







All Shore Industries, Inc.  
ASI-R-12864OF-A--JWD/A

# DATA SHEET

**Acceptance**

ISSUE	VERSION	APPROVER	CHECKER	ENGINEER
	<b>A</b>			



<b>Messrs. 玖邦</b>			
Product Specification			<b>Rev. NO.</b>
			<b>Issued Date.</b>
			A
			July. 24, 07

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## 1. SCOPE

This specification covers the engineering requirements for the ASI-R-12864OF-A--JWD/A liquid crystal module.

## 2. PRODUCT SPECIFICATIONS

### 2.1 General

- Display Format: 128 × 64 dot matrix LCD
- Display mode: FSTN , Positive mode LCD panel
- Transflective , Wide temperature type
- Viewing Direction: 12 O'clock
- Interface Input Data: Serial Interface MPU
- Back light: Edge LED (White)
- Multiplexing driving : 1/65duty, 1/9bias
- COG ST7565P-G

## ● ROHS

### 2.2 Mechanical Characteristics

Item	Characteristic
Dot configuration	128 × 64
Dot dimensions(mm)	0.38 × 0.38
Dot spacing (mm)	0.03
Module dimensions (Horizontal × Vertical × Thickness, mm)	65.0 × 113.43 × 4.5 max.
Viewing area (Horizontal × Vertical, mm)	60.0 × 29.0
Active area (Horizontal × Vertical, mm)	52.45 × 26.21

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## 2.3 Absolute Maximum Ratings (Without LED back-light)

Characteristic	Symbol	Unit	Value
Operating Voltage (logic)	$V_{DD}$	V	-0.3 to +5.0
Input Voltage	$V_{IN}$	V	-0.3 to $V_{DD}$

Note 1: Referenced to  $V_{SS}=0V$ 

## 2.4 Electrical Characteristics (Without LED back-light)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Voltage(logic)	$V_{DD}$	--	1.8	3.0	3.3	V
Input Voltage	$V_{IH}$	--	$0.8V_{DD}$	--	$V_{DD}$	V
	$V_{IL}$	--	VSS	--	$0.2V_{DD}$	
Output Voltage	$V_{OH}$	$I_{OH}=-0.5mA$	$0.8V_{DD}$	--	$V_{DD}$	V
	$V_{OL}$	$I_{OL}=0.5mA$	$V_{DD}$	--	$0.2V_{DD}$	
Operating Frequency	$F_{OSC}$	--	50	--	600	KHz

## 2.5 Optical Characteristics Absolute maximum ratings

Item Sym	bol	Rating	Unit
Operating temperature range	Top	-20~70	°C
Storage temperature range	Tst	-30~80	°C

## 2.6 Optical Characteristics

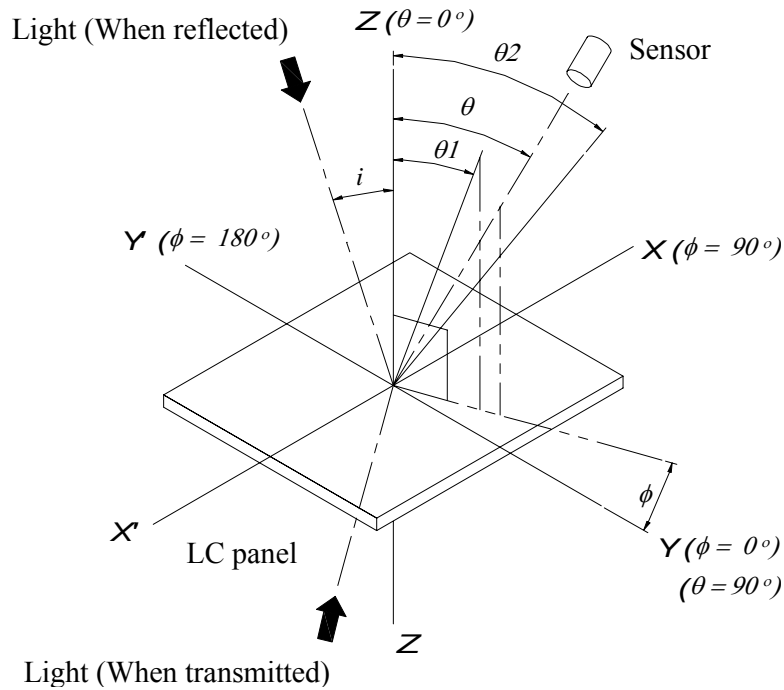
1/64 duty, 1/9bias

Item Sym	bol	Temp.	Min.	Typ.	Max.	Unit
Driving voltage	$V_{op}$	25 °C	10.2	10.5	10.8	V
Contrast K		$\theta=0^\circ$ $\phi=0^\circ$	2.8	7.0	9.29	--
Frame freq.	fF	--	--	70	--	Hz
Viewing angle*	$\theta_1$	25 °C	30	84	--	deg.
	$\theta_2$		60	96	--	
Response time	$t_{on}$	25 °C	--	69	250	ms
	$t_{off}$		--	123	250	

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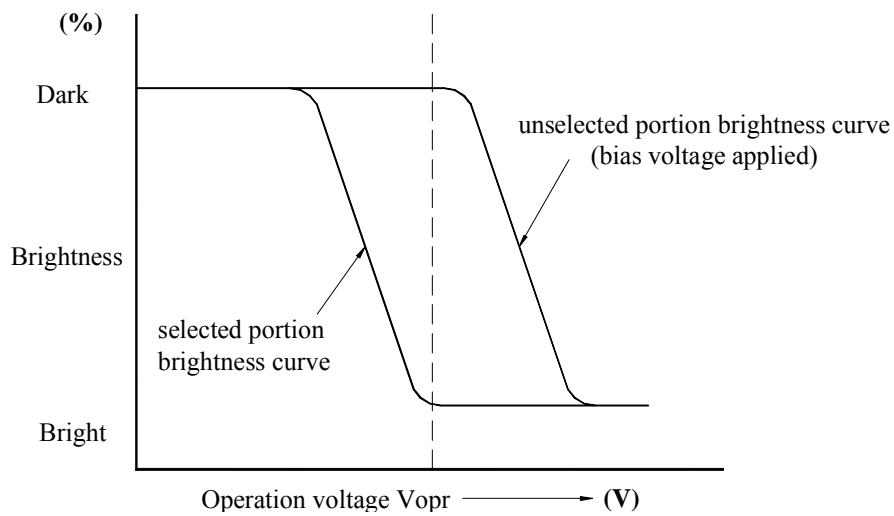
2.6.1 Definition of optical characteristics

\* Definition of angles  $\phi$  and  $\theta$



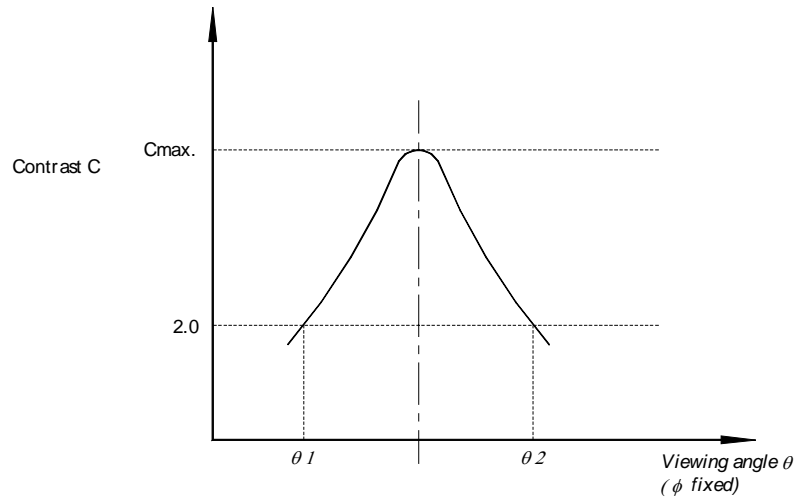
\*Definition of contrast C

$$C = \frac{B1}{B2} = \frac{\text{Brightness of selected portion}}{\text{Brightness of unselected portion}}$$



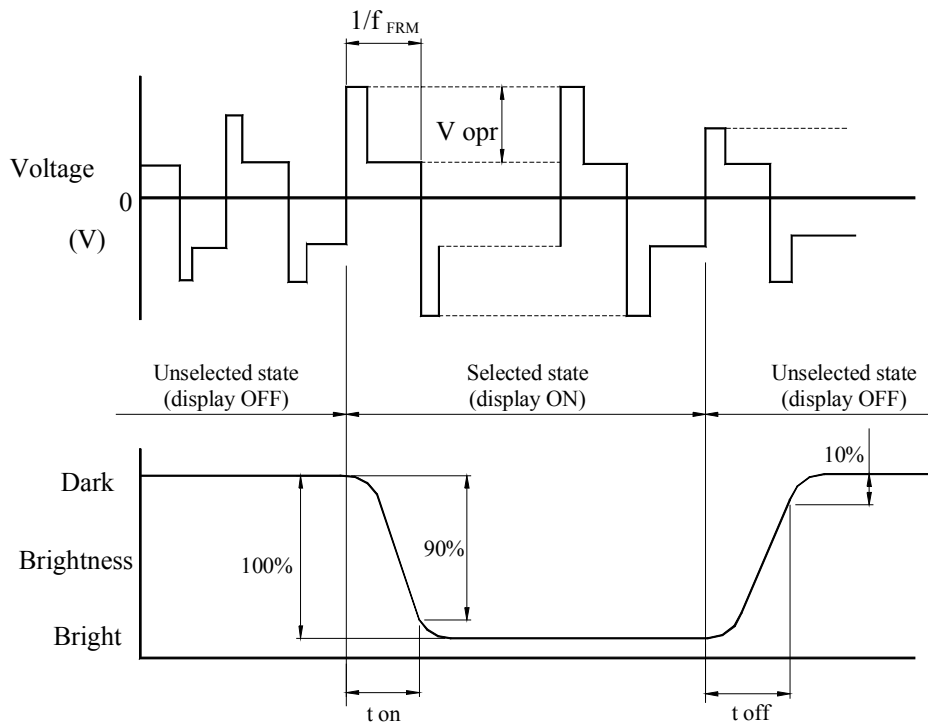
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\* Definition of viewing angles  $\theta_1$  and  $\theta_2$



Note : Optimum vision with the naked eye and viewing angle  $\theta$  at  $C_{max}$  above are not always the same.

\* Definition of response time



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Vopr : Operating voltage (V)

Ton : Response time (rise) (ms)

fFRM : Frame frequency (Hz)

Toff : Response time (fall) (ms)

## 2.7 LED Back-light Characteristics

### 2.7.1 Electrical / optical specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward voltage	$V_f$	If=60mA, White	3.0	3.3	3.6	V
Luminous Tolerance	--	If=60mA, White	70	--	--	%
Luminous Intensity	$I_v$	If=60mA, White	45	--	--	cd/m <sup>2</sup>
*Chromaticity coordinate	x 0.30	If=60mA, White		0.32	0.34	
	y		0.32	0.35	0.38	

Ta = 25°C

Note: \* Measured at the bare LED back-light unit.

### 2.7.2 LED Maximum Operating Range

Item	Symbol	White	Unit
Power Dissipation	$P_{AD}$ 144		mW
Forward Current	$I_F$ 60		mA
Reverse Voltage	$V_R$ 5		V

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### 3. RELIABILITY

#### 3.1 Reliability

Test item	Test condition	Evaluation and assessment
Operation at high temperature and humidity	40 °C±2 °C 90%RH for 500hours	No abnormalities in functions* and appearance**
Operation at high temperature	60 °C±2 °C for 500 hours	No abnormalities in functions* and appearance**
Heat shock	-20± ~ +60 °C Left for 1 hour at each temperature, transition time 5 min, repeated 10times	No abnormalities in functions* and appearance**
Low temperature	-20±2 °C for 500 hours	No abnormalities in functions* and appearance**
Vibration	Sweep for 1 min at 10 Hz, 55Hz, 10Hz, amplitude 1.5mm 2 hrs each in the X,Y and Z directions	No abnormalities in functions* and appearance**
Drop shock	Dropped onto a board from a height of 10cm	No abnormalities in functions* and appearance**

\* Dissipation current, contrast and display functions

\*\* Polarizing filter deterioration, other appearance defects

#### 3.2 Liquid crystal panel service life

100,000 hours minimum at 25 °C±10 °C

#### 3.3 definition of panel service life

- Contrast becomes 30% of initial value
  - Current consumption becomes three times higher than initial value
  - Remarkable alignment deterioration occurs in LCD cell layer
  - Unusual operation occurs in display functions
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#### 4. OPERATING INSTRUCTIONS

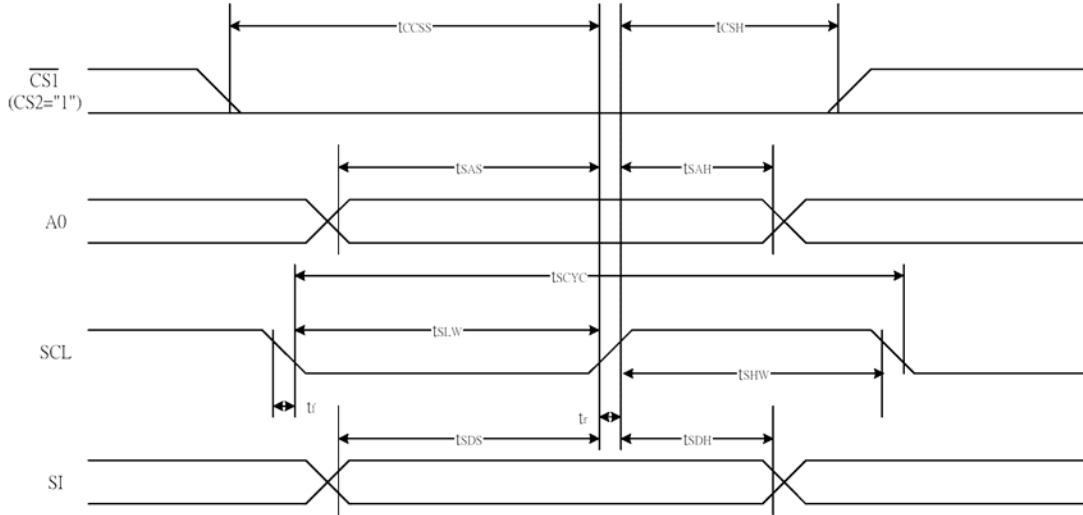
##### 4.1 Input signal Function

NO.	Sym bol	Function
1	/CS	This is the chip select signal
2	/RES	When RES is set to "L", the settings are initialized
3	A0	This is connecting to the least significant bit of the normal MPU address bus
4	SCL(D6)	The serial clock input
5	SI(D7)	Serial data input
6	VDD	Shared with the MPU power supply terminal VCC
7	VSS	This is a 0v terminal connected to the system GND
8	VOUT	DC/DC voltage converter . Connect a capacitor between this terminal and Vss
9	CAP3-	DC/DC voltage converter . Connect a capacitor between this terminal and the CAP1+ terminal
10	CAP1+	DC/DC voltage converter . Connect a capacitor between this terminal and the CAP1- terminal
11	CAP1-	DC/DC voltage converter . Connect a capacitor between this terminal and the CAP1+ terminal
12	CAP2-	DC/DC voltage converter . Connect a capacitor between this terminal and the CAP2+ terminal
13	CAP2+	DC/DC voltage converter . Connect a capacitor between this terminal and the CAP2- terminal
14~18	V4~V0	This is a multi-level power supply for the liquid crystal drive
19	A	LED Backlight (+)
20	K	LED Backlight (-)

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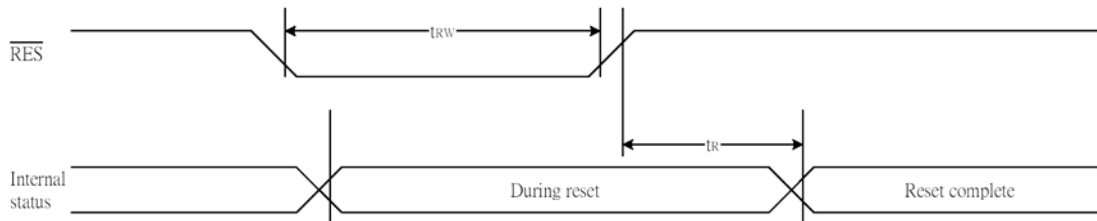
4.2 Timing Diagram

4.2.1 Serial Interface



Item Signal		Symbol	Condition	Rating		Units
				Min	Max.	
Serial Clock Period SCL "H" pulse width SCL "L" pulse width	SCL	t <sub>SCVC</sub> 250	--		--	ns
		t <sub>SHW</sub> 100			--	ns
		t <sub>SLW</sub>		100	--	ns
Address setup time Address hold time	A0	t <sub>SAS</sub> 150	--		--	ns
		t <sub>SAH</sub>		150	--	ns
Data setup time Data hold time	SI	t <sub>SDS</sub> 100	--		--	ns
		t <sub>SDH</sub>		100	--	ns
CS-CSL time	CS	t <sub>CSS</sub> 150	--		--	ns
		t <sub>CSH</sub>		150	--	ns

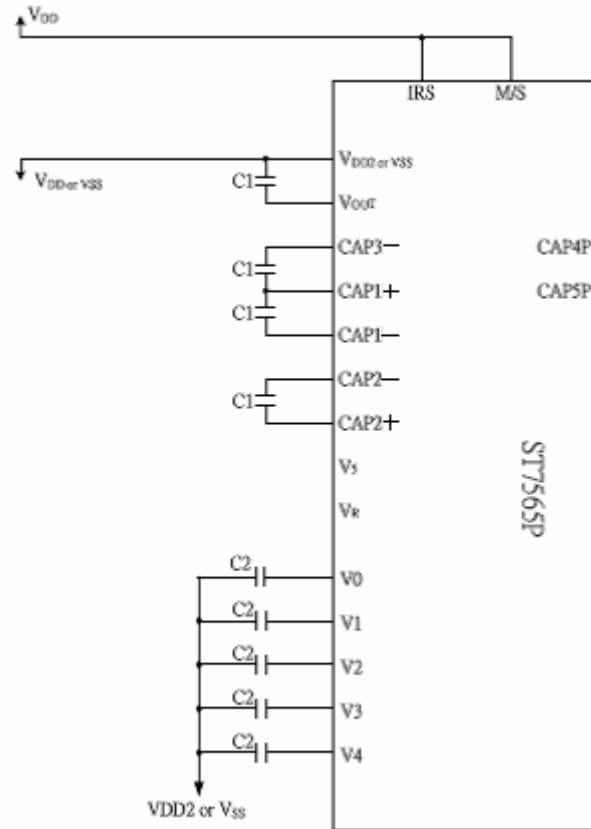
4.2.2 Reset Timing



Item Signal	RES t	Symbol	Condition	Rating Units			
				Min. T	yp.	Max.	
FR delay time		t <sub>R</sub>	--	--	--	1	ns
Reset "L" pulse width		t <sub>RW</sub>	--	1	--	--	ns

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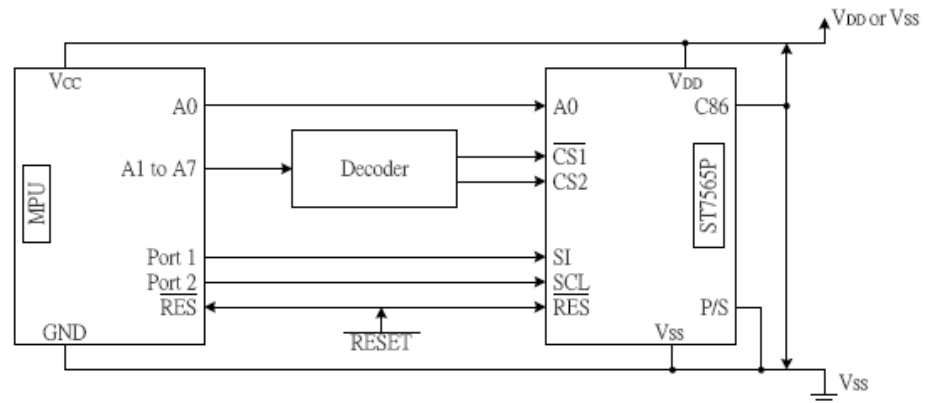
4.3 Booster Circuit



Item	Set value	units
c1	1.0 to 4.7	uF
c2	0.1 to 4.7	uF

C1 and C2 are determined by the size of the LCD being driven

Using the Serial Interface



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## 4.4 Table of ST7565P Commands

Command	Command Code										Function		
	A0	$\overline{RD}$	$\overline{WR}$	D7	D6	D5	D4	D3	D2	D1		D0	
(1) Display ON/OFF	0	1	0	1	0	1	0	1	1	1	0	1	LCD display ON/OFF 0: OFF, 1: ON
(2) Display start line set	0	1	0	0	1	Display start address						Sets the display RAM display start line address	
(3) Page address set	0	1	0	1	0	1	1	Page address				Sets the display RAM page address	
(4) Column address set upper bit	0	1	0	0	0	0	1	Most significant column address				Sets the most significant 4 bits of the display RAM column address.	
Column address set lower bit	0	1	0	0	0	0	0	Least significant column address				Sets the least significant 4 bits of the display RAM column address.	
(5) Status read	0	0	1	Status			0	0	0	0	0	0	Reads the status data
(6) Display data write	1	1	0	Write data								Writes to the display RAM	
(7) Display data read	1	0	1	Read data								Reads from the display RAM	
(8) ADC select	0	1	0	1	0	1	0	0	0	0	0	1	Sets the display RAM address SEG output correspondence 0: normal, 1: reverse
(9) Display normal/reverse	0	1	0	1	0	1	0	0	1	1	0	1	Sets the LCD display normal/reverse 0: normal, 1: reverse
(10) Display all points ON/OFF	0	1	0	1	0	1	0	0	1	0	0	1	Display all points 0: normal display 1: all points ON
(11) LCD bias set	0	1	0	1	0	1	0	0	0	1	0	1	Sets the LCD drive voltage bias ratio 0: 1/9 bias, 1: 1/7 bias (ST7565S)
(12) Read/modify/write	0	1	0	1	1	1	0	0	0	0	0	0	Column address increment At write: +1 At read: 0
(13) End	0	1	0	1	1	1	0	1	1	1	0	0	Clear read/modify/write
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	0	Internal reset
(15) Common output mode select	0	1	0	1	1	0	0	0	*	*	*	1	Select COM output scan direction 0: normal direction 1: reverse direction
(16) Power control set	0	1	0	0	0	1	0	1	Operating mode			Select internal power supply operating mode	
(17) V <sub>s</sub> voltage regulator internal resistor ratio set	0	1	0	0	0	1	0	0	Resistor ratio			Select internal resistor ratio(Rb/Ra) mode	
(18) Electronic volume mode set	0	1	0	1	0	0	0	0	0	0	0	1	Set the V <sub>s</sub> output voltage electronic volume register
Electronic volume register set				0	0	Electronic volume value							
(19) Static indicator ON/OFF	0	1	0	1	0	1	0	1	1	0	0	1	0: OFF, 1: ON
Static indicator register set				0	0	0	0	0	0	0	0	0	0
(20) Booster ratio set	0	1	0	1	1	1	1	1	0	0	0	0	select booster ratio 00: 2x,3x,4x 01: 5x 11: 6x
(21) Power saver													Display OFF and display all points ON compound command
(22) NOP	0	1	0	1	1	1	0	0	0	1	1	1	Command for non-operation
(23) Test	0	1	0	1	1	1	1	*	*	*	*	*	Command for IC test. Do not use this command

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## 5 NOTES

### Safety

- If the LCD panel breaks, be careful not to get the liquid crystal in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

### Handling

- Avoid static electricity as this can damage the CMOS LSI.
- The LCD panel is plate glass; do not hit or crush it.
- Do not remove the panel or frame from the module.
- The polarizing plate of the display is very fragile; handle it very carefully

### Mounting and Design

- Mount the module by using the specified mounting part and holes.
- To protect the module from external pressure, leave a small gap by placing transparent plates (e.g. acrylic or glass ) on the display surface, frame, and polarizing plate
- Design the system so that no input signal is given unless the power-supply voltage is applied.
- Keep the module dry. Avoid condensation, otherwise the transparent electrodes may break.

### Storage

- Store the module in a dark place where the temperature is  $25^{\circ}\text{C}\pm 10^{\circ}\text{C}$  and the humidity below 65% RH.
- Do not store the module near organic solvents or corrosive gases.
- Do not crush, shake, or jolt the module (including accessories).

### Cleaning

- Do not wipe the polarizing plate with a dry cloth, as it may scratch the surface.
- Wipe the module gently with soft cloth soaked with a petroleum benzine.
- Do not use ketonic solvents (ketone and acetone) or aromatic solvents (toluene and xylene), as they may damage the polarizing plate.

## 6. OPERATION PRECAUTIONS

Any changes that need to be made in this specification or any problems arising from it will be dealt with quickly by discussion between both companies.

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7. LCM Dimension

