



ASI-J-24016GF-DC-I-D/I

Item	Contents	Unit
LCD Type	FSTN	
Polarizer Type	Reflective/Positive	
Viewing Direction	6:00	
Interface	8 Bit Parallel interface	
Number of Dots/ characters	240 X 160	Dots
Dot size (W×H)	0.26X0.26	mm
Dot Pitch (W×H)	0.275X0.275	mm
Active Area	65.985x43.985	mm
Outline Dimension (W x H x D)	83.8x60.0x6.7	mm
LCD Controller & Driver	ST7586S	
LCD Driving Method	1/160 Duty 1/14 Bias	
Operating Temperature	-10℃~+60℃	
Storage Temperature	-20℃~+70℃	

1. Scope

ASI-J -24016GF-DC-I-D/I LCM unit consists of 240x160 characters LCD, and ST7586S which incorporates LCD controller and common/segment driver.

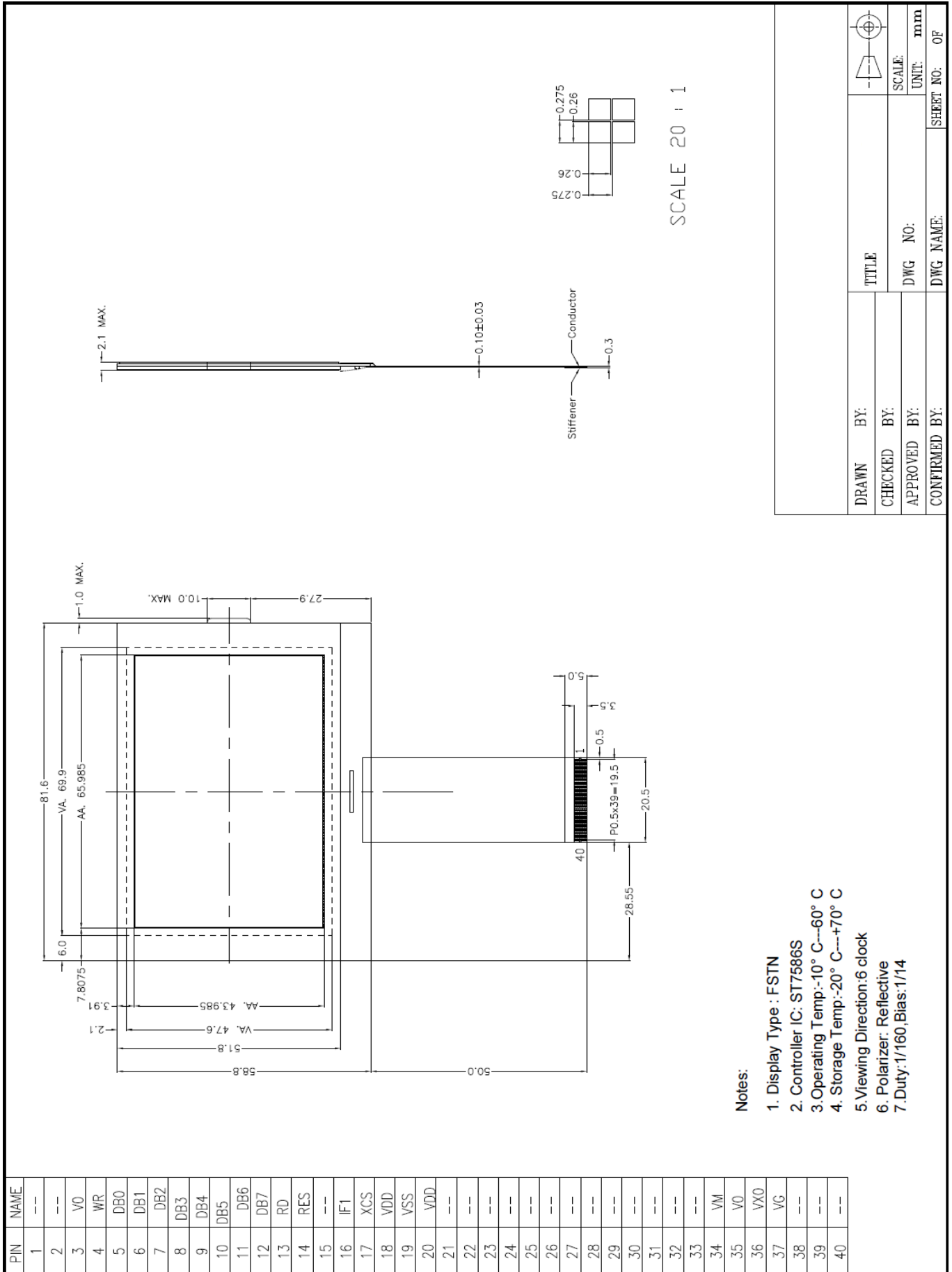
2. Application

Digital equipments which need display, instrumentation, remote control, electronic product.

3. General Information

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4. Outline Drawing



5. Interface signals

Pin No.	Symbol	Function									
1	NC	Not used									
2	NC	Not used									
3	AO	Register select input pin – A0 = "H": DB0 to DB8 or SI are display data – A0 = "L": DB0 to DB8 or SI are control data									
4	WR	Write signal. Low active									
5	DB0	The 8 bit bi-directional bus									
6	DB1										
7	DB2										
8	DB3										
9	DB4										
10	DB5										
11	DB6										
12	DB7										
13	RD	Read signal, low active									
14	RES	Reset input pin. When RST is “L”, initialization is executed.									
15	IF2	These pins select interface operation mode. <table><tr><td>IF2</td><td>IF1</td><td>MPU interface type</td></tr><tr><td>H</td><td>L</td><td>80 series 8-bit parallel</td></tr><tr><td>L</td><td>L</td><td>68 series 8-bit parallel</td></tr></table>	IF2	IF1	MPU interface type	H	L	80 series 8-bit parallel	L	L	68 series 8-bit parallel
IF2	IF1	MPU interface type									
H	L	80 series 8-bit parallel									
L	L	68 series 8-bit parallel									
16	IF1										
17	XCS	Chip select input pin Data/Instruction I/O is enabled only when XCS is “L”. When chip select is non-active, DB0 to DB8 may be high impedance.									
18	VDD	Power supply for LCD model (VDD=3.0 V)									
19	VSS	Power ground									
20	VDD	Power supply for LCD mode (VDD=3.0 V)									
21~33	NC	Not used									
34	VM	LCD bias supply voltage									
35	V0	Positive LCD driver supply voltages									
36	XV0	Negative LCD driver supply voltages									
37	VG	Bias LCD driver supply voltages									
38	VD1	Connect a capacitor between VD1 and VSS									
39~40	NC	Not used									

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VDD	-0.3	3.6	V	
LCD driving Voltage	V0-XV0	-0.3	19	V	
Input Voltage	VIN	-0.3	VDD+0.3	V	

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-10	60	°C	
Storage Temperature	TSTG	-20	70	°C	

7. Electrical Specifications

7.1 Electrical characteristics

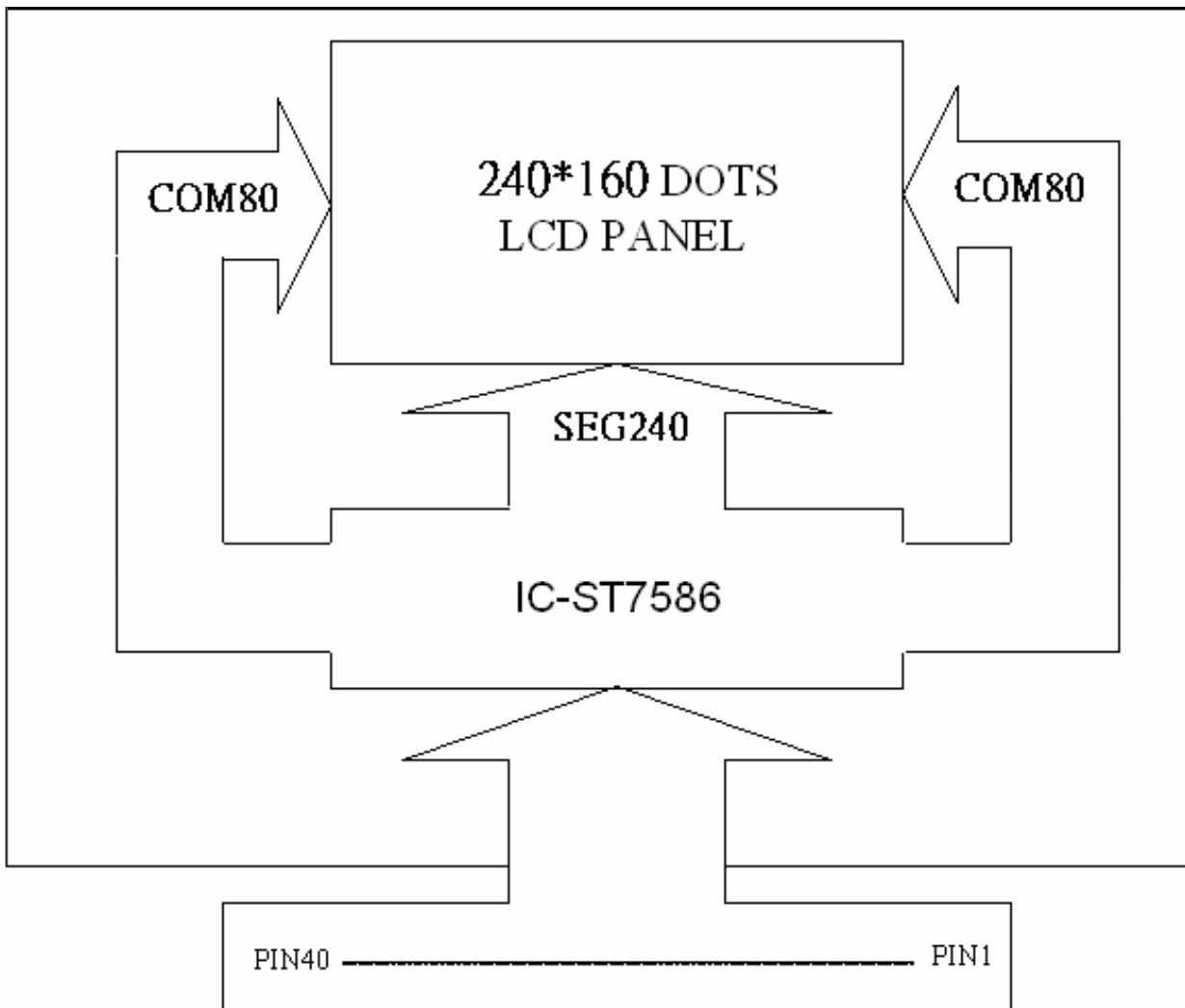
VSS=0V, Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage	VDD	2.7	3.0	3.3	V	
LCM Driver Voltage	VOP Note1	17.9	18.1	18.3	V	-10°C
		17.3	17.5	17.7		25°C
		15.7	15.9	16.1		60°C
Input Signal Voltage	Low VIL	0.7VDD	--	VDD	V	
	High VIH	VSS	--	0.3VDD	V	
Supply current	IDD	-	1.6	-	mA	VDD=3V;VOP=17.5V; Pattern= Full display
		-	2.8	5.0		VDD=3V;VOP=17.5V; Pattern= Horizontal line Note2

Note: 1 The VOP test point is V0- XV0

2 The Maximum current display

7.2. Block Diagram

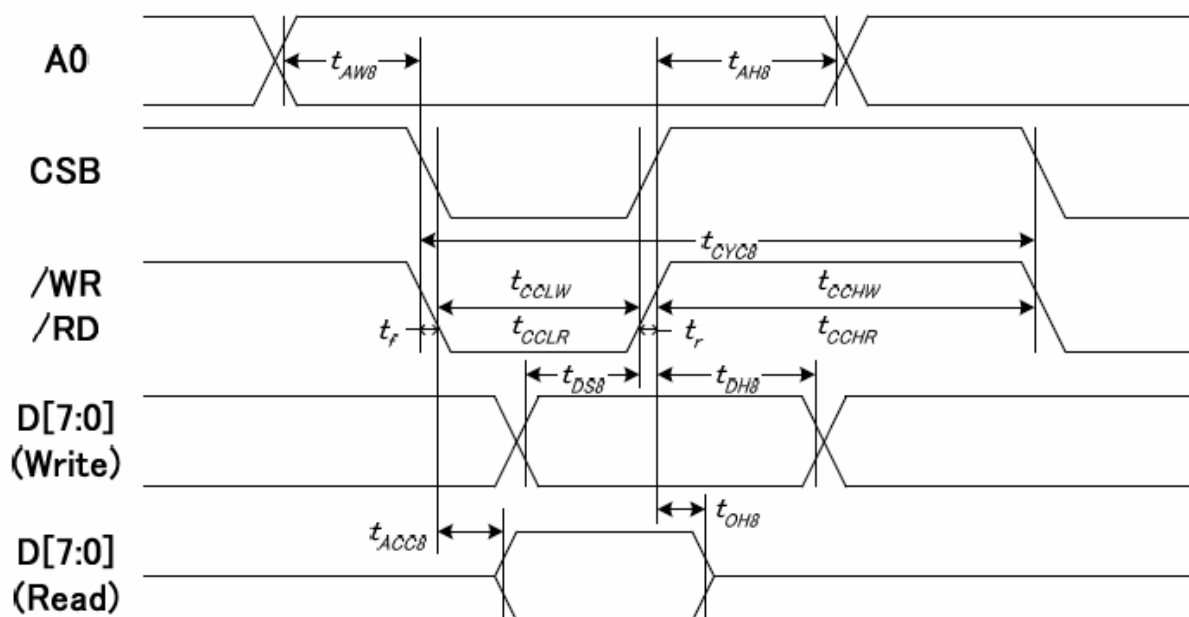


Please refer interface pin description for detail

8. Command/AC Timing

8.1 Timing Characteristics

System Bus Timing for 8080 MCU Interface

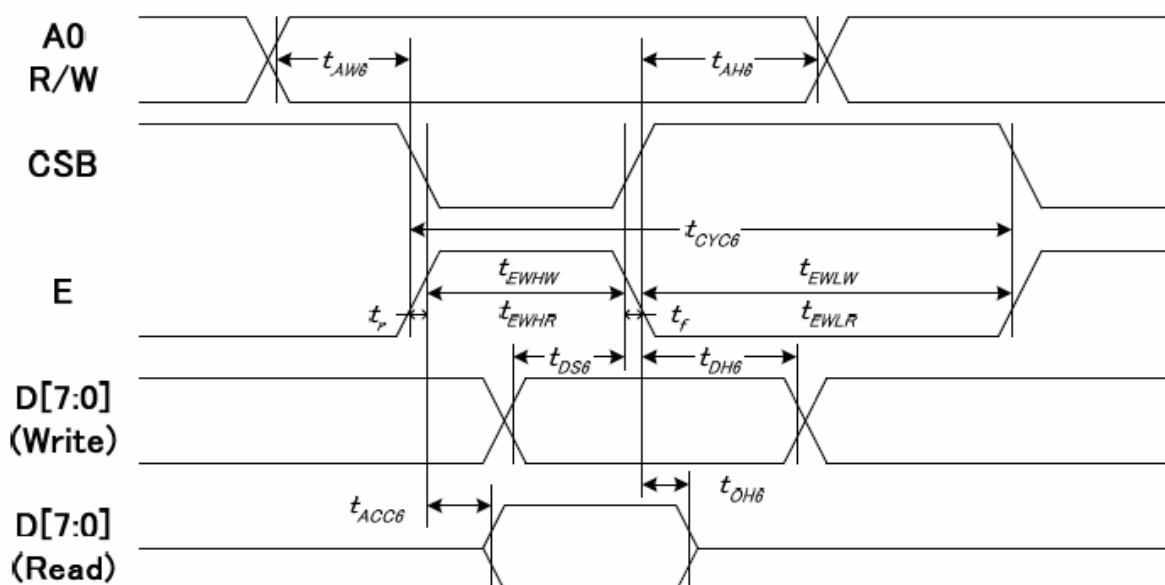


Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	t_{AW8}		0	—	ns
Address hold time		t_{AH8}		0	—	
System cycle time (WRITE)	/WR	t_{CYC8}		240	—	
/WR L pulse width (WRITE)		t_{CCLW}		100	—	
/WR H pulse width (WRITE)		t_{CCHW}		100	—	
System cycle time (READ)	RD	t_{CYC8}		500	—	
/RD L pulse width (READ)		t_{CCLR}		220	—	
/RD H pulse width (READ)		t_{CCHR}		220	—	
WRITE Data setup time	D[7:0]	t_{DS8}		20	—	
WRITE Data hold time		t_{DH8}		20	—	
READ access time		t_{ACC8}	CL = 30 pF	—	100	
READ Output disable time		t_{OH8}	CL = 30 pF	10	110	

Note:

- The input signal rise time and fall time (t_r , t_f) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leq (t_{CYC8} - t_{CCLW} - t_{CCHW})$ for $(t_r + t_f) \leq (t_{CYC8} - t_{CCLR} - t_{CCHR})$ are specified.
- All timing is specified using 20% and 80% of VDD1 as the reference.
- t_{CCLW} and t_{CCLR} are specified as the overlap between CSB being "L" and WR and RD being at the "L" level.

System Bus Timing for 6800 MCU Interface

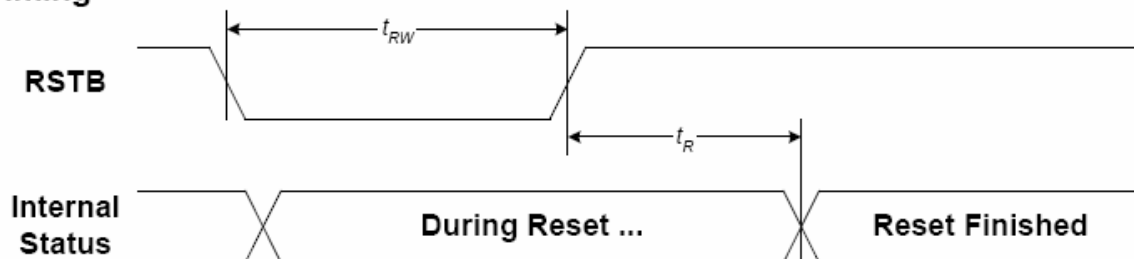


Item	Signal	Symbol	Condition	Min.	Max.	Unit
Address setup time	A0	t_{AW6}		0	—	ns
Address hold time		t_{AH6}		0	—	
System cycle time (WRITE)	E	t_{CYC6}		240	—	
Enable L pulse width (WRITE)		t_{EWLW}		100	—	
Enable H pulse width (WRITE)		t_{EWHW}		100	—	
System cycle time (READ)		t_{CYC6}		500	—	
Enable L pulse width (READ)		t_{EWLR}		220	—	
Enable H pulse width (READ)		t_{EWHR}		220	—	
Write data setup time	D[7:0]	t_{DS6}		20	—	
Write data hold time		t_{DH6}		20	—	
Read data access time		t_{ACC6}	CL = 16 pF	—	100	
Read data output disable time		t_{OH6}	CL = 16 pF	10	110	

Note:

- The input signal rise time and fall time (t_r , t_f) is specified at 15 ns or less. When the system cycle time is extremely fast, $(t_r + t_f) \leq (t_{CYC6} - t_{EWLW} - t_{EWHW})$ for $(t_r + t_f) \leq (t_{CYC6} - t_{EWLR} - t_{EWHR})$ are specified.
- All timing is specified using 20% and 80% of V_{DD1} as the reference.
- t_{EWLW} and t_{EWLR} are specified as the overlap between CSB being "L" and E.

Reset Timing



Item	Symbol	Condition	Min.	Max.	Unit
Reset time	t_R		120	—	ms
Reset "L" pulse width	t_{RW}		10	—	us

9. Optical Specification

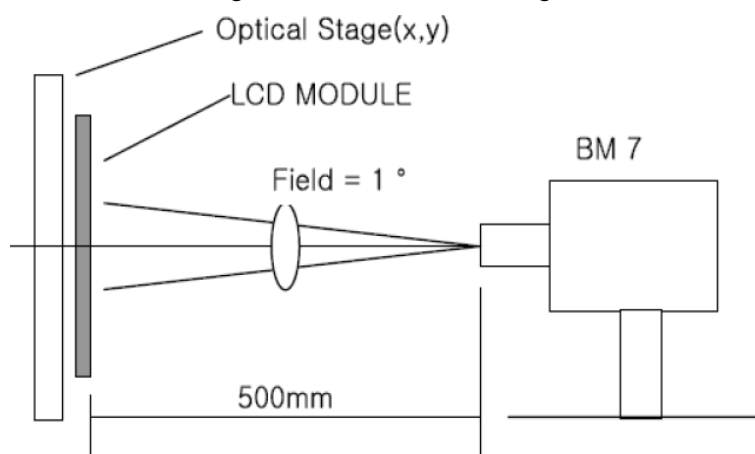
Ta=25°C

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	$\theta=0^\circ$	-	6.9	-		Note1 Note2
Response Time	Rise	tr	25°C	-	150	225	ms	Note1
	Fall	tf		-	370	555	ms	Note3
View Angles		θT	$CR \geq 2$		40	-	Degree	Note 4
		θB		-	40	-		
		θL		-	40	-		
		θR		-	40	-		

Note 1: Definition of optical measurement system.

Temperature = 25°C ($\pm 3^\circ\text{C}$)

LED back-light: ON, Environment brightness < 150 lx

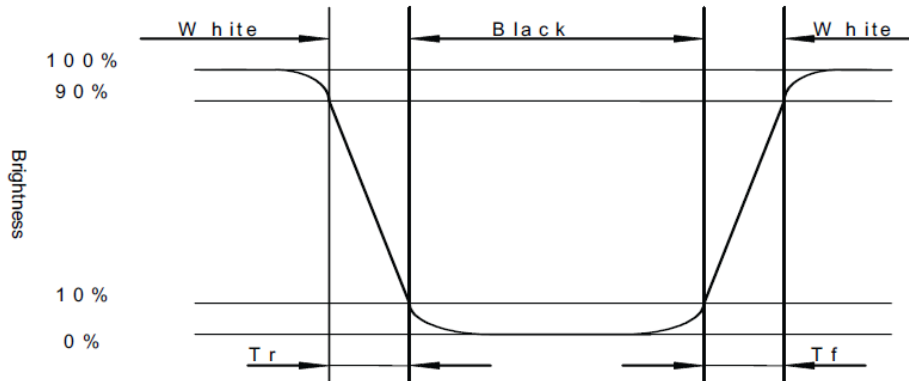


Note 2: Contrast ratio is defined as follow:

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

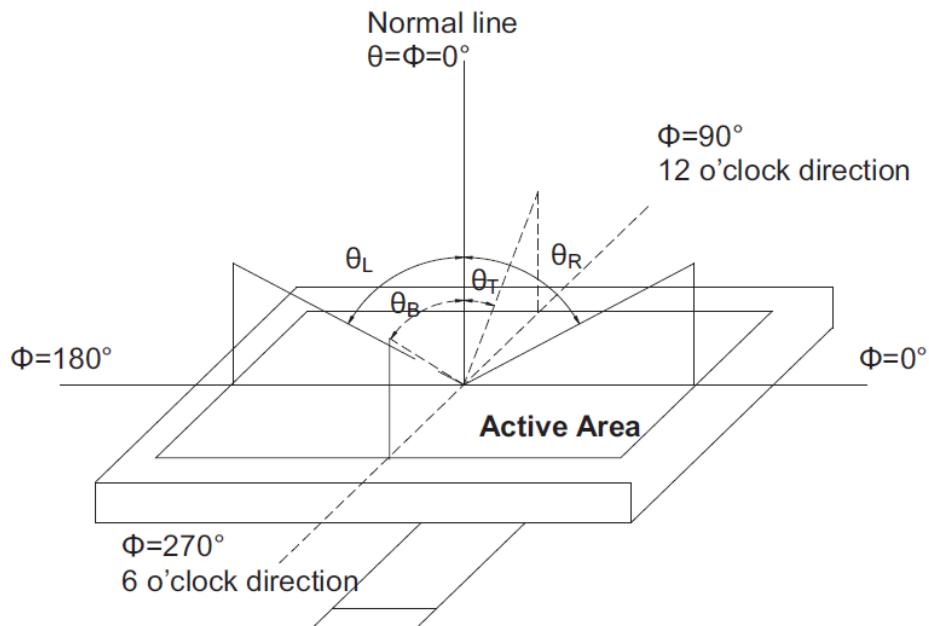
Note 3: Response time is defined as follow:

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



Note 4: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+60°C, 120hrs	Per table in below
2	Low Temp Operation	Ta=-10°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+70°C, 120hrs	Per table in below
4	Low Temp Storage	Ta=-20°C, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+40°C, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-20°C 30 min~+70°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 hours for each direction of X.Y.Z.	2 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.

