



深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO, TD.

# TFT-LCD Module Specification

**Module NO.:** TST050WVHI-21

**Version:** V1.0

APPROVAL FOR SPECIFICATION

APPROVAL FOR SAMPLE

For Customer' s Acceptance:	
Approved by	Comment

Team Source Display:		
Presented by	Reviewed by	Organized by

Version No.	Date	Content	Remark
V1.0	2018-4-7	Initial Release	



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# 1. LCM Specification

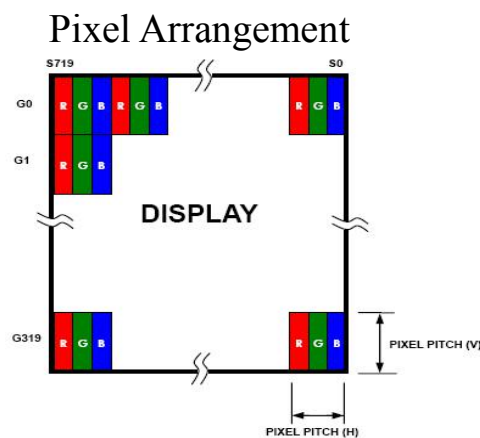
## 1.1 Description

TST050WVHI-21 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 WLED-backlight unit. The active display area is 5.0 inches diagonally measured and the native resolution is 800\*RGB\*480. Features of this product are listed in the following table.

## 1.2 Functions & Features

Table1.1 Module Functions & Features

Parameter	Value	Unit
LCD Mode	a-Si TFT/transmissive	-
Color	16.7M	-
Display Resolution	800*3(RGB)*480	pixels
Outline Dimension	120.7(W) *75.8(H) * 3.0(T)	mm
Active Area(A.A)	108.0*(W) *64.8(H)	mm
Pixel Arrangement	RGB-stripe	-
Viewing Direction	12 O'clock	
Display Mode	Normally WHITE	
Surface Treatment	Anti-Glare,Hardness:3H	
Back-light	White LED*12CHIP	PCS
Operation Temperature	-20~60	°C
Storage Temperature	-30~70	°C





### 3. Electrical Units

#### 3.1 Electrical Specification

<Table3. Electrical specifications>

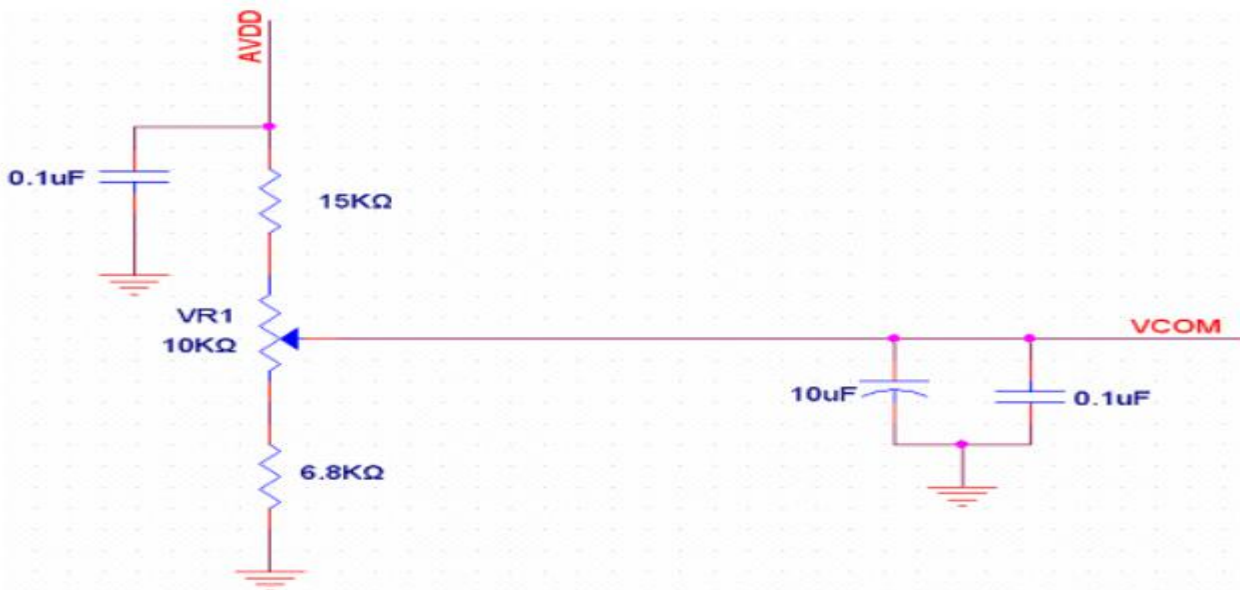
Item	Symbol	Unit	Value			Note
			Min	Typ	Max	
Power voltage	DVDD	V	3.0	3.3	3.6	Note2
	AVDD	V	9.8	10.2	10.6	
	VGH	V	15.0	15.5	16.0	-
	VGL	V	-7.0	-6.8	-6.7	
Input signal voltage	VCOM	V	3.3	3.45	3.6	Note4
Input logic high voltage	V <sub>IH</sub>	V	0.7DVDD	-	DVDD	Note3
Input logic low voltage	V <sub>IL</sub>	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 Date Input(MSB)	B7
13-18	Blue Date Input	B6-B1
19	Blue Date 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	Horizontal inversion	L/R
40	Vertical inversion	UD
41	Gate ON Voltage	VGH
42	Gate OFF Voltage	VGL

43	Analog Power	AVDD
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

3.3.1 Electrical characteristics (Ta=25°C)

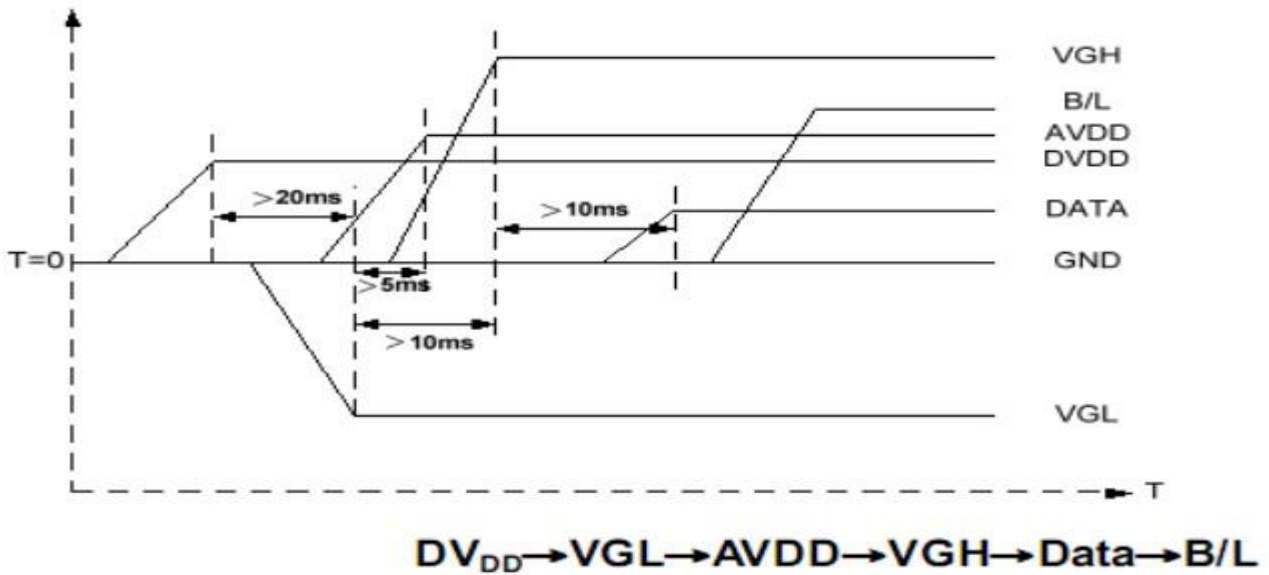
3.3.2 TFT-LCD Current Consumption

Table 3.2:

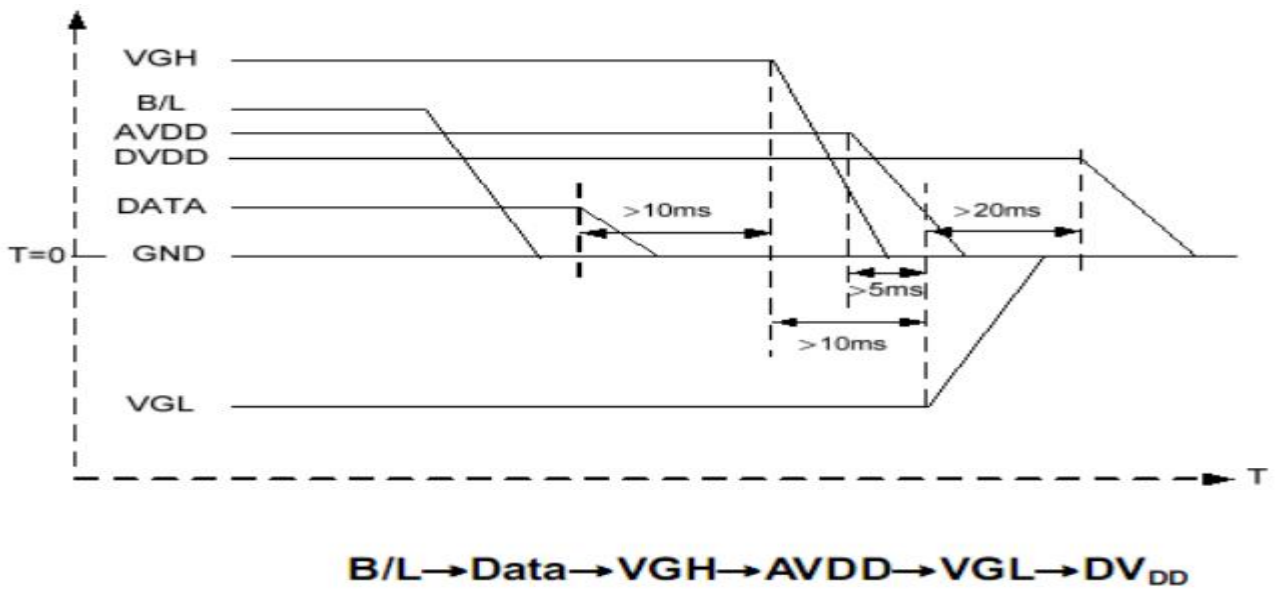
Item	Symbol	Unit	Test Condition	Min	Typ.	Max	Note
Gate on power current	IVGH	mA	VGH=15.5V	-	0.2	1.0	-
Gate off power current	IVGL	mA	VGL=-6.8V	-	0.2	1.0	-
Analog power current	IVDD	mA	VDD=3.3V	-	4.0	10	-
Analog power current	IAVDD	mA	AVDD=10.2V	-	20	50	

### 3.3 Power Sequence

Power ON:



Power OFF:



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



### 3.4 Back-light Specification

Table 3.3 Back-light Specification

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VF	Only Backlight	17.5	18.8	19.5	V
Supply Current	IF		20*2=40			mA
Average Brightness	IV	Backlight Current IF=40mA	--	--	--	Cd/m2
CIE Color Coordinate	X	Backlight Current IF=40mA	0.25	-	0.315	-
	Y		0.25	-	0.315	
Uniformity	B	Backlight Current IF=40mA	75	-	-	(%)
Color	White					

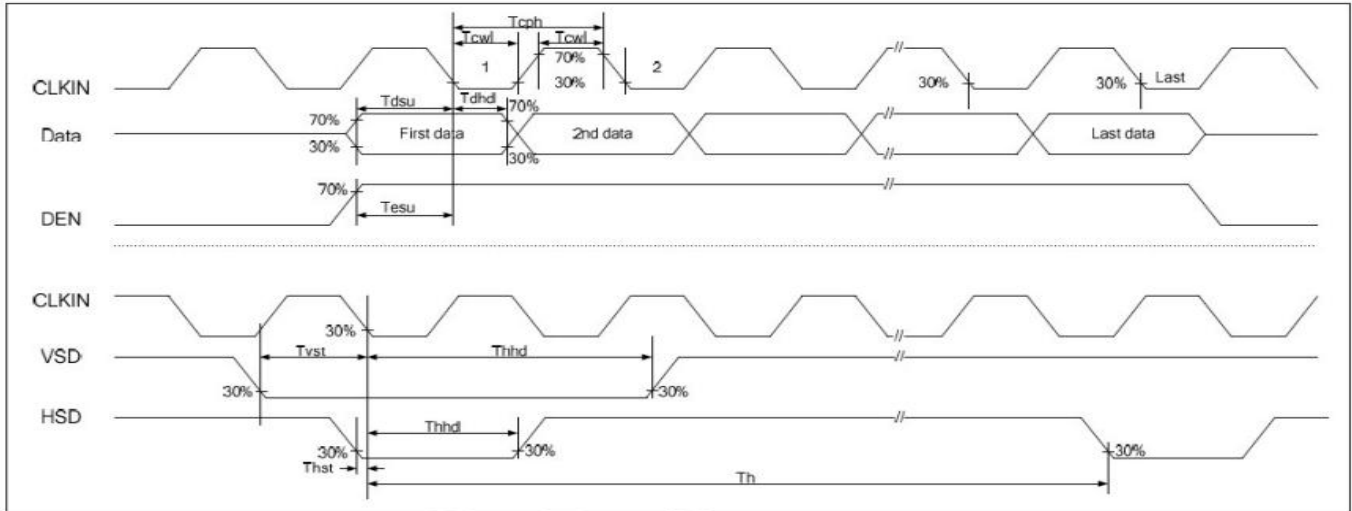
## 4. Timing Characteristics

### 4.1. AC Electrical Characteristics

Item	Symbol	Value			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 hold time	TDHD	8			ns	
DE setup time	TESU	8			ns	
DE hold time	TEHD	8			ns	
DVDD power on slew rate	TPOR	-		20	ms	
RESET pulse width	TRST	1			ms	
DCLK cycle time	TCOH	20			ns	
DCLK pulse duty	TCWH	40	50	60	%	

## 4.2. Timing Diagram

### 4.2.1 input Clock and Data Timing Diagram



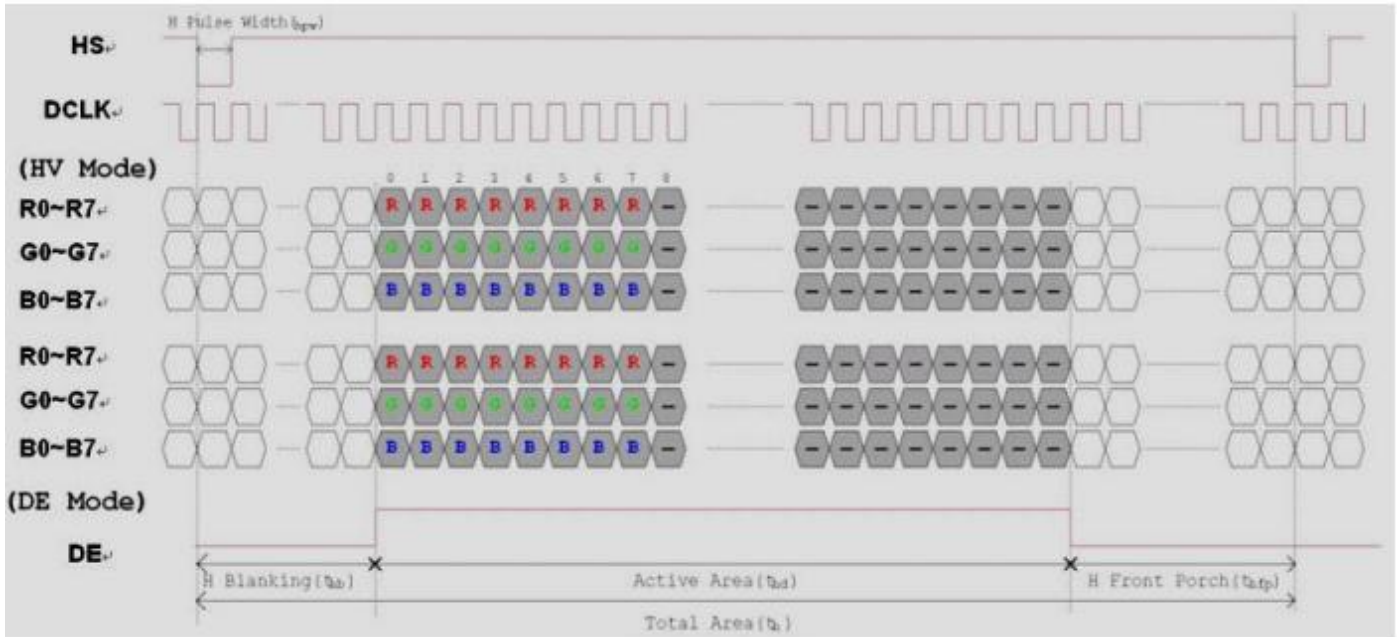
### 4.2.2 Timing

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	

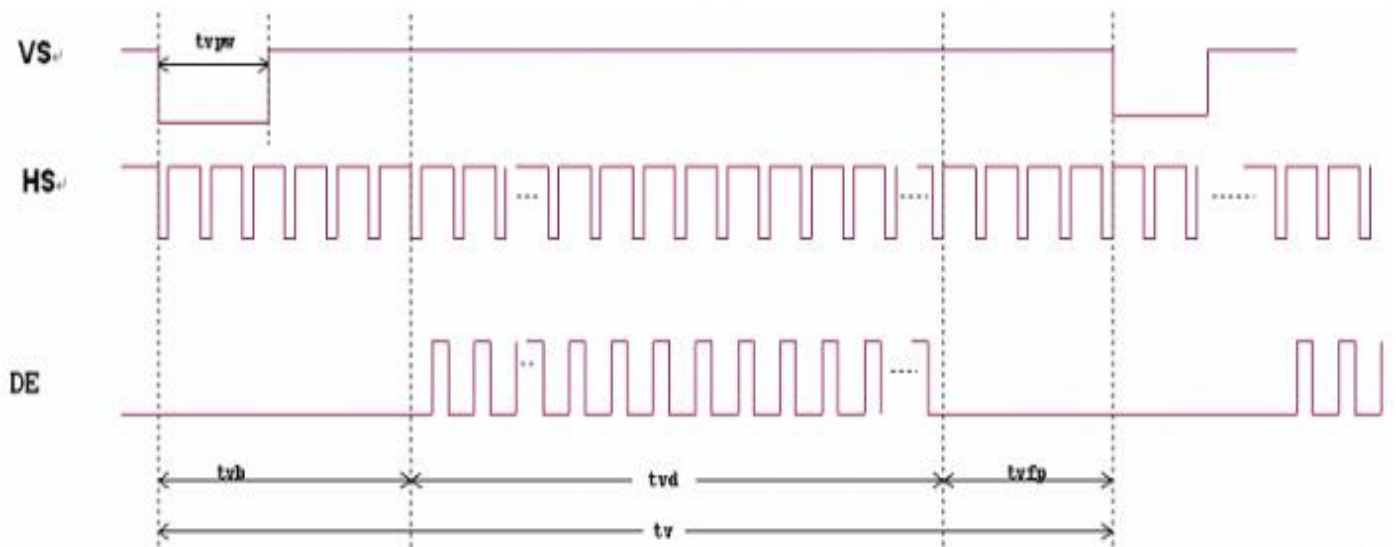
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

### 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	
<b>Contrast ratio</b>	CR	$\varnothing = 0^\circ$	400	500	--		Note1	
<b>Surface Luminance</b>	YL	I=40mA	450	500	--	Cd/M <sup>2</sup>	Note1	
<b>Color saturation</b>	NTSC	-	--	50	--	%		
<b>Response time</b>	T <sub>on</sub>	$\varnothing = 0^\circ$	--	10	20	ms	Note2	
	T <sub>of</sub>		--	15	30			
<b>Viewing angle range</b>	$\varnothing = 0^\circ$	Top	40	50	--		Note3	
		Bottom	60	70	--			
		Left	60	70	--			
		Right	60	70	--			
<b>Module Chromaticity CIE(x,y)</b>	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			--
<b>Transmittance</b>	Trans	--	4.80	5.11	--	%	Note5	
<b>Cross talk</b>	Ct	--	--	--	2	%	Note6	

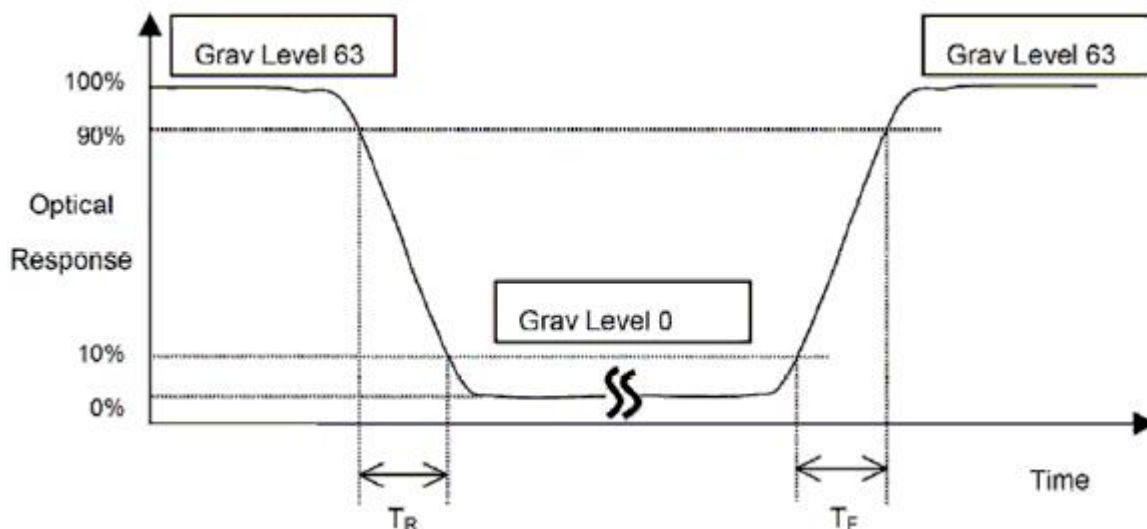
Notes(1) :1. All input terminals LCD panel must be ground while measuring the center area of the panel.

2. Contrast measurements shall be made at viewing angle of  $\Theta = 0$  and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state.

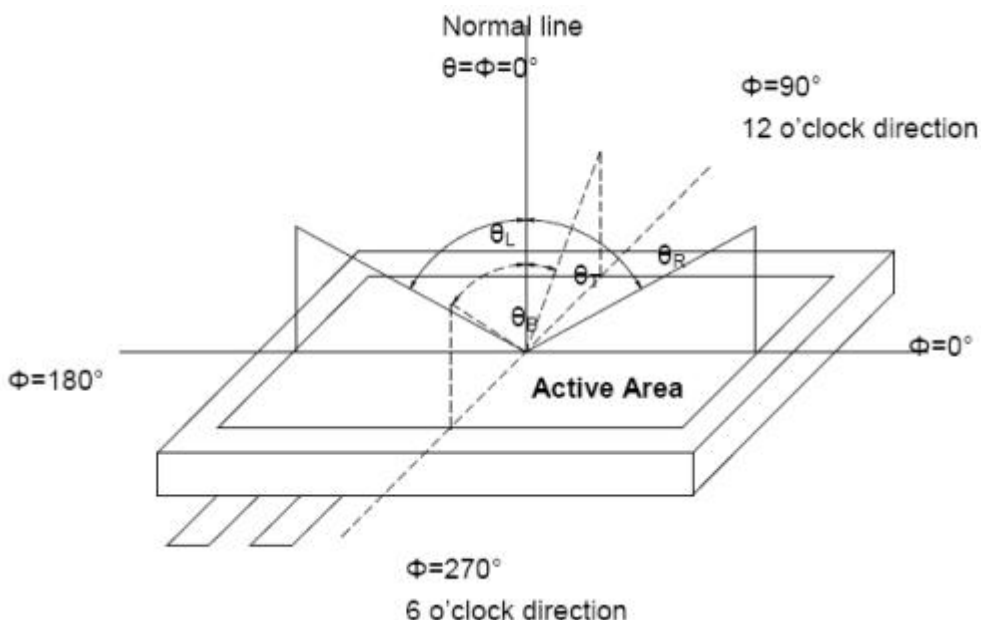
(see Figure 4) Luminance Contrast Ratio (CR) is defined mathematically

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

Note (2) Definition of Response Time (TR, TF):



Note (3) Definition of viewing Angle:

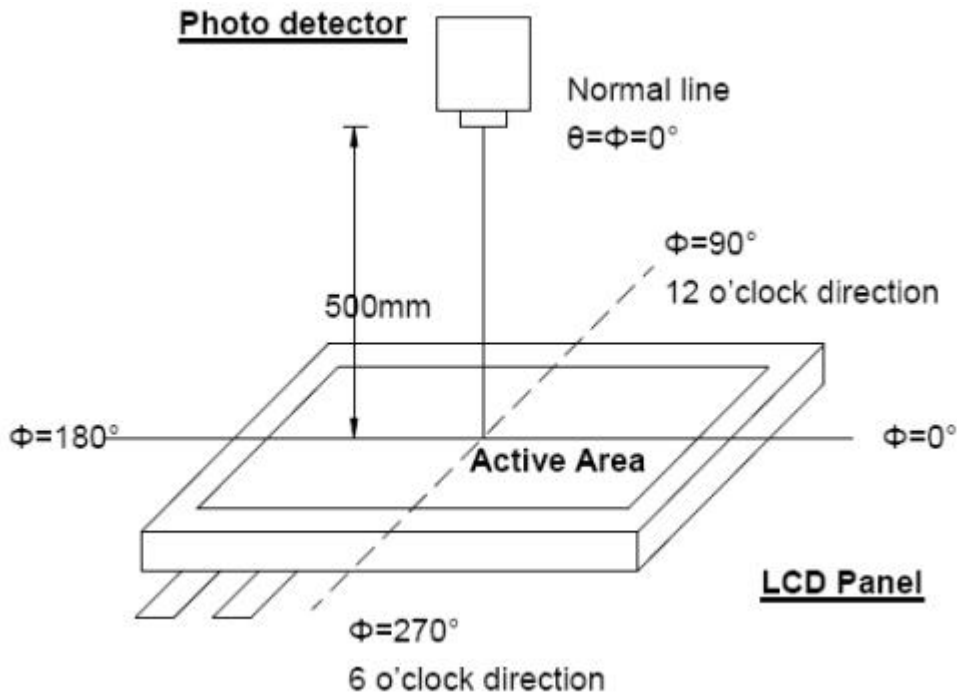


\*\*\* The above “Viewing Angle” is the measuring position with Largest Contrast Ratio; not for good image quality.

View Direction for good image quality is 6 O’clock. Module maker can increase the “Viewing Angle” by applying Wide View Film.

Note (4) Definition of optical measurement system.

The optical characteristics should be measured in dark room. The optical properties are measured at the center point of the LCD screen,(Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/Field of view :1 ° /Height 500mm.)



Note (5) Definition of Transmittance

Where LMOD defined as measured luminance at center point of MOD with "White" state

LBL defined as measured luminance at center point of Backlight Unit with same MOD. The

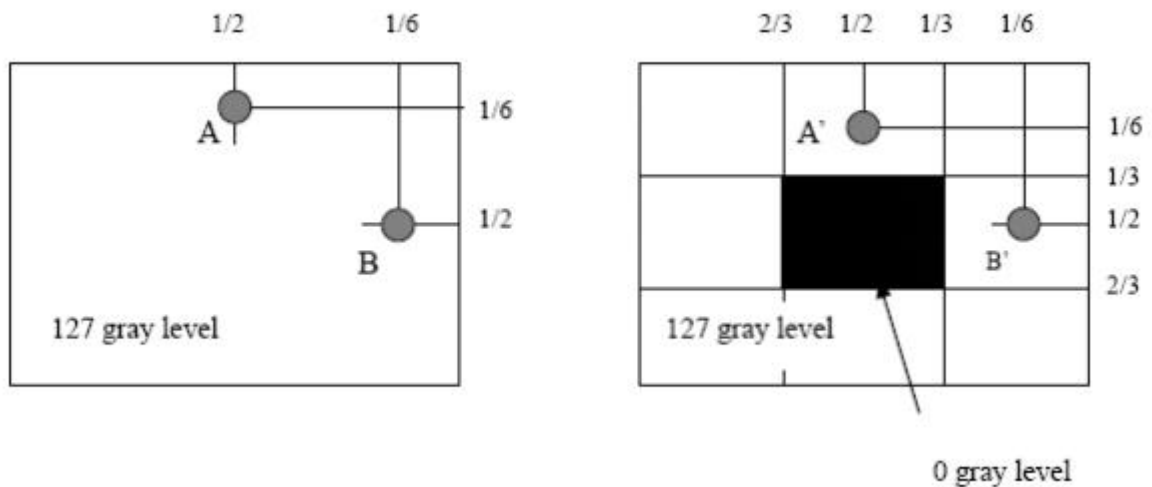
Backlight Unit has composite optical films, except "gain" characteristic optical films.

$$Tr\% = (LMOD / LBL) * 100\%$$

Note (5) Definition of crosstalk:

$1 LA-LA' / LA \times 100\% \leq 2\% \text{ max.}$ , LA and LA' are brightness at location A and A'

$1 LB-LB' / LB \times 100\% \leq 2\% \text{ max.}$ , LB and LB' are brightness at location B and B'



## 6 Reliability Test Items

NO.	Test Item	Test Condition	Check Time
1	High temp storage	T=70	240hrs
2	Low temp storage	T=-30	240hrs
3	High temp operation	T=60	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  $25\pm 10$  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.