AMP DISPLAY INC.

A Brighter Solution

SPECIFICATIONS

7.0-IN COLOR TFT MODULE

CUSTOMER:	
CUSTOMER PART NO.	
AMP DISPLAY PART NO.	A M - 8 0 0 6 0 0 J T M Q W - 0 0 H
APPROVED BY:	
DATE:	

☐ APPROVED FOR SPECIFICATIONS

☐ APPROVED FOR SPECIFICATION AND PROTOTYPES

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2009 /10/ 21	-	New Release	John

1. INSTRUCTION

Ampire 7” Display Module is a color active matrix TFT-LCD that uses amorphous silicon TFT as a switching device . This model is composed of a TFT-LCD panel . This TFT-LCD has a high resolution (800(R.G.B) X 600) and can display up to 262,144 colors.

1.1 Features

(1) Construction : a-Si TFT-LCD with driving system, White LED Backlight

(2) LCD type : Transmissive , Normally White

(3) Number of the Colors : 262K colors (R,G,B 6 bit digital each)

(4) RGB Interface

(5) SVGA (4:3 diagonal) configuration

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	800RGB (W) x 600(H)	dots
Active area	141.60 (W) x 106.20 (H)	mm
Pixel pitch	59 (W) x 177 (H)	um
Color configuration	R.G.B -stripe	
Overall dimension	154(W)x119.2(H)x5.1(D).	mm
Weight	135	g
Brightness	250nit	cd/m^2
Contrast ratio	250	
Backlight unit	LED	
Display color	262,144	colors

3. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power Voltage	VCC	-0.3	6	V	
	AVDD	-0.3	13.5	V	
	VGH	-0.3	+42	V	
	VGL	VGH-42	+0.3	V	
Temperature Range	Operation	-10	70	℃	
	Storage	-20	80	℃	

(1). All of the voltages listed above are with respective to GND=VSSA=0V

(2). Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

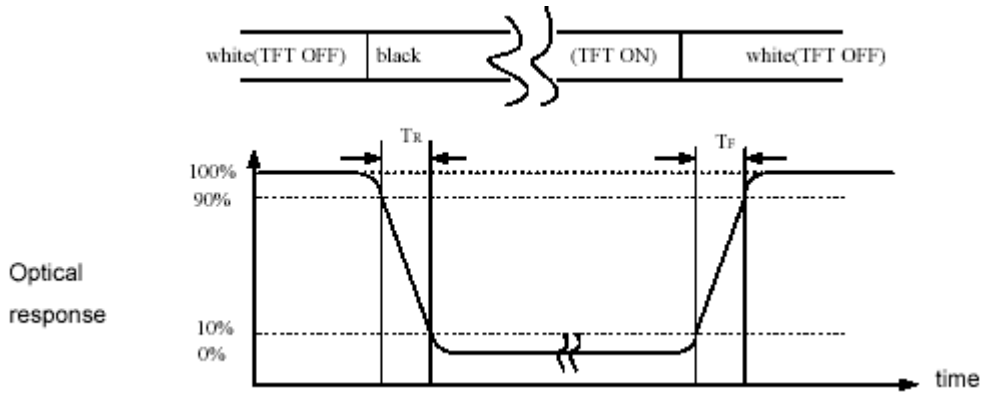
4. OPTICAL CHARACTERISTICS

Item		Symbol	Conditon	Min.	Typ.	Max.	Unit	Note
Response Time		$T_r + T_f$	Θ=Φ=0°	-	16	--	ms	(1)
Contrast ratio		CR		--	250	-	-	(2)(3)
Viewing Angle	Vertical	Θ	CR≧10	--	120	-	Deg.	(5)
	Horizontal	Φ		--	140	-		
Luminance(ILED=120mA)		L	Θ=Φ=0°	--	250	-	cd/m^2	(3)(4)
Luminance Uniformity		ΔL		-	70	-	%	(3)(4)
Color chrom aticity	White	Wx		0.27	0.32	0.37		
		Wy		0.27	0.32	0.37		

NOTE :

● These items are measured by BM-5A(TOPCON) or CA-1000(MINOLTA) in the dark room (no ambient light)

(1) Definition of Response Time (White-Black)



(2) Definition of Contrast Ratio

Measure contrast ratio on the below 5 points(refer to figurel,#1~#5point) and take the average value

Contrast ratio is calculated with the following formula :

Contrast Ratio(CR)=(White)Luminance of ON ÷ (Black)Luminance of OFF

(3) Definition of Luminance :

Measure white luminance on the center of Display.(Point 5)

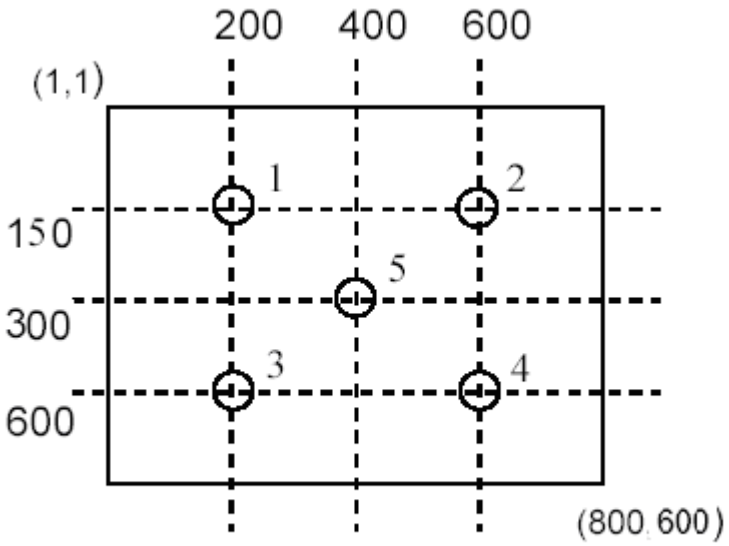


Fig.1 Measuring point

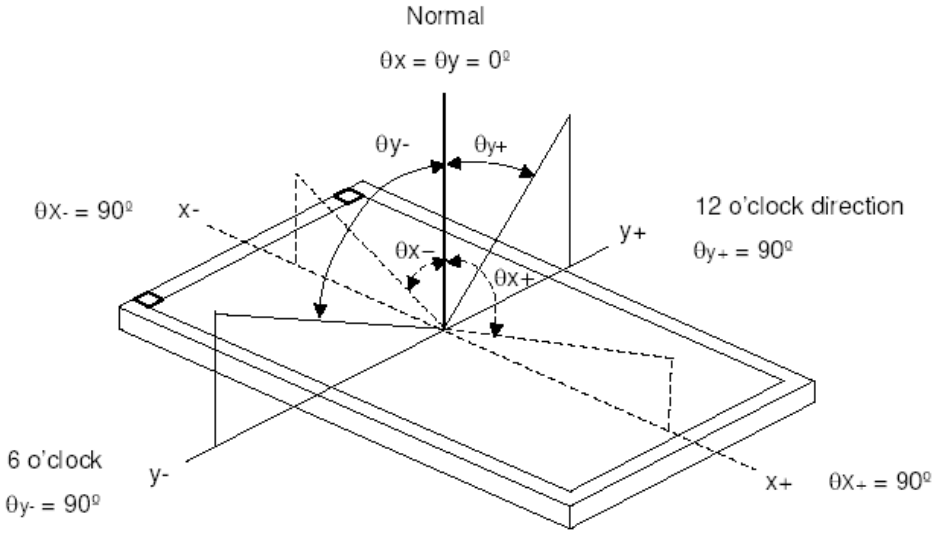
(4)Definition of Luminance Uniformity :

Measured Maximum luminance[L(MAX)] and Minimum luminance[L(MIN)] on the 5 points

Luminance Uniformity is calculated with the following formula :

ΔL =[L(MIN) / L (MAX)] X 100%

(5)Definition of Viewing Angle



Φ =(Θx+)+(Θx-) Θ =(Θy+)+(Θy-)

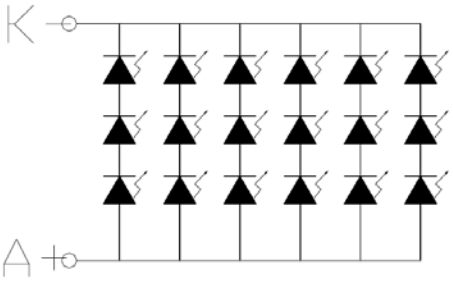
5. ELECTRICAL CHARACTERISTICS

5.1 TFT LCD Module voltage

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Power Voltage For LCD	V_{CC}	3.0	3.3	3.6	V	
Analog Power Supply Voltage	AVDD	10.5	12	13.5	V	
Gate Driver Positive Supply Voltage	VGH	13	16	17	V	
Gate Driver Negative Supply Voltage	VGL	-8	-7	-6	V	
Common Electrode Driving Voltage	VCOM	-	4.3	-	V	
LCD Power Current	Icc	--	150	--	mA	
Logic Input Voltage	VIH	V_{CC}*0.8	--	V_{CC}	V	
	VIL	0	--	V_{CC}*0.2	V	
Input Level V1~V5	Vref1	0.4AVDD	-	AVDD-0.1	V	Gamma correction voltage input
Input Level V6~V10	Vref2	0.1	-	0.6AVDD	V	Gamma correction voltage input

5.2 Backlight unit

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Voltage	VL	--	9.9	--	V	Reference
LED Current	IL	--	120	--	mA	
Luminance	L	--	250	--	cd/m^2	
LED Life Time	-	10000	-	-	Hr	



CURRENT IF=120mA

18LED

6. INTERFACE

RGB INTERFACE CN:

Pin No	Symbol	Function
1	NC	No connection
2	NC	No connection
3	NC	No connection
4	NC	No connection
5	NC	No connection
6	GND	Power Ground
7	EDGSL	Define Input Clock Polarity ”L”= Latch Data By Rising Edge of CLK(Default) “H”= Latch Data By Falling Edge of CLK
8	Vcc	Digital Power Supply(+3.3V)
9	V9	Gamma voltage level 9
10	VGL	Gate OFF power supply voltage
11	V2	Gamma voltage level 2
12	VGH	Gate ON power supply voltage
13	V6	Gamma voltage level 6
14	RESETB	Hardware Global Reset. Low Active(Default Pull HIGH)
15	VCOM	Common electrode voltage input.
16	GND	Power Ground
17	AVDD	Analog Power Supply.
18	NC	No Connection
19	NC	No Connection
20	V8	Gamma voltage level 8
21	V5	Gamma voltage level 5
22	V3	Gamma voltage level 3
23	GND	Power Ground
24	R5	Red Data 5 (MSB)
25	R4	Red Data 4
26	R3	Red Data 3
27	R2	Red Data 2
28	R1	Red Data 1
29	R0	Red Data 0 (LSB)
30	GND	Power Ground
31	GND	Power Ground
32	G5	Green Data 5 (MSB)
33	G4	Green Data 4
34	G3	Green Data 3
35	G2	Green Data 2
36	G1	Green Data 1
37	G0	Green Data 0 (LSB)
38	DE	Input Data Enable Control When DE Mode. Active High To Enable Data input. (Default Pull Low)
39	NC	No Connection.

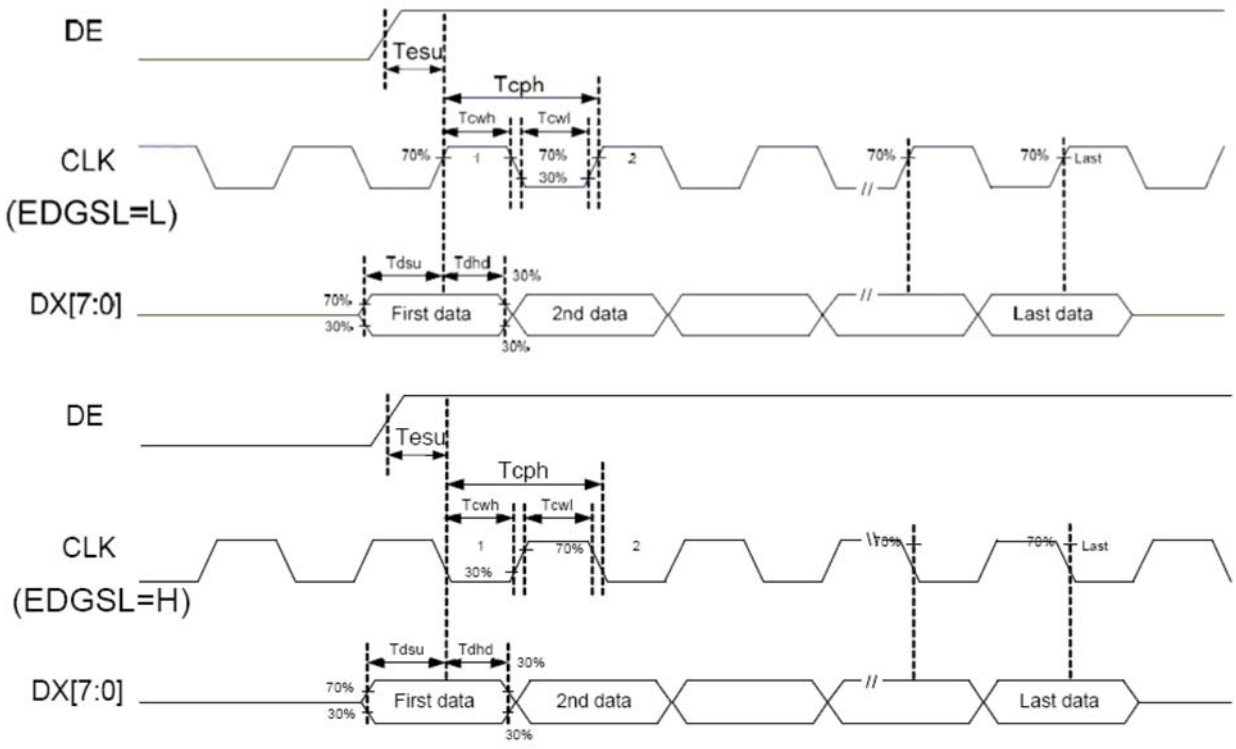
40	GND	Power Ground
41	DCLK	Clock Signal Input.
42	VCC	Digital Power Supply(+3.3V)
43	NC	No Connection
44	NC	No Connection
45	B5	Blue Data 5 (MSB)
46	B4	Blue Data 4
47	B3	Blue Data 3
48	B2	Blue Data 2
49	B1	Blue Data 1
50	B0	Blue Data 0 (LSB)
51	NC	No Connection.
52	V1	Gamma voltage level 1
53	V4	Gamma voltage level 4
54	V7	Gamma voltage level 7
55	V10	Gamma voltage level 10
56	NC	No Connection.
57	NC	No Connection.
58	AVDD	Analog Power Supply.
59	GND	Power Ground
60	VCOM	Common electrode voltage input.

7. AC Timing characteristic

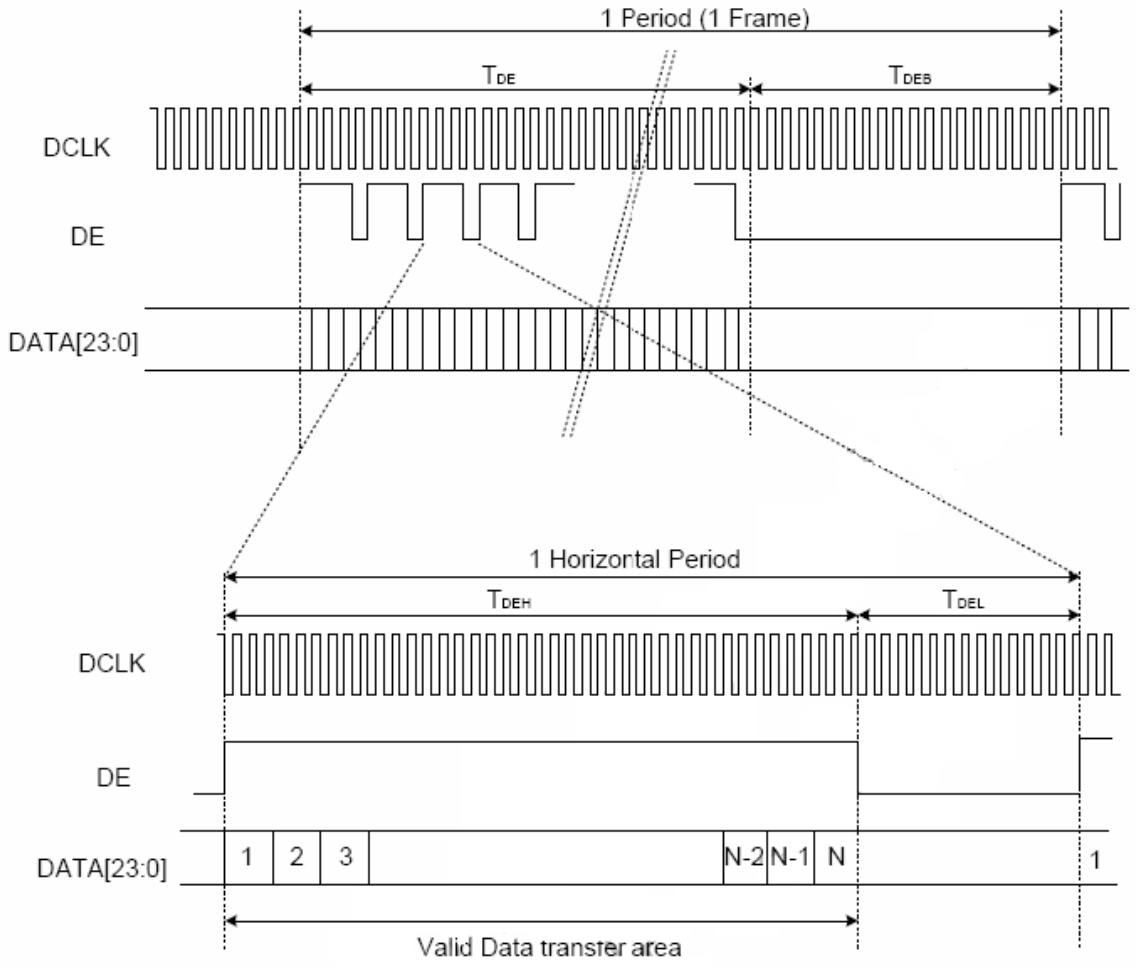
7-1 Timing Specification.

PARAMETER	Symbol	Min.	Typ.	Max	Unit
CLK frequency	F_{CPH}	-	33.79	-	MHz
CLK period	T_{CPH}	-	25.13	-	ns
CLK pulse duty	T_{CWH}	40	50	60	%
DE Period	$T_{DEH}+T_{DEL}$	1000	1056	1200	T_{CPH}
DE Pulse Width	T_{DH}	-	800	-	T_{CPH}
DE Frame Blanking	T_{HS}	10	28	110	$T_{DEH}+T_{DEL}$
DE Frame Width	T_{EP}	-	600	-	$T_{DEH}+T_{DEL}$
Data Setup Time	Tdsu	6	-	-	ns
Data Hold Time	Tdhd	6	-	-	ns
DEN Setup Time	Tesu	6	-	-	ns

7-2 AC Timing Diagrams



7.3 Data input format



8. QUALITY AND RELIABILITY

8.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : 25 ± 5°C

Humidity : 60 ± 25% RH.

8.2 SAMPLING PLAN

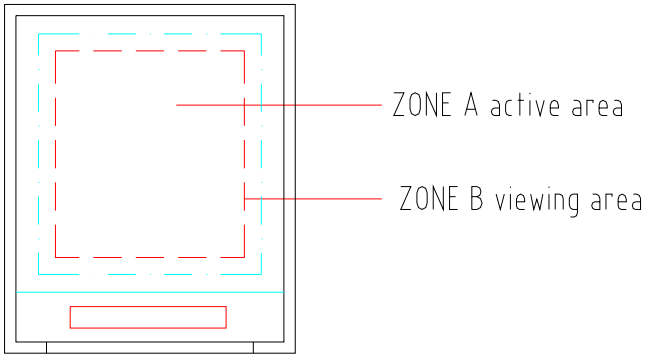
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

8.3 ACCEPTABLE QUALITY LEVEL

A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

8.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under florescent light. The inspection area of LCD panel shall be within the range of following limits.



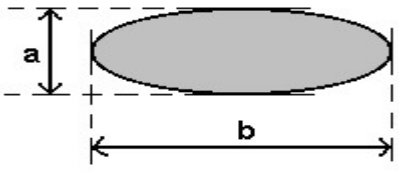
8.5 INCOMING INSPECTION STANDARD FOR TFT-LCD PANEL

<table>
<tr><th colspan="3">DEFECT TYPE</th><th colspan="7">LIMIT</th><th>Note</th></tr>
<tr><td rowspan="8">VISUAL DEFECT</td><td rowspan="8">INTERNAL</td><td rowspan="3">SPOT</td><td colspan="5">φ＜0.15mm</td><td>Ignore</td><td rowspan="3">Note1</td></tr>
<tr><td colspan="5">0.15mm≦φ≦0.5mm</td><td>N≦4</td></tr>
<tr><td colspan="5">0.5mm＜φ</td><td>N=0</td></tr>
<tr><td rowspan="2">FIBER</td><td colspan="5">0.03mm<W≦0.1mm, L≦5mm</td><td>N≦3</td><td rowspan="2">Note1</td></tr>
<tr><td colspan="5">1.0mm＜W, 1.5mm＜L</td><td>N=0</td></tr>
<tr><td rowspan="3">POLARIZER BUBBLE</td><td colspan="5">φ＜0.15mm</td><td>Ignore</td><td rowspan="3">Note1</td></tr>
<tr><td colspan="5">0.15mm≦φ≦0.5mm</td><td>N≦2</td></tr>
<tr><td colspan="5">0.5mm＜φ</td><td>N=0</td></tr>
<tr><td>Mura</td><td colspan="7">It' OK if mura is slight visible through 6%ND filter</td><td></td></tr>
<tr><td rowspan="8">ELECTRICAL DEFECT</td><td colspan="2" rowspan="2">BRIGHT DOT</td><td colspan="3">A Grade</td><td colspan="3">B Grade</td><td></td></tr>
<tr><td>C Area</td><td>O Area</td><td>Total</td><td>C Area</td><td>O Area</td><td>Total</td><td>Note3</td></tr>
<tr><td colspan="2"></td><td>N≦0</td><td>N≦2</td><td>N≦2</td><td>N≦2</td><td>N≦3</td><td>N≦5</td><td>Note2</td></tr>
<tr><td colspan="2">DARK DOT</td><td>N≦2</td><td>N≦3</td><td>N≦3</td><td>N≦3</td><td>N≦5</td><td>N≦8</td><td></td></tr>
<tr><td colspan="2">TOTAL DOT</td><td colspan="3">N≦4</td><td>N≦5</td><td>N≦6</td><td>N≦8</td><td>Note2</td></tr>
<tr><td colspan="2">TWO ADJACENT DOT</td><td>N≦0</td><td>N≦1 pair</td><td>N≦1 pair</td><td>N≦1 pair</td><td>N≦1 pair</td><td>N≦1 pair</td><td>Note4</td></tr>
<tr><td colspan="2">THREE OR MORE ADJACENT DOT</td><td colspan="6">NOT ALLOWED</td><td></td></tr>
<tr><td colspan="2">LINE DEFECT</td><td colspan="6">NOT ALLOWED</td><td></td></tr>
</table>

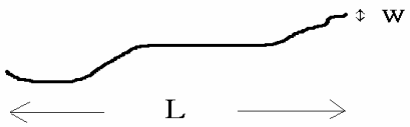
(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

(2) LITTLE BRIGHT DOT ACCEPTABLE UNDER 6 % ND-Filter

[Note1] W : Width[mm], L : Length[mm], N : Number, φ : Average Diameter

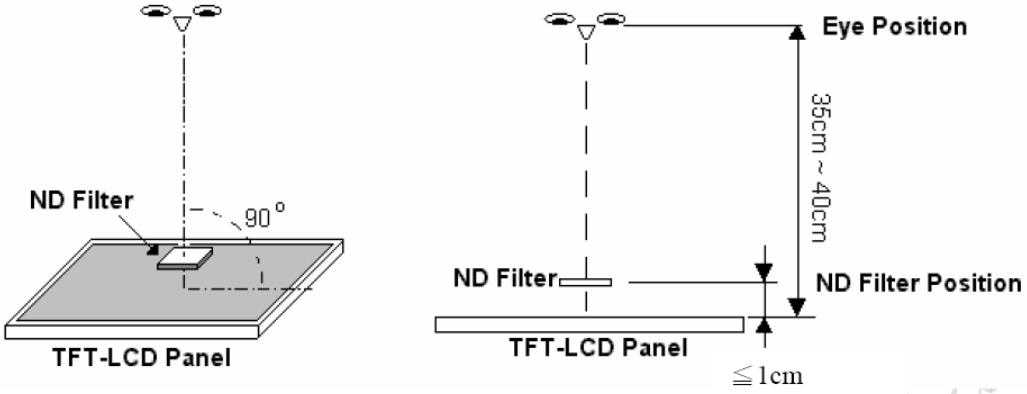


1. (White, black) Spot
2. Polarizer Bubble

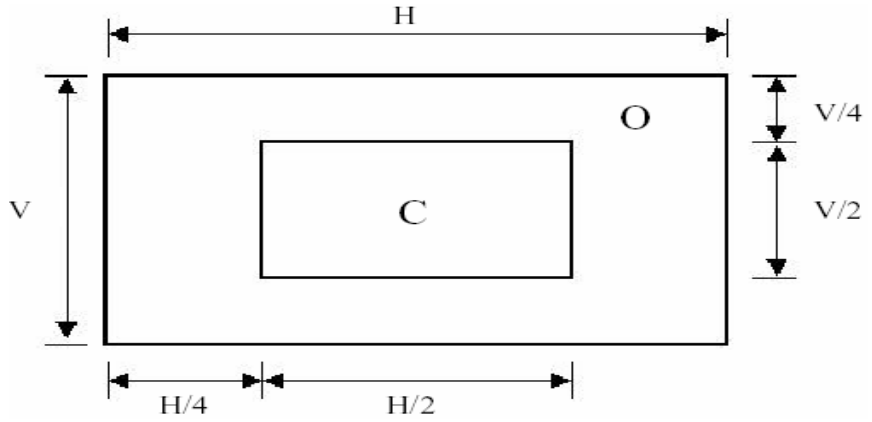


1. fiber

[Note2] Bright dot is defined through 6% transmission ND Filter as following.



[Note3]

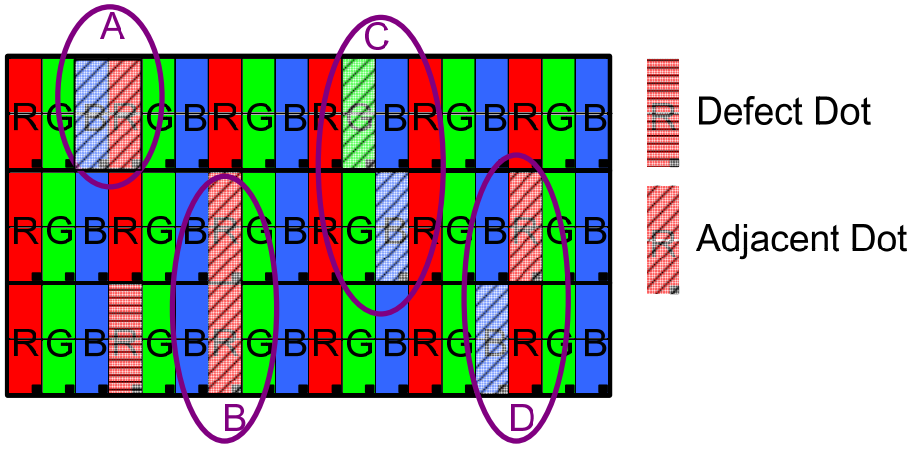


C Area: Center of display area

C Area: Outer of display area

[Note4]

Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dart adjacent dot. And they will be counted 2 defect dots in total quantity.



(1) The defects that are not defined above and considered to be problem shall be reviewed and discussed by both parties.

(2) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

8.6 Reliability Test

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=96 hrs	
Low Temperature Operation	-10±3°C , t=96 hrs	
High Temperature Storage	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-20±3°C , t=96 hrs	1,2
Thermal Shock Test	-10°C ~ 25 °C ~ 70 °C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

9. USE PRECAUTIONS

9.1 Handling precautions

1) The polarizing plate may break easily so be careful when handling it. Do not touch, press or rub it with a hard-material tool like tweezers.
2) Do not touch the polarizing plate surface with bare hands so as not to make it dirty. If the surface or other related part of the polarizing plate is dirty, soak a soft cotton cloth or chamois leather in benzine and wipe off with it. Do not use chemical liquids such as acetone, toluene and isopropyl alcohol. Failure to do so may bring chemical reaction phenomena and deteriorations.
3) Remove any spit or water immediately. If it is left for hours, the suffered part may deform or decolorize.
4) If the LCD element breaks and any LC stuff leaks, do not suck or lick it. Also if LC stuff is stuck on your skin or clothing, wash thoroughly with soap and water immediately.

9.2 Installing precautions

1) The PCB has many ICs that may be damaged easily by static electricity. To prevent breaking by static electricity from the human body and clothing, earth the human body properly using the high resistance and discharge static electricity during the operation. In this case, however, the resistance value should be approx. 1MΩ and the resistance should be placed near the human body rather than the ground surface. When the indoor space is dry, static electricity may occur easily so be careful. We recommend the indoor space should be kept with humidity of 60% or more. When a soldering iron or other similar tool is used for assembly, be sure to earth it.
2) When installing the module and ICs, do not bend or twist them. Failure to do so may crack LC element and cause circuit failure.
3) To protect LC element, especially polarizing plate, use a transparent protective plate (e.g., acrylic plate, glass etc) for the product case.
4) Do not use an adhesive like a both-side adhesive tape to make LCD surface (polarizing plate) and product case stick together. Failure to do so may cause the polarizing plate to peel off.

9.3 Storage precautions

1) Avoid a high temperature and humidity area. Keep the temperature between 0°C and 35°C and also the humidity under 60%.
2) Choose the dark spaces where the product is not exposed to direct sunlight or fluorescent light.
3) Store the products as they are put in the boxes provided from us or in the same conditions as we recommend.

9.4 Operating precautions

1) Do not boost the applied drive voltage abnormally. Failure to do so may break ICs. When applying power voltage, check the electrical features beforehand and be careful. Always turn off the power to the LC module controller before removing or inserting the LC module input connector. If the input connector is removed or inserted while the power is turned on, the LC module internal circuit may break.
2) The display response may be late if the operating temperature is under the normal standard, and the display may be out of order if it is above the normal standard. But this is not a failure; this will be restored if it is within the normal standard.
3) The LCD contrast varies depending on the visual angle, ambient temperature, power voltage etc. Obtain the optimum contrast by adjusting the LC dive voltage.
4) When carrying out the test, do not take the module out of the low-temperature space suddenly. Failure to do so will cause the module condensing, leading to malfunctions.
5) Make certain that each signal noise level is within the standard (L level: 0.2Vdd or less and H level: 0.8Vdd or more) even if the module has functioned properly. If it is beyond the standard, the module may often malfunction. In addition, always connect the module when making noise level measurements.
6) The CMOS ICs are incorporated in the module and the pull-up and pull-down function is not adopted for the input so avoid putting the input signal open while the power is ON.
7) The characteristic of the semiconductor element changes when it is exposed to light emissions, therefore ICs on the LCD may malfunction if they receive light emissions. To prevent these malfunctions, design and assemble ICs so that they are shielded from light emissions.
8) Crosstalk occurs because of characteristics of the LCD. In general, crosstalk occurs when the regularized display is maintained. Also, crosstalk is affected by the LC drive voltage. Design the contents of the display, considering crosstalk.

9.5 Other

1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.
3) AMIPRE will provide one year warranty for all products and three months warrantee for all repairing products.

New Text

10. OUTLINE DIMENSION