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Surenoo SLC1602J Series LCD Module User Manual

Contents

Surenoo SLC1602J Series LCD Module

Shenzhen Surenoo Technology Co.,Ltd. SLC1602J Series LCD Module User Manual

The SLC1602J Series is a character LCD module designed and manufactured by Shenzhen Surenoo Technology Co.,Ltd. The model number for this product is 3ASLC1602J. For more information and to purchase a sample, please visit **www.surenoo.com**.

Specification
The SLC1602J Series LCD Module has the following specifications:

- Display Specification: 16 characters x 2 lines
- Mechanical Specification: 80.0mm x 36.0mm x 12.0mm
- Electrical Specification: 5V DC
- Optical Specification: STN Blue, STN Yellow-Green, FSTN Positive, FSTN Negative

Usage Instructions
The SLC1602J Series LCD Module is designed to display up to 16 characters per line and up to 2 lines of text. The module requires a 5V DC power supply to operate.

Pin Configuration
The pin configuration for the SLC1602J Series LCD Module is as follows:

- Pin 1: Ground
- Pin 2: Power Supply (5V DC)
- Pin 3: Contrast Adjustment
- Pin 4: RS (Register Select)
- Pin 5: R/W (Read/Write)
- Pin 6: Enable
- Pin 7-14: Data Bus (DB0-DB7)
- Pin 15: Backlight Anode (+)
- Pin 16: Backlight Cathode (-)

Electrical Characteristics
The SLC1602J Series LCD Module has the following electrical characteristics:

- Operating Voltage: 5V DC
- Operating Current: 1mA (without backlight), 100mA (with backlight)
- Power Consumption: 500mW (without backlight), 1000mW (with backlight)

Backlight
The SLC1602J Series LCD Module has a built-in backlight that can be turned on and off using a jumper on the back of the module. The backlight requires a separate power supply and can be connected to pins 15 and 16.

Shenzhen Surenoo Technology Co.,Ltd.
www.surenoo.com
Skype: Surenoo365

ORDERING INFORMATION

SLC1602J Series Table

SURENOO CHARACTER DISPLAY										
Model No.	Interface	Display	Outline Size (MM)	Viewing Area (MM)	Area Area (MM)	Voltage (V)	Controller	Mark	Color Code	IMAGE
SLC1602J	I2C/SPI	16*02	80.00*36.00	64.50*16.00	56.20*11.50	5.0V	AIP31068 or Equal		YGYIT BLWIT FPWIT FNWIT	

SLC1602J Series Image
*The number of series image is in accordance with number of the above series table 1.1.

16X02 IIC/SPI Character Display

SPECIFICATION

Display Specification

6I0BT57B54B4E7B M	6S1B58B5T5B48B **ANDARD VALUE**	6U2B59B56NB49B **IT**
6R3B60B57eB50B solution	614B61B658B Characters x 2 Lines	-65B6-2B59B52B
6D6B63B60iB6s8B play Connector	6P7B64B6i1B6n9B Header, 16 Pins / 4P-1.0 Connector	6-8B6-5B62B70B
7O0B67B64Bp86B erating Temperature	-71B628B65B807B ~ +70	7°C2B69B66B88B
7S3B70B6t7B8o9B rage Temperature	7-4B731B68B900B ~ +80	7°C5B72B69B91B
Touch Panel Optional	N/A	-81B7-8B75B
F82B79B7o6B nt Chip Optional	8N3B80B77/B A	—
8*2B79SB76B unlight Readable		8-4B8-1B78B

Mechanical Specification

| 8I6BT83B80B **EM**	8S7B84B8T1B **ANDARD VALUE**	8U8B85B82NB **IT**
8O9B86B83Butline Dimension	890B87B084B .0(W) ×36.0(H) × 13.0(T) (MAX)	9m1B88B85B m
V92B89B8i6Bsual Area	64.50(W) × 16.00(H)	9m3B90B87B m
9A4B91B8c8B tive Area	56.20(W) × 11.50(H)	m95B92B89B m
Character Size	2.96(W) × 5.56(H)	mm
9D6B93B90oB83B t Size	907B94B.91B584B 6 × 0.66	9m8B95B92B m85B
9D9B96B93oB t Pitch	0100B97.B946B 0 × 0.70	m101B98B95 mB
1N02B99B9e6B92B t Weight	1303B1020B97B9.3B 0 ± 15% grams (typical)	g104B101B98B 94B

Electrical Specification

I106TB103B10E0B **M**	S107B104TB101B **ANDARD VALUE**	1U08B105BN102B **IT**
1I09CB106B103B71PB ackage	1C10B107BO104B72B B	1-11B-108B105B
C112B109Bo106B71nB troller	11A3B110B1I07BP72 31068L or Equivalent	-114B-111B108B
1I15nB112B1t09Be95B rface	1I16B1213B11C0B96B MPU Interface default OR 3-SPI MPU Interface	-117B-114B111B

Optical Specification

1I19TB116B11E3B **M**	1S20B117TB114B **ANDARD VALUE**	1U21B118BN115B **IT**
1L22B11C9B116B53DB Type	R123B120Be117B54fB er to 1.1 SLC1602J Series Table	1-24B-121B118B55B
1B25B122aB119B6c5B klight Color	1R26B123Be120B66fB er to 1.1 SLC1602J Series Table	-127B-124B121B67B
V128B125iB12e2B62Bwing Direction	6129B12:6B1023B63B0	1C30B127Bl12o4B64Bck
1L31B12C8B125B56DB Duty	1132B12/9B1126B57B6	D133B130Bu127B58tBy
L134B13C1B128B59DB Bias	1135B13/2B1529B60B	B136B133iB13a0B61Bs

## OUTLINE DRAWING
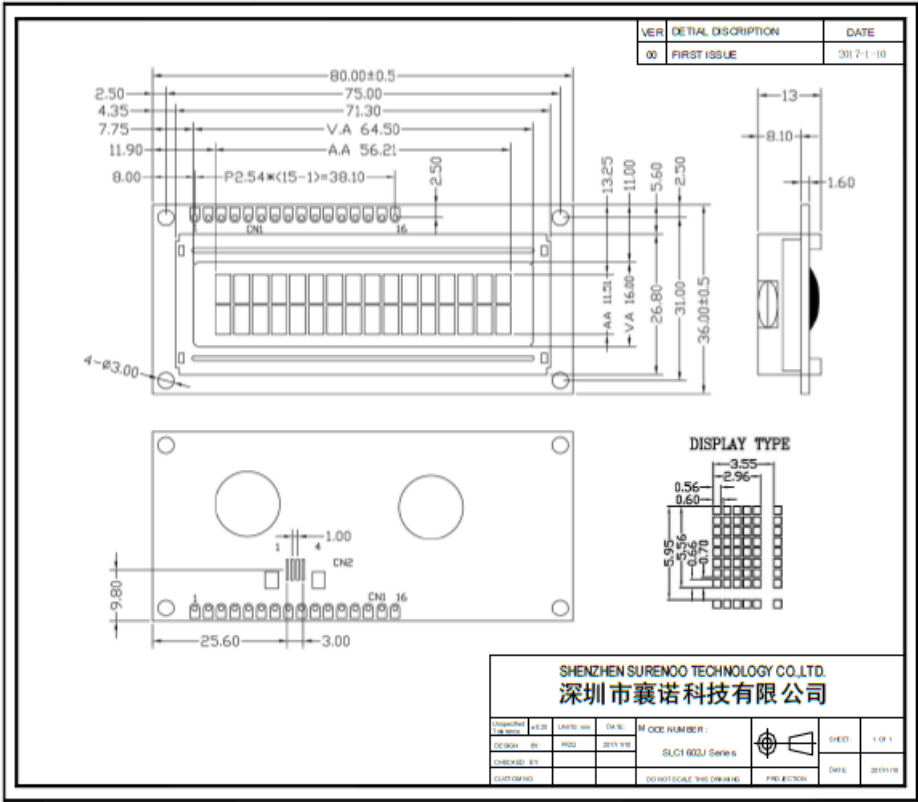
ELECTRICAL SPEC

Pin Configuration
CN1:

ITEM	SYMBOL	LEVEL	FUNCTION
1	VSS	0V	Power Ground
2	VDD	+5.0V	Power Supply For Logic
3	V0	—	Contrast Adjust
4	SCL	H/L	Serial Clock
5	SDA	H/L	Serial Data
6	CSB	L	Chip selection signal. Active "L".(IIC:No connection)
7~14	NC	—	No connection
15	LEDA	+5.0V	Power Supply For LED Backlight
16	LEDK	0V	

NOTE: IIC(default) :IIC short, SPI open; 3-SPI: IIC open, SPI short. CN2:

ITEM	SYMBOL	LEVEL	FUNCTION
1	VSS	0V	Power Ground
2	VDD	+5.0V	Power Supply For Logic
3	SCL	H/L	Serial Clock
4	SDA	H/L	Serial Data

BLOCK DIAGRAM

POWER SUPPLY

VDD-V0=Operating voltage for LCD
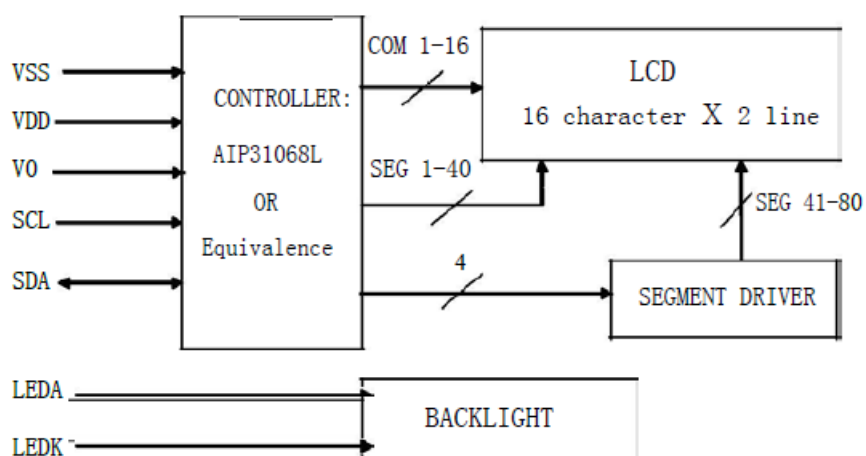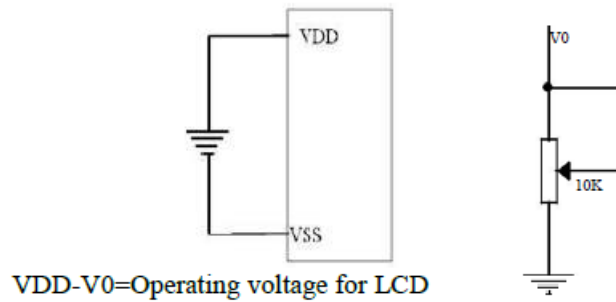
DC Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Logic Supply Voltage	VDD	–	3.0	5.0	5.5	V
Input High Voltage	VIH	–	0.8VDD	–	VDD	V
Input Low Voltage	VIL	–	GND	–	0.3VDD	V
Output High Voltage	VOH	–	0.7VDD	–	VDD	V
Output Low Voltage	VOL	–	GND	–	0.2VDD	V

VDD = 5.0V ± 0.2V, GND = 0V, Ta = 25°C

Backlight Characteristics
LCD Module without LED Backlight Electrical / Optical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	Vf	If=20mA	4.8	5.0	5.2	V
Reverse Current	Ir	If=5v			—	uA
Average Brightness	IV	If=20mA				cd/m2
Wavelength (Without LCD)	λd	If=20mA	—	—	—	nm
Luminous Intensity (without LCD)	Lv Sub	If=20mA				cd/m2
Uniformity	Δ%	IVMin / IVMax *100%	—	–	–	%
Color	WHITE					

INSPECTION CRITERIA

Acceptable Quality Level
Each lot should satisfy the quality level defined as follows

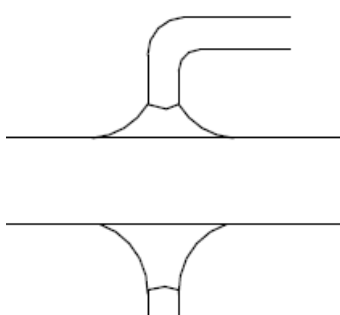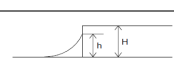| 2P89B286AB283B **RTITION**	2A90B287B**Q**284B **L**	2D91B288B**E**285B **FINITION**
2A92B289.B286B Major	2093B29.0B2487B %	2F94B291uB288Bnctional defective as product
2B95B292.B289B Minor	1296B29.3B2590B %	2S97B294aB291B tisfy all functions as product but not satisfy cosmetic stanard

Definition of Lot
One lot means the delivery quantity to customer at one time.

Condition of Cosmetic Inspection

- INSPECTION AND TEST
    - FUNCTION TEST
    - APPEARANCE INSPECTION
    - PACKING SPECIFICTION
- INSPECTION CONDITION
    - Put under the lamp (20w¡Á2) at a distance 100mm from
    - Tilt upright 45 degree by the front (back) to inspect LCD appearance.
    - AQL INSPECTION LEVEL
    - SAMPLING METHOD: MIL-STD-105D
    - SAMPLING PLAN: SINGLE
    - MAJOR DEFECT: 0.4% (MAJOR)
    - MINOR DEFECT: 1.5% (MINOR)
    - GENERAL LEVEL: II/NORMAL

Module Cosmetic Criteria

NO.	Item	Judgment Criterion	Partition
1	Difference in Spec.	None allowed	Major
2	Pattern Peeling	No substrate pattern peeling and floating	Major
3	Soldering defects	No soldering missing	Major
		No soldering bridge	Major
		No cold soldering	Minor
4	Resist flaw on substrate	Invisible copper foil(0.5mm or more)on substrate pattern	Minor
5	Accretion of metallic Foreign matter	No soldering dust	Minor
		No accretion of metallic foreign matters(Not exceed 0.2 mm)	
6	Stain	No stain to spoil cosmetic badly	Minor

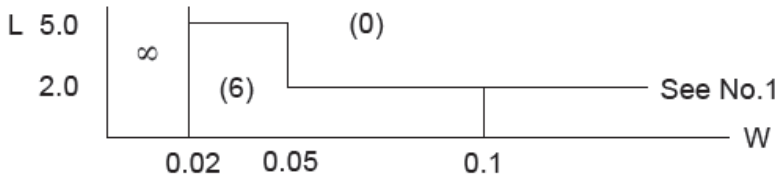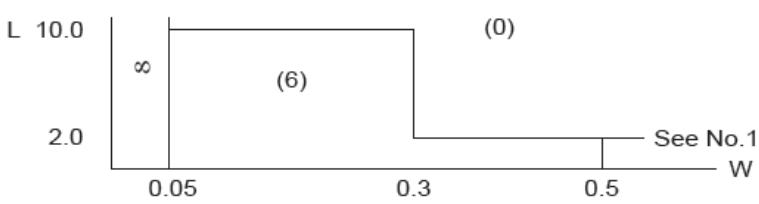|	7	Plate discoloring	No plate fading,rusting and discoloring				Minor
	8	Solder amount 1.Lead parts	Soldering side of PCB Solder to form a'Filet' all around the lead. Solder should not hide the lead form perfectly.(too much) Components side (In case of 'Through Hole PCB')Solder to reach the Components side of PCB				Minor
		2.Flat packages	Either 'toe'(A) or 'heal' (B) of the lead to be covered by 'Filet Lead form to be assume over Solder.				Minor
		3.Chips	(3/2) H≧h≧(1/2)H				Minor
9		Backlight defects	1. Light fails or flickers.(Major) 2. Color and luminance do not correspond to specifications. (Major) 3. Exceeds standards for display's blemishes, foreign matter, dark lines or scratches.(Minor)		See list ←		
10		PCB defects	1. Oxidation or contamination on connectors.* 2. Wrong parts, missing parts, or parts not in specification.* 3. Jumpers set incorrectly.(Minor) 4. Solder(if any)on bezel,LED pad,zebra pad,or screw hole pad is not smooth.(Minor) *Minor if display functions correctly.Major if the display fails.		See list ←		

| 11 | Soldering defects | 1. Unmelted solder paste.
2. Cold solder joints,missing solder connections,or oxidation.*
3. Solder bridges causing short circuits.*
4. Residue or solder balls.
5. Solder flux is black or brown.
 *Minor if display functions correctly.Major if the display fails. | Minor | |
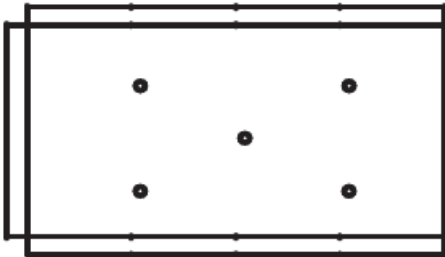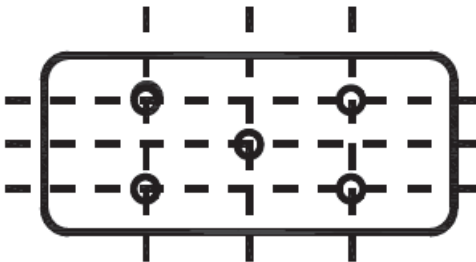
Screen Cosmetic Criteria (Non-Operating)

No.	Defect	Judgment Criterion		Partition
1	Spots	In accordance with Screen Cosmetic Criteria (Operating) No.1.		Minor
2	Lines	In accordance with Screen Cosmetic Criteria (Operation) No.2.		Minor
3	Bubbles in Polarizer	Size: d mm	Acceptable Qty in active area	Minor
		d≦0.3 0.3<d≦1.0	Disregard 3	
		1.0<d≦1.5	1	
		1.5<d	0	
4	Scratch	In accordance with spots and lines operating cosmetic criteria, When the Light reflects on the panel surface, the scratches are not to be remarkable.		Minor
5	Allowable density	Above defects should be separated more than 30mm each other.		Minor
6	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-lit type should be judged with back-lit on state only.		Minor
7	Contamination	Not to be noticeable.		Minor

Screen Cosmetic Criteria (Operating)

No.	Defect	Judgment Criterion		Partition	
		A) Clear			
		Size:d mm	Acceptable Qty in active area		
		d≦0.1 0.1<d≦0.2 0.2<d≦0.3 0.3<d	Disregard 6 2 0		

1	Spots	Note: Including pin holes and defective dots which must be within one pixel Size. B) Unclear		Minor	
		Size:d mm	Acceptable Qty in active area		
		d≦0.2 0.2<d≦0.5 0.5<d≦0.7 0.7<d	Disregard 6 2 0		
2	Lines	Clear Note: () – Acceptable Qty in active area L – Length (mm) W -Width(mm) ∞-Disregard Unclear 		Minor	
3	Rubbing line	Not to be noticeable.			
4	Allowable density	Above defects should be separated more than 10mm each other.		Minor	
5	Rainbow	Not to be noticeable.		Minor	
6	Dot size	To be 95%~105%of the dot size (Typ.) in drawing.		Minor	
		Partial defects of each dot (ex.pin-hole) should be treated as'spot'. (see Screen Cosmetic Criteria (Operating) No.1)			

7	Brightness (only back-lit Module)	Brightness Uniformity must be BMAX/BMIN≦2 • BMAX :Max.value by measure in 5 points • BMIN : Min.value by measure in 5 points Divide active area into 4 vertically and horizontally. Measure 5 points shown in the following figure.	Minor	
8	Contrast Uniformity	Contrast Uniformity must be BmAX/BMIN≦2 Measure 5 points shown in the following figure. Dashed lines divide active area into 4 vertically and horizontally. Measuring points are located at the inter-sections of dashed line. **Note:** BMAX – Max.value by measure in 5 points. BMIN – Min.value by measure in 5 points. O – Measuring points in 10mm.	Minor	

Note:

1. Size : d=(long length + short length)/2
2. The limit samples for each item have priority.
3. Complexed defects are defined item by item, but if the number of defects is defined in above table, the total number should not exceed 10.

'Clear' = The shade and size are not changed by Vo.
'Unclear' = The shade and size are changed by Vo.

PRECAUTIONS FOR USING

Handling Precautions

• This device is susceptible to Electro-Static Discharge (ESD) damage. Observe Anti-Static precautions. display panel is made of glass. Do not subject it to a mechanical shock by dropping it or impact. If 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 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 Isopropyl or alcohol.

- Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the Water.
- 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 cable or the backlight cable.
- Do not attempt to disassemble or process 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 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.

Power Supply Precautions

- Identify and, at all times, observe absolute maximum ratings for both logic and LC drivers. Note that there is some variance between models.
- Prevent the application of reverse polarity to VDD and VSS, however briefly.
- Use a clean power source free from transients. Power-up conditions are occasionally jolting and may exceed the maximum ratings of modules.
- The VDD power of module should also supply the power to all devices that may access the display. Don't allow the data bus to be driven when the logic supply to the module is turned off.

Operating Precautions

- DO NOT plug or unplug module when the system is powered up.
- Minimize the cable length between module and host MPU.
- For models with backlights, do not disable the backlight by interrupting the HV line. Unload inverters produce voltage extremes that may arc within a cable or at the display.
- Operate module within the limits of the modules temperature specifications.

Mechanical/Environmental Precautions

- Improper soldering is the major cause of module difficulty. Use of flux cleaner is not recommended
- Bas they may seep under the electrometric connection and cause display failure.

- Mount module so that it is free from torque and mechanical stress.
- Surface of the LCD panel should not be touched or scratched. The display front surface is an easily scratched, plastic polarizer. Avoid contact and clean only when necessary with soft, absorbent cotton dampened with petroleum benzene.
- Always employ anti-static procedure while handling module.
- Prevent moisture build-up upon the module and observe the environmental constraints for storage tem
- Do not store in direct sunlight
- If leakage of the liquid crystal material should occur, avoid contact with this material, particularly ingestion.
- If the body or clothing becomes contaminated by the liquid crystal material, wash thoroughly with water and soap

Storage Precautions

- When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.
- Keep modules in bags (avoid high temperature / high humidity and low temperatures below 0C
- Whenever possible, LCD modules should be stored in the same conditions in which they were shipped from our company.

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 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.

USING LCD MODULES H H

Liquid Crystal Display Modules
LCD is composed of glass and polarizer. Pay attention to the following items when handling.

- Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.
- Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.).
- N-hexane is recommended for cleaning the adhesives used to attach front/rear polarizers and reflectors made of organic substances which will be damaged by chemicals such as acetone, toluene, ethanol and isopropylalcohol.

- When display surface becomes dusty, wipe gently with absorbent cotton or other soft material like chamois soaked in petroleum benzin. Do not scrub hard to avoid damaging the display surface.
- Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading.
- Avoid contacting oil and fats.
- Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizers. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
- Do not put or attach anything on display area to avoid leaving marks on.
- Do not touch the display with bare hands. This will stain the display area and degradate insulation between terminals (some cosmetics are determinated to the polarizers).
- As glass is fragile. It tends to become or chipped during handling especially on the edges. Please Bavoid dropping or jarring.

Installing LCD Modules

- Cover the surface with a transparent protective plate to protect the polarizer and LC cell.
- 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±0.1mm.

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.
- Do not alter, modify or change the shape of the tab on the metal frame.
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Do not damage or modify the pattern writing on the printed circuit board.
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- 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.
- Make certain that you are grounded when handing LCM.
- 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.
- When soldering the terminal of LCM, make certain the AC power source for the soldering iron does not leak.
- 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

- As far as possible make the electric potential of your work clothes and that of the work bench the ground potential.
- 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 LCM

- Observe the following when soldering lead wire, connector cable and etc. to the LCM.
- Soldering iron temperature : 280℃±10℃
- Soldering time: 3-4 sec.
- Solder: eutectic solder.
- 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.
- 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.
- 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.

Precaution for Operation

- Viewing angle varies with the change of liquid crystal driving voltage (VO). Adjust VO to show the best contrast.
- Driving the LCD in the voltage above the limit shortens its life.
- 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.
- If 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.
- Condensation on terminals can cause an electrochemical reaction disrupting the terminal circuit. Therefore, it must be used under the relative condition of 40℃, 50% RH.
- When turning the power on, input each signal after the positive/negative voltage becomes stable.

Limited Warranty

Unless agreed between and customer, will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of limited to repair and/or replacement on the terms set forth above. will no Be responsible for any subsequent or consequential events.

Return Policy

- No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are:

- Broken LCD glass.

- PCB eyelet damaged or modified.

- PCB conductors damaged.

- Circuit modified in any way, including addition of components.

- PCB tampered with by grinding, engraving or painting varnish.

- Soldering to or modifying the bezel in any manner.

- BModule repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet's, conductors and terminals

  That's the end of the datasheet

www.surenoo.com

Documents / Resources

Surenoo SLC1602J Series LCD Module [pdf] User Manual
SLC1602J Series LCD Module, SLC1602J Series, LCD Module, Module

References

- **Surenoo Tech: Professional LCD Module Supplier Since 2005**