

**Preliminary**

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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-640480G2TNQW-00H (400nits – 50K life time)</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

- Approved For Specifications**  
 **Approved For Specifications & Sample**

**AMPIRE CO., LTD.**

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<b>APPROVED BY</b>	<b>CHECKED BY</b>	<b>ORGANIZED BY</b>

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**RECORD OF REVISION**

<b>Revision Date</b>	<b>Page</b>	<b>Contents</b>	<b>Editor</b>
2010/1/25	--	New Release	Edward

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## 1. INTRODUCTION

This is a color active matrix TFT-LCD that uses amorphous silicon TFT as a switching device . This model is composed of a 5.7inch TFT-LCD panel, touch panel, a driving circuit and LED backlight system . This TFT-LCD has a high resolution (640(R.G.B) X 480) and can display up to 262,144 colors .

### 1-1. Features

- VGA Resolution
- 6 Bits color driver with 1 channel TTL interface
- Wide range operation temperature
- Improved inner FPC material to better reliability.

## 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	0.18 (W) x 0.18 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	127.0(W)x98.43(H)x6.6(D)---(Typ)	mm
Surface treatment	Antiglare , Hard-Coating(3H)	
Brightness	400	cd/m <sup>2</sup>
Contrast ratio	250 : 1	
Backlight unit	LED	
Display color	262,144	colors
Viewing Direction	12 o'clock	
Display Mode	Normally White	

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### 3. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min	Max	Unit	Note
Power Supply Voltage	Vcc	-0.5	5	V	
Signal Input Voltage	DCLK , DE R0~R5 G0~G5 B0~B5	-0.5	Vcc + 0.5	V	
Operation Temperature	Top	-20	70	°C	(1)
Storage Temperature	Tstg	-30	80	°C	(1)

### 4. ELECTRICAL CHARACTERISTICS

#### 4-1 TFT LCD Module voltage

Item	Symbol	Min	Typ	Max	Unit	Note
Power Voltage For LCD	V <sub>CC</sub>	3.0	3.3	3.6	V	(1)
Power Voltage For VLED	V <sub>DD</sub>	--	5.0	--	V	
Logic Input Voltage	V <sub>IH</sub>	V <sub>CC</sub> *0.7	--	V <sub>CC</sub>	V	
	V <sub>IL</sub>	0	--	V <sub>CC</sub> *0.3	V	
ADJ Input Voltage	V <sub>IH</sub>	3.0	--	5.0	V	
	V <sub>IL</sub>	GND	--	0.3	V	

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**4-2 TFT LCD current consumption**

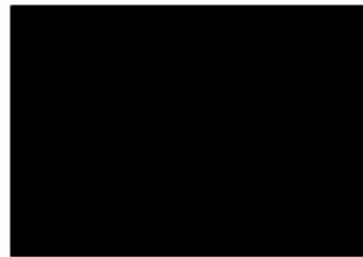
Item	Symbol	Min	Typ	Max	Unit	Note
LCD Power Current	I <sub>cc</sub>	-	82	-	mA	(1)
LED Power Current	I <sub>LED</sub> (V <sub>LED</sub> =5V)	-	(290)	-	mA	(2)

( ): For reference only.

NOTE : (1) Typ : under 64 gray pattern    Max : under black pattern



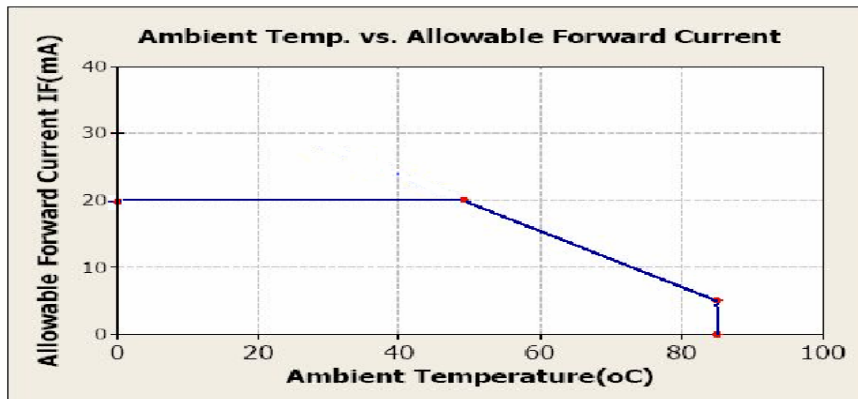
(a) 64 Gray Pattern



(b) Black Pattern

(2) Typ : When V<sub>LED</sub> is 5.0V    Max : When V<sub>LED</sub> is 4.5V

One LED Dice :



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## 6. INTERFACE

Pin No	Symbol	Function
1	U/D	Up or Down Display Control
2	(NC)	No connection
3	Hsync(NC)	Horizontal SYNC. (Sync mode used)
4	VLED	Power Supply for LED
5	VLED	Power Supply for LED
6	VLED	Power Supply for LED
7	Vcc	Power Supply for LCD
8	Vsync(NC)	Vertical SYNC. (Sync mode used)
9	DE	Data Enable
10	Vss	Power Ground
11	Vss	Power Ground
12	ADJ	Adjust for LED Brightness
13	B5	Blue Data 5 (MSB)
14	B4	Blue Data 4
15	B3	Blue Data 3
16	Vss	Power Ground
17	B2	Blue Data 2
18	B1	Blue Data 1
19	B0	Blue Data 0 (LSB)
20	Vss	Power Ground
21	G5	Green Data 5 (MSB)
22	G4	Green Data 4
23	G3	Green Data 3
24	Vss	Power Ground
25	G2	Green Data 2
26	G1	Green Data 1
27	G0	Green Data 0 (LSB)
28	Vss	Power Ground
29	R5	Red Data 5 (MSB)
30	R4	Red Data 4
31	R3	Red Data 3
32	Vss	Power Ground
33	R2	Red Data 2
34	R1	Red Data 1
35	R0	Red Data 0 (LSB)
36	Vss	Power Ground
37	Vss	Power Ground
38	DCLK	Clock Signals
39	Vss	Power Ground
40	L/R	Left or Right Display Control

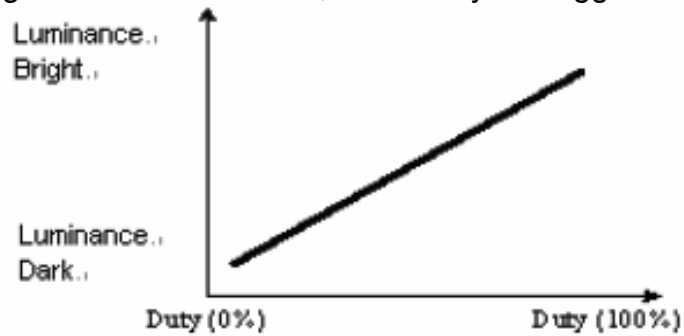
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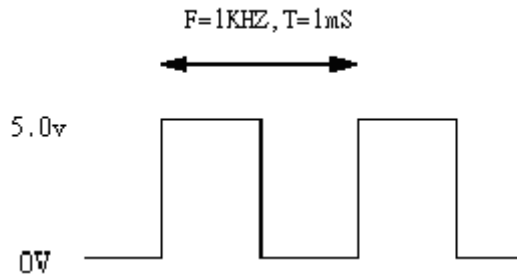
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NOTE :

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



2. ADJ signal = 0 ~ 5.0V , operation frequency : 300Hz~1KHz



3. VSS Pin must ground contact , can not be floating.
4. U/D and L/R are controlled function

L/R	U/D	Function
1	0	Normally display
0	0	Left and Right opposite
1	1	Up and Down opposite
0	1	Left and Right opposite , Up and Down opposite

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## 7. INPUT SIGNAL :

### 7-1 Timing Specification.

Parameter	Symbol	Min.	Typ.	Max	Unit
CLK frequency	FCPH		25.175		MHz
CLK period	TCPH	-	39.7	-	ns
CLK pulse duty	TCWH	40	50	60	%
HS period	TH	-	800	-	TCPH
HS pulse width	TWH	5	30	-	TCPH
HS-first horizontal data time	THS	112	144	175	TCPH
DEN pulse width	TEP	-	640	-	TCPH
VS pulse width	TWV	1	3	5	TH
VS-DEN time	TSTV	-	35	-	TH
VS period	TV	-	525	-	TH

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

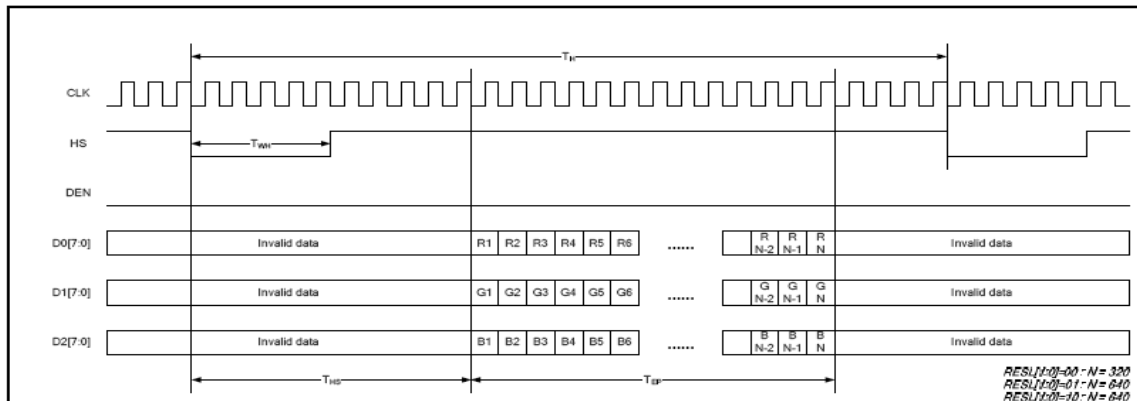
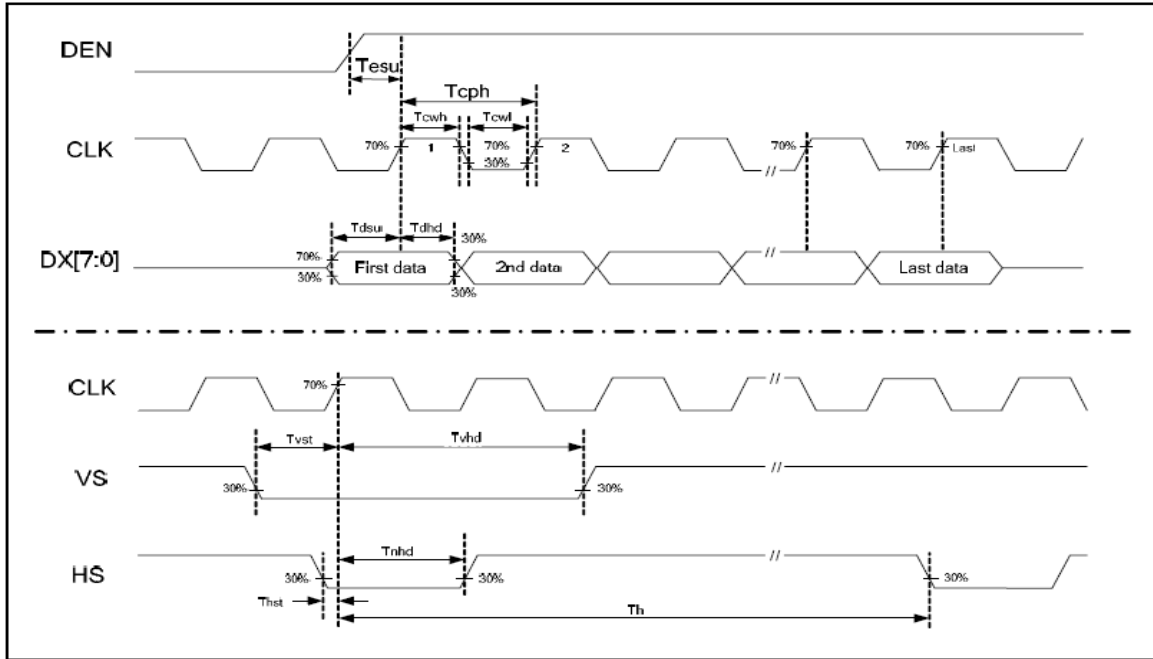
Parameter	Symbol	Min.	Typ.	Max	Unit
OEV pulse width	TOEV		100	-	TCPH
CKV pulse width	TCKV	-	96	-	TCPH
HS-CKV time	T1	-	52	-	TCPH
HS-OEV time	T2	-	8	-	TCPH
HS-POL time	T3	-	72	-	TCPH
STV setup time	TSUV	-	46	-	TCPH
STV pulse width	TWSTV	-	1	-	TH

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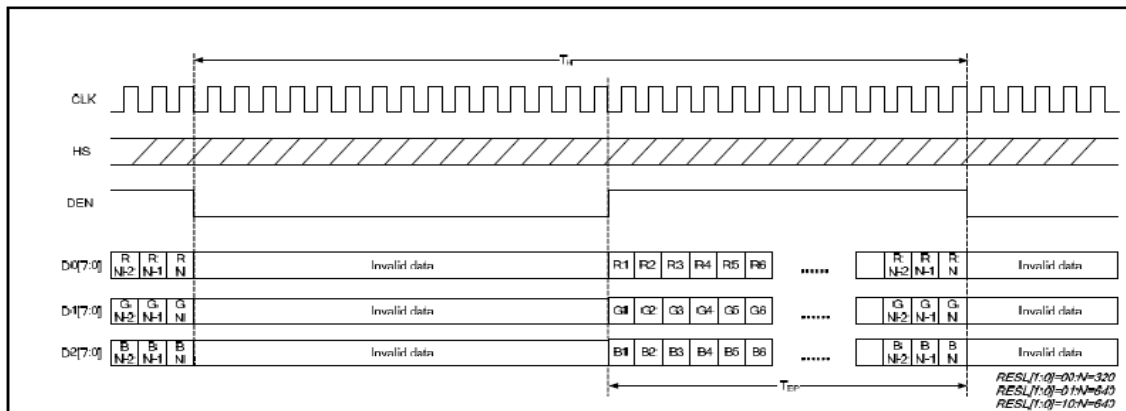
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### 7-2 Timing chart

#### Clock and Data input waveforms



Parallel RGB SYNC Mode Horizontal Data Format



Parallel RGB DE Mode Horizontal Data Format

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**7-3 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
	RED(63)	1	1	1	1	1	1	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
	GREEN (63)	0	0	0	0	0	0	1	1	1	1	1	1	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

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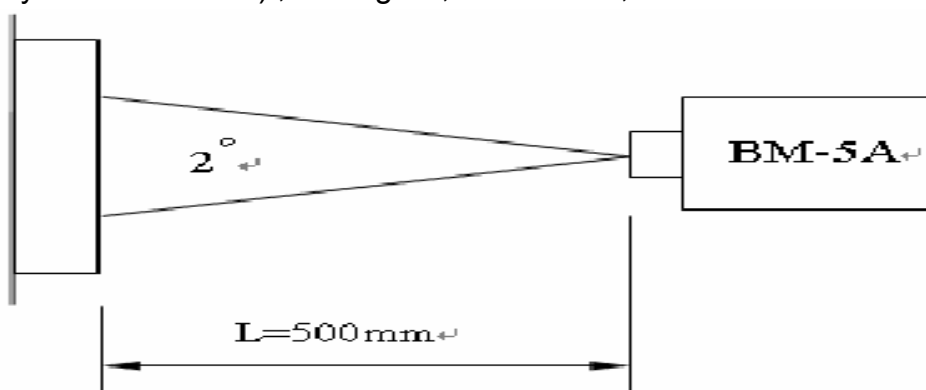
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## 8. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast ratio	CR	Point - 5 $\Theta=\Phi=0^\circ$	200	250	--	--	(1)(2)(3)	
Luminance	Lw		280	400	-	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 $\pm$ 2°C , 60 $\pm$ 10%RH under 10Lux , in the dark room by BM-7TOPCON) ,viewing 2° , VCC=3.3V , VDD=3.3V



- (2) Definition of Contrast Ratio :

**Contrast Ratio (CR) = (White) Luminance of ON  $\div$  (Black) Luminance of OFF**

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### (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

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

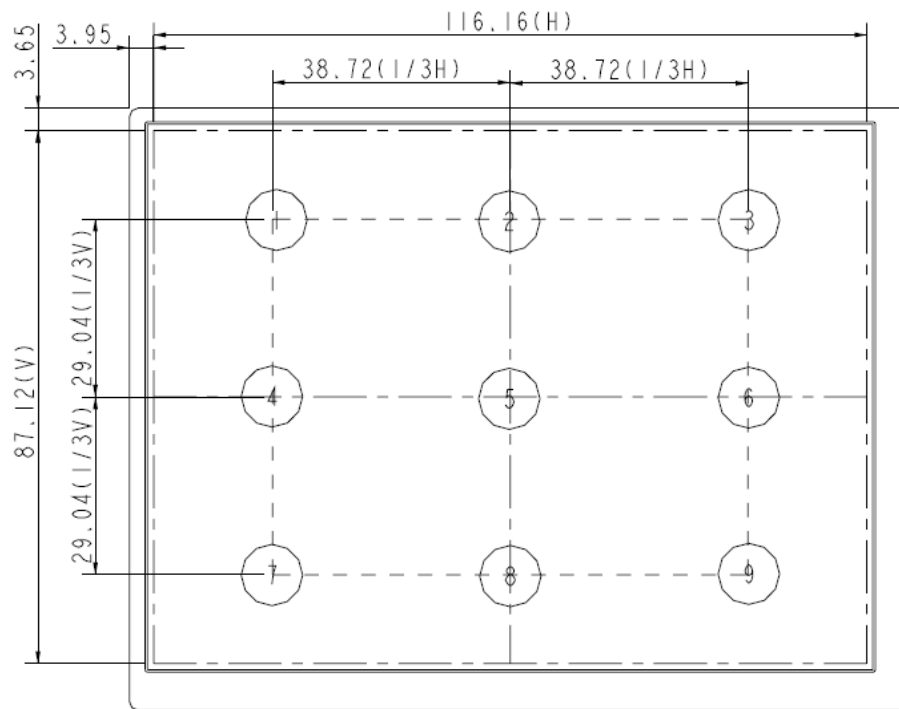


Fig9-1 Measuring point

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

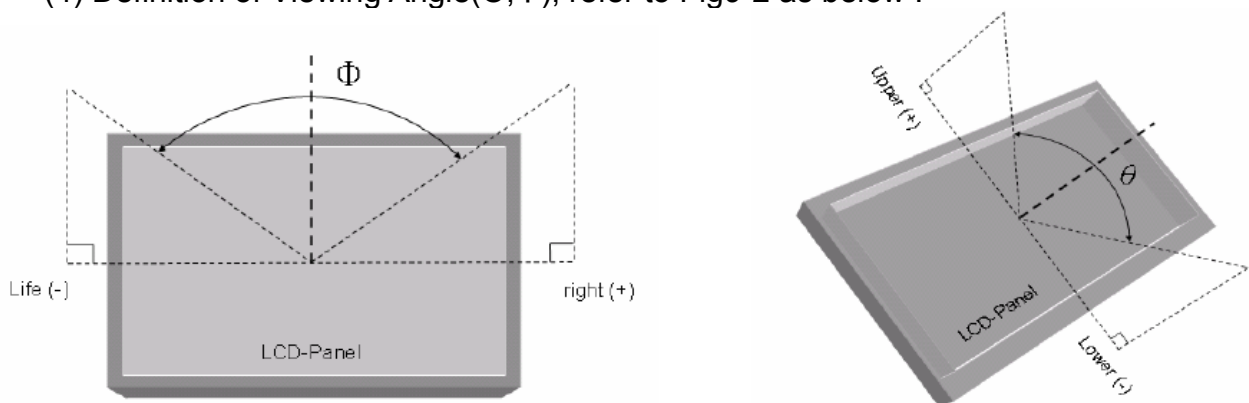


Fig9-2 Definition of Viewing Angle

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

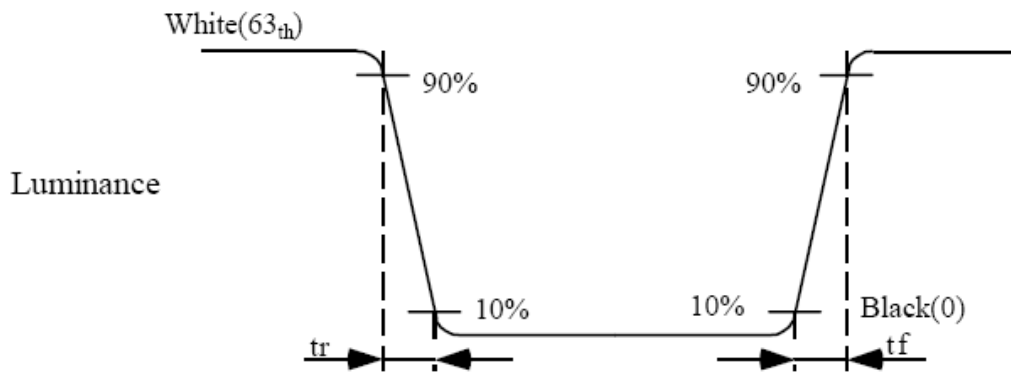


Fig9-3 Definition of Response Time(White-Black)

### (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

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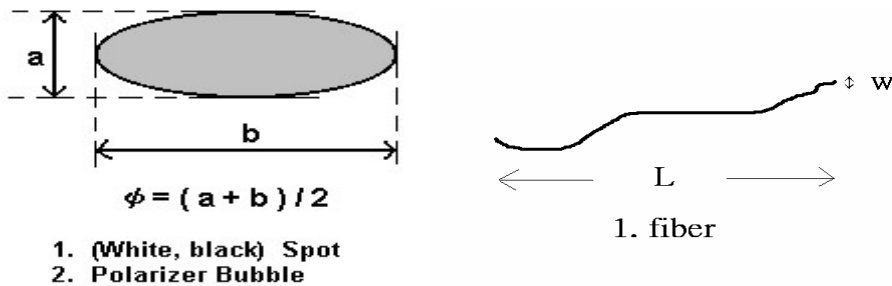
**INCOMING INSPECTION STANDARD FOR TFT-LCD PANEL**

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			$N \leq 2$	$N \leq 3$	$N \leq 3$	$N \leq 8$		
		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	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

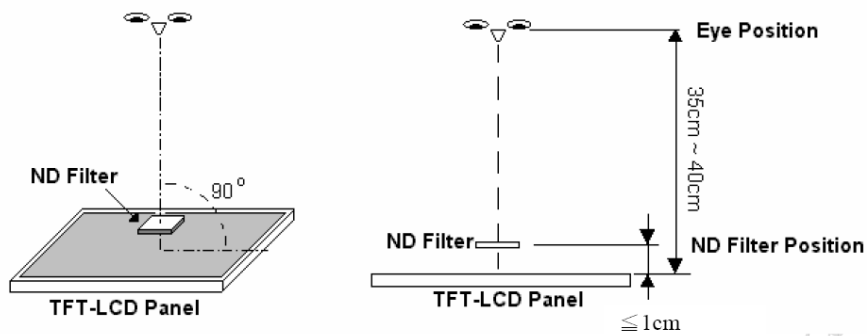
[Note1] W : Width[mm], L : Length[mm], N : Number,  $\phi$ : Average Diameter



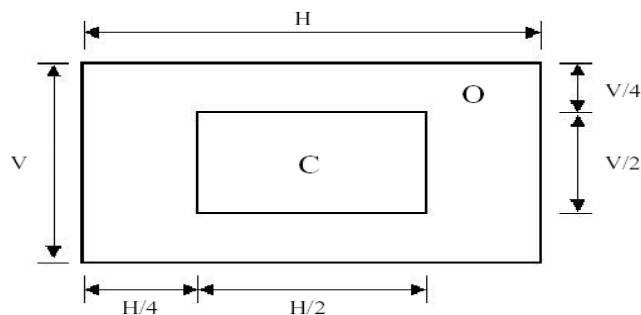
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**[Note2]** Bright dot is defined through 6% transmission ND Filter as following.



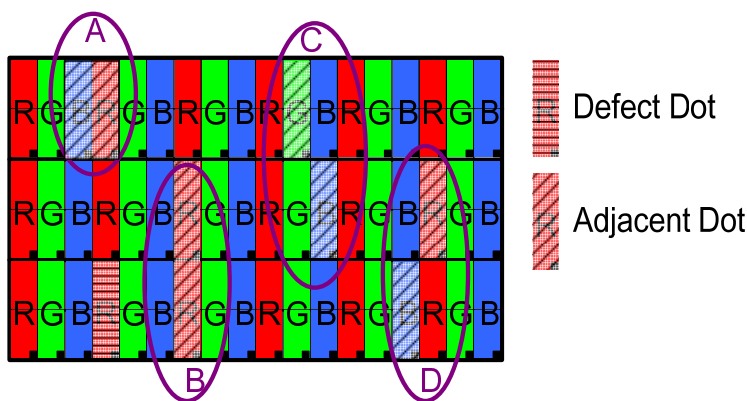
**[Note3]**



**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 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.

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## 10. RELIABILITY TEST CONDITIONS

Item	Conditions
HIGH TEMPERATURE OPERATION	70°C , 240Hrs
HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	60°C , 90%RH , 240Hrs
HIGH TEMPERATURE STORAGE	80°C , 240Hrs
LOW TEMPERATURE OPERATION	-20°C , 240Hrs
LOW TEMPERATURE STORAGE	-30°C , 240Hrs
THERMAL SHOCK	-30°C (0.5Hr) ~80°C (0.5Hr) 200Cycle

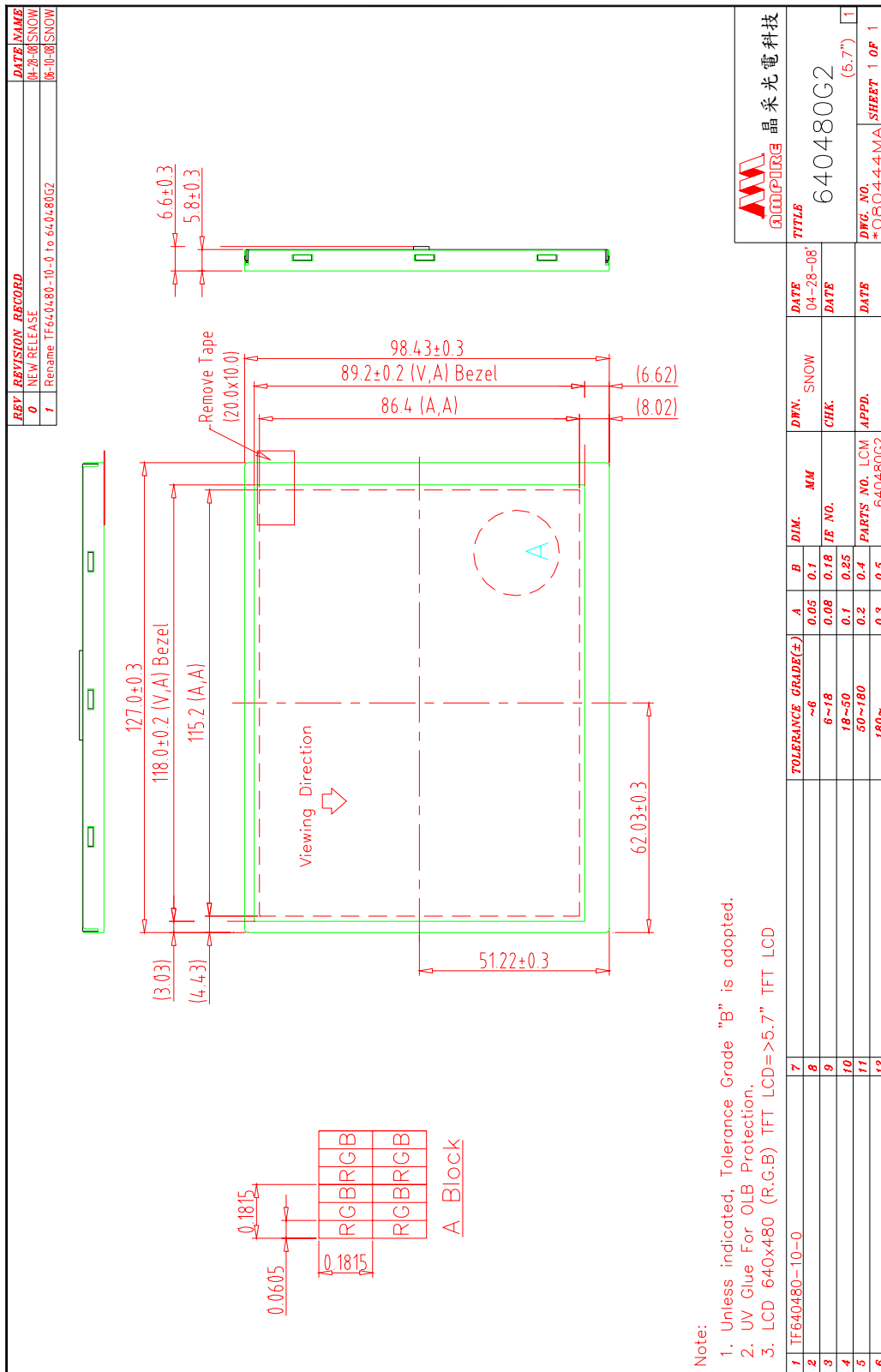
### 10.1 OTHERS

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

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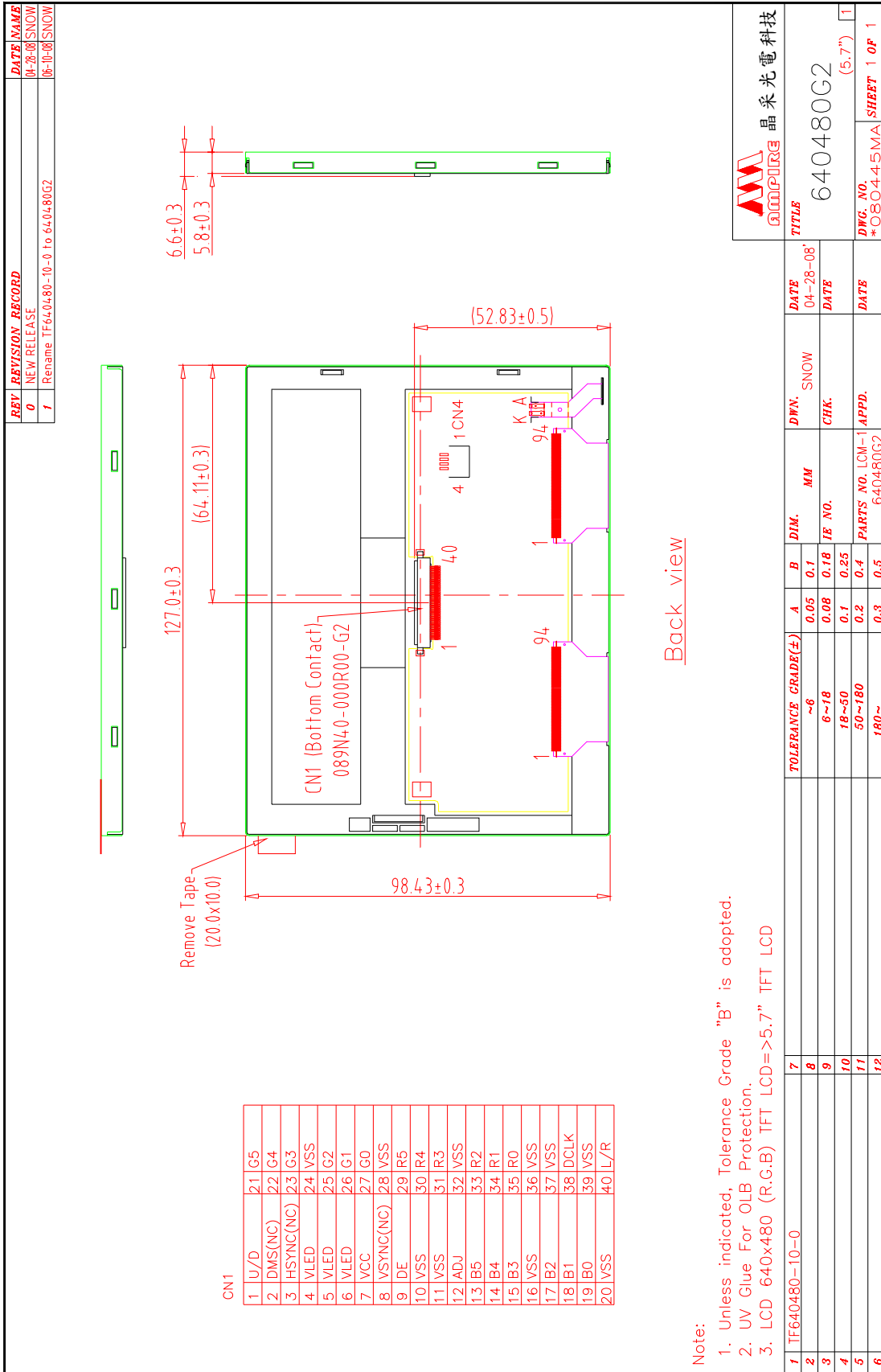
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**11. OUTLINE DIMENSION**



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- Note:
1. Unless indicated, Tolerance Grade "B" is adopted.
  2. UV Glue For OLB Protection.
  3. LCD 640x480 (R.G.B) TFT LCD=>5.7" TFT LCD