晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-480272QTZQW-00H-F
APPROVED BY	
DATE	

☐Approved For Specifications
☐Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2011/12/22	--	New Release	Kain

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 for TFT panel power input . 5V for LED driver.**

(6) Reflective ratio ＜2%

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^2
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	Vcc	-0.5	5	V	
LED Driver Supply Voltage	VLED	--	6	V	
Signal Input Voltage	DCLK , DE R0~R5 G0~G5 B0~B5	-0.5	Vcc + 0.5	V	
Operation Temperature	Top	-20	70	℃	(1)
Storage Temperature	Tstg	-30	80	℃	(1)

4. ELECTRICAL CHARACTERISTICS

4-1 TFT LCD Module voltage

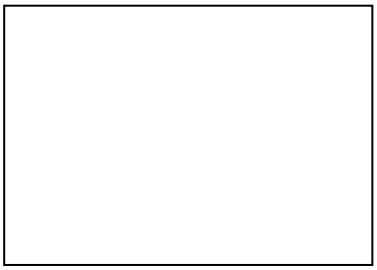
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Power Voltage For LCD	V_{CC}	3.0	3.3	3.6	V	(1)
Power Voltage For VLED	V_{LED}	3.3	5.0	--	V	
Logic Input Voltage	VIH	V_{CC}*0.7	--	V_{CC}	V	
	VIL	0	--	V_{CC}*0.3	V	
ADJ Input Voltage	VIH	3.0	--	5.0	V	
	VIL	GND	--	0.3	V	

4-2 TFT LCD current consumption

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Current	Icc	-	75	-	mA	(1)
LED Power Current	I_{LED}(VLED=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_{LED} is 5.0V Max : When V_{LED} is 4.5V

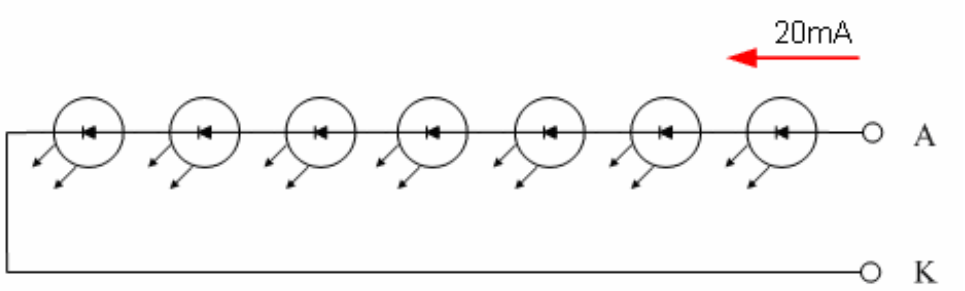
Note: The data is reference only

4-3 Backlight Driving Conditions

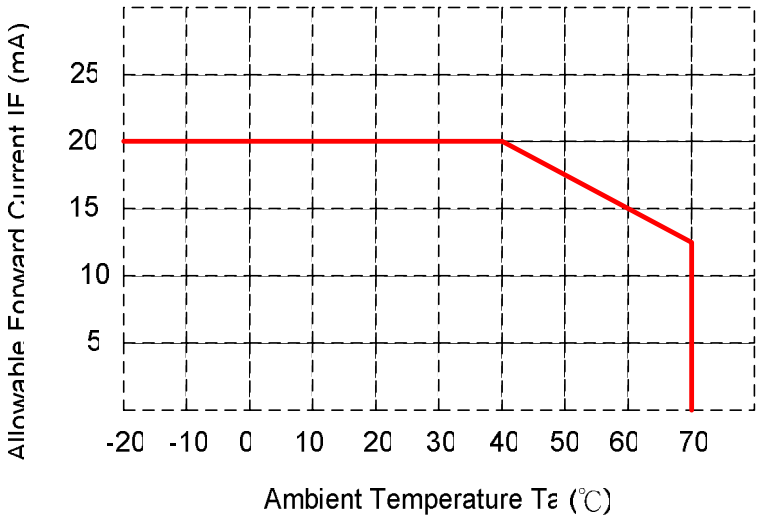
Paramenter	Symbol	Min.	Typ.	Max.	Unit	Condiction
LED voltage	V_{AK}	--	23.1	--	V	I_{LED} =20mA,Ta=25℃
LED forward current	I_{LED}	--	20	--	mA	Ta=25℃
	I_{LED}	--	15	--	mA	Ta=60℃

Note 1 : The LED Supply Voltage is defined by the number of LED at Ta=25℃ and IL=74mA.

Note 2 : The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and I_{LED} =20mA. The LED lifetime could be decreased if operating I_{LED} is larger than 20mA.



Note 3 : When LCM is operated over 40℃ ambient temperature, the ILED should be follow :



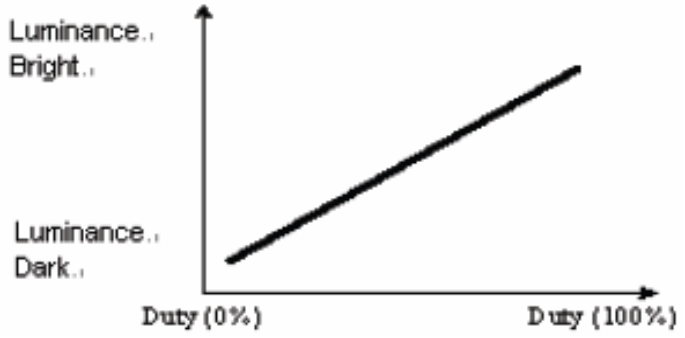
Note 4 : These Data (V_{AK} & I_{LED}) are for design reference only.
The module is with LED driver. The LED back-light uint can be controlled by supply 5V on VLED (PIN 4,5,6) . And PWM dimming signal ADJ(PIN12).

5. INTERFACE

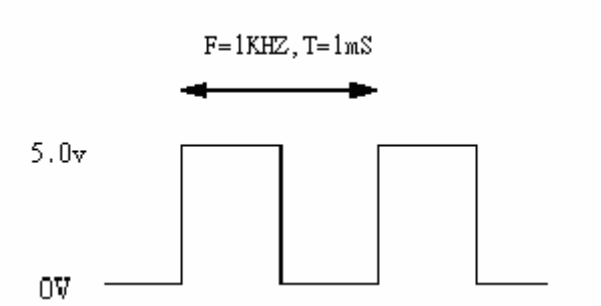
Pin No	Symbol	Function
1	U/D	Up or Down Display Control
2	(NC)	No connection
3	Hsync(NC)	Horizontal SYNC. (Sync mode used)
4	VLED	Power Supply for LED Driver
5	VLED	Power Supply for LED Driver
6	VLED	Power Supply for LED Driver
7	Vcc	Power Supply for LCD
8	Vsync(NC)	Vertical SYNC. (Sync mode used)
9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

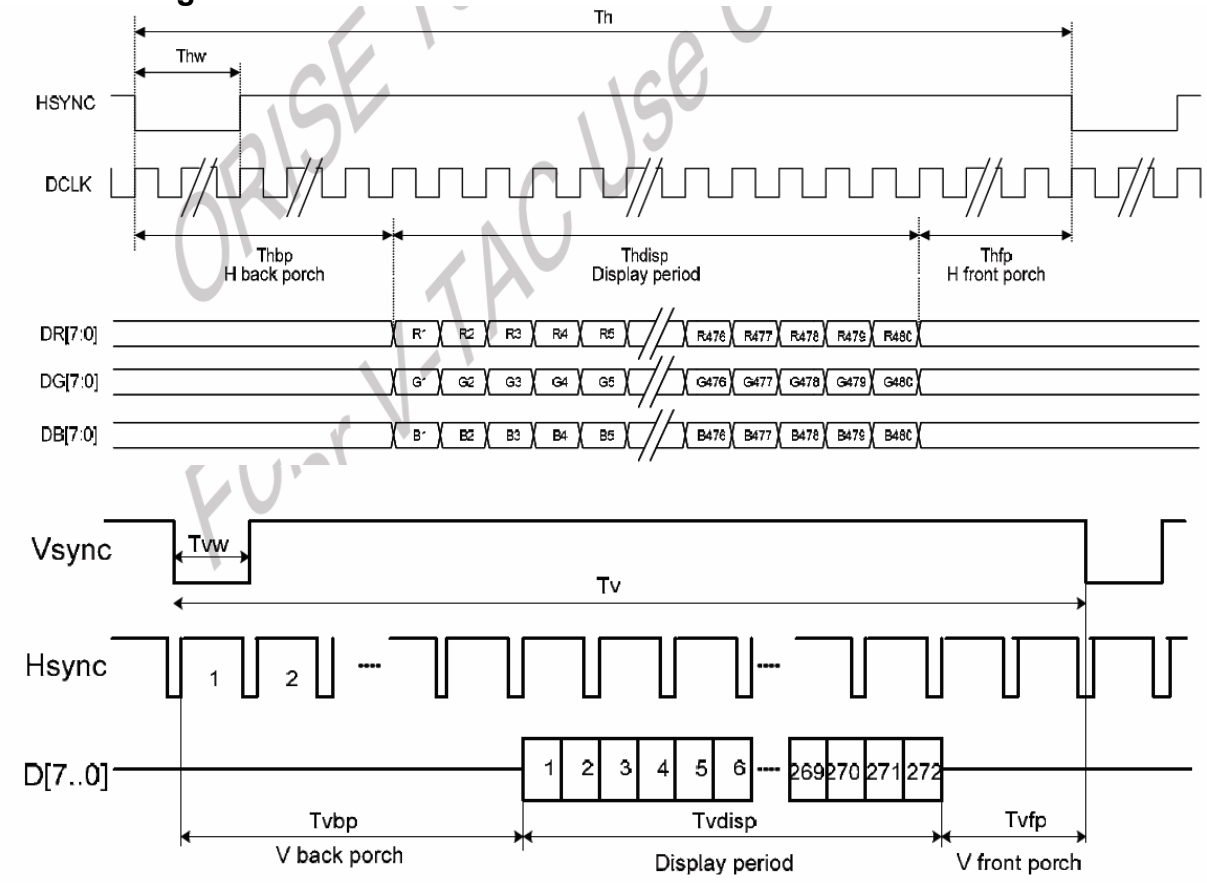
Note: The data is reference only

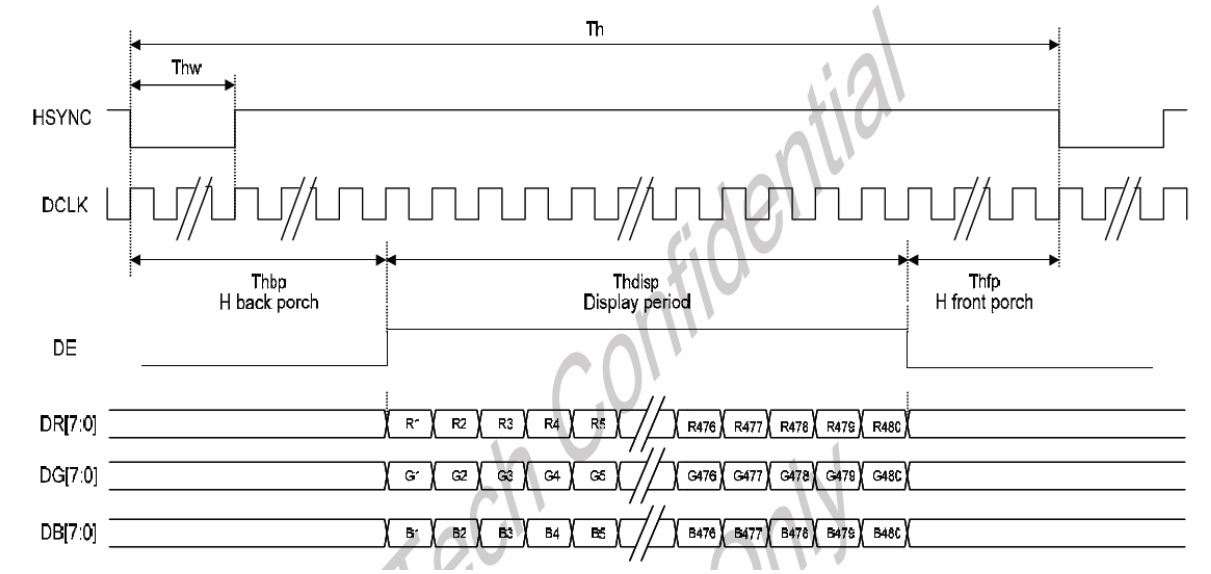
6. INPUT SIGNAL :

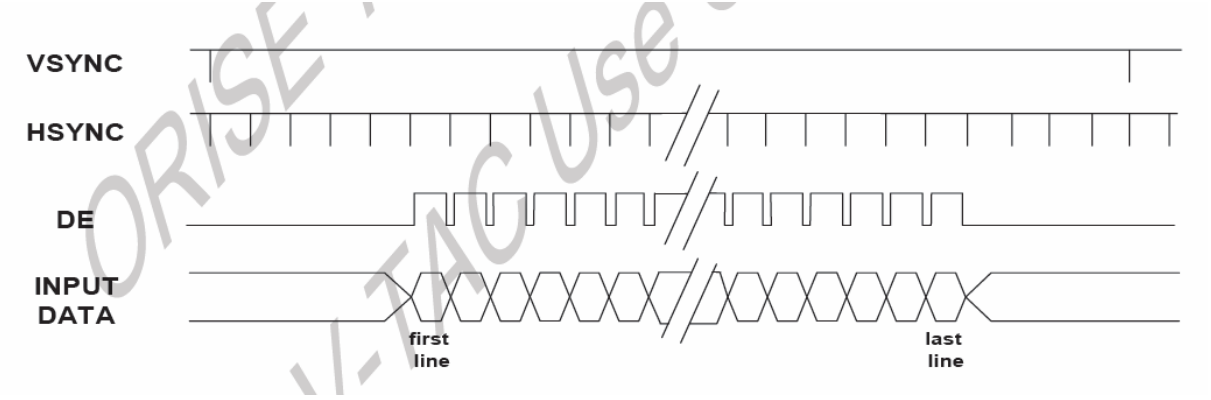
6-1 Timing Specification.

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

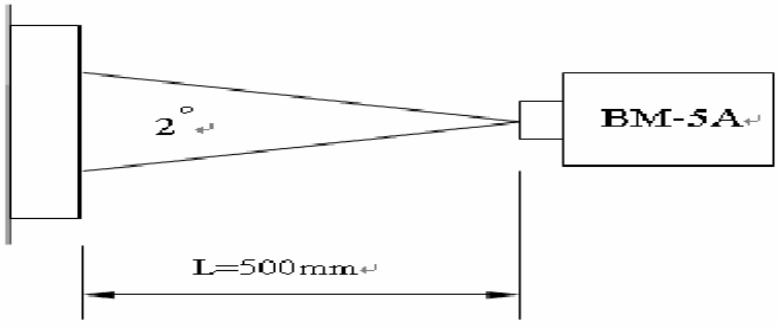
7. OPTICAL CHARACTERISTICS

7.1 LCD module characteristic

Item			Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast ratio			CR	Point - 5 Θ=Φ=0°	--	500	--	--	(1)(2)(3)
Luminance			Lw		--	500	-	cd/m^2	(1)(3)
Luminance Uniformity			ΔL		70	75	-	%	(1)(3)
Response Time (White – Black)			$T_r + T_f$		--	35	--	ms	(1)(3)(5)
Viewing Angle	Horizontal		Θh	CR＞10	--	160	-	Deg.	(1)(2)(4)
	Vertical		Θv		--	160	-		
Color chromaticity		Red	Rx	Point - 5 Θ=Φ=0°	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℃±2℃ , 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 :

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

ΔL = [L(MIN) / L(MAX)] X 100%

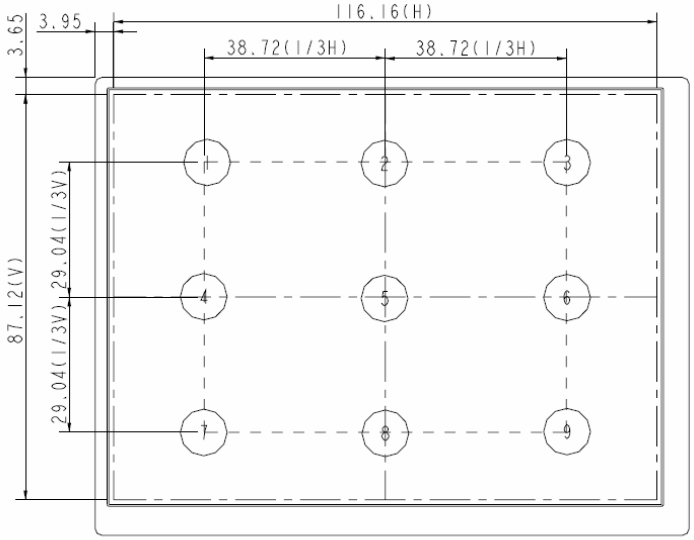


Fig9-1 Measuring point

(4) Definition of Viewing Angle(Θ,Φ), refer to Fig9-2 as below :

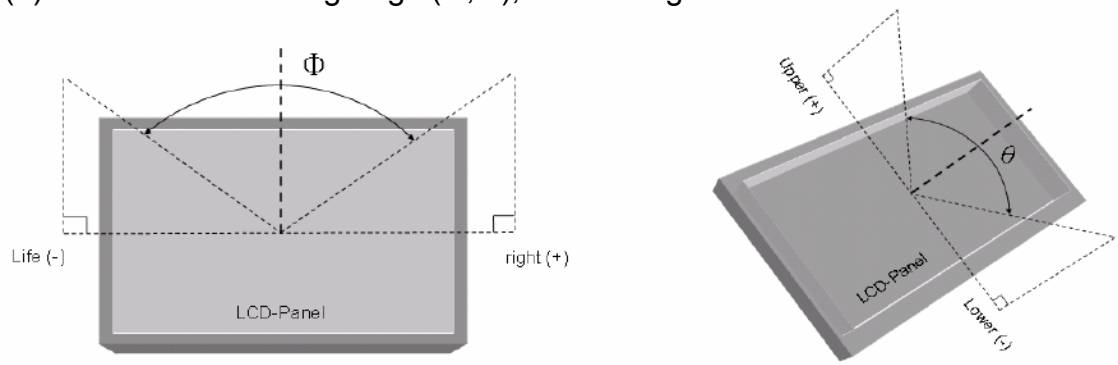


Fig9-2 Definition of Viewing Angle

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

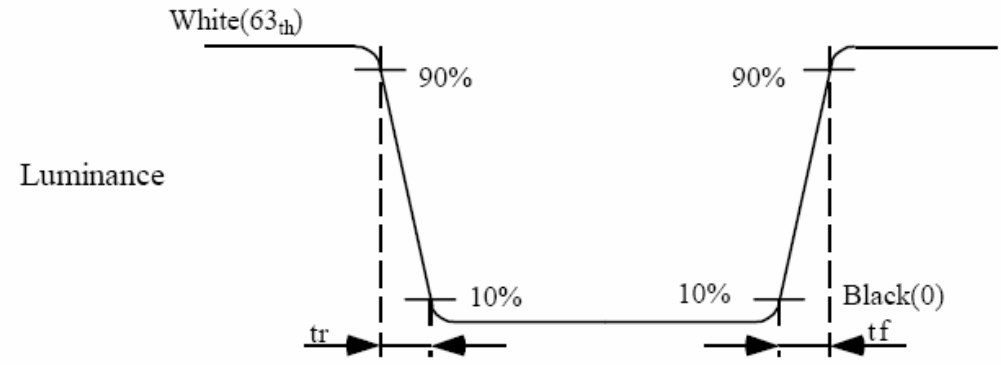
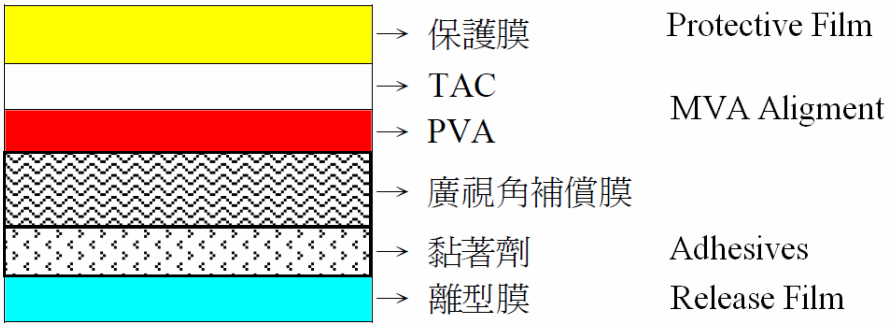


Fig9-3 Definition of Response Time(White-Black)

7.2 Polarizer characteristic

7.2.1 Structure of Polarizer:

LPT Type



7.2.2 Optical property

Item		Condition	Unit
Single Transmittance		41.8	%
Crossed Transmittance		≦0.08	%
Polarizing efficiency		≧99.8	%
Hue	a (NBS)	-1.8±1.5	NBS
	b (NBS)	-4.4±1.5	
UV Cut		≦2	%
Reflectance		＜2	%
Color		Natural Gray	

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±5°C.

Humidity: 65±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:

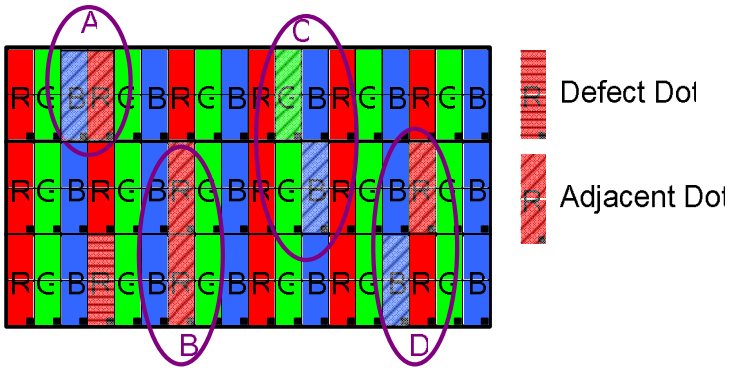
The function defects of line defect, abnormal display, and no display are considered Major defects.

4.2 Bright/Dark Dots:

Defect Type / Specification	G0 Grade	A Grade
Bright Dots	0	N≤ 1
Dark Dots	0	N≤ 3
Total Bright and Dark Dots	0	N≤ 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 dart adjacent dot. And they will be counted 2 defect dots in total quantity.

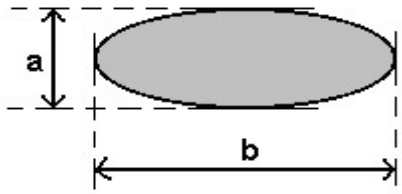
(4) Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.

(5) There should be no distinct non-uniformity visible through 6% ND Filter within 2 sec inspection times.

4.3 Visual Inspection specifications:

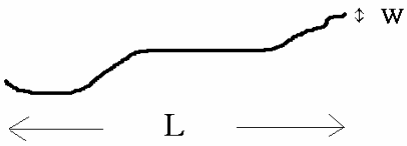
Defect Type	Specification	Count(N)
Dot Shape (Particle、Scratch and Bubbles in display area)	D≤0.15mm	Ignored
	0.15mm < D≤ 0.3mm	N≤ 3
	D > 0.3mm	N=0
Line Shape (Particles、Scratch、Lint and Bubbles in display area)	W≤ 0.05mm	Ignored
	0.05mm<W≤ 0.1mm ， L≤ 3mm	N≤ 3
	W > 0.1mm ， L > 3mm	N=0

[Note 2] W : Width[mm], L : Length[mm], N : Number, φ : Average Diameter



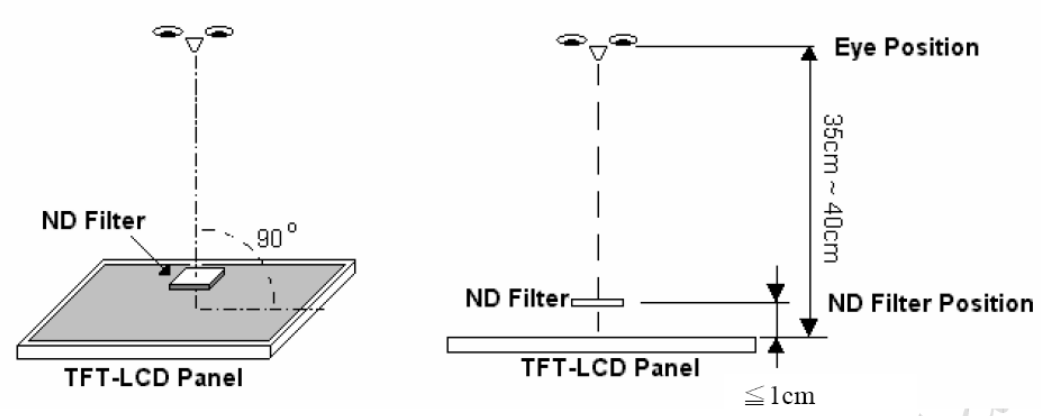
$\phi = (a + b) / 2$

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

9.1 OTHERS

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

10. OUTLINE DIMENSION