

AZ DISPLAYS

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

CUSTOMER APPROVAL			
※ PART NO. : <u>ATM0700D38B-T (AZ DISPLAYS) VER1.2</u>			
APPROVAL		COMPANY CHOP	
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ATM0700D38B-T(AZ DISPLAYS) TFT MODULE V1.2

Document Revision History

Revision	Date	Page	Description	Changed By
V1.0	2017-03-23	--	First issue	
V1.1	2017-04-28	14	Add HS/VS timing	
V1.2	2017-06-19	10	Add LED life time	

Contents

1. LCM Specification.....	3
2. Mechanical Specification.....	4
3. Electrical Units.....	5
4. Timing Characteristics.....	9
5. Optical Specifications.....	12
6. Reliability Test Items.....	15
7. Handling Precautions.....	16

1. LCM Specification

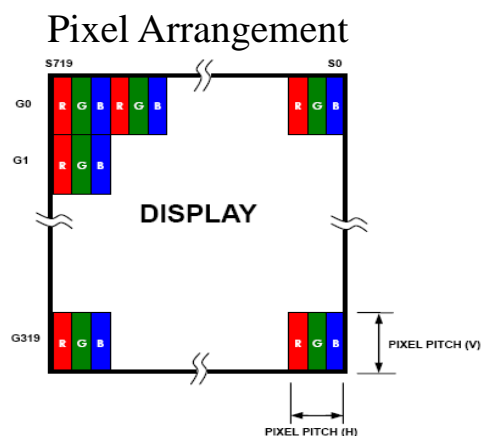
1.1 Description

ATM0700D38B-T 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 7.0 inches diagonally measured and the native resolution is 800*RGB*480. Features of this product are listed in the following table.

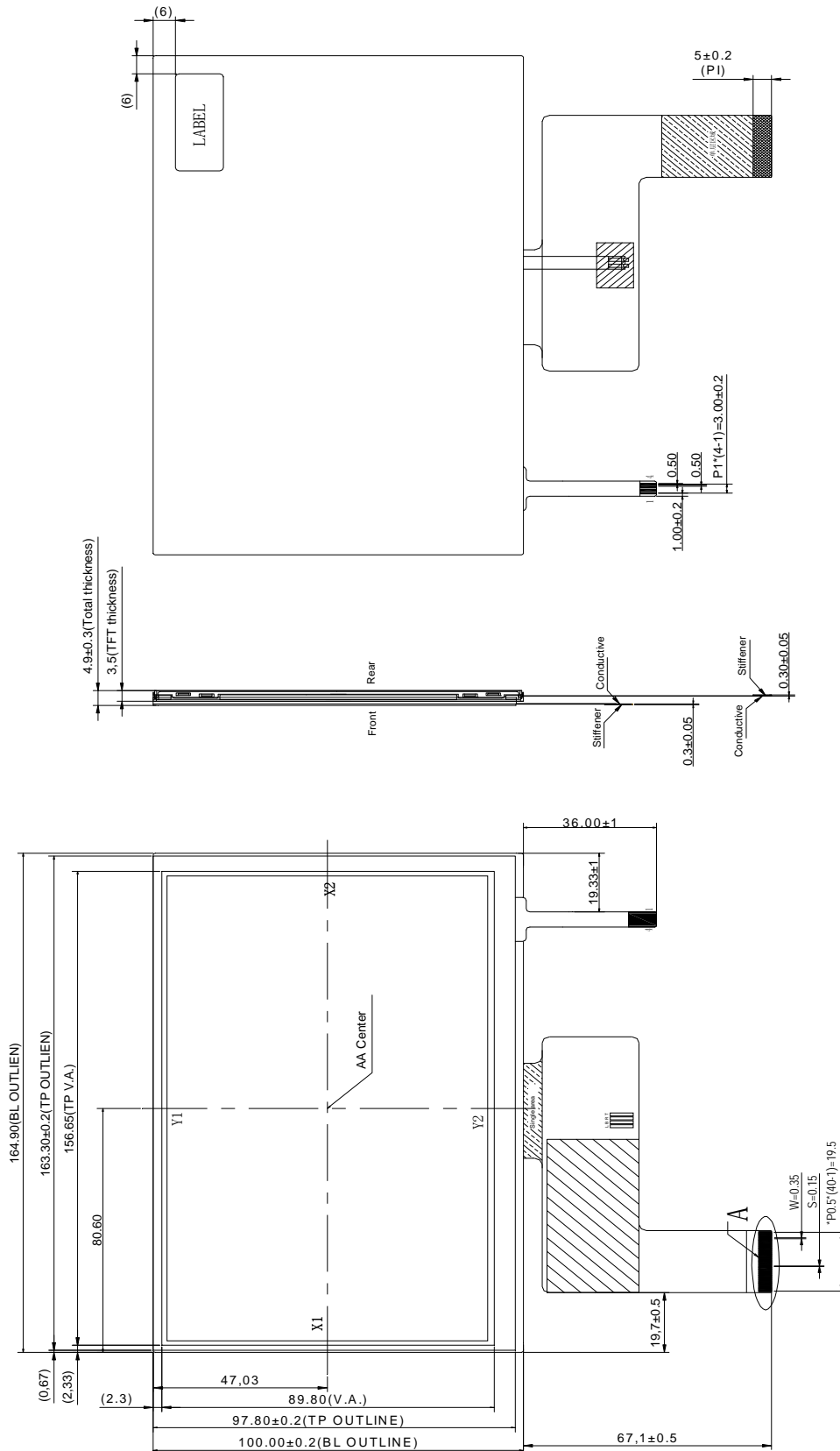
1.2 Functions & Features

Table1.1 Module Functions & Features

Parameter	Value	Unit
LCD Mode	a-Si TFT/transmissive	-
Color	16.2M	-
Display Resolution	800*3(RGB)*480	pixels
Outline Dimension	164.9(W) *100.0(H) *4.9(T)	mm
Active Area(A.A)	154.08*(W) *85.92(H)	mm
Pixel Arrangement	RGB-stripe	-
Viewing Direction	6 O'clock	
Display Mode	Normally WHITE	
Surface Treatment	Anti-Glare	
Back-light	White LED*27CHIP	PCS
Average Brightness	590	cd/m ²
Operation Temperature	-20~70	°C
Storage Temperature	-30~80	°C



2. Mechanical Specification



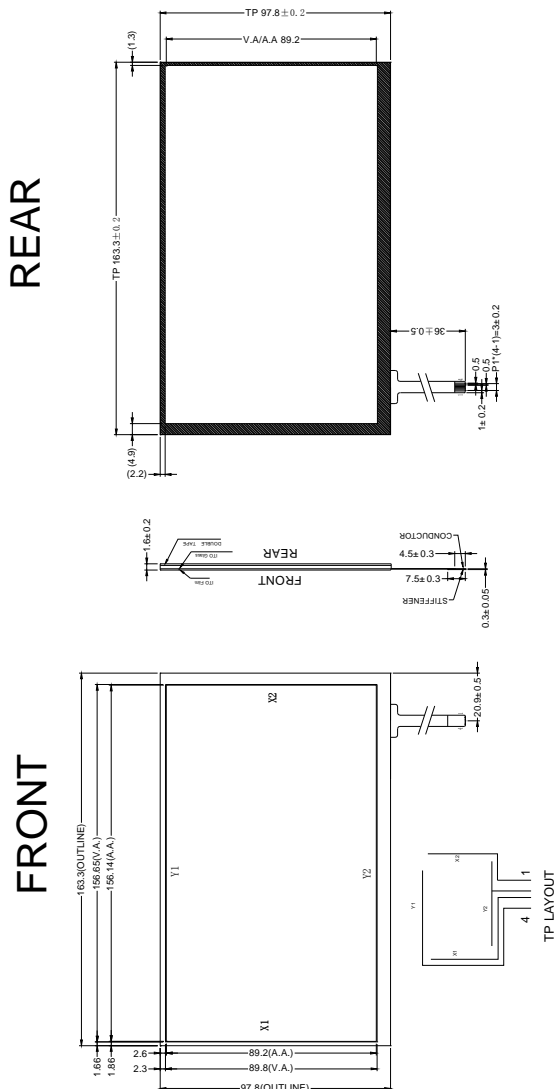
Note:1. Dimensions marked with "()" are for reference.
2. General tolerance: ±0.3

ATM0700D38B-T(AZ DISPLAYS) TFT MODULE V1.2

Touch Panel Section

FPC Connector is used for the module electronics interface. The recommended model is FH12-4S-1SH manufactured by Hirose.

Pin No.	Sym bol	I/O	Function	Remark
4	Y1	Top	Top electrode – differential analog	
3	X1	Left	Left electrode – differential analog	
2	Y2	Bottom	Bottom electrode – differential analog	
1	X2	Right	Right electrode – differential analog	



Parameters:

- 1 Operating voltage: DC5V;
- 2 Operating force: 40~100g;
- 3 Linearity $\leq 1.5\%$; Insulation resistance $> 10M \Omega$, (25VDC);
- 4 Working temperature: $-20^{\circ}C \sim +70^{\circ}C$ 20% ~ 90%RH;
- 5 Storage temperature: $-20^{\circ}C \sim +80^{\circ}C$ 20% ~ 85%RH;
- 6 Transmittance $> 75\%$;
- 7 Structure: Film + Glass;
- 8 ITO-Film: Anti glare;
- 9 Response time $< 10ms$;
- 10 electrode resistance: 200~900 ohms;
- 11 Unspecified tolerance: $\pm 0.3mm$

3. Electrical Units

3.1 Electrical Specification

<Table3. Electrical specifications>

Item	Symbol	Unit	Value			Note
			Min	Typ	Max	
Power voltage	VCC	V	3.0	3.3	3.6	
Operating Temperature	TOP	°C	-20 to		+70	
Storage Temperature	TST	°C	-30 to		+80	

Notes:

1. VCC setting should match the signals output voltage (refer to Note 3) of customer' s system board.
2. DCLK,HS,VS,DE,R0~R7,G0~G7,B0~B7.

3.2 Pin Descriptions

3.2.1 TFT LCD Panel interface FPC Pin Description

Pin No.	Symbol	I/O	Function
1	Led-	P	Power for LED backlight (Cathode)
2	Led+	P	Power for LED backlight (Anode)
3	GND	P	Analog Ground
4	VCC	P	Power voltage
5	R0	I	Data input(LSB)
6	R1	I	Data input
7	R2	I	Data input
8	R3	I	Data input
9	R4	I	Data input
10	R5	I	Data input
11	R6	I	Data input
12	R7	I	Data input(MSB)
13	G0	I	Data input (LSB)
14	G1	I	Data input
15	G2	I	Data input
16	G3	I	Data input
17	G4	I	Data input
18	G5	I	Data input
19	G6	I	Data input
20	G7	I	Data input(MSB)
21	B0	I	Data input (LSB)
22	B1	I	Data input
23	B2	I	Data input
24	B3	I	Data input
25	B4	I	Data input
26	B5	I	Data input
27	B6	I	Data input
28	B7	I	Data input (MSB)
29	GND	P	Digital Ground
30	DCLK	I	Clock input
31	DISP	I	<p>Display on/off control.</p> <p>DISP="L", enter standby mode for power saving. Timing controller and source driver will turn off, all outputs are Hi-Z.</p> <p>DISP="H", normal operation.</p> <p>Note: Normal pull high</p>
32	HS	I	Horizontal sync input. Negative polarity
33	VS	I	Vertical sync input. Negative polarity
34	DE	I	Data enable
35	NC	-	Not connect

ATM0700D38B-T(AZ DISPLAYS) TFT MODULE V1.2

36	GND	P	Digital Ground
37	XR	I/O	Right electrode - differential analog,NC by default
38	YD	I/O	Bottom electrode - differential analog,NC by default
39	XL	I/O	Left electrode - differential analog,NC by default
40	YU	I/O	Top electrode - differential analog,NC by default

I/O: I: input, O: output, P: power

3.3.1 Electrical characteristics (Ta=25°C)

3.3.2 TFT-LCD Current Consumption

Table 3.2:

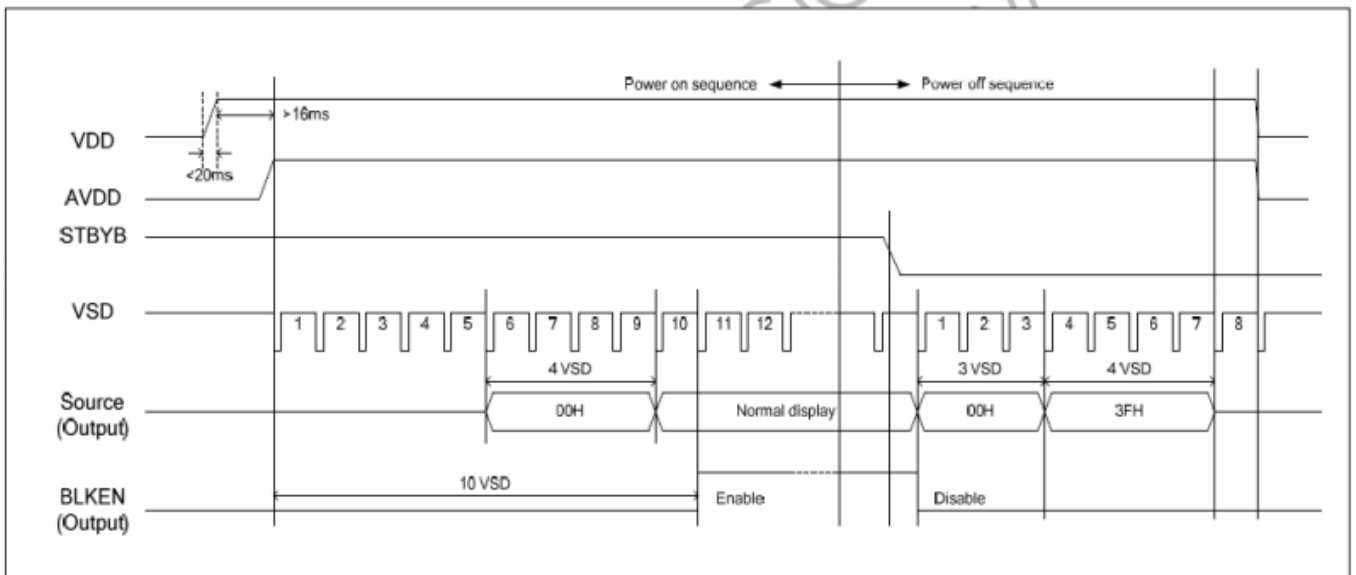
Item	Symbol	Unit	Test Condition	Min	Typ.	Max	Note
Gate on power current	IVGH	mA					-
Gate off power current	IVGL	mA					-
Analog power current	IVDD	mA	VDD=3.3V	-	TBD		-
Analog power current	IAVDD	mA					

3.3 Power Sequence

To prevent the device damage from latch up, the power sequence shown below must be followed.

Power ON: VDD, GND → AVDD, AVSS → V1 to V14

Power OFF: V1 to V14 → AVDD, AVSS → VDD, GND



3.4 Back-light Specification

Table 3.3 Back-light Specification

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VF	Only Backlight	9.0		10	V
Supply Current	IF		20*9=180			mA
LED life time				50000		Hr
Average Brightness(BL+LCD)	IV	Backlight Current IF=180mA	520	590		Cd/m2
CIE Color Coordinate	X	Backlight Current IF=180mA	-		-	-
	Y		-		-	
Uniformity	B	Backlight Current IF=180mA	80	-	-S	(%)
Color	White					

4. Timing Characteristics

4.1. AC Electrical Characteristics

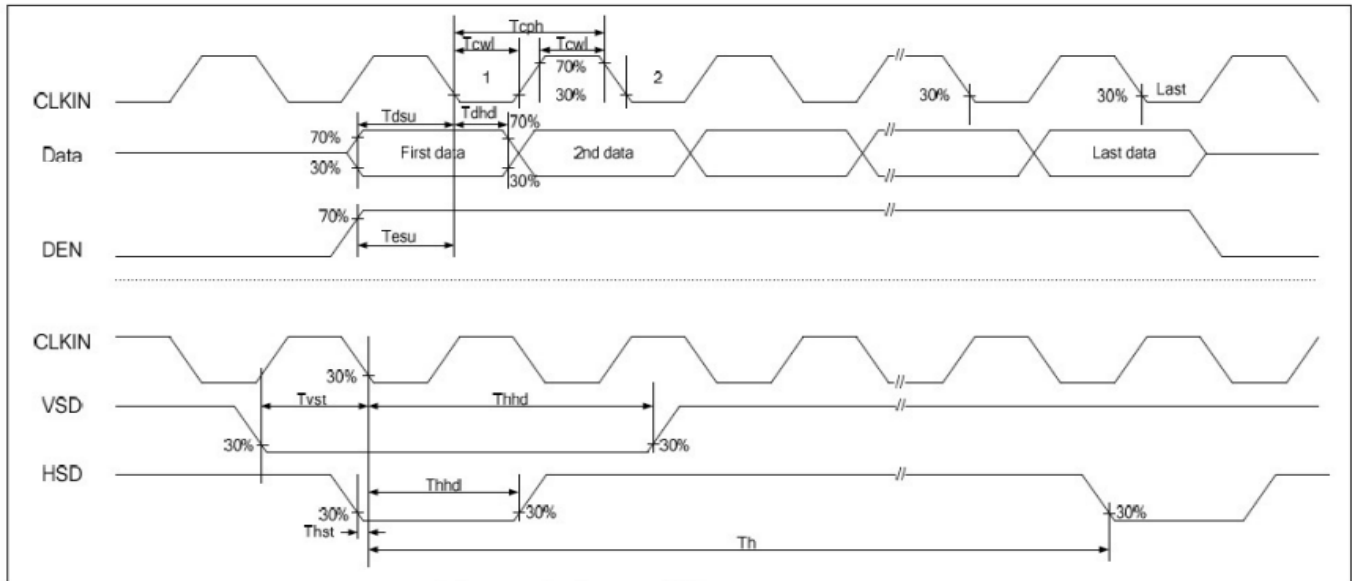
Item	Symbol	Value			Unit	Remark
		Min	Typ	Max		
Hs setup time	T _{HST}	8			ns	
Hs hold time	T _{HHD}	8			ns	
VS setup time	T _{VST}	8			ns	
VS hold time	T _{VHD}	8			ns	
Data setup time	T _{DSU}	8			ns	
Data hold time	T _{DHD}	8			ns	
DE setup time	T _{ESU}	8			ns	
DE hold time	T _{EHD}	8			ns	
DVDD power on slew rate	T _{POR}	-		20	ms	
RESET pulse width	T _{RST}	10			ns	
Dot Clock	L/T _{CLK}	29	33	38	MHZ	
DCLK pulse duty	T _{CWH}	40	50	60	%	

4.2. Timing characteristics of input signals

Parameter	Symbol	Spec			Unit
		Min.	Typ.	Max.	
CLK frequency	fclk	-	33.3	50	MHz
DE H period	thpw+thb+thd+thfp = th	885	1000	1010	DCLK
DE H-Display Area	thd	800			DCLK
DE H-Blanking	th-thd	85	200	210	DCLK
DE V period	tpw+tvb+tvd+tvfp	500	512	-	DCLK
DE V-Display Area	tvd	480			th
DE V-Blanking	tv-tvd	20	32	-	th

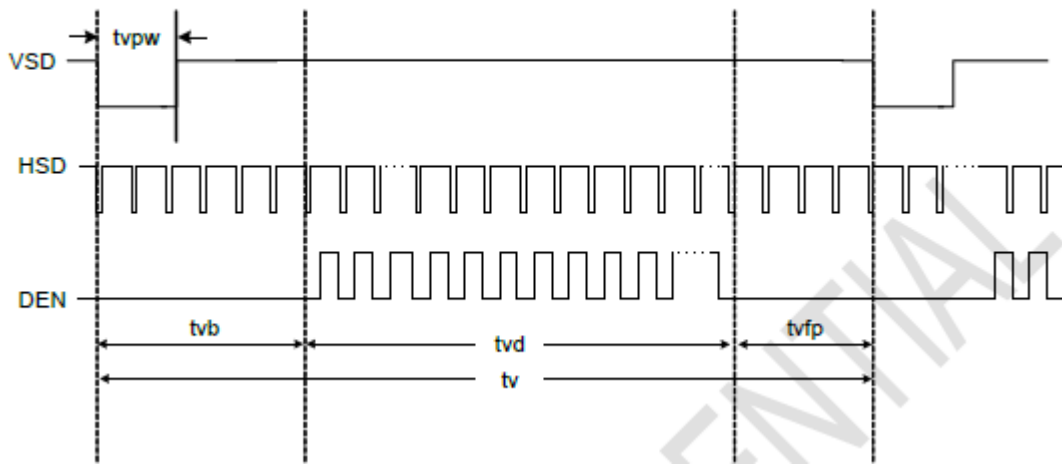
4.3. Timing Diagram

4.3.1 input Clock and Data Timing Diagram

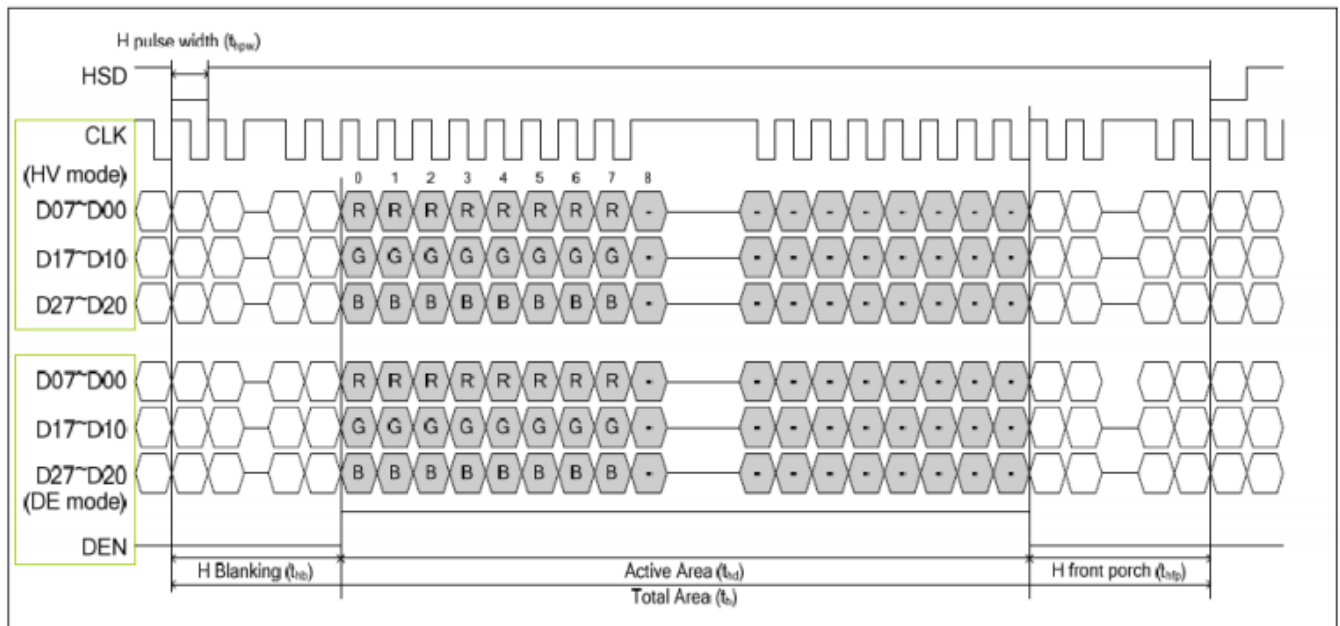


4.3.2 Data Input Format for TTL

Vertical input timing



Horizontal input timing



● **Horizontal timing**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd	800			DCLK
DCLK frequency	fclk	-	30	50	MHz
One Horizontal Line	th	889	928	1143	DCLK
HS pulse width	thpw	1	48	255	DCLK
HS Back Porch (Blanking)	thb	88			DCLK
HS Front Porch	thfp	1	40	255	DCLK
DE mode Blanking	th-thd	85	128	512	DCLK

● **Vertical timing**

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	480			T _H
VS period time	tv	513	525	767	T _H
VS pulse width	tvpw	3	3	255	T _H
VS Back Porch (Blanking)	tvb	32			T _H
VS Front Porch	tvfp	1	13	255	T _H
DE mode Blanking	tv-tvd	4	45	255	T _H

5 Optical Specifications

Item of electro-optical characteristics	Symbol	Condition	Min	Typ	Max	Unit	Remark
Contrast ratio	CR	$\varnothing = 0^\circ$	350	500	--		Note1
Surface Luminance	YL	180mA	490	550	--	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	50	60	--		Note3
		Bottom	40	50	--		
		Left	60	70	--		
		Right	60	70	--		
Module Chromaticity CIE(x,y)	White	x	$\varnothing = 0^\circ$				Note4
		y					
	Red	x		--	--		
		y		--	--		
	Green	x		--	--		
		y		--	--		
	Blue	x		--	--		
		y		--	--		
Transmittance	Trans	--			--	%	Note5
Cross talk	Ct	--	--	--		%	Note6

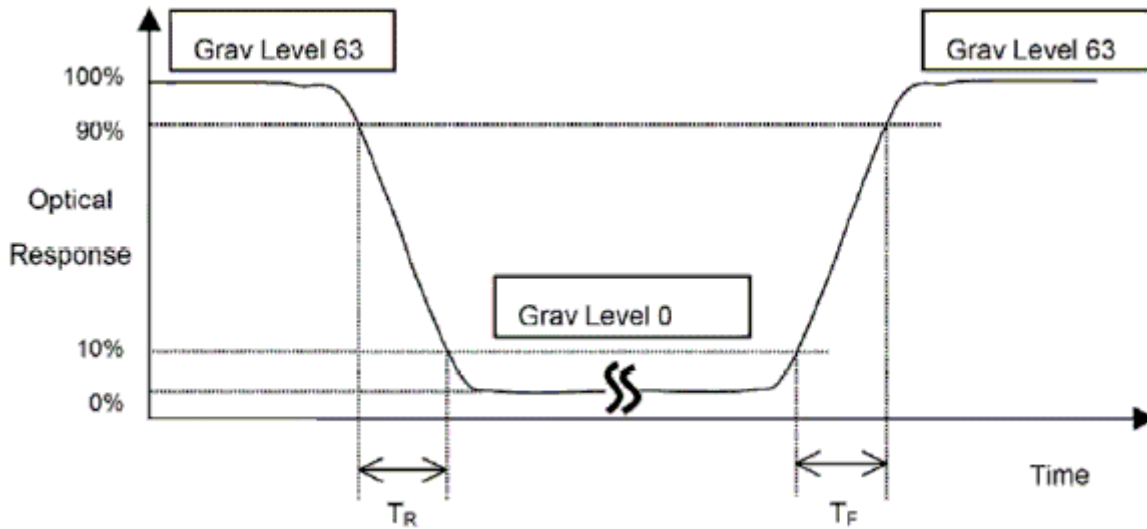
Notes(1) :1. All input terminals LCD panel must be ground while measuring the center area of the panel.

2. Contrast measurements shall be made at viewing angle of $\varnothing = 0$ 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.

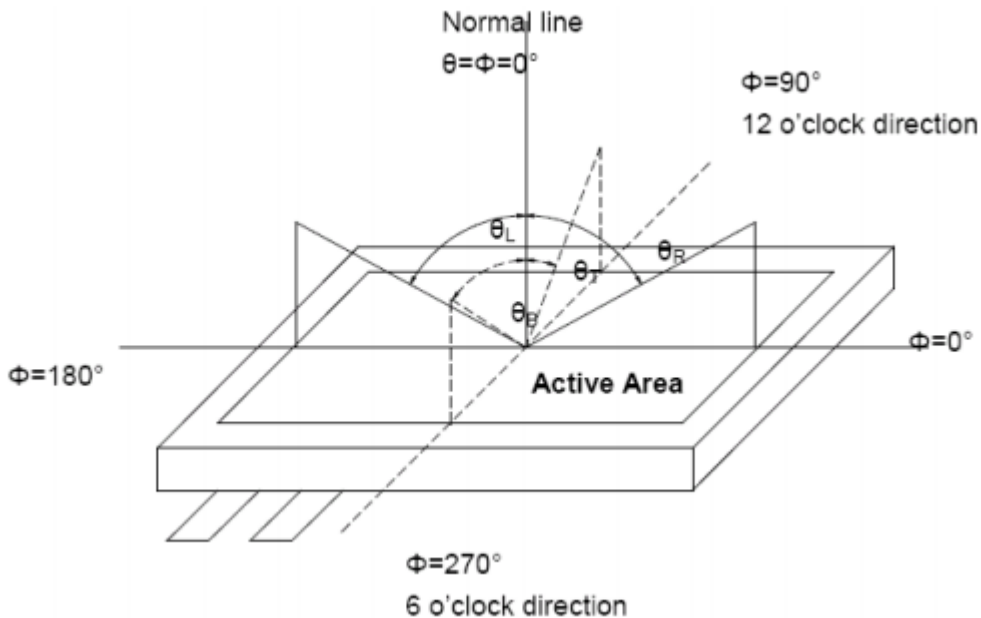
(see Figure 4) Luminance Contrast Ratio (CR) is defined mathematically

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

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



Note (3) Definition of viewing Angle:

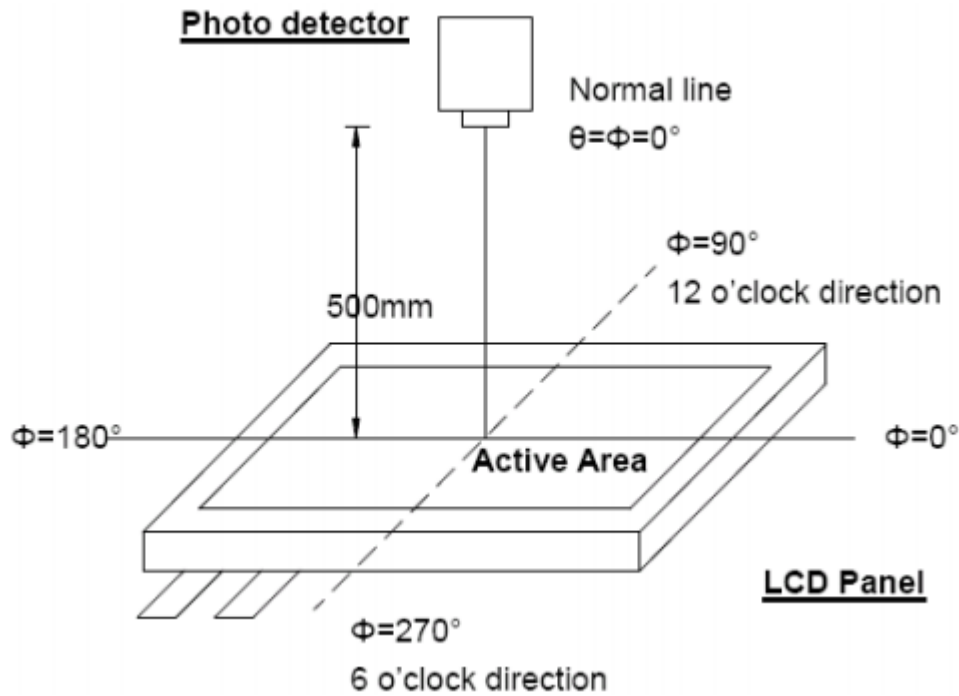


*** The above "Viewing Angle" is the measuring position with Largest Contrast Ratio; not for good image quality.

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

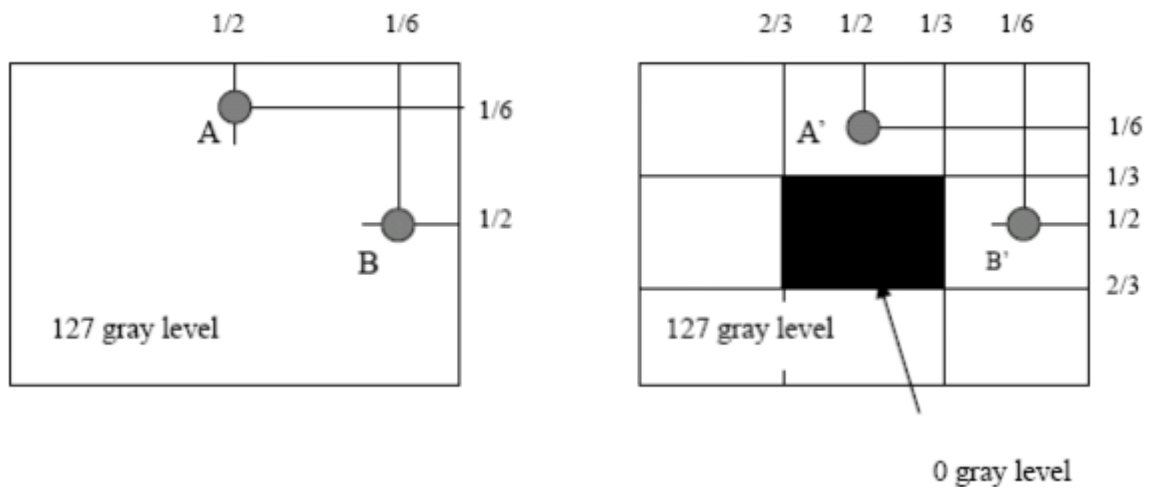
Backlight Unit has composite optical films, except "gain" characteristic optical films.

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

Note (5) Definition of crosstalk:

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

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



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.