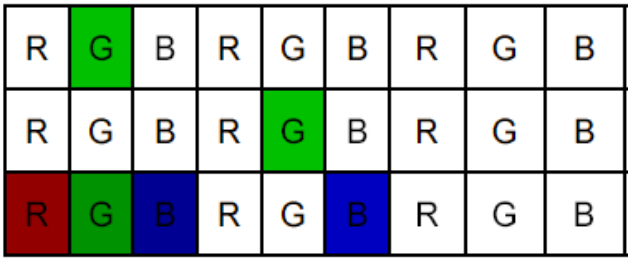
13.2.1. CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.

13.2.2. CHECKER SHALL SEE OVER 300±25 mm WITH BARE EYES FAR FROM SAMPLE AND USING 2 PCS. OF 20W FLUORESCENT LAMP.

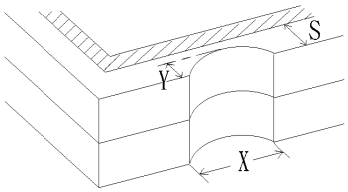
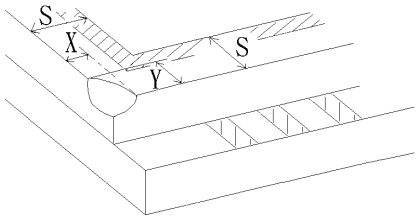
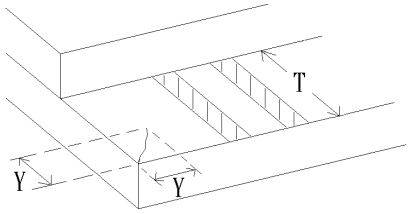
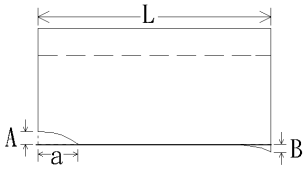
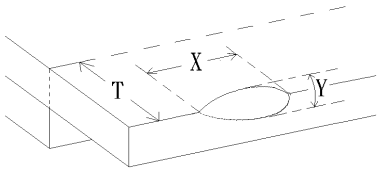
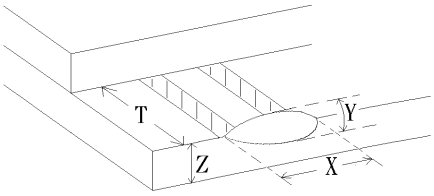
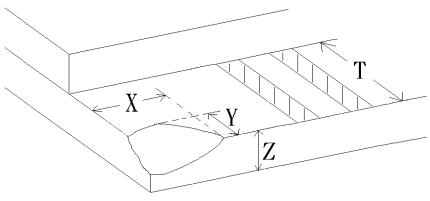
13.3. INSPECTION PLAN :

CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA ……..REJECTED	Minor
	6. BLEMISH、BLACK SPOT、 WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	7. BLEMISH、BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION (INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR (OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE (IF NEEDED, AND INSIDE VIEWING AREA)	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS (CONTRAST、VOP、 CHROMATICITY … ETC)	ACCORDING TO SPECIFICATION OR DRAWING . (INSIDE VIEWING AREA)	Critical
	11.MISSING LINE	MISSING DOT、LINE、CHARACTER ....REJECTED	Critical
	12.SHORT CIRCUIT、 WRONG PATTERN DISPLAY	NO DISPLAY、WRONG PATTERN DISPLAY、CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. DOT DEFECT (FOR COLOR AND TFT)	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

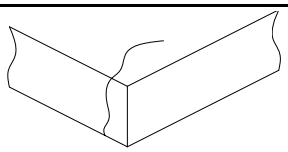
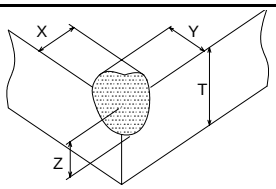
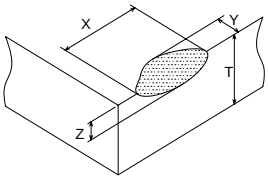
13.4. STANDARD OF VISUAL INSPECTION

<table>
<tr><th>NO.</th><th>CLASS</th><th>ITEM</th><th>JUDGEMENT</th></tr>
<tr><td>13.4.1</td><td>MINOR</td><td>BLACK AND WHITE SPOT
FOREIGN MATERIEL
DUST IN THE CELL
BLEMISH
SCRATCH</td><td>(A) ROUND TYPE: unit : mm.
<table>
<tr><th>DIAMETER (mm.)</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦ 0.1</td><td>DISREGARD</td></tr>
<tr><td>0.1 < Φ ≦ 0.25</td><td>3 (D>5mm)</td></tr>
<tr><td>0.25 < Φ</td><td>0</td></tr>
</table>
NOTE: Φ=(LENGTH+WIDTH)/2
(B) LINEAR TYPE: unit : mm.
<table>
<tr><th>LENGTH</th><th>WIDTH</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>------</td><td>W ≦0.03</td><td>DISREGARD</td></tr>
<tr><td>L ≦ 5.0</td><td>0.03 < W ≦0.07</td><td>3 (D>5mm)</td></tr>
<tr><td>------</td><td>0.07 < W</td><td>FOLLOW ROUND TYPE</td></tr>
</table></td></tr>
<tr><td>13.4.2</td><td>MINOR</td><td>BUBBLE IN POLARIZER
DENT ON POLARIZER</td><td>unit : mm.
<table>
<tr><th>DIAMETER</th><th>ACCEPTABLE Q'TY</th></tr>
<tr><td>Φ ≦0.2</td><td>DISREGARD</td></tr>
<tr><td>0.2 < Φ ≦ 0.5</td><td>2 (D>5mm)</td></tr>
<tr><td>0.5 < Φ</td><td>0</td></tr>
</table></td></tr>
<tr><td>13.4.3</td><td>MINOR</td><td>Dot Defect</td><td>
<table>
<tr><th>Items</th><th>ACC. Q'TY</th></tr>
<tr><td>Bright dot</td><td>N≦ 4 (D>5mm)</td></tr>
<tr><td>Dark dot</td><td>N≦ 4 (D>5mm)</td></tr>
</table>
Pixel Define
 

Not 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
Not 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.
Not 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern.</td></tr>
</table>

NO.	CLASS	ITEM	JUDGEMENT
13.4.4	MINOR	LCD GLASS CHIPPING	 Y > S Reject
13.4.5	MINOR	LCD GLASS CHIPPING	 X or Y > S Reject
13.4.6	MAJOR	LCD GLASS GLASS CRACK	 Y > (1/2) T Reject
13.4.7	MAJOR	LCD GLASS SCRIBE DEFECT	 1. a> L/3 , A>1.5mm. Reject 2. B : ACCORDING TO DIMENSION
13.4.8	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL AREA)	 Φ= (x+y)/2 > 2.5 mm Reject
13.4.9	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL SURFACE)	 Y > (1/3) T Reject
13.4.10	MINOR	LCD GLASS CHIPPING	 Y > T Reject

13.5 INSPECTION STANDARD OF TOUCH PANEL (Contains the CTP)

NO.	CLASS	ITEMS		JUDGEMENT	
13.5.1	MAJOR	Touch Panel Crack			Reject
13.5.2	MINOR	Touch Panel Chipping	Corner		X≦2mm, Y≦2mm, Z＜1/2T Accept
			Edge		X≦3mm, Y≦3mm, Z＜1/2T Accept
13.5.3	MINOR	Scratch Dust and Foreign materiel (Linear Type)		W≦0.05, L≦5.0mm	Accept
				0.05mm<W≦0.07mm；L≦5.0mm Distance between seratch＞5.0mm	Accept 3 ea Max.
				W>0.07mm	Reject
13.5.4	MINOR	Scratch Dust and Foreign materiel (Round Type：Φ=(Length+Width)/2)		Φ≦0.25mm	Accept
				0.25mm＜Φ≦0.35mm Distance between spots＞5.0mm	Accept 5 ea Max.
				Φ＞0.35mm	Reject
13.5.5	MINOR	Touch Panel Dent / Fish Eyes		Φ≦0.35mm	Accept
				0.35mm＜Φ≦1.0mm Distance ＞5.0mm	Accept 3 ea Max.
				Φ＞1.0mm	Reject
13.5.6	MINOR	Touch Panel Air Bubble		Φ≦0.2mm	Accept
				0.2mm＜Φ≦0.5mm Distance between bubbles＞5.0mm	Accept 3 ea Max.
				Φ＞0.5mm	Reject
13.5.7	MINOR	Touch Panel Printing area Scratch		0.03mm＜W≦0.05mm, L≦5mm Distance between scratch＞5.0mm	Accept 3 ea Max.
				W＞0.05mm or L＞5mm (W>0.05 Follow 8.5.4 Round type)	Reject
13.5.8	MINOR	Touch Panel White Haze Mark / Dust		Can not be removed	Reject