

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-640480GTMQW-00H
APPROVED BY	
DATE	2006/09/01

- Approved For Specifications**
 Approved For Specifications & Sample

APPROVED BY	CHECKED BY	ORGANIZED BY

RECORD OF REVISION

Revision Date	Page	Contents	Editor
2006/09/01	-	New Release	LEE

1. INTRODUCTION

Ampire Display Module AM640480 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 , 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

1-2. Applications

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

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	640RGB (W) x 480(H)	dots
Display area	116.16 (W) x 87.12 (H)	mm
Pixel pitch	0.1815 (W) x 0.1815 (H)	mm
Color configuration	R.G.B Vertical stripe	
Overall dimension	127.0(W)x100.0(H)x7.0(D)---(Typ)	mm
Surface treatment	Antiglare , Hard-Coating(3H)	
Brightness	220 nit(typ)	cd/m ²
Contrast ratio	300 : 1	
Backlight unit	LED	
Display color	262,144	colors

3. ABSOLUTE MAX. 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	-30	85	°C	(1)
Storage Temperature	Tstg	-40	95	°C	(1)
Forward Current(per LED)	If	-	30	mA	
Reverse Voltage(per LED)	VR	-	5	V	
Pulse forward Current(per LED)	I _{fp}	-	100	mA	(2)

NOTE :

1. If users use the product out off the environment operation range (temperature and humidity) , it will concern for visual quality.
2. I_{fp} conditions : Pulse Width = 0.1msec and Duty = 1/10

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 LED	V_{DD}	2.7	3.3	5.0	V	
Logic Input Voltage	V_{IH}	$V_{CC} \cdot 0.7$	-	V_{CC}	V	
	V_{IL}	0	-	$V_{CC} \cdot 0.3$	V	

NOTE : 1. V_{CC} – dip condition :

When $2.7V \leq V_{CC} < 3.0V$, $t_d \leq 10ms$

$V_{CC} > 3.0V$, V_{CC} – dip condition should be same as V_{CC} turn-on condition

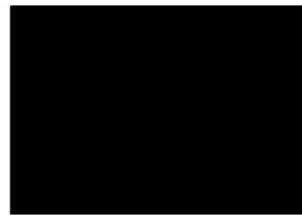
4-2 TFT LCD current consumption

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Current	I_{CC}	-	TBD	TBD	mA	(1)
LED Power Current	I_{DD}	-	TBD	TBD	mA	(2)

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



(a) 64 Gray Pattern



(b) Black Pattern

(2) Typ : When V_{DD} is 3.3V Max : When V_{DD} is 2.7V

4-3 Power Signal sequence

$$t1 \leq 10ms$$

$$50ms \leq t2$$

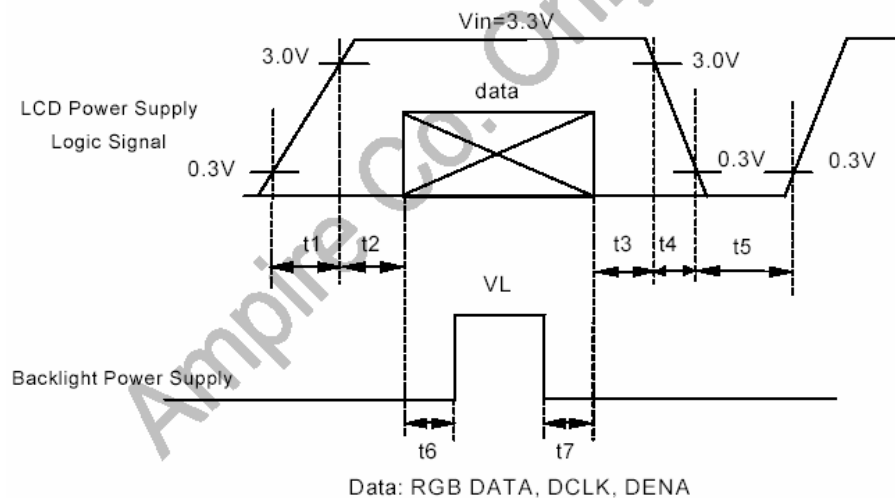
$$0 < t3 \leq 50ms$$

$$0 < t4 \leq 10ms$$

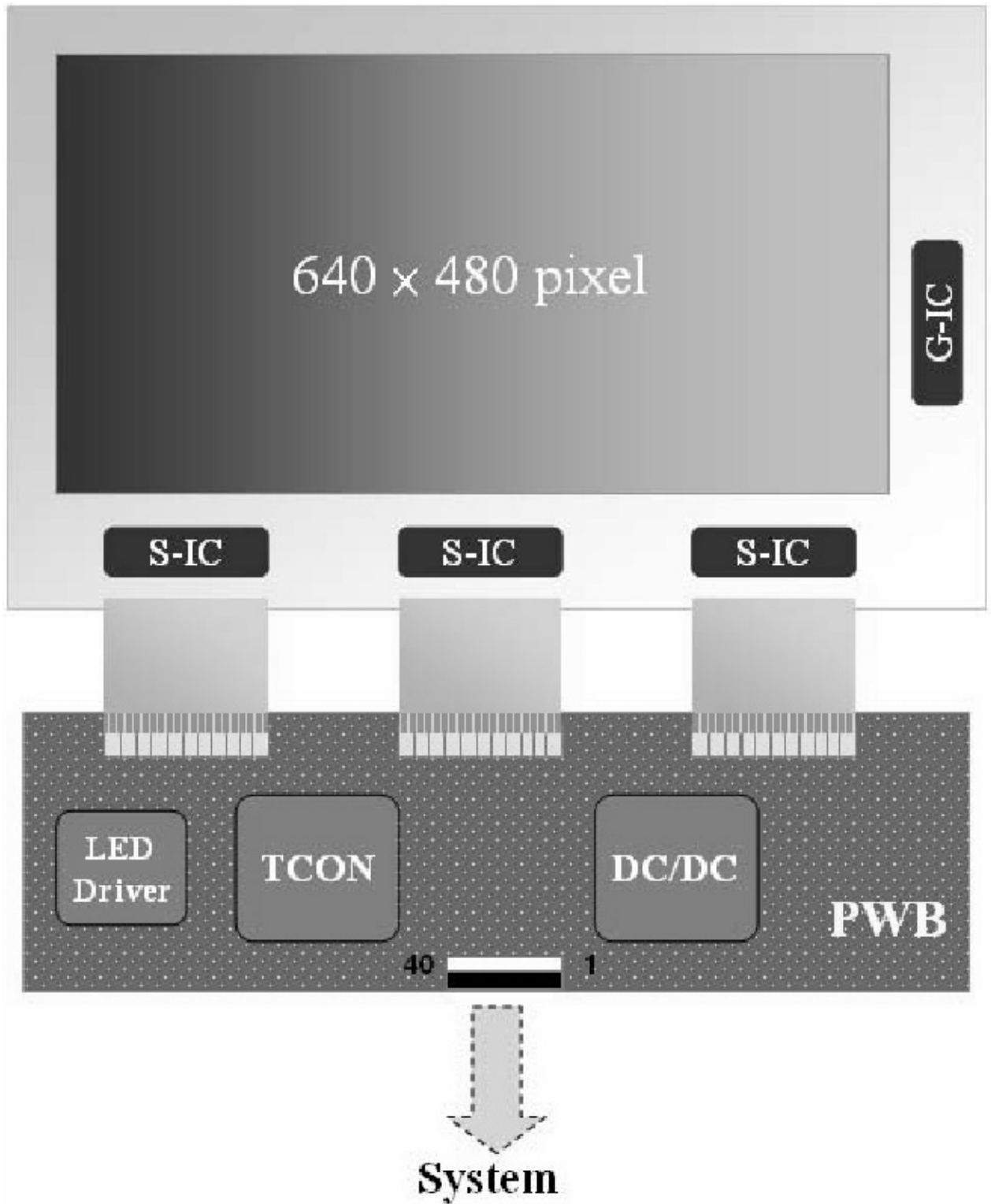
$$1sec \leq t5$$

$$200ms \leq t6$$

$$200ms \leq t7$$



5. BLOCK DIAGRAM

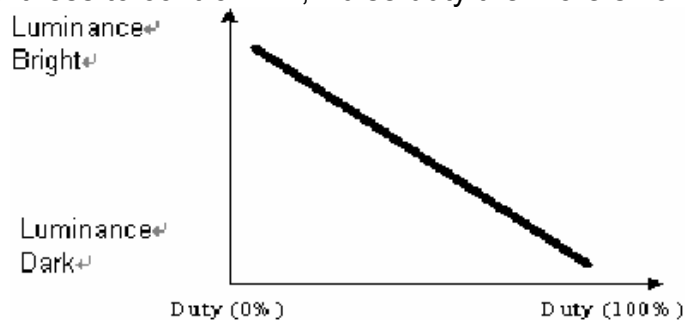


6. INTERFACE

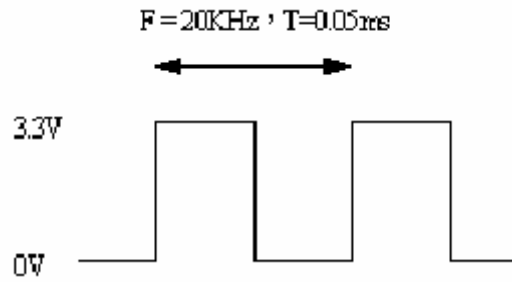
Pin no	Symbol	Function
1	U/D	Up or Down Display control
2	DMS	Selection DE or SYNC
3	Hsync	Horizontal SYNC
4	Vcc	Power supply for digital circuit
5	Vcc	Power supply for digital circuit
6	Vcc	Power supply for digital circuit
7	Vcc	Power supply for digital circuit
8	Vsync	Vertical SYNC
9	DE	Data Enable
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 more small the more bright



2. ADJ signal = 0 ~ 3.3V , operation frequency : 20Khz



3. GND Pin must ground contact , can not be floating

4. U/D and L/R are controled function

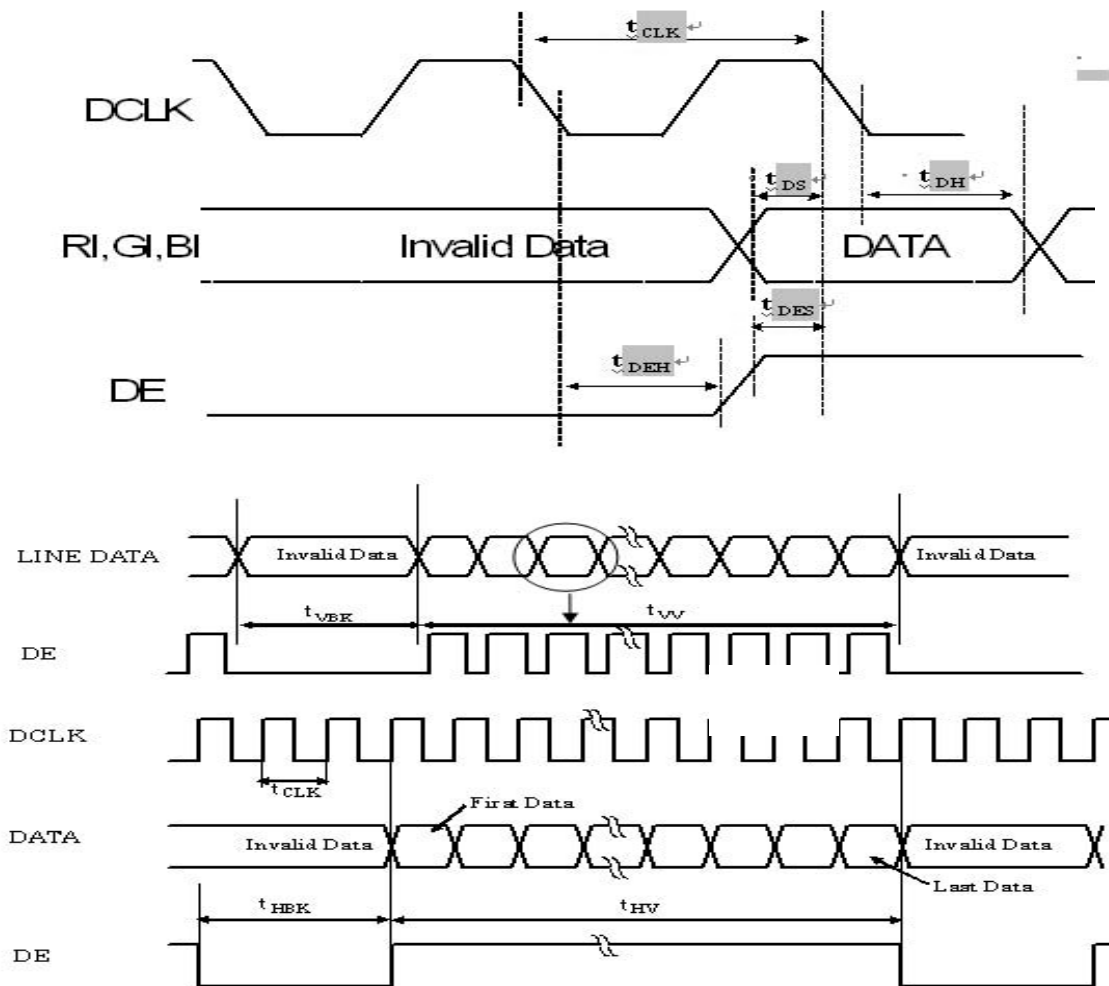
L/R	U/D	Function
1	0	Normally display
0	0	Left and Right opposite
1	1	Up and Down opposite
0	1	Left and Right opposite , Up and Down opposite

5. DMS (Selection DE / SYNC mode)

DMS	Function
1	DE Mode
0	SYNC Mode

7.INPUT SIGNAL (DE mode only) :

7-1 Timing chart



7-2 Timing Specification

ITEM	Symbol	SPEC			UNIT	
		Min	Typ	Max		
DCLK Frequency	f_{CLK}	5	-	40	MHZ	
DCLK Period	t_{CLK}	16.67	-	-	ns	
DCLK Low Level Width	t_{WCL}	0.3	-	-	ns	
DCLK High Level Width	t_{WCH}	0.3	-	-	ns	
DE	Set-up Time	t_{DES}	5	-	-	ns
	Hold Time	t_{DEH}	10	-	-	ns
	Horizontal Period	t_{HP}	750	800	900	t_{CLK}
	Horizontal Valid	t_{HV}	640			t_{CLK}
	Horizontal Blank	t_{HBK}	110	160	260	t_{CLK}
	Vertical Period	t_{VP}	515	525	560	t_{HP}
	Vertical Valid	t_{VV}	480			t_{HP}
	Vertical Blank	t_{VBK}	35	45	80	t_{HP}
Data Set-up Time	t_{DS}	4	-	-	ns	
Data Hold Time	t_{DH}	8	-	-	ns	

7-3 Color Data Assignment

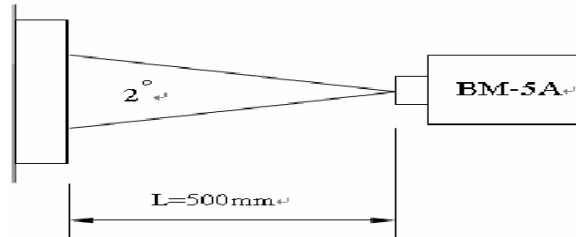
COLOR	Input Data	R DATA					G DATA					B DATA							
		R5 MSB	R4	R3	R2	R1	R0 LSB	G5 MSB	G4	G3	G2	G1	G0 LSB	B5 MSB	B4	B3	B2	B1	B0 LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0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

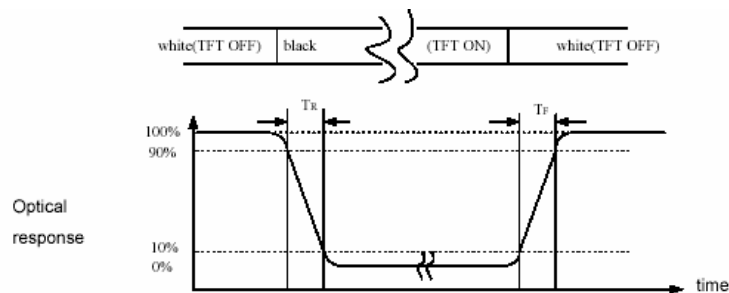
8. OPTICAL CHARACTERISTICS

Item		Symbol	Conditon	Min.	Typ.	Max.	Unit	Note
Response Time		$T_r + T_f$	$\Theta = \Phi = 0^\circ$	-	30	50	ms	(1)
Contrast ratio		CR		200	300	-	-	(2)(3)
Viewing Angle	Vertical	Θ	$CR \geq 10$	80	100	-	Deg.	(5)
	Horizontal	Φ		120	140	-		
Luminance		L	$\Theta = \Phi = 0^\circ$	180	220	-	cd/m ²	(3)(4)
Luminance Uniformity		ΔL		70	80	-	%	(3)(4)
Color chromaticity	Red	Rx	$\Theta = \Phi = 0^\circ$	TBD	TBD	TBD	-	(3)
		Ry						
	Green	Gx		TBD	TBD	TBD		
		Gy						
	Blue	Bx		TBD	TBD	TBD		
		By						
	White	Wx		0.273	0.313	0.353		
		Wy		0.289	0.329	0.369		

NOTE : Measure conditions : 25°C±2°C , 60±10%RH under 10Lux , in the dark room by BM-5A(TOPCON) ,viewing 2° , VCC=3.3V , VDD=3.3V



(1) Definition of Response Time (White-Black)



(2) Definition of Contrast Ratio

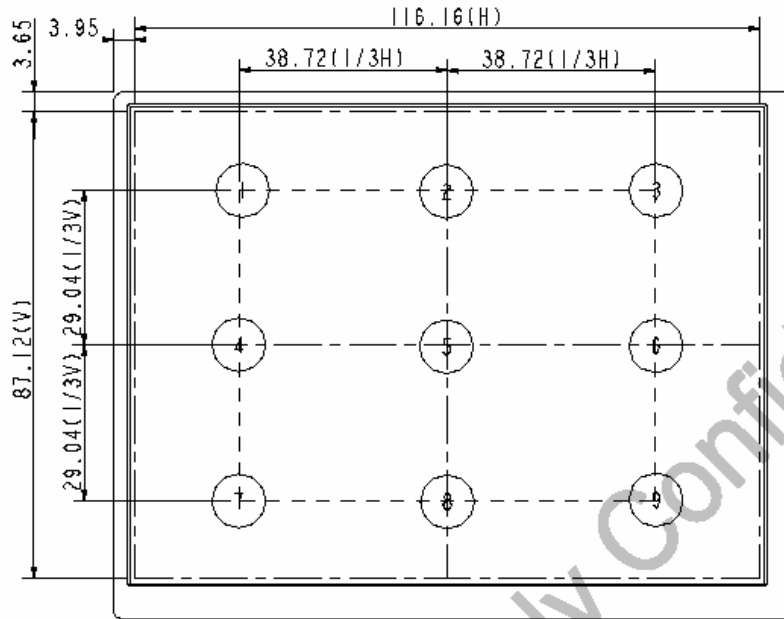
Measure contrast ratio on the below 5 points(refer to figurel,#1~#5point) and take the average value

Contrast ratio is calculated with the following formula :

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

(3) Definition of Luminance :

Measure white luminance on the same 5 points and take the average value



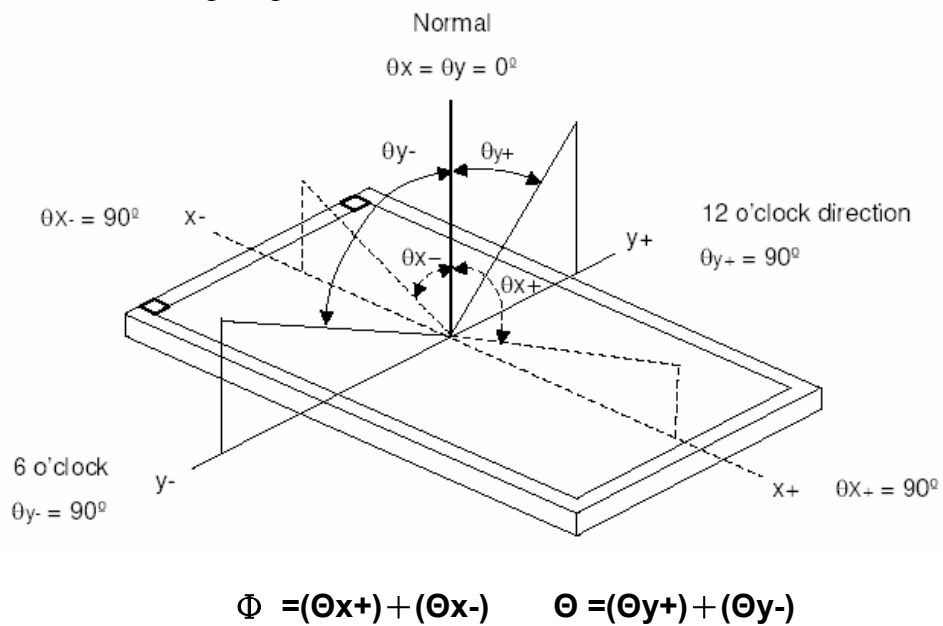
(4) Definition of Luminance Uniformity :

Measured Maximum luminance[L(MAX)] and Minimum luminance[L(MIN)] on the 5 points

Luminance Uniformity is calculated with the following formula :

$$\Delta L = [L(\text{MAX}) / L(\text{MIN}) - 1] \times 100$$

(5) Definition of Viewing Angle



9. RELIABILITY TEST CONDITIONS

ITEM	CONDITIONS
HIGH TEMPERATURE OPERATION	85°C , 240Hrs
HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	60°C , 90%RH , 240Hrs
HIGH TEMPERATURE STORAGE	90°C , 240Hrs
LOW TEMPERATURE OPERATION	-30°C , 240Hrs
LOW TEMPERATURE STORAGE	-40°C , 240Hrs
THERMAL SHOCK	-30°C (1Hr) ~85°C (1Hr) 200Cycle
SHOCK (NON-OPERATIONS)	● 980m/S ² (equal to 100G),6ms ● (1/2 Sine wave),XYZ
VIBRATION (NON-OPERATIONS)	● Frequency range:8~33.3Hz 1stroke:1.3mm Vibration sinusoidal wave, perpendicular axis(both x,z axis:2Hrs,y axis :4Hrs) 1 sweep:2.9G , 33.3~400Hz 1cycle : 15min

NOTE : Judgment standard

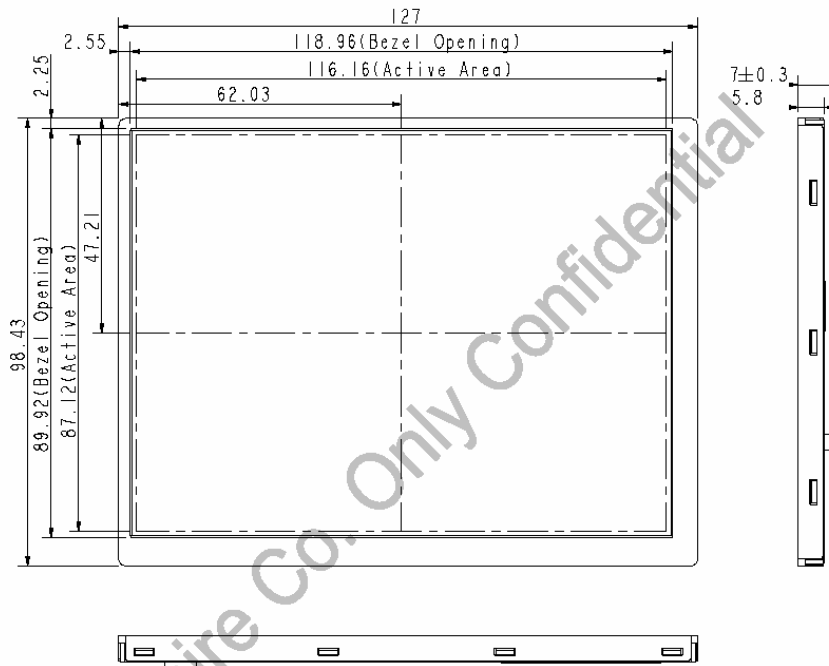
The Judgment of the above test should be made as follow :

Pass : Normal display image with no obvious non-uniformity and no line defect . Partial transformation of the module parts should be ignored.

Fail : No display image , obvious non-uniformity or line defect

10. OUTLINE DIMENSION

10-1 Front view(unit:mm)



10-2 Back view(unit:mm)

