

ZETTLER DISPLAYS

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

CUSTOMER APPROVAL			
※ PART NO. : ATM0900D6(ZETTLER DISPLAYS) VER1.2			
APPROVAL		COMPANY CHOP	
CUSTOMER COMMENTS			

ZETTLER DISPLAYS ENGINEERING APPROVAL		
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1. LCM Specification

1.1 Description

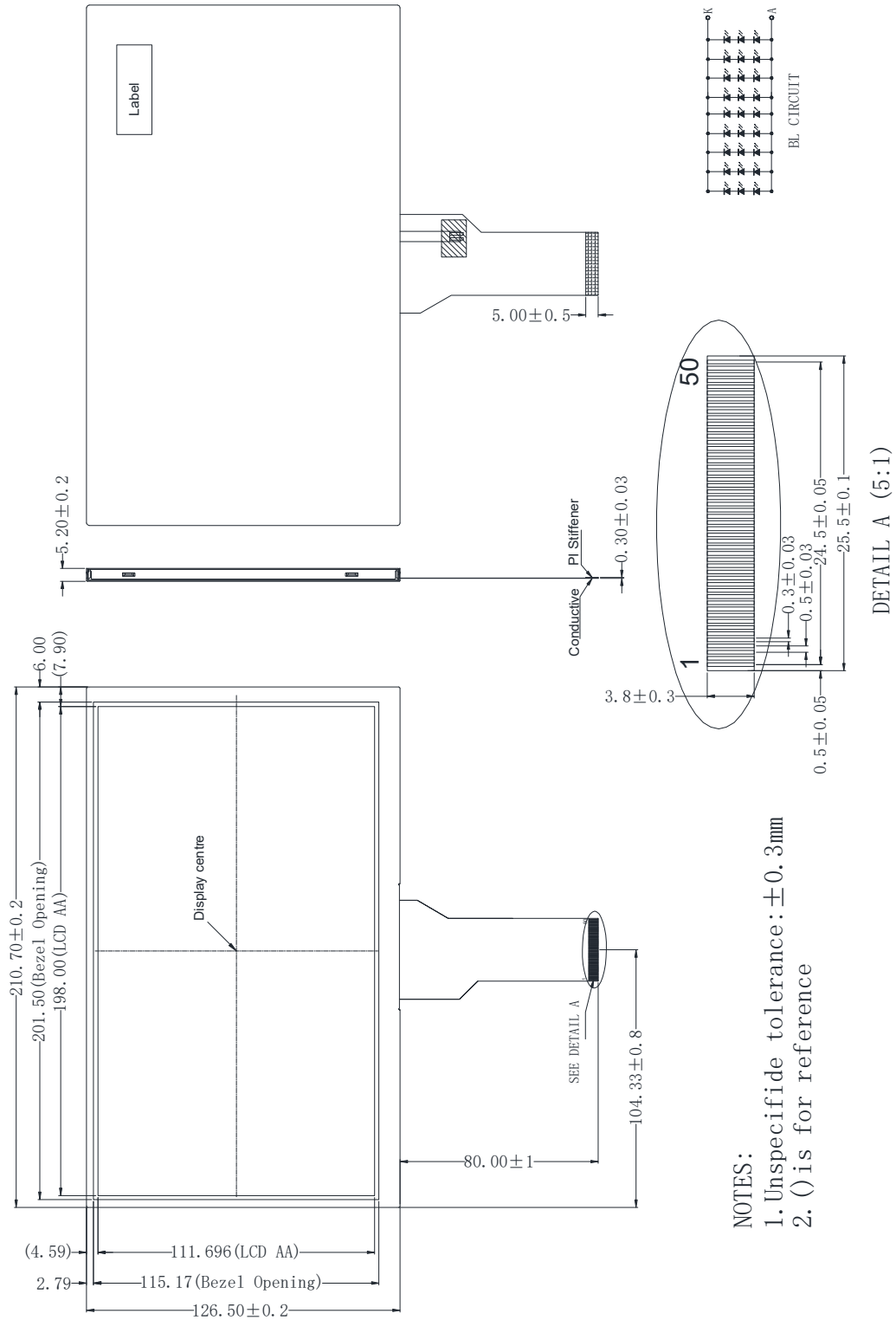
ATM0900D6 is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT LCD panel, a drive IC, a FPC, and a White LED-backlight unit. The active display area is 9.0 inches diagonally measured and the native resolution is 800*RGB*480. Features of this product are listed in the following table.

1.2 General specification

Item	Specification	Remark
1. LCD size	9.0 inch(Diagonal)	
2. Driver element	a-Si TFT active matrix	
3. Resolution	800x(RGB)x480	
4. Display mode	Normally White, TN, Transmissive	
5. Dot Pitch (W*H)	0.0825mm(W) x 0.2327mm(H)	
6. Pixel pitch(W*H)	0.2475mm(W) x 0.2327mm(H)	
7. Active Area(W*H)	198.0mm(W) x 111.696mm(H)	
8. Module size (W*H)	210.7mm(W) x 126.5(H) x5.2mm(D)	Note 1
9. Surface treatment	Anti-glare	
10. Color arrangement	RGB-stripe	
11. Color	16.7M	
12. Viewing angle (L/R/T/B)	70/70/50/70	
13. Interface	24bit RGB interface	
14. LCD controller	N.A.	
15. LCM Brightness	300 cd/m2 (Typ.)	
16. Backlight driving condition	180mA @9.6V	
17. Touch panel	N.A.	
18. Touch controller	N.A.	
19. Operation Temperature	-20~70 °C	
20. Weight	223.3g (Typ.)	
21. RoHS	RoHS compliant	

Note 1: Please refer to mechanical drawing.

2. Mechanical Specification



3. Electrical Units

3.1 Electrical Specification

<Table3. Electrical specifications>

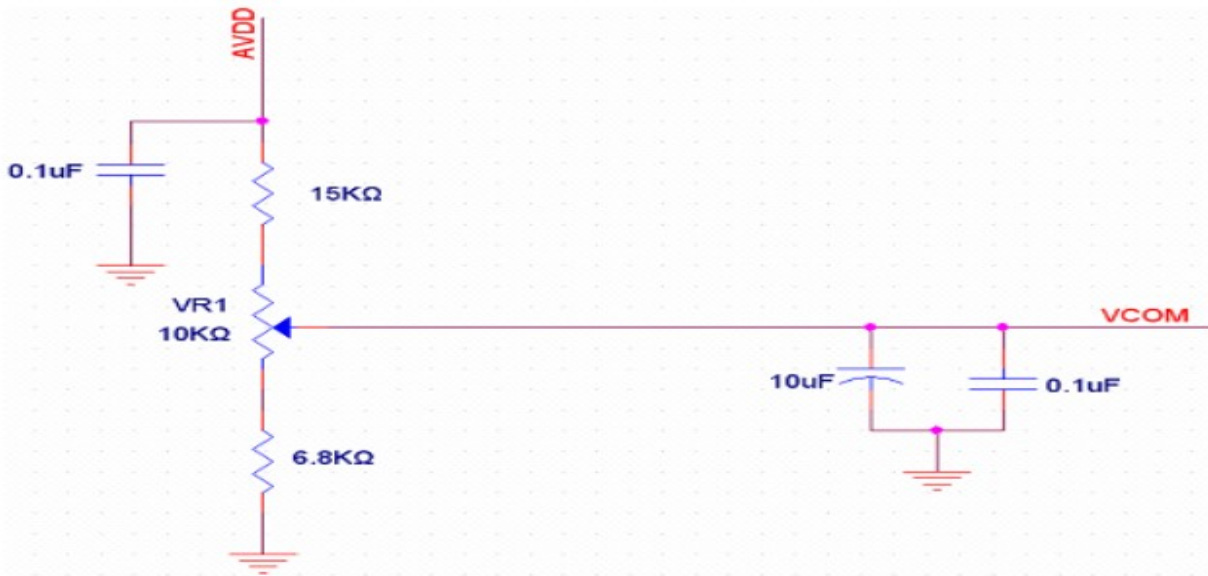
Item	Symbol	Unit	Value			Note
			Min	Typ	Max	
Power voltage	DVDD	V	3.0	3.3	3.6	Note2
	AVDD	V	10.2	10.4	10.6	
	VGH	V	16.3	17.0	17.7	-
	VGL	V	-5.7	-5.0	-5.3	
Input signal voltage	VCOM	V	3.2	4.2	5.2	Note4
Input logic high voltage	V _{IH}	V	0.7DVDD	-	DVDD	Note3
Input logic low voltage	V _{IL}	V	0	-	0.3DVDD	

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note 2: DVDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: DCLK,HS,VS,RESET,U/D, L/R,DE,R0~R7,G0~G7,B0~B7,MODE,DITHB.

Note 4: Typical VCOM is only a reference value. It must be optimized according to each LCM. Please use VR and base on below application circuit.



3.2 Pin Descriptions

3.2.1 TFT LCD Panel interface FPC Pin Description

Pin NO.	Function Descriptions	Symbol
1	LED Anode	LED+
2	LED Anode	LED+
3	LED Cathode	LED -
4	LED Cathode	LED -
5	Ground	GND
6	Common Voltage	VCOM
7	Digital Power	DVDD
8	DE/SYNC mode select Normally pull high H:DE mode. L:HSD/VSD mode	MODE
9	Date Enable signal	DE
10	Vertical sync input.Negative polarity	VSD
11	Horizontal sync input.Negative polarity	HSD
12	Blue Data Input(MSB)	B7
13-18	Blue Data Input	B6-B1
19	Blue Data Input(LSB)	B0
20	Green Data Input(MSB)	G7
21-26	Green Data Input	G6-G1
27	Green Data Input(LSB)	G0
28	Red Data Input(MSB)	R7
29-34	Red Data Input	R6-R1
35	Red Data Input(LSB)	R0
36	Power ground	GND
37	Clock input	DCLK
38	Ground	GND
39	Left or Right Display Control	SHLR
40	Up / Down Display Control	UPDN
41	Positive Power for TFT	VDDG
42	Negative Power for TFT	VEEG
43	Analog Power	AVDD
44	Global rest pin.Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability.	RSTB

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	Normally pull high.(R=10K	
44	Global rest pin.Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high.(R=10K	RSTB
45	Not connect	NC
46	Common Voltage	VCOM
47	Dithering setting DITH="H"6bit resolution(last 2 bit of input data)truncated DITH="H"6bit resolution(default setting)	DITH
48	Power ground	GND
49	Not connection	NC
50	Not connection	NC

Remarks:

1)UPDN and SHLR control function

UPDN	SHLR	FUNCTION
0	1	Normal display
0	0	Inverse Left and Right
1	1	Inverse Up and Down
1	0	Inverse Left and Right Inverse Up and Down

3.2 Electrical characteristics (Ta=25°C)

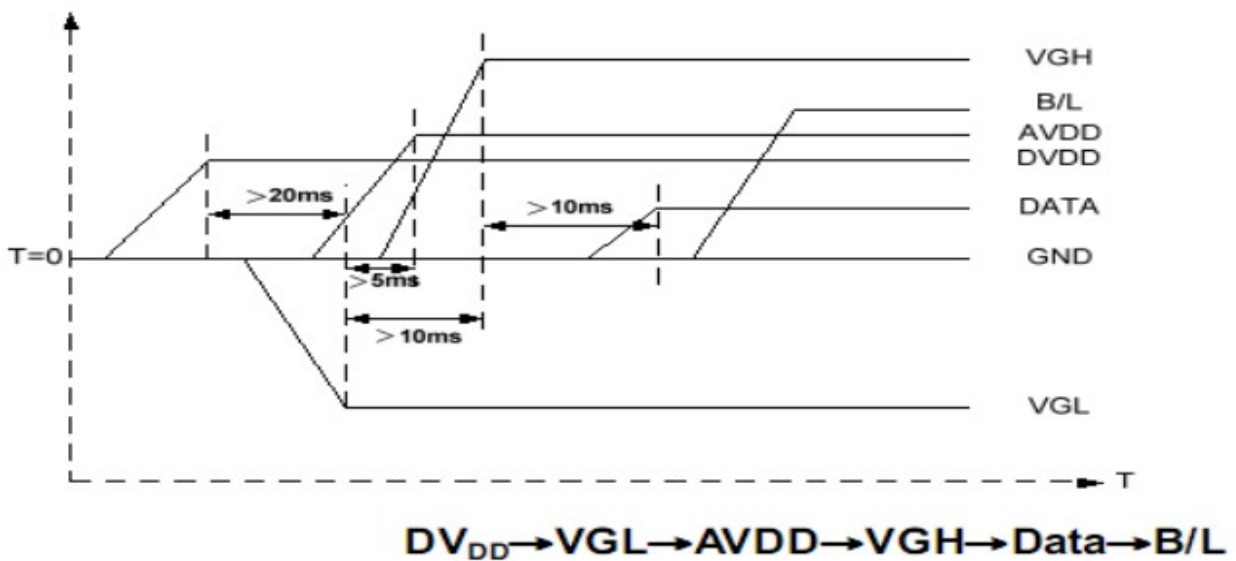
3.2.1 TFT-LCD Current Consumption

Table 3.2:

Item	Symbol	Unit	Test Condition	Min	Typ.	Max	Note
Gate on power current	IVGH	mA	VGH=17V	-	0.2	1.0	-
Gate off power current	IVGL	mA	VGL=-5.0V	-	0.2	1.0	-
Analog power current	IVDD	mA	VDD=3.3V	-	4.0	10	-
Analog power current	IAVDD	mA	AVDD=10.4V	-	20	50	

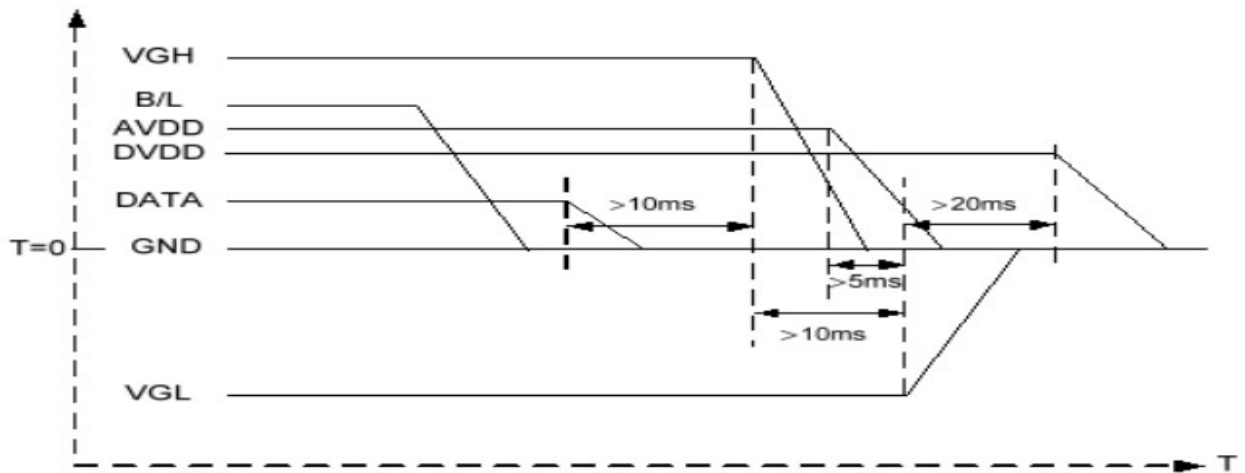
3.3 Power Sequence

Power ON:



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Power OFF:



B/L→Data→VGH→AVDD→VGL→DV_{DD}

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

3.3 Back-light Specification

Table 3.3 Back-light Specification

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VF	Only Backlight	8.6	9.6	10.5	V
Supply Current	IF		20*9=180			mA
Average Brightness	IV	Backlight Current	--	--	--	cd/m2
CIE Color Coordinate	X	Backlight Current	0.25	-	0.315	-
	Y		0.25	-	0.315	
Uniformity	B	Backlight Current	80	-	-	(%)
Color	White					

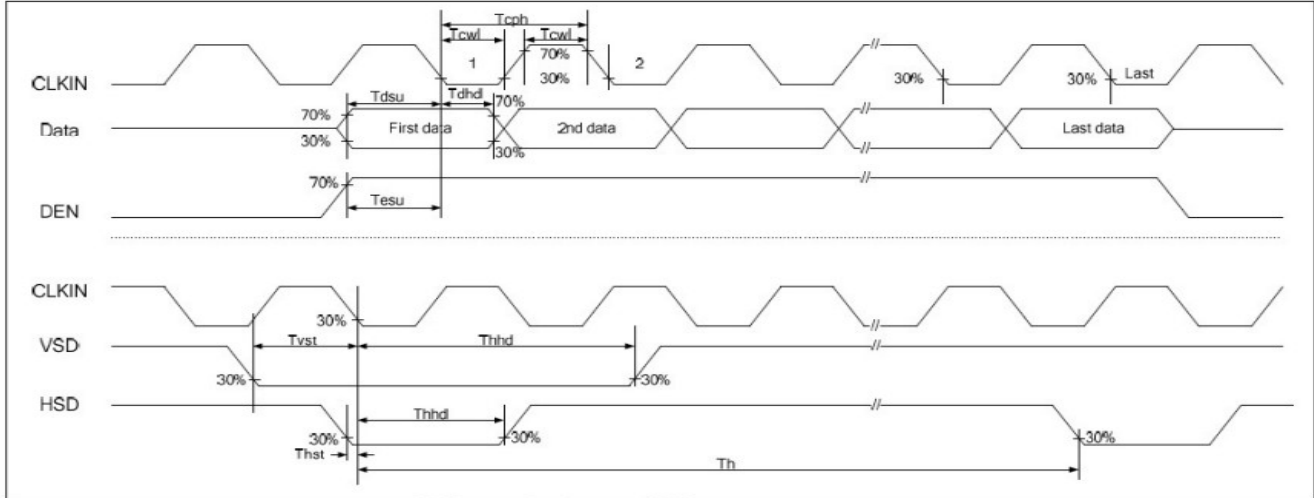
4. Timing Characteristics

4.1. AC Electrical Characteristics

Item	Symbol	Value			Unit	Remark
		Min	Typ	Max		
Hs setup time	T _{HST}	8			ns	
Hs hold time	T _{HHD}	8			ns	
VS setup time	T _{VST}	8			ns	
VS hold time	T _{VHD}	8			ns	
Data setup time	T _{DSU}	8			ns	
Data hold time	T _{DHD}	8			ns	
DE setup time	T _{ESU}	8			ns	
DE hold time	T _{EHD}	8			ns	
DVDD power on slew rate	T _{POR}	-		20	ms	
RESET pulse width	T _{RST}	1			ms	
DCLK cycle time	T _{COH}	20			ns	
DCLK pulse duty	T _{CWH}	40	50	60	%	

4.2. Timing Diagram

4.2.1 input Clock and Data Timing Diagram



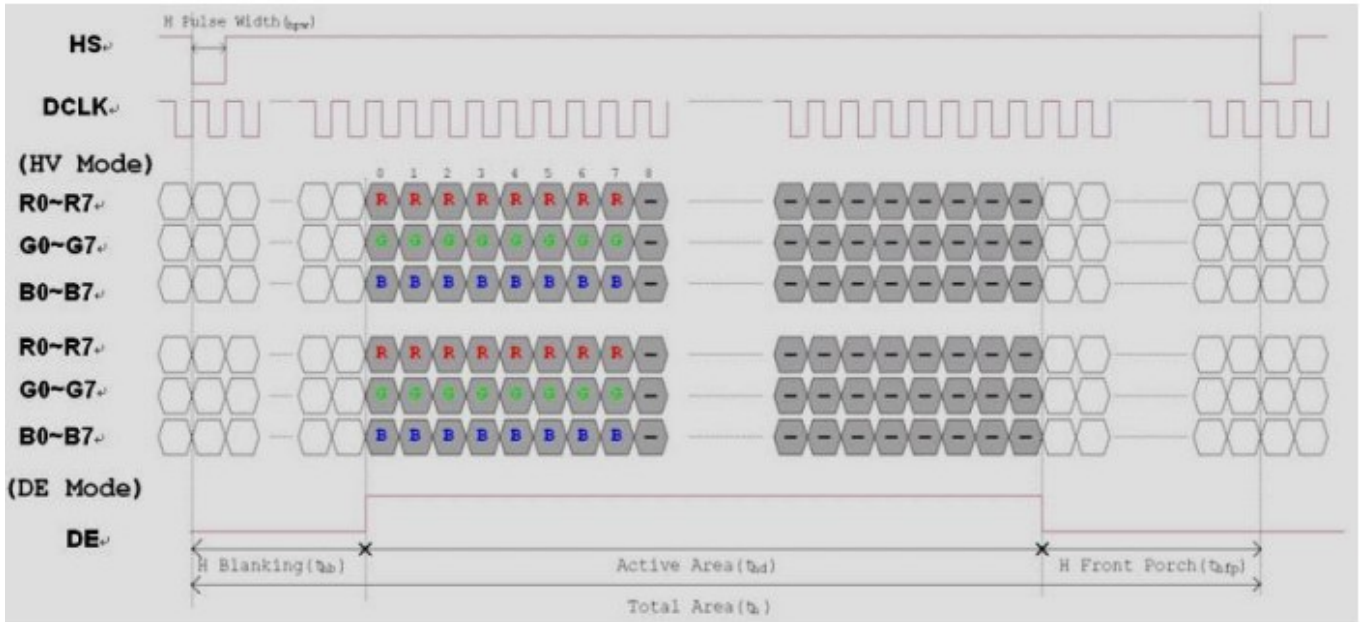
4.2.2 Timing

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	

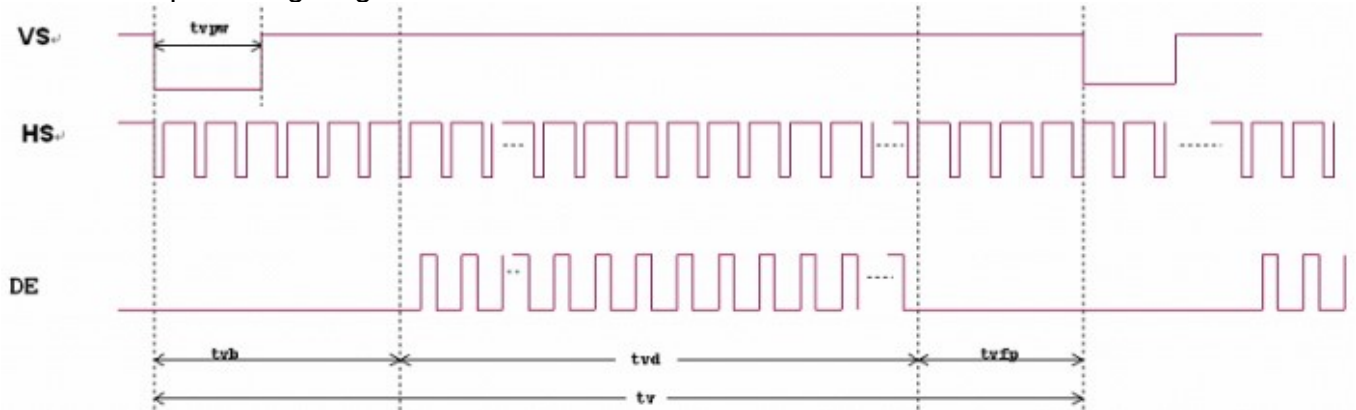
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

4.2.2 Data Input Format

Horizontal input timing diagram



Vertical input timing diagram



5. Optical Specifications

Item of electro-optical characteristics	Symbol	Condition	Min	Typ	Max	Unit	Remark	
Contrast ratio	CR	$\varnothing = 0^\circ$		500	--		Note1	
Surface Luminance	YL	180mA	250	300	--	cd/m ²	Note1	
Color saturation	NTSC	-	--	50	--	%		
Response time	Ton	$\varnothing = 0^\circ$	--	10	20	ms	Note2	
	Tof		--	15	30			
Viewing angle range	$\varnothing = 0^\circ$	Top	40	50	--		Note3	
		Bottom	60	70	--			
		Left	60	70	--			
		Right	60	70	--			
Module Chromaticity CIE(x,y)	White	x	$\varnothing = 0^\circ$	0.310			Note4	
		y		0.330				
	Red	x		--	0.587			--
		y		--	0.331			--
	Green	x		--	0.344			--
		y		--	0.571			--
	Blue	x		--	0.146			--
		y		--	0.092			--

Test Conditions:

1. IL=180mA (Backlight current), the ambient temperature is 25°C.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

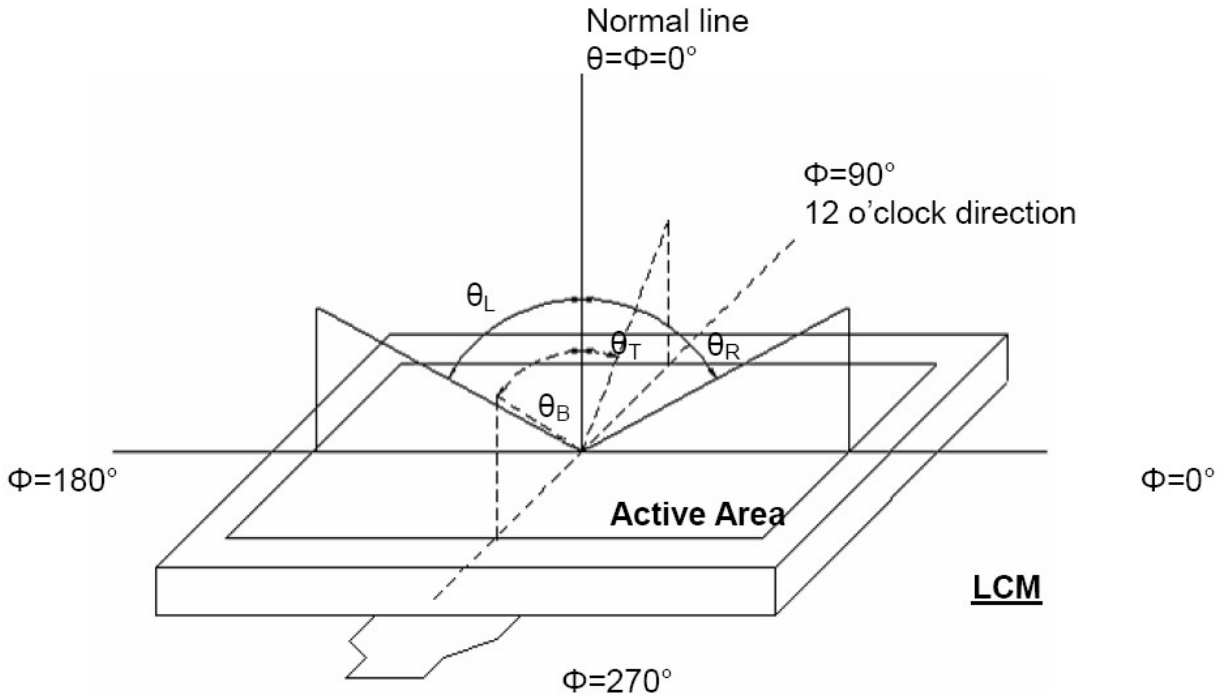


Figure 4.1 Definition of viewing angle.

Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON)

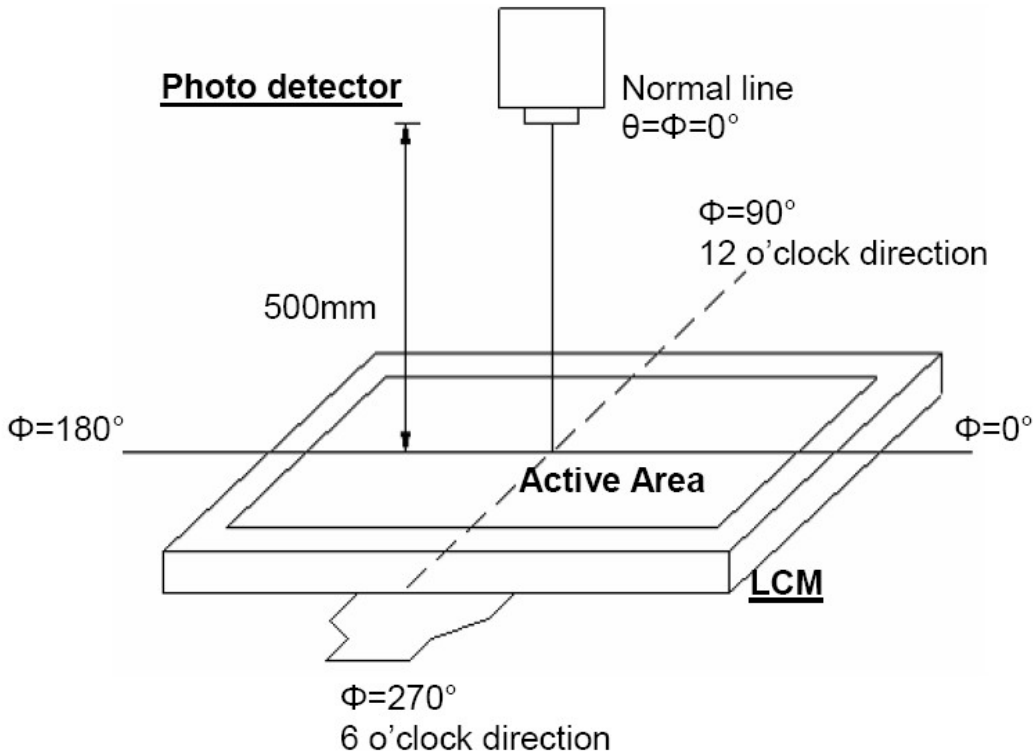


Figure 4.2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

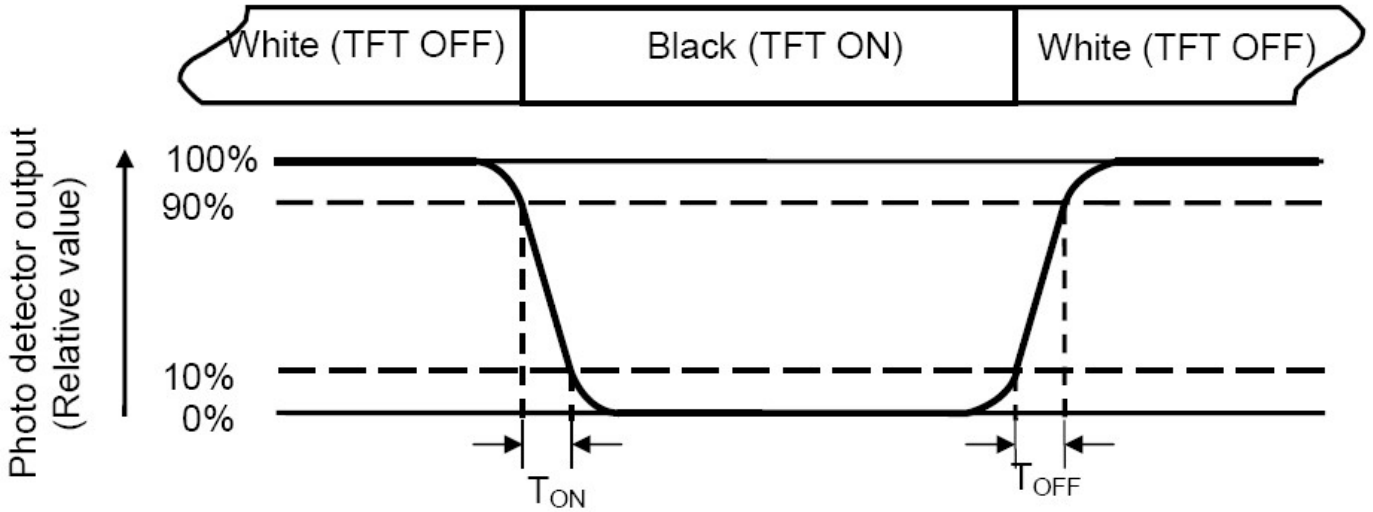


Figure 4.3 Definition of response.

Note 4: Definition of contrast ratio

$$\text{Contrast ratio(CR)} = \frac{\text{Luminance measured when LCD on the "white" state}}{\text{Luminance measured when LCD on the "black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel.

Note 7: 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.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

L-----Active area length W----- Active area width

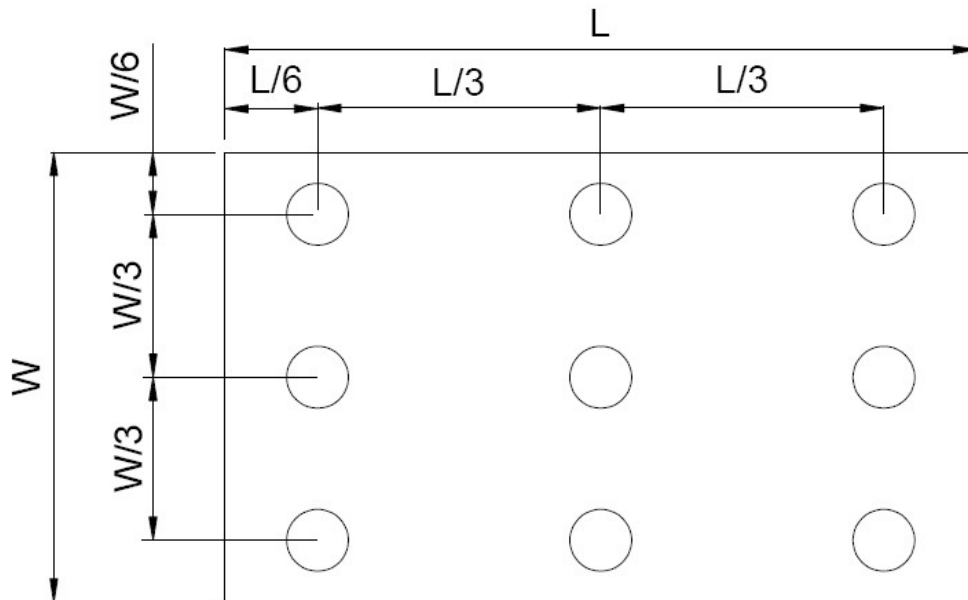


Figure 4.4 Definition of measuring points.

Bmax: The measured maximum luminance of all measurement position.

Bmin: The measured minimum luminance of all measurement position.

6 Reliability Test Items

NO.	Test Item	Test Condition	Check Time
1	High temp storage	T=80	240hrs
2	Low temp storage	T=-30	240hrs
3	High temp operation	T=70	240hrs
4	Low temp operation	T= -20	240hrs
5	High temp&high humidity	T=50 H=90%	240hrs

Reliability Test Criteria:

Display function should be no change under normal operating condition.

7. Handling Precautions

7.1 Safety

The liquid crystal in the LCD is poisonous. Keep away from your mouth and eyes. If the liquid crystal contacts with your skin, mouse or clothes, use soap to wash it off immediately.

7.2 Handling

- i. The LCD panel is made by thin glass. Prevent the panel from mechanical shock or putting excessive force on its surface.
- ii. The polarizer attached on the display is very easy to be damaged, handle it with special attention.
- iii. To avoid contamination on the display surface, do not touch the display surface with bare hands.
- iv. The transparent electrodes may be disconnected if you use the LCD panel under dew-condensing environment.
- v. The characteristics of the semiconductor devices may be affected when they are exposed to light, possibly resulting in malfunctioning of the ICs. To prevent such malfunctioning of the ICs, make sure the application and the mounting of the panel are designed so that the IC is not exposed to light.

7.3 Static Electricity

Ground soldering iron tips, tools and testers when you operate. Also ground your body when handling the products and store the products in an anti-electrostatic container.

7.4 Storage

Store the products in a dark place where the temperature is within the range of 25 ± 10 and with low humidity (65%RH or less). Do not store the LCD product in an atmosphere containing organic solvents or corrosive gases.

7.5 Cleaning

Do not wipe the polarizer with dry cloth, as it might cause scratching. Wipe the polarizer with a soft cloth soaked with petroleum IPA. Other chemical might damage the panel.