INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: _____

Model Name: CT018TN06 V.1(Linda)

Spec. No.: C018-06-TT-01

Date: 2006/08/25

Version: 1.0

■ **Preliminary Specification**

□ **Final Specification**

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by
HY Chou	Andy Chou	Lanny Lan

Record of Revision

Version	Revise Date	Page	Content
1.0	2006/08/25	All	Initial release

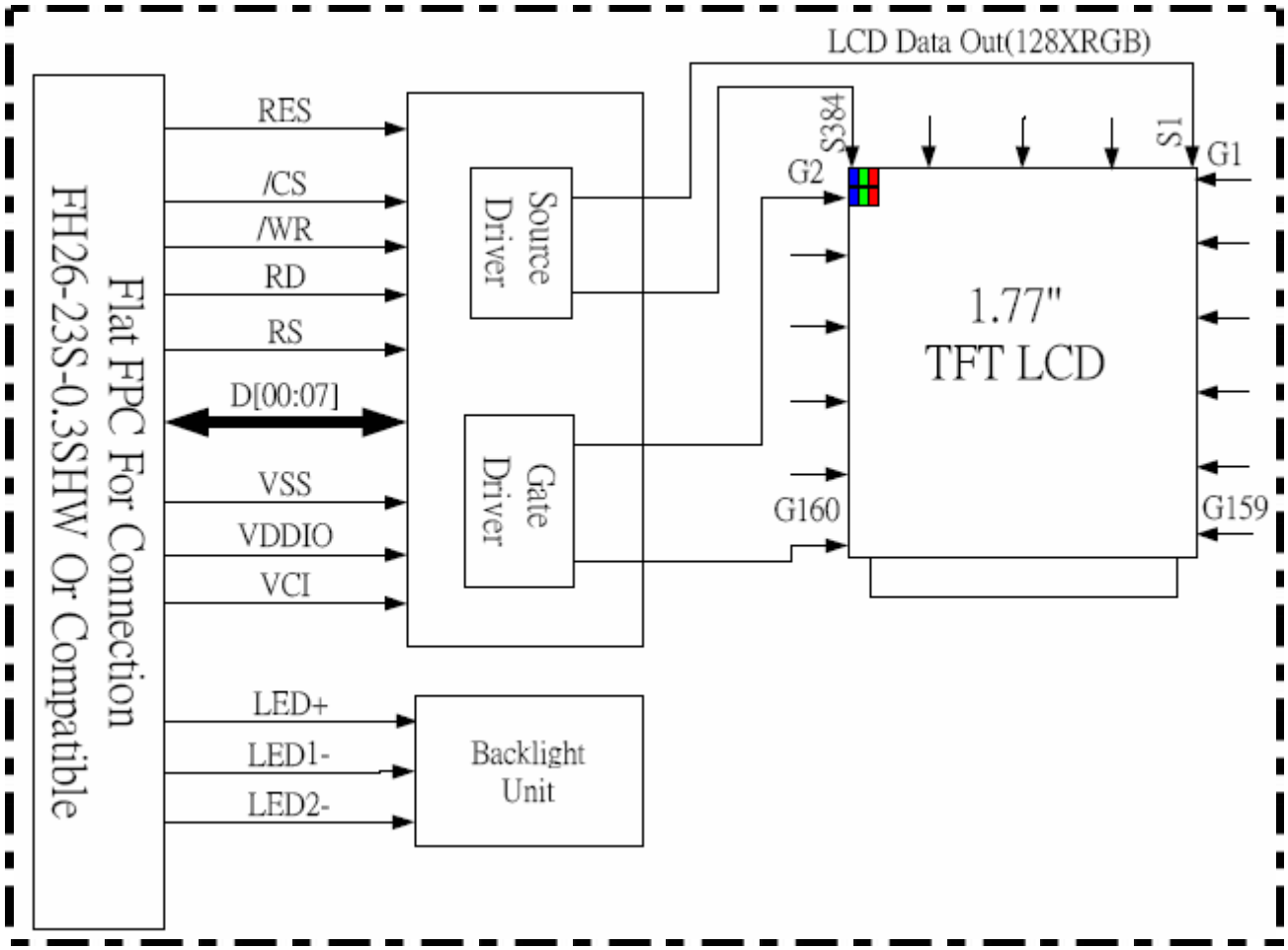
Contents

1. General Specifications

No.	Item	Specification	Unit	Remark
1	LCD Size	1.77	inch	-
2	Panel Type	a-Si TFT active matrix	-	-
3	Resolution	128x (RGB) x 160	pixel	-
4	Display Mode	Normally white,Transmissive	-	-
5	Display Number of Colors	262K/65K	-	-
6	Viewing Direction	12 o'clock	-	Note
7	Contrast Ratio	250(Typ)	-	-
8	Luminance	240(Typ)	cd/m^2	-
9	Module Size	34.00(W) x47.00(L)x2.60(T)	mm	Note
10	Active Area	28.032(W) x 35.04(L)	mm	Note
11	Pixel Pitch	0.219(W) x 0.219(L)	mm	-
12	Weight	TBD	g	-
13	Driver IC	S6D0144	-	-
14	Driver IC RAM Size	128x18x160	bit	-
15	Light Source	2 LEDs White	-	-
16	Interface	8080 system 8-bit Parallel	-	-
17	Operating Temperature	-10~60	℃	-
18	Storage Temperature	-20~70	℃	-

Note: Please refer to the mechanical drawing on Page 16.

2. Block Diagram



3. Pin Assignments

Pin No.	Symbol	I/O	Function	Remark
1	VSS	P	Ground	-
2	VSS	P	Ground	-
3	VSS	P	Ground	-
4	RD	I	Read data signal (Low: active)	-
5	D07	I/O	Data bus (Bit 07)	-
6	LED+	-	LED Common Anode	-
7	D06	I/O	Data bus (Bit 06)	-
8	LED1-	-	LED Cathode	-
9	D05	I/O	Data bus (Bit 05)	-
10	LED2-	-	LED Cathode	-
11	D04	I/O	Data bus (Bit 04)	-
12	VDDIO	P	I/O Supply Voltage	-
13	D03	I/O	Data bus (Bit 03)	-
14	VCI	P	Analog supply voltage	-
15	D02	I/O	Data bus (Bit 02)	-
16	VCI	P	Analog supply voltage	-
17	D01	I/O	Data bus (Bit 01)	-
18	/CS	I	Chip select (Low: active)	-
19	D00	I/O	Data bus (Bit 00)	-
20	RS	I	Register select	-
21	/WR	I	Write data signal	-
22	RES	I	Reset signal	-
23	VSS	P	GND	-

4. Electrical Specifications

4.1 Absolute Maximum Rating

(T_a=+25℃)

Item		Symbol	Values		Unit	Remark
			Min.	Max.		
TFT Module	I/O Supply Voltage	VDDIO	-0.3	+5.0	V	Note 1
	Analog Supply Voltage	VCI	-0.3	+5.0	V	Note 1
Backlight Unit	Current	I_B	-	50	mA	Note 2
	Power Consumption	P_{BL}	-	160	mW	Note 2

Note1: Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is applied.

Note2: Without LED driver IC, please refer to 4.3

4.2 Typical Operation Conditions

(T_a=+25℃,VCI=+2.8V VDDIO=+2.8V)

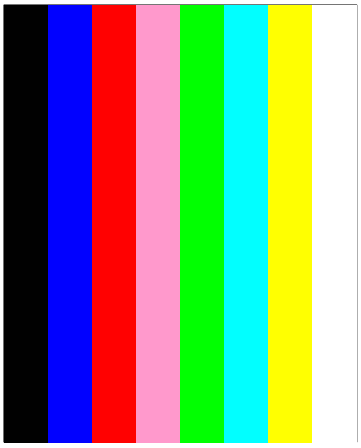
Item		Symbol	Values			Unit	Remark
			Min.	Typ.	Max.		
Logic Supply Voltage		VDDIO	1.65	2.8	3.3	V	-
Analog Supply Voltage		VCI	2.5	2.8	3.3	V	-
Input High Voltage		VIH	0.7 VDDIO	-	VDDIO	V	Note1
Input Low Voltage		VIL	0V		0.3VDDIO	V	Note1
Current Consumption	Standby	I_{STB}	-	10	20	μA	Note2
	Still	I_{STILL}	-	1.4	2.0	mA	Note3
Frame Frequency		f_{FRAME}	-	60	-	Hz	-

Note1: To prevent IC latch up or DC operation in LCD panel, the power on/off sequence should follow the driver IC specification.

Note2: In the Standby mode, all the internal display operations are suspended including the internal R-C oscillator.

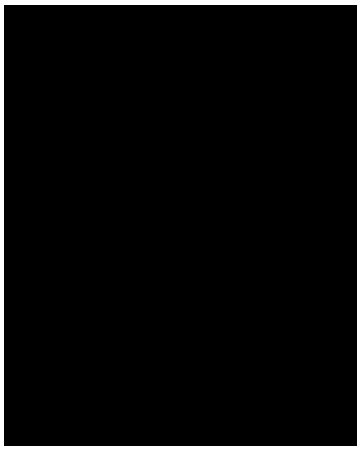
Note3: Test patterns:

Typ. current check pattern:



8-Color Bar

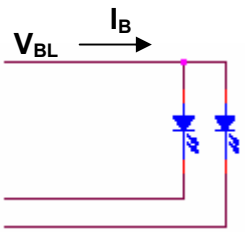
Max. current check pattern:



Black

4.3 Backlight Unit

The backlight system is an edge lighting type with 2 white LEDs.



(T_a=+25℃)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Current	I_B	-	36	-	mA	Note 1
Power Consumption	P_{BL}	-	115	-	mW	Note 2

Note1: 2 LEDs are connected in parallel; each LED forward current is 18mA.

Note2: Where I_B= 36mA, P_{BL} = I_B x V_{BL}

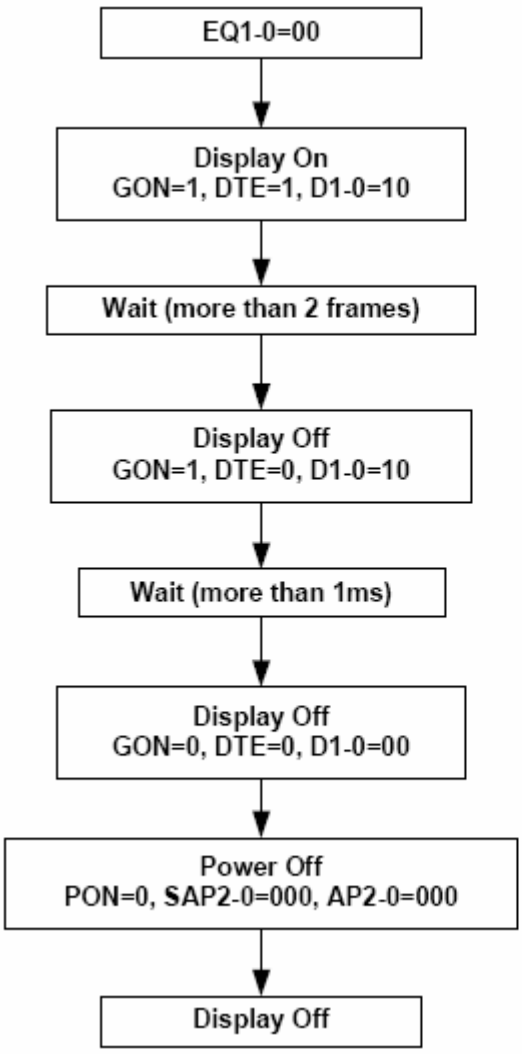
4.4 Instruction List

TBD

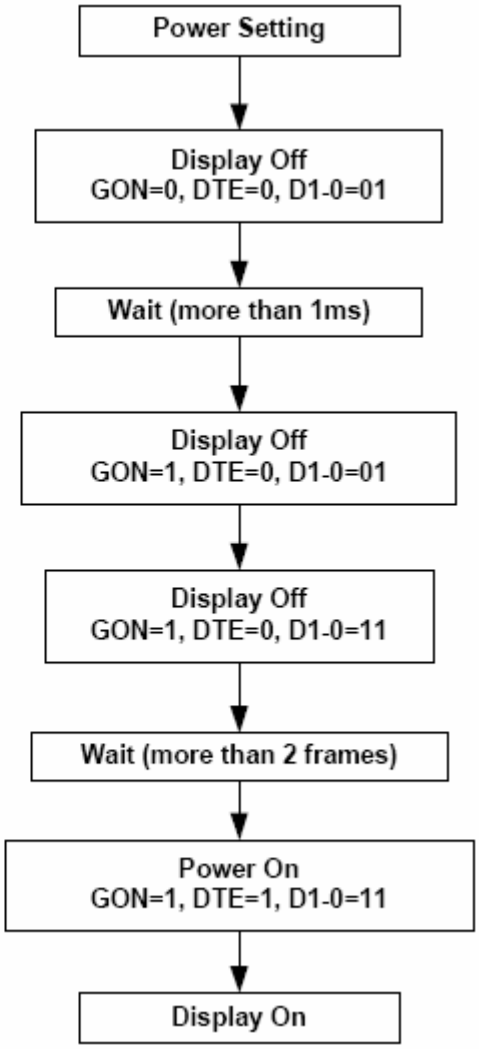
4.5 Instruction Setting Flow

4.5.1 Display On/Off Sequence

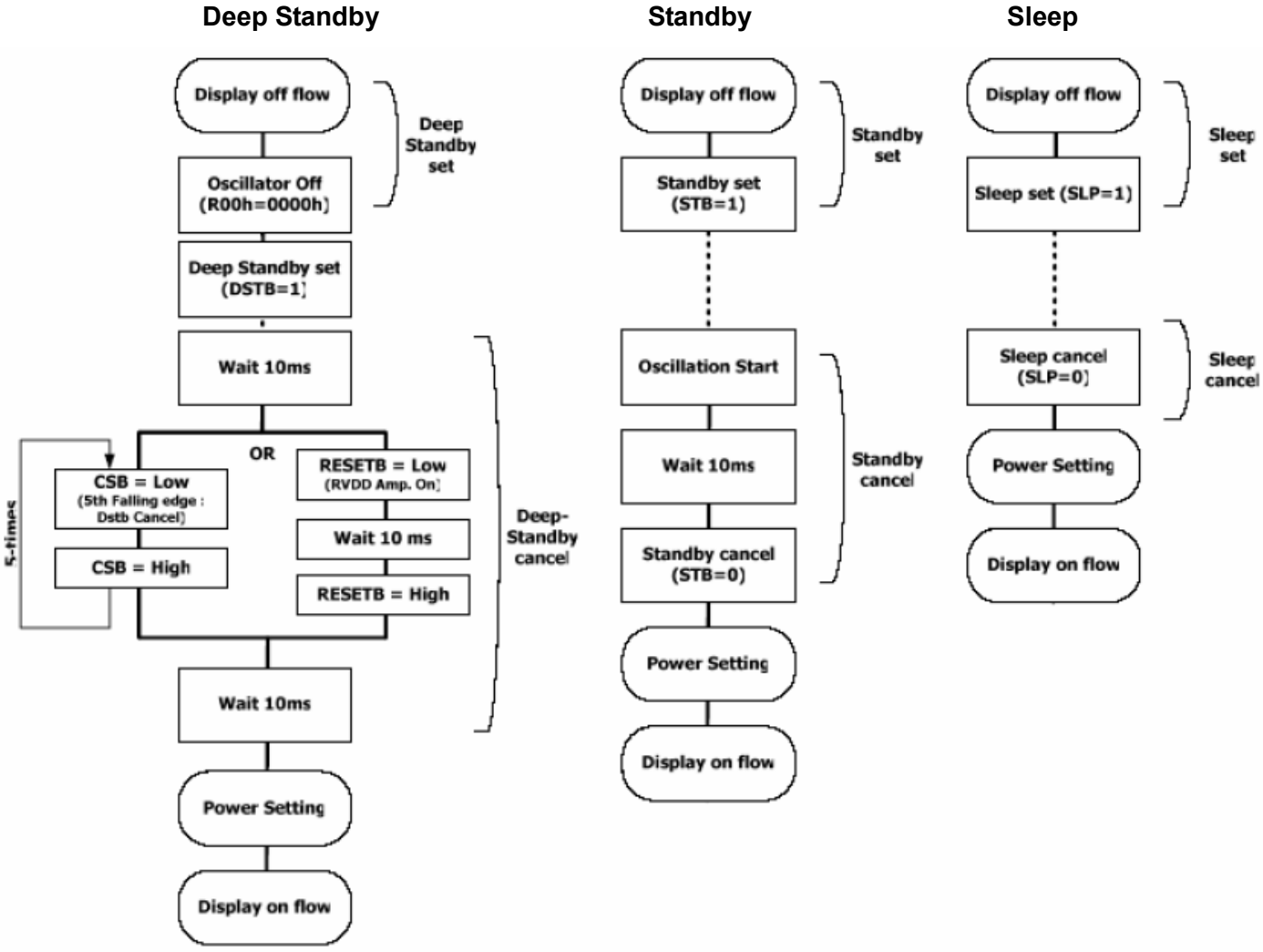
Display Off



Display On

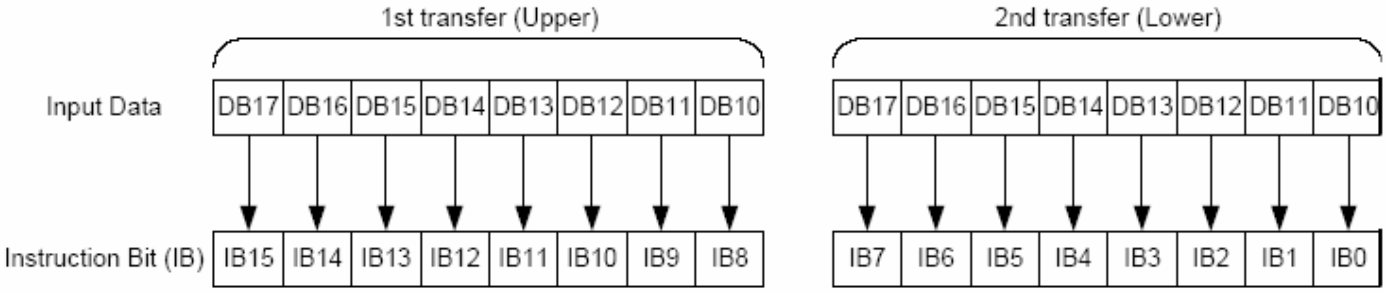


4.5.2 Deep Standby, Standby & Sleep Mode Sequence

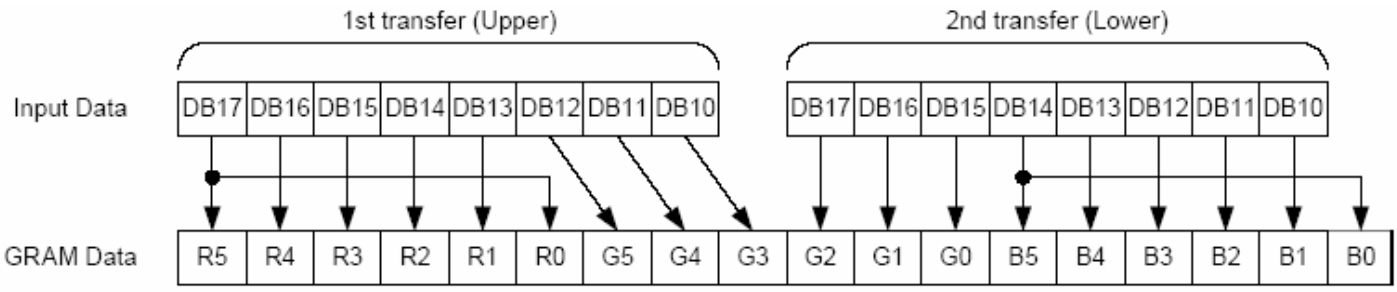


4.6 Display RAM Data Format and input Bus

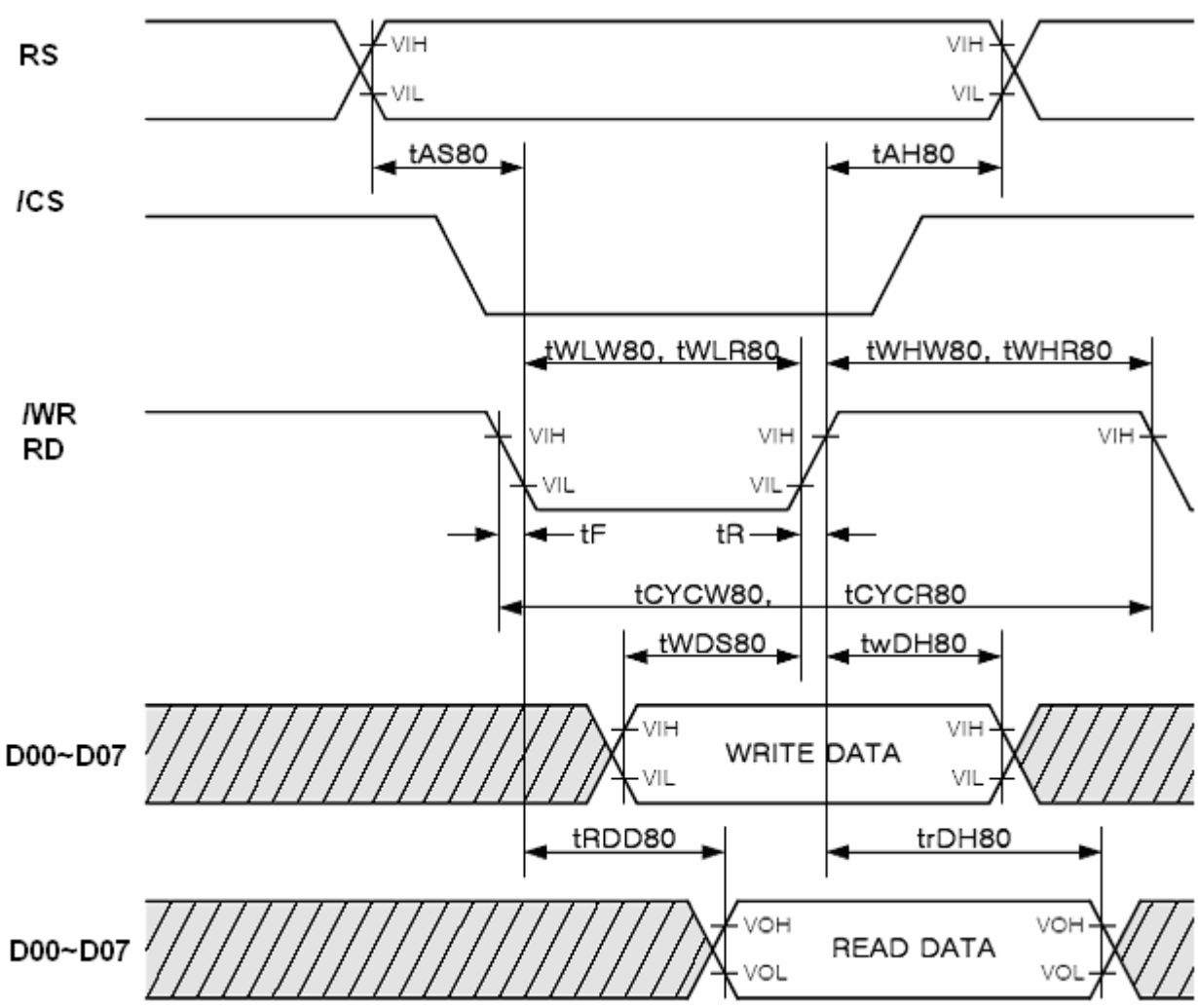
4.6.1 Bit Assignment of Instructions on 8080 8-Bit CPU Interface



4.6.2 Bit Assignment of GRAM Data on 8080 8-Bit CPU Interface (65,536 Color)



4.7 Timing Characteristic



Paraeter	Description	Min	Max	Unit
tCYCW80	Cycle time (Write)	100	-	ns
tCYCR80	Cycle time (Read)	500	-	
tR, tF	Pulse rise/fall time	-	25	
tWLW80	Pulse Width Low (Write)	40	-	
tWLR80	Pulse Width Low (Read)	250	-	
tWHW80	Pulse Width High (Write)	40	-	
tWHR80	Pulse Width High (Read)	200	-	
tAS80	RS to /CS, /WR (or RD) setup time	0	-	
tAH80	RS to /CS, /WR (or RD) hold time	0	-	
tWDS80	Write data setup time	60	-	
tWDH80	Write data hold time	2	-	
tRDD80	Read data delay time	-	200	
tRDH80	Read data hold time	5	-	

5. Optical Specifications

(T_a=+25, VDDIO=+2.8V VCI=+2.8V, I_B=36mA)

Item		Symbol	Condition	Values			Unit	Remark
				Min.	Typ.	Max.		
Viewing Angle Range	Left	θ_L	CR≧10	-	45	-	degree	Note 1,2
	Right	θ_R		-	45	-		
	Top	θ_T		-	35	-		
	Bottom	θ_B		-	15	-		
Response Time		T_{on} +T_{off}	Normal θ=Φ=0°	-	30	50	ms	Note 2,3
Contrast Ratio		CR	Normal θ=Φ=0°	200	250	-	-	Note 2,4
Luminance		L	Normal θ=Φ=0°	-	240	-	cd/m^2	Note 2,5
Color Chromaticity (CIE1931)	White	W_x	Normal θ=Φ=0°	0.260	0.310	0.360	-	Note 2,6
		W_y		0.280	0.330	0.380		
	Red	R_x		0.611	0.641	0.671		
		R_y		0.315	0.345	0.375		
	Green	G_x		0.266	0.296	0.326		
		G_y		0.554	0.584	0.614		
	Blue	B_x		0.102	0.132	0.162		
		B_y		0.106	0.136	0.166		
Color Gamut		NTSC	CIE1931	-	58	-	%	-
Luminance Uniformity		U_L	Normal θ=Φ=0°	75	80	-	%	Note 2,7

Note 1: Definition of viewing angle range

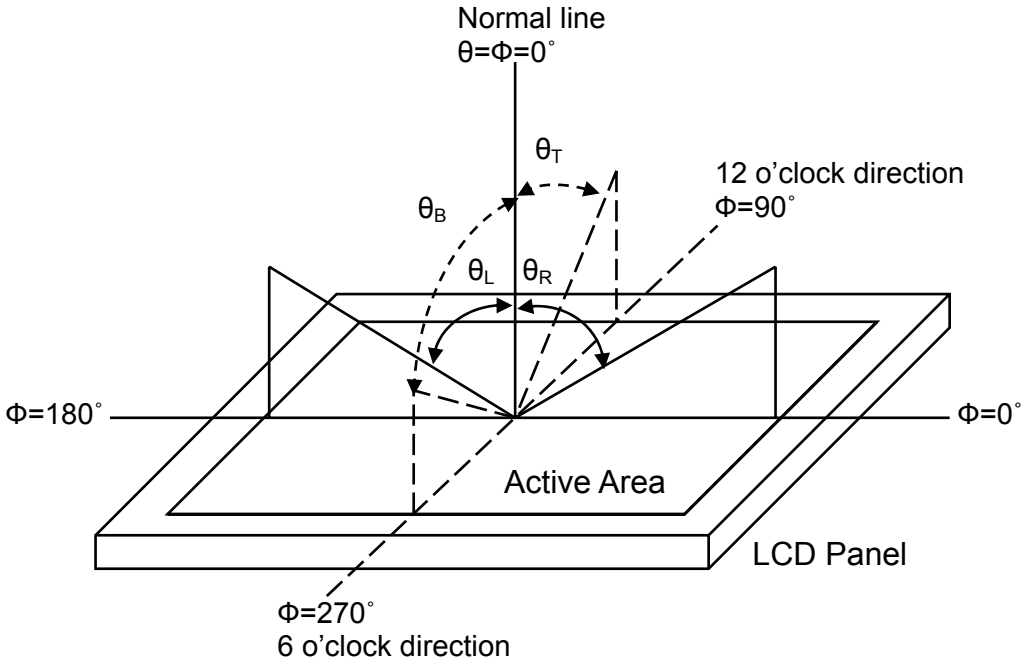


Fig. 1 Definition of viewing angle

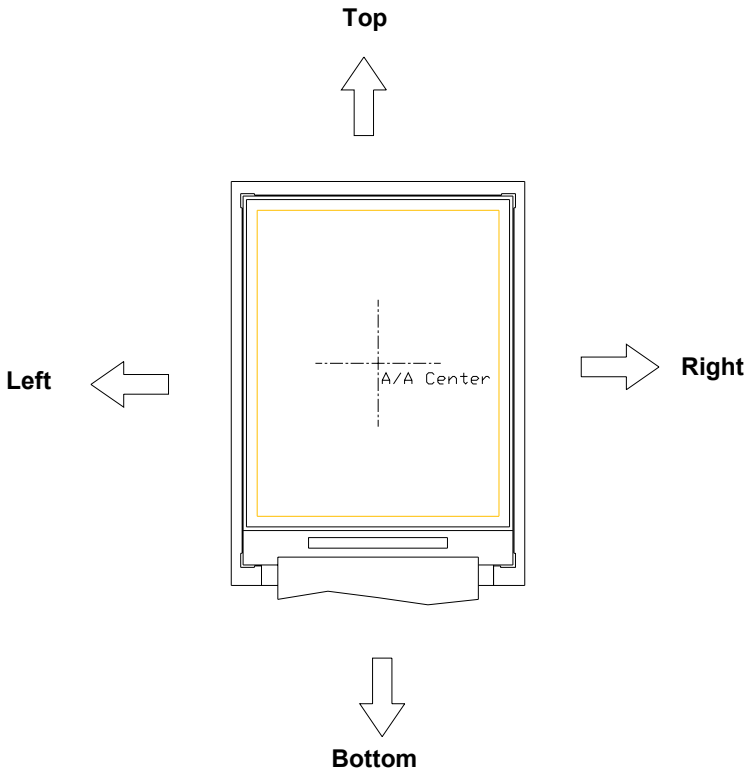


Fig. 2 Definition of viewing angle for display

Note 2: Definition of optical measurement system

The optical characteristics should be measured in a dark room with ambient temperature T_a=+25. The optical properties are measured at the center point of the LCD screen after 5 minutes operation. (Equipment: Photo detector TOPCON BM-5A or BM-7 /Field of view: 1˚ /Height: 500mm.)

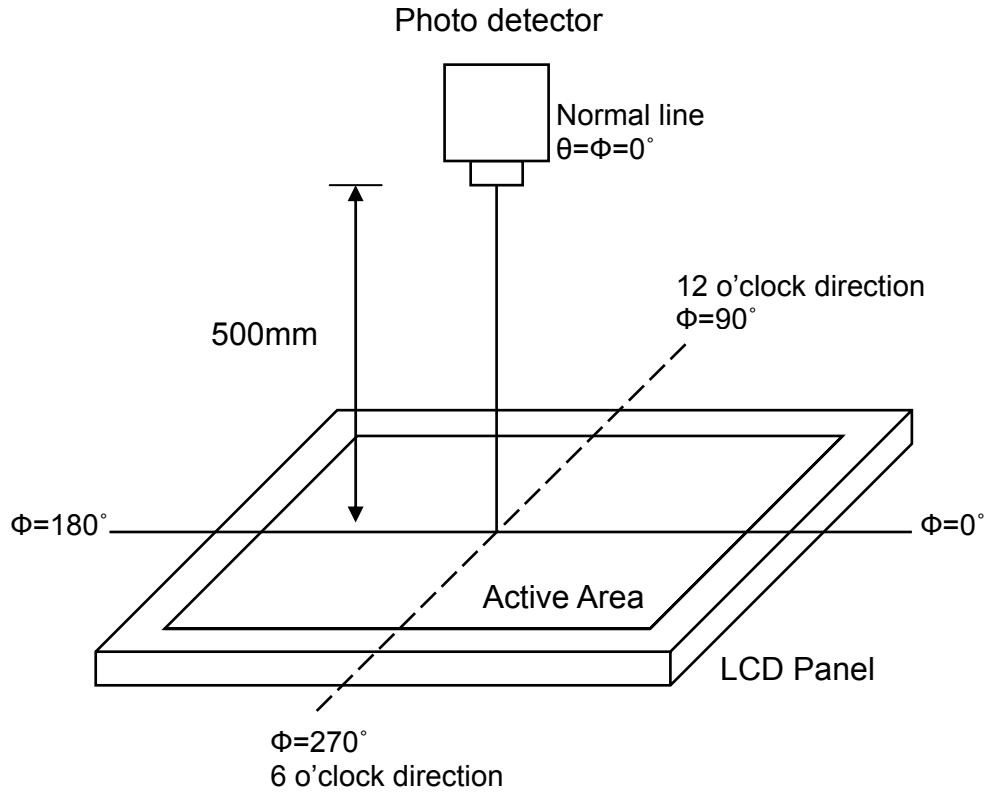


Fig. 3 Optical measurement system setup

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 (T_{on}) is the time between photo detector output intensity changed from 90% to 10%, and fall time (T_{off}) is the time between photo detector output intensity changed from 10% to 90%.

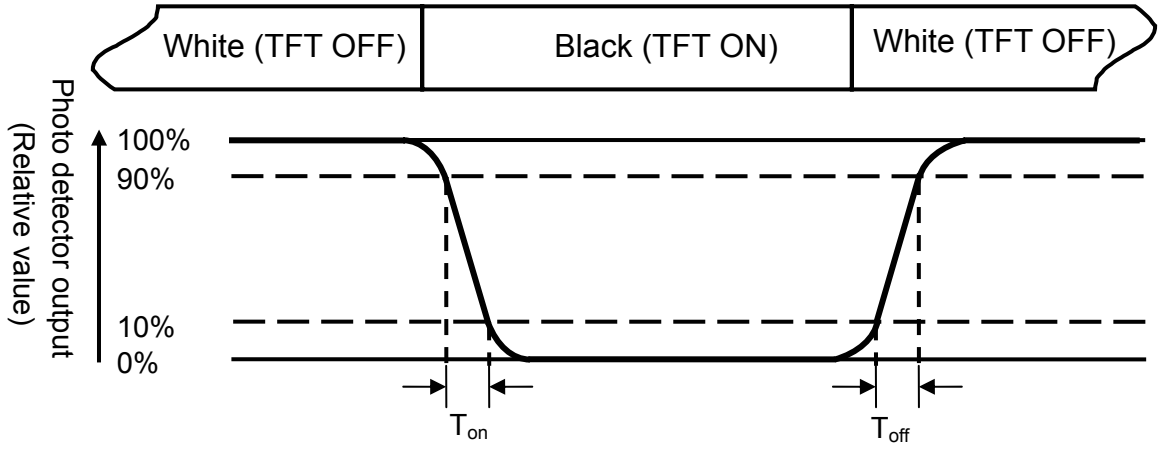


Fig. 4 Definition of response time

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 luminance

Measured at the center area of the panel when LCD panel is driven at “white” state.

Note 6: Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD when panel is driven at “White”, “Red”, “Green” and “Blue” state respectively.

Note 7: Definition of luminance uniformity

To test for uniformity, the tested area is divided into 3 rows and 3 columns. The measurement spot is placed at the center of each circle as below.

$$\text{Luminance Uniformity } (U_L) = \frac{L_{min}}{L_{max}}$$

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

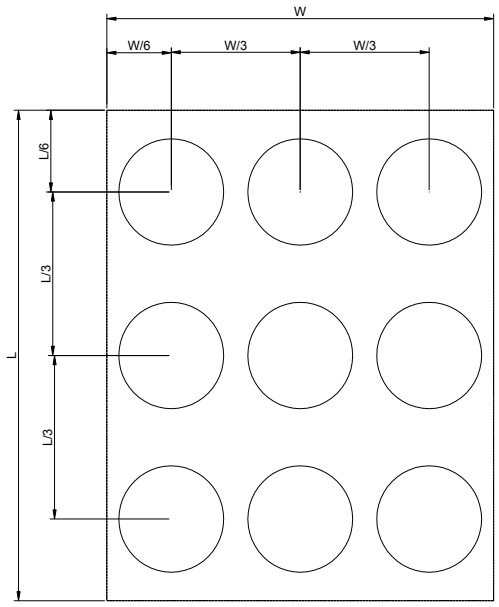


Fig. 5 Definition of luminance uniformity

L_{max} : The measured maximum luminance of all measurement position.

L_{min} : The measured minimum luminance of all measurement position.

6. Reliability Test Items

Test Items	Test Conditions	Remark
High Temperature Storage	+80℃±3℃ for 240 hours	-
Low Temperature Storage	-30℃±3℃ for 240 hours	-
High Temperature Operation	+70℃±3℃ for 240 hours	-
Low Temperature Operation	-20℃±3℃ for 240 hours	-
High Temperature and Humidity Operation	+60℃±3℃, 90%±3%RH max. for 240 hours	-
Thermal Shock	-30℃/0.5h ~ +80℃/0.5h for a total 100 cycles, Start with cold temp and end with high temp	-
Vibration Test	Frequency range:10~55Hz Stoke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	-
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	-
Package Vibration Test	Random Vibration : $0.015G^2$/Hz from 5-200Hz, -6dB/Octave from 200-500Hz 1 hour for each direction of X. Y. Z. (3 hours for total)	-
Package Drop Test	Height :72cm(Weight≦10kg); 60cm(Weight>10kg) 1 corner, 3 edges, 6 surfaces	-
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	-

Note1: During the display practical test under normal operation condition, there shall be not change or effect to the display function.

Note2: Before function check, the test sample requires 2 hours storage at room temperature.

7. Handling Precautions

7.1 Safety

7.1.1 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.

7.2 Handling

7.2.1 The LCD panel is made of plate glass. **DO NOT** subject the panel to mechanical shock or to excessive force on its surface.

7.2.2 The polarizer attached to the display is easily to be damaged, please handle it with care.

7.2.3 To avoid contamination on the display surface, **DO NOT** touch the display surface with bare hands.

7.2.4 Provide a space so that the LCD panel does not come into contact with other components.

7.2.5 To protect the LCD panel from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.

7.2.6 Transparent electrodes may be disconnected if the LCD panel is used under environmental conditions where dew condensation occurs.

7.2.7 Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.

7.2.8 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.

7.3 Static Electricity

7.3.1 Ground soldering iron tips, tools and testers when they are in operation.

7.3.2 Ground your body when handling the products.

7.3.3 Power on the LCD module **BEFORE** applying the voltage to the input terminals.

7.3.4 **DO NOT** apply voltage which exceeds the absolute maximum rating.

7.3.5 Store the products in an anti-electrostatic bag or container.

7.4 Storage

7.4.1 Store the products in a dark place at +25℃±10℃ with low humidity (65%RH or less).

7.4.2 **DO NOT** store the products in an atmosphere containing organic solvents or corrosive gas.

7.5 Cleaning

7.5.1 **DO NOT** wipe the polarizer with dry cloth, as it may cause scratch.

7.5.2 Wipe the polarizer with a soft cloth soaked with petroleum IPA, other chemical may damage the product.

8. Mechanical Drawing