



晶采光電科技股份有限公司  
AMPIRE CO., LTD.

## SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AM-800480STMQW-00</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

Approved For Specifications

**Approved For Specifications & Sample**

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## RECORD OF REVISION

<b>Revision Date</b>	<b>Page</b>	<b>Contents</b>	<b>Editor</b>
2009/10/13	--	New Release	John
2010/04/20	--	Rename to AM-800480STMQW-00.	Emil
2010/12/14	3	Added view direction	Eric
	13	Modify IIS of bright and dark dot.	Eric

## 1. INTRODUCTION

Ampire 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, timing controller . This TFT-LCD has a high resolution (800(R.G.B) X 480) and can display up to 262,144 colors .

### 1-1. Features

- 7" WVGA (16:9 diagonal) configuration
- Input interface voltage : 3.3V
- Data enable mode

### 1-2. Applications

- Portable TV
- Car user DVD
- Industrial application
- HMI (Human machine interface)

## 2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	800RGB (W) x 480(H)	dots
Active area	152.4 (W) x 91.44 (H)	mm
Pixel pitch	0.1905 (W) x 0.1905 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	165.0(W)x104.44(H)X5.2(T)	mm
View direction	6 O'clock	
Brightness	350 nit	cd/m <sup>2</sup>
Contrast ratio	400 : 1	
Backlight unit	LED	
Display color	262,144	colors

### 3. ABSOLUTE MAX. RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT
Power Supply Voltage for LCD	Vcc	-0.5	6.0	V
Signal input voltage	DCLK DE R0~R5 G0~G5 B0~b5	-0.5	VCC+0.3	V
Operation Temperature	Top	-20	70	°C
Storage Temperature	Tstg	-30	80	°C

The following values are maximum operation conditions , If exceeded , it may cause faulty operation or damage

## 4. ELECTRICAL CHARACTERISTICS

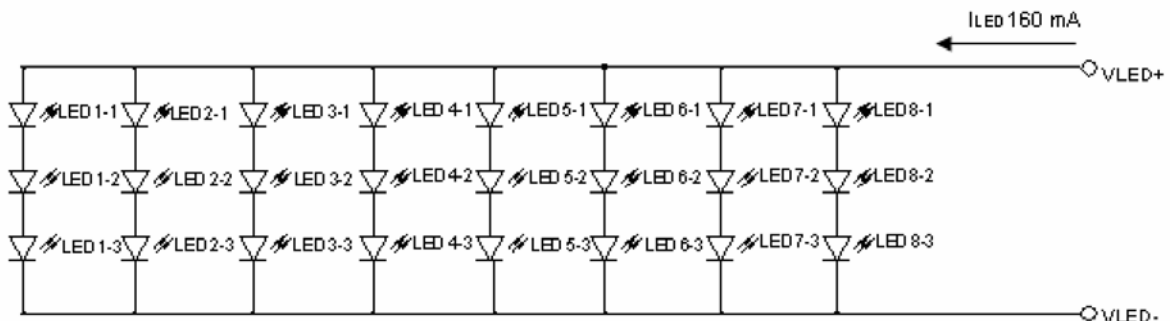
### 4-1 TFT LCD Module voltage

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
Power Supply Voltage For LCD		V <sub>CC</sub>	3.0	3.3	3.6	V	
Power Supply Current For LCD		I <sub>CC</sub>	-	200	260	mA	V <sub>CC</sub> =3.3V
LED Backlight Voltage		V <sub>BL</sub>	-	9.9	-	V	For reference
LED Backlight Current		I <sub>BL</sub>	-	160	-	mA	
Logic Input Voltage	Input Voltage	V <sub>IN</sub>	0	-	V <sub>CC</sub>	V	
	Threshold Voltage(High)	V <sub>TH</sub>	0.7V <sub>CC</sub>	-	V <sub>CC</sub>	V	
	Threshold Voltage(Low)	V <sub>TL</sub>	0	-	0.3V <sub>CC</sub>	V	

### 4-2 LED Driving Conditions

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
LED Backlight Voltage	V <sub>BL</sub>	-	9.9	-	V	Note1
LED Backlight Current	I <sub>BL</sub>	-	160	-	mA	
LED Life Time	-	10000	20000		Hr	Note2

Note 1 : There are 8 Groups LED shown as below , V<sub>LED</sub>=9.9V , I<sub>LED</sub>=160mA.



Note 2 : Brightness to be decreased to 50% of the initial value.

## 5. INTERFACE

Pin no	Symbol	Function
1	GND	Ground
2	GND	Ground
3	NC	No connection
4	VCC	Power supply for Digital Circuit
5	VCC	Power supply for Digital Circuit
6	VCC	Power supply for Digital Circuit
7	VCC	Power supply for Digital Circuit
8	NC	No connection
9	DE	Data Enable Timing Signal
10	GND	Ground
11	GND	Ground
12	GND	Ground
13	B5	Blue data (MSB)
14	B4	Blue data
15	B3	Blue data
16	GND	Ground
17	B2	Blue data
18	B1	Blue data
19	B0	Blue data (LSB)
20	GND	Ground
21	G5	Green data (MSB)
22	G4	Green data
23	G3	Green data
24	GND	Ground
25	G2	Green data
26	G1	Green data
27	G0	Green data (LSB)
28	GND	Ground
29	R5	Red data (MSB)
30	R4	Red data
31	R3	Red data
32	GND	Ground
33	R2	Red data
34	R1	Red data
35	R0	Red data (LSB)
36	GND	Ground
37	GND	Ground
38	DCLK	Data Clock :Latch Data at Falling Edge
39	GND	Ground
40	GND	Ground

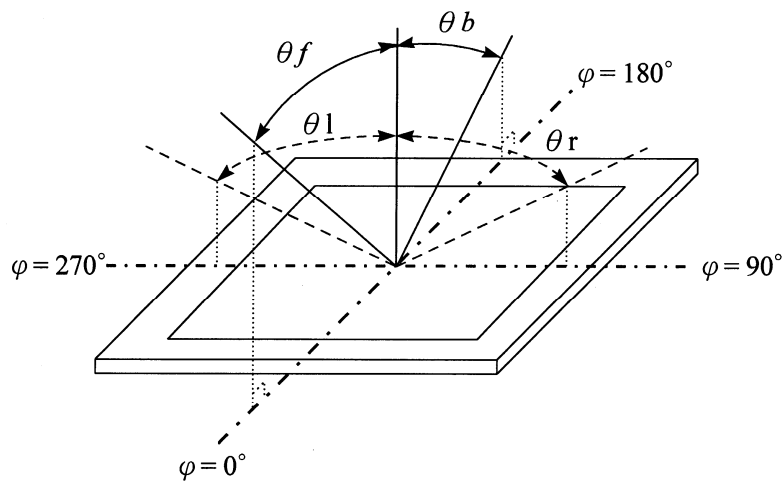
Note: User's connector part number is **PF050-40ZSG-F09-S** manufactured by UJU or equivalent.

## 6. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Viewing Angle	Front	$\theta f$	$CR \geq 10$	50	60	--	deg.	(1)(2)(3)
	Back	$\theta b$		60	70	--		
	Left	$\theta l$		60	70	--		
	Right	$\theta r$		60	70	--		
Contrast ratio	CR	$\Theta = \Phi = 0^\circ$	250	400	--	--	(1)(3)	
Response Time	$T_r$	$\Theta = \Phi = 0^\circ$	--	5	10	ms	(1)(4)	
	$T_f$		--	11	16	ms	(1)(4)	
Color chromaticity	White	$W_x$	0.249	0.299	0.349	--	(1)	
		$W_y$	0.278	0.328	0.378			
Luminance	L	$\Theta = \Phi = 0^\circ$	300	350	--	cd/m <sup>2</sup>	(1)(5)	
Luminance Uniformity	$\Delta L$	$\Theta = \Phi = 0^\circ$	70	--	--	%	(1)(5)(6)	

Note 1:  $T_a = 25^\circ\text{C}$ . To be measured on the center area of panel after 10 minutes operation.

Note 2: Definition of Viewing Angle



Note 3: Definition of contrast ratio:

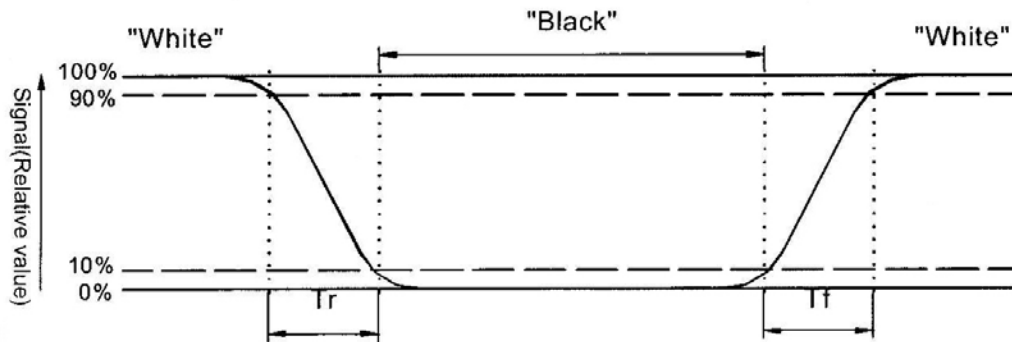
Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector Output when LCD is at "Black" state}}$$

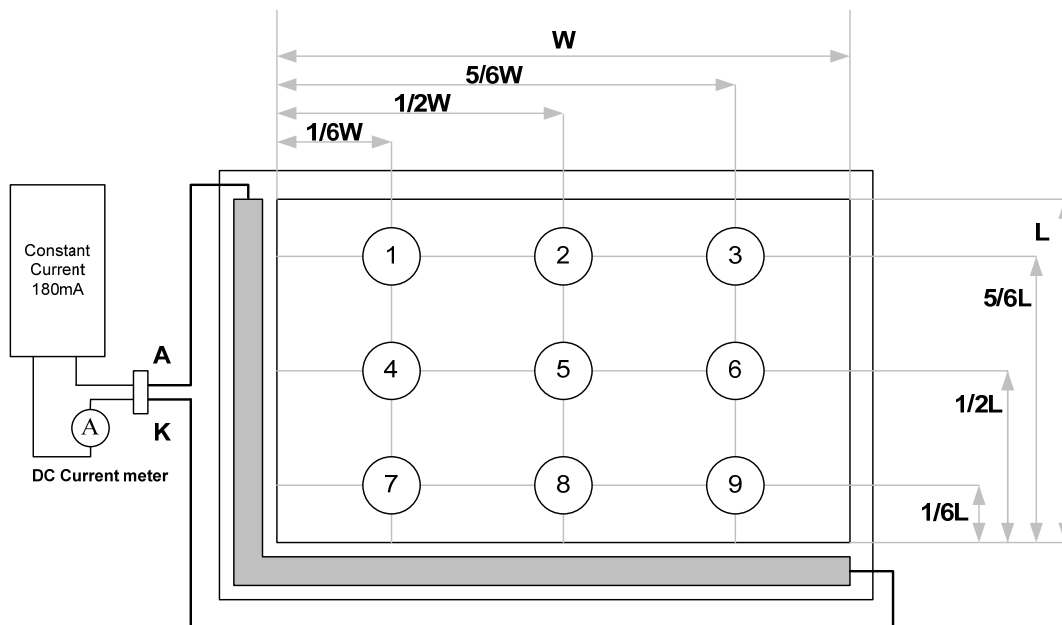
Note 4: Definition of response time:

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.



Note 5 : Luminance is measured at point 5 of the display.



Note 6 : Definition of Luminance Uniformity

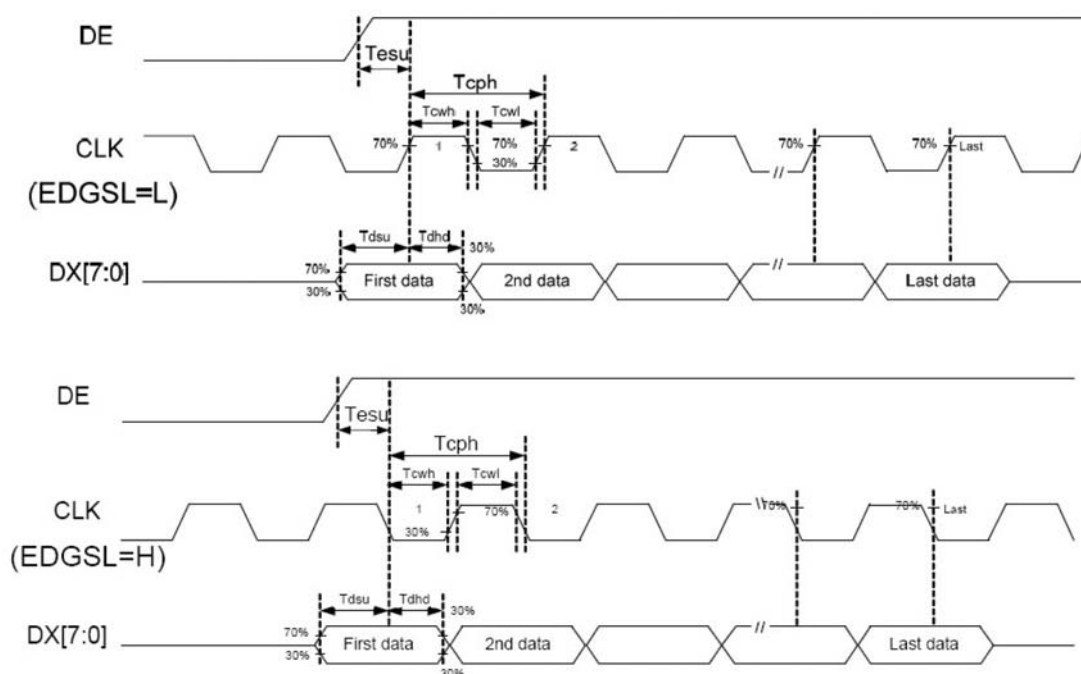
$$\Delta L = [ L(\text{min.}) \text{ of } 9 \text{ points} / L(\text{max.}) \text{ of } 9 \text{ points}] \times 100\%$$

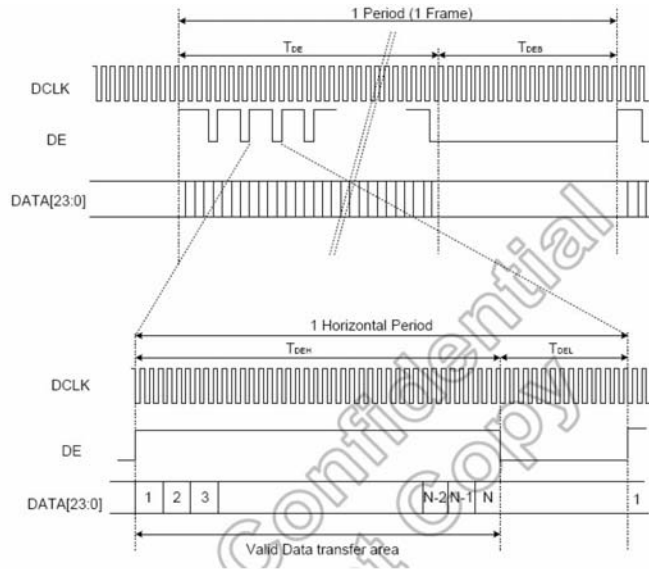


## 7. INPUT SIGNAL ( DE ONLY MODE )

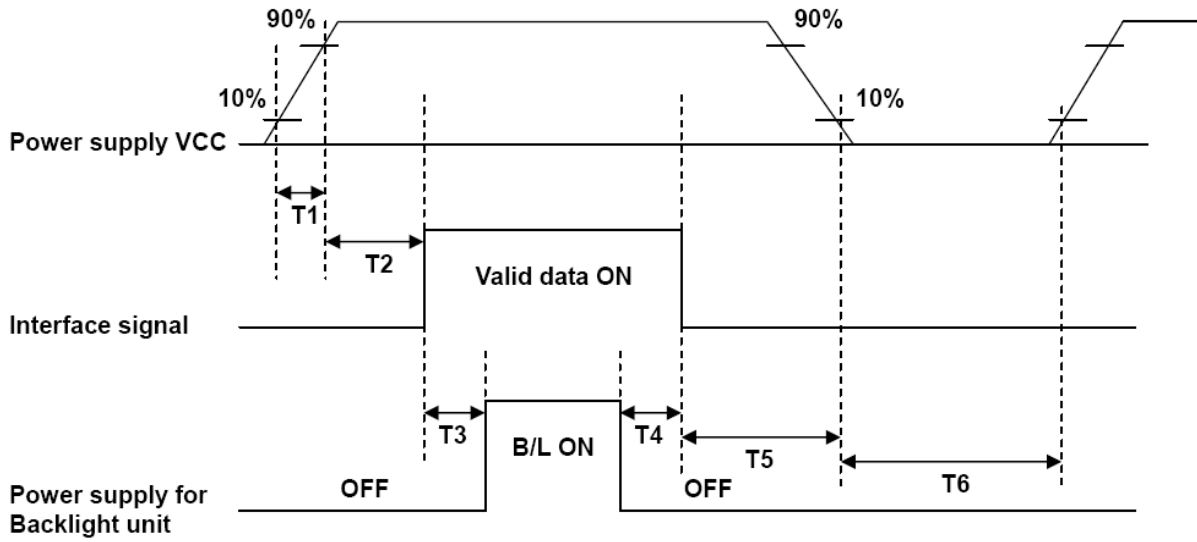
Parameter	Symbol	Rating			Unit
		Min.	Typ.	Max.	
Data setup time	Tdsu	6	-	-	ns
Data hold time	Tdhd	6	-	-	Tcph
DE setup time	Tesu	6	-	-	Tcph
CLK frequency	F <sub>CPH</sub>		33.26		MHz
CLK period	T <sub>CPH</sub>		30.06		ns
CLK pulse duty	T <sub>CWH</sub>	40	50	60	%
DE period	T <sub>DEH</sub> +T <sub>DEL</sub>	1000	1056	1200	T <sub>CPH</sub>
DE pulse width	T <sub>DEH</sub>	-	800	-	T <sub>CPH</sub>
DE frame blanking	T <sub>DEB</sub>	10	45	110	T <sub>DEH</sub> +T <sub>DEL</sub>
DE frame width	T <sub>DE</sub>	-	480	-	T <sub>DEH</sub> +T <sub>DEL</sub>

Note : We suggest using the typical value, so it can have better performance.



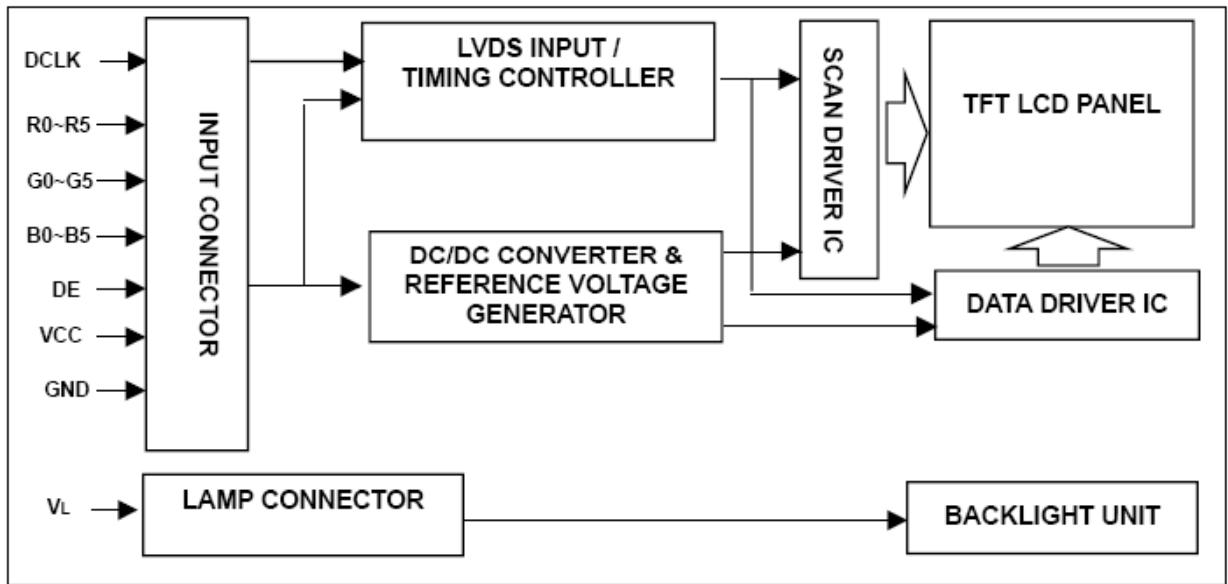


### Power Sequence



Parameter	SPEC.			Unit
	Min.	Typ.	Max.	
T1	1		2	ms
T2	0	60		ms
T3	200			ms
T4	200			ms
T5	1			ms
T6	1000			ms

## 8. BLOCK DIAGRAM



## 9. QUALITY AND RELIABILITY

### 9.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature :  $25 \pm 5^{\circ}\text{C}$

Humidity :  $60 \pm 25\% \text{ RH}$ .

### 9.2 SAMPLING PLAN

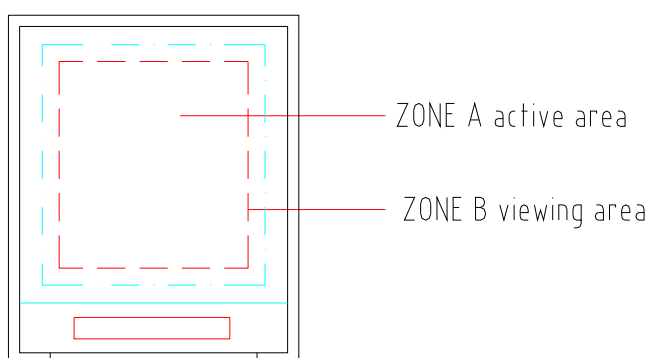
Sampling method shall be in accordance with MIL-STD-105E , level II, normal single sampling plan .

### 9.3 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.

### 9.4 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.



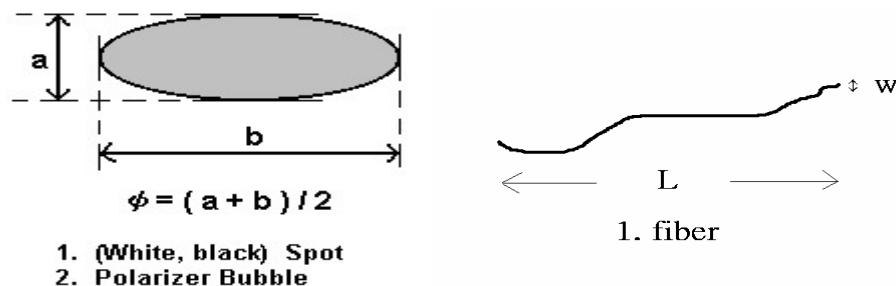
## 9.5 Incoming Inspection Standard

Defect Type			Limit		Note
Visual Defect	Internal	Spot	$\phi < 0.15\text{mm}$	Ignore	(1)
			$0.15\text{mm} \leq \phi \leq 0.5\text{mm}$	$N \leq 4$	
			$0.5\text{mm} < \phi$	$N=0$	
		Fiber	$0.1\text{mm} < W \leq 0.5\text{mm},$ $L \leq 1.5\text{mm}$	$N \leq 4$	(1)
			$1.0\text{mm} < W, 1.5\text{mm} < L$	$N=0$	
		Polarizer Bubble	$\phi < 0.15\text{mm}$	Ignore	(1)
			$0.15\text{mm} \leq \phi \leq 0.5\text{mm}$	$N \leq 4$	
			$0.5\text{mm} < \phi$	$N=0$	
		Mura	It' OK if mura is slight visible through 6%ND filter		
Electrical Defect	Bright Dot		Random	(3)	
			$N \leq 3$	(2)	
	Dark Dot		$N \leq 5$		
	Total Dot		$N \leq 7$	(2)	
	Two Adjacent Dot		$N \leq 1$ pair	(4)	
	Three or More Adjacent Dot		Not Allowed		
	Line Defect		Not Allowed		

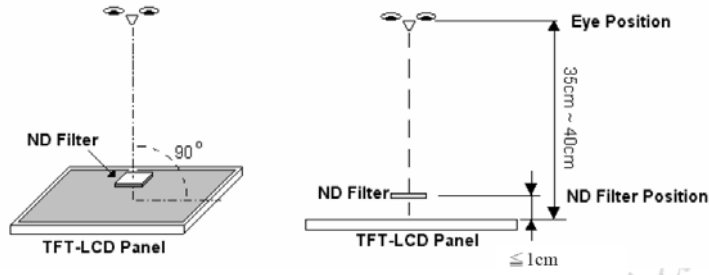
(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

(2) LITTLE BRIGHT DOT acceptable under 6% ND-Filter

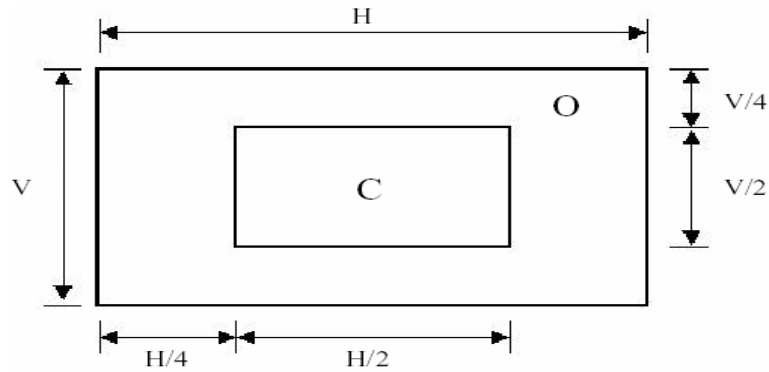
**[Note1]** W : Width[mm], L : Length[mm], N : Number,  $\phi$ : Average Diameter



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



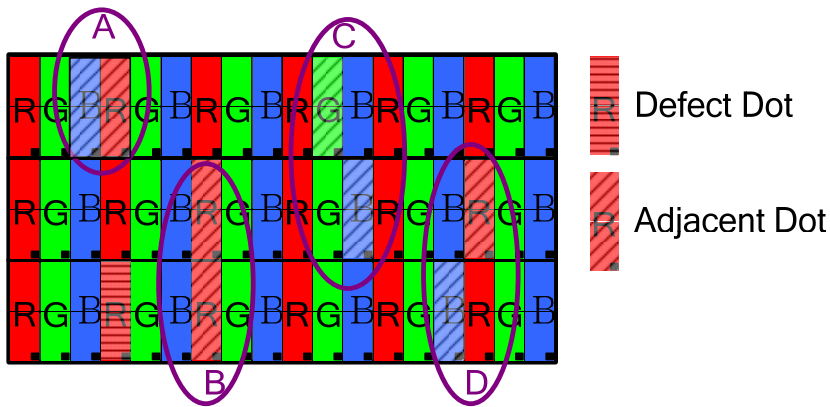
**[Note3]**



**C Area: Center of display area**  
**O 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 dark 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.

## 9.6 RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C ,Dry t=240 hrs	
Low Temperature Operation	-20±3°C, Dry t=240 hrs	
High Temperature Storage	80±3°C , Dry t=240 hrs	1,2
Low Temperature Storage	-30±3°C ,Dry t=240 hrs	1,2
Thermal Shock Test	-15°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. ( 1 cycle ) Total 100 cycle(Dry)	1,2
Humidity Test	60 °C, Humidity 90%, 240 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.

## **10. USE PRECAUTIONS**

### **10-1 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 benzene 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.
- (1) 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.

### **10-2 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.  $1M\Omega$  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

### **10-3 Storage precautions**

- (1) Avoid a high temperature and humidity area. Keep the temperature between  $0^{\circ}\text{C}$  and  $35^{\circ}\text{C}$  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.



#### **10-4 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 drive 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:  $0.2V_{dd}$  or less and H level:  $0.8V_{dd}$  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.

#### **10-5 Other**

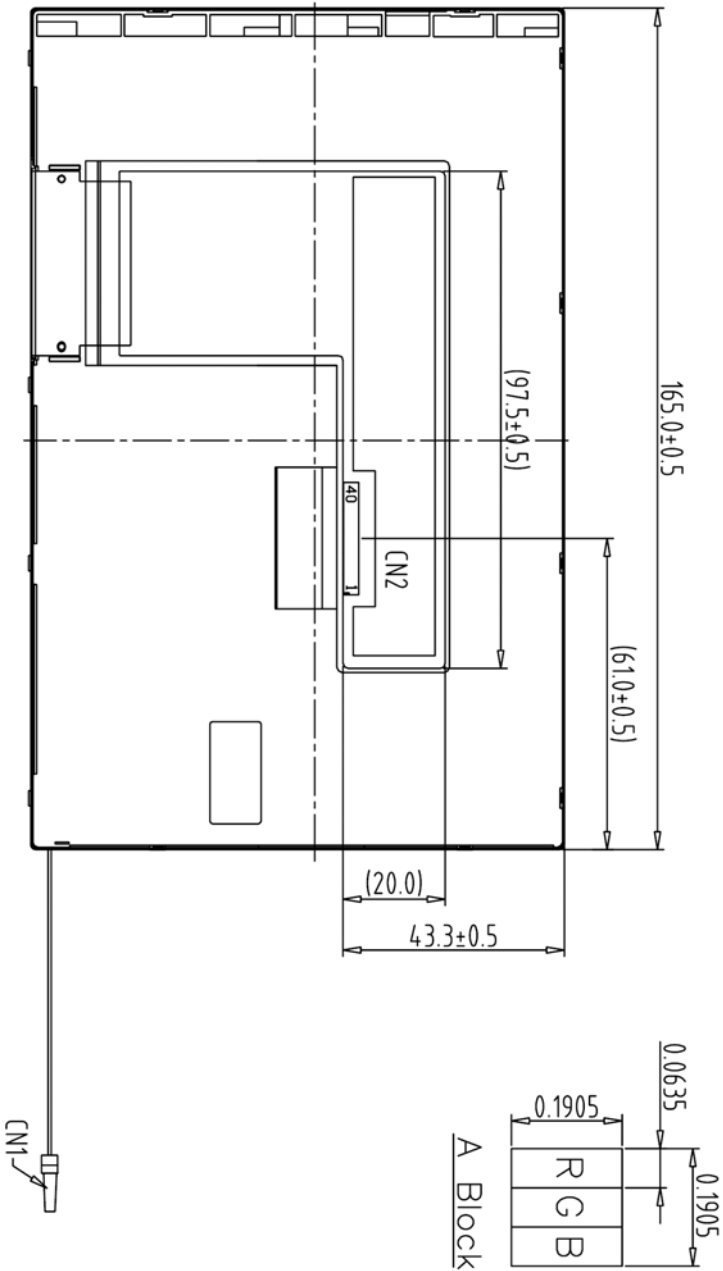
- (1) Do not disassemble or take the LC module into pieces. The LC modules once disassembled or taken into pieces are not the guarantee articles.
- (2) The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is 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 warranty for all repairing products..



REV	REVISION RECORD	DATE/NAME
0	NEW RELEASE	08-27-09/EMILY

1	VLED+	Red,LED_Anode
2	VLED-	White,LED_Cathode

1	GND	21	G5
2	GND	22	G4
3	NC	23	G3
4	VCC	24	GND
5	VCC	25	G2
6	VCC	26	G1
7	VCC	27	G0
8	NC	28	GND
9	DE	29	R5
10	GND	30	R4
11	GND	31	R3
12	GND	32	GND
13	B5	33	R2
14	B4	34	R1
15	B3	35	R0
16	GND	36	GND
17	B2	37	GND
18	B1	38	DCLK
19	B0	39	GND
20	GND	40	GND



Back View

- Note:
1. Unless indicated, Tolerance "±0.3"
  2. UV Glue For OLB Protection.
  3. CN1:BHSR-02YS-1 or Equivalent
  4. CN2:UJU PF050-40ZSG-F09-S or Equivalent
  5. LCD 800X3(R,G,B)x480=> 7.0" Digital TFT LCD

			TOLERANCE GRADE(±)	A	B	DIM.	MM	DWN.	EMILY	DATE	TITLE
1	7		~6	0.05	0.1	IE NO.		CHK.		DATE	800480S
2	8		6~18	0.08	0.18						(7.0")
3	9		18~50	0.1	0.25	PARTS NO.	LCM-1	APPD.			*090846MA
4	10		50~180	0.2	0.4		800480S				SHEET 1 OF 1
5	11		180~	0.3	0.5						
6	12										