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-640480GTMQW-00H
APPROVED BY	
DATE	2007/03/07

■ Preliminary Specification
☐ Approved Specification

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2006/09/01	-	New Release	LEE
2007/03/05	3	2. PHYSICAL SPECIFICATIONS : Overall dimension : 127.0(W)x100.0(H)x7.0(D)→127.0(W)x100.0(H)x6.6(D)	LEE
	5	4-1 TFT LCD Module Voltage : LED Voltage : 2.7(min)→4.5(min) ; 3.3(typ)→5.0(typ) ; 5(max)→5.5(max) 4-2 TFT LCD current comsumption : LCD Power current : Icc TBD→150(typ);TBD→190(max) LED Power current :	LEE
	7	I_{DD} TBD→320(typ) ; TBD→360(max) 6. INTERFACE : PIN2 (DMS→NC) ; PIN3 (Hsync→NC) ; PIN 4~6 (Vcc→VLED) ; PIN8 (Vsync→NC)	LEE
	9	NOTE : 1 (Pulse duty the more small the more bright → Pulse duty the bigger the brighter)	LEE
	11	7-2 Timing Specification : f_{CLK} → 25MHZ	LEE
	13	Color chromaticity 9. RELIABILITY TEST CONDITIONS:THERMAL SHOCK{-30℃(1Hr) ~85℃(1Hr) 200Cycle → -30℃ (0.5Hr) ~85℃(0.5Hr) 200Cycle	LEE
	14	10. OUTLINE DIMENSION	LEE
2007/03/07	4	Modify Absolute Max. Ratings and the paragraph arrange.	Edward
	5	Add a figure to TFT LCD current consumption.	Edward

1. INTRODUCTION

Ampire Display Module AM640480G 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)x6.6(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	℃	(1)
Storage Temperature	Tstg	-40	95	℃	(1)

NOTE :

1. If users use the product out off the environment operation range (temperature and humidity) , it will concern for visual quality.

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_{LED}	4.5	5.0	5.5	V	
Logic Input Voltage	VIH	V_{CC}*0.7	-	V_{CC}	V	
	VIL	0	-	V_{CC}*0.3	V	

NOTE : 1. Vcc – dip condition :

When 2.7V≦Vcc＜3.0V , td ≦10ms

Vcc＞3.0V , Vcc – dip condition should be same as Vcc turn-on condition

4-2 TFT LCD current comsumption

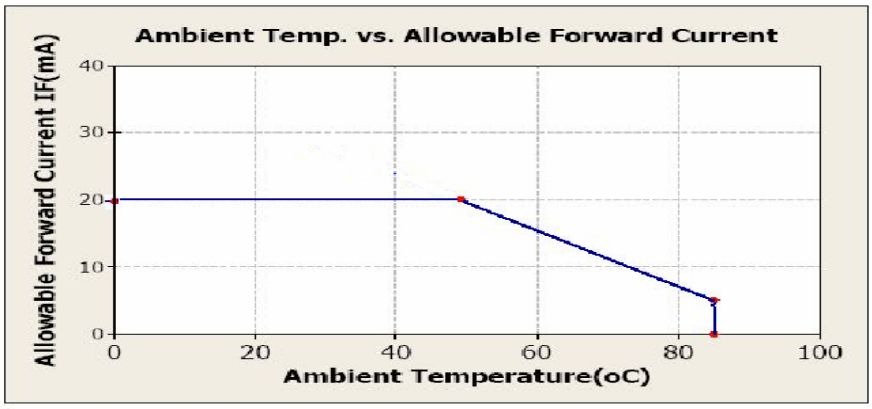
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Current	ICC	-	150	190	mA	(1)
LED Power Current	IDD	-	320	360	mA	(2)

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

(a) 64 Gray Pattern

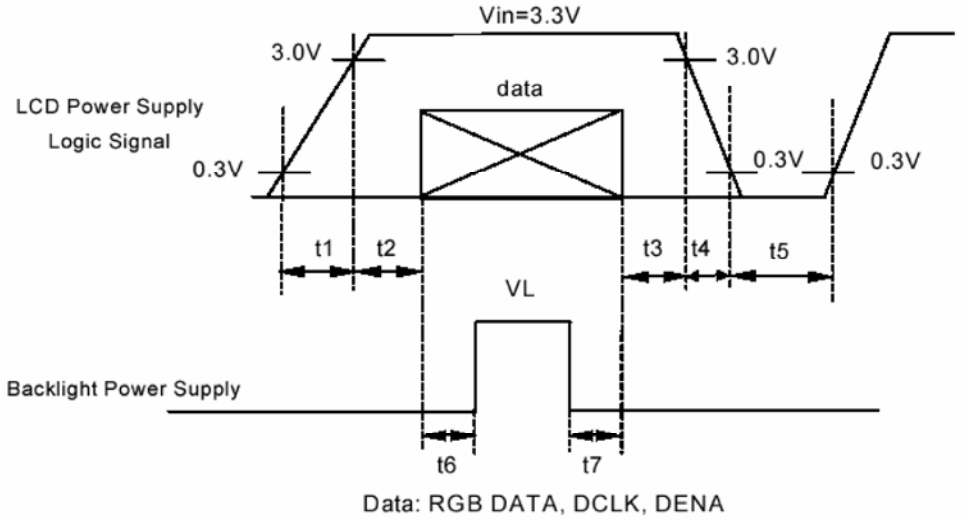
(b) Black Pattern

(2) Typ : When VDD is 5.0V Max : When VDD is 4.5V

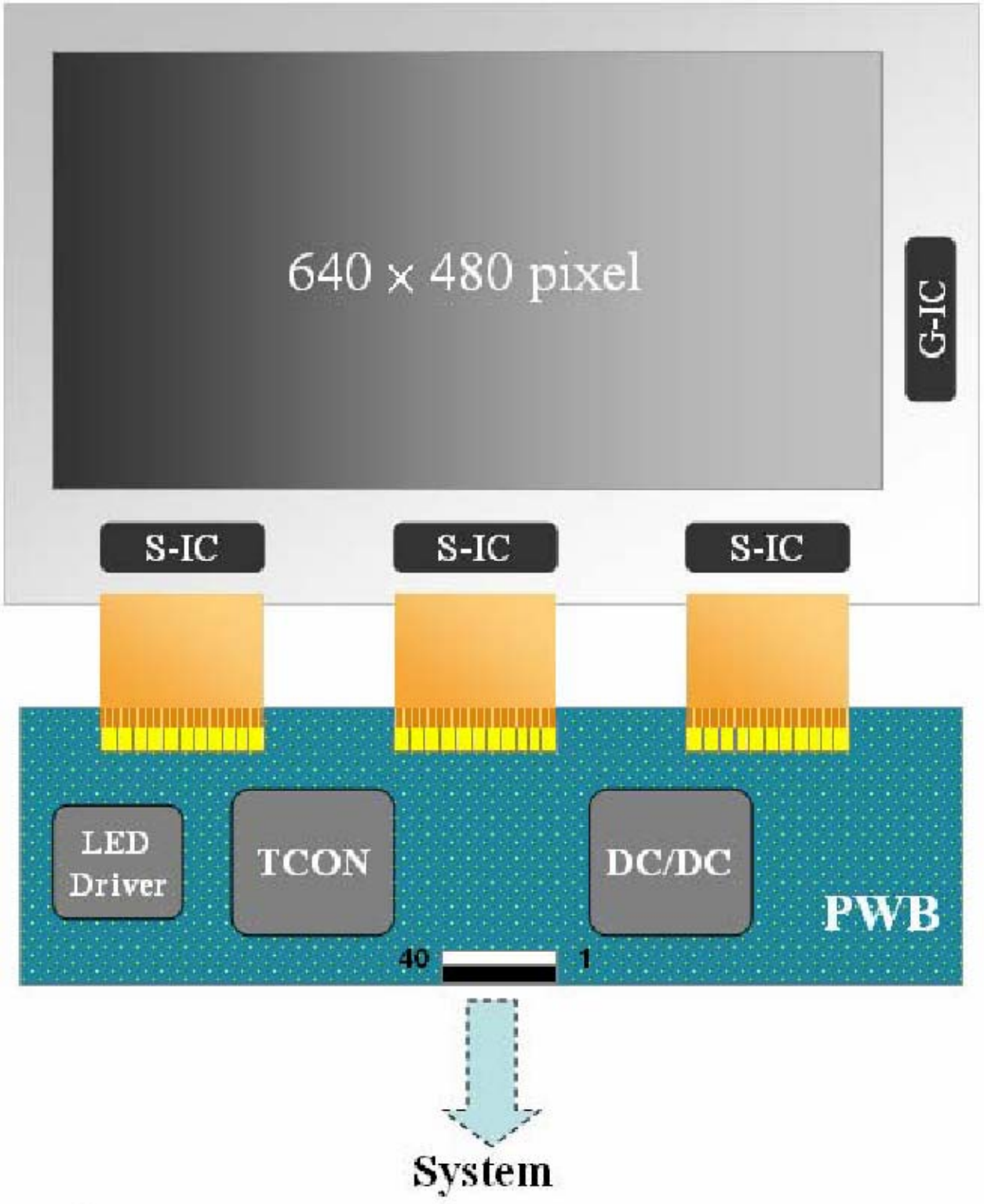


4-3 Power Signal sequence

t1≦10ms 50ms≦t2 0＜t3≦50ms
0＜t4≦10ms 1sec≦t5 200ms≦t6
200ms≦t7



5. BLOCK DIAGRAM

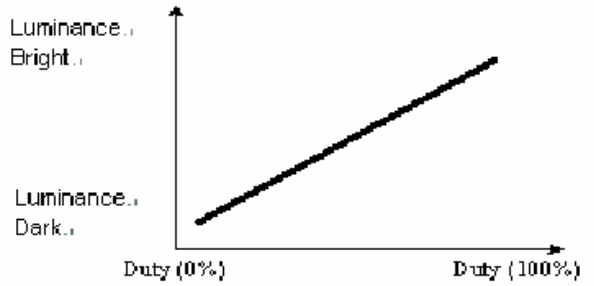


6. INTERFACE

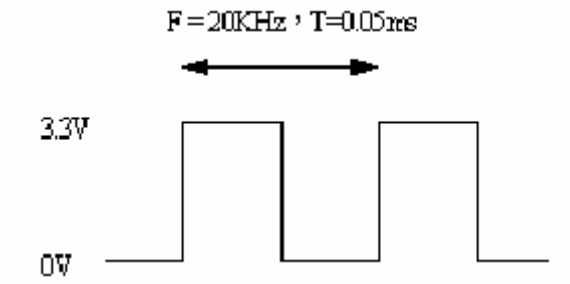
Pin no	Symbol	Function
1	U/D	Up or Down Display control
2	NC	Custom non-connect ; initial pull high = DE Mode
3	NC	NC
4	VLED	Power supply for digital circuit LED
5	VLED	Power supply for digital circuit LED
6	VLED	Power supply for digital circuit LED
7	Vcc	Power supply for digital circuit LCD
8	NC	NC
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 ~ 3.3V , operation frequency : 20Khz



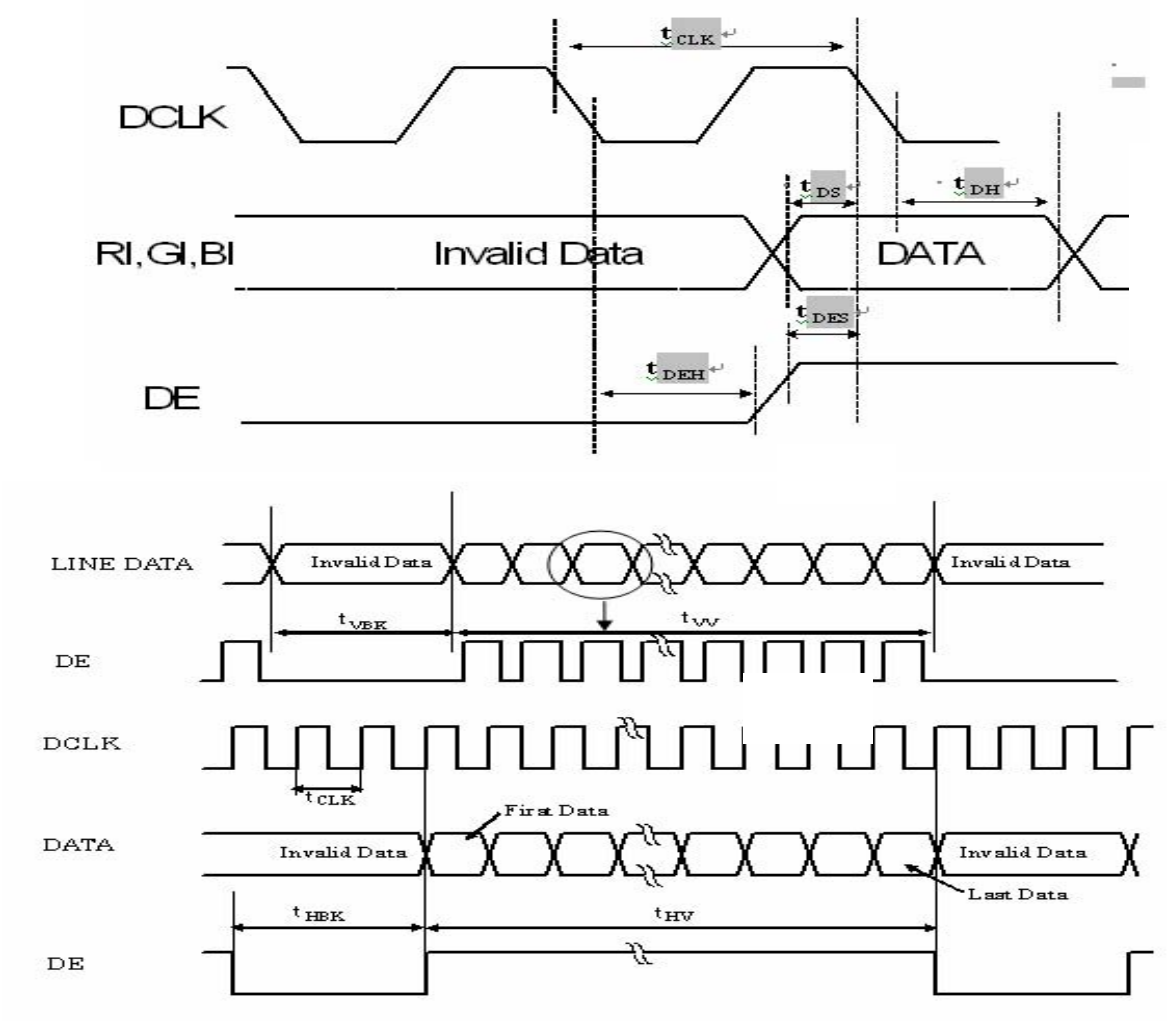
3. GND Pin must ground contact , can not be floating

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

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	25	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}
	Vertical Frequency	f_V	55	60	65	Hz
Data Set-up Time		t_{DS}	4	-	-	ns
Data Hold Time		t_{DH}	8	-	-	ns

7-3 Color Data Assignment

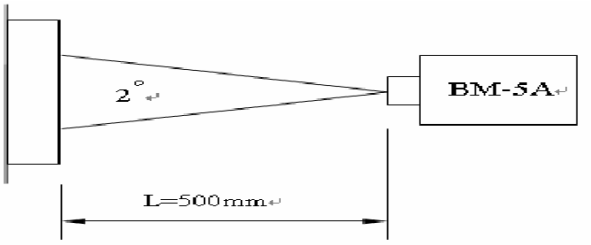
COLOR	Input Data	R DATA						G DATA						B DATA					
		R5 MSB	R4	R3	R2	R1	R0 LSB	G5 MSB	G4	G3	G2	G1	G0 LSB	B5 MSB	B4	B3	B2	B1	B0 LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0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

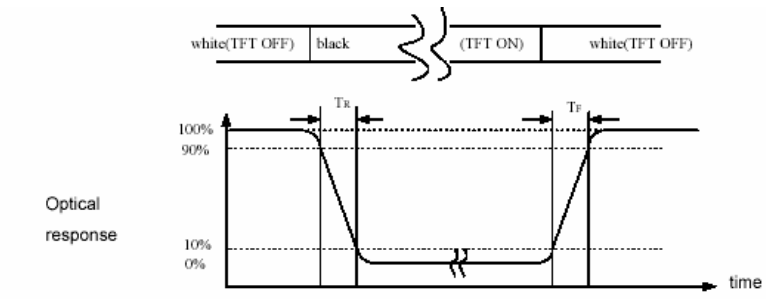
8. OPTICAL CHARACTERISTICS

Item		Symbol	Conditon	Min.	Typ.	Max.	Unit	Note
Response Time		T_r+T_f	Θ=Φ=0°	-	30	50	ms	(1)
Contrast ratio		CR		200	300	-	-	(2)(3)
Viewing Angle	Vertical	Θ	CR≧10	80	100	-	Deg.	(5)
	Horizontal	Φ		120	140	-		
Luminance		L	Θ=Φ=0°	180	220	-	cd/m^2	(3)(4)
Luminance Uniformity		ΔL		70	80	-	%	(3)(4)
Color chromaticity	Red	Rx	Θ=Φ=0°	0.570	0.610	0.650	-	(3)
		Ry		0.296	0.336	0.376		
	Green	Gx		0.290	0.330	0.370		
		Gy		0.534	0.574	0.614		
	Blue	Bx		0.106	0.146	0.186		
		By		0.070	0.110	0.150		
	White	Wx		0.273	0.313	0.353		
		Wy		0.289	0.329	0.369		

NOTE : Measure conditions : 25℃±2℃ , 60±10%RH under 10Lux , in the dark room by BM-5A(TOPCON) ,viewing 2° , VCC=3.3V , VDD=5.0V



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



(2) Definition of Contrast Ratio

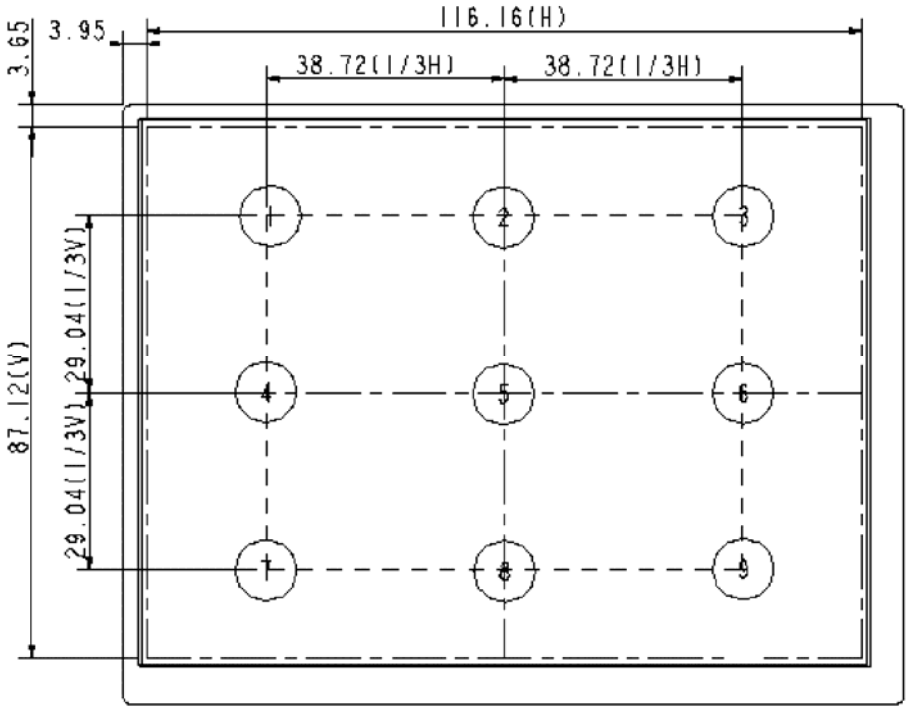
Measure contrast ratio on the below 5 points(refer to figurel,#1~#5point) and take the average value

Contrast ratio is calculated with the following formula :

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

(3) Definition of Luminance :

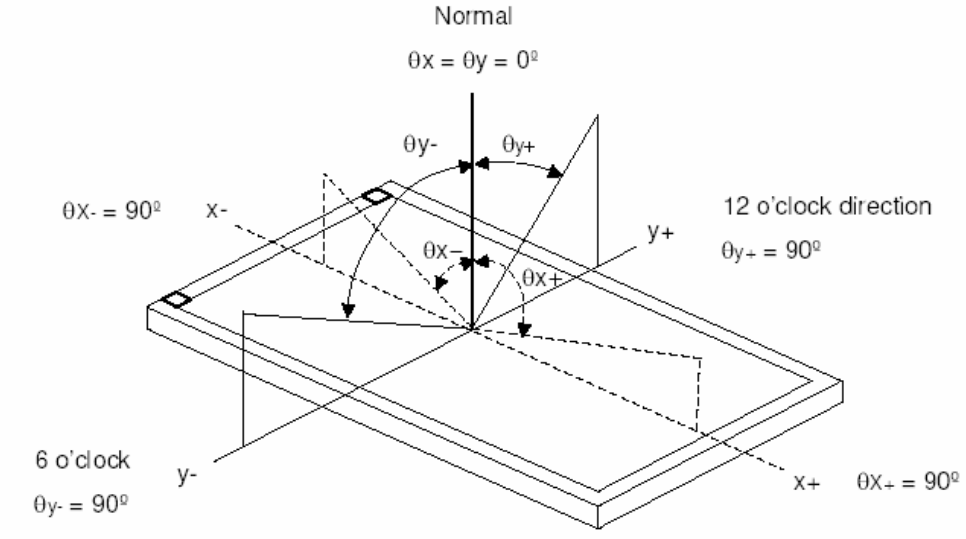
Measure white luminance on the same 5 points and take the average value



(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 :

ΔL =[L(MAX) / L(MIN) –1] X 100

(5) Definition of Viewing Angle



Φ =(Θx+)+(Θx-) Θ =(Θy+)+(Θy-)

9. RELIABILITY TEST CONDITIONS

ITEM	CONDITIONS
HIGH TEMPERATURE OPERATION	85℃ , 240Hrs
HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	60℃ , 90%RH , 240Hrs
HIGH TEMPERATURE STORAGE	90℃ , 240Hrs
LOW TEMPERATURE OPERATION	-30℃ , 240Hrs
LOW TEMPERATURE STORAGE	-40℃ , 240Hrs
THERMAL SHOCK	-30℃(0.5Hr) ~85℃(0.5Hr) 200Cycle
SHOCK (NON-OPERATIONS)	● 980m/S^2(equal t0 100G),6ms ● (1/2 Sine wave),XYZ
VIBRATION (NON-OPERATIONS)	● Frequency range:8~33.3Hz 1stoke: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

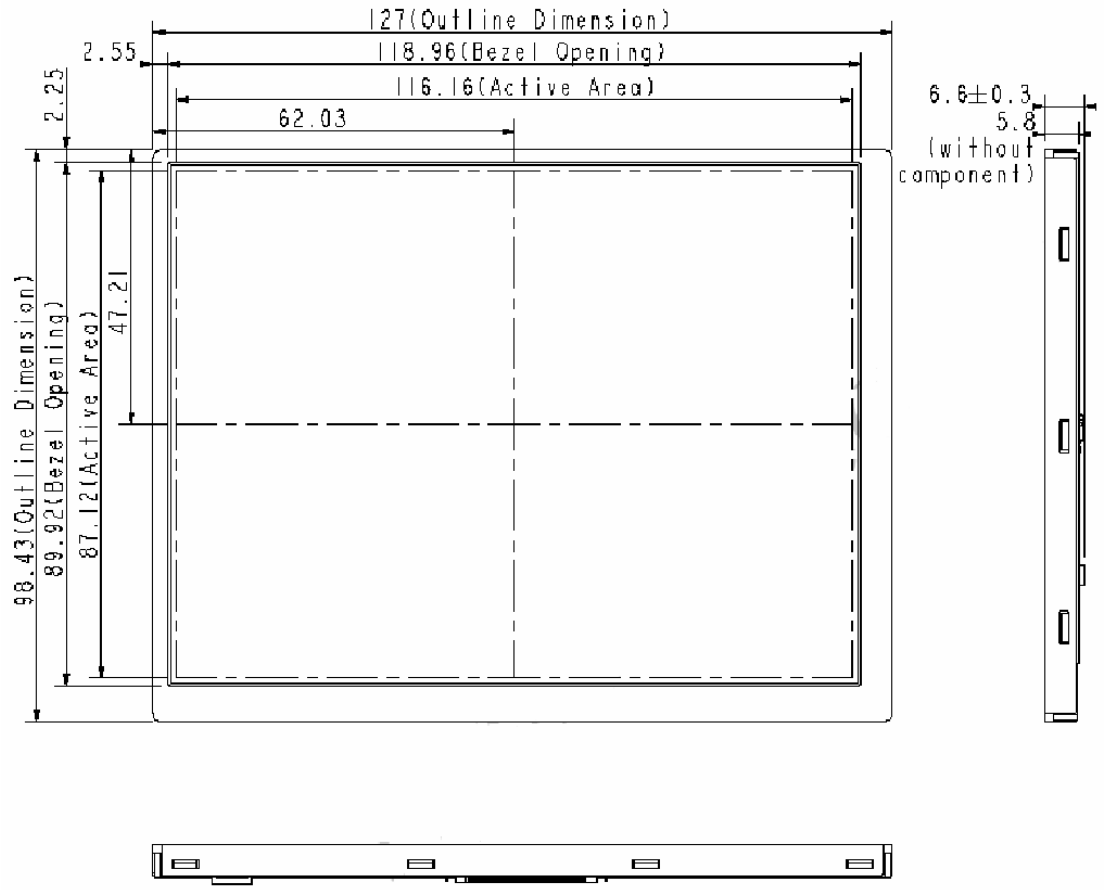
The Judgment of the above test should be made as follow :

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)