

**DLC Display Co., Limited**

德爾西顯示器有限公司



MODEL No: DLC0900ABM54QB-1

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### Record of Revision

Date	Revision No.	Summary
2018-10-30	1.0	Rev 1.0 was issued

### 1. Scope

This data sheet is to introduce the specification of DLC0900ABM54QB-1 active matrix TFT module. It is composed of a color TFT-LCD panel, driver IC, FPC and a backlight unit. The 9.0" display area contains 800(RGB) x 480 pixels.

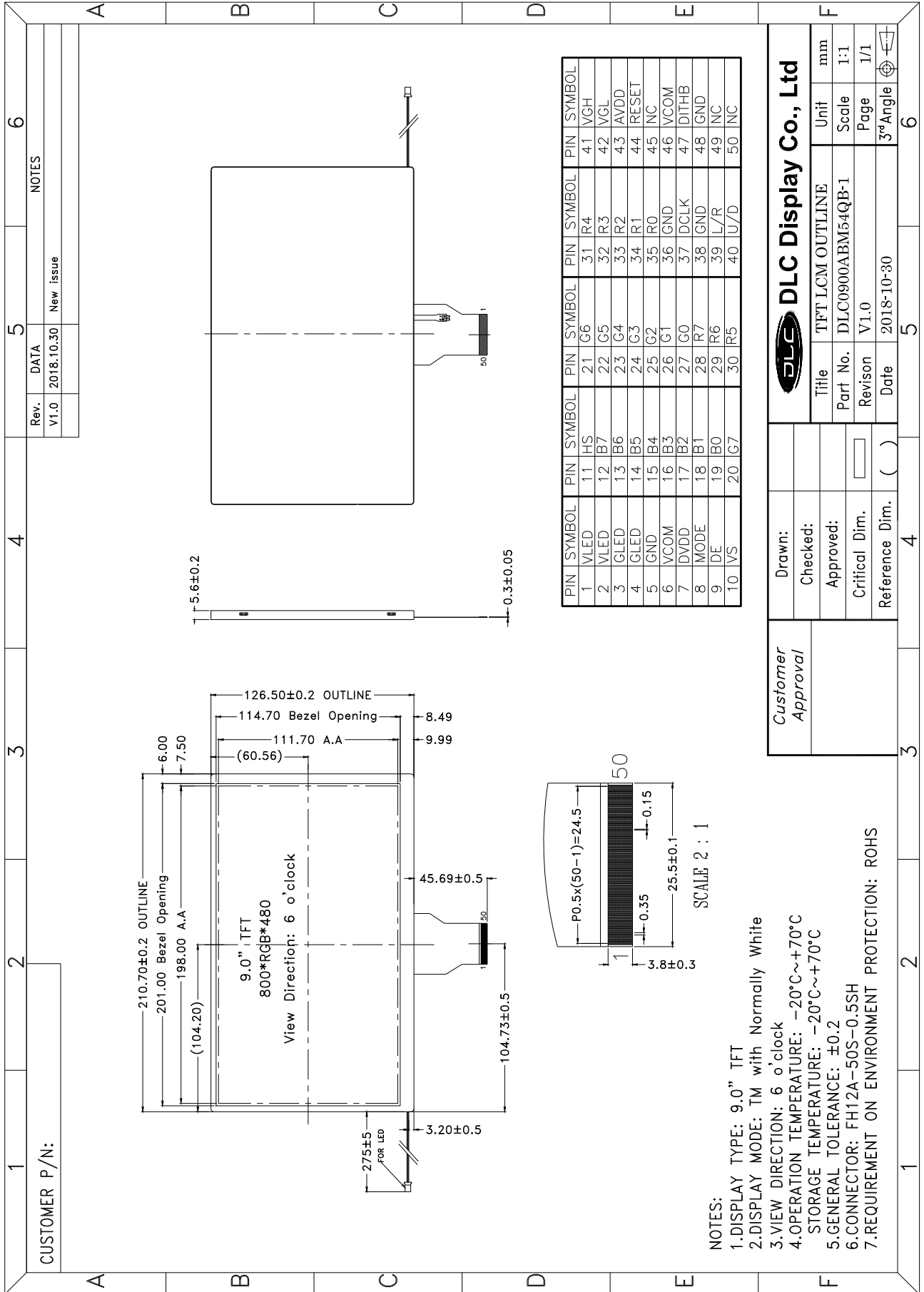
### 2. Application

Digital equipments which need color display, mobile navigator/video systems.

### 3. General Information

Item	Contents	Unit
Size	9.0	inch
Resolution	800 (RGB) x 480	/
Interface	Digital	/
Technology type	a-Si TFT	/
Pixel pitch	0.0825 x 0.2327	mm
Pixel Configuration	RGB stripes	
Outline Dimension (W x H x D)	210.70 x 126.50 x 5.60	mm
Active Area	198.00 x 111.70	mm
Display Mode	Transmissive, Normally white	/
Backlight Type	LED	/
Viewing Direction	6 o'clock	/
Weight	TBD	g

### 4. Outline Drawing



## 5. Interface signals

Pin No	Symbol	Function
1-2	VLED	Power for LED backlight
3-4	GLED	Ground for LED backlight
5	GND	Power ground
6	VCOM	Common voltage
7	DVDD	Power for digital circuit
8	MODE	DE/SYNC mode select <span style="float: right;">Note1</span>
9	DE	Data input enable
10	VS	Vertical sync input
11	HS	Horizontal sync input
12-19	B7~B0	Blue data <span style="float: right;">Note2</span>
20-27	G7~G0	Green data <span style="float: right;">Note2</span>
28-35	R7~R0	Red data <span style="float: right;">Note2</span>
36	GND	Power ground
37	DCLK	Sample clock <span style="float: right;">Note3</span>
38	GND	Power ground
39	L/R	Left/Right selection <span style="float: right;">Note4,5</span>
40	U/D	Up/Down selection <span style="float: right;">Note4,5</span>
41	VGH	Gate ON voltage
42	VGL	Gate OFF voltage
43	AVDD	Power for analog circuit
44	RESET	Global reset pin <span style="float: right;">Note6</span>
45	NC	No connection
46	VCOM	Common voltage
47	DITHB	Dithering function <span style="float: right;">Note7</span>
48	GND	Power supply
49-50	NC	No connection

FPC Connector is used for the module electronics interface. The recommended model is FH12A-50S-0.5SH manufactured by Hirose.

Note1: 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.

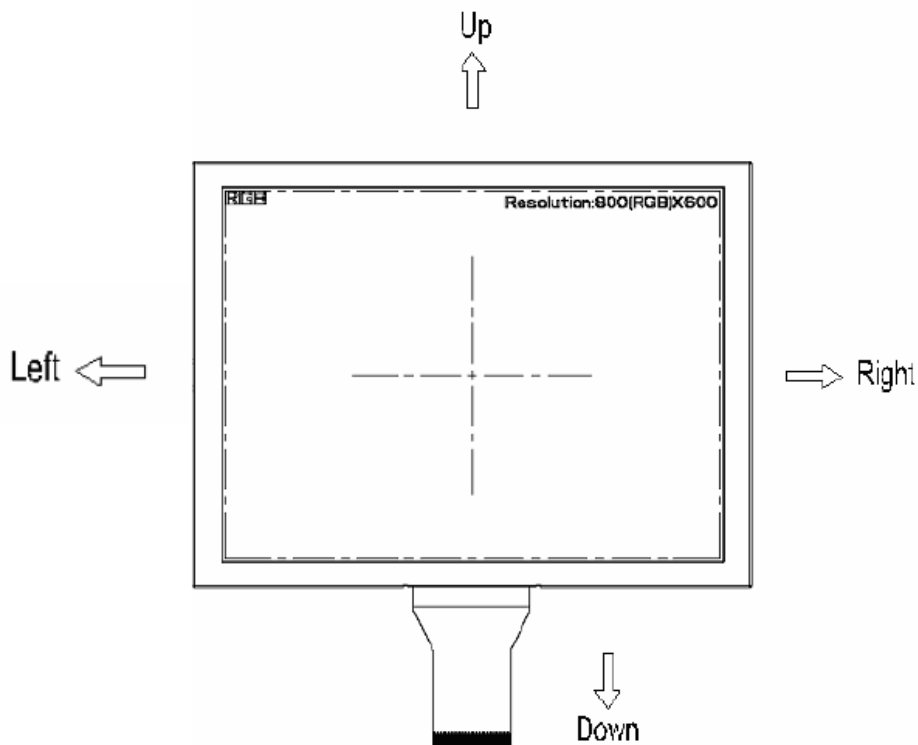
Note2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

Note3: Data shall be latched at the falling edge of DCLK.

Note4: 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

Note5: Definition of scanning direction.  
 Refer to the figure as below:



Note6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note7: Dithering function enable control, normally pull high.  
 When DITHB="1", Disable internal dithering function,  
 When DITHB="0", Enable internal dithering function,

## 6. Absolute maximum Ratings

### 6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power Voltage	DVDD	-0.3	5.0	V	
	AVDD	-0.5	13.5	V	
	VGH	13.0	19.0	V	
	VGL	-12.0	-2.0	V	
	VGH-VGL	-	31.0	V	
LED Reverse Voltage	VR	-	1.2	V	Each LED
LED Forward Current	IF	-	25	mA	Each LED

Note1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note2: VR Conditions: Zener Diode 20mA.

### 6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	70	°C	
Storage Temperature	TSTG	-20	70	°C	

## 7. Electrical Specifications

### 7.1 Electrical characteristics

Ta = 25 °C, GND=0V

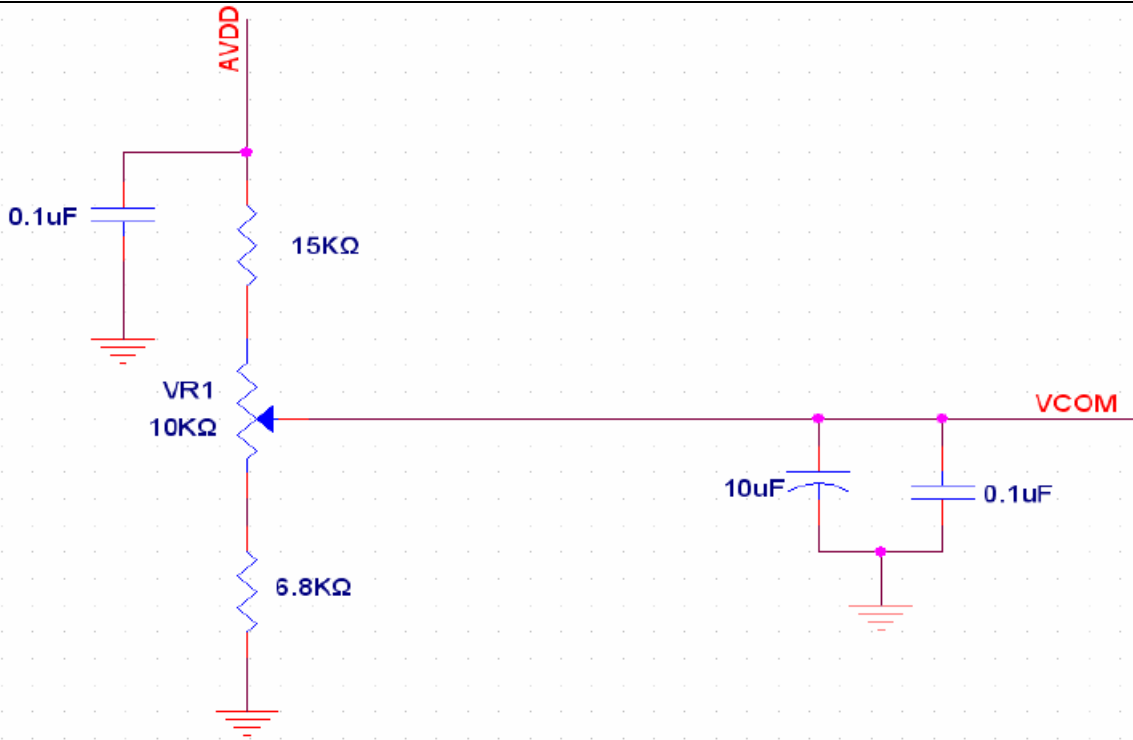
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power Voltage	DVDD	3.0	3.3	3.6	V	Note2
	AVDD	10.2	10.4	10.6	V	
	VGH	16.3	17.0	17.7	V	
	VGL	-5.7	-5.0	-4.3	V	
Input signal voltage	VCOM	3.2	4.2	5.2	V	Note4
Input logic high voltage	VIH	0.7*DVDD	-	DVDD	V	Note3
Input logic low voltage	VIL	0	-	0.3*DVDD	V	

Note1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note2: DVDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

Note4: Typical VCOM is only a reference value, it must be optimized according to each LCM. Be sure to use VR.



## 7.2 Current Consumption

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Current Driver	IGH	-	0.3	1	mA	VGH=17.0V
	IGL	-	0.3	1	mA	VGL=-5.0V
	IDVDD	-	5.5	10	mA	VCC=3.3V
	IAVDD	-	32	50	mA	AVDD=10.4V

## 7.3 LED Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Voltage for LED Backlight	VL	18.0	18.6	18.8	V	Note1
Current for LED Backlight	IL	-	180	-	mA	
LED Life time	-	20,000	-	-	Hr	Note2

Note1: The LED Supply Voltage is defined by the number of LED at Ta=25°C and IL =180mA.

Note 2: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL =180mA. The LED lifetime could be decreased if operating IL is larger than 180mA.

## 8. Command/AC Timing

### 8.1 AC Electrical Characteristics

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	Tehd	8	-	-	ns	
DVDD Power On Slew rate	TPOR	-	-	20	ms	From 0 to 90% DVDD
RESET pulse width	TRst	1	-	-	ms	
DCLK cycle time	Tcoh	20	-	-	ns	
DCLK pulse duty	Tcwh	40	50	60	%	

### 8.2 Data Input Format



Figure: Horizontal input timing diagram

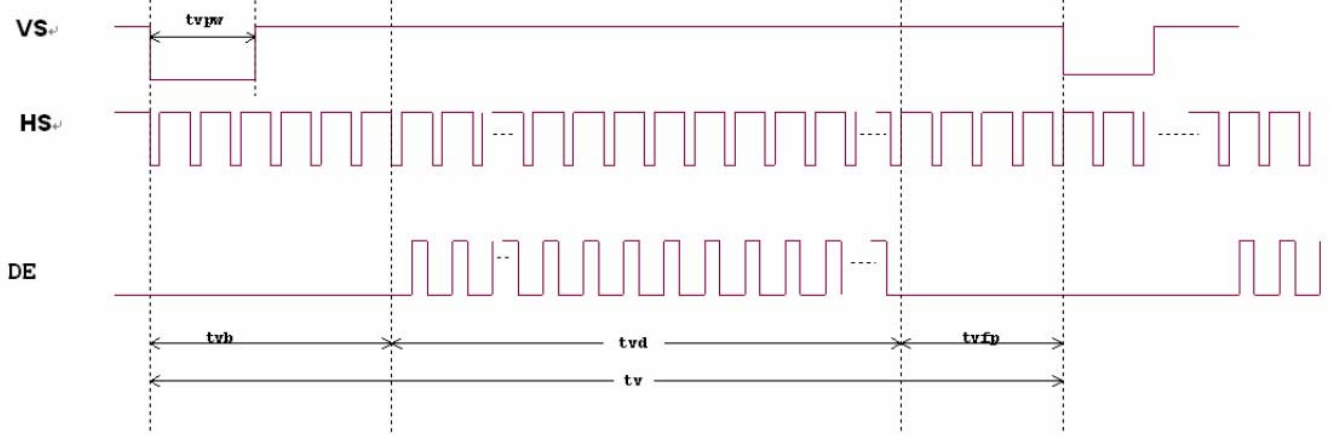


Figure: Vertical input timing diagram

### 8.3 Timing

Parameter	Symbol	Spec.			Unit	Note
		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 back porch (Blanking)	thb	46	46	46	DCLK	
HS front porch	thfp	16	210	354	DCLK	

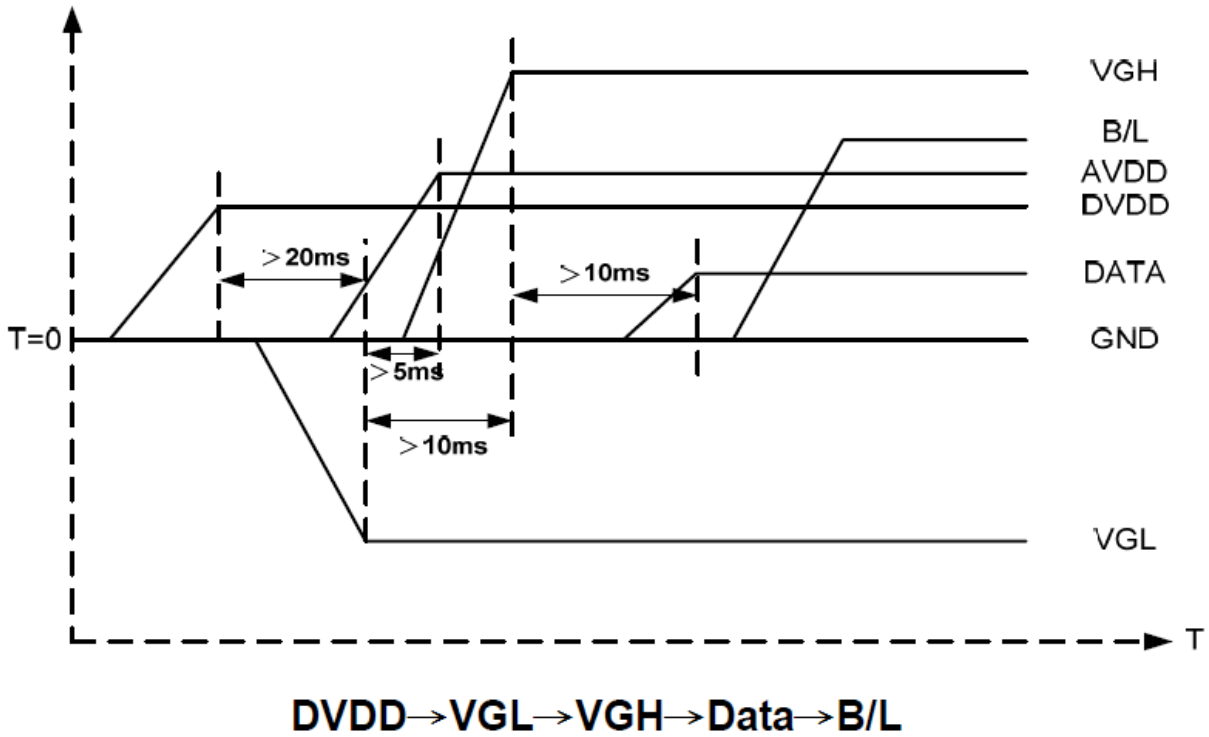
Table: Horizontal input timing

Parameter	Symbol	Spec.			Unit	Note
		Min	Typ	Max		
Vertical display area	tvd	480			TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tpw	1	-	20	TH	
VS back porch (Blanking)	tvb	23	23	23	TH	
VS front porch	tvfp	7	22	147	TH	

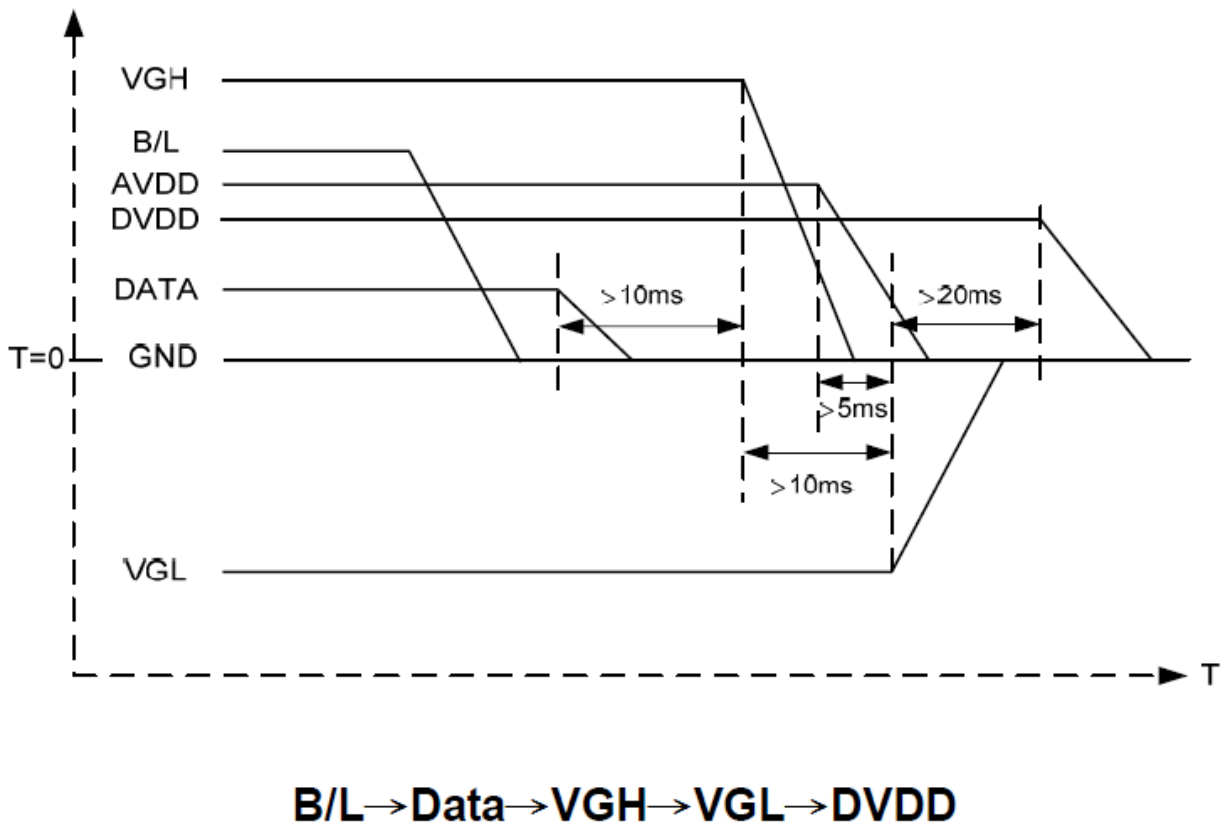
Table: Vertical input timing

### 8.4 Power Sequence

Power on:



Power off:



Note: Data include R0~R7, B0~B7, GO~G7, U/D, L/R, DCLK, HS,VS,DE.

## 9. Optical Specification

Ta=25°C

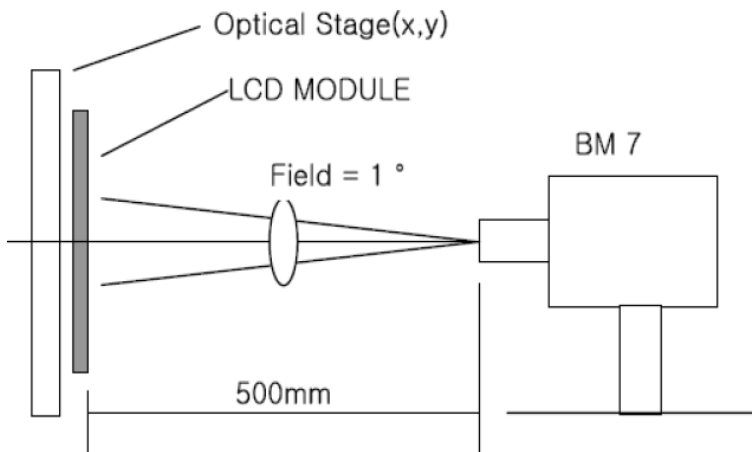
Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	400	500	-		Note1 Note2
Response Time	Ton	25°C	-	10	20	ms	Note1 Note3
	Toff		-	15	30		
View Angles	$\Theta T$	$CR \geq 10$	60	70	-	Degree	Note 4
	$\Theta B$		40	50	-		
	$\Theta L$		60	70	-		
	$\Theta R$		60	70	-		
Chromaticity	White	x	Brightness is on	0.26	0.31	0.36	Note5, Note1
		y		0.28	0.33	0.38	
Luminance	L		-	1000	-	cd/m <sup>2</sup>	Note1 Note6
Uniformity	U		70	75	-	%	Note1 Note7

Test Conditions: VCC=3.3V, IL=180mA (Backlight current), the ambient temperature is 25°C.

### Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

LED back-light: ON, Environment brightness < 150 lx

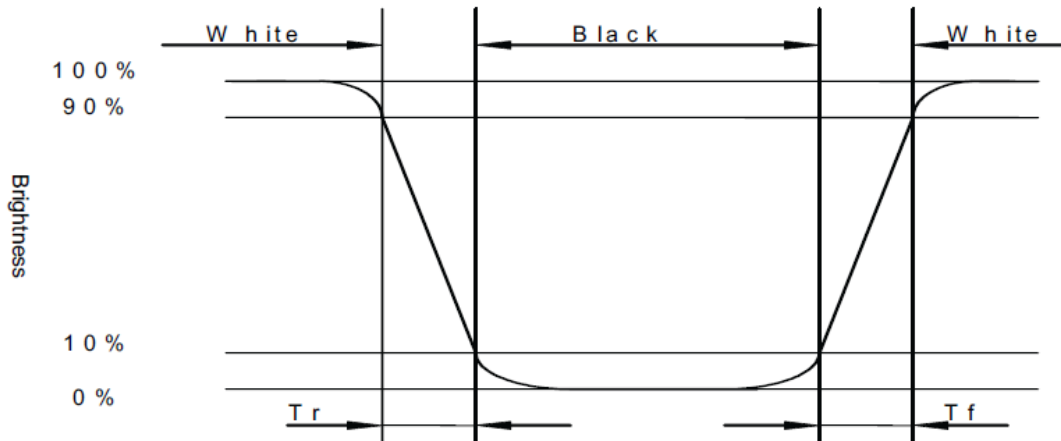


### Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

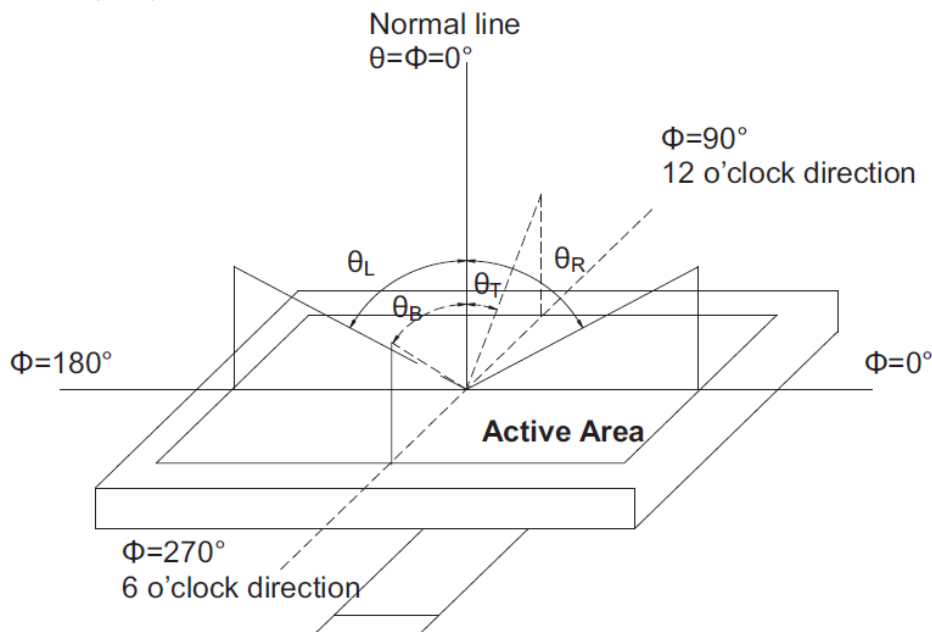
Note 3: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise Time,  $T_r$ ) and from white to black(Decay Time,  $T_f$ ).



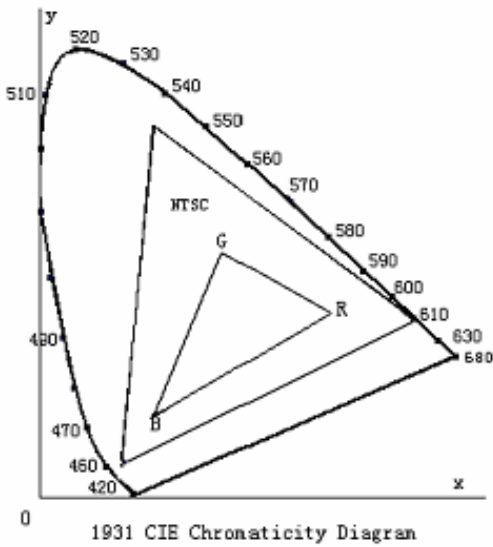
Note 4: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 5: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.



$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 6: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels “White” at the center of display area on optimum contrast.

Note 7: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity (U)} = \frac{\text{Minimum Luminance( brightness ) in 9 points}}{\text{Maximum Luminance( brightness ) in 9 points}}$$

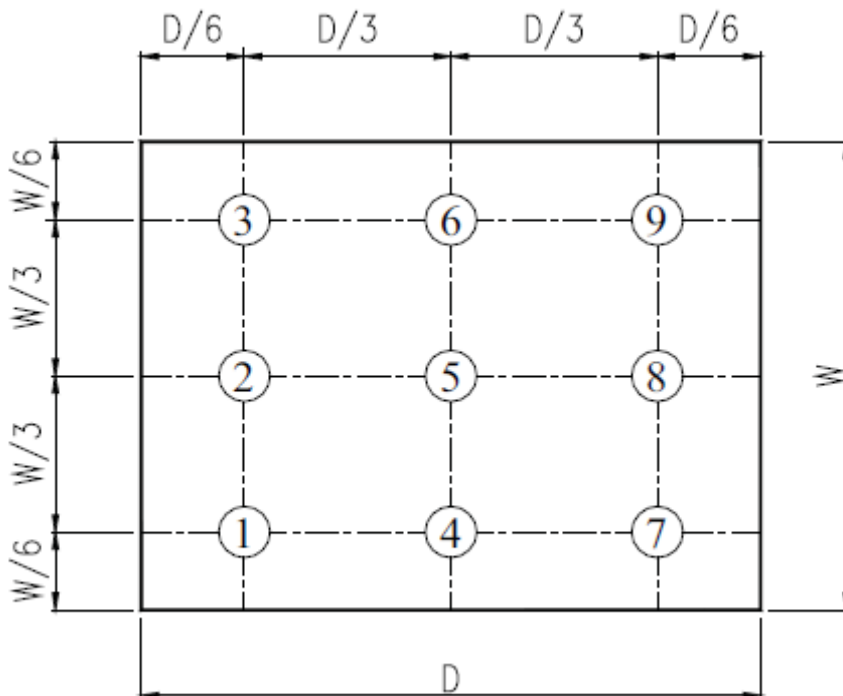


Fig. 2 Definition of uniformity

## 10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70°C, 120hrs	Per table in below
2	Low Temp Operation	Ta=-20°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+70°C, 120hrs	Per table in below
4	Low Temp Storage	Ta=-20°C, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH 120hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-20°C 30 min~+70°C 30 min, Change time:5min, 10 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω , 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times;	Per table in below
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.	Per table in below
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	Per table in below
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

## 11. Precautions for Use of LCD Modules

### 11.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

### 11.2 Handling

- A. The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability
- C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.
- D. Provide a space so that the panel does not come into contact with other components.
- E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.
- F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.
- G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.
- H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

### 11.3 Static Electricity

- A. Ground soldering iron tips, tools and testers when they are in operation.
- B. Ground your body when handling the products.
- C. Power on the LCD module before applying the voltage to the input terminals.
- D. Do not apply voltage which exceeds the absolute maximum rating.
- E. Store the products in an anti-electrostatic bag or container.
- F. Peel off the LCM protective film slowly since static electricity may be generated.

### 11.4 Storage

- A. Store the products in a dark place at  $+25^{\circ}\text{C}\pm 10^{\circ}\text{C}$  with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.
- B. Storage in a clean environment, free from dust, active gas, and solvent.

### 11.5 Cleaning

- A. Do not wipe the touch panel with dry cloth, as it may cause scratch.
- B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

### 11.6 Cautions for installing and assembling

- A. Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.
- B. In order to make the display assembly stable and firm, DLC recommends to design some supporting at the display backside, especially for the display with tape-attached touch panel, such supporting is important and essential, or else, the display may drop-off from front after some period of time.
- C. Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.

