ORIENT DISPLAY

Your Total LCD Solution Provider

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SPECIFICATION
FOR
LCD MODULE

MODULE NO: AFE800480I-10.2N-9271A-T
REVISION NO: A01

Customer's Approval:

	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)		
CHECKED BY		
APPROVED BY		

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DOCUMENT REVISION HISTORY

Sample Version	Doc. Version	DATE	DESCRIPTION	CHECKED BY
01	A	2012-01-12	First Release.	

CONTENTS

1. GENERAL DESCRIPTION:

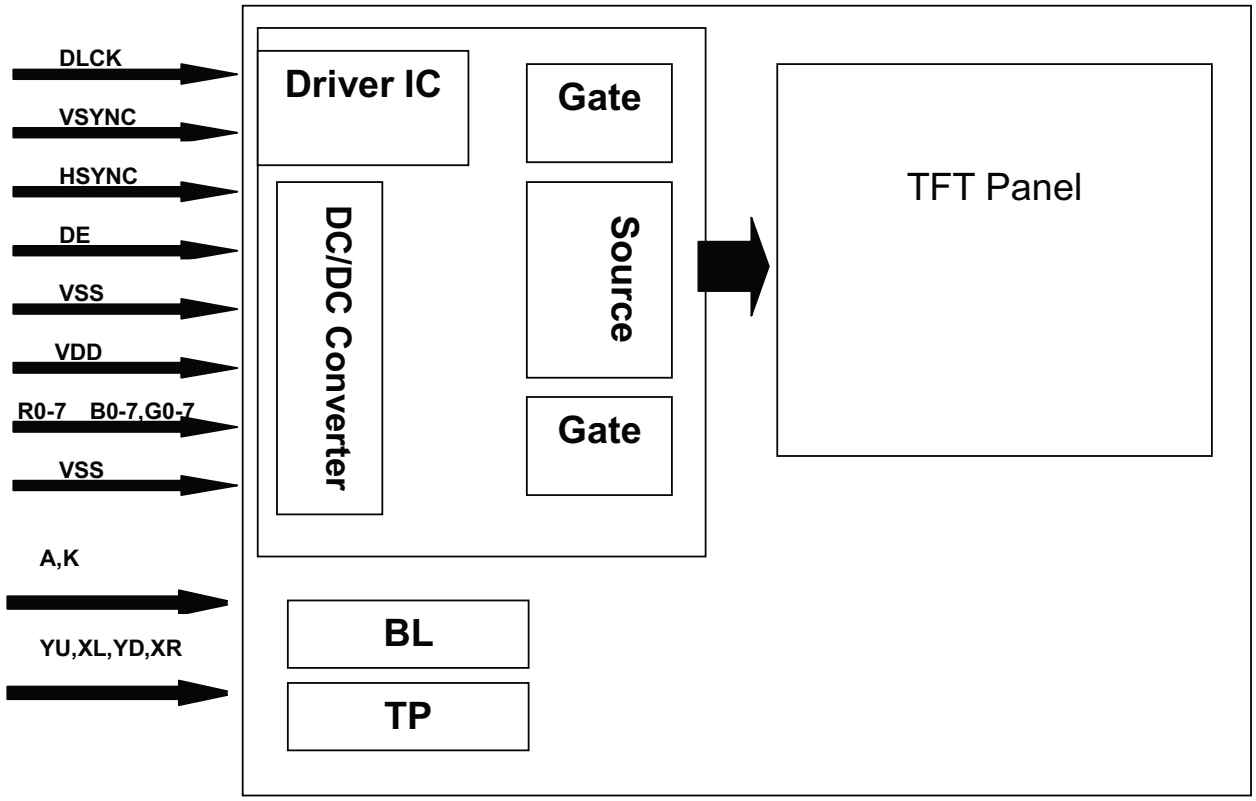
Display & LCD Type: 800 * RGB * 480 ,TFT-Panel
Viewing Direction: 6 O′clock
Backlight Type: White LED

2. MECHANICAL SPECIFICATIONS:

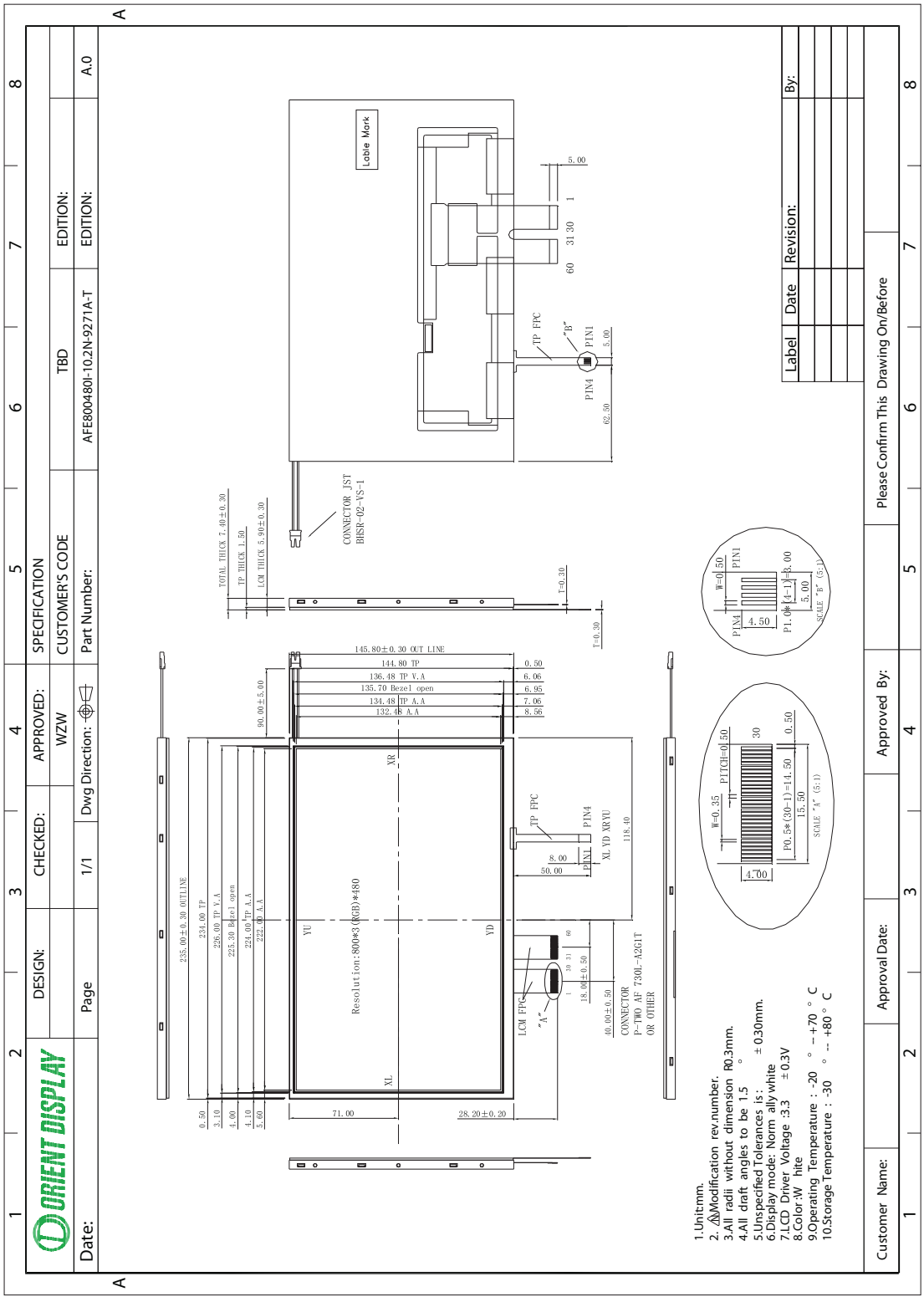
ITEM	SPECIFICATION	UNIT
DISPLAY SIZE	10.2	inch
OUTLINE DIMEMSIONS	235.0*145.8*7.4	mm
DISPLAY MODE	Normally White	-
INTERFACE TYPE	RGB	-

***See attached drawing for details.**

3.BLOCK DIAGRAM:



4.DIMENSIONAL OUTLINE:



5. PIN DESCRIPTION:

FPC Connector is used for the module electronics interface. The recommended model is "AF 73L-A2G1T" manufactured by P-TWO.

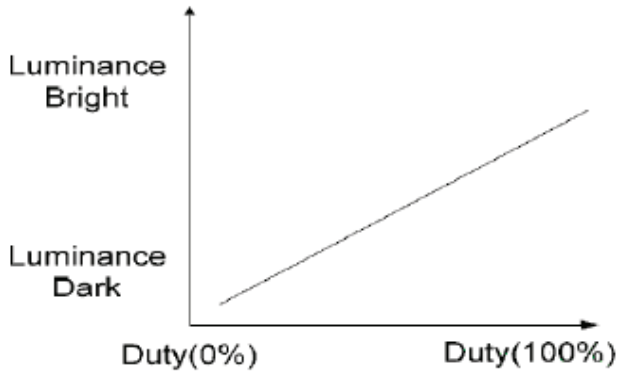
"AF 730L-A2G1T" manufactured by P-TWO

Pin No.	Symbol	I/O	Function	Remark
1	POL	I	Polarity selection	
2	STVD	I/O	Vertical start pulse input when U/D-H	Note 1
3	OEV	I	Output enable	
4	CKV	I	Vertical clock	
5	STVU	I/O	Vertical start pulse input when U/D-L	Note 1
6	GND	P	Power ground	
7	EDGSL	I	Selet rising edge or rising/falling edge	
8	V_{CC}	P	Power supply for digital circuit	
9	V9	I	Gamma voltage level	
10	V_{GL}	P	Gate OFF voltage	
11	V2	I	Gamma voltage level 2	
12	V_{GH}	P	Gate ON voltage	
13	V6	I	Gamma voltage level 6	
14	U/D	I	Up/down selection	Note 1,2
15	V_{CCM}	I	Common voltage	
16	GND	P	Power ground	
17	AV_{DD}	P	Power supply for analog circuit	
18	V14	I	Gamma voltage level 14	
19	V11	I	Gamma voltage level 11	
20	V8	I	Gamma voltage level 8	
21	V5	I	Gamma voltage level 5	
22	V3	I	Gamma voltage level 3	
23	GND	P	Power ground	
24	R5	I	Red data (MSB)	
25	R4	I	Red data	
26	R3	I	Red data	
27	R2	I	Red data	
28	R1	I	Red data	

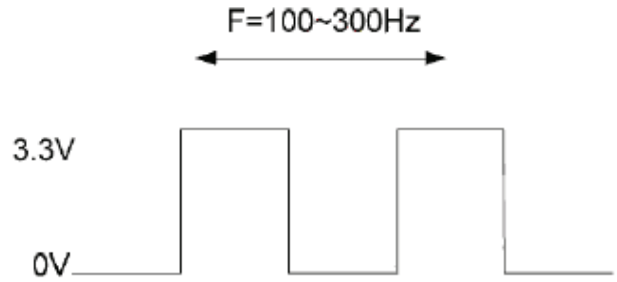
29	R0	I	Red data (LSB)	
30	GND	P	Power ground	
31	GND	P	Power ground	
32	G5	I	Green data (MSB)	
33	G4	I	Green data	
34	G3	I	Green data	
35	G2	I	Green data	
36	G1	I	Green data	
37	G0	I	Green data (LSB)	
38	STHL	I/O	Horizontal start pulse input when R/L-L	Note 1
39	REV	P	Control signal are inverted or not	Note 3
40	GND	I	Power ground	
41	DCLK	I	Sample clock	
42	V_{CC}	P	Power supply for digital circuit	
43	STHR	I/O	Horizontal start pulse input when R/L-H	Note 1
44	LD	I	Latches the polarity of outputs and switches the new data to outputs	
45	B5	I	Blue data (MSB)	
46	B4	I	Blue data	
47	B3	I	Blue data	
48	B2	I	Blue data	
49	B1	I	Blue data	
50	B0	I	Blue data (LSB)	
51	R/L	I	Right/left selection	
52	V1	I	Gamma voltage level 1	Note 1,2
53	V4	I	Gamma voltage level 4	
54	V7	I	Gamma voltage level 7	
55	V10	I	Gamma voltage level 10	
56	V12	I	Gamma voltage level 12	
57	V13	I	Gamma voltage level 13	
58	AV_{DD}	P	Voltage for analog circuit	
59	GND	P	Power ground	
60	$V_{CC}M$	I	Common voltage	

Note: I：input,O:output,P:Power

Note1: ADJ adjust brightness to control Pin,Pulse duty the bigger the brighter.



Note 2: ADJ signal=0~3.3V;Operating frequency:100~300Hz.



Note 3: DE Mode: Mode="H", HS floating and VS floating.
HV Mode: Mode="L" and DE floating.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	V_{CC}	Up to down, left to right
V_{CC}	GND	Down to up, right to left
GND	GND	Up to down, right to left
V_{CC}	V_{CC}	Down to up, left to right

6. MAXIMUM ABSOLUTE LIMIT:

Item	Symbol	Value	Unit
Power supply voltage for logic	V_{DD}	3.0-3.6	V
Input voltage	Vin	V_{DD}+0.3	V
Operating temperature	Topr	-20 to 70	°C
Storage temperature	Tstg	-30 to 80	°C

Note: Note1: Absolute maximum rating is the limit value beyond which the IC maybe broken. They do not assure operations.

Note2: Background color changes slightly depending on ambient temperature. This Phenomenon is reversible.

Ta≦70℃: 75%RH max

Ta>70℃: absolute humidity must be lower than the humidity of 75%RH at 70℃

Note3: Ta at -30℃ will be <48hrs, at 80 ℃ will be <120hrs

7.ELECTRICAL CHARACTERISTICS

7.1 DC Characteristics (V_{DD}=3.3V,Ta=25°C)

Item	Symbol	Min	Type	Max	Unit	Test condition
Operating voltage	V_{DD}	3.0	3.3	3.6	V	-
Supply current	I_{DD}	-	130	200	mA	V_{DD}=3.3V,Ta=25°C
Input voltage	V_{IH}	0.7VDD	-	VDD	V	-
	V_{IL}	0	-	0.3VDD	V	
Input leakage current	I_{IL}	-	TBD	-	μA	V_{IN}=V_{DD} or V_{SS}

Note: Voltage greater than above may damage the module.

All voltages are specified relative to V_{SS}=0V.

7.2 Backlight Electrical-optical Characteristics

1. Stander Lamp Styles (Edge Lighting Type):

The LED chips are distributed over the edge light area of the illumination unit, which gives the less power consumption:

2. The Main Advantages of the LED Backlight are as following:

2.1 The brightness of the backlight can simply be adjusted by a resistor or a potentiometer.

3. Data About LED Backlight:

Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition	Note
Supply Voltage	Vf	**8.4**	**9.3**	**10.5**	V	If=200mA	-
Supply Current	If	180	**200**	220	mA	-	-
Reverse Voltage	Vr	-	-	5	V	-	
Power dissipation	Pd	-	1900	-	mW	-	
Luminous Intensity for LCM	-	180	220	-	Cd/m^2	If=200mA	-
Uniformity for LCM	-	70	75	-	%	If=200mA	-
Backlight Color	White						

NOTE:

1. Uniformity = Min/Max * 100%
2. LED life time defined as follows:

   The final brightness is at 70% of original brightness;

   Measured Method: (X*Y: Light Area);

7. 3.Touch screen panel specifications:

Item	Symbol	Min.	Type.	Max.	unit	Remark
TransParency	-	-	82	-	%	JIS K-7105
Haze	-	-	1	-	%	JIS K-7105
Hardness Of Surface	-	-	3	-	H	150gf 45°
FPC Peeling Strength	-	5		-	N	Upward 90°
FPC Bending	-	-	3	-	cycle	R=1.0, 90°
Input Force	-	-		50	gf	-
Rated Voltage	V touch			7	V	DC
X-axis Resistance	Rx	400		930		FPC PIN
X-axis Resistance	Ry	100		400		
Linearity	-	-	±1.5	±2.0	%	-
Chattering	-	-	-	20	ms	-
Insulation Resistance	Ri	10	-	-	MΩ	-
Notes Life	-	100,000	-	-	Times	-
Input Life	-	1,000,000	-	-	Times	-

8. AC CHARACTERISTICS (V_{DD}=3.3V, TA=25°C)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
DCLK frequency	F_{dclk}	-	40	45	MHz	
DCLK cycle	T_{cph}	22	25	-	ns	
DCLK pulse width	T_{cw}	8	-	-	ns	
Data set-up time	T_{su}	4	-	-	ns	
Data hold time	T_{hd}	2	-	-	ns	
Time that the last data to LD	T_{ld}	1	-	-	Tcph	
Pulse width of LD	T_{wld}	2	-	-	Tcph	
Time that LD to STHL/R	T_{lds}	5	-	-	Tcph	
POL set-up time	T_{psu}	6	-	-	ns	
POL hold time	T_{phd}	6	-	-	ns	
CKV frequency	F_{vclk}	-	-	200	KHz	
CKV rise time	T_{rck}	-	-	100	ns	
CKV falling time	T_{fck}	-	-	100	ns	
CKV pulse width	P_{WCLK}	500	-	-	ns	
Horizontal display timing range	T_{dh}	-	800	-	Tcph	
Horizontal timing range	T_h	-	1056	-	Tcph	
STVU/D setup time	T_{sudv}	200	-	-	ns	
STVU/D hold time	T_{hdv}	300	-	-	ns	
STVU/D delay time	T_{dt}	-	-	500	ns	
Driver output delay time	T_{do}	-	-	900	ns	
Output rise time	T_{tlh}	-	500	1000	ns	
Output falling time	T_{thl}	-	400	600	ns	
OEV pulse width	T_{wcl}	1	-	-	us	
OEV to Driver output delay time	T_{oe}	-	-	900	ns	
Horizontal lines per field	T_v	512	525	610	Line	
Vertical display timing range	T_{vd}	-	480	-	Line	

8.2 Clock and Data Input Waveform:

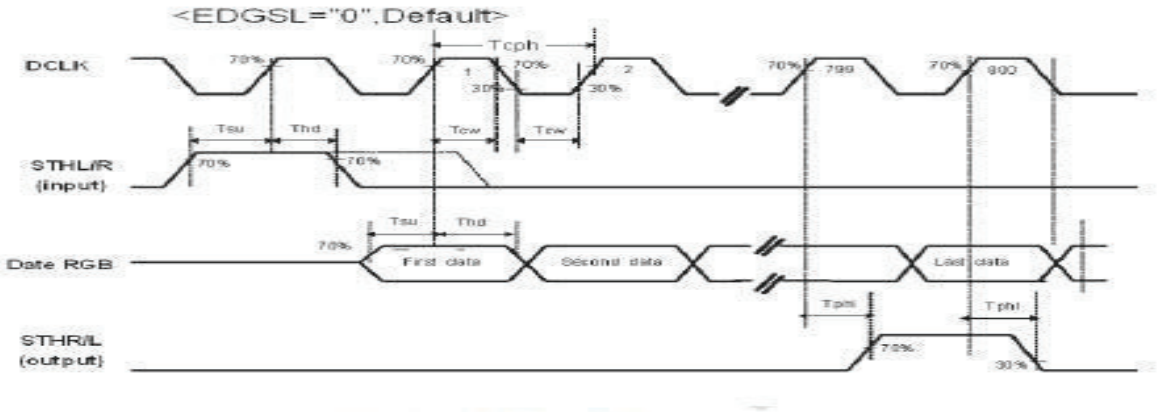


Fig.3-1 operation model 1

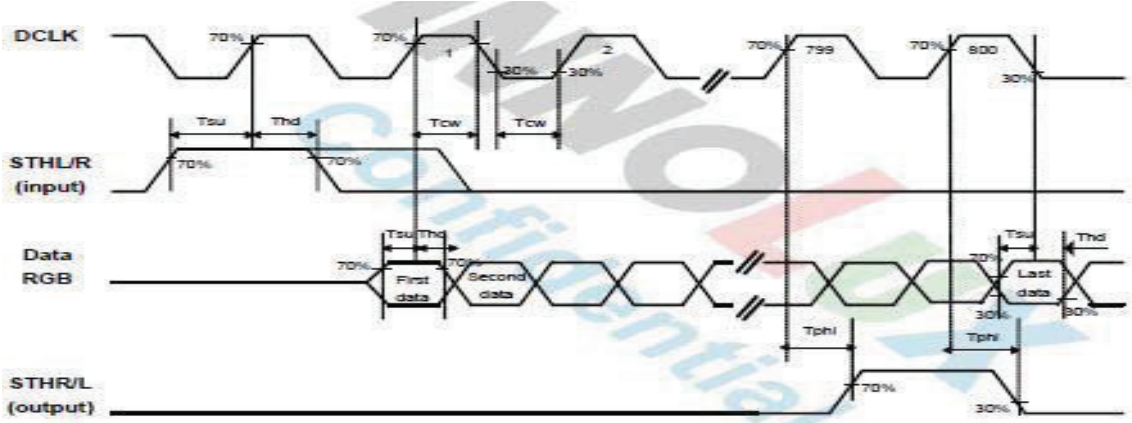


Fig.3-2 operation model 2

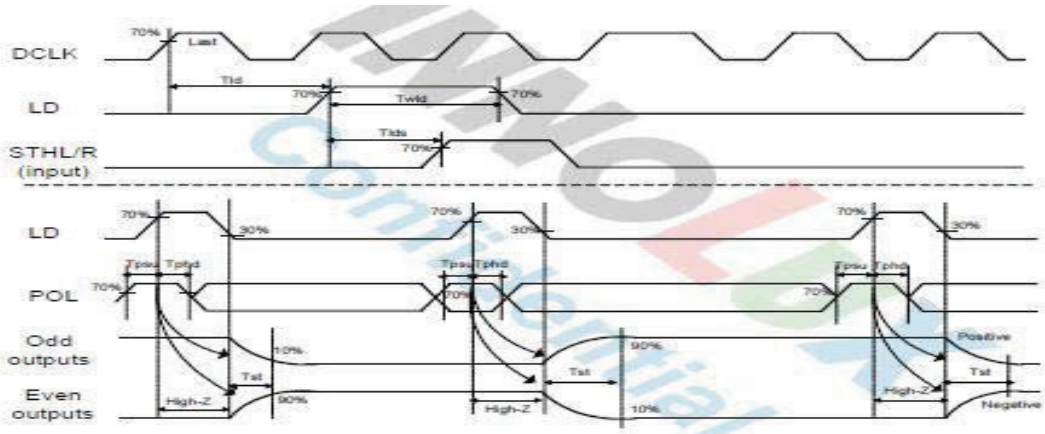


Fig.3-3 Horizontal timing 1

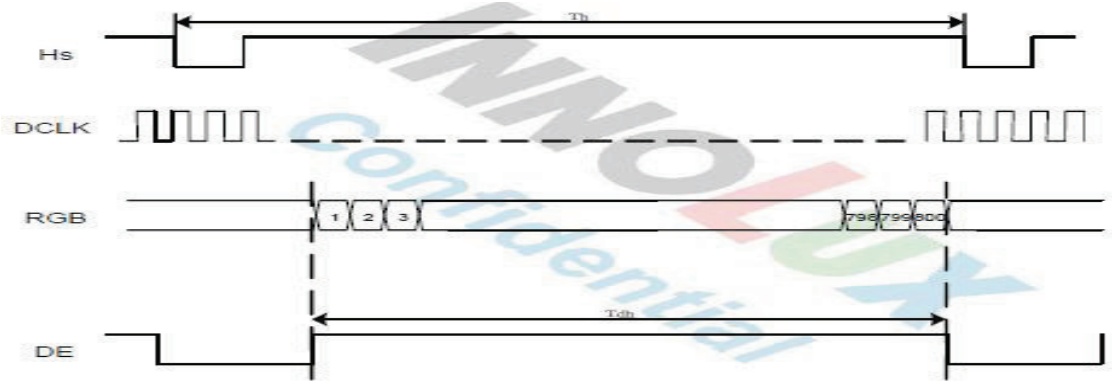


Fig.3-4 Horizontal timing 2

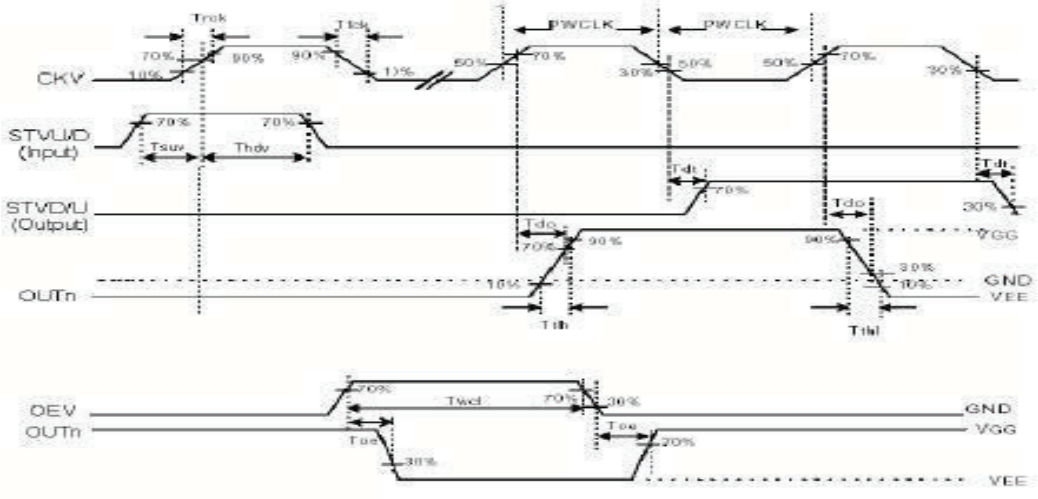


Fig.3-5 Vertical shift clock timing

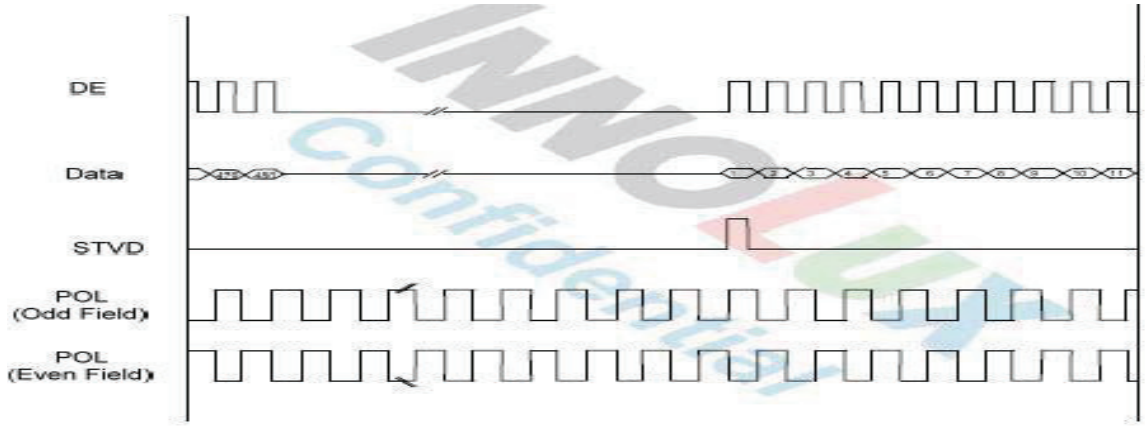


Fig.3-6 Vertical timing (from up to down)

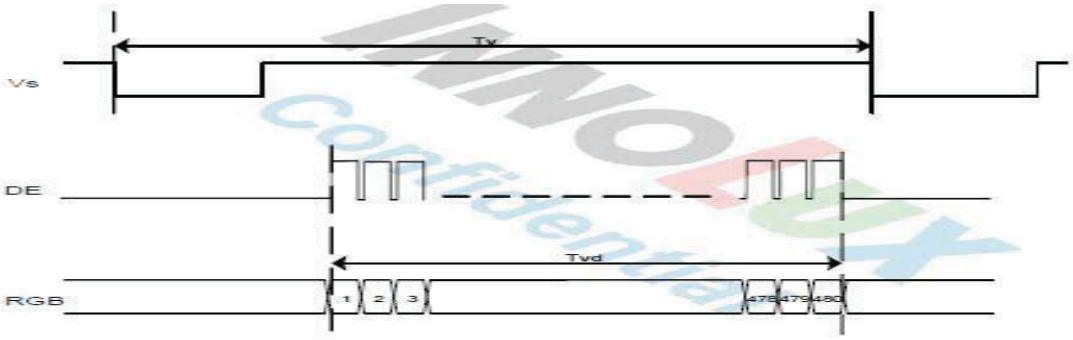
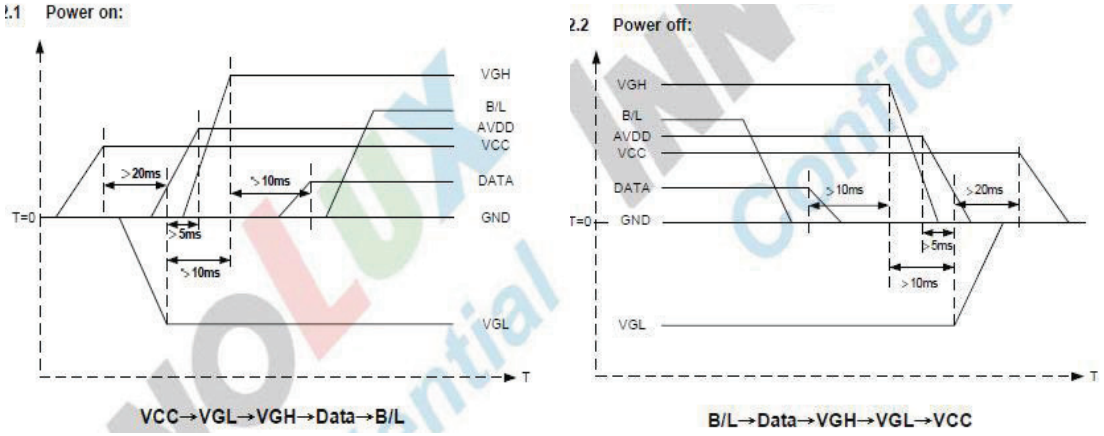


Fig.3-7 Vertical timing

8.3 Power Sequence



Note：

(1) The supply voltage of the external system for the module input should be the same as the definition of V_{DD}.

(2) Apply the lamp volatge within the LCD operation range. When the back-light turns on before the LCD operation or the LCD truns off before the back-light turns off, the display may momentarily become white.

(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

(4) TP4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

9. OPTICAL CHARACTERISTICS:

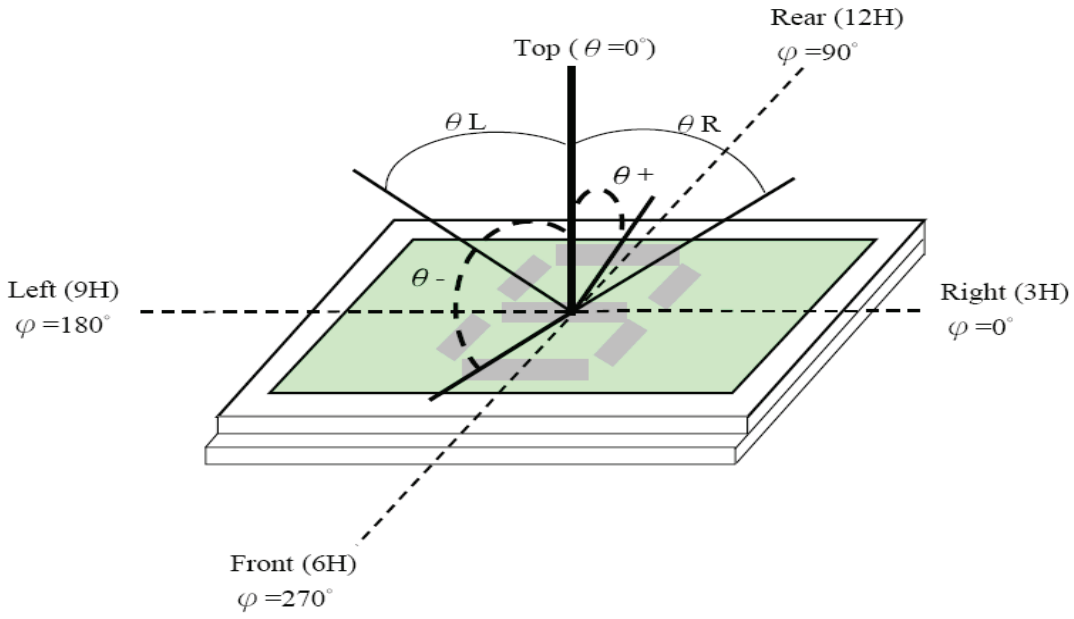
No.	ITEM		Symbol	Conditions	Specification			Unit	Note
					Min	Typ	Max		
1	Response Time		Tr+Tf	25℃	-	35	-	Ms	(1)(2)
2	Transmittance (With PL)		T(%)	-	-	7.1	-	-	-
3	Contrast Rate		Cr	θ=0, Normal viewing angle	250	300	-	-	(1)(3)
4	Viewing Angle	Hor.	θR	CR>10	55	65	-	Deg	-
			θL		55	65	-		
		Ver.	Θ+		35	45	-		
			Θ-		55	65	-		

Measure Conditions:

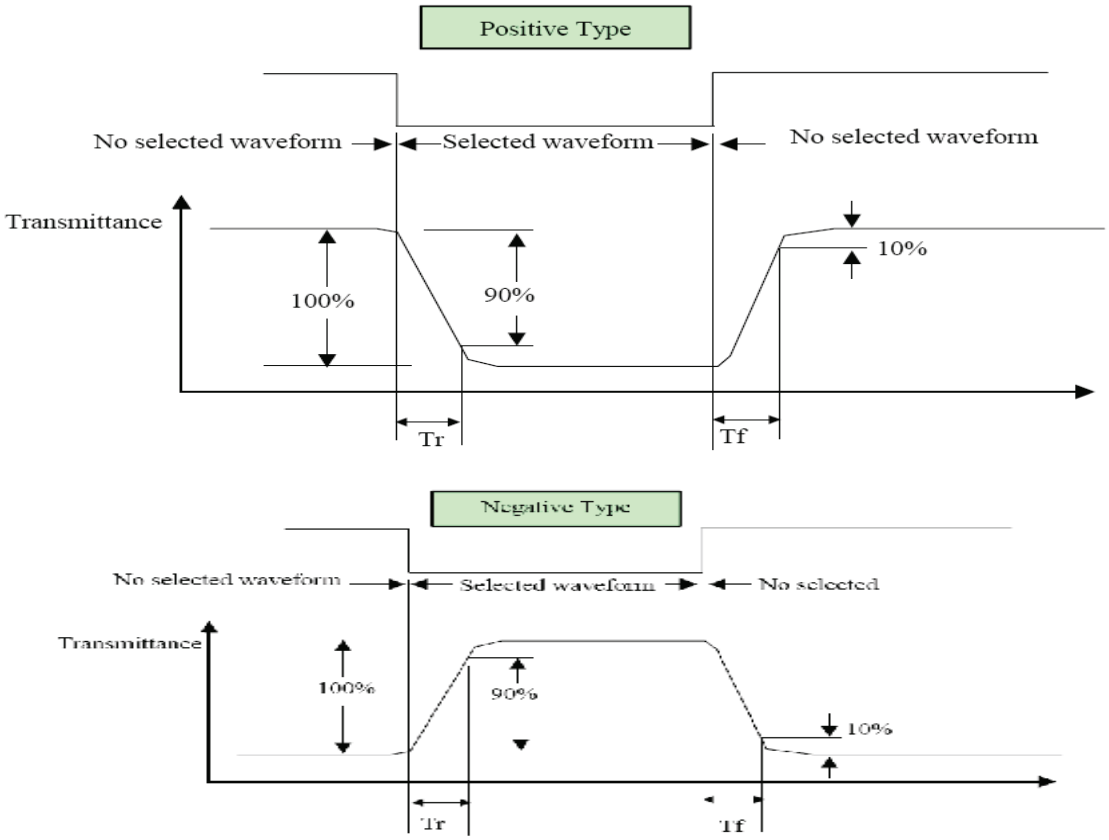
1. Measure surrounding : dark room;
2. Ambient temperature: 25±2℃;
3. 30min.warm-up time.

Note Definition:

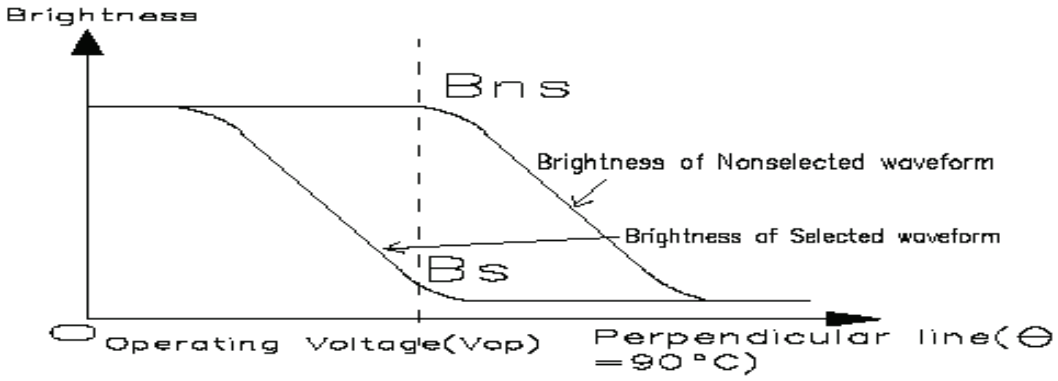
Note(1)Viewing angle range:



Note(2)Response Time:

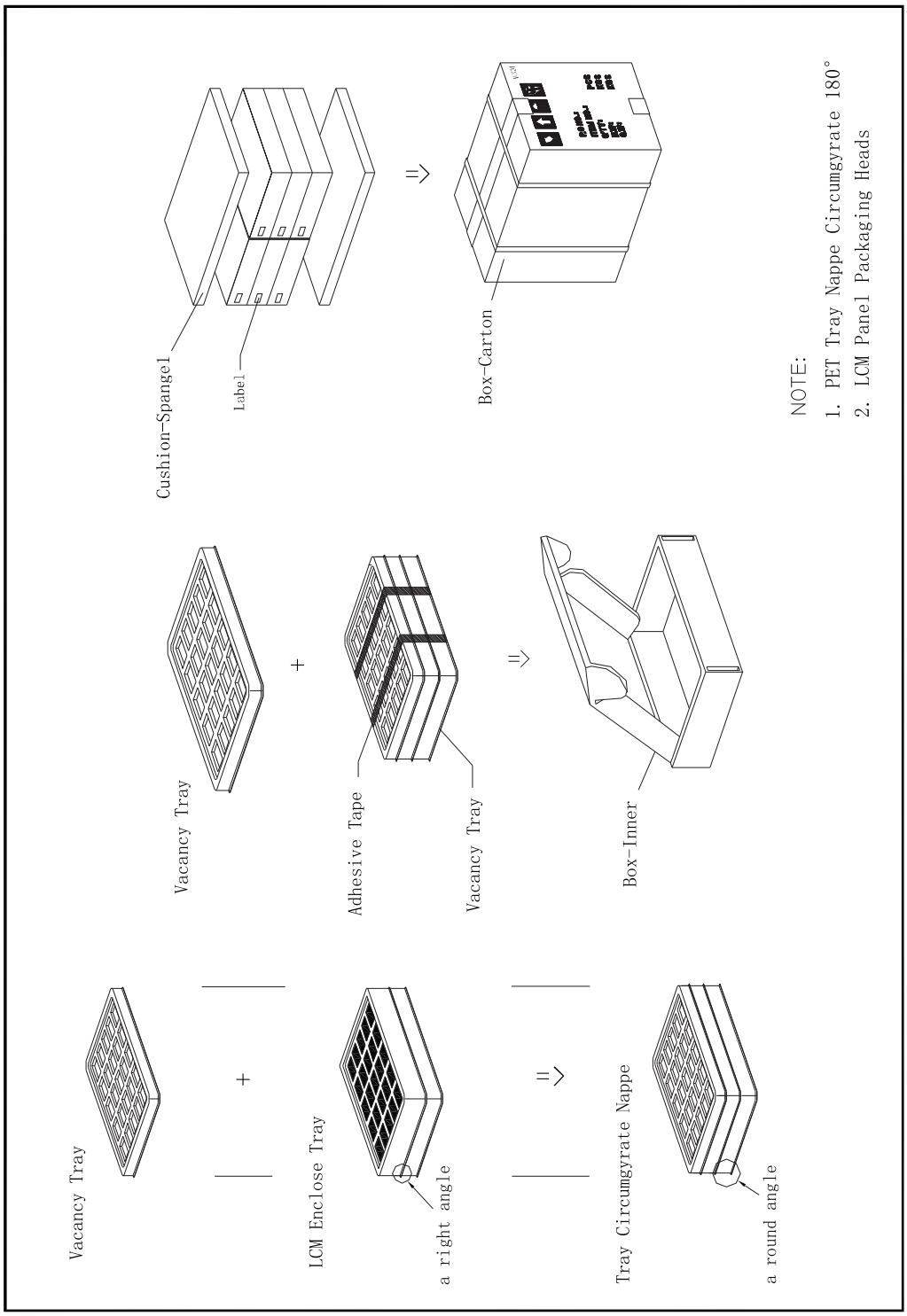


Note(3)Contrast Ratio Definition:



$$\text{Contrast Ratio (Cr)} = \frac{\text{Luminance with all pixel white}}{\text{Luminance with all pixel black}}$$

10.PACKAGE.


Vacancy Tray
+
LCM Enclose Tray
a right angle
=>
Tray Circumgyrate Nappe
a round angle
Vacancy Tray
+
Adhesive Tape
Vacancy Tray
=>
Box-Inner
Cushion-Spangel
Label
=>
Box-Carton
NOTE:
1. PET Tray Nappe Circumgyrate 180°
2. LCM Panel Packaging Heads

11. STANDARD SPECIFICATION FOR RELIABILITY:

Item	Condition	Time (hrs)	Assessment
High temp. Storage	80°C	120	No abnormalities in functions and appearance
High temp. Operating	70°C	120	
Low temp. Storage	-30°C	120	
Low temp. Operating	-20°C	120	
Humidity	40°C/ 90%RH	120	
Thermal Shock Temp. Cycle	-20°C ← 25°C →70°C (0.5 hour ← 5 min → 0.5 hour)	10cycles	

Functions, performance, appearance, etc. shall be free from remarkable deterioration within 50,000 hours under ordinary operating and storage conditions room temperature (25±10℃), normal humidity (45±20% RH), and in area not exposed to direct sun light. (Life time of backlight, please refer to Data about backlight.)

Testing Conditions and Inspection Criteria:

For the final test the testing sample must be stored at room temperature for 24 hours, after the tests listed in up Table, Standard specifications for Reliability have been executed in order to ensure stability.

Item	Test Model	In section Criteria
Current Consumption	Refer To Specification	The current consumption should conform to the product specification.
Contrast	Refer To Specification	After the tests have been executed, the contrast must be larger than half of its initial value prior to the tests.
Appearance	Visual inspection	Defect free.

12.SPECIFICATION OF QUALITY ASSURANCE:

12.1 Purpose

This standard for Quality Assurance should affirm the quality of LCD Module products to supply to purchaser by Orient Display.

12.2 Standard for Quality Test

a. Inspection:

Before delivering, the supplier should take the following tests, and affirm the quality of product.

b. Electro-Optical Characteristics:

According to the individual specification to test the product.

c. Test of Appearance Characteristics:

According to the individual specification to test the product.

d. Test of Reliability Characteristics:

According to the definition of reliability on the specification for testing products.

e. Delivery Test:

Before delivering, the supplier should take the delivery test.

(i) Test method: According to MIL-STD105E.General Inspection Level Ⅱ take a single time.

(ii) The defects classify of AQL as following:

Major defect: AQL = 0.65

Minor defect: AQL = 2.5

Total defects: AQL = 2.5

12.3. Nonconforming Analysis & Deal With Manners

a. Nonconforming Analysis:

(i) Purchaser should supply the detail data of non- conforming sample and the non- conforming.

(ii) After accepting the detail data from purchaser, the analysis of nonconforming should be finished in two weeks.

(iii) If supplier can not finish analysis on time, must announce purchaser before two weeks.

b. Disposition of nonconforming:

(i) If find any product defect of supplier during assembly time, supplier must change the good product for every defect after recognition.

(ii) Both supplier and customer should analyze the reason and discuss the disposition of nonconforming when the reason of nonconforming is not sure.

12.4. Agreement items

Both sides should discuss together when the following problems happen.

a. There is any problem of standard of quality assurance, and both sides think that it must be modified.

b. There is any argument item which does not record in the standard of quality assurance.

c. Any other special problem.

12.5 Standard of The Product Appearance Test

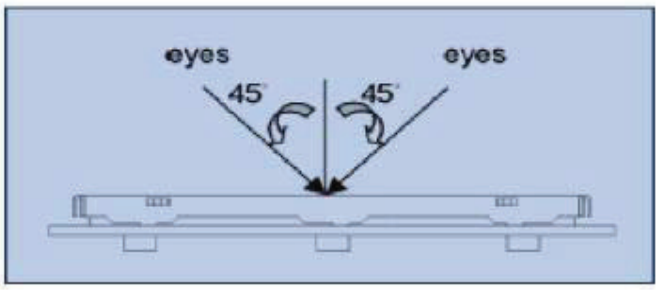
a. Manner of appearance test: This specification should be applied for both light on and off situation.

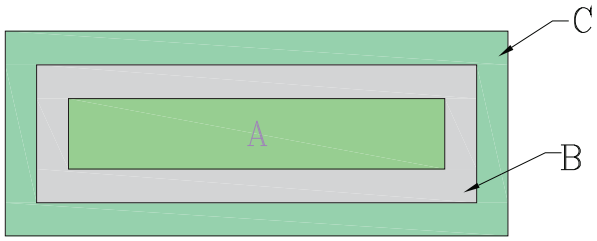
(i) The test must be under 20W × 2 or 40W fluorescent light, and the distance of view must be at 30±5cm.

(ii) When test the model of transmissive product must add the reflective plate.

(iii)The test direction is base on about around 10° of vertical line (Left graph)

(iiii)Temperature: 25±5℃ Humidity: 65±10%RH





(iv) Definition of area (Right graph)

A. Area: Viewing area. B. Area: Out of viewing area.(Outside viewing area)

b. Basic principle:

(i) It will accord to the AQL when the standard can not be described.

(ii) The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

(iii) Must add new item on time when it is necessary.

c. Standard of inspection: (Unit: mm)

Allowable limits defined in follow Dot defect Table should be met for each white, black , R, G, B raster. The limits apply to the entire area. Missing white in 60% or more of typical (one color, R or G or B) pixel aperture is defined as a bright defect, less than 60% is acceptable .Black spot in 60% or more of typical pixel aperture is defined as a dark defect, less than 60% is acceptable.

Dot defect table:

Item		White dot defect	Black dot defect	Total
1	Defect counts	3	3	3
2	Combined defect Counts	No combined dot defect allowed. Two Single dot defect that within 5mm during each dot defect should becounted as combined dot defect.		

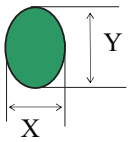
12.6 Inspection specification

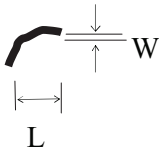
AQL inspection standard

Sampling method: MIL-STD-105E, Level II, single sampling

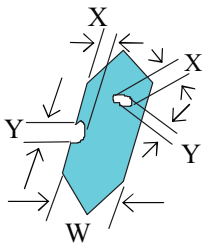
Classify	Item		Note	AQL
Major	Display state	Short or open circuit	1	0.65
		Contrast defect (dim, ghost)		
		LC leakage		
		Flickering		
		No display		
		Wrong viewing direction	2	
		Wrong Back-light	7	
	Non-display	Flat cable or pin reverse	9	
		Wrong or missing component	10	
Minor	Display state	Background color deviation	2	2.5
		Black spot and dust	3	
		Line defect	4	
		Scratch		
		Rainbow	5	
		Pin hole	6	
	Polarizer	Bubble and foreign material	3	
		Scratch	4	
	PCB,FPC	Scratch	4	
	Soldering	Poor connection	8	
	Wire	Poor connection	9	
	LCD	CHIP OUT	11	

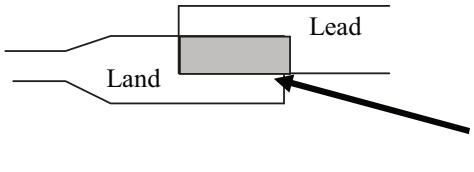
Note on defect classification:

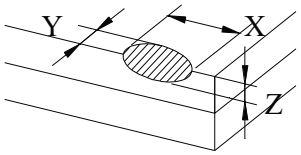
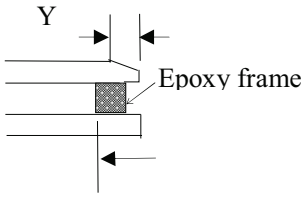
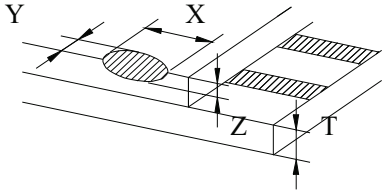
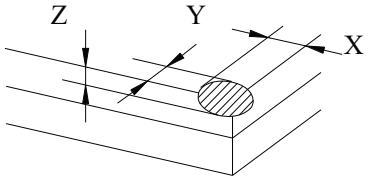
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td rowspan="6">1</td><td>Short or open circuit</td><td rowspan="6">Not allow</td></tr>
<tr><td>LC leakage</td></tr>
<tr><td>Flickering</td></tr>
<tr><td>No display</td></tr>
<tr><td>Wrong viewing direction</td></tr>
<tr><td>Wrong Back-light</td></tr>
<tr><td rowspan="2">2</td><td>Contrast defect</td><td rowspan="2">Refer to approval sample</td></tr>
<tr><td>Background color deviation</td></tr>
<tr><td>3</td><td>Point defect,
Black spot, dust (incl. Polarizer) ex.: dirt under polarizer,
Pinhole of reflector ,glass scratch, dirt under glass,scratch on polarizer
φ= (X+Y)/2</td><td> 

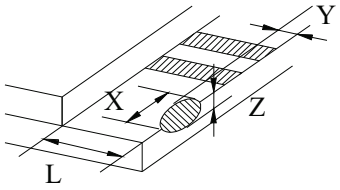
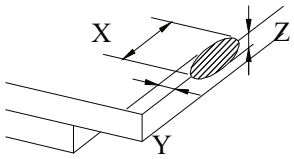
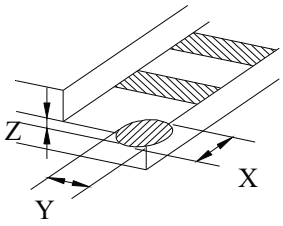
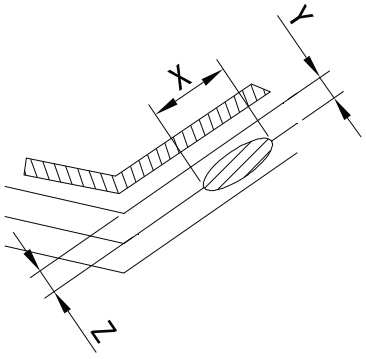
<table>
<tr><td>Point</td><td>Acceptable Qty.</td></tr>
<tr><td>Size</td><td></td></tr>
<tr><td>ϕ≤0.10</td><td>Disregard</td></tr>
<tr><td>0.10<ϕ≤0.20</td><td>3</td></tr>
<tr><td>0.20<ϕ≤0.25</td><td>2</td></tr>
<tr><td>0.25<ϕ≤0.30</td><td>1</td></tr>
<tr><td>ϕ>0.30</td><td>0</td></tr>
</table>
Unit：mm</td></tr>
<tr><td>4</td><td>Line defect</td><td> 

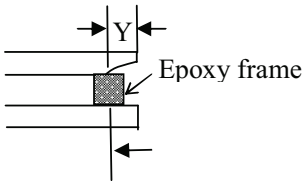
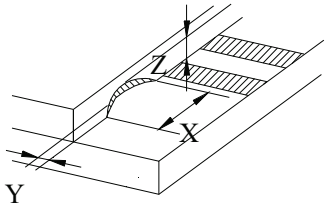
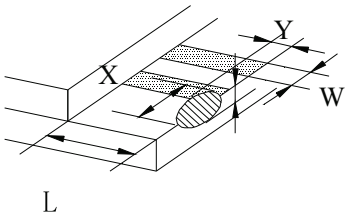
<table>
<tr><td></td><td>Line</td><td>Acceptable Qty.</td></tr>
<tr><td>L</td><td>W</td><td></td></tr>
<tr><td>---</td><td>0.015≥W</td><td>Disregard</td></tr>
<tr><td>3.0≥L</td><td>0.03≥W</td><td rowspan="2">2</td></tr>
<tr><td>2.0≥L</td><td>0.05≥W</td></tr>
<tr><td>1.0≥L</td><td>0.1＞W</td><td>1</td></tr>
<tr><td>---</td><td>0.05<W</td><td>Applied as point defect</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>5</td><td>Rainbow</td><td>Not more than two color changes across the viewing area</td></tr>
</table>

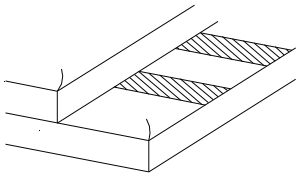
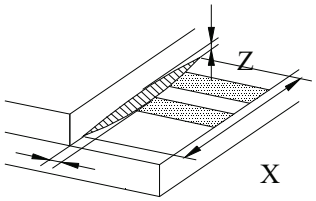
<table>
<tr><th>No.</th><th>Item</th><th>Criterion</th></tr>
<tr><td>6</td><td>Segment pattern
W = Segment width
φ = (X+Y)/2</td><td>(1) Pin hole
ϕ < 0.15mm is acceptable.
 

<table>
<tr><td>Point Size</td><td>Acceptable Qty</td></tr>
<tr><td>ϕ≤1/4W</td><td>Disregard</td></tr>
<tr><td>1/4W< ϕ≤1/2W</td><td>1</td></tr>
<tr><td>ϕ＞1/2W</td><td>0</td></tr>
</table>
Unit: mm</td></tr>
<tr><td>7</td><td>Back-light</td><td>(1) The color of backlight should correspond its specification.
(2) Not allow flickering</td></tr>
<tr><td>8</td><td>Soldering</td><td>(1) Not allow heavy dirty and solder ball on PCB or FPC.
(The size of dirty refer to point and dust defect)
(2) Over 50% of lead should be soldered on Land.
 
</td></tr>
<tr><td>9</td><td>Wire</td><td>(1) Copper wire should not be rusted
(2) Not allow crack on copper wire connection.
(3) Not allow reversing the position of the flat cable.
(4) Not allow exposed copper wire inside the flat cable.</td></tr>
<tr><td>10</td><td>PCB,FPC</td><td>(1) Not allow screw rust or damage.
(2) Not allow missing or wrong putting of component.</td></tr>
</table>

11	LCD	**2.1.1 chip on the surface**     Note: A:LCD Length X / Z >1/8A: ≤0.3mm: ≤1/2T ≤1/8A: Not enter into epoxy frame: ≤T ≤1/8A: Not enter into the inner edge of epoxy: ≤1/2T

11	**LCD**	**2.1.2chip on the terminal**    X | Y | Z >1/8A | ≤0.3mm | ≤1/2T ≤1/8A | ≤1/2L | ≤T ≤1/8A&≤1mm | ≤L | ≤T ≤1/8A&≤2mm | ≤L | ≤1/2T Note: A:LCD Length. the distance between crack and contact pad must be greater than the width of 1st contact pad. **2.1.3chip out on between side** 

11	**LCD**	  <table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td rowspan="2">≤ 1/8A</td><td>Not enter into epoxy frame</td><td>Z≤2T</td></tr><tr><td>Not enter into 1/2 epoxy frame</td><td>Z≤1/2T</td></tr></table>Note: A : LCD Length 2.1.4 including corner chip and side chip  Note: A:LCD Length <table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>>1/8A</td><td>≤1/6L</td><td rowspan="3">≤1/2T</td></tr><tr><td>≤1/8A</td><td>≤1/3L</td></tr><tr><td>≤1/4W</td><td>≤2/3L</td></tr></table>

<table>
<tr><td rowspan="2">11</td><td rowspan="2">LCD</td><td>2.2 Chip out
 
1) Chip out is that crackles extend to inner edge.
2) Crackles round epoxy frame will be rejected.
3) Chip out on the terminal will be rejected: Z=T length >1mm or Z<T length >2mm
4) The chip out at ITO will be rejected.</td></tr>
<tr><td>2.3 Poor cutting
 

<table>
<tr><th>X</th><th>Y</th><th>Z</th></tr>
<tr><td>>1/8 A</td><td>≤0.3</td><td>≤1/2T</td></tr>
<tr><td>≤1/8 A</td><td>According to drawing</td><td>1/2T≤Z≤T</td></tr>
</table>
Note : A: LCD Length.</td></tr>
<tr><td>12</td><td>SMT</td><td>According to the <Acceptable of electronic assemblies>
IPC-A-610C class 2 stander. Component missing or function defect are Major defect ,the others are Minor defect.</td></tr>
<tr><td colspan="3">Any one out of the specification will be rejected.</td></tr>
</table>

13. GENERAL PRECAUTIONS

(1) Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizers which easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling the LCD Modules.

(2) Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotrifloroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface. Do not use the following solvent:

- Water
- Ketone
- Aromatics

(3) Caution against static charge

The LCD Module use C-MOS LSI drivers, so we recommend that you connect any unused input terminal to VDD or VSS, do not input any signals before power is turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

(4) Packaging

Modules use LCD elements, and must be treated as such. Avoid intense shock and falls from a height.

- To prevent modules from degradation. Do not operate or store them exposed directly to sunshine or high temperature/humidity.

(5) Caution for operation

- It is indispensable to drive LCD′s within the specified voltage limit since the higher voltage than the limit shorten LCD life. An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD′s show dark color in them.

However those phenomena do not mean malfunction or out of order with LCD′s which will come back in the specified operating temperature range.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- As light dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 40°C, 50%RH or less is required.

(6) Storage

In the case of storing for a long period of time (for instance, for years) for the purpose or replacement use, The following ways are recommended.

- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is.

Keeping temperature in the specified storage temperature range.

- Storing with no touch on polarizer surface by the anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery)

(7) Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol which should be burned up later.
- When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

Limited Warranty

The LCM of Orient Display are not consumer products, but may be incorporated by Orient Display's customers into consumer products or components thereof, Orient Display does not warrant that its components are fit for any such particular purpose.

1. The liability of Orient Display is limited to repair or replacement on the terms set forth below. Orient Display will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between Orient Display and the customer, Orient Display will only replace or repair any of its LCM which is found defective electrically or visually when inspected in accordance with Orient Display.

2. No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.

3. In returning the LCM, they must be properly packaged; there should be detailed description of the failures or defect.

Orient Display reserves the right to change this specification.

- END -