

HITACHI

KAOHSIUNG HITACHI ELECTRONICS CO., LTD.

FOR MESSRS: _____

DATE: Apr. 30th 2009

TECHNICAL DATA

10.4" SVGA TFT with CMOS Interface

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(NOTE)

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2. RECORD OF REVISION

DATE	SHEET No.	SUMMARY

3. GENERAL DATA

3.1 DISPLAY FEATURES

This module is a 10.4" SVGA of 4:3 format amorphous silicon TFT. The pixel format is vertical stripe and sub pixels are arranged as R(red), G(green), B(blue) sequentially. This display is RoHS compliant, and COG (chip on glass) technology and LED backlight are applied on this display.

Part Name	TX26D**VM-CMOS
Module Dimensions	243.0(W) mm x 185.1(H) mm x 11.0max. (D) mm
LCD Active Area	211.2(W) mm x 158.4(H) mm
Dot Pitch	0.088(W) mm x 3(R, G, B)(W) x 0.264(H) mm
Resolution	800 x 3(RGB)(W) x 600(H) dots
Color Pixel Arrangement	R, G, B Vertical stripe
LCD Type	Transmissive Color TFT; Normally Black
Display Type	Active Matrix
Number of Colors	16777k Colors (8-bit RGB)
Backlight	LED
Weight	(570) g (typ.)
Interface	CMOS
Power Supply Voltage	3.3V for LCD; 12V for Backlight
Power Consumption	1.221 W for LCD (SVGA) ;7.68W for backlight
Viewing Direction	Super Wide Version (Horizontal and Vertical: 170°, CR ≥ 10)

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remarks	
Supply Voltage	VDD	0	4.0	V	-	
Input Voltage of Logic	VI	-0.3	VDD+0.3	V	Note 1	
Operating Temperature	Top	(-20)	(70)	°C	Note 2	
Storage Temperature	Tst	(-30)	(80)	°C	Note 2	
LED Unit	Forward Current	IF	-	120	mA	Note 3
	Reverse Voltage	VR	-	3.65	V	

Note 1: It shall be applied to pixel data signal and clock signal.

Note 2: The maximum rating is defined as above based on the temperature on the panel surface, which might be different from ambient temperature after assembling the panel into the application. Moreover, some temperature-related phenomenon as below needed to be noticed:

- Background color, contrast and response time would be different in temperatures other than 25°C.
- Operating under high temperature will shorten LED lifetime.

Note 3: Fig. 4.1 shows the maximum rating of LED forward current against temperature. The backlight unit in this display has been set to 80 mA per LED. This is within the range when operating the display between -20~70°C.

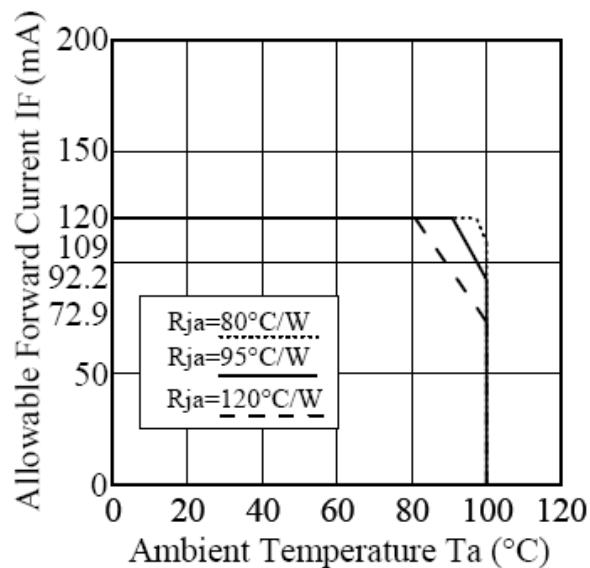


Fig. 4.1

5. ELECTRICAL CHARACTERISTICS

5.1 LCD CHARACTERISTICS

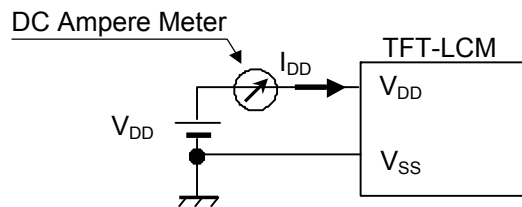
$T_a = 25\text{ }^\circ\text{C}$, $V_{SS} = 0\text{V}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	VDD	-	3.0	3.3	3.6	V	-
Input Voltage for Logic	Hi	V _{IH}	-	0.7VDD	-	V	Note 1
	Lo	V _{IL}	-	-	0.3VDD		
Power Supply Current	I _{DD}	VDD-VSS = 3.3V	-	370	-	mA	Note 2,3
Vsync Frequency	f_v	-	-	(60)	-	Hz	
Hsync Frequency	f_H	-	-	(37.7)	-	KHz	
DCLK Frequency	f_{CLK}	-	-	(40)	-	MHz	

Note 1) It shall be applied to pixel data signal and clock signal.

2) $f_v=60\text{Hz}$, $f_{CLK}=40\text{MHz}$, $V_{DD}=3.3\text{V}$, DC Current.

Typical value is measured when displaying vertical 256 gray scale. Maximum is measured when displaying Vertical-stripe.



3) As this module contains 0.8A fuse, prepare current source that is enough for cutting current fuse when a trouble happens. (larger than 2A.)

5.2 BACKLIGHT CHARACTERISTICS

$T_a = 25^\circ\text{C}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
LED Input Voltage	VLED	-	-	(12)	-	V	Note 1
LED Forward Current (DIM Control)	ILED	0V; 0% duty	-	(640)	-	mA	Note 2
		3.3VDC; 100% duty	-	(10)	-		
LED lifetime	-	640mA	-	(70K)	-	Hrs	Note 3

Note 1: As Fig. 5.1 shown, LED current is constant, 640 mA, controlled by the LED driver when applying 12V VLED.

Note 2: Dimming function can be obtained by applying DC voltage or PWM signal from the display interface CN1. The recommended PWM signal is 1K ~ 10K Hz with 3.3V amplitude.

Note 3: The estimated lifetime is specified as the time to reduce 50% brightness by applying 640 mA at 25°C .

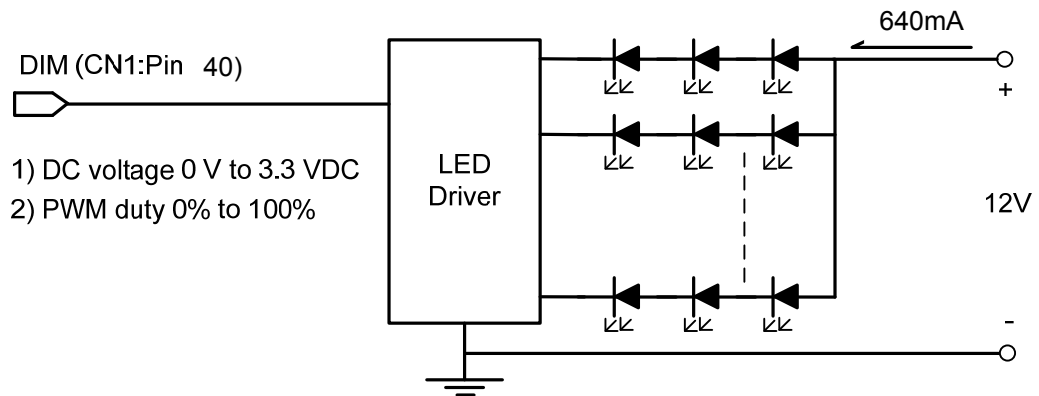


Fig. 5.1

6. OPTICAL CHARACTERISTICS

The optical characteristics are measured based on the conditions as below:

- Supplying the signals and voltages defined in the section of electrical characteristics.
- The backlight unit needs to be turned on for 30 minutes.
- The ambient temperature is 25 °C.
- In the dark room around 500~1000 lx, the equipment has been set for the measurements as shown in Fig 6.1.

$$T_a = 25\text{ }^\circ\text{C}, f_v = 60\text{ Hz}, VDD = 3.3\text{V}$$

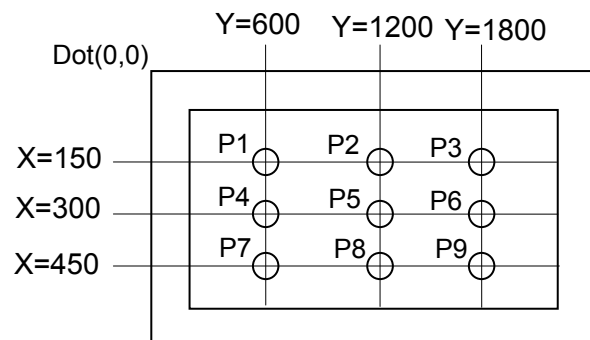
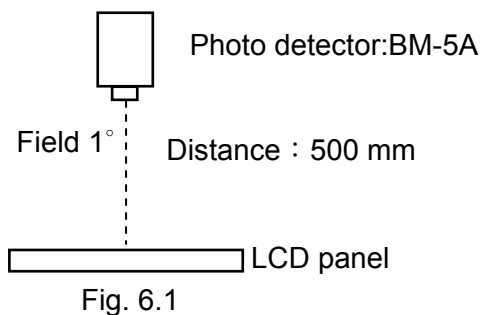
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Brightness of White	-	$\phi = 0^\circ, \theta = 0^\circ$, ILED= 640 mA	-	(450)	-	cd/m ²	Note 1
Brightness Uniformity	-		(70)	-	-	%	Note 2
Contrast Ratio	CR		(200)	(800)	-	-	Note 3
Response Time	Rise + Fall	$\phi = 0^\circ, \theta = 0^\circ$	-	(25)	-	ms	Note 4
NTSC Ratio	-	$\phi = 0^\circ, \theta = 0^\circ$	-	(60)	-	%	-
Viewing Angle	θ_x	$\phi = 0^\circ, CR \geq 10$	-	85	-	Degree	Note 5
	$\theta_{x'}$	$\phi = 180^\circ, CR \geq 10$	-	85	-		
	θ_y	$\phi = 90^\circ, CR \geq 10$	-	85	-		
	$\theta_{y'}$	$\phi = 270^\circ, CR \geq 10$	-	85	-		
Color Chromaticity	Red	X	-	(0.61)	-	-	Note 6
		Y	-	(0.36)	-		
	Green	X	-	(0.37)	-		
		Y	-	(0.59)	-		
	Blue	X	-	(0.15)	-		
		Y	-	(0.10)	-		
	White	X	-	(0.35)	-		
		Y	-	(0.37)	-		

Note 1: The brightness is measured from 9 point average value of the panel, P5 in Fig. 6.2, for the typical value.

Note 2: The brightness uniformity is calculated by the equation as below:

$$\text{Brightness uniformity} = \frac{\text{Min. Brightness}}{\text{Max. Brightness}} \times 100\%$$

, which is based on the brightness values of the 9 points measured by BM-5 as shown in Fig. 6.2.



Note 3: The Contrast ratio is measured from the center point of the panel, P5, and defined as the following equation:

$$CR = \frac{\text{Brightness of White}}{\text{Brightness of Black}} \times 100\%$$

Note 4: The definition of response time is shown in Fig. 6.3. The rising time is the period from 10% brightness to 90% brightness when the data is from black to white. Oppositely, Falling time is the period from 90% brightness falling to 10% brightness.

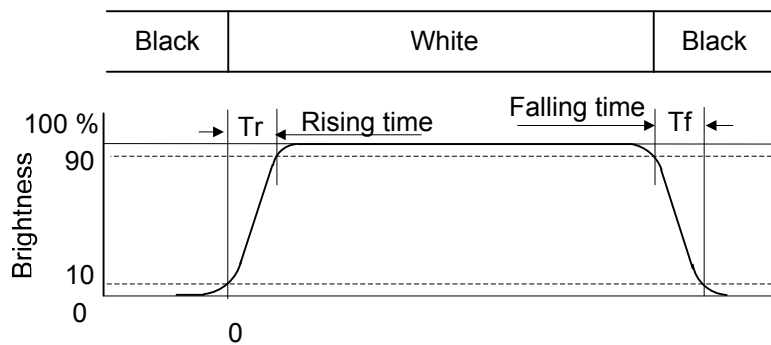


Fig . 6.3

Note 5: The definition of viewing angle is shown in Fig. 6.4. Angle ϕ is used to represent viewing directions, for instance, $\phi = 270^\circ$ means 6 o'clock, and $\phi = 0^\circ$ means 3 o'clock. Moreover, angle θ is used to represent viewing angles from axis Z toward plane XY.

The display is super wide viewing angle version, so that the best optical performance can be obtained from every viewing direction.

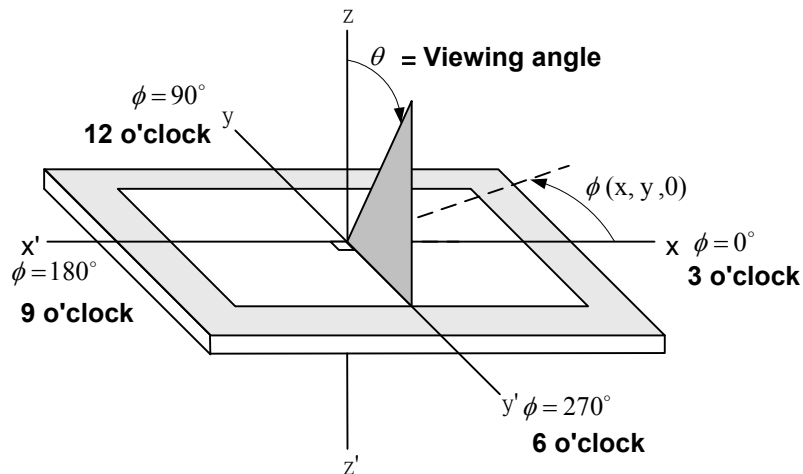
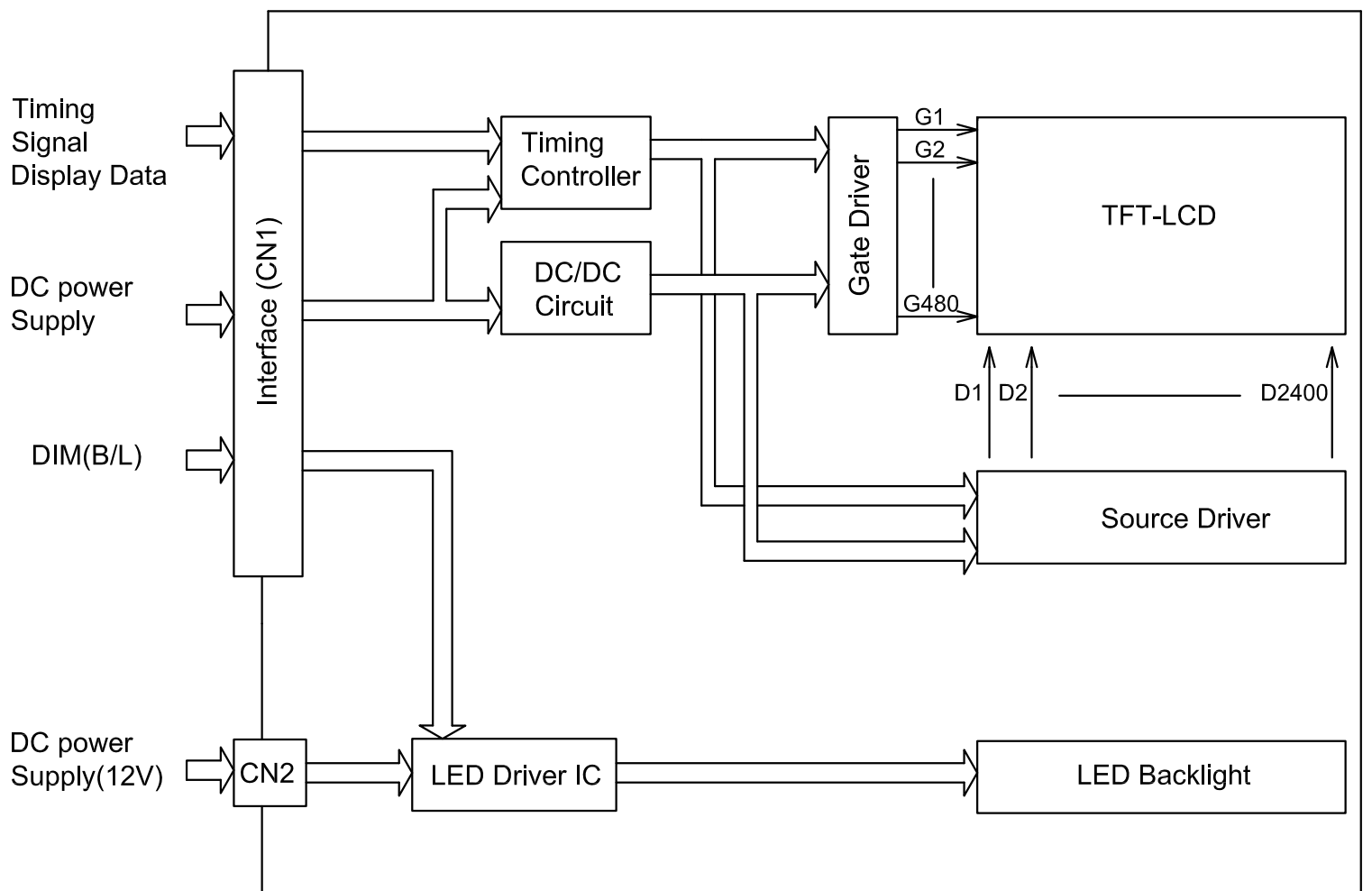


Fig. 6.4

Note 6: The color chromaticity is measured from the center point of the panel, P5, as shown in Fig. 6.2.

7 BLOCK DIAGRAM



8. LCD INTERFACE

8.1 INTERFACE PIN CONNECTIONS

: CN1 《JAE-FA5B040HP1R3000》

PIN NO.	SYMBOL	DESCRIPTION	NOTE
1	VDD	Power Supply 3.3V	1)
2	VDD		
3	VDD		
4	NC	-	
5	VSS	GND	2)
6	DTMG	Display Timing Data	
7	VSS	GND	2)
8	B7	B Data	
9	B6		
10	B5		
11	B4		
12	VSS	GND	2)
13	B3	B Data	
14	B2		
15	B1		
16	B0		
17	VSS	GND	2)
18	G7	G Data	
19	G6		
20	G5		
21	G4		
22	VSS	GND	2)
23	G3	G Data	
24	G2		
25	G1		
26	G0		
27	VSS	GND	2)
28	R7	R Data	
29	R6		
30	R5		
31	R4		
32	VSS	GND	2)
33	R3	R Data	
34	R2		
35	R1		
36	R0		
37	VSS	GND	2)
38	DCLK	Dot Clock	
39	VSS	GND	2)
40	DIM	Normal Brightness:0V or 0% PWM Duty Brightness Control:0V to 3.3VDC or 0% to 100% PWM Duty.	

Note 1) All VDD pins shall be connected to (+3.3V)(Typ.).

2) All VSS pins shall be grounded. Metal bezel is internally connected to VSS.

8.2 BACK-LIGHT UNIT

CN2 : SM08B-SRSS-TB (JST):

Pin No.	Signal	Level	Function
1~3	V _{LED} ⁺	-	Power Supply for LED
4~5	NC	-	No Connection
6~8	V _{LED} ⁻	-	GND

8.3 RELATIONSHIP BETWEEN DISPLAY COLORS AND INPUT SIGNALS(8BIT MODE)

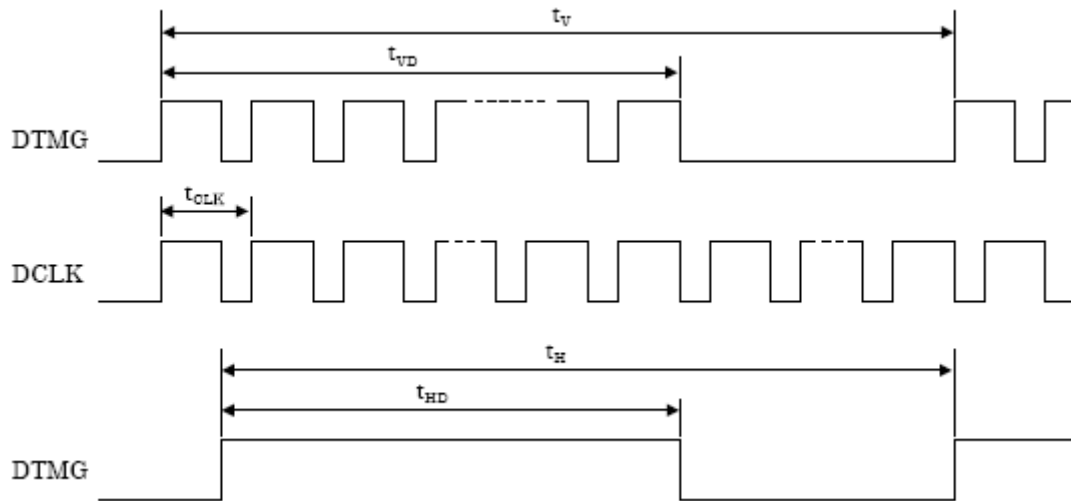
Input color		Red Data								Green Data								Blue Data													
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0						
		MSB								LSB								MSB								LSB					
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0						
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1						
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1						
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1						
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0						
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1						
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:						
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:						
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0						
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0						
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0						
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0						
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0						
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1						
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0						
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	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1						
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0						
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1						

Note 1) Definition of gray scale : Color(n) Number in parenthesis indicates gray scale level. Larger number corresponds to brighter level.

Note 2) Data Signal : 1 : High, 0 : Low

8.4 INTERFACE TIMING

(1) Timing Chart



The timings except mentioned above are referred to the specifications of your transmitter.

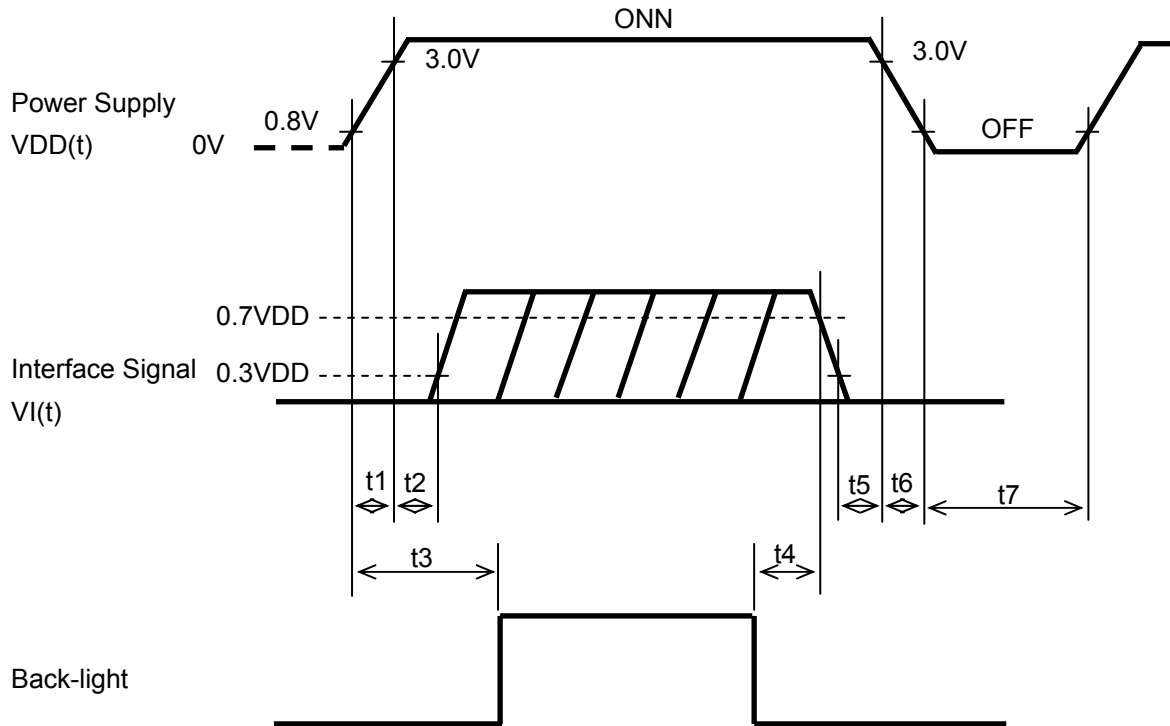
(2) INTERFACE TIMING SPECIFICATIONS

Item		Symbol	Min.	Typ.	Max.	Unit
DCLK	Cycle time	t_{CLK}	-	(25.0)	-	ns
DTMG	Horizontal Cycle	t_H	-	(1060)	-	t_{CLK}
	Horizontal Valid Data width	t_{HD}	-	(800)	-	
	Vertical Cycle	t_V	-	(628)	-	t_H
	Vertical Valid Data width	t_{VD}	-	(600)	-	

Note 1: It counts by a typical value of line cycle time.

(3) TIMING BETWEEN INTERFACE SIGNAL AND POWER SUPPLY

Power Supply, Input Signal and Backlight Voltage ON/OFF/REENTRY should comply with the following sequence.



POWER ON	POWER OFF
$t1 \leq 15\text{ms}$	$5\text{ms} \leq t4$
$0\text{ms} \leq t2 \leq 45\text{ms}$	$0\text{ms} \leq t5 \leq 45\text{ms}$
$0.1\text{s} \leq t3$	$0\text{ms} \leq t6 \leq 20\text{ms}$
	$0.4\text{s} \leq t7$

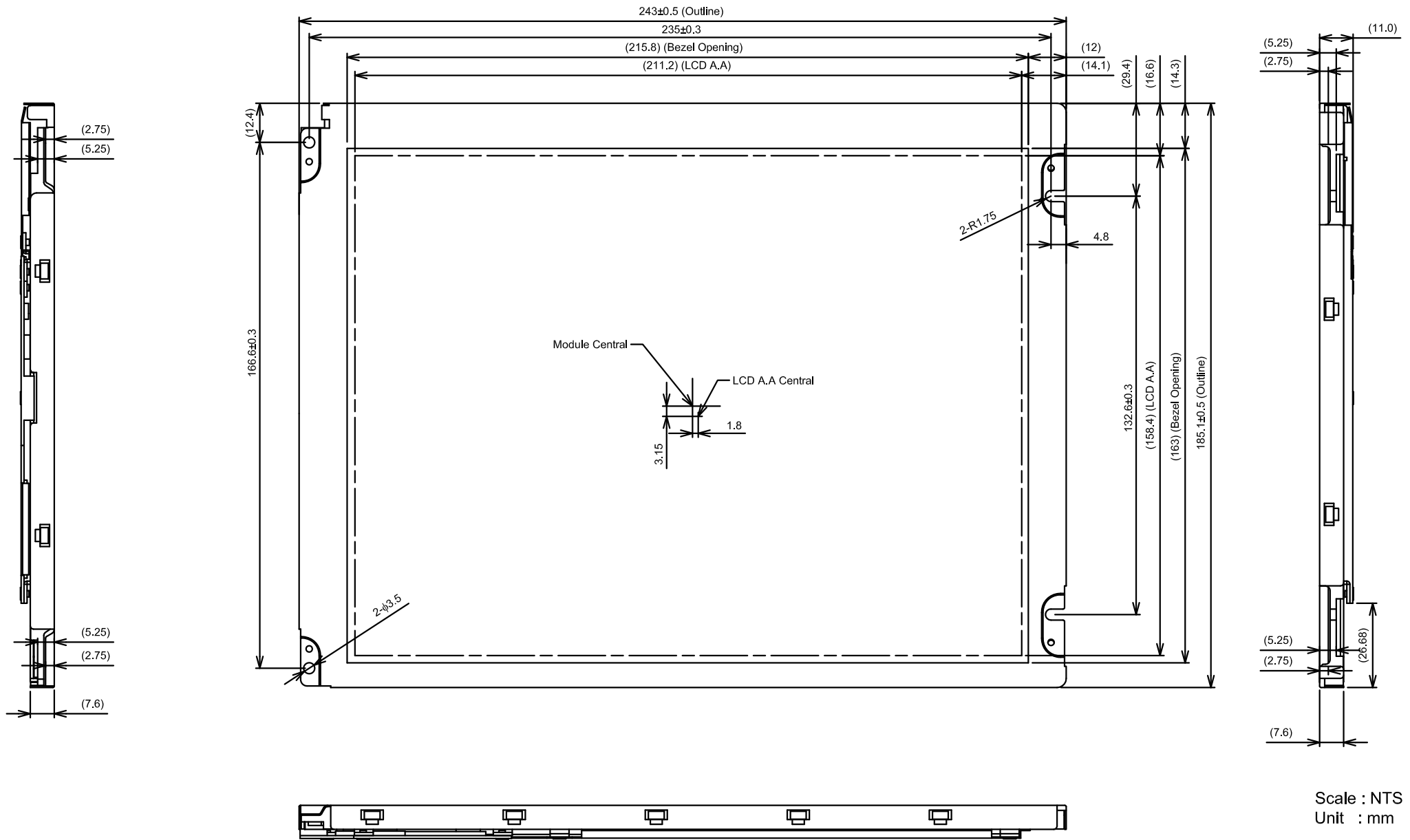
Note 1: In order to prevent electronic parts from destruction caused by latch-up, please input signal after Power Supply Voltage ON. In addition, please turn off signals before power supply voltage OFF.

Note 2: In order to prevent from function error due to residual charge, please reenter power supply voltage after time stipulated with t7.

Note 3: Please turn on Backlight after signals fix and turn off before signals down, otherwise noise appears in the display. The noise cause no problem with display performance in case of timing sequence comply with the spec.

9. OUTLINE DIMENSIONS

9.1 SURFACE SIDE



Scale : NTS
Unit : mm

9.2 BACK SIDE

