



## ASI-T-3501NA5FN/D

Item	Contents	Unit
Size	3.5	inch
Resolution	480(RGB) x 800	/
Interface	RGB 24 bits	/
Technology type	TFT active matrix	/
Pixel pitch	0.0945x0.0945	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	51.16x 86.45x2.0	mm
Active Area	45.36 x 75.6	mm
Display Mode	Transflective Normally black	/
Viewing Direction	All Angle	/
Backlight Type	LED	/
Driver IC	R63302	/

### Record of Revision

Date	Revision No.	Summary

1. Scope

This data sheet introduces the specification of ASI-T-3501NA5FN/D active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 3.5" display area contains 480(RGB) x 800 pixels.

2. Application

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

3. General Information

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## 5. Interface signals

No	Symbol	I/O	Description	Remarks
1	GND	-	GND level pin	
2	VCC	-	Power supply for analog and logic	
3	VCC	-	Power supply for analog and logic	
4	VDDIO	-	Power supply for I/O	
5	GND	-	GND level pin	
6	B0	I	Data signal in RGB I/F (BLUE)	
7	B1	I	Data signal in RGB I/F (BLUE)	
8	B2	I	Data signal in RGB I/F (BLUE)	
9	B3	I	Data signal in RGB I/F (BLUE)	
10	B4	I	Data signal in RGB I/F (BLUE)	
11	B5	I	Data signal in RGB I/F (BLUE)	
12	B6	I	Data signal in RGB I/F (BLUE)	
13	B7	I	Data signal in RGB I/F (BLUE)	
14	GND	-	GND level pin	
15	G0	I	Data signal in RGB I/F (GREEN)	
16	G1	I	Data signal in RGB I/F (GREEN)	
17	G2	I	Data signal in RGB I/F (GREEN)	
18	G3	I	Data signal in RGB I/F (GREEN)	
19	G4	I	Data signal in RGB I/F (GREEN)	
20	G5	I	Data signal in RGB I/F (GREEN)	
21	G6	I	Data signal in RGB I/F (GREEN)	
22	G7	I	Data signal in RGB I/F (GREEN)	
23	GND	-	GND level pin	
24	LEDPWM	O	Control signal for LED backlight	PWM signal's width is selected from 256 values
25	GND	-	GND level pin	
26	GND	-	GND level pin	
27	LEDC	-	LED cathode	
28	GND	-	GND level pin	
29	LEDA	-	LED Anode	
30	GND	-	GND level pin	
31	MARKER ID	-	MARKER_ID pin = "GND"	
32	DE	I	Data enable signal in RGB	
33	HSYNC	I	Line synchronous signal in RGB I/F	
34	VSYNC	I	Frame synchronous signal in RGB I/F	
35	DCLK	I	Dot clock signal in RGB I/F	
36	CS	I	Chip Select pin in Serial I/F	Low(GND) enable
37	SCL	I	Serial clock signal in Serial I/F	
38	SDI	I	Serial data input signal in Serial I/F	

39	SDO	O	Serial data output signal in Serial I/F	
40	RESET	I	Reset enable pin	Low(GND) enable
41	GND	-	GND level pin	
42	R0	I	Data signal in RGB I/F (RED)	
43	R1	I	Data signal in RGB I/F (RED)	
44	R2	I	Data signal in RGB I/F (RED)	
45	R3	I	Data signal in RGB I/F (RED)	
46	R4	I	Data signal in RGB I/F (RED)	
47	R5	I	Data signal in RGB I/F (RED)	
48	R6	I	Data signal in RGB I/F (RED)	
49	R7	I	Data signal in RGB I/F (RED)	
50	GND	-	GND level pin	

Connection: (Panasonic AXT550124 50 pins, 0.4mm pitch)

## 6. Absolute maximum Ratings

### 6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	VDDIO-GND	-0.3	4.6	V	NOTE1
	VCC-GND	-0.3	4.6	V	
Input Voltage	VIN	-0.3	VDDIO+0.3	V	NOTE2

NOTE1: VCC >= VDDIO

NOTE2: Input terminal of logic system. Voltage value is based on GND = 0V.

### 6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	70	°C	
Storage Temperature	TSTG	-30	80	°C	

## 7. Electrical Specifications

### 7.1 Electrical characteristics

GND=0V, Ta=25°C, DCLK=26MHZ

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage	VDDIO-VSS	1.7	1.8	2.95	V	NOTE1
Supply Voltage	VCC-VSS	2.75	2.80	2.95	V	NOTE1
Input Signal Voltage	VIL	-0.3	--	0.2*VDD	V	NOTE1
	VIH	0.8*VDD	--	VDD	V	
Output Signal Voltage	VOL	--	--	0.2*VDD	V	NOTE2
	VOH	0.8*VDD	--	--	V	NOTE3
Current consumption	IDD+ICC	--	20.5	--	mA	NOTE4

NOTE1: The condition  $VDDIO \leq VCC$  must be met

NOTE2: Input mode of R0~R7, G0~G7, B0~B7, VSYNC, HSYNC, DCLK, DE, RESET, SDI, SCL, CS

NOTE3: Output mode of SDO, LEDPWM.

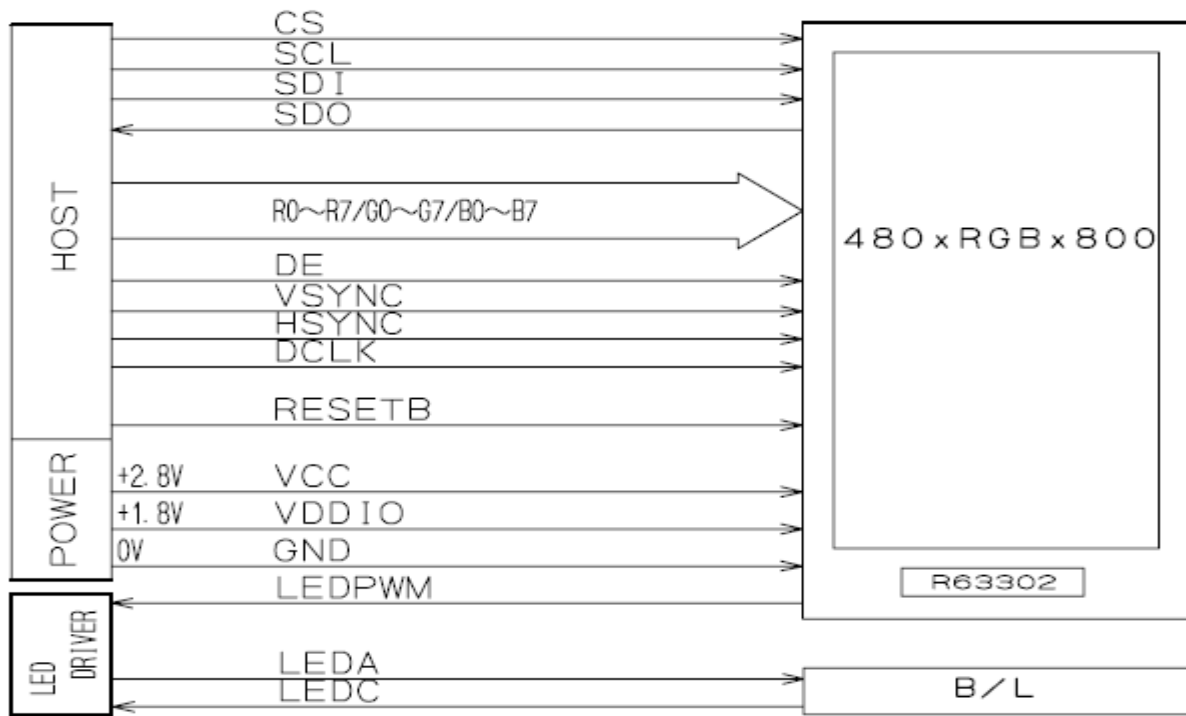
NOTE4: Following Conditions: Ta=25frame frequency=60Hz (DCLK=26MHz)

### 7.2 LED Backlight

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF		140		mA	
Forward voltage	VF		3.1		V	

7.3 Schematic of LCD module system

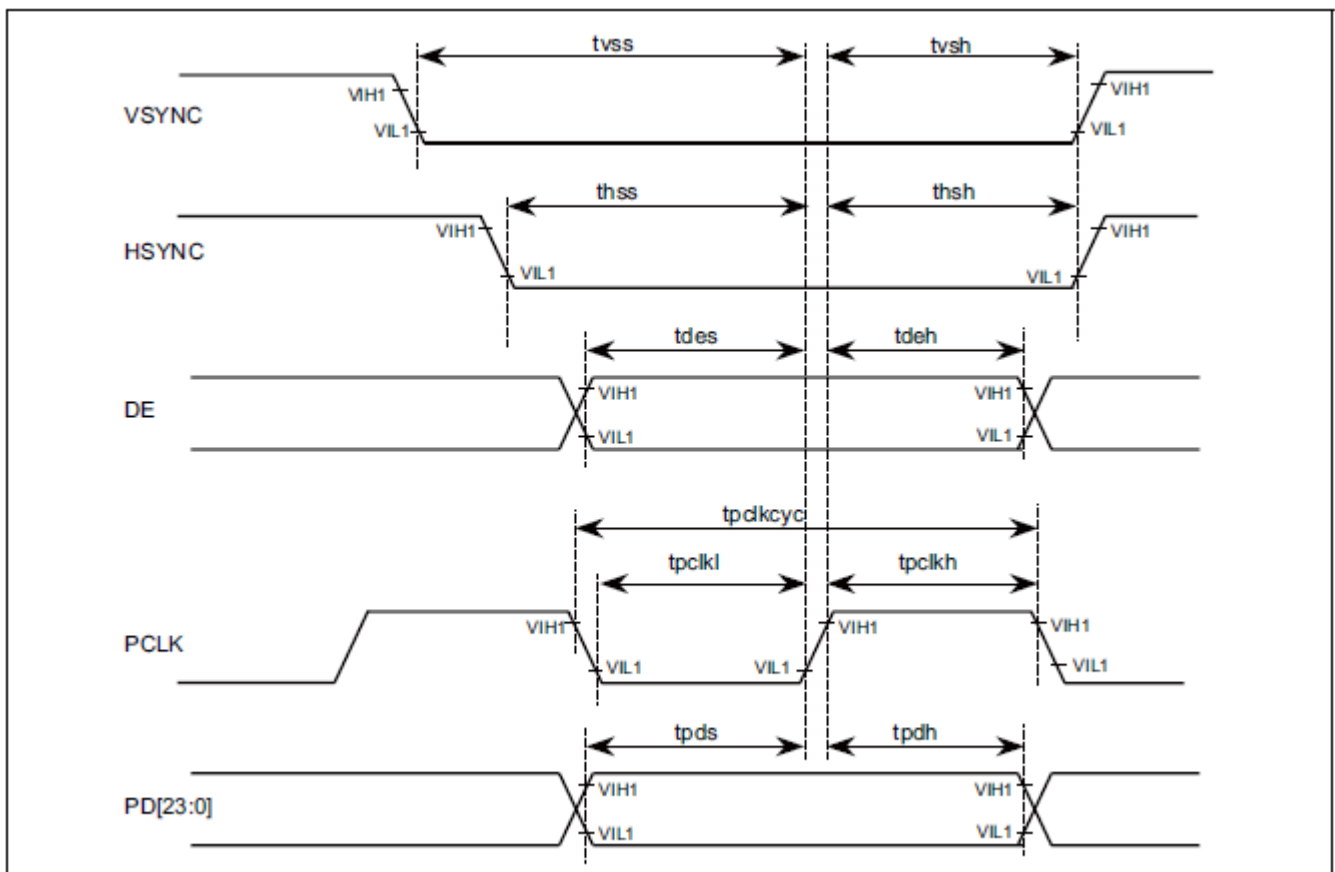


## 8. Command/AC Timing

### 8.1 Host Interface Timing Diagrams for serial interface

Condition : GND=0, VDDIO=1.7V--2.95V, Ta = 25°C

Item	Symbol	Unit	Test Condition	Min.	Max.
Chip Select Set Up Time	CSX	tc <sub>ss</sub>	ns	40	-
Chip Select Hold Time		tc <sub>sh</sub>	ns	40	-
Chip Select High Pulse Width		tch <sub>w</sub>	ns	100	
Write Cycle Time	SCL (Write)	t <sub>wc</sub>	ns	100	-
SCL"High"Width(Write)		t <sub>wrh</sub>	ns	40	-
SCL"Low"Width(Write)		t <sub>wrl</sub>	ns	40	-
SCL Set Up Time		t <sub>ssu</sub>	ns	10	
Read Cycle Time	SCL (Read)	t <sub>rc</sub>	ns	300	-
SCL"High"Width(Read)		t <sub>rdh</sub>	ns	120	-
SCL"Low"Width(Read)		t <sub>rdl</sub>	ns	120	-
Data Set Up Time	DIN	t <sub>ds</sub>	ns	30	-
Data Hold Time		t <sub>dh</sub>	ns	30	-
Access Time	DOUT	t <sub>acc</sub>	ns	-	110
Output Disable Time		t <sub>od</sub>	ns	CL Max.30pF Min.8pF	10
Rising/Falling Time	-	t <sub>r</sub> /t <sub>f</sub>	ns	-	15

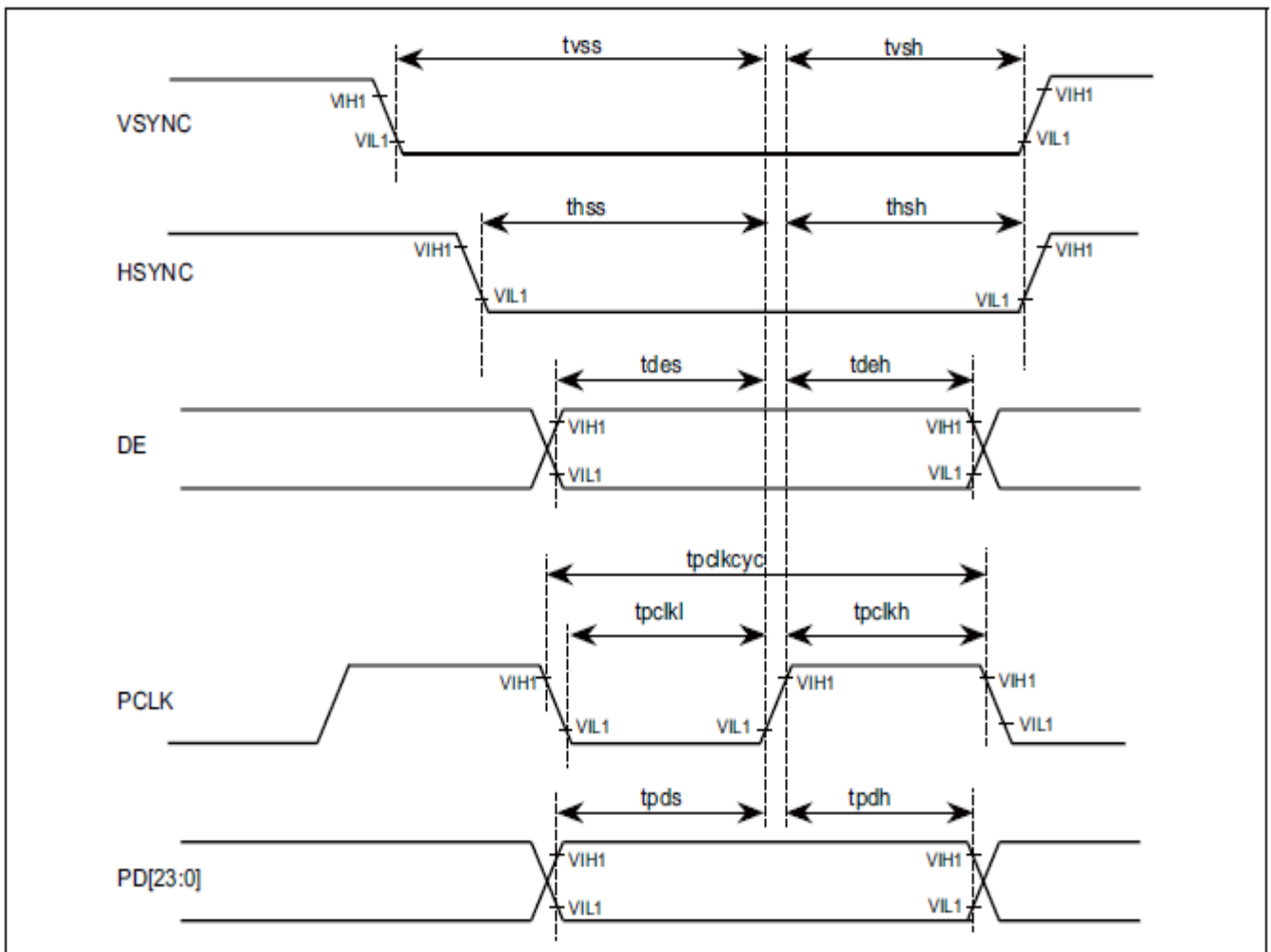


8.2 Host Interface Timing Diagrams for RGB interface

Condition : GND=0, VDDIO=1. .7V--2.95V, Ta = 25°C

Item	Symbol	Unit	Test Condition	Min.	Max.
VSYNC setup time	VSYNC	tyss		10	-
VSYNC hold time		tvsh		15	-
HSYNC setup time	HSYNC	thss		10	-
HSYNC hold time		thsh		15	-
DE setup time	DE	tdes		10	-
DE hold time		tdeh		15	-
Pixel clock cycle time	PCLK	tpclkcyc		31	-
Pixel clock "Low" period		tpckl		10	-
Pixel clock "High" period		tpckh		10	-
Data setup time	PD[23:0]	tds		10	-
Data hold time	DE	tdh		10	-
Rise / Fall time	-	tr/tf	ns	-	5

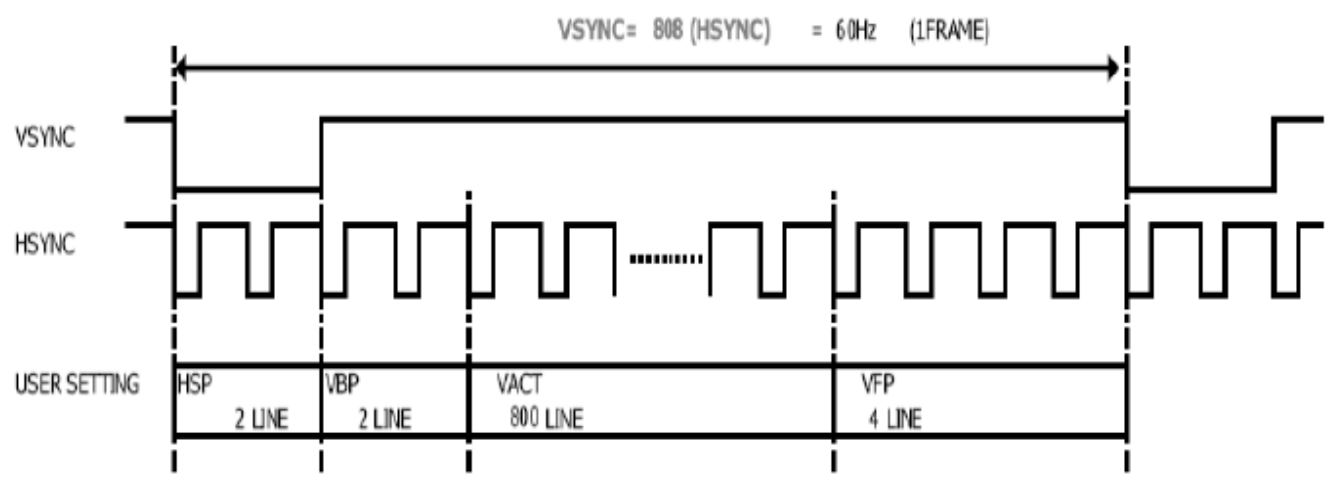
\*1 : R0~R7/G0~G7/B0~B7/DE



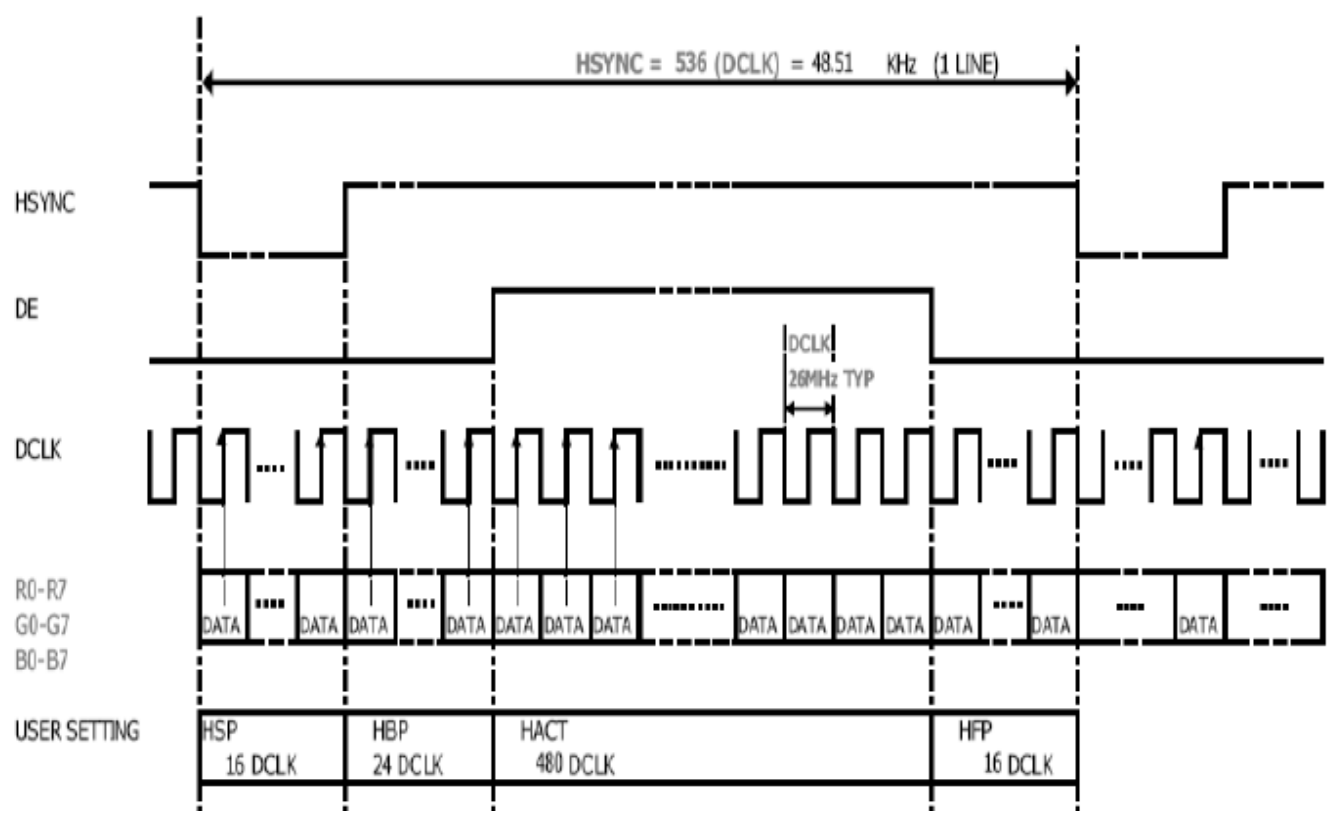
### 8.3 Picture data input timing Diagrams for RGB interface

Item	Symbol	unit	MIN	TYP	MAX
Input dot clock	DCLK	MHz	24.70	26.00	27.30
Horizontal sync period	HSYNC	DCLK	-	536	-
Horizontal sync pulse width	HSP	DCLK	-	16	-
Horizontal back porch	HBP	DCLK	-	24	-
Horizontal front porch	HFP	DCLK	-	16	-
Horizontal active	HACT	DCLK	-	480	-
Vertical sync period	VSYNC	HSYNC	-	808	-
Vertical sync pulse width	VSP	HSYNC	-	2	-
Vertical back porch	VBP	HSYNC	-	2	-
Vertical front porch	VFP	HSYNC	-	4	-
Vertical active	VACT	HSYNC	-	800	-

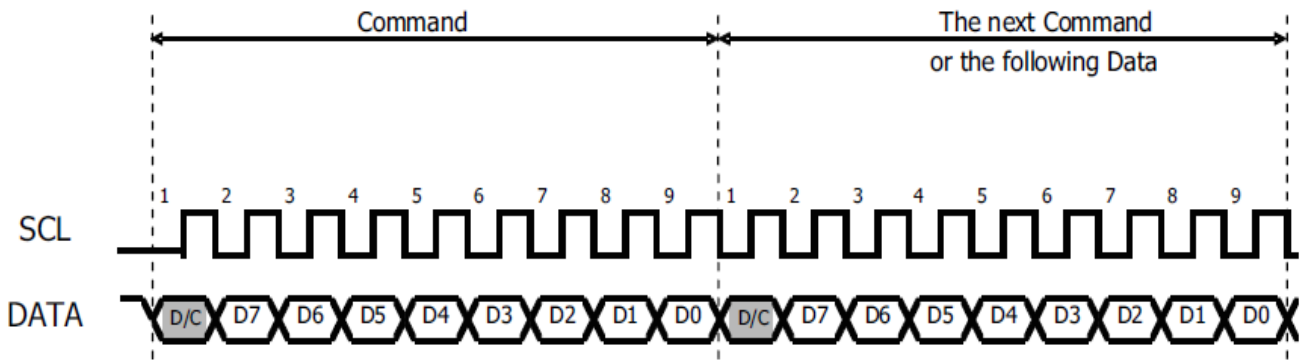
#### VERTICAL



#### HORIZONTAL



### 8.4 Serial data input data format



### 8.5 POWER ON Sequence

ITEM	D/C	Command or Data	HEX	REMARK
VCC ON				
WAIT min 0ms				
VDDIO ON				
VSYNC="H"/HSYNC="H"/DE="H"/DCLK="H or L"/R0-7,G0-7,B0-7="H or L"				
HW RESET=L				
WAIT min 1 ms				
HW RESET=H				
WAIT min 5 ms				
Picture Write (VSYNC/HSYNC/DE/DCLK/R0-7/G0-7/B0-7 start)				
Display ON	L	Command	29h	
Sleep OUT	L	Command	11h	
WAIT min 120ms				
Address Mode Setting	L	Command	36h	
	H	Data	00h	
Pixel Format Setting	L	Command	3Ah	
	H	Data	70h	
Command Access Enable	L	Command	B0h	
	H	Data	00h	
BLC Setting	L	Command	B8h	
	H	Data	**h	00h : BLC OFF 01h : BLC ON
LED PWM ON/OFF , Brightness Setting	L	Command	B9h	
	H	Data	01h	
	H	Data	FFh	
Command Access Disable	L	Command	B0h	
	H	Data	03h	

### 8.6 POWER OFF Sequence

ITEM	D/C	Command or Data	HEX	REMARK
Sleep IN	L	Command	10h	
WAIT min 120ms				
Display OFF	L	Command	28h	
VSYNC="H"/HSYNC="H"/DE="H"/DCLK="H or L"/R0-7,G0-7,B0-7="H or L"				
VDDIO OFF				
WAIT min 0ms				
VCC OFF				

8.7 SLEEP MODE ON

ITEM	D/C	Command or Data	HEX	REMARK
Sleep IN	L	Command	10h	
WAIT 120ms				
Display OFF	L	Command	28h	
VSYNC="H"/HSYNC="H"/DE="H"/DCLK="H or L"/R0-7,G0-7,B0-7="H or L"				

8.8 SLEEP MODE OFF

ITEM	D/C	Command or Data	HEX	REMARK
Picture Write (VSYNC/HSYNC/DE/DCLK/R0-7/G0-7/B0-7 start)				
Display ON	L	Command	29h	
Sleep OUT	L	Command	11h	
WAIT min 120ms				

9. Optical Specification

Ta=25°C

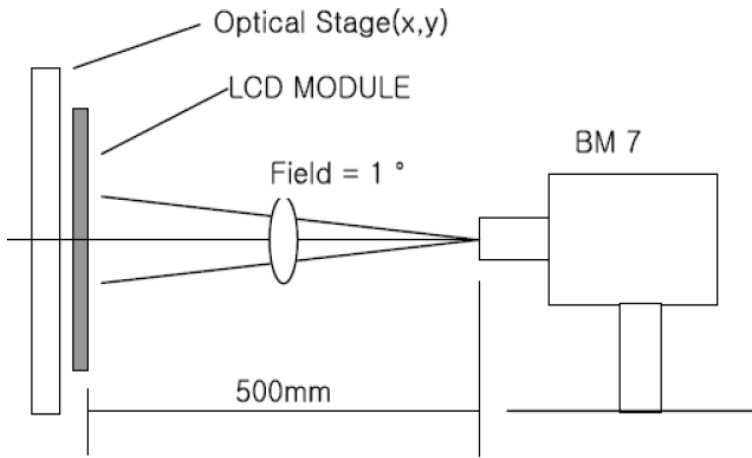
Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark		
Contrast Ratio	CR	$\theta=0^\circ$	400	500	-		Note1 Note2		
Response Time	Ton	25°C	--	11	22	ms	Note1 Note3		
	Toff		--	25	48				
View Angles	$\Theta T$	$CR \geq 10$	70	80	-	Degree	Note 4		
	$\Theta B$		70	80	-				
	$\Theta L$		70	80	-				
	$\Theta R$		70	80	-				
Chromaticity	White	Brightness is on	Typ-0.05	Tpy+0.05			Note5, Note1		
								x	0.29
	y							0.31	
	Red							x	0.60
								y	0.35
	Green							x	0.30
								y	0.54
	Blue							x	0.15
y		0.09							
NTSC	S		40	50	--	%	Note5		
Luminance	L		350	500	--	cd/m <sup>2</sup>	Note1 Note6		
Uniformity	U		80	--	-	%	Note1 Note7		
Reflectance	R			1.5		%	Note8		

Test condition: VDD=3.3V, IL=20mA(LED 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

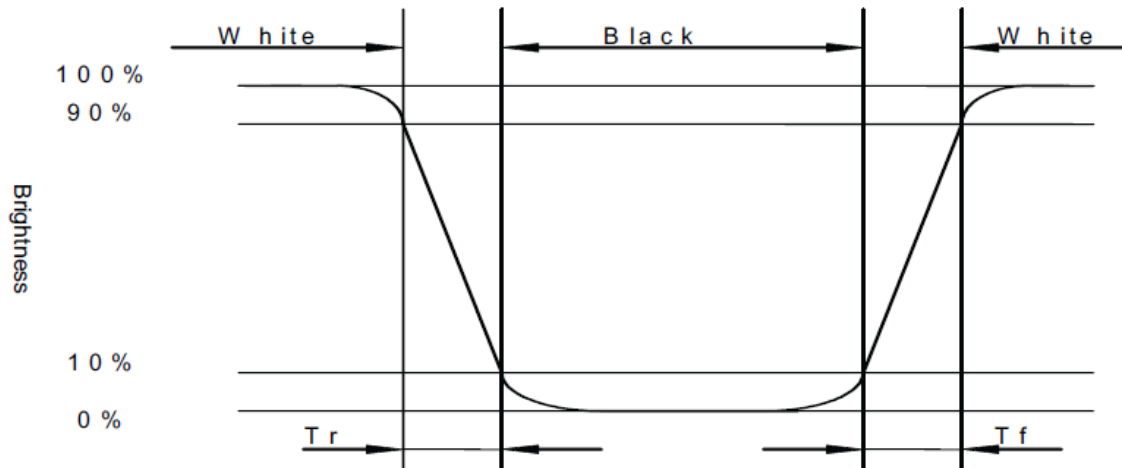


**Note 2: Contrast ratio is defined as follow:**

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

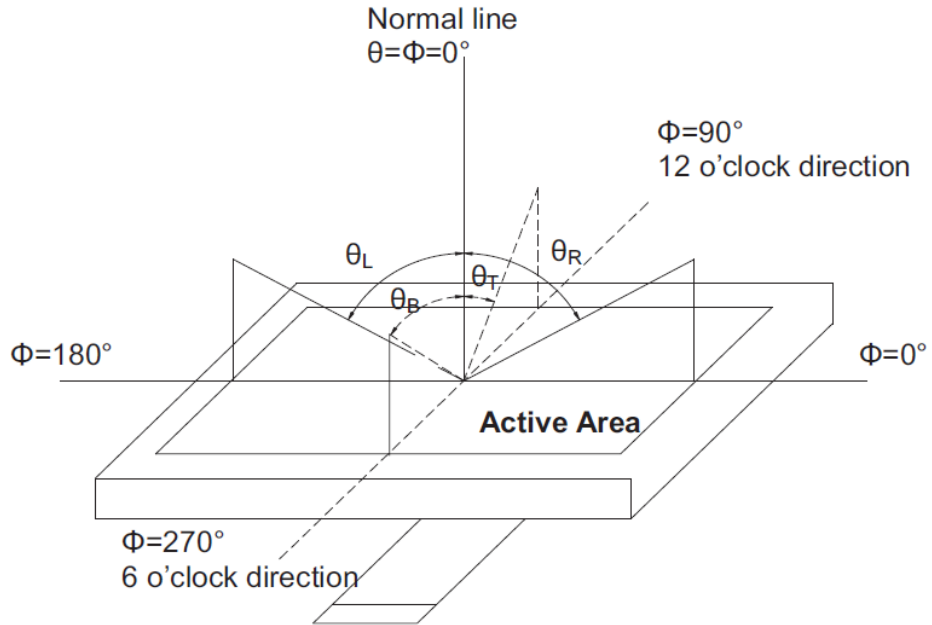
**Note 3: Response time is defined as follow:**

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



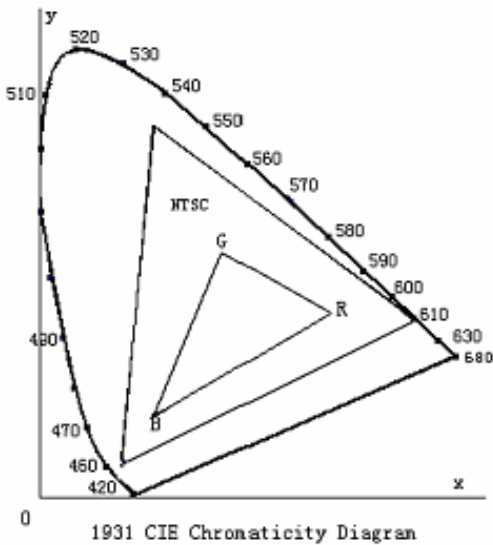
Note 4: Viewing angle range is defined as follow:

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.

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

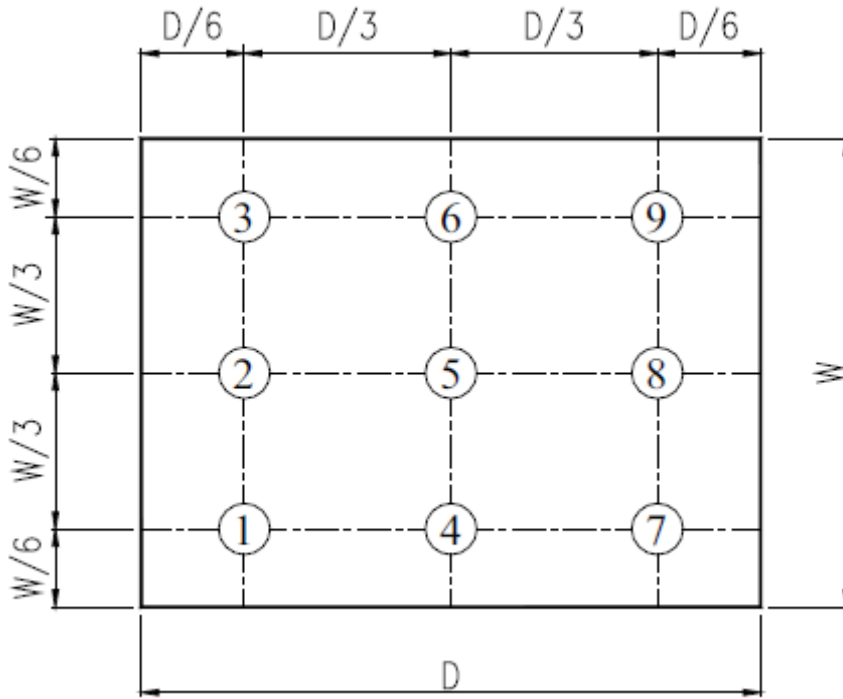
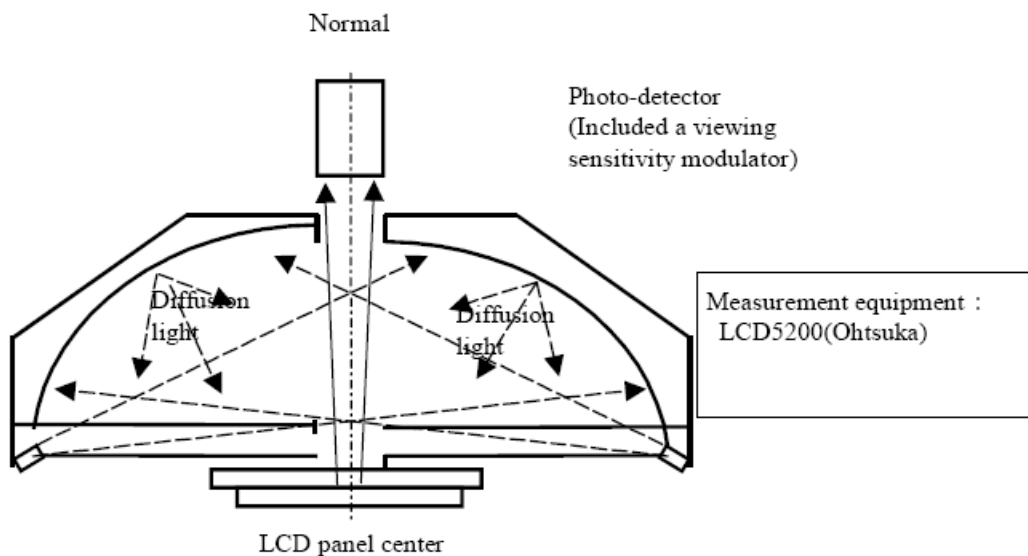


Fig. 2 Definition of uniformity

Note 8: Reflectance measurement system is defined as follow:



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=+80°C, 120hrs	Per table in below
4	Low Temp Storage	Ta=-30°C, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min~+80°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.

### 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

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.

