



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-640480GHTNQW-T00H</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

Approved For Specifications

Approved For Specifications & Sample

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## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2009/3/6	--	New Release	John
2009/4/29	6	Re-modify T/P Interface Symbol	John
2011/02/15	13	Mention LED life time.	Emil
2012/01/31	6	Included the touch panel layout.	Emil

## 1. Features

5.7 inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 5.7" TFT-LCD panel, a driver circuit, touch panel and backlight unit.

- (1) Construction: 5.7" a-Si color TFT-LCD, LED Backlight, touch panel and PCB.
  - (2) Resolution (pixel): 640(R.G.B) X 480
  - (3) Number of the Colors : 262K colors ( R , G , B 6 bit digital each)
  - (4) LCD type : Transmissive Color TFT LCD (normally White)
  - (5) Interface: 40 pin
  - (6) Power Supply Voltage: 3.3V single power input. Built-in power supply circuit.
- Viewing Direction: 12 O'clock ( The direction it's hard to be discolored )

## 2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	640RGB (W) x 480(H)	dots
Display area	115.2 (W) x 86.4 (H)	mm
Pixel pitch	0.1815 (W) x 0.1815 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	131.0(W)x102.2(H)x13.17(D)---(Typ)	mm
Brightness	270	cd/m <sup>2</sup>
Contrast ratio	250 : 1	
Backlight unit	LED	

## 3. ABSOLUTE MAXIMUM RATINGS

### 3.1 Absolute max. ratings

#### 3.1.1 Electrical Absolute max. ratings

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Power Supply Voltage	Vcc	-0.5	5	V	
Signal Input Voltage		-0.5	Vcc + 0.5	V	Note 1

Note 1: Hsync, Vsync, DTMG, DCLK, R0~R5, G0~G5, B0~B5

### 3.1.2 Environmental Absolute max. ratings

Item	OPERATING		STORAGE		Remark
	MIN	MAX	MIN	MAX	
Temperature	-20	70	-30	80	Note2,3,4,5,6,7
Humidity	Note1		Note1		
Corrosive Gas	Not Acceptable		Not Acceptable		

Note1 :  $T_a \leq 40^\circ\text{C}$  : 85% RH max

$T_a > 40^\circ\text{C}$  : Absolute humidity must be lower than the humidity of 85%RH at  $40^\circ\text{C}$

Note2 : For storage condition  $T_a$  at  $-30^\circ\text{C} < 48\text{h}$  , at  $80^\circ\text{C} < 100\text{h}$

For operating condition  $T_a$  at  $-20^\circ\text{C} < 100\text{h}$

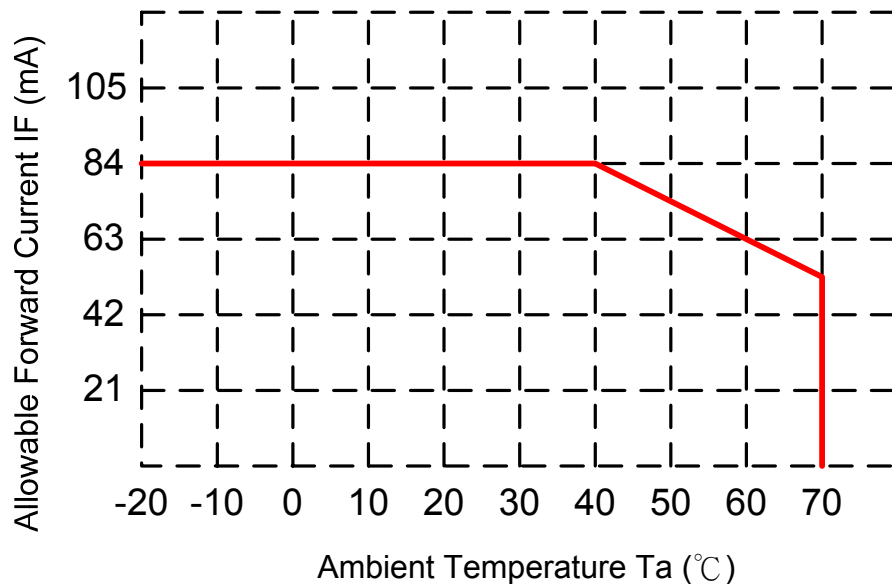
Note3 : Background color changes slightly depending on ambient temperature.

This phenomenon is reversible.

Note4 : The response time will be slower at low temperature.

Note5 : Only operation is guaranteed at operating temperature. Contrast , response time, another display quality are evaluated at  $+25^\circ\text{C}$

Note6 : When LCM is operated over  $40^\circ\text{C}$  ambient temperature, the  $I_{\text{LED}}$  of the LED back-light should be follow :



Note7 : This is panel surface temperature, not ambient temperature.

Note8 : When LCM be operated over than  $40^\circ\text{C}$  , the life time of the LED back-light will be reduced.

## 4. ELECTRICAL CHARACTERISTICS

### 4-1 DC Electrical characteristic of the LCD

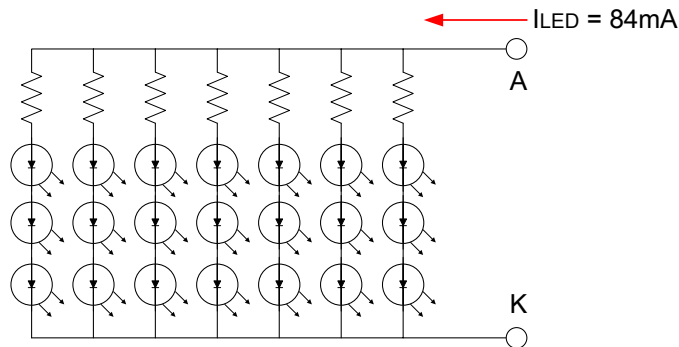
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Power Voltage For LCD	$V_{CC}$	3.0	3.3	3.6	V	
Logic Input Voltage	$V_{IH}$	$V_{CC} * 0.7$	--	$V_{CC}$	V	Note1
	$V_{IL}$	0	--	$V_{CC} * 0.3$	V	
LCD Power Current	$I_{CC}$	--	82	--	mA	Note2

Note1: Hsync, Vsync, DTMG, DCLK, R0~R5, G0~G5, B0~B5

Note2:  $f_V = 60\text{Hz}$  ,  $T_a = 25^\circ\text{C}$  , Display pattern : All Black

### 4-2 Electrical characteristic of LED Back-light

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
LED voltage	$V_{AK}$	9.0	9.12	9.24	V	$I_{LED} = 84\text{mA}$ , $T_a = 25^\circ\text{C}$
LED forward current	$I_{LED}$	--	84	91	mA	$T_a = 25^\circ\text{C}$



### 4-3 Touch Panel Electrical Specification

Parameter	Condition	Standard Value
Terminal Resistance	X Axis	340 ~ 1090 Ω
	Y Axis	180 ~ 470 Ω
Insulating Resistance	DC 25 V	More than 20MΩ
Linearity	--	±1.5 %
Pen writing Durability	Note a	100,000 times(min)
Input life by finger	Note b	1,000,000 times (min)

#### Note A .

Writing length 35 mm.

Writing speed: 300mm/sec.

Shape of pen end : R0.8

Load : 250 g

#### Note B

By Silicon rubber tapping at same point

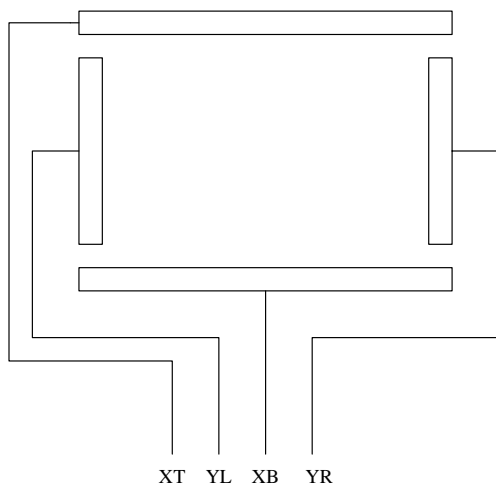
Shape of rubber end : R8

Load : 200g

Frequency : 5 Hz

#### Interface

No.	Symbol	Function
1	YR	Touch Panel Right Signal
2	XB	Touch Panel Bottom Signal
3	YL	Touch Panel Left Signal
4	XT	Touch Panel Top Signal

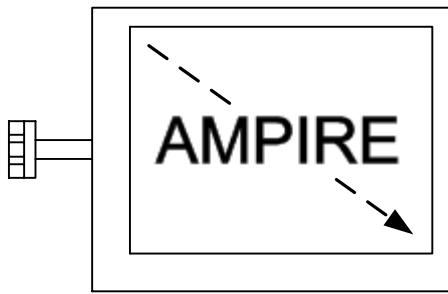


## 5. INTERFACE

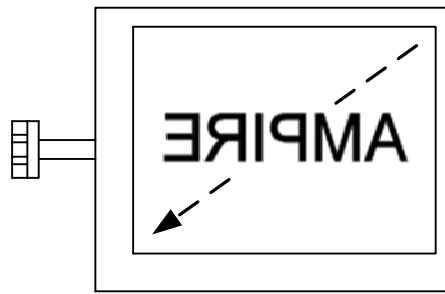
Pin No	Symbol	Function
1	VDD	Power Supply for Logic
2	VDD	
3	U/D	Vertical Display mode Control (Note 1)
4	L/R	Horizontal Display mode Control (Note 1)
5	VSYNC	Vertical Sync Pulse (Note 2)
6	DEN	Timing Signal for Data (Note 2)
7	VSS	GND
8	DCLK	Dot Clock
9	VSS	GND
10	HSYNC	Horizontal Sync Pulse (Note 2)
11	VSS	GND
12	B5	Blue Data
13	B4	
14	B3	
15	VSS	GND
16	B2	Blue Data
17	B1	
18	B0	
19	VSS	GND
20	G5	Green Data
21	G4	
22	G3	
23	VSS	GND
24	G2	Green Data
25	G1	
26	G0	
27	VSS	GND
28	R5	Red Data
29	R4	
30	R3	
31	VSS	GND
32	R2	Red Data
33	R1	
34	R0	
35	NC	No Connection
36	VSS	GND
37	YR	Touch Panel Right Signal
38	YL	Touch Panel Left Signal
39	XT	Touch Panel Top Signal
40	XB	Touch Panel Bottom Signal

Note 1: Vertical Display mode and Horizontal Display mode control.

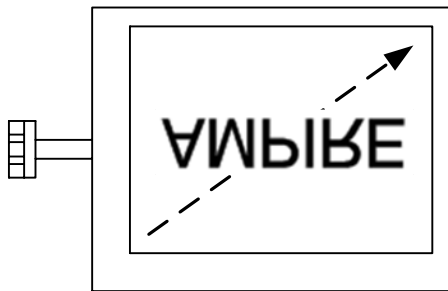
L/R : H, U/D : H



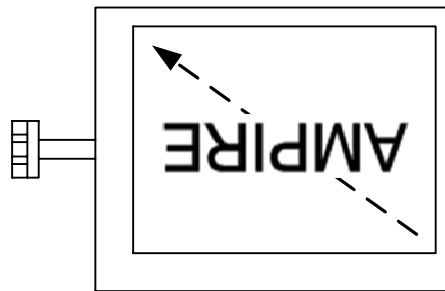
L/R : L, U/D : H



L/R : H, U/D : L



L/R : L, U/D : L



Note 2: It will auto detect which mode is used. If DEN signal is fixed low, SYNC mode is used. Otherwise, DE mode is used.

- (1) Use DE mode : DEN only, VSYNC and HSYNC short to GND
- (2) Use SYNC mode : VSYNC and HSYNC only, DEN short to GND.



## 6. INPUT SIGNAL :

### 6-1 Timing Specification.

#### 6.1.1 AC Electrical Characteristics

PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max	
HS setup time	$T_{HST}$	10			ns
HS hold time	$T_{HHD}$	10			ns
VS setup time	$T_{VST}$	10			ns
VS hold time	$T_{VHD}$	10			ns
Data setup time	$T_{DSU}$	10			ns
Date hold time	$T_{DHD}$	10			ns
DEN setup time	$T_{ESU}$	10			ns

#### 6.1.2 Digital Parallel RGB interface

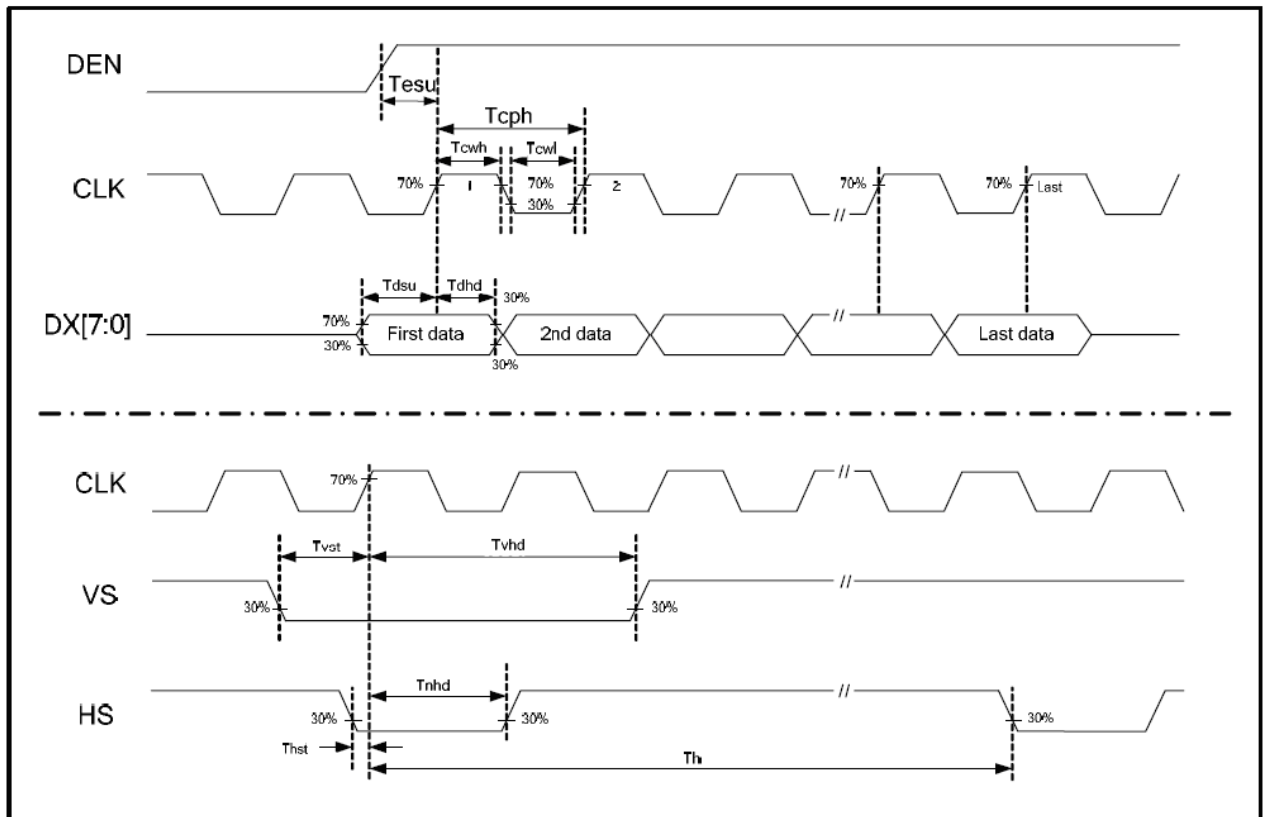
PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max	
CLK frequency	$F_{CPH}$		25.175		MHz
CLK period	$T_{CPH}$	-	39.7	-	ns
CLK pulse duty	$T_{CWH}$	40	50	60	%
HS period	$T_H$	-	800	-	$T_{CPH}$
HS pulse width	$T_{WH}$	5	30	-	$T_{CPH}$
HS-first horizontal data time	$T_{HS}$	112	144	175	$T_{CPH}$
DEN pulse width	$T_{EP}$	-	640	-	$T_{CPH}$
VS pulse width	$T_{WV}$	1	3	5	$T_H$
VS-DEN time	$T_{STV}$	-	35	-	$T_H$
VS period	$T_V$	-	525	-	$T_H$

**Note:** When SYNC mode is used, 1st data start from 144th CLK after HS falling (when  $STHD[5:0]=00000$ )

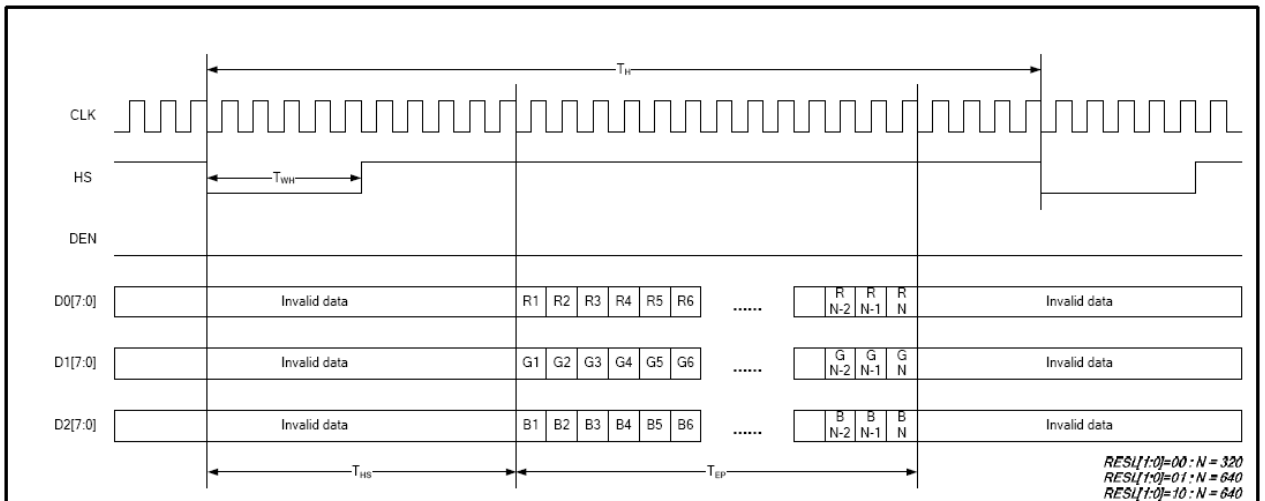
PARAMETER	Symbol	Spec.			Unit
		Min.	Typ.	Max	
OEV pulse width	$T_{OEV}$		100	-	$T_{CPH}$
CKV pulse width	$T_{CKV}$	-	96	-	$T_{CPH}$
HS-CKV time	$T_1$	-	52	-	$T_{CPH}$
HS-OEV time	$T_2$	-	8	-	$T_{CPH}$
HS-POL time	$T_3$	-	72	-	$T_{CPH}$
STV setup time	$T_{SUV}$	-	46	-	$T_{CPH}$
STV pulse width	$T_{WSTV}$	-	1	-	$T_H$

## 6-2 Timing chart

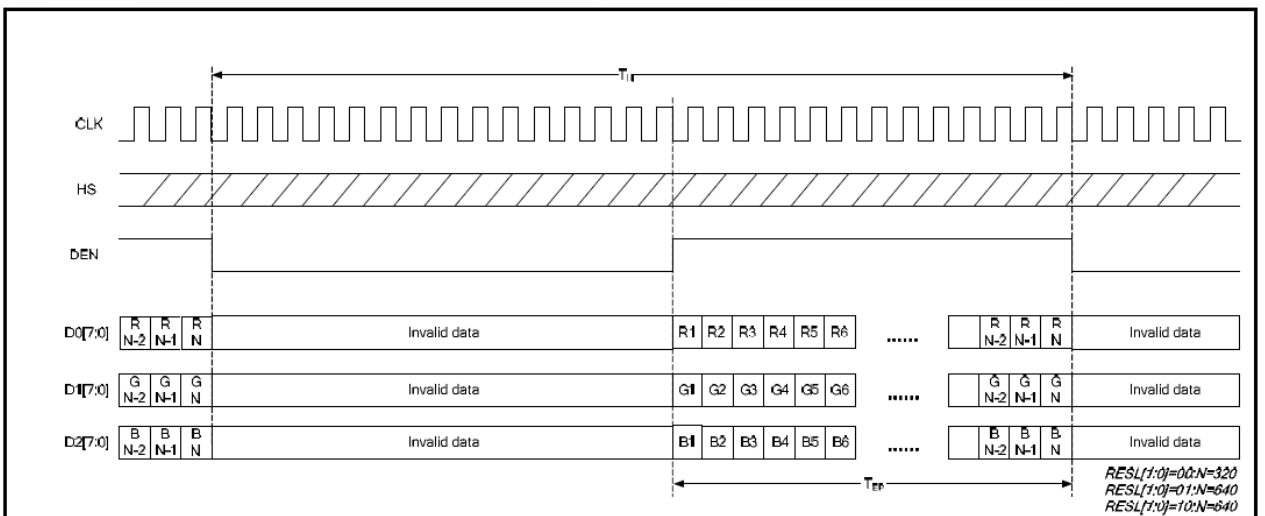
### Clock and Data input waveforms



### Parallel RGB SYNC Mode Horizontal Data Format



### Parallel RGB DE Mode Horizontal Data Format



### 6-3 Color Data Assignment

COLOR	Input Data	R DATA						G DATA						B DATA					
		R5 MSB	R4	R3	R2	R1	R0 LSB	G5 MSB	G4	G3	G2	G1	G0 LSB	B5 MSB	B4	B3	B2	B1	B0 LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN (2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GREEN (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
BLUE	BLUE (0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

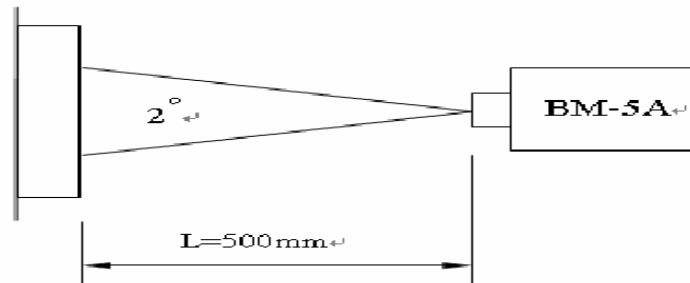
NOTE : (1) Definition of Gray Scale , Color(n) : n is series of Gray Scale  
The more n value is the bright Gray Scale  
(2) Data : 1-High , 0-Low

## 7. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast ratio		CR	Point - 5 $\Theta = \Phi = 0^\circ$	200	250	--	--	(1)(2)(3)
Luminance		Lw		160	270	-	cd/m <sup>2</sup>	(1)(3)
Luminance Uniformity		$\Delta L$		70	75	-	%	(1)(3)
Response Time ( White – Black )		$T_r + T_f$		--	50	--	ms	(1)(3)(5)
Viewing Angle	Vertical	$\Theta$	CR $\geq$ 10 Point – 5	80	100	-	Deg.	(1)(2)(4)
	Horizontal	$\Phi$		120	140	-		
Color chromaticity	Red	Rx	Point - 5 $\Theta = \Phi = 0^\circ$	0.566	0.616	0.666	--	(1)(3)
		Ry		0.302	0.352	0.402		
	Green	Gx		0.308	0.358	0.408		
		Gy		0.518	0.568	0.618		
	Blue	Bx		0.096	0.146	0.196		
		By		0.086	0.136	0.186		
	White	Wx		0.296	0.346	0.396		
		Wy		0.328	0.378	0.428		
Life time		Ta = 25°C	--	50K	--	Hour	(6)	

NOTE :

- (1) Measure conditions : 25°C ± 2°C , 60 ± 10%RH under 10Lux , in the dark room by BM-7TOPCON), viewing 2° , VCC=3.3V , VDD=3.3V



- (2) Definition of Contrast Ratio :

$$\text{Contrast Ratio (CR)} = (\text{White}) \text{ Luminance of ON} \div (\text{Black}) \text{ Luminance of OFF}$$

- (3) Definition of Luminance :

Definition of Luminance Uniformity

Measure white luminance on the point 5 as figure9-1

Measure white luminance on the point 1 ~ 9 as figure9-1

$$\Delta L = [ L(\text{MIN}) / L(\text{MAX}) ] \times 100\%$$

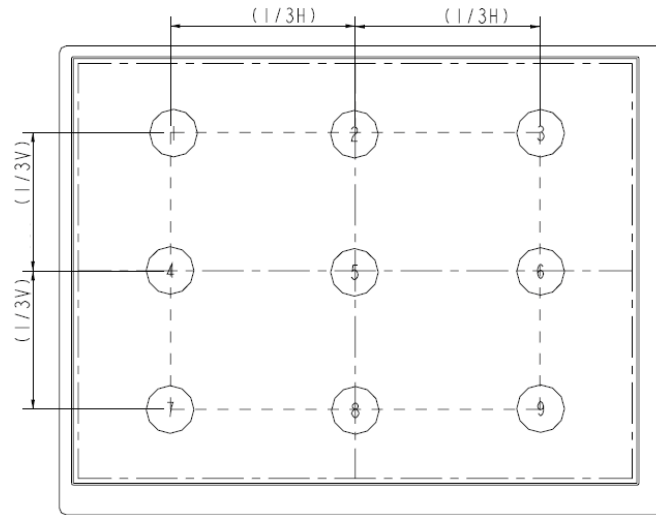


Fig9-1 Measuring point

(4) Definition of Viewing Angle( $\Theta, \Phi$ ), refer to Fig9-2 as below :

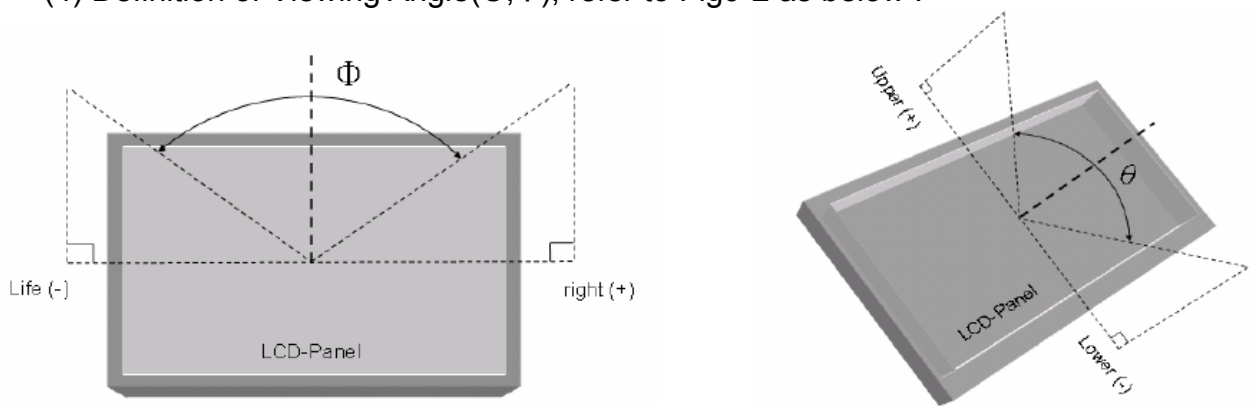


Fig9-2 Definition of Viewing Angle

(5) Definition of Response Time.(White – Black)

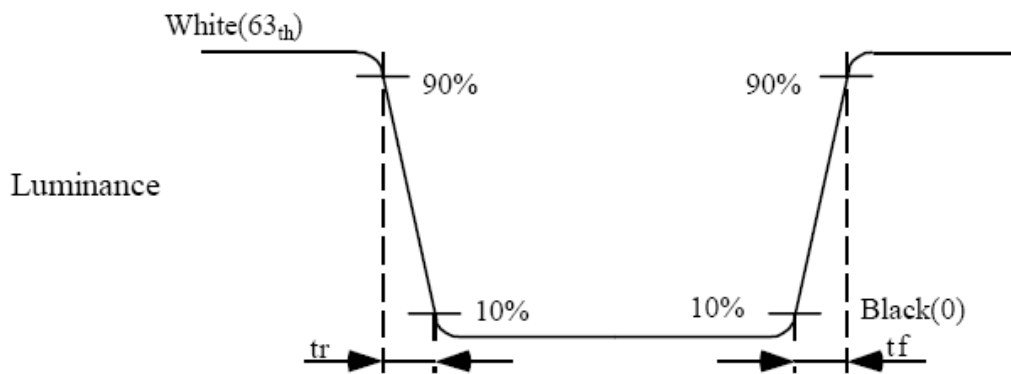


Fig9-3 Definition of Response Time(White-Black)

(6) End of Life shall be determined by the time when any of the following is satisfied under continuous lighting at 25°C

- Intensity drops to 50% of the Initial Value (Min. Luminance)
- Based on LED
- It is an estimative value

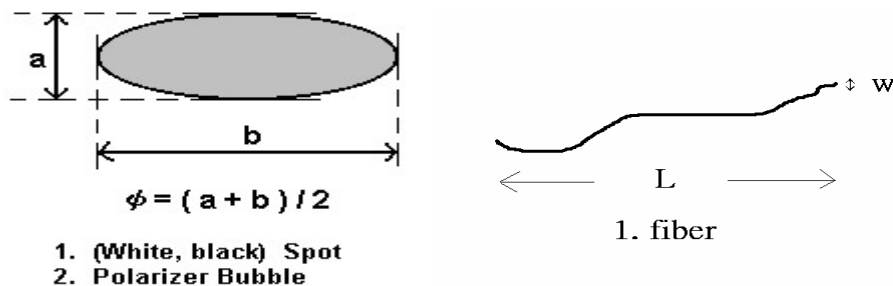
## 8. INCOMING INSPECTION STANDARD FOR TFT-LCD PANEL

DEFECT TYPE			LIMIT			Note		
VISUAL DEFECT	INTERNAL	SPOT	$\phi < 0.15\text{mm}$	Ignore		Note1		
			$0.15\text{mm} \leq \phi \leq 0.5\text{mm}$	$N \leq 4$				
			$0.5\text{mm} < \phi$	$N = 0$				
		FIBER	$0.03\text{mm} < W \leq 0.1\text{mm},$ $L \leq 5\text{mm}$	$N \leq 3$		Note1		
			$1.0\text{mm} < W, 1.5\text{mm} < L$	$N = 0$				
		POLARIZER BUBBLE	$\phi < 0.15\text{mm}$	Ignore		Note1		
	$0.15\text{mm} \leq \phi \leq 0.5\text{mm}$		$N \leq 2$					
	$0.5\text{mm} < \phi$		$N = 0$					
	Mura	It' OK if mura is slight visible through 6%ND filter						
	ELECTRICAL DEFECT	BRIGHT DOT	A Grade			B Grade		
C Area			O Area	Total	C Area	O Area	Total	Note3
$N \leq 0$			$N \leq 2$	$N \leq 2$	$N \leq 2$	$N \leq 3$	$N \leq 5$	Note2
DARK DOT		$N \leq 2$	$N \leq 3$	$N \leq 3$	$N \leq 3$	$N \leq 5$	$N \leq 8$	
TOTAL DOT		$N \leq 4$			$N \leq 5$	$N \leq 6$	$N \leq 8$	Note2
TWO ADJACENT DOT		$N \leq 0$	$N \leq 1$ pair	$N \leq 1$ pair	$N \leq 1$ pair	$N \leq 1$ pair	$N \leq 1$ pair	Note4
THREE OR MORE ADJACENT DOT		NOT ALLOWED						
LINE DEFECT		NOT ALLOWED						

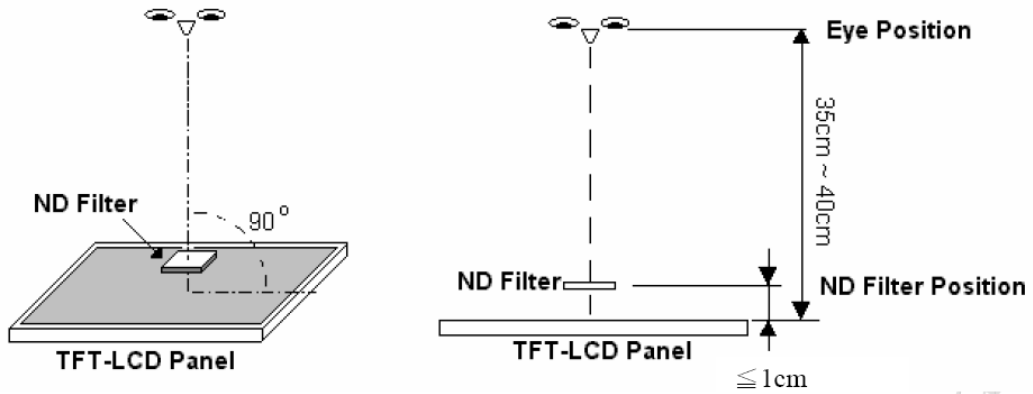
(1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)

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

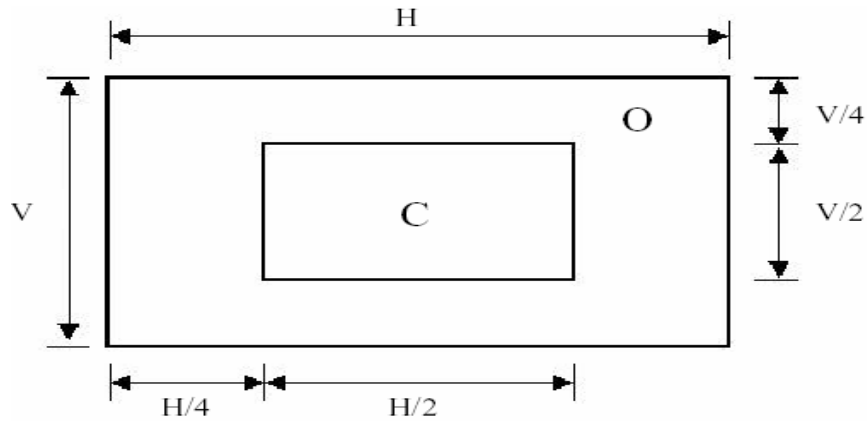
[Note1] W : Width[mm], L : Length[mm], N : Number,  $\phi$ : Average Diameter



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



**[Note3]**

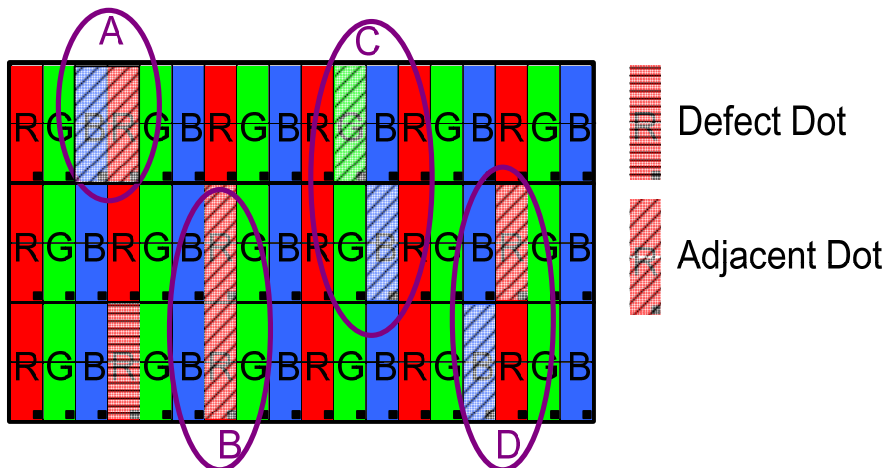


**C Area: Center of display area**

**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. RELIABILITY TEST CONDITIONS

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=96 hrs	
Low Temperature Operation	-20±3°C , t=96 hrs	
High Temperature Storage	80±3°C , t=96 hrs	1,2
Low Temperature Storage	-30±3°C , t=96 hrs	1,2
Thermal Shock Test	-20°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.

### 9.1 OTHERS

AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

# 10. OUTLINE DIMENSION

