



PACIFIC DISPLAY DEVICES

LCD Component Data Sheet

Model Number: 04105

**4 Characters (Alpha Numeric - 5x7 Dot Matrix)
TN COG LCD Assembly
With Embedded Controller**

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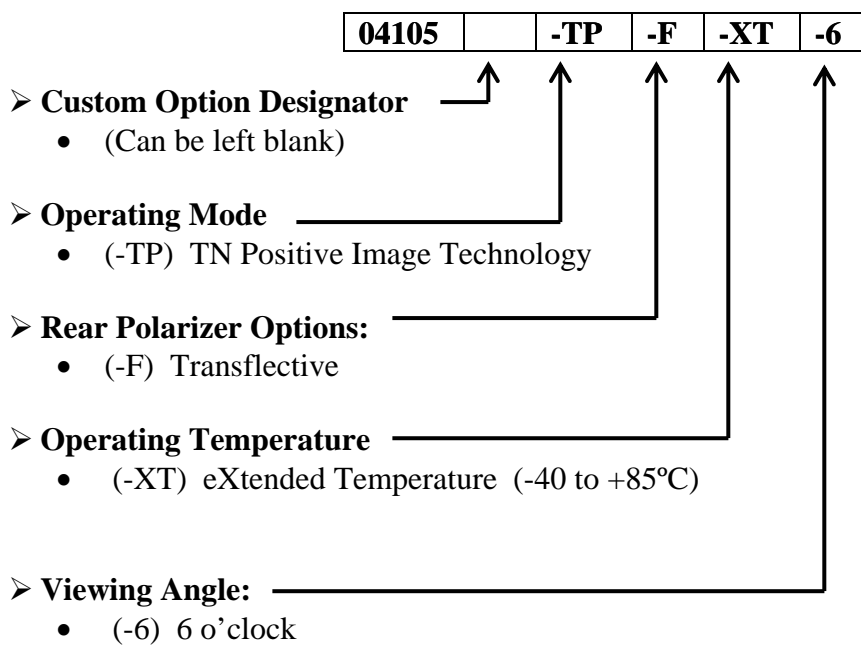
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1. GENERAL INFORMATION

1.1 Product Overview

- Configuration: LCD with COG Controller and Solder Pin Interface
- Operating Mode: Twisted Nematic (TN) Positive Image technology
- Graphics: 4 Characters (5 x 7 Dot Matrix) w/ colon and decimal point indicators
- LCD Controller: COG PCF8576 segment controller
- Drive Requirements: 1/4 duty, 1/3 bias
- COG LCD Assy Service Life: 100,000 hours minimum
- Rear Polarizer: Transflective Mode

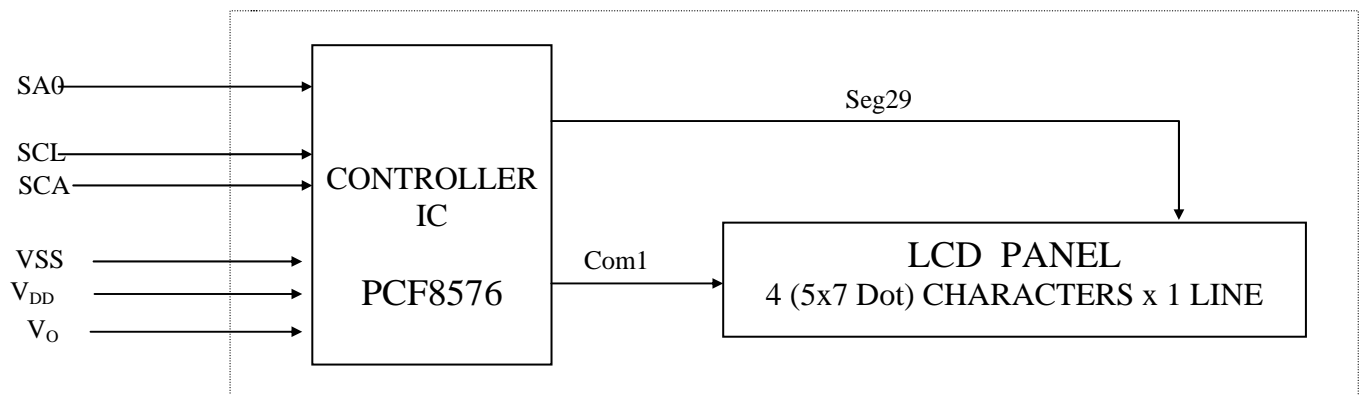
1.2 Part Options & Numbering System



1.3 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	V _{DD}	-0.3	8.0	V
Supply voltage for LCD	V _{LCD}	V _{DD} -8.0	V _{DD}	V
Input voltage	V _I	V _{SS} -0.5	V _{DD} +0.5	V
eXtended Operating temperature	TOP (-XT)	-40	85	°C
eXtended Storage temperature	TST (-XT)	-46	85	°C
Soldering Temp	T _{solder}	260		°C

1.4 Circuit Block Diagram



1.5 Mechanical Characteristics

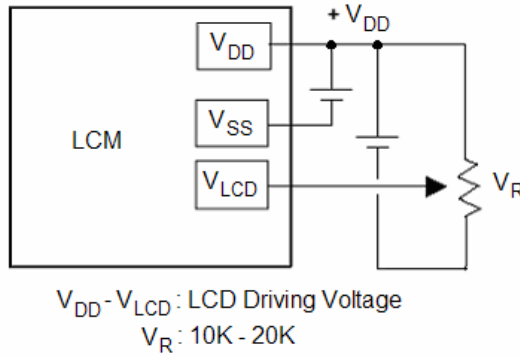
Item	Contents	Unit
Module size (W×H×T)	18.75 x 15.0 x 2.85	mm
Viewing area (W×H)	15.75 x 6.5	mm
Active Area (W×H)	14.38 x 4.96	mm
Character size (W×H)	2.85 x 4.96	mm
Dot Size (W×H)	0.43 x 0.58	mm
Dot Size (W×H)	0.58 x 0.73	mm

1.6 Input Signal Function

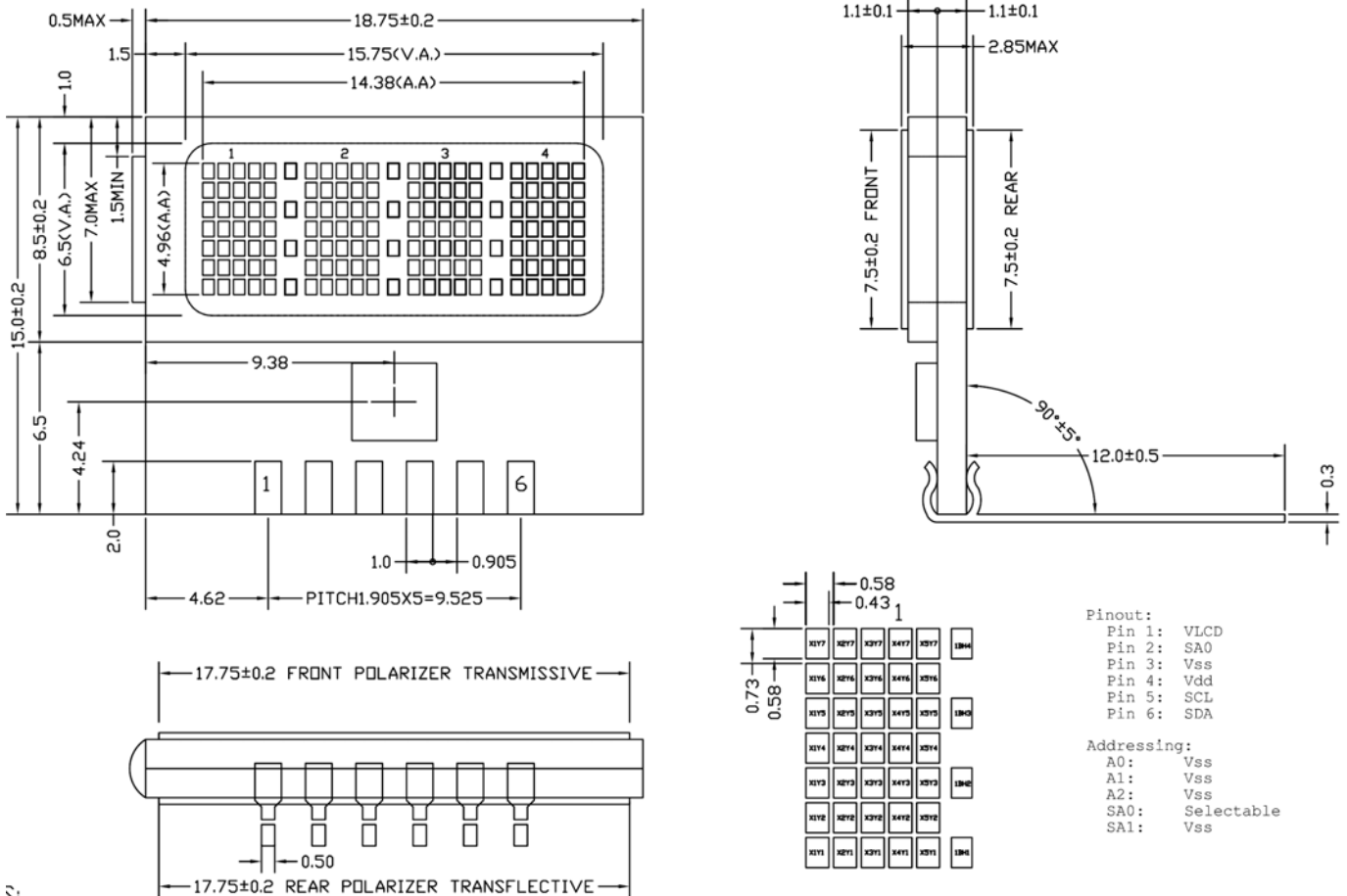
(Typical: $V_{DD} = +3V \pm 5\%$, $V_{SS} = 0V$, $T_a = 25^\circ C$)

Pin #	Symbol	Level	Description
1	V_{LCD}	$V_{DD} - 4.8V$	Input voltage for LCD
2	SA0	H/L	I2C Address Select 0 (program I2C Address)
3	V_{SS}	0V	Ground
4	V_{DD}	3.0V to 5.0V	Supply voltage for logic
5	SCL	H/L	I2C Serial Clock
6	SDA	H/L	I2C Serial Data

1.7 LCM Contrast Control and Bias

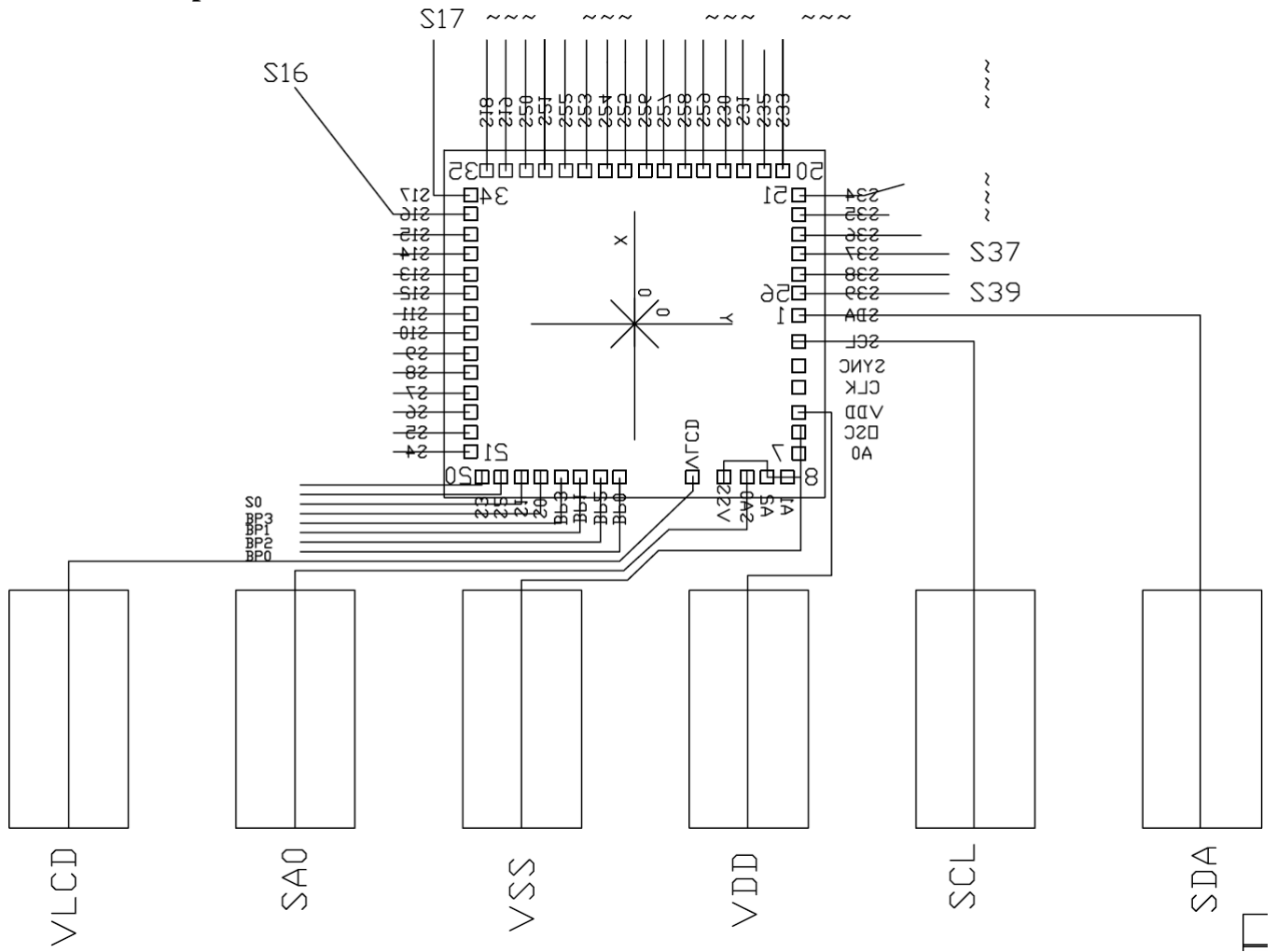


1.8 LCM Dimensions



S:

1.10 LCM Chip Interconnections



2. ELECTRICAL / OPTICAL CHARACTERISTICS

2.1 DC Electrical Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Supply voltage for logic	V_{DD}	---	2.0	3.0 or 5.0	6.0	V
Supply current for logic	I_{DD}	---	---	---	120	μA
Operating voltage for LCD*	$V_{DD}-V_{LCD}$	0°C	---	---	---	V
		25°C	---	$V_{DD} - 4.8V$	---	V
		50°C	---	---	---	V
Input voltage 'H' level	V_{IH}	---	$0.7 \times V_{DD}$	---	V_{DD}	V
Input voltage 'L' level	V_{IL}	---	V_{SS}	---	$0.3 \times V_{DD}$	V

*Note: -This voltage will change approximately -10mv/°C.

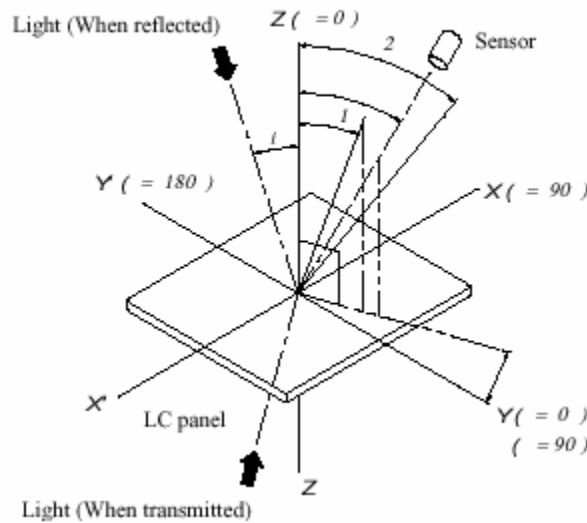
2.2 AC Electrical Characteristics

Please refer to the Phillips PCF8576 Data Sheet.

2.3 Optical Characteristics ($V_{OP} = 4.8V$, $T_a = 25^{\circ}C$)

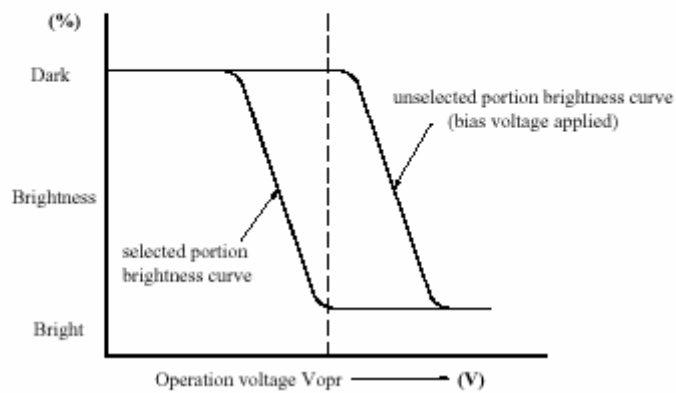
Item	Symbol	Condition	Min	Typ	Max	Unit
Response time	Tr	---	---	100	200	ms
	Tf	---	---	210	340	ms
Frame Frequency	fFRM	---	---	64	---	Hz
Contrast ratio (TN)	Cr	---	---	3.5	---	---
Viewing angle range	θ_1	25° C	65	--	115	Deg
	θ_2		-20	--	20	Deg

* Definition of angles ϕ and θ

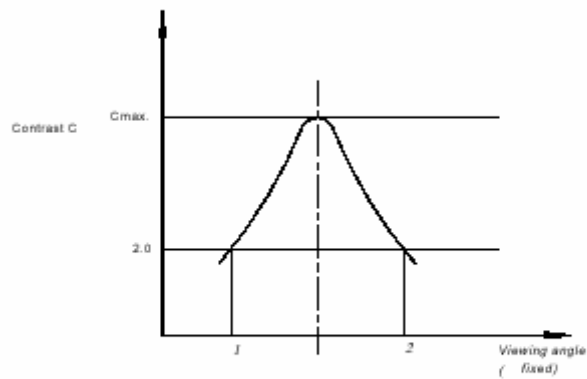


*Definition of contrast C

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

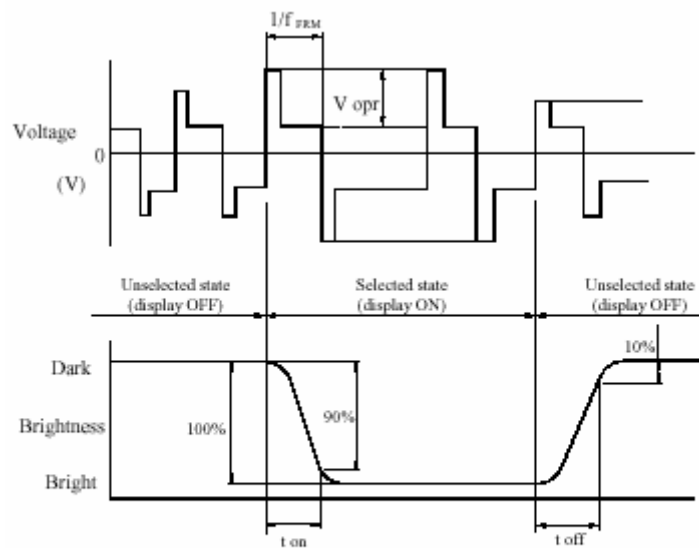


* Definition of viewing angles θ_1 and θ_2



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

* Definition of response time



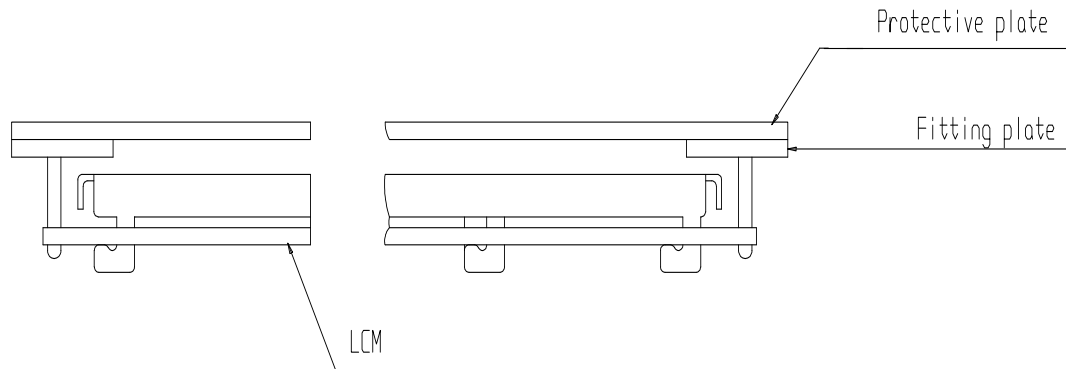
V_{opr} : Operating voltage (V) t_{on} : Response time (rise) (ms)
 f_{FRM} : Frame frequency (Hz) t_{off} : Response time (fall) (ms)

5. PRECAUTIONS FOR USING LCD MODULES

Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

- 1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



- 2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ± 0.1 mm.

Precaution for Handling LCD Modules

Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- 1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.
- 2) Do not alter, modify or change the shape of the tab on the metal frame.
- 3) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- 4) Do not damage or modify the pattern writing on the printed circuit board.
- 5) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- 6) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- 7) Do not drop, bend or twist LCM.

Electro-Static Discharge Control

Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC.

- 1) Make certain that you are grounded when handling LCM.
- 2) Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.
- 3) When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
- 4) When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- 5) As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- 6) To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.

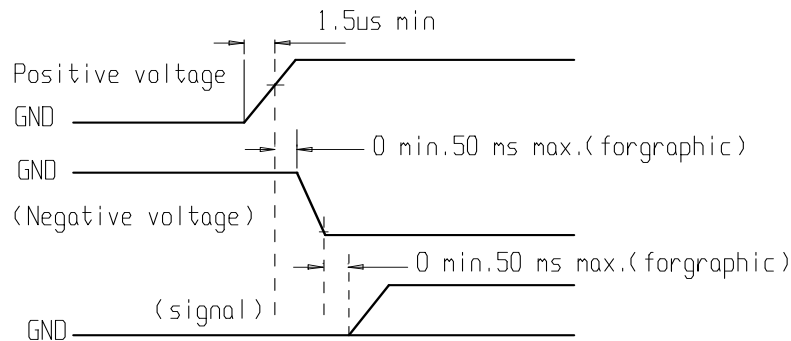
Precaution for soldering to the LCM

- 1) Observe the following when soldering lead wire, connector cable and etc. to the LCM.
 - a) Soldering iron temperature : $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$.
 - b) Soldering time : 3-4 sec.
- 2) Solder : eutectic solder.

- 3) If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.
- 4) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.
- 5) When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

Precautions for Operation

- 1) Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.
- 2) Driving the LCD in the voltage above the limit shortens its life.
- 3) Response time is greatly delayed at temperature below the operating temperature range. However, this does not mean the LCD will be out of the order. It will recover when it returns to the specified temperature range.
- 4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.
- 5) Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40°C , 50% RH.
- 6) When turning the power on, input each signal after the positive/negative voltage becomes stable.



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

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it or impact.
- If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.
- If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents :
 - Isopropyl alcohol
 - Ethyl alcohol
- Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
 - Water
 - Ketone
 - Aromatic solvents
- Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
- Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
- Do not attempt to disassemble or process the LCD module.
- NC terminal should be open. Do not connect anything.
- If the logic circuit power is off, do not apply the input signals.

- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
 - Be sure to ground the body when handling the LCD modules.
 - Tools required for assembling, such as soldering irons, must be properly grounded.
 - To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
 - The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

Storage

- When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps
- 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 benzene.
- Do not use ketonic solvents (ketone and acetone) or aromatic solvents (toluene and xylene), as they may damage the polarizing plate.

Others:

- Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
- If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
- To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.
 - Exposed area of the printed circuit board.
 - Terminal electrode sections.