TIAN-MA
MICROELECTRONICS CO., LTD

DEVICE SPECIFICATION FOR LCD MODULE

Model No. TM8064CBC

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Approved by:		**Date:**	1/11-99

To: _____

☐**CUSTOMER'S APPROVAL**

DATE _____

By: _____

Presented

By: _____

Sell and Market Dep.

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REVISION RECORD

Date	Ref. Page	Revision No.	Revision Items	Check & Approval

1 Display Specifications

1.1 Display type: STN

1.2 Display color*:

Display color: Blue-Black

Background color: yellow-green

1.3 Polarizer mode: Transflective/Positive

1.4 Viewing Angle: 6:00

1.5 Driving Duty: 1/65

1.6 Backlight: Led

* Color tone is slightly changed by temperature and driving voltage.

2 Mechanical Specifications

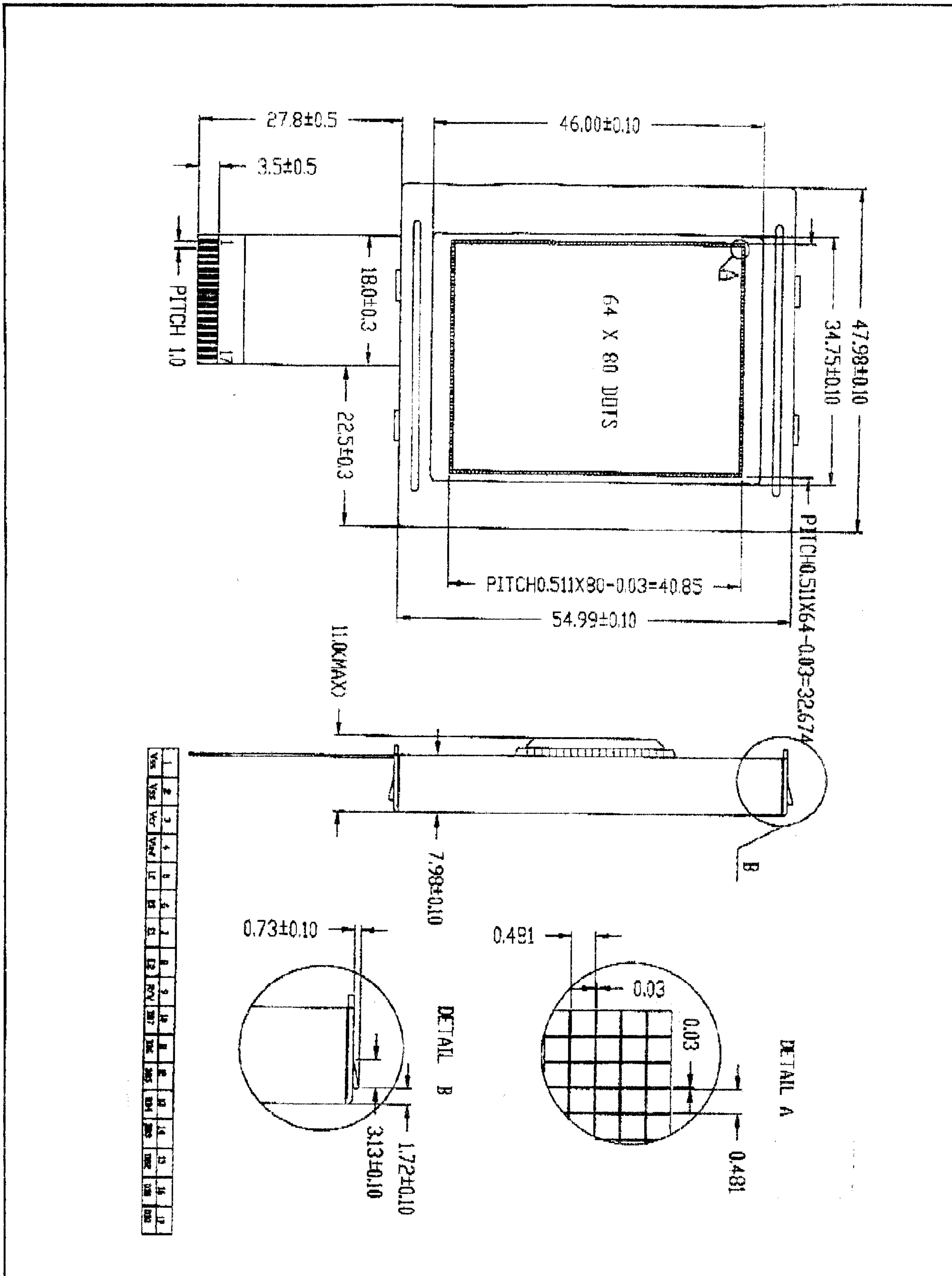
2.1 Outline Dimensions: Refer to outline drawing on page: 2

2.2 Dot Matrix: Refer to outline drawing on page: 2

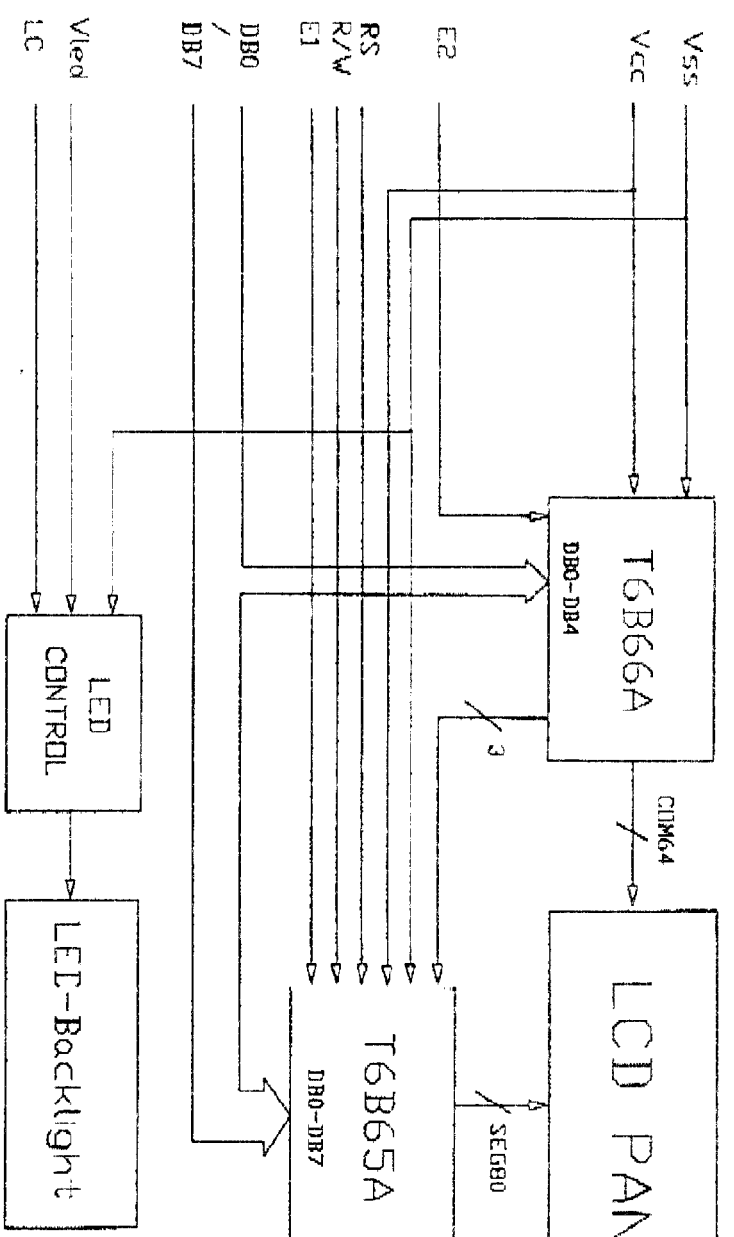
2.3 Dot size: 0.481×0.481(mm)

2.4 Dot pitch: 0.511×0.511(mm)

2.5 Weight: 80g


27.8±0.5
3.5±0.5
PITCH 1.0
18.0±0.3
22.5±0.3
46.00±0.10
64 X 80 DOTS
34.75±0.10
47.98±0.10
PITCH0.511X80-0.03=40.85
54.99±0.10
PITCH0.511X64-0.03=32.674
11.0(MAX)
7.98±0.10
B
0.73±0.10
DETAIL B
3.13±0.10
1.72±0.10
0.491
0.03
0.03
DETAIL A
0.481

3 Circuit Block Diagram



4 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	V_{CC}– V_{SS}	4.5	5.5	V	
LCD Driving Voltage	V_{LCD}	0	7V		
Operating Temperature Range	T_{OP}	0	50	℃	No Condensation
Storage Temperature Range	T_{ST}	-20	60		

5 Electrical Specifications and Instruction Code

5.1 Electrical characteristics

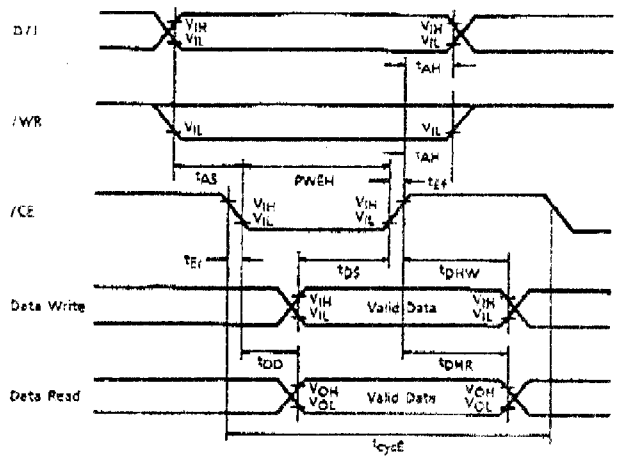
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage (Logic)		V_{CC}–V_{SS}	4.5	5.0	5.5	V	
Supply Voltage (LCD Drive)		V_{CC}–V_0	-	11.5	-	V	
Input Signal Voltage	'H'Level	V_{IH}	2.2	-	V_{CC}	V	
	'L'Level	V_{IL}	-0.3	-	0.6	V	
Supply current (Logic)		I_{DD}	-	2.5		mA	
Supply current (LCD Drive)		I_{EE}	-	2.0		mA	

5.2 Interface Signals

Pin No.	Symbol	Level	Description
1	Vss	0V	Ground
2	Vss	0V	Ground
3	Vcc	5.0V	Power supply voltage for logic and LCD(+)
4	Vled	5.0V	Power supply voltage for LED
5	Lc	H/L	BackLight control terminal
6	RS	H/L	Selection display data or instruction
7	E1	H/L	Chip enable singal
8	E2	H/L	Chip enable singal
9	R/W	H/L	Read/Write Singal
10	DB7	H/L	Data bit7
11	DB6	H/L	Data bit6
12	DB5	H/L	Data bit5
13	DB4	H/L	Data bit4
14	DB3	H/L	Data bit3
15	DB2	H/L	Data bit2
16	DB1	H/L	Data bit1
17	DB0	H/L	Data bit0

5.3 Interface Timing Chart:

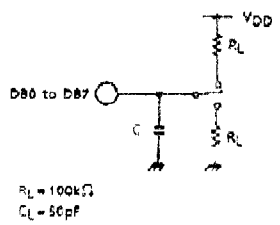
A. For T6B65



TEST CONDITIONS (1) (V_{SS} = 0V, V_{DD} = 3.0V ± 10%, V_{LC5} = 0V, Ta = – 20 to 75°C)

ITEM	SYMBOL	MIN	MAX	UNIT
Enable Cycle Time	t_{cycE}	1000	—	ns
Enable Pulse Width	PWEH	450	—	ns
Enable Rise/Fall Time	t_{Er}, t_{Ef}	—	25	ns
Address Set-up Time	t_{AS}	40	—	ns
Address Hold Time	t_{AH}	10	—	ns
Data Set-up Time	t_{DS}	280	—	ns
Data Hold Time	t_{DHW}	10	—	ns
Data Delay Time	t_{DD} (Note)	—	300	ns
Data Hold Time	t_{DHR} (Note)	20	—	ns

LOAD CIRCUIT

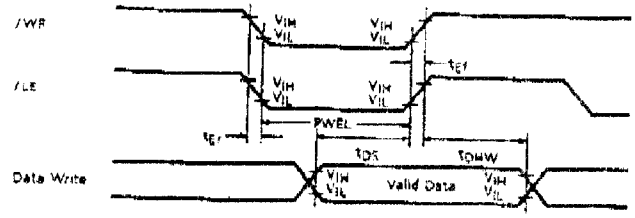


TEST CONDITIONS (2) (V_{SS} = 0V, V_{DD} = 5.0V ± 10%, V_{LC5} = 0V, Ta = – 20 to 75°C)

ITEM	SYMBOL	MIN	MAX	UNIT
Enable Cycle Time	t_{cycE}	500	—	ns
Enable Pulse Width	PWEH	220	—	ns
Enable Rise/Fall Time	t_{Er}, t_{Ef}	—	20	ns
Address Set-up Time	t_{AS}	40	—	ns
Address Hold Time	t_{AH}	0	—	ns
Data Set-up Time	t_{DS}	60	—	ns
Data Hold Time	t_{DHW}	10	—	ns
Data Delay Time	t_{DD} (Note)	—	120	ns
Data Hold Time	t_{DHR} (Note)	20	—	ns

(Note) With load circuit connected

B. For T6B66



TEST CONDITIONS (1) (V_{SS} = 0V, V_{DD} = 3.0V ± 10%, V_{DD} – V_{EE} = 16V, Ta = – 20 to 75°C)

ITEM	SYMBOL	MIN	MAX	UNIT
Enable Rise / Fall Time	t_{Er}, t_{Ef}	—	25	ns
Enable Pulse Width	PWEL	60	—	ns
Data Set-up Time	t_{DS}	60	—	ns
Data Hold Time	t_{DHW}	10	—	ns

TEST CONDITIONS (2) (V_{SS} = 0V, V_{DD} = 5.0V ± 10%, V_{DD} – V_{EE} = 16V, Ta = – 20 to 75°C)

ITEM	SYMBOL	MIN	MAX	UNIT
Enable Rise / Fall Time	t_{Er}, t_{Ef}	—	20	ns
Enable Pulse Width	PWEL	60	—	ns
Data Set-up Time	t_{DS}	60	—	ns
Data Hold Time	t_{DHW}	10	—	ns

5.4 Instruction Code

A.T6B65

CODE										
/WR	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	FUNCTION
0	0	0	0	0	0	0	0	1	1/0	Display ON (1) / OFF (0)
0	0	0	0	0	0	0	1	Y/X	U/D	Y (1) /X (0) Counter Select UP (1) / Down (0) Mode Select
0	0	0	0	0	0	1	*	*	*	Test Mode Select
0	0	0	1	Z-Address (0 to 63)						Set Z-Address
0	0	1	0	X-Address (0 to 63)						Set X-Address
0	0	1	1	*	F/DR	Y (Page)-Address (0 to 9)				Set Y (Page)-Address
1	0	B	0	D	R	0	F/DR	Y/X	U/D	Status Read (Note)
0	1	Write Data								Write display data
1	1	Read Data								Read display data

* : INVALID

(Note) B : Busy flag
D : Display ON (1) / OFF (0)
R : Reset
Y/X : Counter Select 1 : Y-Counter 0 : X-Counter
U/D : Up/Down Select 1 : Up 0 : Down
F/DR : Flag mode 1 : Flag mode 0 : Display RAM mode

B.T6B66

CODE						
DB5	DB4	DB3	DB2	DB1	DB0	FUNCTION
1	CONTRAST (0 to 31)					Set Contrast
0	1	1	*	*	*	Test Mode Select
0	1	0	1	1/0	1/0	Op-Amp Control OP1
0	1	0	0	*	1/0	Op-Amp ON/OFF
0	0	0	1	R_1	R_2	Bias Control
0	0	0	0	1	1/0	Display ON/OFF

* : INVALID

6.Optical Characteristics

6.1 Optical Characteristics

Top=25℃

Item		Symbol	Condition		Min.	Typ.	Max.	Unit	Remark
Viewing Angle		θ_x	Cr>2	$\theta_y=0°$	-35	--	10	Deg	
		θ_y		$\theta_x=0°$	-30	--	30		
Contrast Ratio		Cr	$\theta_x=0°$ $\theta_y=0°$		3.0				
Response Time	Turn on	Ton	$\theta_x=0°$ $\theta_y=0°$				150	ms	
	Turn off	Toff					150		

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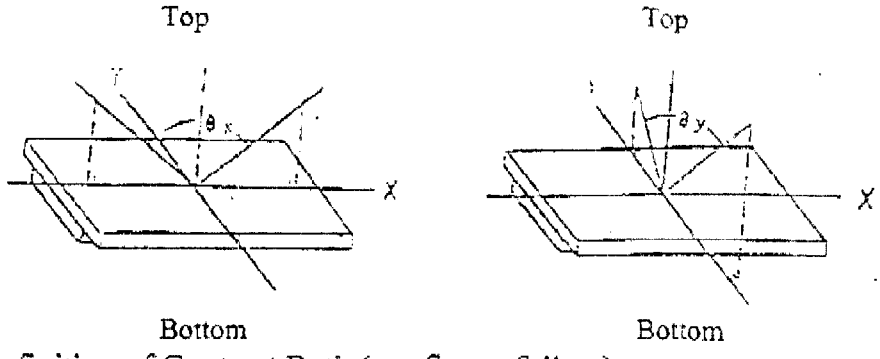
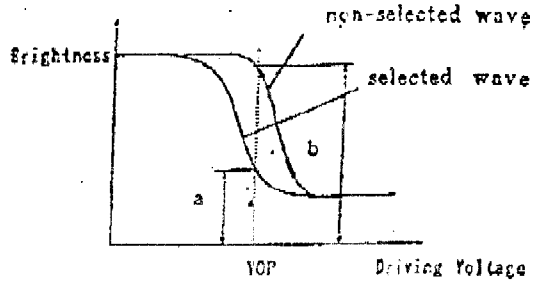
6.2 Definition of optical characteristics

6.2.1 Definition of viewing Angle(see fig. as follow)



6.2.2 Definition of Contrast Ratio(see fig. as follow)

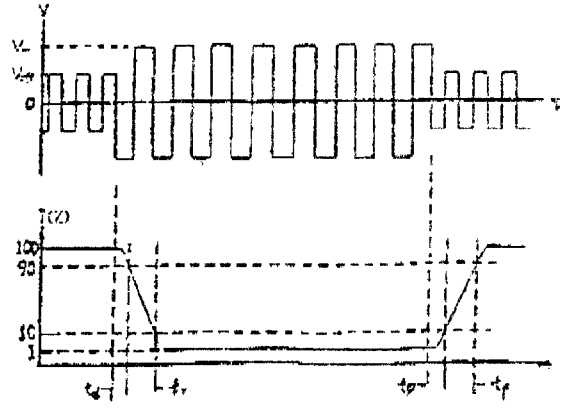


$$\text{Contrast Ratio} = b / a = \frac{\text{non-selected state brightness}}{\text{selected state brightness}}$$

Measuring Conditions:

1) Ambient Temperature: 25℃ ; 2) Frame frequency: 64Hz

6.2.3 Definition of Response time(see fig. as follow)



Turn-on time: $t_{on}=t_d+t_r$

Turn-off time: $t_{off}=t_d+t_f$

Measuring Condition:

1) Operating Voltage: 11.5V ; 2) Frame frequency: 64Hz

7. Reliability

7.1 Content of Reliablity Test (T_{OP}=25℃)

No.	Test Item	Content of Test	Test condition
1	High Temperature Storage	Endurance test applying the high storage temperature for a long time	60℃ 96H
2	Low Temperature Storage	Endurance test applying the low storage temperature for a long time	-20℃ 96H
3	High Temperature Operation	Endurance test applying the electric stress (voltage & current) and the thermal stress to the element for a long time	50℃ 240H
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time	0℃ 240H
5	High Temperature /Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time	40℃ 90%RH 96H
6	Temperature Cycle	Endurance test applying the low and high temperature cycle -20℃ ←→ 25℃ ←→ 60℃ ←→ 25℃ 30min 5min 30min 5min ←——————→ 1 cycle	-20℃/60℃ 10 cycles
7	Vibration Test (package state)	Endurance test applying the vibration during transportation	10Hz~150Hz, 50m/s^2, 40min
8	Shock Test (package state)	Endurance test applying the shock during transportation	Half-sinewave, 100m/s^2, 11ms
9	Atmospheric Pressure Test	Endurance test applying the atmospheric pressure during transportation by air	40kPa 16H

7.2 Failure Judgment Criterion

Criterion Item	Test Item No.									Failure Judgement Criterion
	1	2	3	4	5	6	7	8	9	
Basic Specification	0	0	0	0	0	0	0	0	0	Out of the basic Specification
Electrical specification	0	0	0	0	0					Out of the electrical specification
Mechanical Specification							0	0		Out of the mechanical specification
Optical Characteristic	0	0	0	0	0	0			0	Out of the optical specification
Remark	Basic specification = Optical specification + Mechanical specification									

8 Precautions for use of LCD Modules

8.1 Handling Precautions

8.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

8.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

8.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

8.1.4 The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

8.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

—Isopropyl alcohol

— Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

— Water

—Ketone

—Aromatic solvents

8.1.6 Do not attempt to disassemble the LCD Module.

8.1.7 If the logic circuit power is off, do not apply the input signals.

8.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environwent.

a. Be sure to ground the body when handling the LCD Modules.

b. Tools required for assembly, such as soldering irons, must be properly ground.

c. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

d. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.