



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-480272QTZQW-00H</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>
2011/04/01	--	New Release	Rober
2011/09/02	--	Redefine Part No.	Rober
2011/09/05	4	Redefine Operation & Storage Temperature	Rober
2011/09/30	16	Update OUTLINE DIMENSION	Rober
2012/1/11	5	Add LED Life Time	Rober

## 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 4.3inch TFT-LCD panel, a driving circuit and LED backlight system. This TFT-LCD has a high resolution (480(R.G.B) X 272) 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 :Normally Black, VA
- (3) Number of the Colors : 262,144 colors (R,G,B 6 bit digital each)
- (4) RGB Interface 40 pin.
- (5) LCD Power Supply Voltage : 3.3V single power input,

## 2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	480RGB (W) x 272(H)	dots
Display area	95.04 (W) x 53.856 (H)	mm
Pixel pitch	0.198 (W) x 0.198 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	68.2 (W) x 105.5 (H)x6.71(T)	mm
Surface treatment	Glare , Hard-Coating(3H)	
Brightness	500	cd/m <sup>2</sup>
Contrast ratio	500 : 1	
Backlight unit	LED	
Display color	262,144	colors
Display Mode	Normally Black	

### 3. ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Power Supply Voltage	V <sub>cc</sub>	-0.5	5	V	
Led Supply Voltage	V <sub>LED</sub>	--	6	V	
Signal Input Voltage	DCLK , DE R0~R5 G0~G5 B0~B5	-0.5	V <sub>cc</sub> + 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	

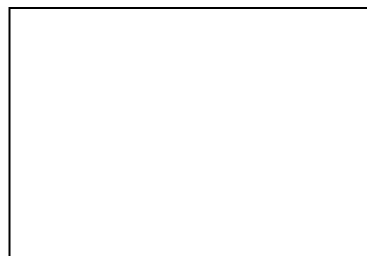
#### 4-2 TFT LCD current consumption

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Current	I <sub>cc</sub>	-	75	-	mA	(1)
LED Power Current	I <sub>LED</sub> (V <sub>LED</sub> =5V)	-	130	-	mA	(2)

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



(a) 64 Gray Pattern



(b) White Pattern

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

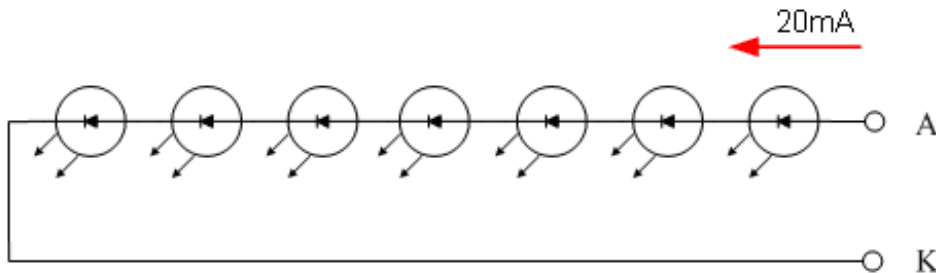
Note: The data is reference only

### 4-3 Backlight Driving Conditions

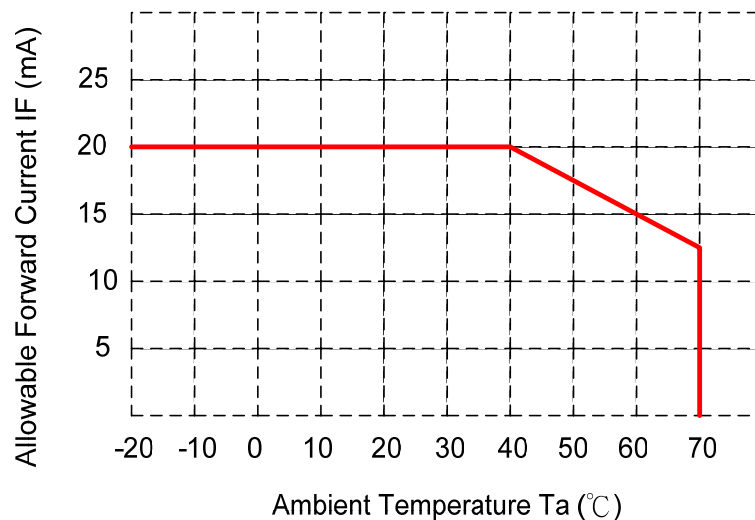
Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
LED voltage	$V_{AK}$	--	22.4	--	V	$I_{LED} = 20\text{mA}$ $T_a = 25^\circ\text{C}$
LED Life time	--	--	30K	--	hours	Note(4)
LED forward current	$I_{LED}$	--	20	--	mA	$T_a = 25^\circ\text{C}$
	$I_{LED}$	--	15	--	mA	$T_a = 60^\circ\text{C}$

Note 1 : The LED Supply Voltage is defined by the number of LED at  $T_a = 25^\circ\text{C}$  and  $I_L = 74\text{mA}$ .

Note 2 : The "LED life time" is defined as the module brightness decrease to 50% original brightness at  $T_a = 25^\circ\text{C}$  and  $I_L = 74\text{mA}$ . The LED lifetime could be decreased if operating  $I_L$  is larger than 74mA.



Note 3 : When LCM is operated over  $40^\circ\text{C}$  ambient temperature, the  $I_{LED}$  should be follow :



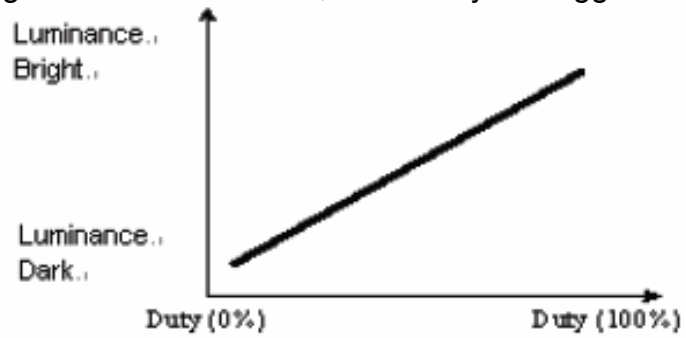
Note 4: Brightness to be decreased to 50% of the initial value.

## 5. INTERFACE

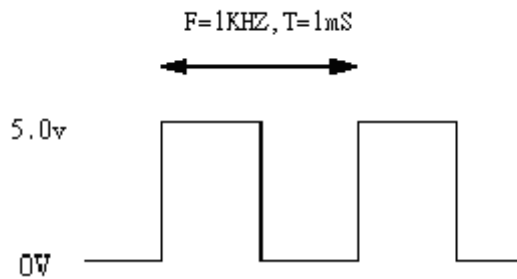
Pin No	Symbol	Function
1	U/D	Up or Down Display Control
2	(NC)	No connection
3	Hsync(NC)	Horizontal SYNC. (Sync mode used)
4	VLED	Power Supply for LED
5	VLED	Power Supply for LED
6	VLED	Power Supply for LED
7	Vcc	Power Supply for LCD
8	Vsync(NC)	Vertical SYNC. (Sync mode used)
9	DE	Data Enable
10	Vss	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

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.

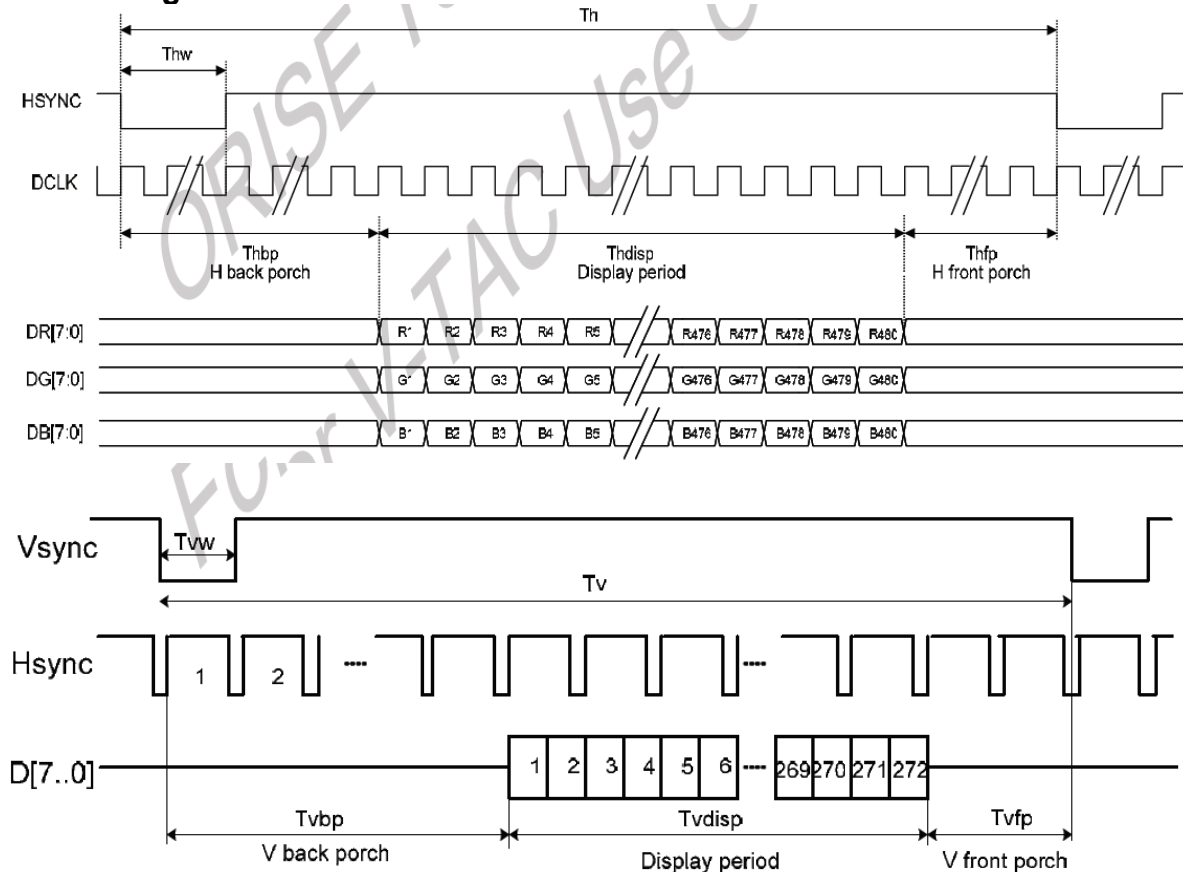
Note: The data is reference only

## 6. INPUT SIGNAL :

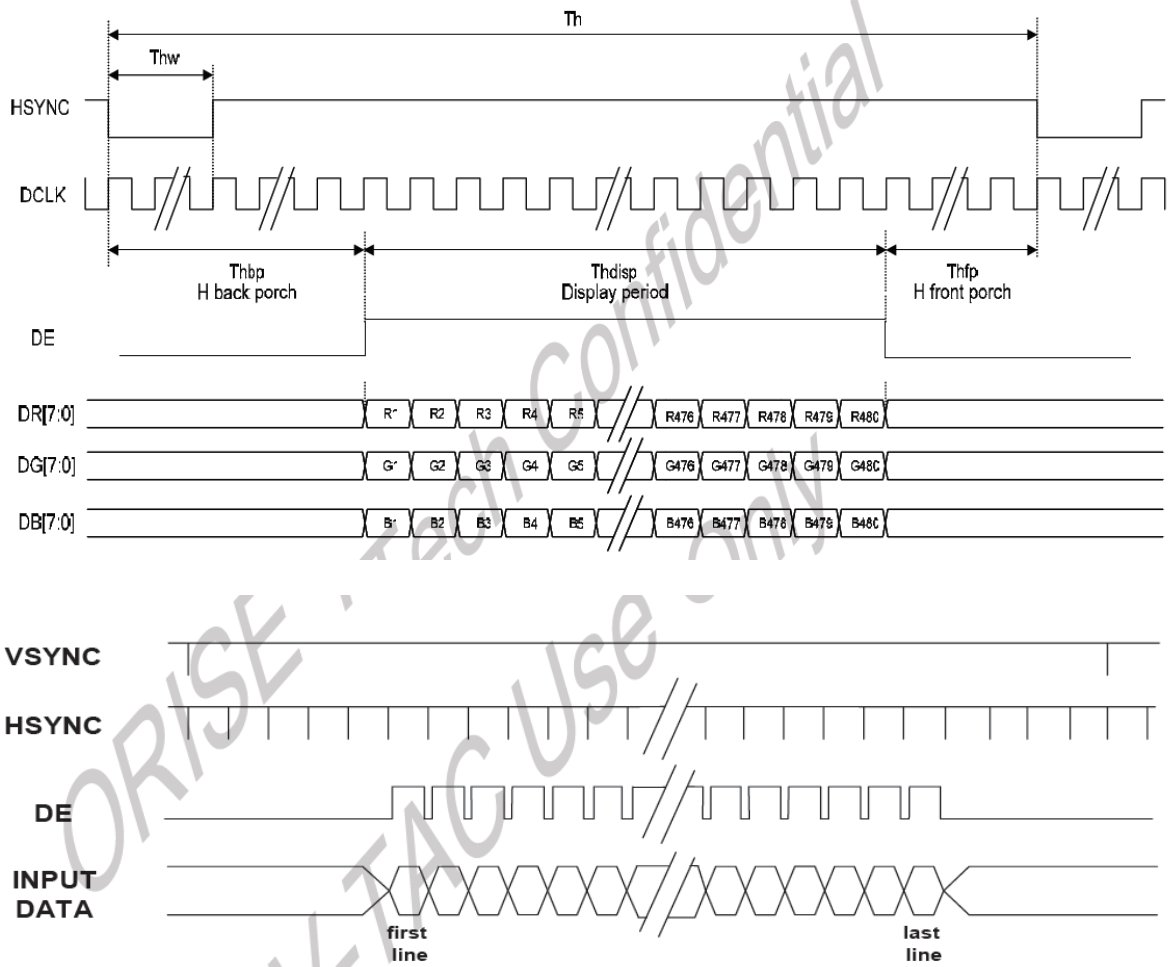
### 6-1 Timing Specification.

Item	Symbol	Min.	Typ.	Max.	Unit		
DCLK Frequency	Fclk	5	9	12	MHz		
DCLK Period	Tclk	83	110	200	ns		
Hsync	Period Time	Th	490	531	605	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	8	43		DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8		DCLK	
	Pulse Width	Thw	1			DCLK	
Vsync	Period Time	Tv	275	288	335	H	
	Display Period	Tvdisp		272		H	
	Back Porch	Tvbp	2	12		H	By V_BLANKING setting
	Front Porch	Tvfp	1	4		H	
	Pulse Width	Tvw	1	10		H	

### 6-2 Timing chart







### 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
	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	0	0	0	0	0	1
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

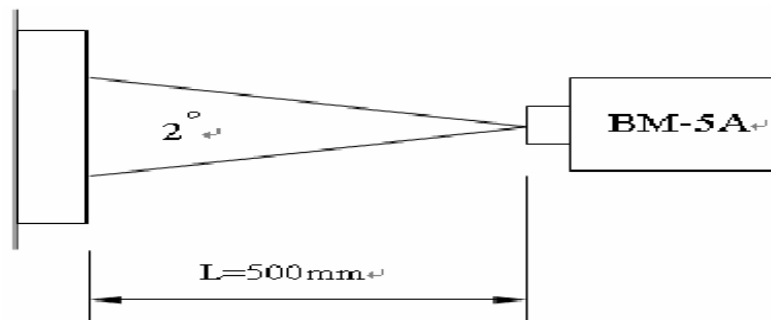
NOTE : (1) Definition of Gray Scale , Color(n) : n is series of Gray Scale  
The more n value is the bright Gray Scale  
(2) Data : 1-High , 0-Low

## 7. OPTICAL CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast ratio	CR	Point - 5 $\Theta = \Phi = 0^\circ$	400	500	--	--	(1)(2)(3)	
Luminance	Lw		--	500	-	cd/m <sup>2</sup>	(1)(3)	
Luminance Uniformity	$\Delta L$		70	75	-	%	(1)(3)	
Response Time ( White – Black )	$T_r + T_f$		--	35	--	ms	(1)(3)(5)	
Viewing Angle	Horizontal	$\Theta_h$	CR > 10	--	160	-	Deg.	(1)(2)(4)
	Vertical	$\Theta_v$		--	160	-		
Color chromaticity	Red	Rx	Point - 5 $\Theta = \Phi = 0^\circ$	0.60	0.65	0.70	--	(1)(3)
		Ry		0.28	0.33	0.38		
	Green	Gx		0.26	0.31	0.36		
		Gy		0.52	0.57	0.62		
	Blue	Bx		0.09	0.14	0.19		
		By		0.08	0.13	0.18		
	White	Wx		0.26	0.31	0.36		
		Wy		0.29	0.34	0.39		

NOTE :

- (1) Measure conditions :  $25^\circ\text{C} \pm 2^\circ\text{C}$  ,  $60 \pm 10\% \text{RH}$  under 10Lux , in the dark room by BM-7TOPCON) , viewing  $2^\circ$  , VCC=3.3V , VDD=3.3V



- (2) Definition of Contrast Ratio :

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

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

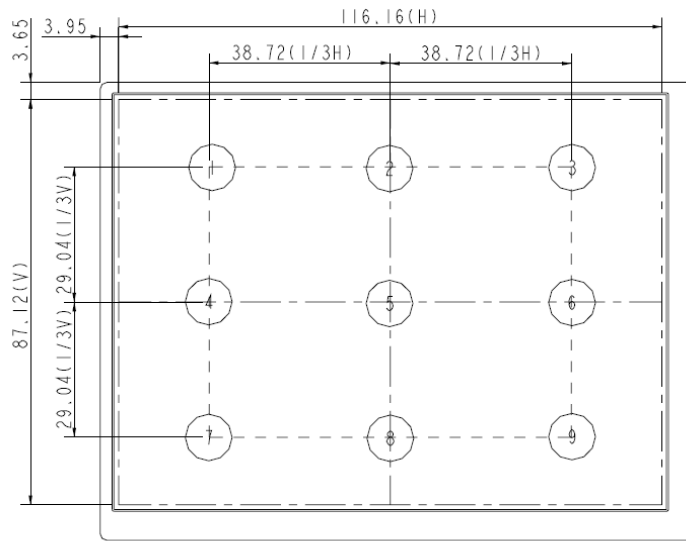


Fig9-1 Measuring point

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

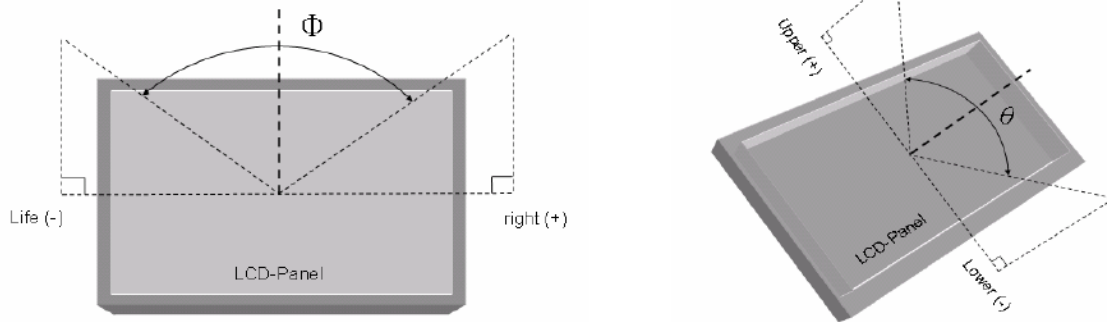


Fig9-2 Definition of Viewing Angle

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

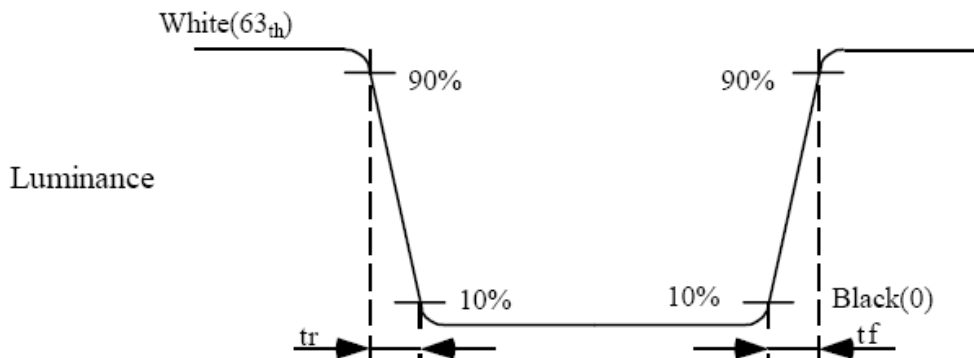


Fig9-3 Definition of Response Time(White-Black)

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

### **1. Scope**

Specifications contain

1.1 Display Quality Evaluation

1.2 Mechanics Specification

### **2. Sampling Plan**

Unless there is other agreement, the sampling plan for incoming inspection shall follow MIL-STD-105E LEVEL II.

2.1 Lot size: Quantity per shipment as one lot (different model as different lot ).

2.2 Sampling type: Normal inspection, single sampling.

2.3 Sampling level: Level II.

2.4 AQL: Acceptable Quality Level

Major defect: AQL=0.65

Minor defect: AQL=1.0

### **3. Panel Inspection Condition**

3.1 Environment:

Room Temperature:  $25\pm 5^{\circ}\text{C}$ .

Humidity:  $65\pm 5\%$  RH.

Illumination: 300 ~ 700 Lux.

3.2 Inspection Distance:

35-40 cm

3.3 Inspection Angle:

The vision of inspector should be perpendicular to the surface of the Module.

3.4 Inspection time :

Perceptibility Test Time: 20 seconds max.

### **4. Display Quality**

4.1 Function Related:

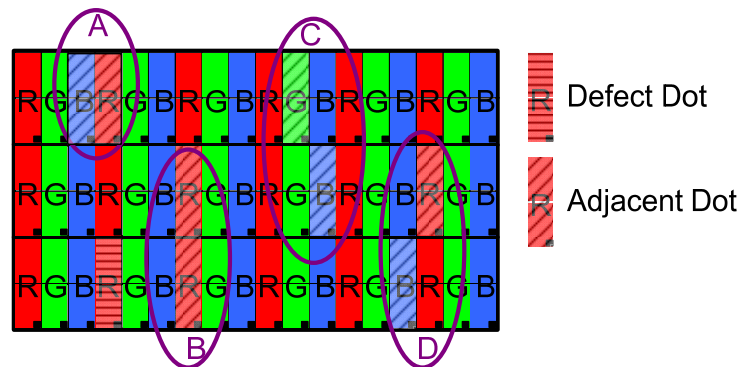
The function defects of line defect, abnormal display, and no display are considered Major defects.

#### 4.2 Bright/Dark Dots:

Defect Type / Specification	G0 Grade	A Grade
Bright Dots	0	$N \leq 1$
Dark Dots	0	$N \leq 3$
Total Bright and Dark Dots	0	$N \leq 3$

**[Note 1]**

Judge defect dot and adjacent dot as following.

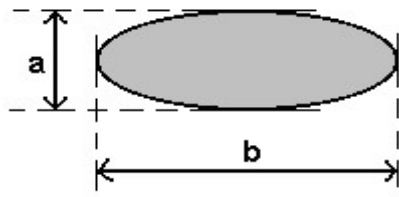


- (1) One pixel consists of 3 sub-pixels, including R,G, and B dot.(Sub-pixel = Dot)
- (2) The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.
- (3) Allow above (as A, B, C and D status) adjacent defect dots, including bright and dark adjacent dot. And they will be counted 2 defect dots in total quantity.
- (4) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.
- (5) There should be no distinct non-uniformity visible through 6% ND Filter within 2 sec inspection times.

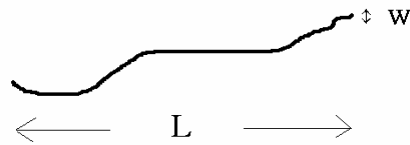
#### 4.3 Visual Inspection specifications:

Defect Type	Specification	Count(N)
Dot Shape (Particle, Scratch and Bubbles in display area)	$D \leq 0.15\text{mm}$	Ignored
	$0.15\text{mm} < D \leq 0.3\text{mm}$	$N \leq 3$
	$D > 0.3\text{mm}$	$N=0$
Line Shape (Particles, Scratch, Lint and Bubbles in display area)	$W \leq 0.05\text{mm}$	Ignored
	$0.05\text{mm} < W \leq 0.1\text{mm}$ , $L \leq 3\text{mm}$	$N \leq 3$
	$W > 0.1\text{mm}$ , $L > 3\text{mm}$	$N=0$

[Note 2] W : Width[mm], L : Length[mm], N : Number,  $\phi$  : Average Diameter

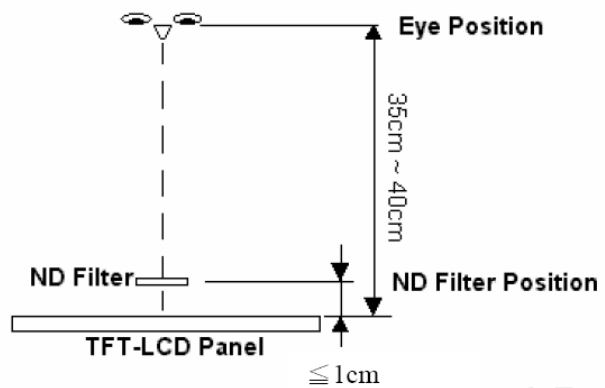
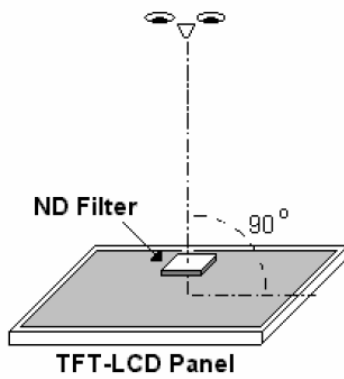


1. (White, black) Spot
2. Polarizer Bubble



1. fiber

[Note 3] Bright dot is defined through 6% transmission ND Filter as following.



## 9. RELIABILITY TEST CONDITIONS

ITEM	CONDITIONS
HIGH TEMPERATURE OPERATION	80°C , 240Hrs
HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	60°C , 90%RH , 240Hrs
HIGH TEMPERATURE STORAGE	85°C , 240Hrs
LOW TEMPERATURE OPERATION	-30°C , 240Hrs
LOW TEMPERATURE STORAGE	-40°C , 240Hrs
THERMAL SHOCK	-20°C (0.5Hr) ~70°C (0.5Hr) 200Cycle

### 9.1 OTHERS

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



