Product Specifications

BONA
Display Specialist

BT1416A

Product

- 7.0'' TFT LCD
- 800(RGB)×480
- 24 bits interface
- 27 chip LED Backlight
- Resistive Touch

Version	Prepared / Date	Approved / Date
0	CSB / 05-09-2014	HB / 05-09-2014

Table of Contents

1.Revision History

Version	Summary	Date
0	Original	05-09-2014

2. Mechanical Description

Name	Content	Unit
Outline Size	165.0 (W) * 100.0 (H) * 7.0(T)	mm
Module size	7.0 (V.A)	inch
Resolution	800(RGB)* 480 Pixels	–
Viewing size	156.6(W) * 89.1(H)	mm
Pixel size	0.198 * 0.198	mm
LCD Type	TFT (262K)/ Transmissive / Positive	–
Viewing Angle	6 H	–
Driver IC	–	–
Backlight Type	3 Serial 9 Pararel LED	–
Interface Type	24 Bit RGB	–

3. Mechanical Drawing

BT1416A   **Ver. 0**   *Bona Fide Technology Ltd.*
www.bonafide.com.hk / sales@bonafide.com.hk
Tel.: 852-2345-2355 / Fax.: 852-2345-2377   P.5 of 18
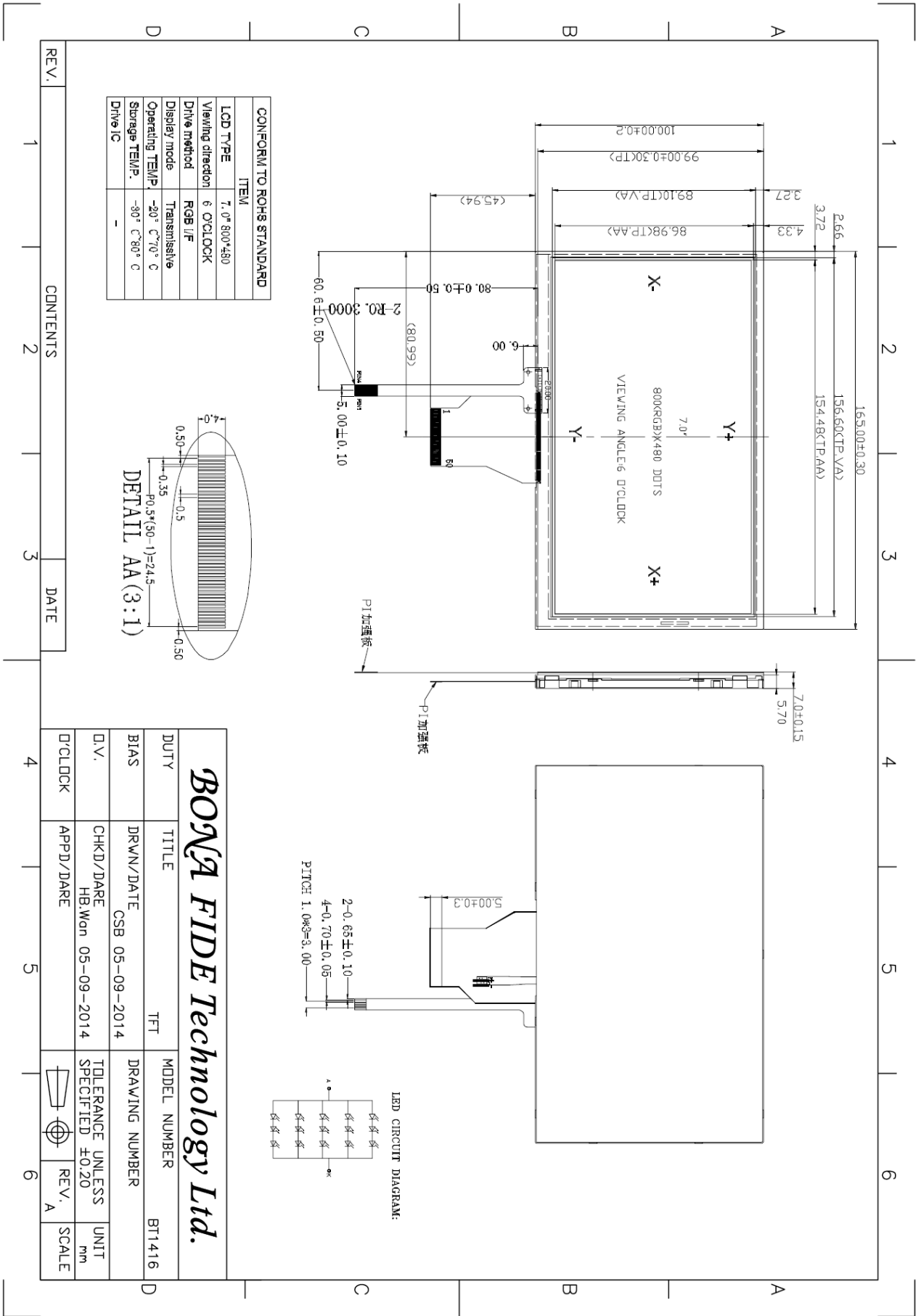
4. Interface Definition

PIN NO.	PIN Name	Funtion Description
1	VLED+	Power for LED backlight (Anode)
2	VLED+	Power for LED backlight (Anode)
3	VLED-	Power for LED backlight (Cathode)
4	VLED-	Power for LED backlight (Cathode)
5	GND	Ground
6	VCOM	Common voltage
7	DVDD	Power for Digital Circuit
8	MODE	DE/SYNC mode select
9	DE	Data Input Enable
10	VS	Vertical Sync Input
11	HS	Horizontal Sync Input
12-19	B7-B0	Blue data
20-27	G7-G0	Green data
28-35	R7-R0	Red data
36	GND	Power Ground
37	DCLK	Sample clock
38	GND	Ground
39	L/R	Left/right selection
40	U/D	Up/down selection
41	VGH	Gate ON Voltage
42	VGL	Gate OFF Voltage
43	AVDD	Power for Analog Circuit
44	RESET	Global reset pin.
45	NC	No connection
46	VCOM	Common Voltage
47	DITHB	Dithering function
48	GND	Power Ground
49	NC	No connection
50	NC	No connection

Note 1: DE/SYNC mode select. Normally pull high.
When select DE mode, MODE="1", VS and HS must pull high.
When select SYNC mode, MODE= "0", DE must be grounded.
Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

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Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DVDD	Up to down, left to right
DVDD	GND	Down to up, right to left
GND	GND	Up to down, right to left
DVDD	DVDD	Down to up, left to right

Note 5: Definition of scanning direction.
Refer to the figure as below:
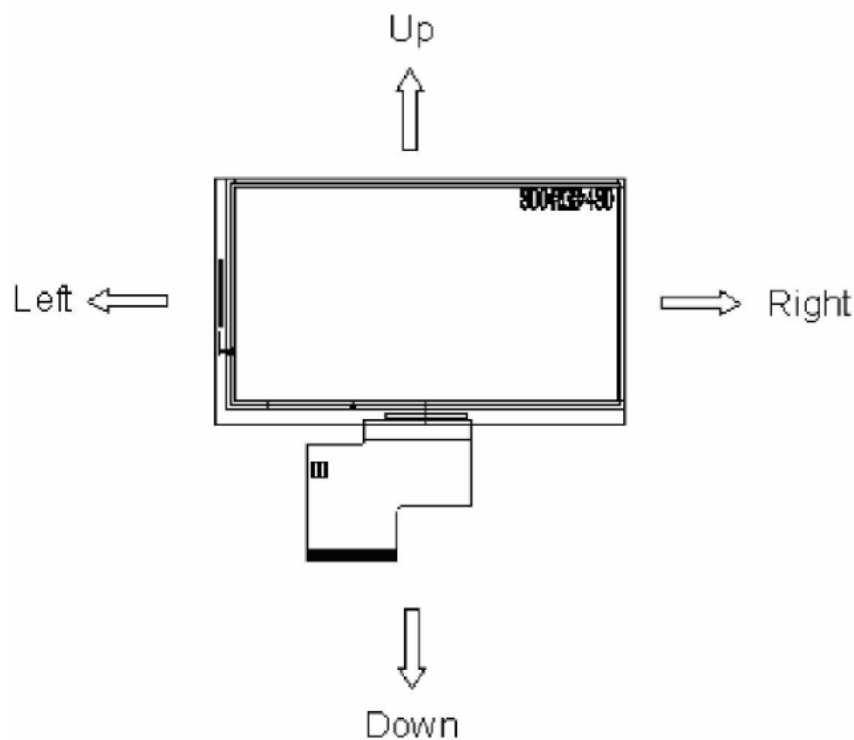
Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.
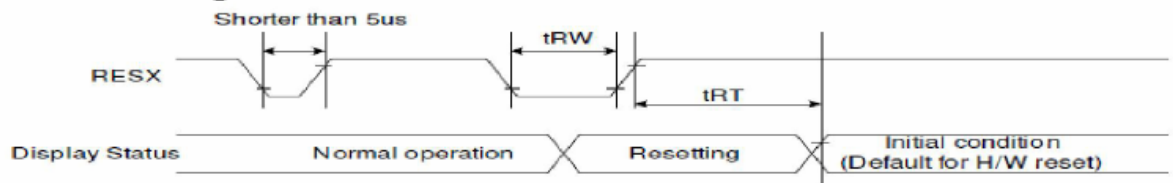
Note 7: Dithering function enable control, normally pull high.
When DITHB="1",Disable internal dithering function,
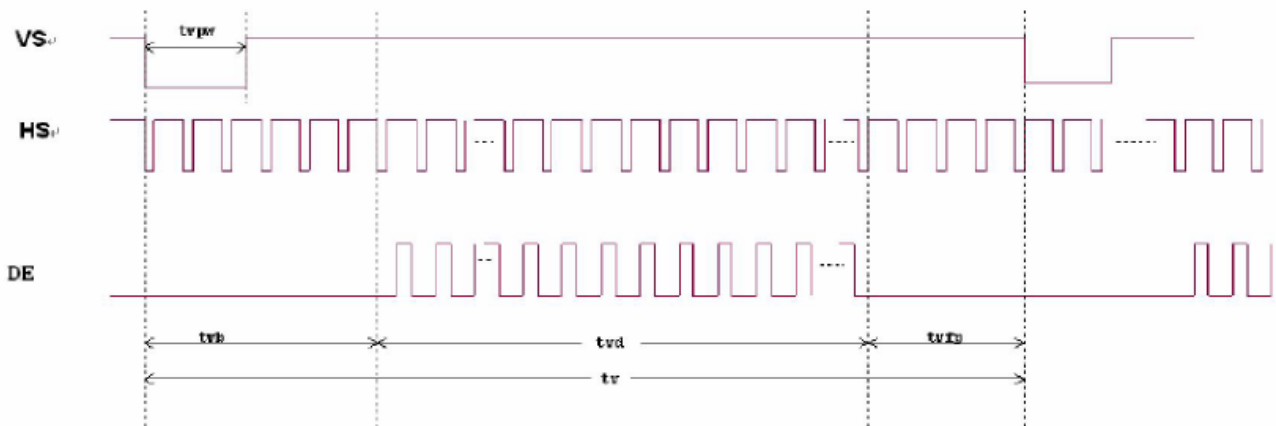When DITHB="0",Enable internal dithering function,

5. Interface Timing：
5.1 Reset Timing

Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

5.2 RGB Interface Timing

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHZ	
One Horizontal Line	th	862	1056	1200	DCLK	
HS Pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period tine	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

5.3 AC Timing Diagram
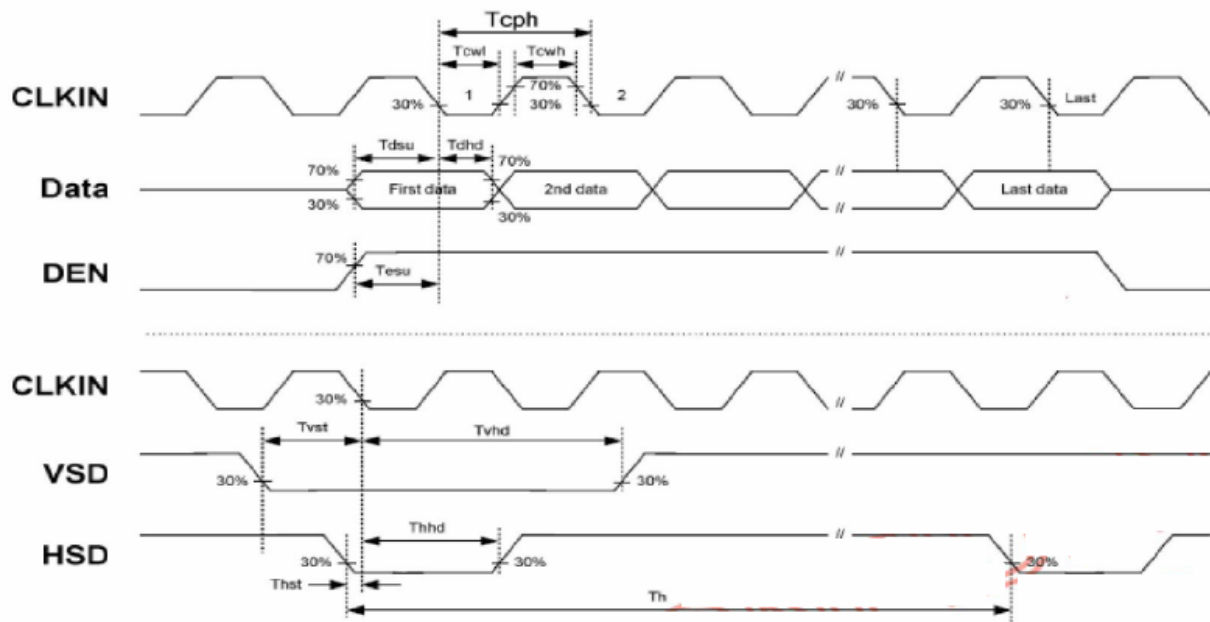
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
HS setup time	Thst	8		-	ns	
HS hold time	Thhd	8			ns	
VS setup time	Tvst	8			ns	
VS hold time	Tvhd	8	-		ns	
Data setup time	Tdsu	8			ns	
Data hole time	Tdhd	8			ns	
DE setup time	Tesu	8			ns	
DE hole time	Tend	8			ns	
DV$_{DD}$ Power On Slew rate	Tpor	-	-	20	ms	From 0 to9％ DV$_{DD}$
RESET pulse width	Trst	1			ms	
DCLK cycle time	Tcoh	20			ns	
DCLK pulse duty	Tcwh	40	50	60		

a. Power on sequence:
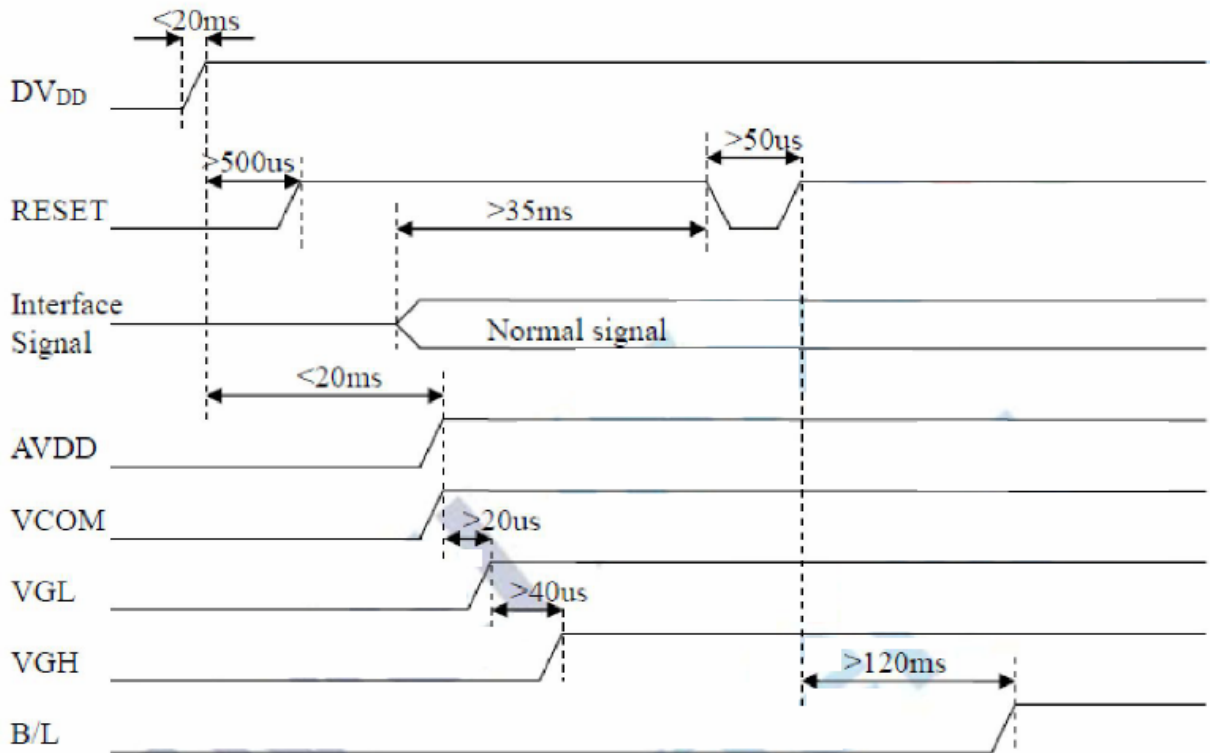
b. Power off sequence:
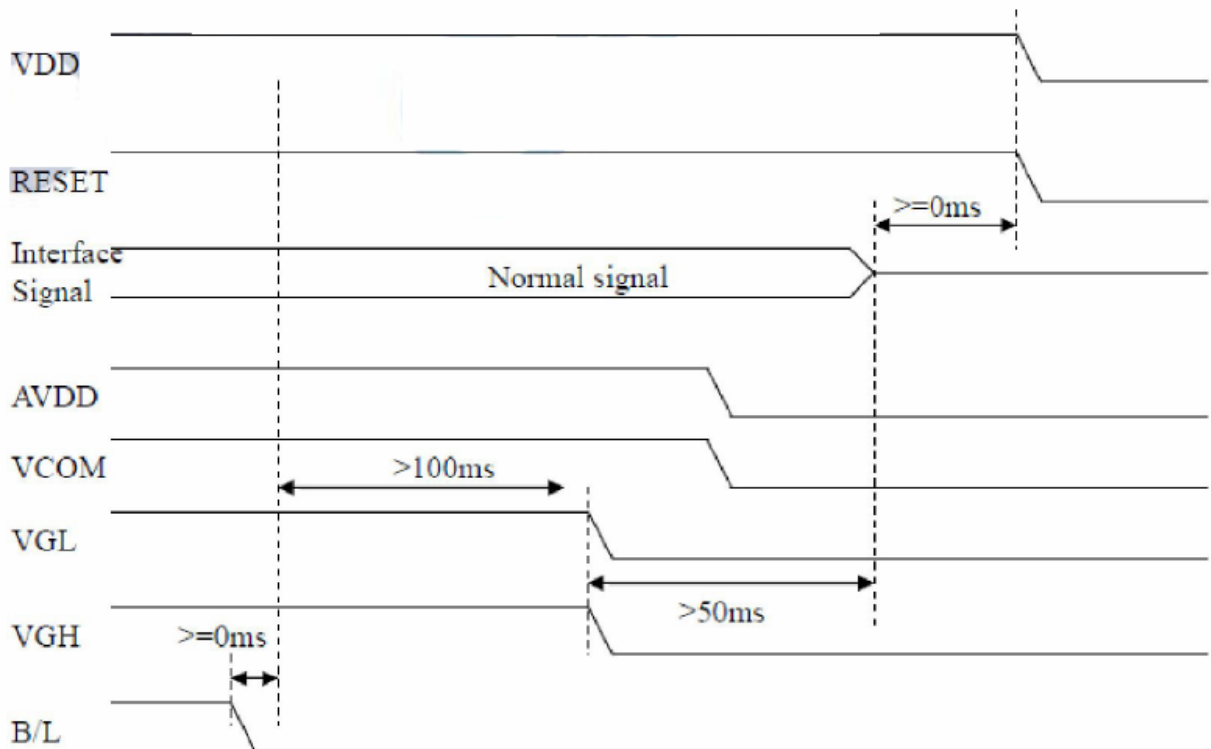
6. Absolute Maximum Ratings：

Name	symbol	Min	Type	Max	Unit
Operation Temperature	Top	-20	-	70	℃
Storage Temperature	Tst	-30	-	80	℃

7. DC Characteristics

Name	Symbol	Min	Type	Max	Unit
Logical Voltage	VDD	3.0	3.2	3.4	V
Input High Voltage	VIH	0.7IOVCC	-	IOVCC	V
Input Low Voltage	VIL	-0.3	-	0.3IOVCC	V
Output High Voltage	VOH	0.7IOVCC	-	-	V
Output Low Voltage	VOL	-	-	0.3IOVCC	V
Current Consumption	IDD	-	-	220	mA

8. Blacklight：

Name	Min	Type	Max	Unit
Current	-	180	190	mA
Voltage	-	9.3	9.9	V
Power Consumption	-	1674	-	mW
luminance	280	300	-	CD/M^2 (Note1)
Luminance uniformity	70%	75%	-	(Note2)
X Color Coordinates	0.27	0.28	0.31	-
Y Color Coordinates	0.27	0.28	0.31	-

Note1: This luminance is tested with assembling the LCD.
Note2: Definition of Luminance Uniformity.
    Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

$$Luminance\ Uniformity\ (Yu) = \frac{B_{min}}{B_{max}}$$
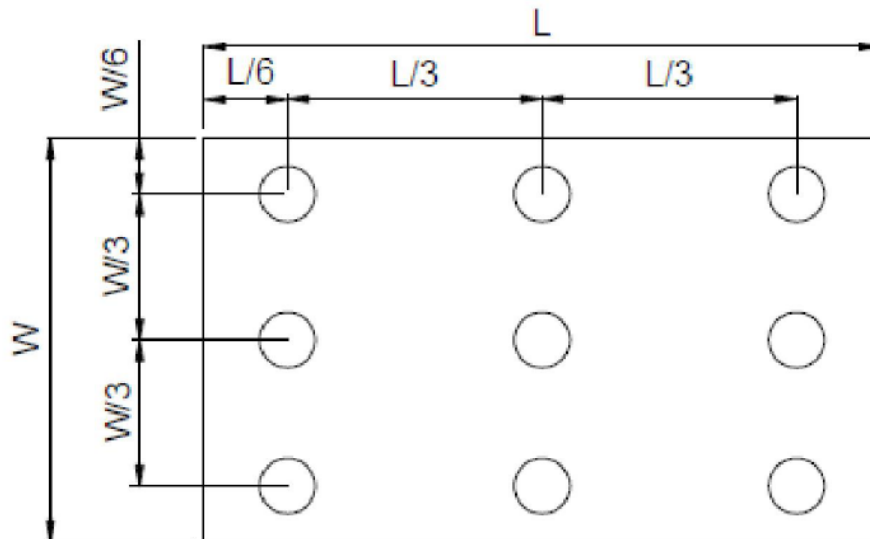
L-------Active area length   W----- Active area width


Fig. 4-4 Definition of measuring points

B_{max}: The measured maximum luminance of all measurement position.
B_{min}: The measured minimum luminance of all measurement position.

9. Optical Specification

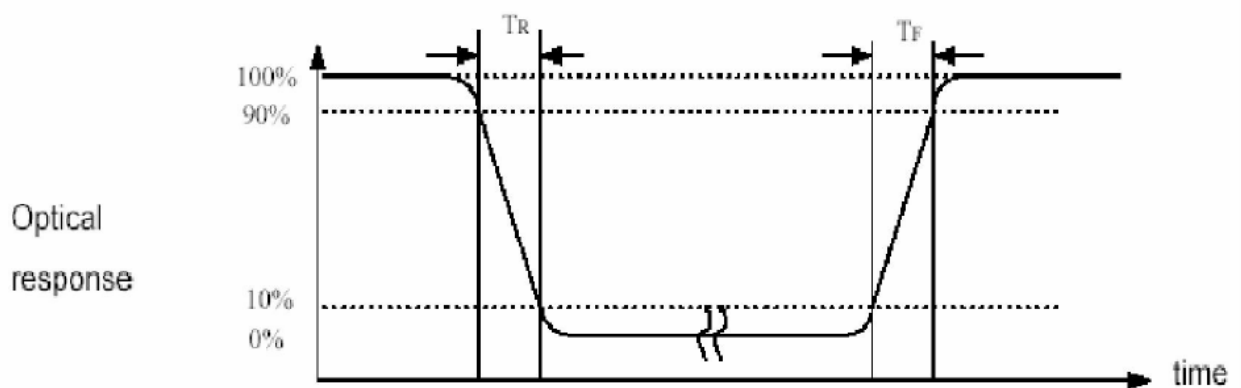| Name	Symbol	Min	Type	Max	Unit
Transmittance rate	T(%)	–	4	–	%
Contrast ratio	C/R	400	500	–	–
Response time	Tr+Tf	–	25	–	ms
Viewing Angle	θU	40	50	–	degree（C/R>10）
	θD	60	70	–	
	θL	60	70	–	
	θR	60	70	–	

*Viewing angle descriptin:
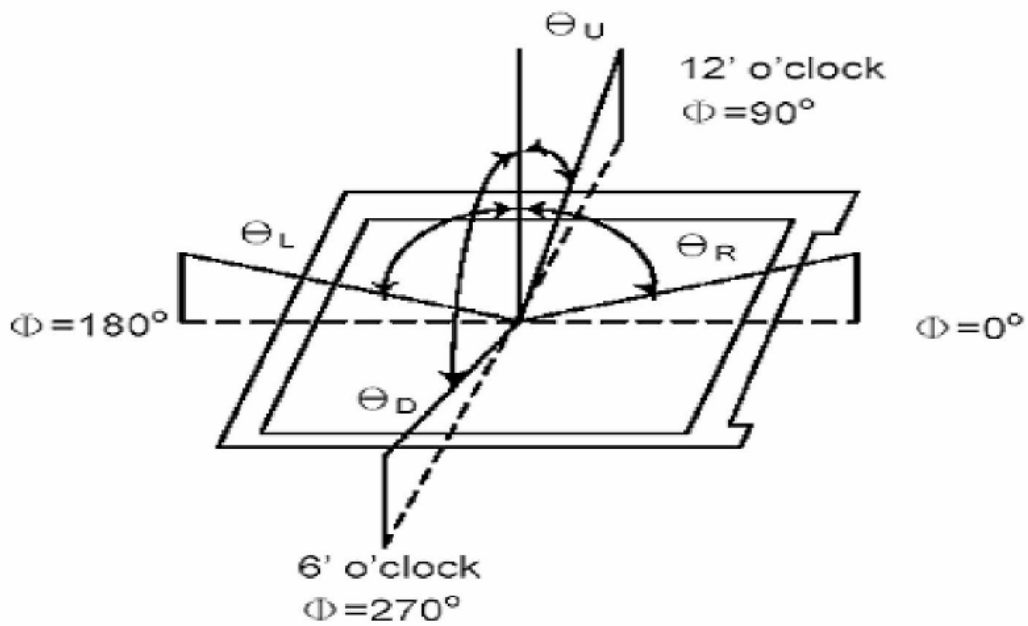
*Contrast rate description(CR) :
Tested in the center of the LCM panel

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

*Response time description : Sum of TR and TF

10. Reliability testing：

Item No	Name	Condition	Remark
1	High temperature Operating	70° C , 168Hours	Finish product (With polarizer)
2	Low temperature Operating	-20° C , 168 Hours	Finish product (With polarizer)
3	High temperature Storage	80° C , 168 Hours	Finish product (With polarizer)
4	Low temperature Storage	-30° C , 168 Hours	Finish product (With polarizer)
5	High temperature & humidity Storage	60° C , 90%RH, 168 Hours	Finish product (With polarizer)
6	Thermal Shock Storage (No operation)	-20° C , 30min. <=> 70° C , 30min. 10 Cycles	Finish product (With polarizer)
7	ESD test	Voltage:+8KV R:330 ohm, C:150pF Air discharge, 10 times	Finish product (With polarizer)
8	Vibration test	10 => 55 =>10 => 55 => 10 Hz, within 1 minute; Amplitude:1.5mm. 15 minutes for each Direction (X, Y, Z)	Finish product (With polarizer)
9	Drop test	Packed, 100CM free fall 6 sides, 1 corner, 3edges	Finish product (With polarizer)

*One single product test for only one item.

* Judgment after test: keep in room temperature for more than 2 hours.

- Current consumption < 2 times of initial value

- Contrast > 1/2 initial value

- Function: work normally

11.   Using LCD Modules

11-1. Liquid Crystal Display Modules

LCD is composed of glass and polarizer. Pay attention to the following items when handling.

1. Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

2. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc).

3. N-hexane is recommended for cleaning the adhesive used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.

4. When the display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum benzin. Do not scrub hard to avoid damaging the display surface.

5. Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.

6. Avoid contacting oil and fats.

7. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

8. Do not put or attach anything on the display area to avoid leaving marks on.

9. Do not touch the display with bare hands .This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).

10. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring.

11-2. Precaution for Handling LCD Modules

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

1. Do not alter, modify or change the shape of the tab on the metal frame.

2. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

3. Do not damage or modify the pattern writing on the printed circuit board.

4. Absolutely do no modify the zebra rubber strip (conductive rubber) or heat seal connector.

5. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

6. Do not drop, bend or twist LCM.

11-3. Electro-Static Discharge Control

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

1. Make certain that you are grounded when handing LCM.

2. Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.

3. When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.

4. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

5. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.

6. To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%~60% is recommended.

11-4. Precaution for soldering to the LCM

1. Observe the following when soldering lead wire, connector cable and etc. to the LCM.
   - Soldering iron temperature: 280℃±10℃
   - Soldering time: 3-4 sec.
   - Solder: eutectic solder.

   If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non- halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage dug to flux spatters.

2. When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature of the soldering iron.

3. When remove the electroluminescent panel form the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged

11-5. Precaution for Operation

1. Viewing angle varies with the change of liquid crystal driving voltage (Vo). Adjust Vo to show the best contrast.

2. Driving the LCD in the voltage above the limit shortens its life.

3. Response time is greatly at temperature below the operating temperature range. However, this does not mean the LCM will be out of the order. It will recover when it returns to the specified temperature range.

4. If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

5. Condensation of terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40℃,50%RH .

6. When turning the power on, input each signal after the positive/negative voltage becomes stable.
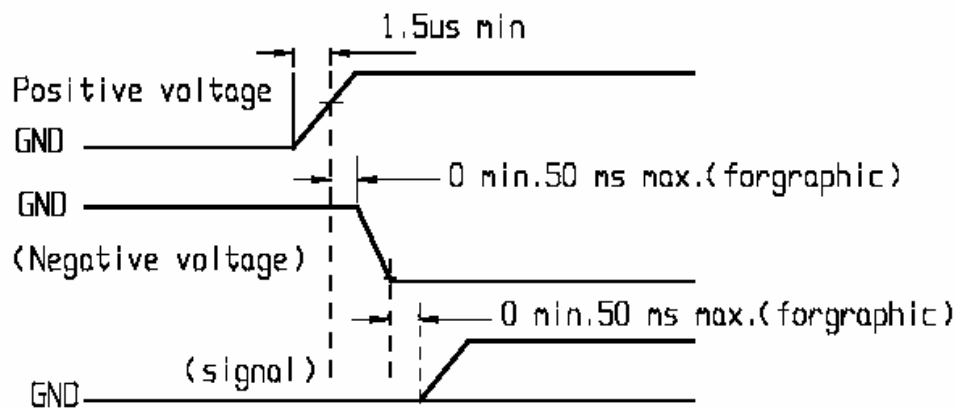
11-6. Storage

When storing LCD as spares for some years, the following precaution are necessary.

1. Store them in a sealed polyethylene bag. If properly sealed, there is no need for dessicant.

2. Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0℃ and 35℃.

3. The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped.)

4. Environmental conditions:

   - Do not leave them for more than 168hrs. at 60℃.

   - Should not be left for more than 48hrs. at -20℃.

11-7. Safety

1. It is recommended to crush damaged or unnecessary LCD into pieces and wash off with solvents such as acetone and ethanol, which should later be burned.

2. If any liquid leak out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

11-8. Limited Warranty

Unless agreed between BONA and customer, BONA will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with BONA LCD acceptance standards(copies available upon request) for a period of one year from date of shipments. Cosmetic/ visual defects must be returned to BONA within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of BONA limited to repair and/or replacement on the terms set forth above. BONA will not be responsible for any subsequent or consequential events.

11-9. Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are:

- Broken LCD glass.
- PCB eyelet's damaged.
- PCB conductors damaged.
-Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
-Soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet's conductors and terminals.