

SPECIFICATION FOR TFT LCD MODULE

MODEL NO:	BD047NDB01
CUSTOMER:	
CUSTOMER P/N.	
VERSION	V1.0
CUSTOMER APPROVED	

- Preliminary Specification
- Final Specification

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT

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CONTENTS

	Page
1.NOTICE	1
2.General Specifications	5
3. Outline Drawing	6
4. Circuit Block Diagram	6
5. Absolute Maximum Ratings(Ta=25°C)	8
6. Electrical Specifications and Instruction Code.....	9
7. Optical Characteristics	15
8.Initial Code Setting.....	19
9. Reliability Test Items and Criteria	20
10 Quality level	22
11. Package Method.....	27

1.NOTICE

1.1 announce

1.1.1 These specification sheets are the proprietary product of Tianma and include materials protected under copyright of Tianma. Do not reproduce or cause any third party to reproduce them in any form or by any means, electronic or mechanical, for any purpose, in whole or in part, without the express written permission of Tianma. Tianma assumes no responsibility for any problems related to any industrial property right of a third party resulting from the use of the device.

1.1.2 Do not use the device for equipment that requires an extreme level of reliability, such as aerospace applications, nuclear power control equipment and medical or other equipment for life support. Tianma assumes no responsibility for any damage resulting from the use of the device which does not comply with the instructions and the precautions specified in these specification sheets.

1.1.3 Contact and consult with a Tianma sales representative for any questions about this device.

1.2 For handling and system design

1.2.1 Do not scratch the surface of the polarizer film as it is easily damaged.

1.2.2 If the cleaning of the surface of the LCD panel is necessary, wipe it swiftly with cotton or other soft cloth. Do not use organic solvent as it damages polarizer.

1.2.3 Water droplets on polarizer must be wiped off immediately as they may cause color changes, or other defects if remained for a long time.

1.2.4 Since this LCD panel is made of glass, dropping the module or banging it against hard objects may cause cracks or fragmentation.

1.2.5 Certain materials such as epoxy resin (amine's hardener) or silicone adhesive agent (de-alcohol or de-oxym) emits gas to which polarizer reacts (color change). Check carefully that gas from materials used in system housing or packing do not harm polarizer.

1.2.6 Liquid crystal material will freeze below specified storage temperature range and it will not get back to normal quality even after temperature comes back within specified temperature range. Liquid crystal material will become isotropic above specified temperature range and may not get back to normal quality. Keep the LCD module always within specified temperature range.

1.2.7 Do not expose LCD module to the direct sunlight, or to strong ultraviolet light for long time. If the LCD driver IC is exposed to light, normal operation may be impeded. It is necessary to design so that the light is shut off when the LCD module is mounted.

1.2 Do not disassemble the LCD module as it may cause permanent damage. Hold LCD very carefully when placing LCD module into the system housing. Do not apply excessive stress or pressure to LCD module.

1.2.9 As this LCD module contains components sensitive to electrostatic discharge, be sure to follow the instructions in below.

① Operators

Operators must wear anti-static wears to prevent electrostatic charge up to and discharge

from human body.

②Equipment and containers

Process equipment such as conveyer, soldering iron, working bench and containers may possibly generate electrostatic charge up and discharge. Equipment must be grounded through 100Mohms resistance. Use ion blower.

③Floor

Floor is an important part to leak static electricity which is generated from human body or equipment. There is a possibility that the static electricity is charged to them without leakage. In case of insulating floor, so the countermeasure (electrostatic earth: $1 \times 10^8 \Omega$) should be made.

④Humidity

Proper humidity of working room may reduce the risk of electrostatic charge up and discharge. Humidity should be kept over 50% all the time.

⑤Transportation/storage

Storage materials must be anti-static to prevent causing electrostatic discharge.

⑥Others

Protective film is attached on the surface of LCD panel to prevent scratches or other damage. When removing this protective film, remove it slowly under proper anti-ESD control such as ion blower.

1.2.10 Do not hold or touch LCD panel to flex interconnection area as it may be damaged. As the binding material between LCD panel and flex connector mentioned in flex area contains an organic material, any type of organic solvents are not allowed to be used. Direct contact by fingers are also prohibited.

1.2.11 When carrying the LCD module, place it on the tray to protect from mechanical damage.

It is recommended to use the conductive trays to protect the CMOS components from electrostatic discharge. When holding the module, hold the Plastic Frame of LCD module so that the panel, TCP and other electric parts are not damaged. e.g. chart1

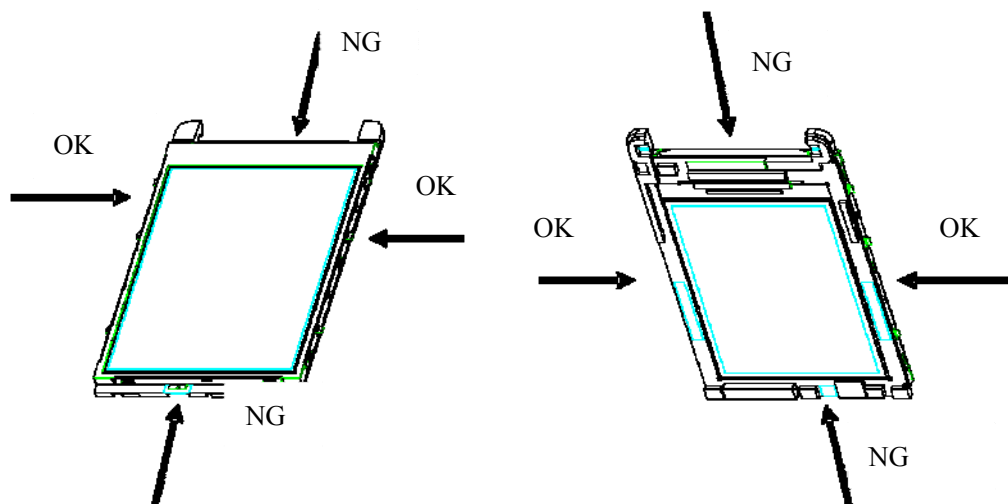


chart1 Note : The LCD module illustration is general module image

1.2.12 Do not touch the FPC 's exposed base film and patterning area, slit part. Otherwise the circuit maybe damaged. Do not touch LSI chips as it may cause a trouble in the inner lead connection.

1.2.13 Place a protective cover on the LCD module to protect the glass panel from mechanical damages.

1.2.14 LCD panel is susceptible to mechanical stress and even the slightest stress will cause a color change

in background. So make sure the LCD panel is placed on flat plane without any continuous twisting, bending or pushing stress.

1.2.15 Protective film is placed onto the surface of LCD panel when it is shipped from factory. Make sure to peel it off before assembling the LCD module into the system. Be very careful not to damage LCD module by electrostatic discharge when peeling off this protective film. Ion blower and ground strap are recommended.

1.2.16 Make sure the mechanical design of the system in which the LCD module will be assembled matches specified viewing angle of this LCD module.

1.3 For operating LCD module

1.3.1 Do not operate or store the LCD module under outside of specified environmental conditions.

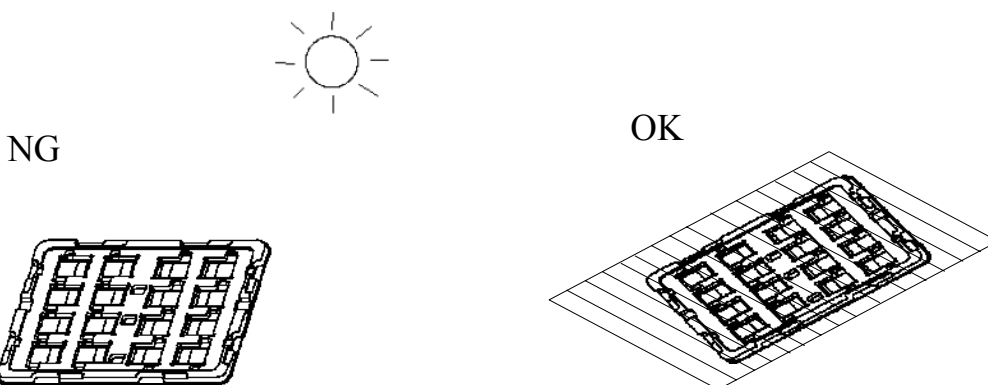
1.3.2 As opto-electrical characteristics of LCD will be changed, dependent on the temperature, the confirmation of display quality and characteristics has to be done after temperature is set at 25 °C and it becomes stable.

1.4 Precautions for Storage

1.4.1 Do not expose the LCD module to direct sunlight or strong ultraviolet light for long periods. Store in a dark place.

1.4.2 The liquid crystal material will solidify if stored below the rated storage temperature and will become an isotropic liquid if stored above the rated storage temperature, and may not retain its original properties. Only store the module at normal temperature and humidity (25±5°C · 60±10% R H) in order to avoid exposing the front polarizer to chronic humidity.

1.4.3 Keeping method



a. Don't keeping under the direct sunlight.

b. Keeping in the tray under the dark place

1.5 Other Notice

1.5.1 Generally, At power on, in order not to apply DC charge directly to LCD panel, supply

logic voltage first and initialize LSI logic function including polarity alternation. Then supply voltage for LCD bias. At power off, in order not to apply DC charge directly to LCD panel, execute Power OFF sequence and Discharge command.

1.5.2 Don't touch to PWB surface, exposed IC chip, electric parts and other parts, to any electric, metallic materials.

1.5.3 No bromide specific fire-retardant material is used in this module.

1.5.4 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.

2.General Specifications

BD047BDZ01 is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver IC, FPC and a back light unit. The 4.7" display area contains 480 x 272 pixels and can display up to 262K colors. This product accords with RoHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	TFT	-	
Display Color	65K/262K		1
Viewing Direction	12:00	O'Clock	
Active Area(W×H)	103.68×58.75	mm	
Number of Dots	480(RGB)×272	-	
Controller	HX8257-A	-	
V _{DD}	3.3	V	
Outline Dimensions	Refer to outline drawing on next page		
Backlight	10-LEDs(white)	-	
Weight	-	g	
Interface	RGB 24 bits	-	
Polarizer Mode	Transmissive/Positive	-	

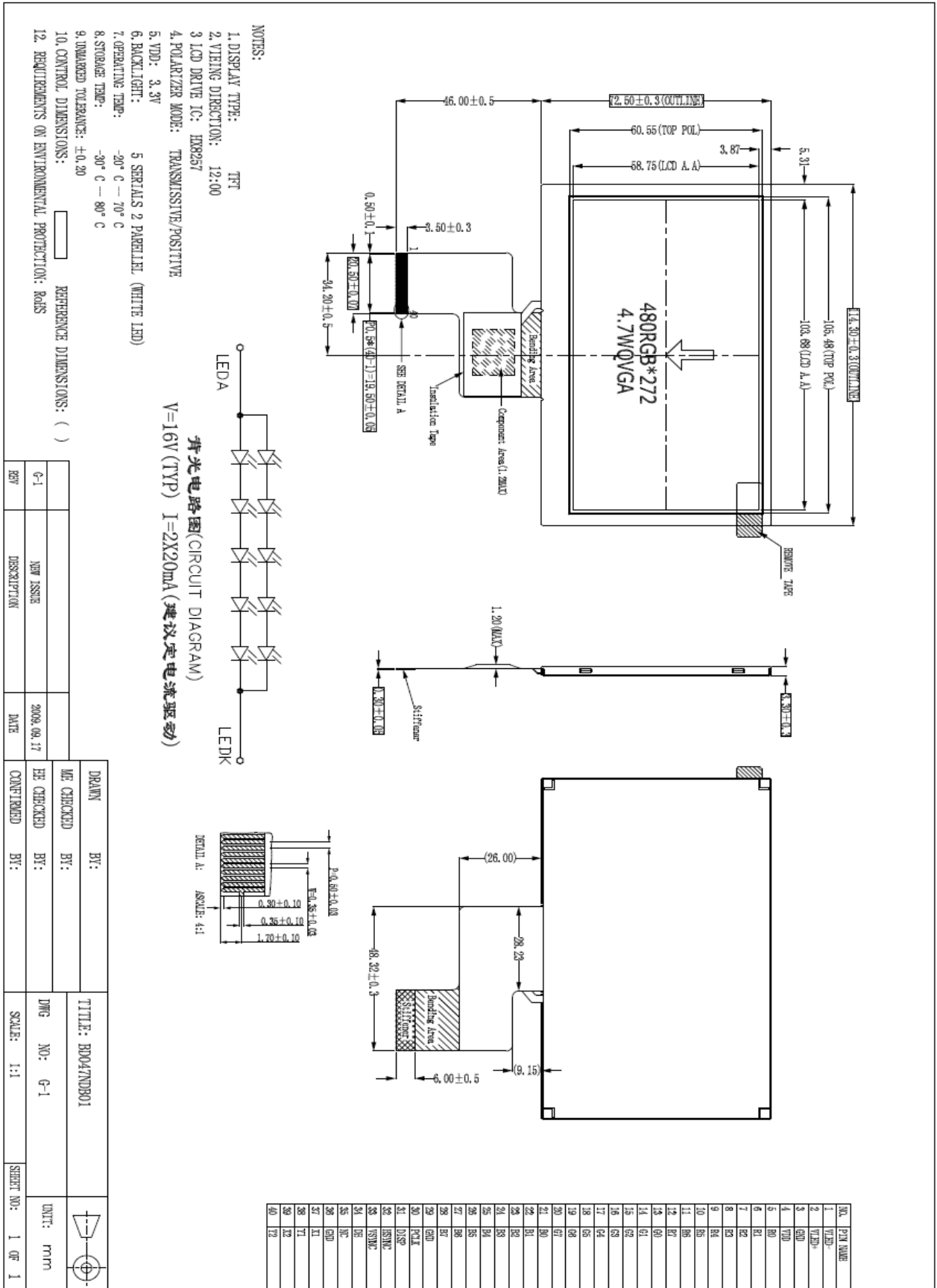
Note 1: Color tune is slightly changed by temperature and driving voltage.

Note 2: Requirements on Environmental Protection:RoHS

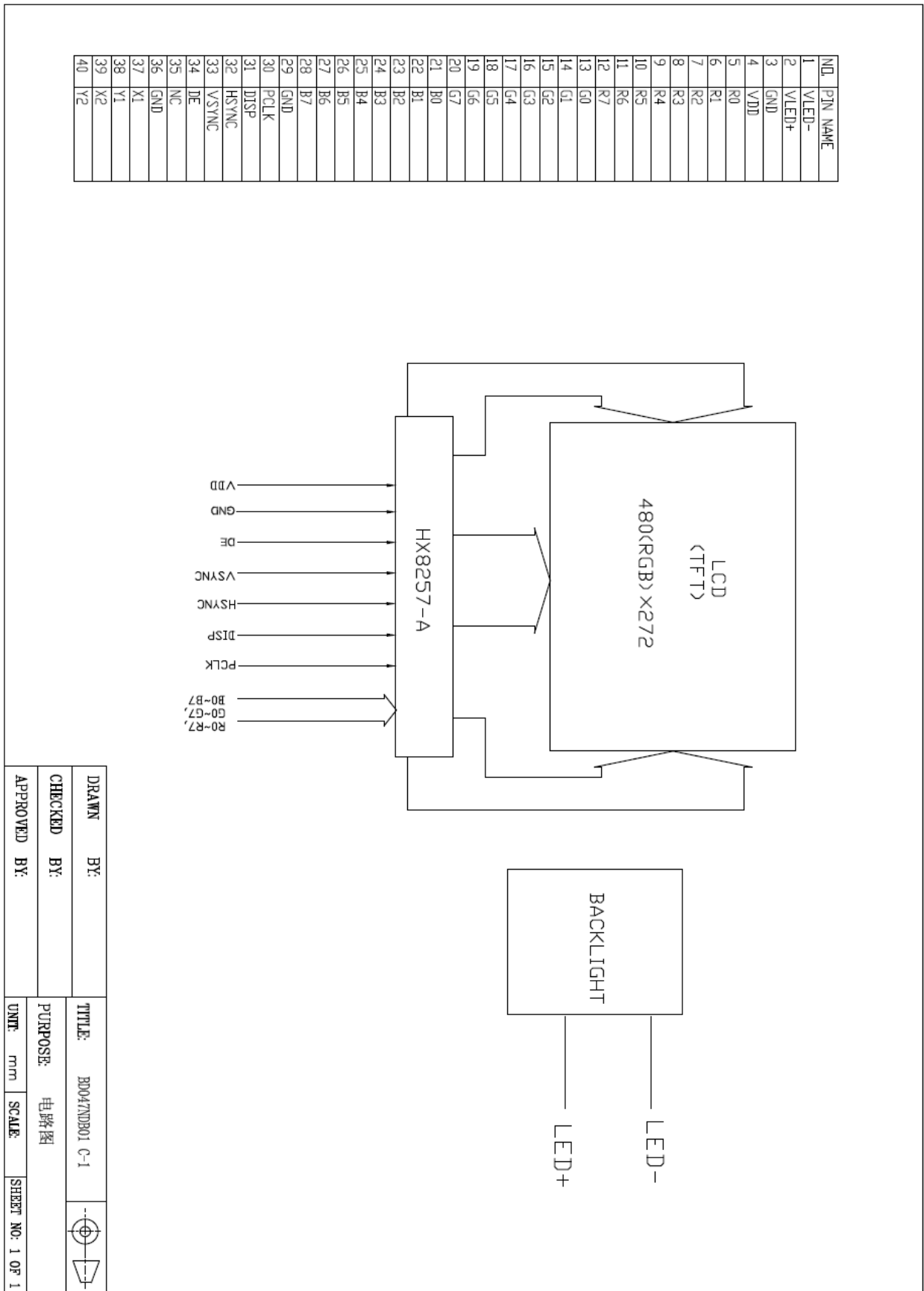
Note 3: Customer should do assembly according to our FPC bending sketch in the outline drawing.

Note 4: Please approve our spec before placing mass production order. Otherwise we will regard customer has approved the spec when we receive the first 2Kpcs or above order from customer.

3. Outline Drawing



4. Circuit Block Diagram



5. Absolute Maximum Ratings(Ta=25°C)

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V _{DD}	-0.3	5.0	V	1 , 2,3
Logic Signal Input /Output Voltage	V _{I/OVCC}	-0.3	4.0	V	
Operating Temperature	Top	-20	+70	°C	
Storage Temperature	Tst	-30	+80	°C	

Notes:

1. In case of below 0°C , the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of LC 's characteristics.
2. If the module is 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.
3. V_{DD} >V_{SS} must be maintained.

6. Electrical Specifications and Instruction Code

6.1 Electrical characteristics($V_{SS}=0V$, $T_a=25^{\circ}C$)

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Input voltage	'H'	V_{IH}	-	$0.8V_{DDIO}$	-	V_{DDIO}	V	
	'L'	V_{IL}	-	0	-	$0.2V_{DDIO}$	V	
Output Voltage	'H'	V_{OH}	$I_{out}=-100\mu A$	$0.9V_{DDIO}$	-	V_{DDIO}	V	
	'L'	V_{OL}	$I_{out}=100\mu A$	0	-	$0.1V_{DDIO}$	V	
Current Consumption		I_{CC1}	Normal mode	-	-	-	mA	1,3
		I_{CC2}	Standby mode	-	-	-	mA	2

Note:

1: Display full white. Backlight on state.

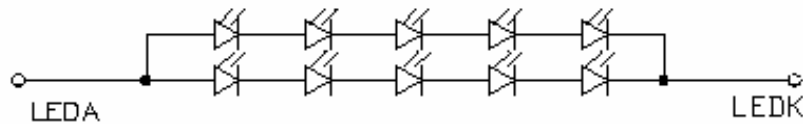
2: IC on standby mode.

3: the default voltage is 3.2V, for N lights in series, the power is that the current multiply N.

6.2 LED backlight specification(VDD=2.8V,Vss=0V ,Ta=25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply voltage	V _f	I _f =2*20mA	15	16	17	V	1
Reverse voltage	V _r	-	-	-	-	V	
Forward current	Normal	I _{pn}	10-chip Serial/ Parallel	2*20		mA	2
	Dimming	I _{pd}					
Reverse Current	I _r	-	-	-	-	μA	
Uniformity	ΔBp	I _f =40mA	80%				
Color coordinate*	X		0.265	-	0.315	-	
	Y		0.265	-	0.315	-	

White LED CIRCUIT DIAGRAM:



背光电路图(CIRCUIT DIAGRAM)

NOTE:

- 1 The LED 's driver mode needs to be constant **current** mode.
- 2 Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded .Functional operation should be restricted to the conditions described under normal operating conditions.

6.3 Interface Signals

No	Symbol	I/O	Description	Remark
1	VLED-	P	Power for LED	
2	VLED+	P	Power for LED	
3	GND	P	Power Ground	
4	VDD	P	Power Supply (+3.3V)	
5	R0	I	Red data	
6	R1	I	Red data	
7	R2	I	Red data	
8	R3	I	Red data	
9	R4	I	Red data	
10	R5	I	Red data	
11	R6	I	Red data	
12	R7	I	Red data	
13	G0	I	Green data	
14	G1	I	Green data	
15	G2	I	Green data	
16	G3	I	Green data	
17	G4	I	Green data	
18	G5	I	Green data	
19	G6	I	Green data	
20	G7	I	Green data	
21	B0	I	Blue data	
22	B1	I	Blue data	
23	B2	I	Blue data	
24	B3	I	Blue data	
25	B4	I	Blue data	
26	B5	I	Blue data	
27	B6	I	Blue data	
28	B7	I	Blue data	
29	GND	P	Power Ground	
30	PCLK	I	Pixel clock	
31	DISP	I	Display on/off	
32	HSYNC	I	Horizontal sync signal	
33	VSNC	I	Vertical sync signal	
34	DE	I	Date enable	
35	NC	-	No connection	
36	GND	P	Power Ground	
37	X1	P	Touch Panel X(Right Side)	
38	Y1	P	Touch Panel Y(6 Clock Side)	
39	X2	P	Touch Panel X(Left Side)	
40	Y2	P	Touch Panel Y(12 Clock Side)	

Note2-1: I/O definition:

I----Input O---Output P----Power/Ground

6.4 Interface Timing Chart

Note: Please refer to HIMAX's [HX8257-A](#) data sheet for more details.

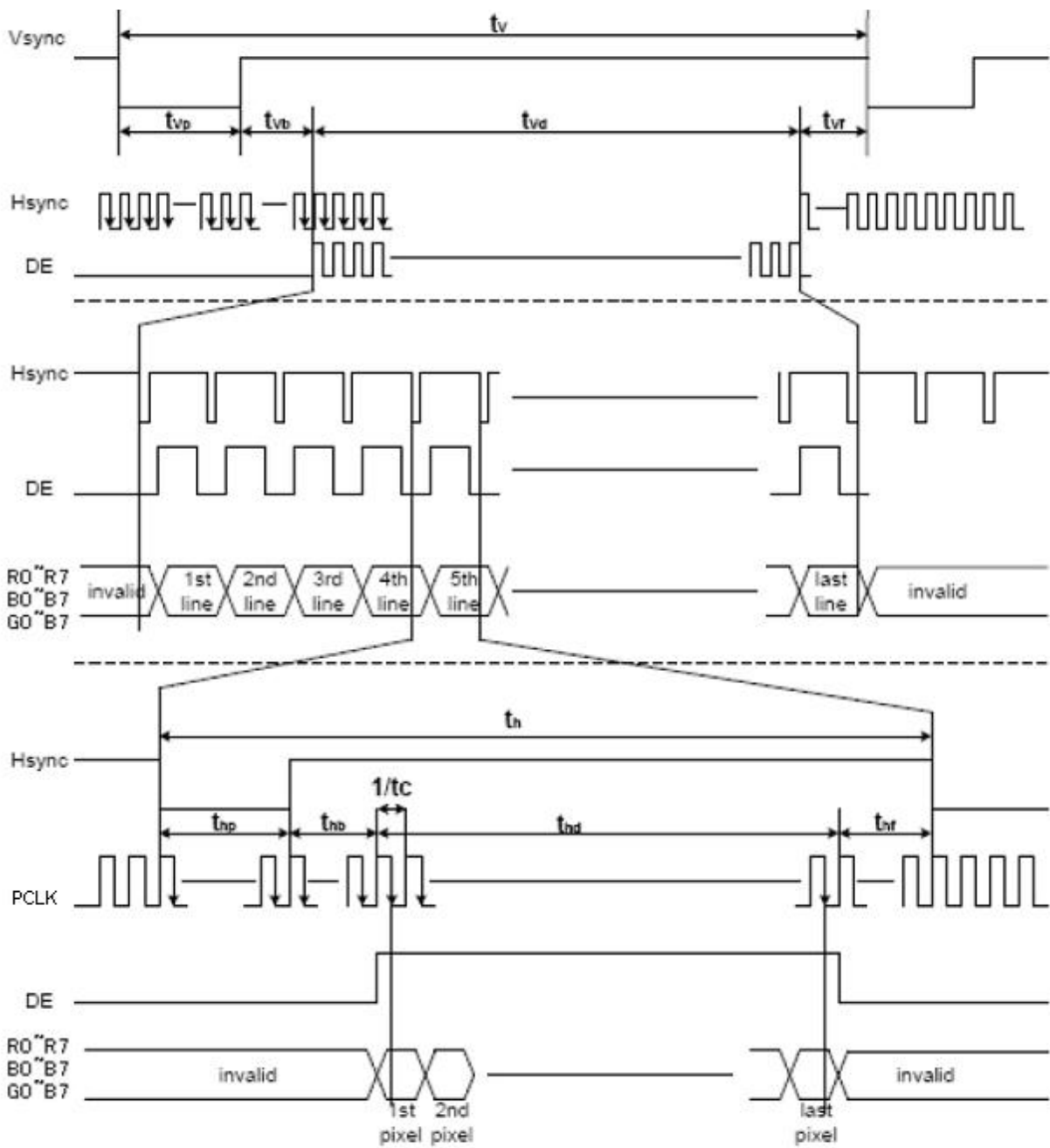
[HX8257-A](#) INTERFACE PROTOCOL Inter 80 system CPU interface

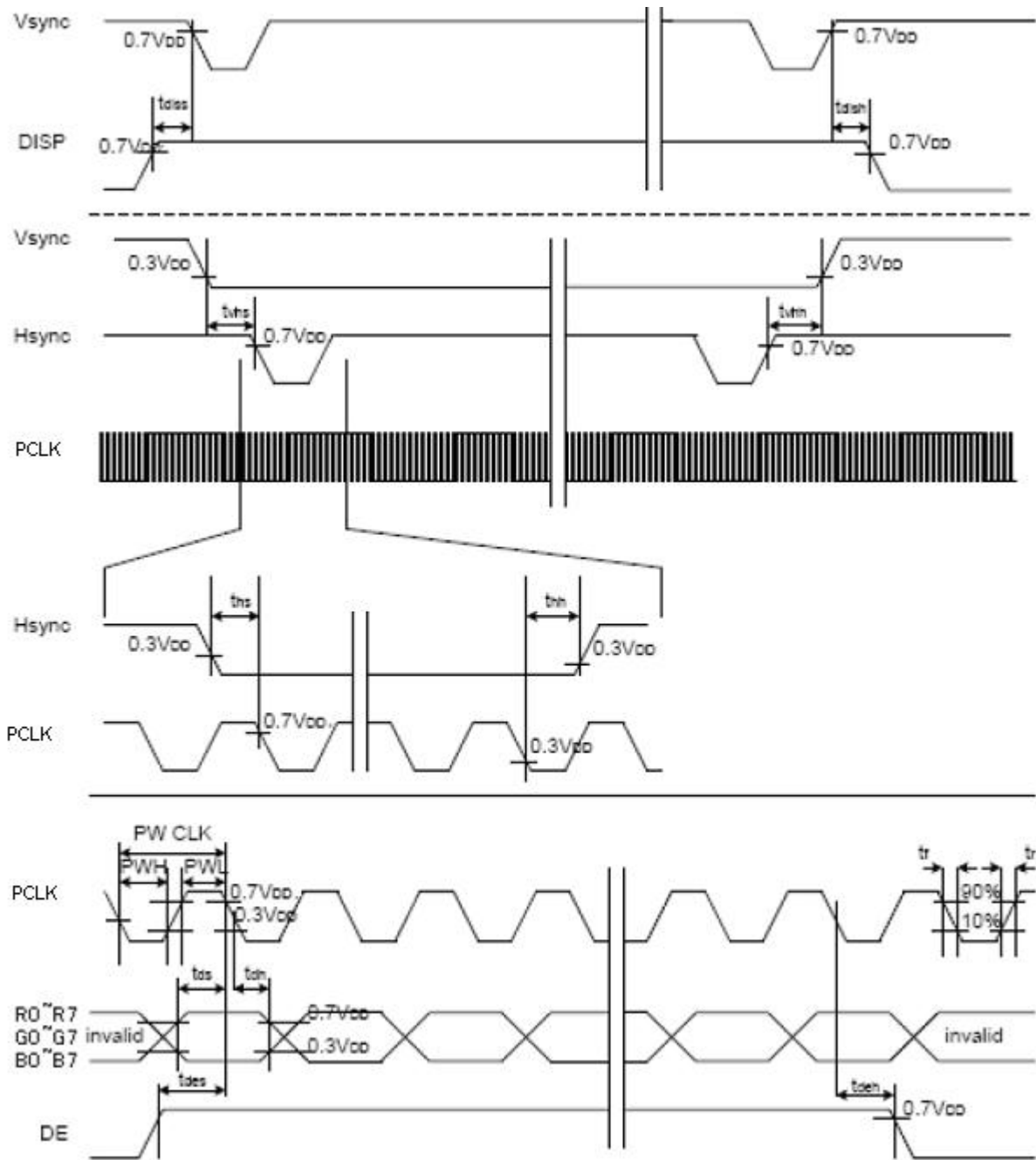
Item	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Clock cycle	1/tc	-	9.00	15	MHz	
Hsync cycle	1/fH	-	17.14	-	KHz	
Vsync cycle	1/fV	-	59.94	-	Hz	
Horizontal signal	Th	525	525	605	CLK	
Horizontal display period	Thd	480	480	480-	CLK	
Horizontal Front porch	Thf	2	2	82	CLK	
Horizontal Pulse width	Thp	2	41	41	CLK	
Horizontal Back porch	Thb	2	2	41	CLK	
Vertical cycle	Tv	285-	286	511	H	
Vertical display period	Tvd	272	272	272	H	
Vertical Front porch	Tvf	1	2	227	H	
Vertical Pulse width	Tvp	1	10	11	H	
Vertical Back porch	Tvb	1	2	11	H	
DISP Setup Time	Tdiss	10	-	-	ns	
DISP Hold Time	Tdish	10	-	-	ns	
Clock Period	PW CLK	66.7	-	-	ns	
Clock Pulse High Period	PWH	26.7	-	-	ns	
Clock Pulse Low Period	PWL	26.7	-	-	ns	
Hsync Setup Time	Ths	10	-	-	ns	
Hsync Hold Time	Thh	10	-	-	ns	
Data Setup Time	Tds	10	-	-	ns	
Data Hold Time	Tdh	10	-	-	ns	
DE Setup Time	Tdes	10	-	-	ns	
DE Hold Time	Tdeh	10	-	-	ns	
Vsync Setup Time	Tvhs	10	-	-	ns	
Vsync Hold Time	Tvhh	10	-	-	ns	

Note 1: Thd=480CLK, Thf= 2CLK, Thp= 41CLK, Thb= 2CLK

$$525\text{CLK}=480\text{CLK} + 2\text{CLK} + 41\text{CLK} + 2\text{CLK}$$

Note 2: Thf+ Thp+ Thb > 44 CLK





7. Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp	$\theta=0^\circ$	-	250	-	Cd/m ²	1
Uniformity	ΔBp	$\Phi=0^\circ$	80%	-	-		1,2
Viewing Angle	θ_1 ($\Phi=90^\circ$ or 270°)	Cr \geq 10	-60~+50			Deg	3
	θ_2 ($\Phi=0^\circ$ or 180 $^\circ$)						
Contrast Ratio	Cr	$\theta=0^\circ$ $\Phi=0^\circ$		500		-	4
Response Time	T _r		-	-	-	Ms	5
	T _f	-	-	-	Ms		
Color of CIE Coordinate	W	x	0.2554	0.3054	0.3554	-	1,6
		y	0.2771	0.3271	0.3771	-	
	R	x	0.5431	0.5931	0.6431	-	
		y	0.3032	0.3532	0.4032	-	
	G	x	0.2842	0.3342	0.3842	-	
		y	0.5144	0.5644	0.6144	-	
	B	x	0.0960	0.1469	0.1960	-	
		y	0.0372	0.0872	0.1372	-	
NTSC Ratio	S	50%	-				

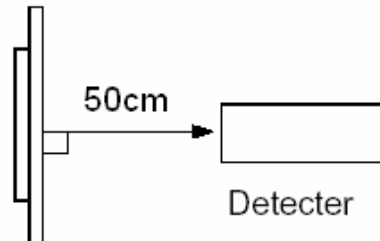
Note : The parameter is slightly changed by temperature, driving voltage and materiel.

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white.
 The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25°C.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

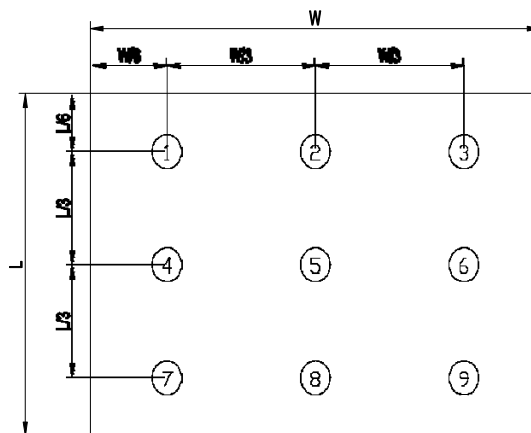


Note 2: The luminance uniformity is calculated by using following formula.

$$\Delta Bp = Bp (\text{Min.}) / Bp (\text{Max.}) \times 100 (\%)$$

Bp (Max.) = Maximum brightness in 9 measured spots

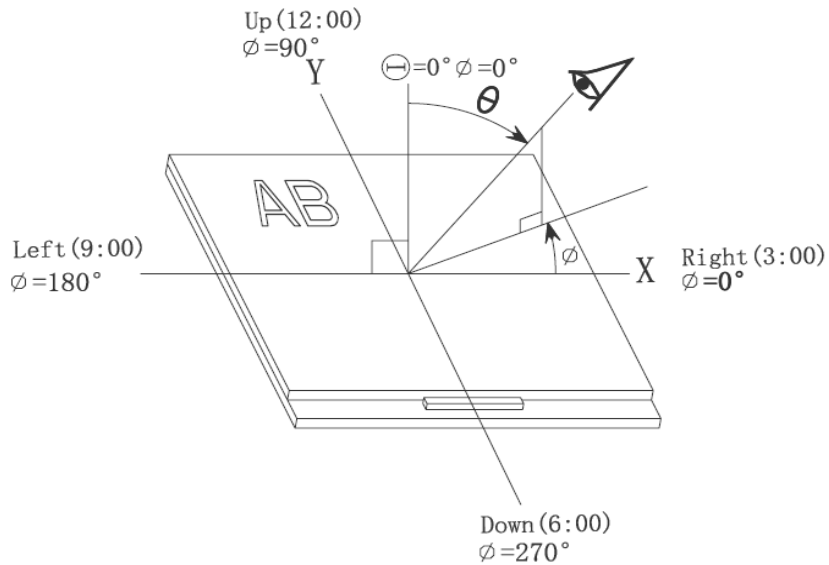
Bp (Min.) = Minimum brightness in 9 measured spots.



Measurement equipment PR-705 (Φ8mm)

Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and ϕ



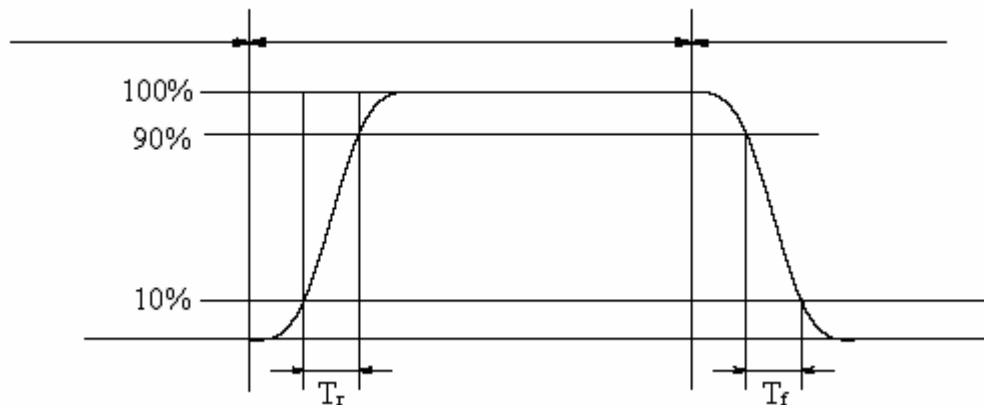
Note 4: The definition of contrast ratio (Test LCM using PR-705):

$$\text{Contrast Ratio(CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

(Contrast Ratio is measured in optimum common electrode voltage)

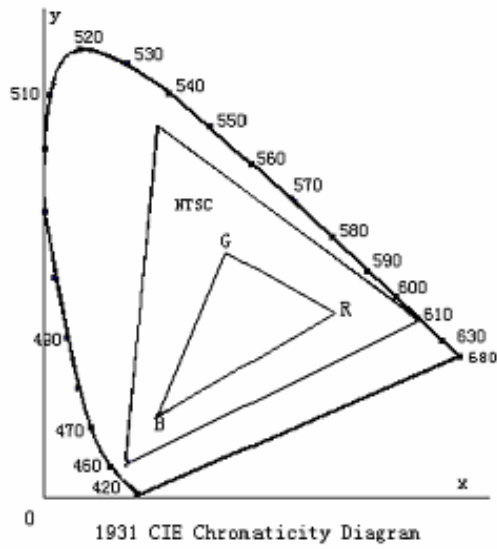
Note 5: Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.



The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.



Color gamut:

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

8.Initial Code Setting

TBD

9. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80°C±2°C 96H Restore 2H at 25°C Power off	The test result shall be evaluated after the sample has been left at room temperature and humidity for 2 hours without load. No condensation shall be accepted. The sample shall be free from defects: 1.Air bubble in the LCD; 2.Sealleak; 3.Non-display; 4.missing segments; 5.Glass crack;
2	Low Temperature Storage	-30°C±2°C 96H Restore 2H at 25°C Power off	
3	High Temperature Operation	70°C±2°C 96H Restore 2H at 25°C Power on	
4	Low Temperature Operation	-20°C±2°C 96H Restore 4H at 25°C Power on	
5	High Temperature & Humidity Operation	60°C±2°C 90%RH 96H Power on	
6	Temperature Cycle	-30°C→25°C→80°C 30min 5 min 30min after 10cycle, Restore 2H at 25°C	
7	Vibration Test	10Hz~150Hz, 100m/s ² , 120min	
8	Shock Test	Half-sine wave,300m/s	
9	Drop Test(package state)	800mm, concrete floor,1corner,	
10	ESD Sensitivity test	Contact ±4KV , 150PF/330 , 20times Air ±8KV,150PF/330 , 20times	

NOTE:

- 1.The test samples should be applied to only one test item.
- 2.Sample size for each test item is 5~10pcs.
- 3.For Damp Proof Test, Pure water(Resistance>10MΩ) should be used.
- 4.In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part. Using ionizer(an antistatic blower) is recommended at working area in order to reduce electro-static voltage. When removing protection film from LCM panel, peel off the tag slowly(recommended more than one second) while blowing with ionizer toward the peeling face to minimize ESD which may

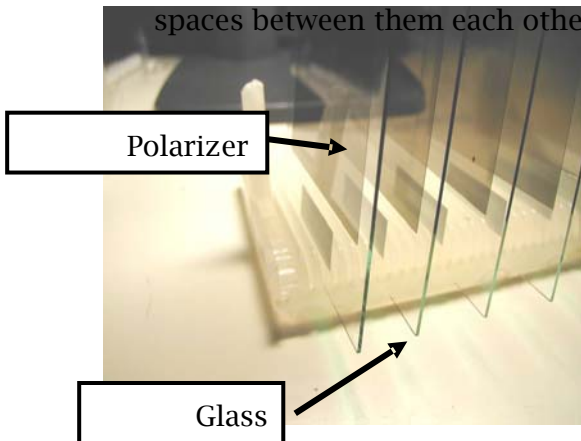
damage electrical circuit.

5. EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.

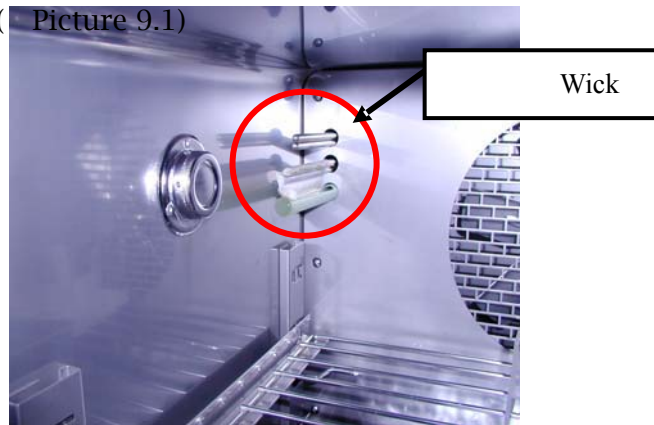
6. Polarizer test criteria

a. when testing avoid samples take out then return, It can cause water coagulation in Polarizer. Increase the distance of samples , And put samples before the wind.

b. When the samples are put into the test, put them upright so that the glasses keep spaces between them each other. (Picture 9.1)



Picture 9.1



Picture 9.2

c. Put samples into testing machine as small as possible so that it is drafty.

d. Do not put samples under wick because water will fall.(Picture 9.2)

e. Do not open testing machine except for taking them out in order to prevent moisture condensation.

7.Please use automatic switch menu(or roll menu) testing mode when test operating mode

8.The inspection terms after reliability test, as below

ITEM	Inspection standard
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0.05

10 Quality level

10.1 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.

10.2 Definition of inspection range

<p>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): 0mm X2(A.A~V.A): 0mm Y1(A.A~V.A): 0mm Y2(A.A~V.A): 0mm</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Figure 1</p> </div> <div style="text-align: center;"> <p>Figure 2</p> </div> </div>
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10.3 Inspection items and general notes

General notes	<p>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 °C Inspection angle : 45 degrees in 12 o'clock direction (all defects in viewing area should be inspected from this direction)</p>	
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

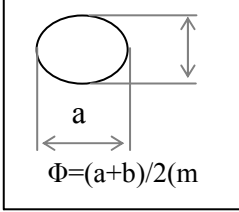
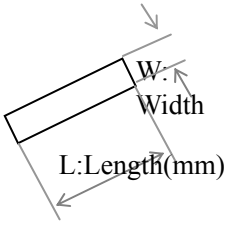
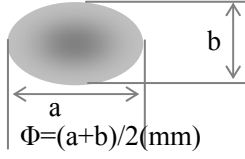
	Functional defect	No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction
	Glass defect	Glass crack, Shaved corner of glass, Surplus glass
	PCB defect	Components assembly defect

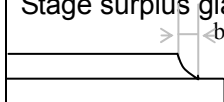
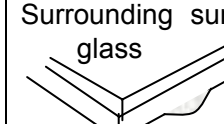
10.4 Outgoing Inspection level

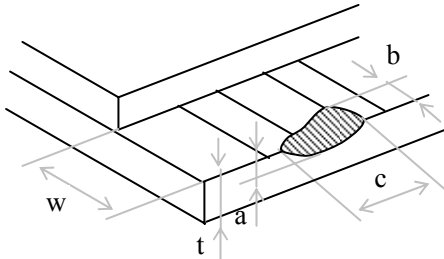
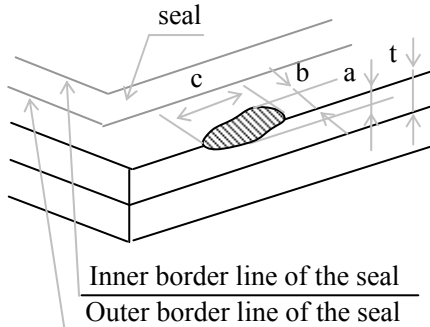
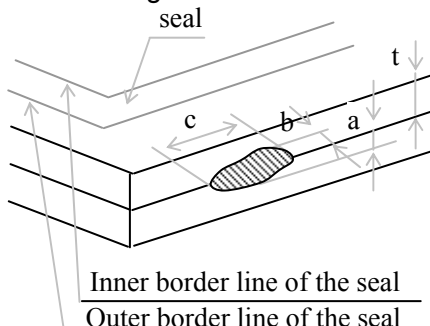
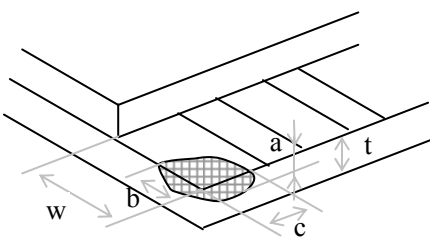
Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 8.3 general notes	See 8.5			II	0.65
Minor Defects	See 8.3 general notes	See 8.5			II	1.5

Note: Sampling standard conforms to GB2828

10.5 Inspection Items and Criteria

Inspection items			Judgment standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Bright Spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass	 <p>$\Phi=(a+b)/2(m)$</p>	A	$\Phi \leq 0.10$	Neglected	
			B	$0.10 < \Phi \leq 0.15$	2	
			C	$0.15 < \Phi \leq 0.20$	1	
			D	$0.20 < \Phi$	0	
			Total defective point(B,C)		3	
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass	 <p>L:Length(mm)</p>	A	$W \leq 0.01$	Neglected	
			B	$0.01 < W \leq 0.03$ $L \leq 3.0$	2	
			C	$0.03 < W \leq 0.05$ $L \leq 3.0$	1	
			D	$0.05 < W$	0	
			Total defective point(B,C)		3	
3	Contrast variation	 <p>$\Phi=(a+b)/2(mm)$</p>	A	$\Phi \leq 0.2$	Neglected	
			B	$0.2 < \Phi \leq 0.3$	2	
			C	$0.3 < \Phi \leq 0.4$	1	
			D	$0.4 < \Phi$	0	
			Total defective point(B,C)		3	

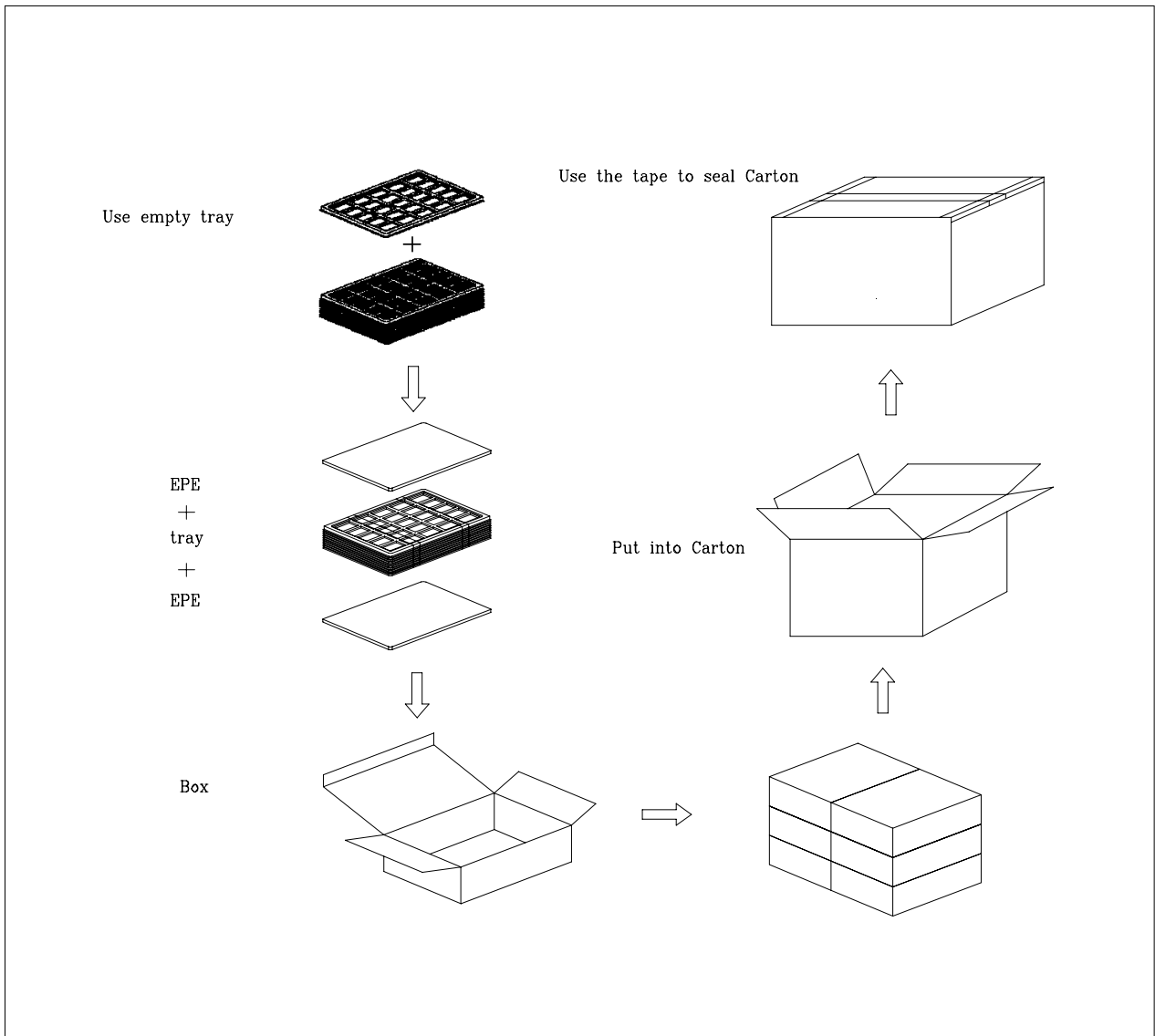
4	Dot defect (if TFT LCD is used)	TFT LCD is smaller than 3 inches	LCD Class	Defect	A area		B area
		TFT LCD between 3~10.4 inches	B	Bright dot	2		Neglected
				Dark dot	3		
				Total	4		
		LCD Class	Defect	A area	B area	C area	
B	Bright dot	2	2	Neglected			
	Dark dot	2	3				
	Total	6					
Notes: Bright dot: in R、G、B or dark display figure, the pixel appears bright. Dark dot: in R、G、B or white display figure, the pixel appears dark. Defect area must be less than an half size of the dot.							
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	$\Phi \leq 0.3$	Neglected		Neglected
			B	$0.3 < \Phi \leq 0.7$	2		
			C	$0.7 < \Phi$	0		
7	Surplus glass	Stage surplus glass 	$b \leq 0.3\text{mm}$				
		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		Acceptable number		
		Category(application: B zone)				
15	Glass defect crack	①The front of lead terminals	A	$a \leq t, b \leq 1/5W, c \leq 3\text{mm}$	Max.3 defects allowed	
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark		
			②Surrounding crack—non-contact side			
			③ Surrounding crack— contact side			
		④Corner	A	$a \leq t, b \leq 3.0, c \leq 3.0$		
			B	Glass crack should not cover patterns u and alignment mark and patterns.		

Inspection items		Judgment standard	
		Category(application: B zone)	
16	PCB defect	<p>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)</p>	<p>Component</p> <p>Soldering pad Lead Component</p> <p>$L \leq W/2$</p> <p>$L1 > 0$</p> <p>$L2 > 0$</p>
		<p>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</p>	
		<p>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</p>	<p>head Base Board</p> <p>Soldering tin is not permit in this area</p> <p>Soldering tin is not permit in this area</p> <p>socket Base Board</p>
		<p>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.</p>	<p>Glue Lead</p> <p>PCB Insulative coat</p>

11. Package Method

模块出货包装示意图：



注：卡通箱堆叠高度需小于 1.5m