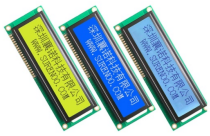
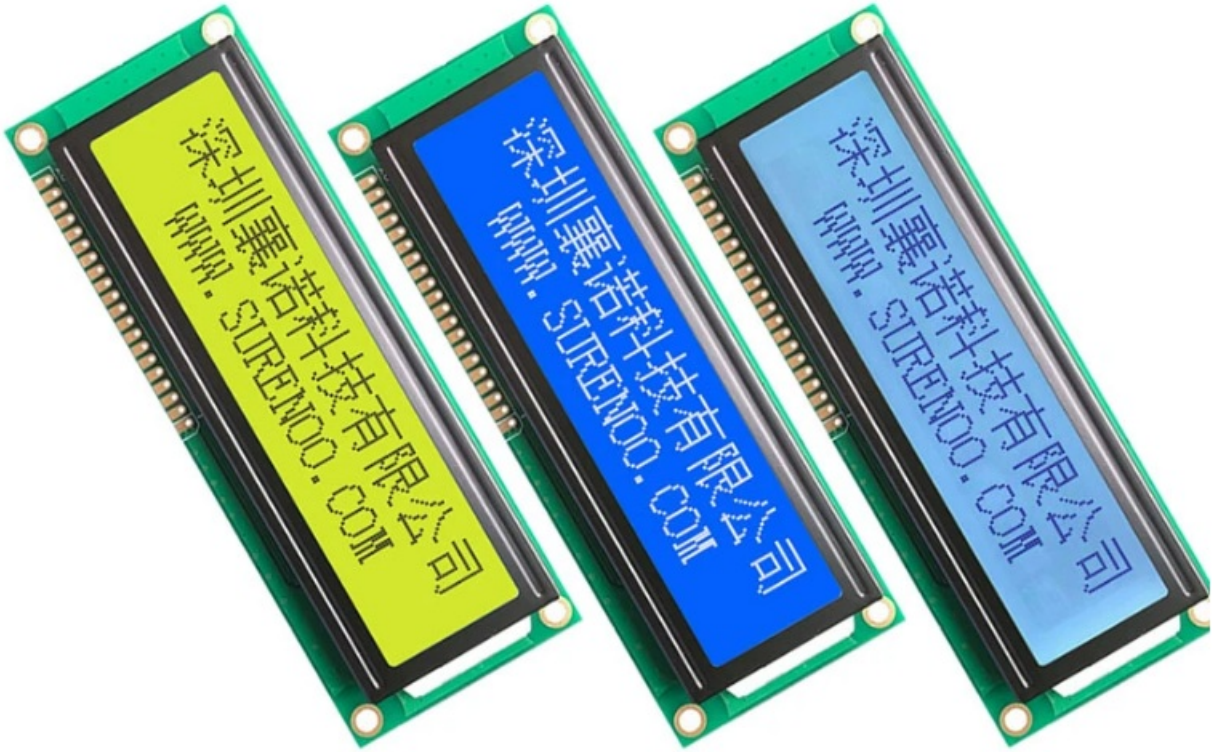


Surenoo SLG16032B Series Graphic LCD Module User Manual

Contents

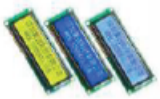
1 Surenoo SLG16032B Series Graphic LCD Module
2 ORDERING INFORMATION
3 SPECIFICATION
4 OUTLINE DRAWING
5 ELECTRICAL SPEC
6 INSPECTION CRITERIA
7 PRECAUTIONS FOR USING
8 USING Graphic MODULES
9 IMAGE STICKING
10 Documents / Resources
10.1 References
11 Related Posts

Surenoo SLG16032B Series Graphic LCD Module



ORDERING INFORMATION

Order Number

Model No.	Display	Size	Outline Size (MM)	Viewing Area (MM)	Area Area (MM)	Interface	Voltage	Controller	MARK	Color Valid	Image
SLG16032B	160*32	3.5"	122.00*44.00	99.00*24.00	89.55*18.19	20P/2.54 8 Bit Parallel Serial SPI	5.0V	ST7920 AIP31020		SURENOO SURENOO SURENOO	

Image

SPECIFICATION

Display Specification

I60B**T**57B54B4**E**7B **M**	6**S**1B58B5**T**5B48B **ANDARD VALUE**	**U**62B59B56**N**B49B **IT**
D63B60B57oB50B t Matrix	614B61B258B51B2 x 32 Dots	-65B6-2B59B52B
6D6B63B60iB6s8B play Connector	6P7B64B6i1B6n9B Header, 20 Pins	6-8B6-5B62B70B
7O0B67B64Bp86B erating Temperature	7-1B628B65B807B ~ +70	7°C2B69B66B88B
7S3B70B6t7B8o9B rage Temperature	7-4B731B68B900B ~ +80	7°C5B72B69B91B
Touch Panel Optional	N/A	-81B7-8B75B
8F2B79B7o6B nt Chip Optional	8N3B80B77/B A	—

Mechanical Specification

8**I**6B**T**83B80B **EM**	8**S**7B84B8**T**1B **ANDARD VALUE**	8**U**8B85B82**N**B **IT**
8O9B86B83Butline Dimension	190B87B284B 2.0(W) × 44.0(H) ×12.9(T) (MAX)	m91B88B85Bm
9V2B89B8i6Bsual Area	99.00(W) × 24.00(H)	9m3B90B87Bm
9A4B91B8c8B tive Area	89.55(W) × 18.19(H)	m95B92B89Bm
9D6B93B90oB83B t Size	0.51×0.52	9m8B95B92Bm85B
9D9B96B93oB t Pitch	0.56×0.57	1m01B98B95mB
1N02B99B9e6B92B t Weight	6103B1000B97B9.3B 0 ± 15% grams (typical)	1g04B101B98B94B

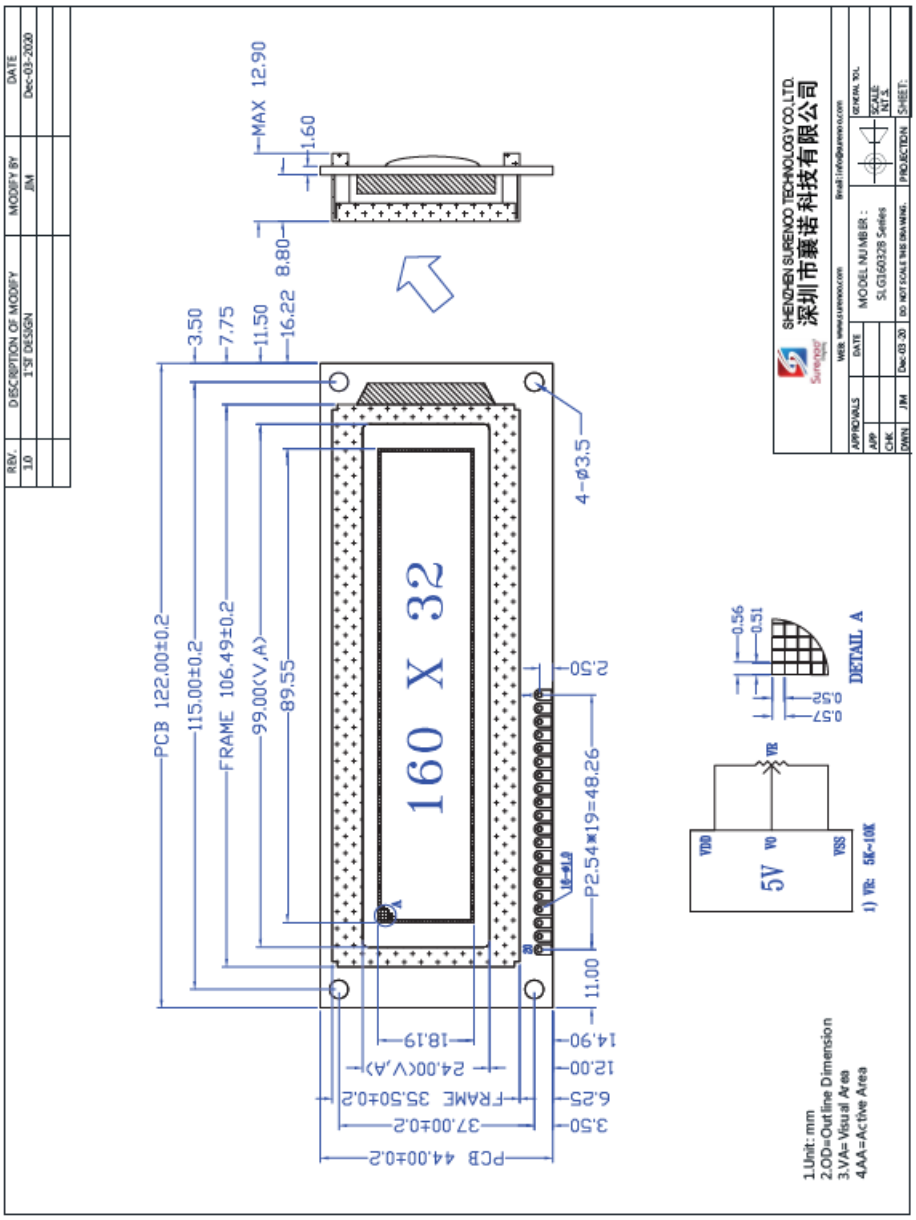
Electrical Specification

1**I**06**T**B103B10**E**0B **M**	1**S**07B104**T**B101B **ANDARD VALUE**	1**U**08B105B**N**102B **IT**
I109CB106B103B71PB ackage	1C10B107BO104B72B B	1-11B-108B105B
1C12B109Bo106B71nB troller	1S13B110BT107B727B 920 / AIP31020	1-14B-111B108B
1I15nB112B1t09Be95B rface	1616B1183B110B096B 0 8-bit Parallel, 6800 4-bit Parallel ,3-Wire SPI	-117B-114B111B

Optical Specification

1**I**19**T**B116B11**E**3B **M**	1**S**20B117**T**B114B **ANDARD VALUE**	1**U**21B118B**N**115B **IT**
1L22B11C9B116B53DB Type	R123B120Be117B54fB er to 1.1 SLG16032B Series Table	1-24B-121B118B55B
1B25B122aB119B6c5B klight Color	1R23B120Be117B54fB er to 1.1 SLG16032B Series Table	-127B-124B121B67B
1V28B125iB12e2B62Bwing Direction	1629B12:6B1023B63B06	1C30B127Bl12o4B64Bck
1L31B12C8B125B56DB Duty	1132B12/9B1326B57B2	1D33B130Bu127B58tBy
1L34B13C1B128B59DB Bias	1135B13/2B1629B60B	1B36B133iB13a0B61Bs

OUTLINE DRAWING



ELECTRICAL SPEC

Pin Configuration

PIN	SYMBOL	LEVEL	DESCRIPTION
1	VSS	0V	Ground
2	VDD	+5.0V	Power Supply For Logic
3	V0	--	Power Supply For LCD
4	RS(cs)	H/L	L:Instrction Code H:Data Code
5	R/W(sid)	H/L	Read/Write Signal
6	E(sclk)	L	Enable Signal
7-14	DB0-DB7	H/L	Data Bus
15	PSB	H	H: Parallel Mode L: Serial Mode
16	NC	--	No Connect
17	/RST	L	Reset Signal
18	NC	--	No Connect
19	LEDA	+5.0V	Power Supply For Backlight(+)
20	LEDK	0V	Power Supply For Backlight(-)

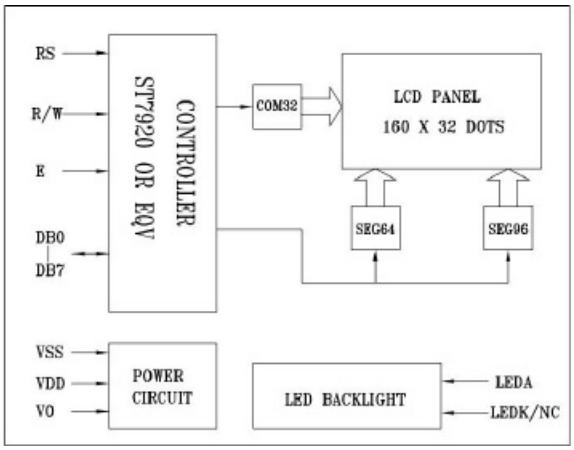
Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	MAX.	UNIT
Power Supply(Logic)	V_{DD}	-0.3	5.5	V
Power Supply(LCD)	V_{LCD}	-0.3	6.0	V
Input Voltage	V_I	-0.3	VDD+0.3	V
Operating Temp.	Topr	-20	+70	°C
Storage Temp.	Tstg	-30	+80	°C

Electrical Characteristics

ITEM	SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNI
Power Supply(Logic)	V_{DD}	--	4.7	5.0	5.3	V
LCD Driving Voltage	VDD-V0	TA=25°C	--	4.5	--	V
Supply Current	I_{DD}	VDD=5.0V	--	60.0	80.0	mA
Input High Voltage	V_{IH}	--	0.7VDD	--	VDD	V
Input Low Voltage	V_{IL}	--	0	--	0.6	V
Output High Voltage	V_{OH}	--	0.8VDD	--	VDD	V
Output Low Voltage	V_{OL}	--	0	--	0.4	V

Block Diagram



INSPECTION CRITERIA

Partition	AQL	Definition
A. Major	0.4%	Functional defective as product
B. Minor	1.5%	Satisfy all functions as product but not satisfy cosmetic standard

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

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 SPECIFICATION

INSPECTION CONDITION

- Put under the lamp (20W) at a distance 100mm from
- Tilt upright 45 degree by the front (back) to inspect Panel 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 0.2mm)	
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	a. Soldering side of PCB Solder to form a'Filet'all around t Solder should not hide the lead f or b. 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. A B	Minor
	3.Chips	(3/2) H≧h≧(1/2)H h 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 lin es or scratches.(Minor)	See list ←
10	PCB Defects	Oxidation or contamination on connectors.* 2. Wrong parts, missing parts, or parts not in specification.* 3.Jumper s set incorrectly.(Minor) 4.Solder(if any)on bezel, LED pad, zebra pad, or screw hole pad is n ot 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			Minor
		Size: d mm	Acceptable Qty in active area	
		d≦0.3 0.3<d≦1.0 1.0<d≦1.5 1.5<d	Disregard 3 1 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 Graphic 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
1	Spots	A) Clear		Minor
		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	
		Note: Including pin holes and defective dots which must be within one pixel Size. Unclear		
		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	A) Clear L 5.0 (0) 2.0 (6) See No.1 W 0.02 0.05 0.1 Note: () – Acceptable Qty in active area L – Length (mm) W -Width(mm) ∞-Disregard B) Unclear L 10.0 (0) (6) 2.0 See No.1 W 0.05 0.3 0.5		Minor
Clear' = The shade and size are not changed by Vo. Unclear'= The shade and size are changed by Vo.				

No.	Defect	Judgment Criterion	Partition
3	Rubbing line	Not to be noticeable.	Minor
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. Partial defects of each dot (ex.pin-hole) should be treated as spot. (see Screen Cosmetic Criteria (Operating) No.1)	Minor
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.			

Operating Precautions

- DO NOT plug or unplug Surenoo module when the system is powered up.
- Minimize the cable length between Surenoo 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 Surenoo 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 as they may seep under the electrometric connection and cause display failure.
- Mount Surenoomodule so that it is free from torque and mechanical stress.
- Surface of the Graphic 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 Surenoo 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 Graphic modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep Surenoo modules in bags (avoid high temperature / high humidity and low temperatures below 0 ºC. Whenever possible, Surenoo G raphic 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 Surenoo G raphic 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 Graphic 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

PRECAUTIONS FOR USING

Handling Precautions

- .This device is susceptible to Electro-Static Discharge (ESD) damage. Observe Anti-Static precautions.
- Surenoo display panel is made of glass. Do not subject it to a mechanical shock by dropping it or impact.
- If Surenoo 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 Surenoo display surface or the adjoining areas since this may cause the color tone to vary.
- The polarizer covering the Surenoo display surface of the Graphic module is soft and easily scratched. Handle this polarizer carefully.
- If Surenoo 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 Surenoo G raphic Module by using the mounting holes. When mounting the Graphic 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 Surenoo G raphic 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 Surenoo Graphic 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 Graphic 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 Surenoo modules.
- The VDD power of Surenoo 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

USING Graphic MODULES

Liquid Crystal Display Modules

- Surenoo Display 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 isopropyl alcohol.
- When Surenoo 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 Surenoo 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 avoid dropping.

Installing Graphic 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 Graphic Modules
Since Surenoo 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.

Limited Warranty

Unless agreed between Surenoo and customer, Surenoo will replace or repair any of its Graphic modules which are found to be functionally defective when inspected in accordance with Surenoo G raphic acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to Surenoo within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of Surenoo limited to repair and/or replacement on the terms set forth above. Surenoo will not 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 Graphic 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.

Module 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.

IMAGE STICKING

What is Image Sticking?
If you remain a fixed image on Graphic Display for a long period of time, you may experience a phenomenon called Image Sticking. Image Sticking – sometimes also called "image retention" or "ghosting"- is a phenomenon where a faint outline of a previously displayed image remains visible on the screen when the image is changed. It can occur at variable levels of intensity depending on the specific image makeup, as well as the amount of time the core image elements are allowed to remain unchanged on the screen. In POS applications, for example, a button menu which remains fixed, or in which the "frame" elements (core image) remain fixed and the buttons may change, may be susceptible to image sticking. It is important to note that if the screen is used exclusively for this application, the user may never notice this phenomenon since the screen never displays other content. `It is only when an image other than the "retained" image is shown on the screen that this issue becomes evident. Image sticking is different that the "burn-in" effect commonly associated with phosphor based devices.

What causes Image Sticking?
Image sticking is an intrinsic behavior of Graphic displays due to the susceptibility to polarization of the interior materials (liquid crystals) when used under static, charged conditions (continuously displaying the same image). The individual liquid crystals in an Graphic panel have unique electrical properties. Displaying a fixed pattern – such as the POS menu described above – over prolonged periods can cause a parasitic charge build-up (polarization) within the liquid crystals which affects the crystals' optical properties and ultimately prevents the liquid crystal from returning to its normal, relaxed state when the pattern is finally changed. This effect takes place at a cellular level within the Panel, and the effect can cause charged crystal alignment at the bottom or top of a crystal cell in the "z" axis, or even crystal migration to the edges of a cell, again based on their polarity. These conditions can cause image sticking over an entire area, or at boundaries of distinct color change respectively. In either case, when the liquid crystals in the pixels and sub-pixels utilized to display the static image are polarized such that they can not return fully to their "relaxed" state upon deactivation, the result is a faint, visible, retained image on the panel upon presentation of a new, different image. The actual rate of image retention depends on variation factors such as the specific image, how long it is displayed unchanged, the temperature within the panel and even the specific panel brand due to manufacturing differences amongst panel manufacturers.

Documents / Resources

	Surenoo SLG16032B Series Graphic LCD Module [pdf] User Manual SLG16032B Series Graphic LCD Module, SLG16032B Series, Graphic LCD Module, LCD Module, Module

References

- Surenoo Tech: Professional LCD Module Supplier Since 2005