

A Brighter Solution

AMP DISPLAY INC.

SPECIFICATIONS

8.9-in Color TFT MODULE

CUSTOMER:	
CUSTOMER PART NO.	
AMP DISPLAY PART NO.	A M - 1 0 2 4 6 0 0 C T M Q W - 0 0
APPROVED BY:	
DATE:	

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APPROVED FOR SPECIFICATIONS

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APPROVED FOR SPECIFICATION AND PROTOTYPES

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2008/12/31	--	New Release	Edward

1. Features

8.9 (17:10)inch Amorphous-TFT-LCD (Thin Film Transistor Liquid Crystal Display) module. This module is composed of a 8.9" TFT-LCD panel, a driver circuit and backlight unit.

- (1) Construction: 8.9" a-Si color TFT-LCD, White LED Backlight and PCB.
- (2) Resolution (pixel): 1024(R.G.B) X 600
- (3) Number of the Colors : 256K colors (R , G , B 6 bit digital each)
- (4) LCD type : Transmissive Color TFT LCD (normally White)
- (5) Interface: 30 pin
- (6) Power Supply Voltage: 3.3V single power input. Built-in power supply circuit.
- (7) Viewing Direction: 6 o'clock (The direction it's hard to be discolored)
- (8) One Channel LVDS interface.
- (9) RoHS compliance

2. PHYSICAL SPECIFICATIONS

Item	Specifications	unit
Display resolution(dot)	1024 RGB (W) x 600(H)	Pixels
Display area	195.072 (W) x 113.4 (H)	mm
Pixel pitch	190.5 (W) x 189 (H)	um
Color configuration	R.G.B Vertical stripe	
Overall dimension	213.36 (W)x129.55 (H)x5.15 (D)---(Typ)	mm
Surface treatment	Antiglare , Hard-Coating (3H) with EWV film	
Brightness	220 (Typ)	cd/m ²
Contrast ratio	500	
Backlight unit	LED	
Power consumption	Logic System : 0.95 (Max) B/L System : 2.1 (Max)	W

3. ABSOLUTE MAXIMUM RATINGS

3.1 Absolute max. ratings

3.1.1 Electrical Absolute max. ratings

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
Logic Supply voltage	VDD	-0.3	6.0	V	GND=0
LED Power Supply voltage	VLED	-0.3	6.0	V	

3.1.2 Environmental Absolute max. ratings

Item	OPERATING		STORAGE		Remark
	MIN	MAX	MIN	MAX	
Temperature	0	50	-20	60	Note2,3,4,5,6,7
Humidity	Note1		Note1		
Corrosive Gas	Not Acceptable		Not Acceptable		

Note1 : $T_a \leq 40^{\circ}\text{C}$: 85% RH max

$T_a > 40^{\circ}\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at 40°C

Note2 : For storage condition T_a at $-20^{\circ}\text{C} < 48\text{h}$, at $60^{\circ}\text{C} < 100\text{h}$

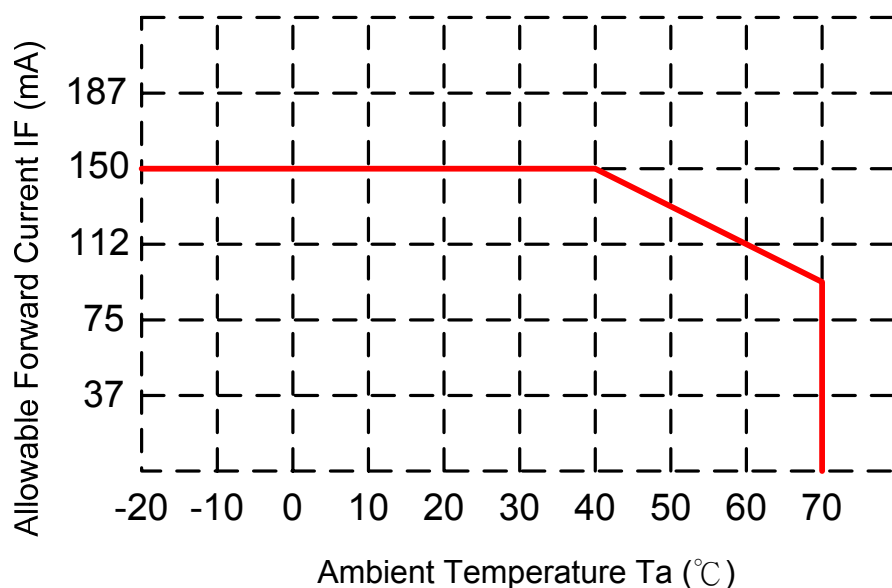
For operating condition T_a at $0^{\circ}\text{C} < 100\text{h}$

Note3 : Background color changes slightly depending on ambient temperature.
This phenomenon is reversible.

Note4 : The response time will be slower at low temperature.

Note5 : Only operation is guaranteed at operating temperature. Contrast ,
response time, another display quality are evaluated at $+25^{\circ}\text{C}$

Note6 : When LCM is operated over 40°C ambient temperature, the I_{LED} of the
LED back-light should be follow :



Note7 : This is panel surface temperature, not ambient temperature.

Note8 : When LCM be operated over than 40°C , the life time of the LED
back-light will be reduced.

4. ELECTRICAL CHARACTERISTICS

4-1 DC Electrical characteristic of the LCD

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Power Voltage For LCD	VDD	3.0	3.3	3.6	V	Note3
	VLED	4.7	5.0	5.3	V	
LCD Power Current	IDD	--	0.27	--	A	Note2

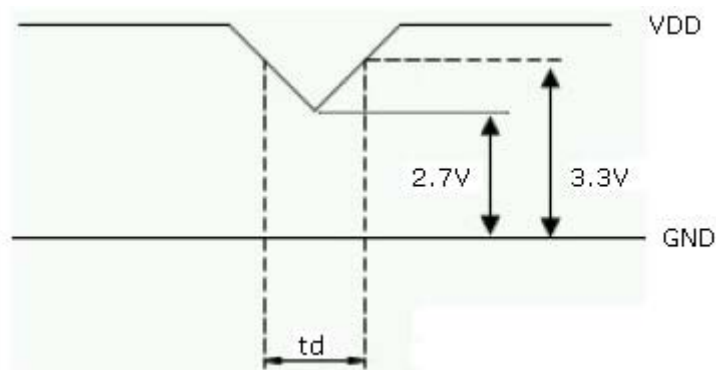
Note : (1) The brightness of LCD panel could be changed by adjusting ADJ.

(2) VDD = 3.3V, L0 pattern

(3) VDD-dip condition:

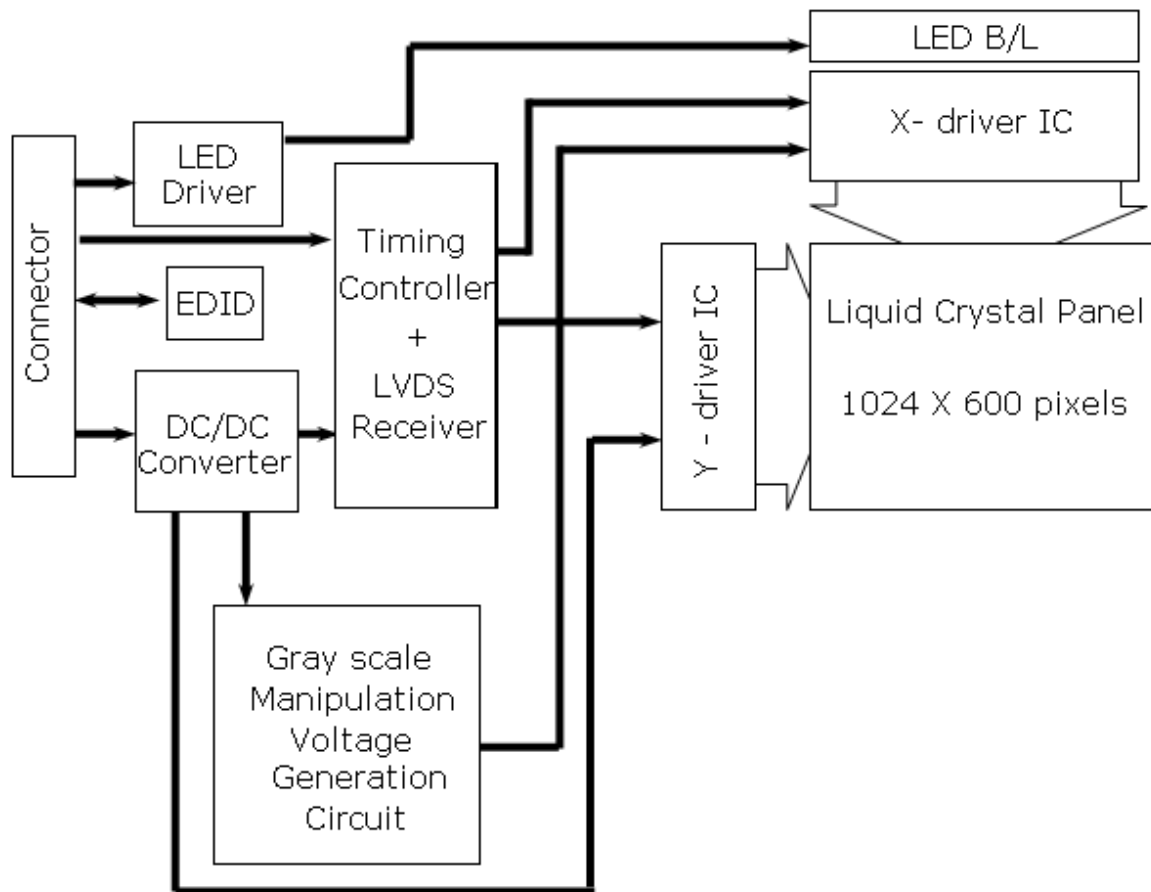
When VDD operating within $2.7V \leq VDD < 3.0V$, $t_d \leq 10ms$, the display may momentarily become abnormal.

VDD>3.0V, VDD-dip condition should be same as VDD-turn-con condition.

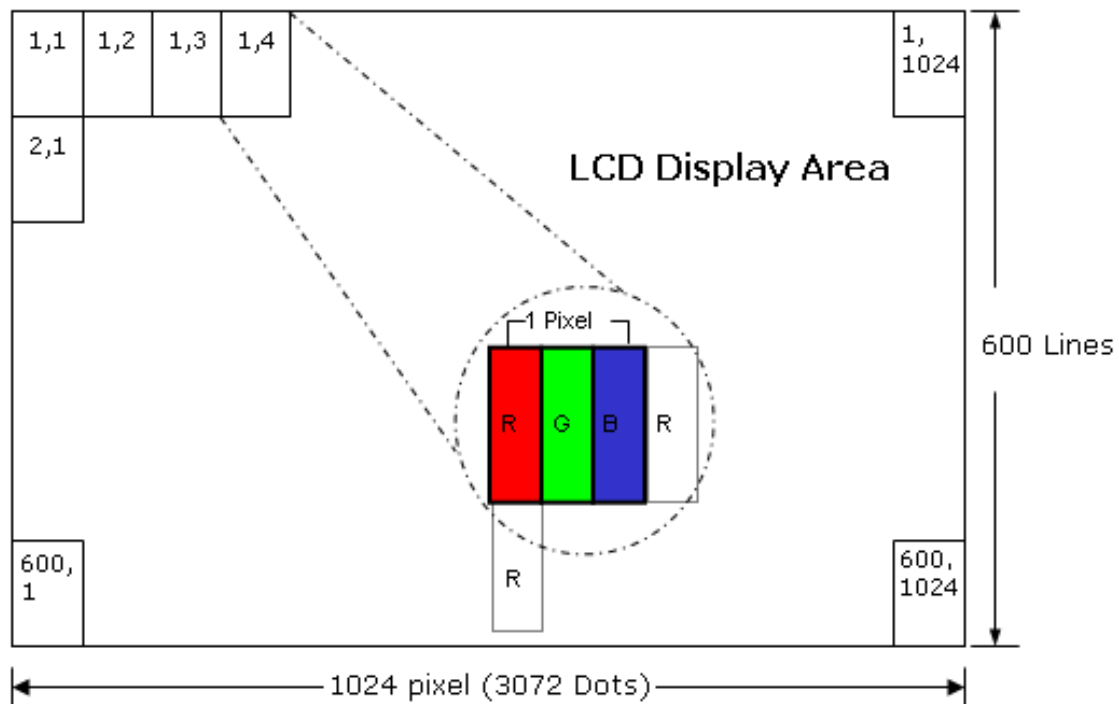


5. BLOCK DIAGRAM

5-1 TFT LCD Module



5-2 Pixel Format

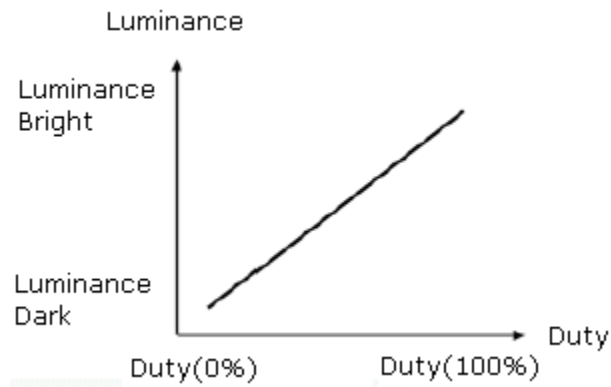


6. INTERFACE

Pin No	Symbol	Function
1	GND	Ground
2	VDD	3.3V Power
3	VDD	3.3V Power
4	V_EDID	3.3V Power for EDID
5	ADJ	Adjust for LED brightness (Note 1)
6	CLK_EDID	EDID Clock Input
7	DATA_EDID	EDID Data Input
8	RXIN0-	LVDS Signal- Channel0-
9	RXIN0+	LVDS Signal+ Channel0+
10	GND	Ground
11	RXIN1-	Data Input Channel1-
12	RXIN1+	Data Input Channel1+
13	GND	Ground
14	RXIN2-	Data Input Channel2-
15	RXIN2+	Data Input Channel2+
16	GND	Ground
17	RXCLKIN-	Data Input CLK-
18	RXCLKIN+	Data Input CLK+
19	GND	Ground
20	NC	No connection
21	NC	No connection
22	GND	Ground
23	GND	Ground
24	VLED	LED Power +5V
25	VLED	LED Power +5V
26	VLED	LED Power +5V
27	NC	No connection
28	NC	No connection
29	NC	No connection
30	NC	No connection

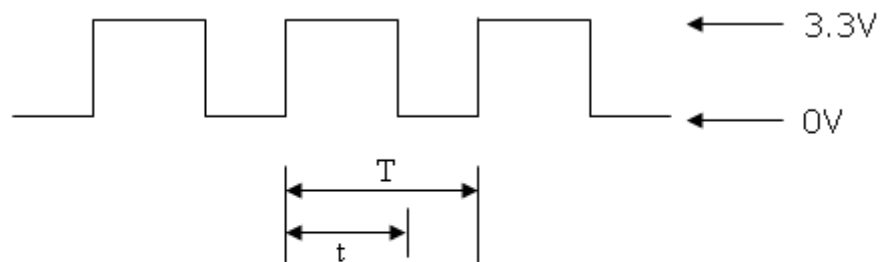
Note : (1) The brightness of LCD panel could be changed by adjusting ADJ.

(2) ADJ can adjust brightness to control Pin. Pulse duty the bigger the brighter.



(3) ADJ Signal = 0~3.3V, Operation Frequency :

Dimming Range		
PWM Frequency (F)	Duty Cycle (Min.)	Duty Cycle (Max.)
100Hz < F < 500Hz	5%	100%
500Hz < F < 20KHz	10%	100%



$$\text{Duty Cycle} = t/T * 100\%$$

$$T = 1/F$$

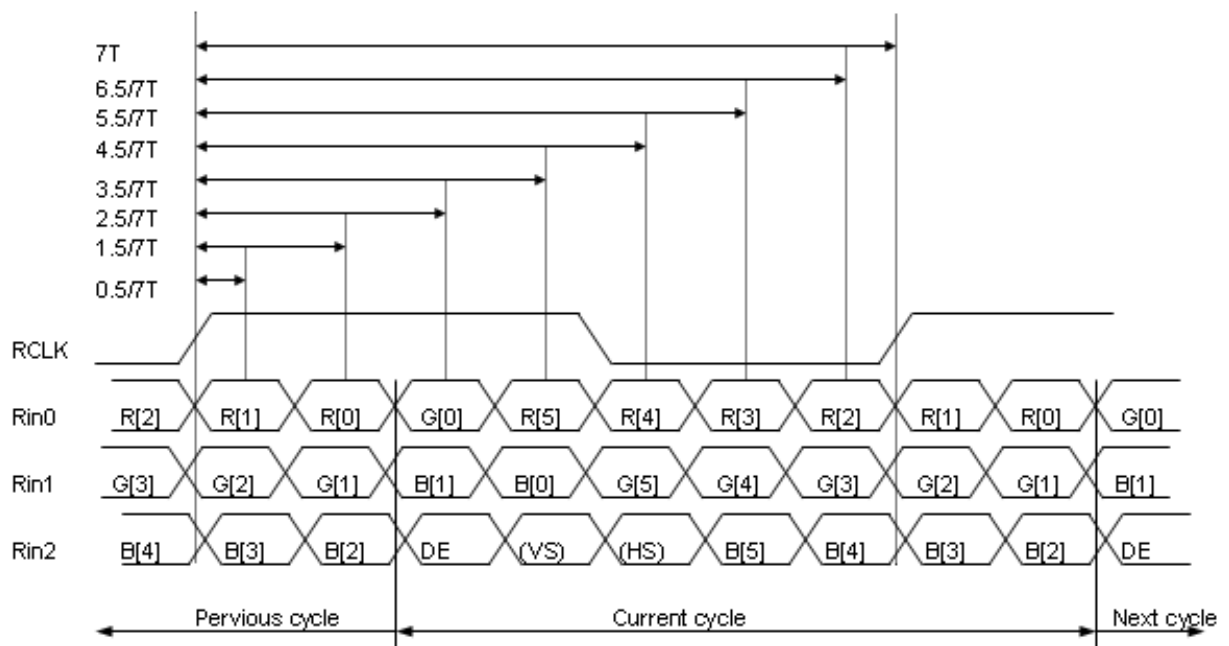
7. INPUT SIGNAL :

7-1 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Differential Input High Threshold	V _{th}	--	--	100	mV	(1)
Differential Input Low Threshold	V _{tl}	-100	--	--	mV	(1)
Input Current	LIN	-10	--	+10	uA	
Differential input Voltage	VID	0.1	--	0.6	V	
Common Mode Voltage Offset	VCM	(VID /2)	1.25	1.8-0.4-(VID /2)	V	

Note : (1) conditions : VCM = 1.2V

7-2 Bit Mapping & Interface Definition



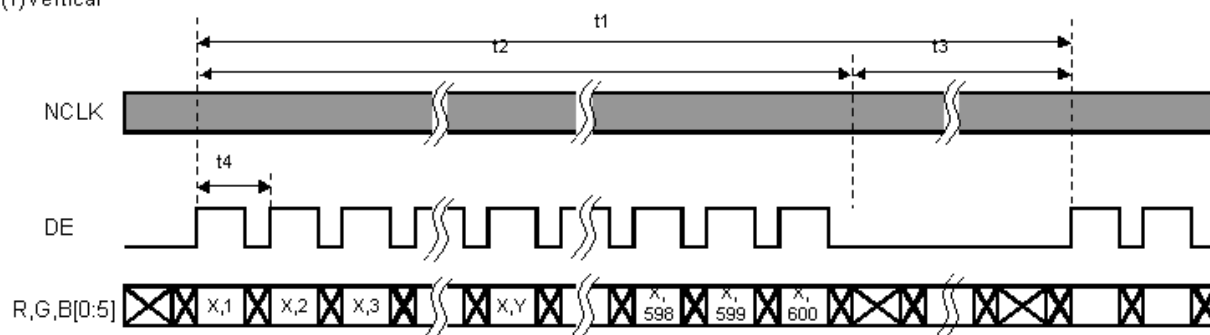
LVDS Receiver Input Timing Definition for 6 bits LVDS input

7-3 Interface Timing (DE mode)

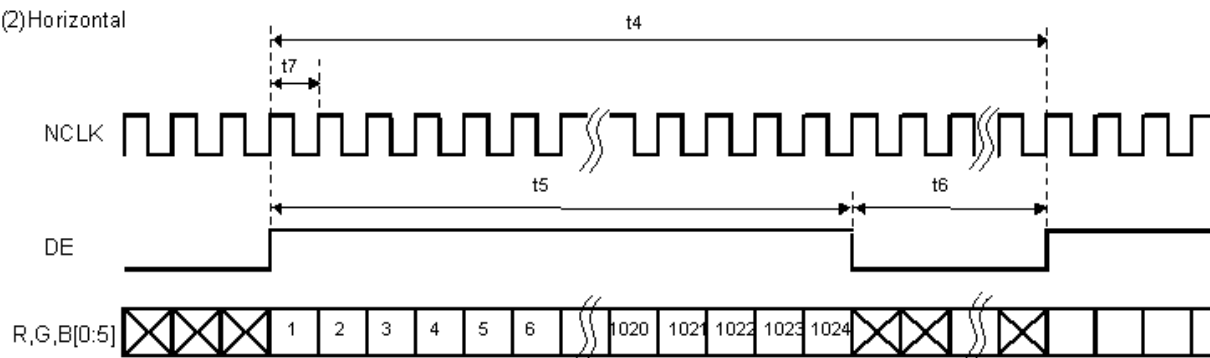
Item	Symbol	Min.	Typ.	Max.	Unit
Frame Rate	--	55	60	65	Hz
Frame Period	t1	612	625	638	Line
Vertical Display Time	t2	600	600	600	Line
Vertical Blanking Time	t3	12	25	38	Line
1 Line Scanning Time	t4	1160	1200	1240	Clock
Horizontal Display Time	t5	1024	1024	1024	Clock
Horizontal Blanking Time	t6	136	176	216	Clock
Clock Rate	t7	39	45	51.42	MHz

Timing Diagram of Interface Signal (DE mode)

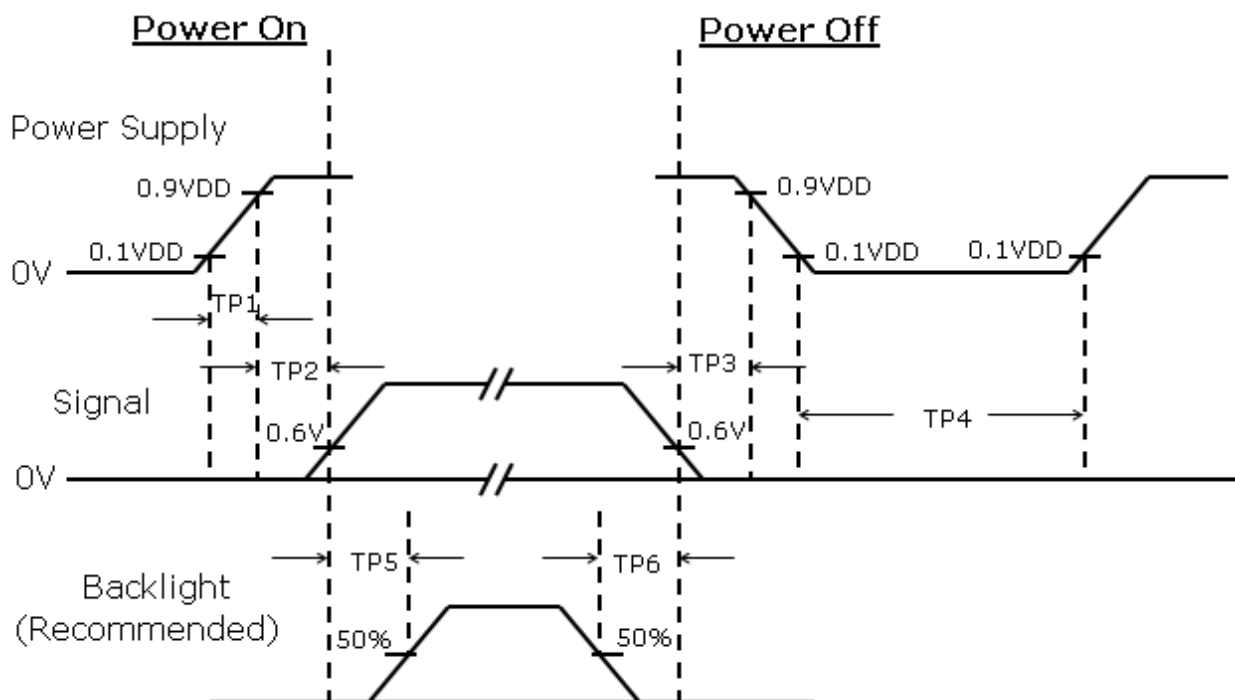
(1)Vertical



(2)Horizontal



7-4 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit
TP1	0.5	--	10	msec
TP2	0	--	50	msec
TP3	0	--	50	msec
TP4	500	--	--	msec
TP5	200	--	--	msec
TP6	200	--	--	msec

Note : (1) The supply Voltage of the external system for module input should be the same as the definition of VDD.

(2) Apply the lamp voltage within the LCD operation range. When the back-light turns on before the LCD operation or the LCD turns off before the back-light turn off, the display may momentarily become white.

(3) In case of VDD = off level, please keep the level of input signal on the low or keep a high impedance.

(4) TP4 should be measured after the module has been fully discharged between power off and on period.

(5) Interface signal shall not be kept at high impedance when the power is on.

7-5 Relationship Between Displayed Color and Input

Color	Display	R Data						G Data						B Data						Gray scale
		R5 MSB	R4	R3	R2	R1	R0 LSB	G5 MSB	G4	G3	G2	G1	G0 LSB	B5 MSB	B4	B3	B2	B1	B0 LSB	level
Basic color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	-
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	-
	Light Blue	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	-
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	-
	Purple	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	-
Gray scale of Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L0
	Dark ↑ ↓ Light	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	L1
		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L60
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
		1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	L61
		1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	L62
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	Red L63
Gray scale of Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L0
	Dark ↑ ↓ Light	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	L1
		0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L60
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	
		0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	L61
		0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	L62
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	Green L63
Gray scale of Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L0
	Dark ↑ ↓ Light	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	L1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L60
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	
		0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	L61
		0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	L62
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	Blue L63
Gray scale of White & Black	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	L0
	Dark ↑ ↓ Light	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	0	L1
		0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	0	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L60
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
		1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	
		1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	L61
		1	1	1	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	L62
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	White L63

Note : (1) Data : 1-High , 0-Low

8. OPTICAL CHARACTERISTICS

8-1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta=0^{\circ}$ Normal viewing angle	400	500	--	--	(1)(2)
Response time	Rising	Tr		--	5	7	msec	(1)(3)
	Falling	Tf		--	20	28		
White Luminance (Center)		YL		180	220		cd/m ²	(1)(4) (I _L =150mA)
Color chromaticity (CIE1931)	White	Wx		0.260	0.310	0.360	--	(1)(4)
		Wy	0.280	0.330	0.380			
Viewing angle	Hor.	Θ_L	CR>10	60	70	--	--	
		Θ_R		60	70	--		
	Ver.	Θ_U		40	50	--		
		Θ_D		50	60	--		
Brightness uniformity		Buni	$\Theta=0$	70	--	--	%	(5)
Optima View Direction		6 o'clock						(6)

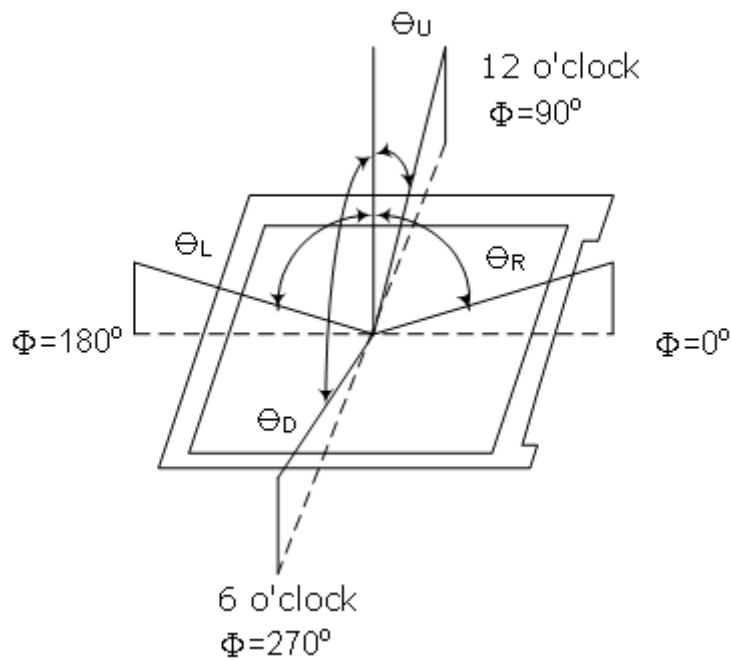
8-2 Measuring Condition

- (1) Measuring surrounding : dark room
- (2) LED current I_L : 150mA
- (3) Ambient temperature : $25\pm 2^\circ\text{C}$
- (4) 15min. warm-up time.

8-3 Measuring Equipment

- (1) FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- (2) Measuring spot size : 20~21mm.

Note (1) Definition of Viewing Angle :



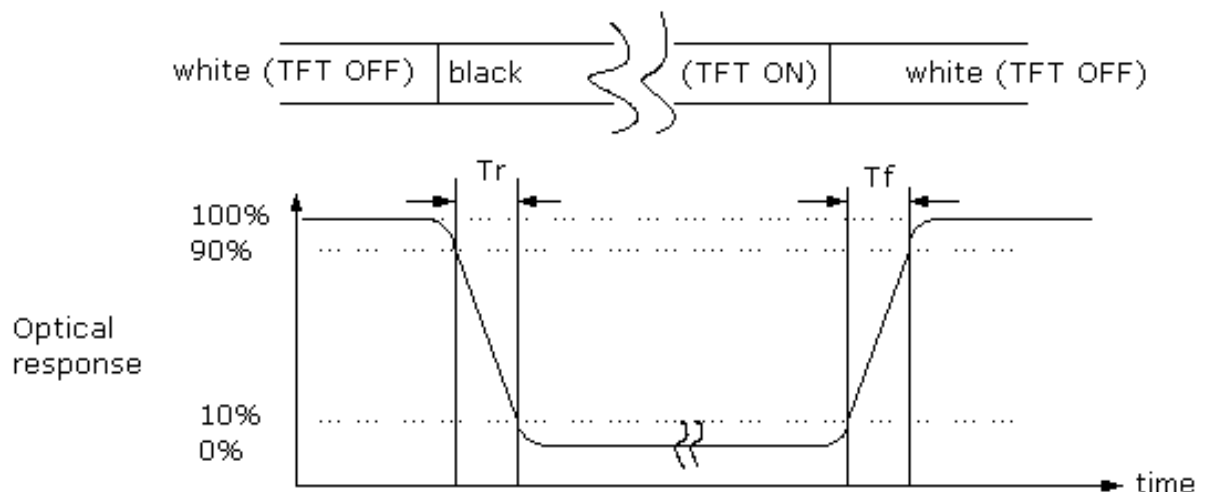
Note (2) Definition of Contrast Ratio (CR) :

measured at the center point of panel

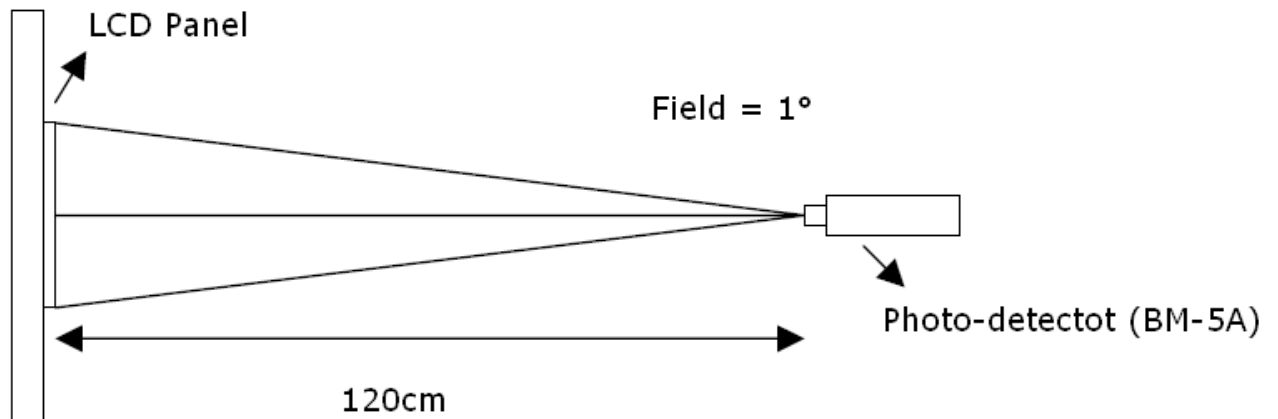
Luminance with all pixels white

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

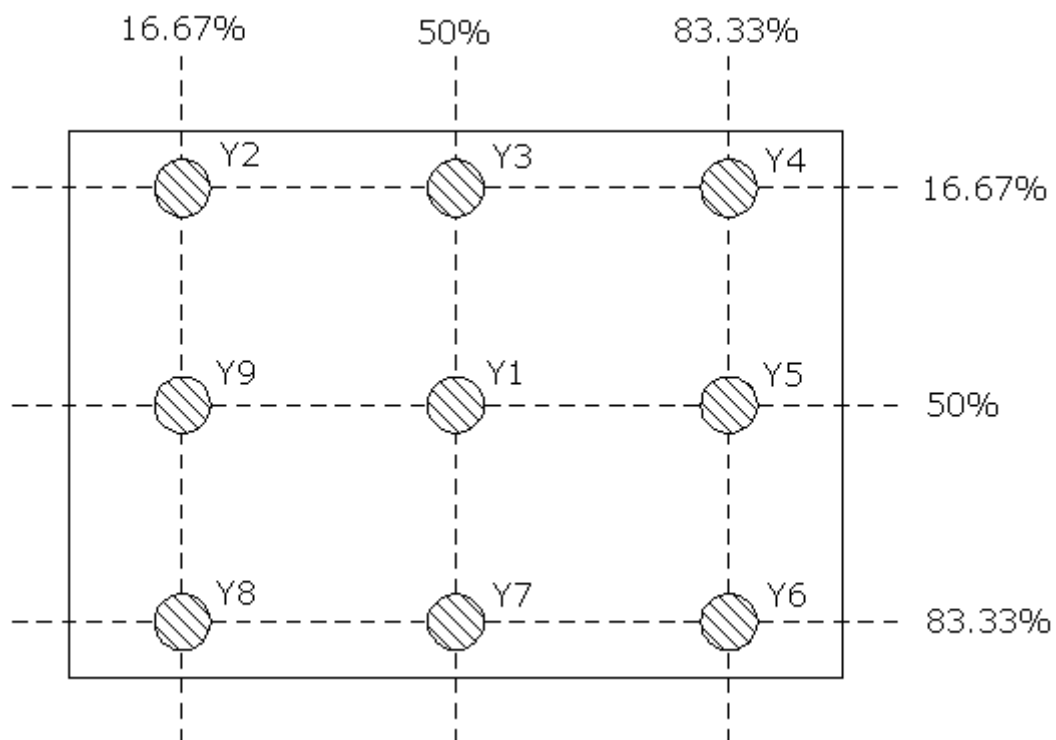
Note (3) Definition of Response Time : Sum of T_r and T_f



Note (4) Definition of optical measurement setup.



Note (5) Definition of brightness uniformity



$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)

9. RELIABILITY TEST CONDITIONS

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta = +60°C, 240hrs	
2	Low Temperature Storage	Ta = -20°C, 240hrs	
3	High Temperature Operation	Ta = +50°C, 500hrs	
4	Low Temperature Operation	Ta = 0°C, 500hrs	
5	High Temperature and High Humidity (operation)	Ta = +50°C, 80%RH, 500hrs	
6	Thermal Cycling Test (non operation)	-20°C(30min)→+60°C(30min), 100 cycles	
7	Electrostatic Discharge	±200V, 200pF(0Ω) 1 time/connector	
8	Vibration	1. Random : 1.04G, 10~500Hz, XYZ, 30min/each direction 2. Sine: 1.5G, 5~500Hz, XYZ 30min/each direction	
9	Shock	Half-Sine, 220G, 2ms,±XYZ, 1time	
10	Vibration (with carton)	Random: 1.04G, 10~500Hz, XYZ, 45min/each direction	
11	Drop (with carton)	Height : 60 cm 1 corner, 3 edges, 6 surfaces	

Note : There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

10. GENERAL PRECAUTION

10.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

10.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. AMPIRE does not warrant the module, if customers disassemble or modify the module.

10.3 Breakage of LCD Panel

- (1) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- (2) If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- (3) If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- (4) Handle carefully with chips of glass that may cause injury, when the glass is broken.

10.4 Electric Shock

- (1) Disconnect power supply before handling LCD module.
- (2) Do not pull or fold the LED cable.
- (3) Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

10.5 Absolute Maximum Ratings and Power Protection Circuit

- (1) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- (2) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- (3) It's recommended to employ protection circuit for power supply.

10.6 Operation

- (1) Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

- (2) Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- (3) When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- (4) Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may cause deformation or color fading.
- (5) When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.

10.7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

10.8 Static Electricity

- (1) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- (2) Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

10.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

10.10 Disposal

When disposing LCD module, obey the local environmental regulations.

10.11 Others

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

10. OUTLINE DIMENSION

