



PACIFIC DISPLAY DEVICES

LCD Component Data Sheet **Model Number: 16032-05**

160 x 32 Dot
Graphic LCD Assembly
With SBN-1661/SBN-0080 Graphics Controllers
LED Array & Edge Backlight

CONTENTS

1.	GENERAL INFORMATION	
1.1	Product Overview	2
1.2	Part Options and Numbering System	2
1.3	Absolute Maximum Ratings	3
1.4	Circuit Block Diagram	3
1.5	Mechanical Characteristics	3
1.6	Input Signal Function	4
1.7	LCM Power, Contrast Control and Bias	4
1.8	LCM Schematic	5
1.9	LCM Dimensions	6
2.	ELECTRICAL / OPTICAL CHARACTERISTICS	
2.1	DC Electrical Characteristics	7
2.2	AC Electrical Characteristics	8
2.3	Optical Characteristics	9
2.4	LED Backlight Characteristics	10
3.	LCD CONTROLLER CHARACTERISTICS	
3.1	LCD Controller Display and Control Functions	11
4.	RELIABILITY	12
5.	PRECAUTIONS FOR USING LCD MODULES	13

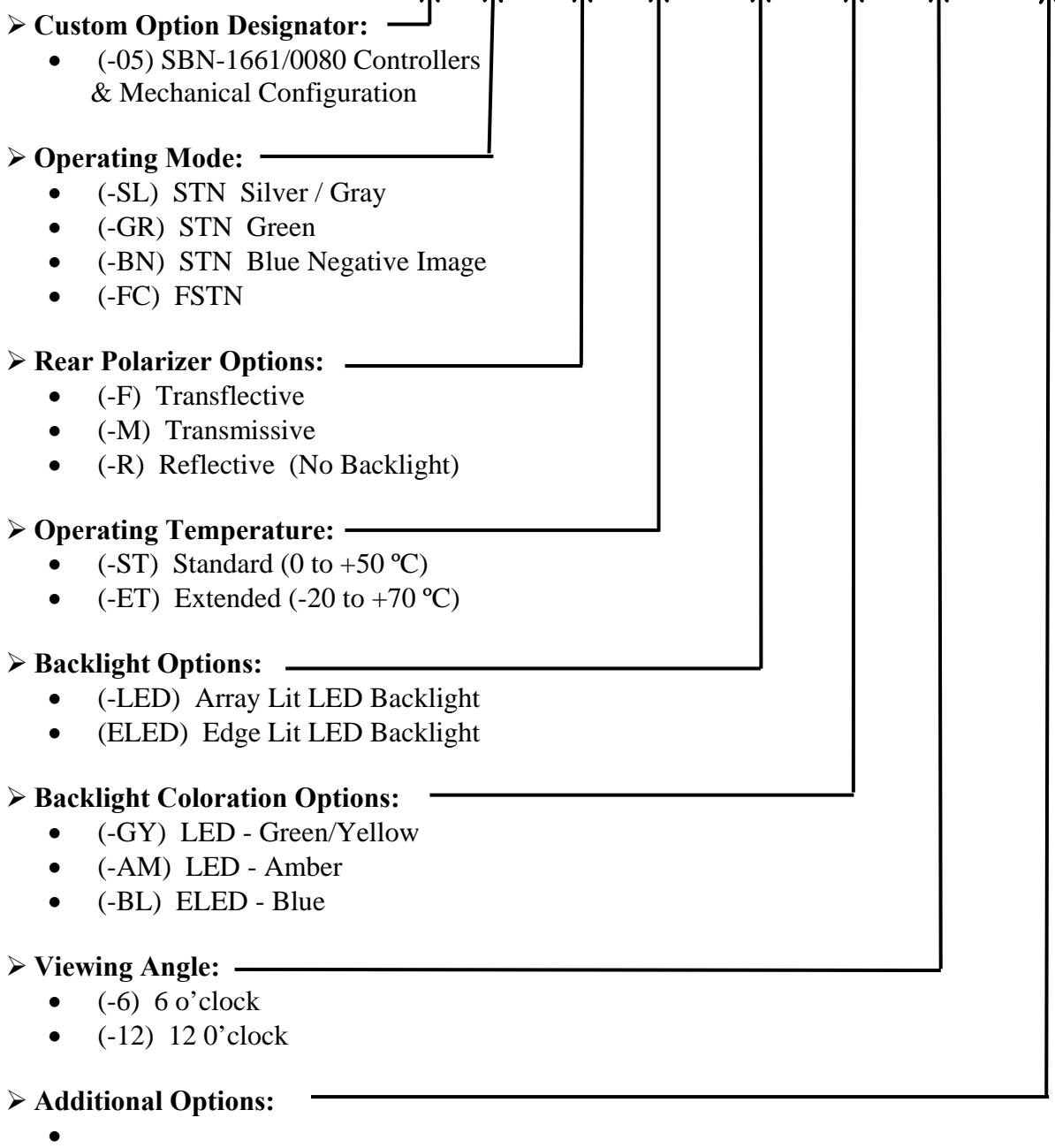
1. GENERAL INFORMATION

1.1 Product Overview

- 160 x 32 dot matrix LCD
- FSTN & STN Technology
- SBN-1661/0080 (or equivalent) Graphics Controllers
- Multiplex drive : 1/32 duty, 1/6 bias
- LCD Module Service Life: 100,000 hours minimum

1.2 Part Options and Numbering System

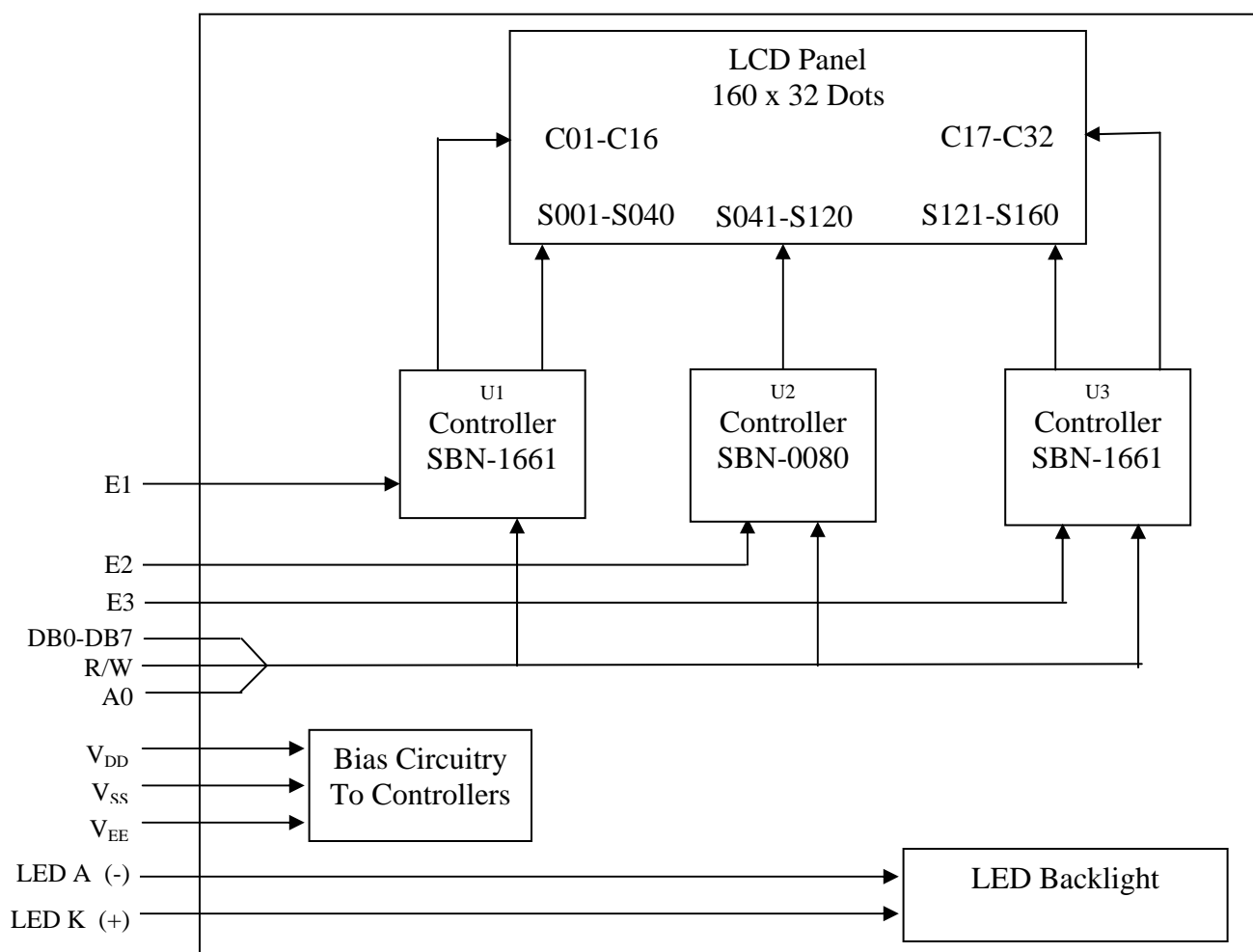
16032	-05	-FC	-F	-ET	-LED	-GY	-6	
-------	-----	-----	----	-----	------	-----	----	--



1.3 Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	$V_{DD} - V_{SS}$	-0.3	7.0	V
Supply voltage for LCD	$V_{DD} - V_{LCD}$	-0.3	13.0	V
Input voltage	V_I	-0.3	$V_{DD} + 0.3$	V
Standard Operating temperature	TOP (-ST)	0	50	°C
Standard Storage temperature	TST (-ST)	-10	60	°C
Extended Operating temperature	TOP (-ET)	-20	70	°C
Extended Storage temperature	TST (-ET)	-30	80	°C
Soldering Temp	Tsolder	260		°C

1.4 Circuit Block Diagram



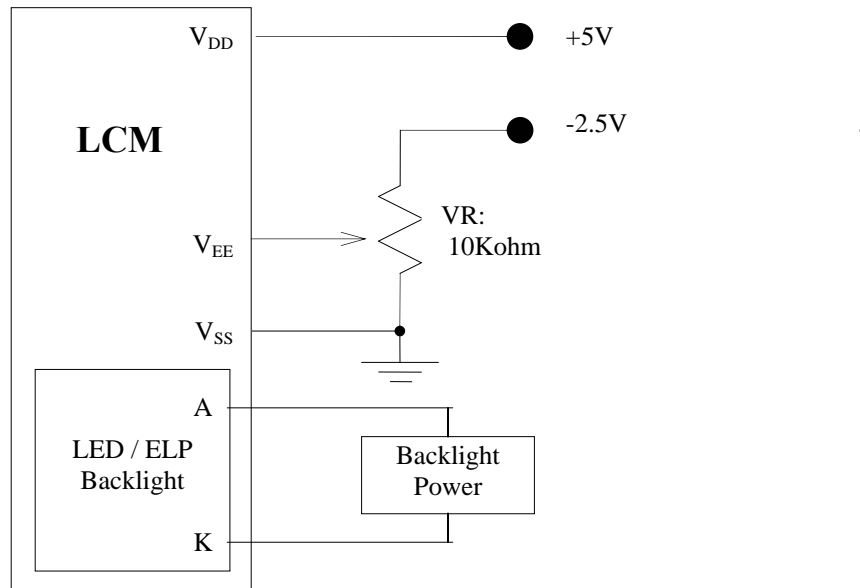
1.5 Mechanical Characteristics

Item	Contents	Unit
Module size (W×H×T)	116.0 x 44.0 x 13.6 Max (LED Backlight) 116.0 x 44.0 x 10.5 Max (Reflective)	mm
Viewing area (W×H)	99.0 x 24.0	mm
Active area (W×H)	94.36 x 18.84	mm
Number of dots	160 x 32	dots
Dot size (W×H)	0.55 x 0.55	mm
Dot pitch (W×H)	0.59 x 0.59	mm

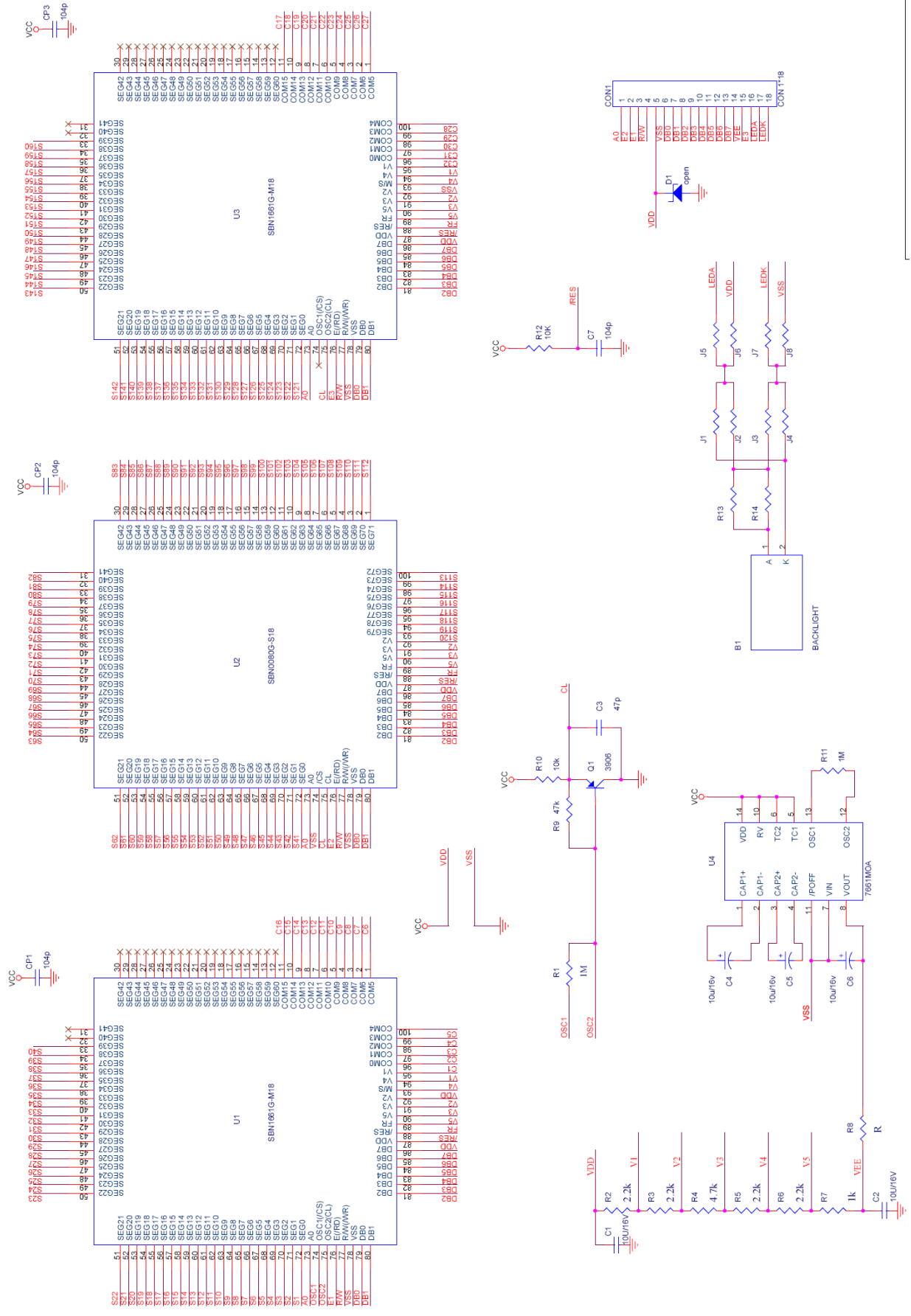
1.6 Input Signal Function

Pin No.	Symbol	Description
1	A0	H : Data signal, L : Instruction signal
2	E2	Chip select signal for SBN-0080 (U2)
3	E1	Chip select signal for SBN-1661 (U1)
4	R/W	Read Data (H) / Write Data (L)
5	V _{DD}	Supply voltage for logic
6	V _{SS}	Ground
7	DB0	Data bit 0
8	DB1	Data bit 1
9	DB2	Data bit 2
10	DB3	Data bit 3
11	DB4	Data bit 4
12	DB5	Data bit 5
13	DB6	Data bit 6
14	DB7	Data bit 7
15	V _{EE}	Input voltage for LCD backplane (Contrast)
16	E3	Chip select signal for SBN-1661 (U3)
17	LED-A	LED Backlight Anode
18	LED-K	LED Backlight Cathode

1.7 LCM Power, Contrast Control and Bias



1.8 LCM Schematic

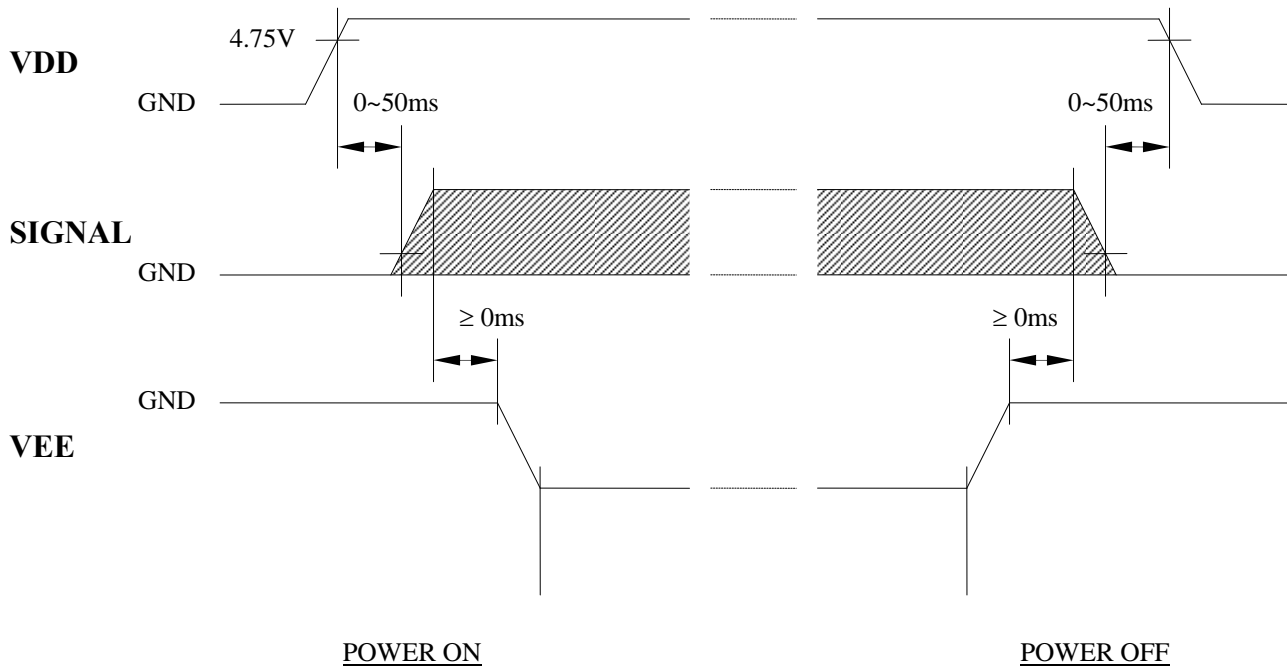


2. ELECTRICAL / OPTICAL CHARACTERISTICS

2.1 DC Electrical Characteristics ($V_{DD} = +5V \pm 10\%$, $V_{SS} = 0V$, $T_a = 25^\circ C$)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Supply voltage for logic	V_{DD}	---	2.7	3.3 or 5.0	5.5	V
Supply current for logic	I_{DD}	---	---	0.3	1.0	mA
Operating voltage for LCD	$V_{DD} - V_{EE}$	0°C	6.15	6.55	6.95	V
		20°C	5.95	6.35	6.75	
		50°C	5.75	6.15	6.55	
Input voltage 'H' level	V_{IH}	---	$0.7 V_{DD}$	---	V_{DD}	V
Input voltage 'L' level	V_{IL}	---	0	---	$0.3 V_{DD}$	V

■ TIMING OF POWER SUPPLY



Note : The missing pixels may occur when the LCM is driven except above power supply timing sequence.

2.2 AC Electrical Characteristics

Please refer to the SBN-1661/0080 Graphics Controller Data Sheets

They can be found on the Pacific Display Devices web site:

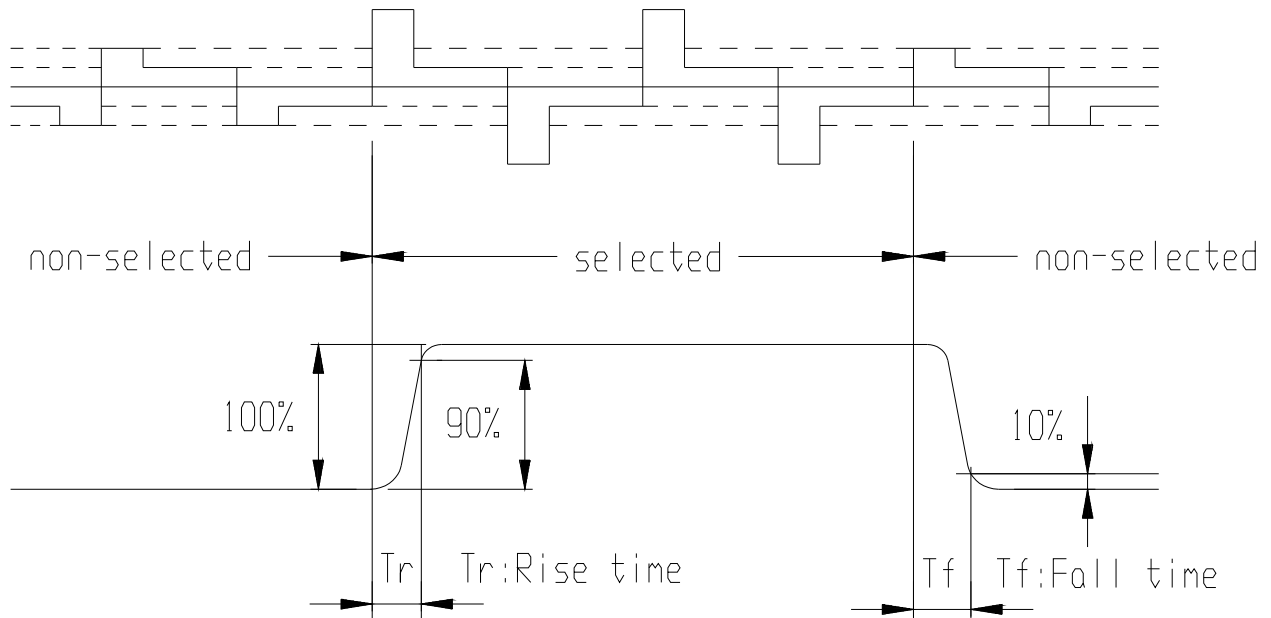
http://www.pacificdisplay.com/lcd_ics.htm

They are manufactured by Avant Electronics

2.3 Optical Characteristics ($V_{OP} = 4.7V$, $T_a = 25^\circ C$, FSTN Technology)

Item	Symbol	Condition	Min	Typ	Max	Unit	Remarks	Note
Response time	T_r	---	---	32	250	ms	---	1
	T_f	---	---	103	250	ms	---	1
Frame Frequency	f_F	---	32	70	128	Hz	---	---
Contrast ratio	Cr	---	---	8	---	---	---	2
Viewing angle range	θ	$Cr \geq 2$	31	---	---	deg	$\varnothing = 90^\circ$	3
			30	---	---	deg	$\varnothing = 270^\circ$	3
			53	---	---	deg	$\varnothing = 0^\circ$	3
			39	---	---	deg	$\varnothing = 180^\circ$	3

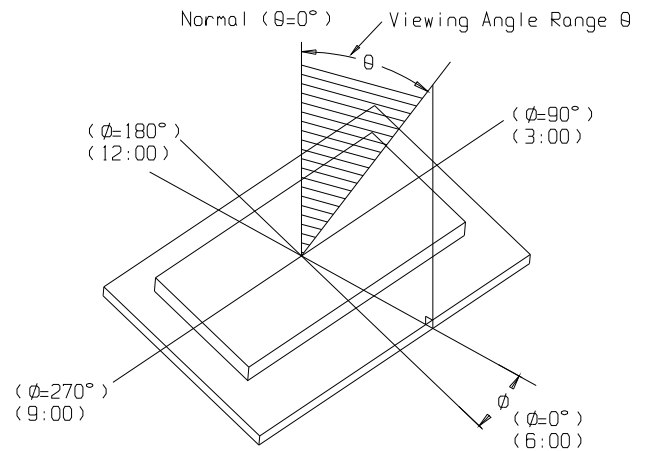
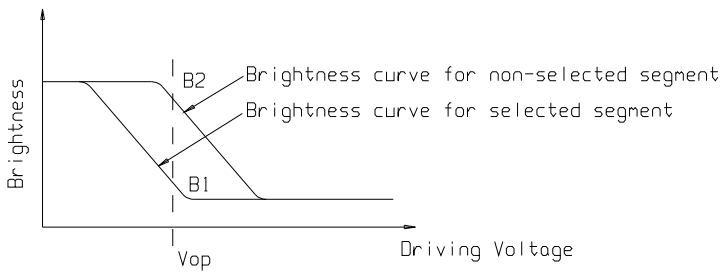
Note1: Definition of response time.



Note2: Definition of contrast ratio 'Cr' .

Note3: Definition of viewing angle range 'θ'.

$$Cr = \frac{\text{Brightness of non-selected segment}(B2)}{\text{Brightness of selected segment}(B1)}$$



2.4 LED Backlight Characteristics

■ **Yellow-Green LED Operating Characteristics (Array Lit)**

Item	Symbol	Conditions	Standard			Unit
			Min.	Typ.	Max.	
Forward voltage	V_f	---	3.9	4.1	4.3	VDC
Forward Current	I_F	---	---	260	520	mA

Item	Conditions	Standard		Unit
		Min.	Max.	
Life	$T_a = 25\text{ }^\circ\text{C}$	100,000	---	hrs

■ **Blue LED Operating Characteristics (Edge Lit)**

Item	Symbol	Conditions	Standard			Unit
			Min.	Typ.	Max.	
Forward voltage	V_f	---	3.0	3.2	3.5	VDC
Forward Current	I_F	---	---	80	120	mA

Item	Conditions	Standard		Unit
		Min.	Max.	
Life	$T_a = 25\text{ }^\circ\text{C}$	45,000	---	hrs

3. OPERATING PRINCIPALS AND METHODS

3.1 LCD Controller Display and Control Functions

Please refer to the SBN-1661/0080 Graphics Controller Data Sheets

They can be found on the Pacific Display Devices web site:

http://www.pacificdisplay.com/lcd_ics.htm

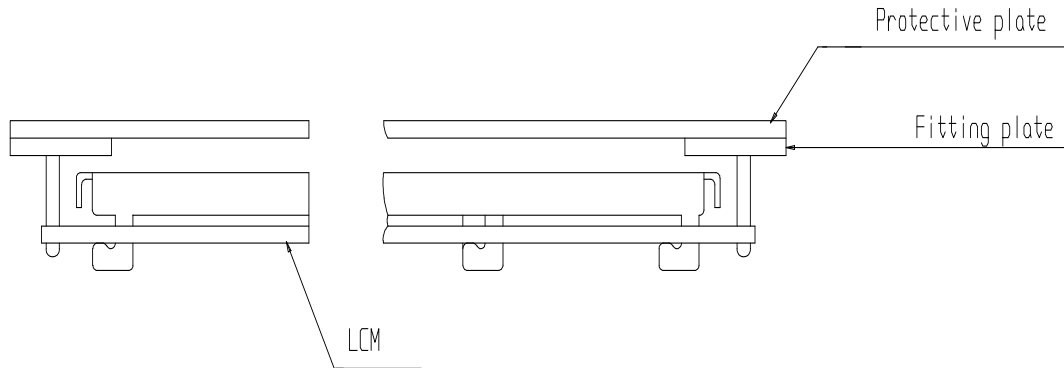
They are manufactured by Avant Electronics

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 (VLCD). Adjust VLCD 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.

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.