

1. Features:

The features of LCD are as follows:

- Display mode : STN /BLUE, NEGATIVE, TRANSMISSIVE
- Colour : Display dot :WHITE
Background: BLUE
- Display Format : 192x64
- * IC : SBN0064
- Interface Input Data : 8 Bits
- Driving Method : 1/64 Duty, 1/9 Bias
- Viewing Direction: 6 O'clock
- Backlight : LED (WHITE)

2. Mechanical Specifications:

Item	Specification	Unit
Module Size	130.00(W) X65.00(H) X12.4(T)	mm
Viewing Area	104.00(W) X 39.00(H)	mm
Effective Display Area	97.49(W) X32.46(H)	mm
Number of Dots	192x64	-
Dot Size	0.458(W) X 0.458(H)	mm
Dot Pitch	0.508(W) X 0.508(H)	mm

3. Electrical Specifications:

1. Absolute Maximum Ratings (V_{SS} = 0V)

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	V _{DD}	-0.3	-	5.0	V
Supply Voltage For LCD Drive	V ₀ , V _{OUT}	-0.3	-	14.5	V
Operating Temp.	T _{OP}	-20	-	+70	°C
Storage Temp.	T _{ST}	-30	-	+80	°C
Static Electricity	Be sure that you are ground when handing LCM				

2. Electrical Characteristics:

Item		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Voltage For Logic		V _{DD} – V _{SS}	T _a =25°C	4.8	5.0	5.2	V
Supply Voltage For LCD		V _{DD} – V ₀	T _a =25°C	4.6	4.8	5.0	V
Input Voltage	“H” Level	V _{IH}	T _a =25°C	0.8V _{DD}	-	V _{DD}	V
	“L” Level	V _{IL}		V _{SS}	-	0.2V _{DD}	V
Output Voltage	“H” Level	V _{OH}	I _{OUT} = -0.5mA	0.8V _{DD}	-	V _{DD}	V
	“L” Level	V _{OL}	I _{OUT} = 0.5mA	V _{SS}	-	0.2V _{DD}	V
Current Consumption		I _{DD}	V _{IN} = V _{DD}	-	-	1.0	mA

NOTE: 1) Duty ratio=1/65, Bias=1/9
2) Measured in Dots ON-state

3. BACKLIGHT:

3.1 Absolute Maximum Ratings:

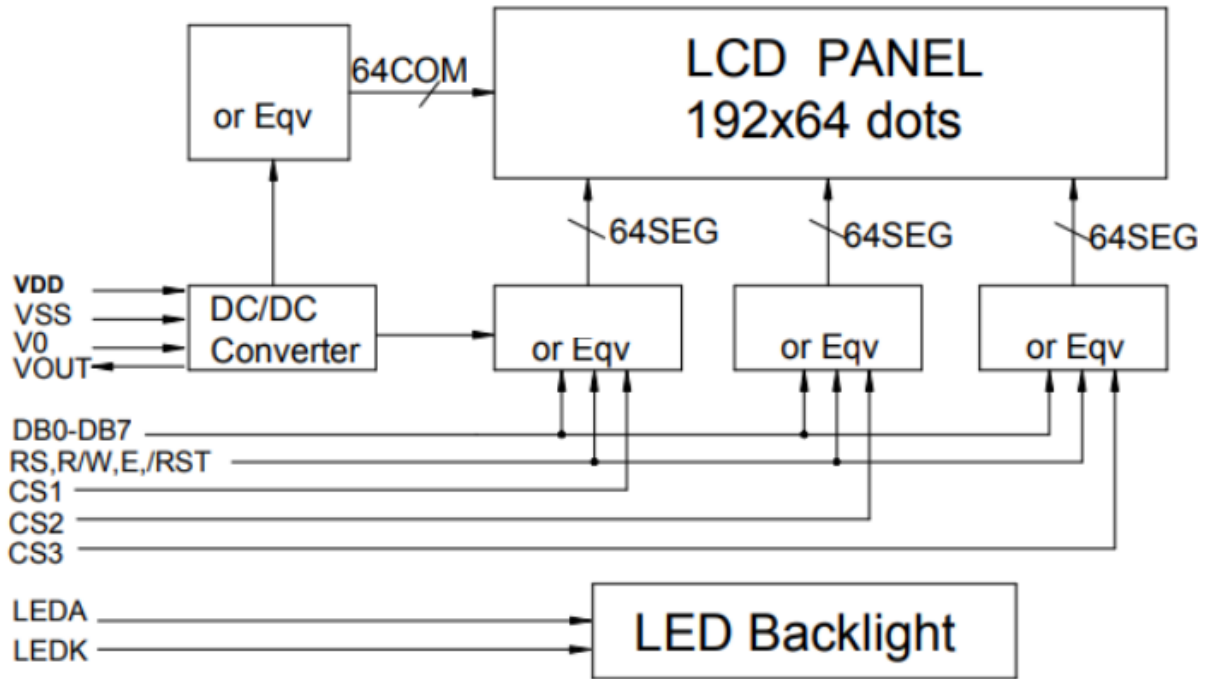
Item	Symbol	Condition	Min.	Typ.	Max	Unit
Forward Current	IF	Ta= 25°C	-	-	20	mA
Reverse Voltage	VR		-	-	5	V
Power Dissipation	PD	Ta= 25°C	-	-	100	mW

3.2 Opto-electronic Characteristics:

Item	Symbol	Condition	Min.	Typ.	Max	Unit
Forward Voltage	VF	Ta= 25°C IF= 30mA	4.8	5.0	5.2	V
Luminous	-		100	150	-	cd/m ²

** The brightness is measured without LCD panel*

4. Schematic Design:



5. Interface Pin Function:

ITEM	SYMBOL	LEVEL	FUNCTION
1	VSS	0V	Power Ground
2	VDD	+3.3V	Power Supply For Logic
3	V0	-	Contrast Adjust
4	RS	H/L	H: Data L: Command
5	R/W	H/L	H: Read L: Write
6	E	H, H->L	Enable Signal
7	DB0	H/L	Data Bus
~	~		
14	DB7		
15	/CS1	L	Chip Selection A
16	/RST	L	Reset Signal
17	/CS2	L	Chip Selection B
18	/CS3	L	Chip Selection C
19	Vout	-	Negative Power output For LCD Driving
20	LEDA	+3.3V	Power Supply For LED Backlight



6. Command List:

Instructions	Code										Function	Note
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Display on/off	0	0	0	0	1	1	1	1	1	1/0	Controls the display on or off. Internal status and display data in RAM is not affected 0=off, 1=on	*2
Set Column (Y) Address	0	0	0	1	Y address (0-63)						Set the Column address into the Y address counter	*2
Set Page (X) Address	0	0	1	0	1	1	1	X address (0-7)			Set the Page address into the X address register	*2
Set Display Start Line (Z address)	0	0	1	1	Z address (0-63)						Indicates the display data RAM displayed at the top of the screen	*2
Status Read	0	1	Busy	0	on/off	Reset	0	0	0	0	Read status Busy=L, Driver ready; Busy=H, Driver busy on/off=L, Display is on; on/off=H, Display is off Reset=L, Normal Running; Reset=H, reset	*1
Write Display Data	1	0	Write data								Write display data into display data RAM, After writing instruction, Y address counter increased by 1 automatically	*2
Read Display Data	1	1	Read data								Read display data form the display data RAM	*1

Note:

1*. Only one section(driver) could be read at the same time.

2*. For the details of the display control instructions, please refer to SBN0064G datasheet.

7. Timing Characteristics (Continued):

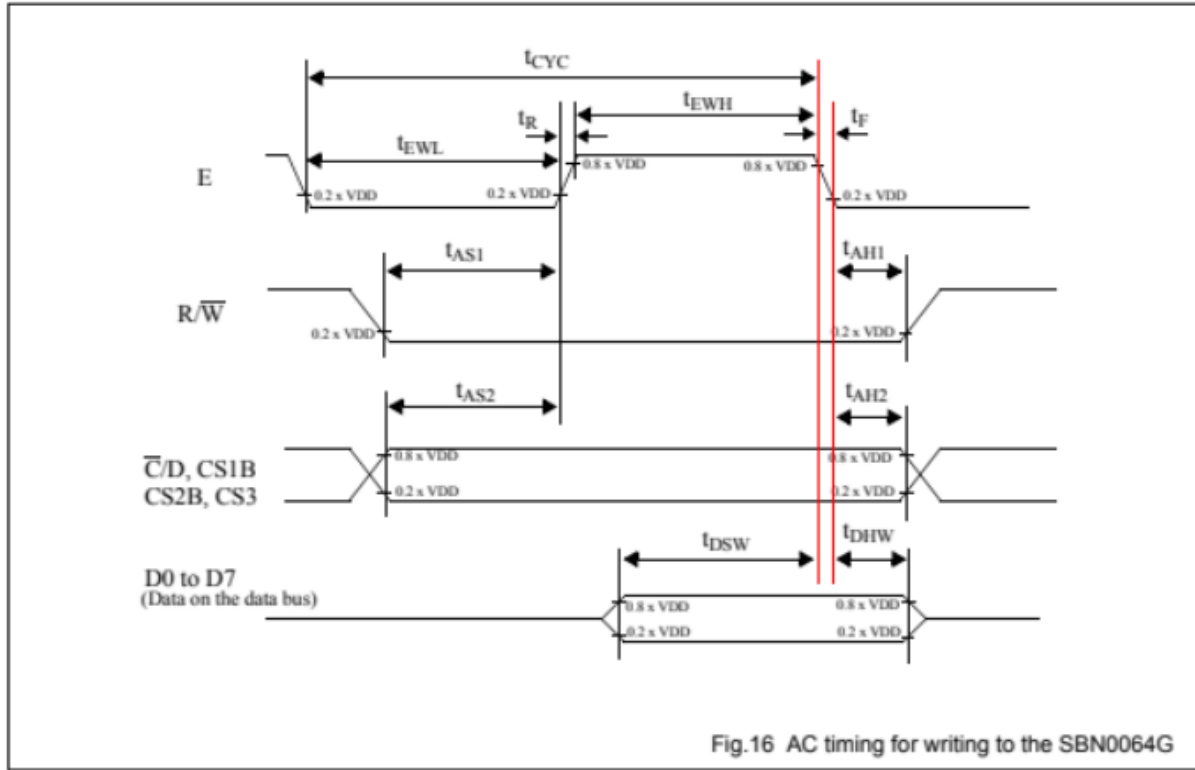


Fig.16 AC timing for writing to the SBN0064G

Table 25 AC timing for writing to the SBN0064G

$V_{DD} = 5\text{ V} \pm 10\%$; $V_{SS} = 0\text{ V}$; $T_{amb} = -20\text{ }^{\circ}\text{C}$ to $+75\text{ }^{\circ}\text{C}$.

symbol	parameter	min.	max.	test conditions	unit
t_{CYC}	Enable (E) cycle time	1000			ns
t_{EWL}	Enable (E) LOW width	450			
t_{EWH}	Enable (E) HIGH width	450			
t_R	Enable (R) rise time		20		
t_F	Enable (F) fall time		20		
t_{AS1}	Write set-up time	140			
t_{AH1}	Write hold time	10			
t_{AS2}	C/D, CS1B, CS2B, CS3 set-up time	140			
t_{AH2}	C/D, CS1B, CS2B, CS3 hold time	10			
t_{DSW}	Data setup time (on the data bus)	200		The loading on the data bus is shown in Fig. 18.	
t_{DHW}	Data hold time (on the data bus)	10			

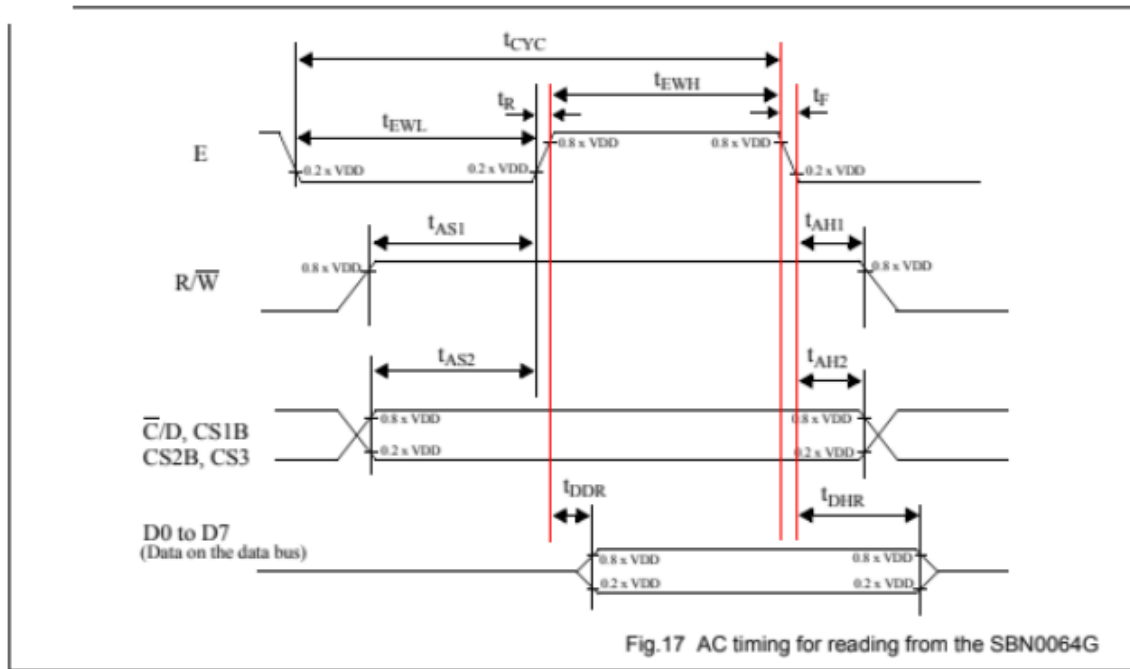
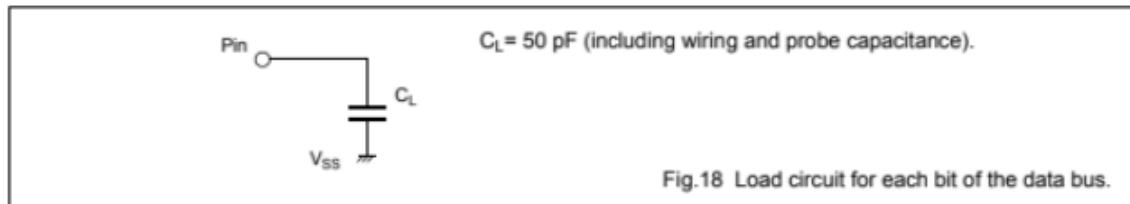


Table 26 AC timing for reading from the SBN0064G

$V_{DD} = 5\text{ V} \pm 10\%$; $V_{SS} = 0\text{ V}$; $T_{amb} = -20\text{ }^\circ\text{C}$ to $+75\text{ }^\circ\text{C}$.

symbol	parameter	min.	max.	test conditions	unit
t_{CYC}	Enable (E) cycle time	1000			ns
t_{EWL}	Enable (E) LOW width	450			
t_{EWH}	Enable (E) HIGH width	450			
t_r	Enable (R) rise time		20		
t_f	Enable (F) fall time		20		
t_{AS1}	READ set-up time	140			
t_{AH1}	READ hold time	20			
t_{AS2}	C/D, CS1B, CS2B, CS3 set-up time	140			
t_{AH2}	C/D, CS1B, CS2B, CS3 hold time	10			
t_{DDR}	Data delay time (on the data bus)	320		The loading on the data bus is shown in Fig. 18.	
t_{DHR}	Data hold time (on the data bus)	20			



13.2 CLK1, CLK2 timing

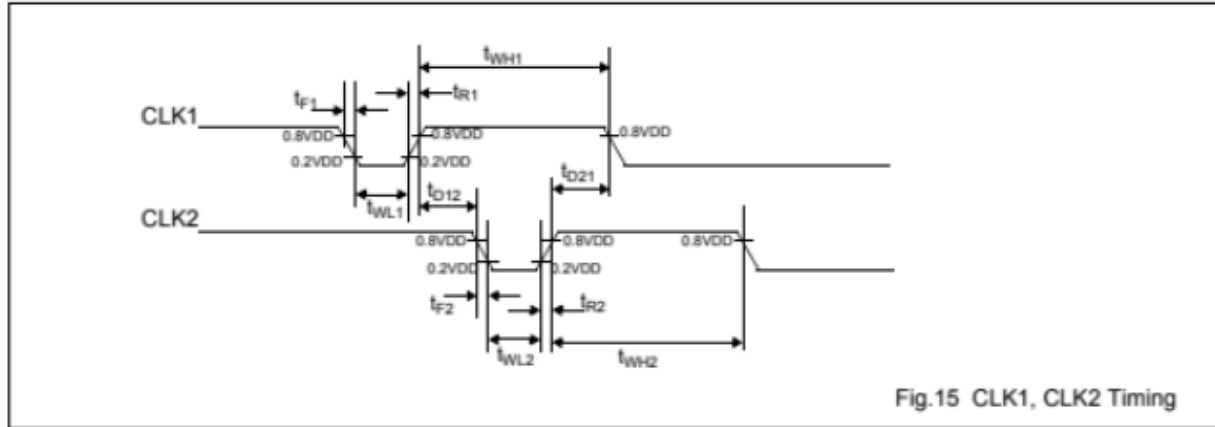


Fig.15 CLK1, CLK2 Timing

Table 24 CLK1 and CLK2 timing characteristics

$V_{DD} = 5\text{ V} \pm 10\%$; $V_{SS} = 0\text{ V}$; all voltages with respect to V_{SS} unless otherwise specified; $T_{amb} = -20\text{ to }+75\text{ }^{\circ}\text{C}$.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
T_{WH1}	CLK1 clock high pulse width		2000			ns
T_{WL1}	CLK1 clock low pulse width		600			
T_{R1}	CLK1 clock rise time				130	
T_{F1}	CLK1 clock fall time				130	
T_{WH2}	CLK2 clock high pulse width		2000			
T_{WL2}	CLK2 clock low pulse width		600			
T_{R2}	CLK2 clock rise time				130	
T_{F2}	CLK2 clock fall time				130	
T_{D12}	CLK1-to-CLK2 delay		660			
T_{D21}	CLK2-to-CLK1 delay		660			

8. Quality Specification (Continued):

8-3. Sampling Plan and Acceptance

1. Sampling Plan

MIL - STD - 105E (II) ordinary single inspection is used.

2. Acceptance

Major defect: AQL = 0.25%

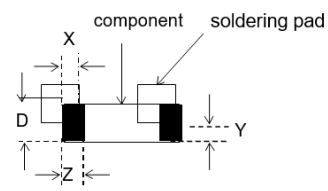
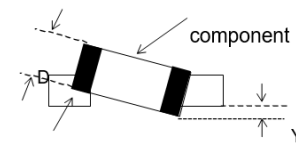
Minor defect: AQL = 0.65%

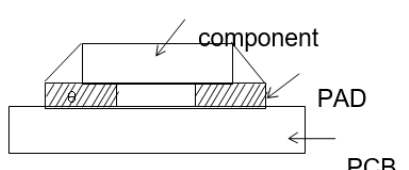
8-4. Criteria

a) COB

Defect	Inspection Item	Inspection Standards	
Major	PCB copper flakes peeling off	Any copper flake in viewing Area should be greater than 1.0mm ²	Reject
Major	Height of coating epoxy	Exceed the dimension of drawing	Reject
Major	Void or hole of coating epoxy	Expose bonding wire or IC	Reject
Major	PCB cutting defect	Exceed the dimension of drawing	Reject

b) SMT

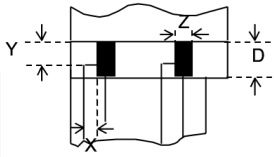
Defect	Inspection Item	Inspection Standards	
Minor	Component marking not readable		Reject
Minor	Component height	Exceed the dimension Of drawing	Reject
Major	Component solder defect (missing , extra, wrong component or wrong orientation		Reject
Minor	 <p>Component position shift</p>	$X < 3/4Z$ $Y > 1/3D$	Reject Reject
Minor	 <p>Component tilt</p>	$Y > 1/3D$	Reject

Minor	<p>Insufficient solder</p> 	$\theta \leq 20^\circ$	Reject
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c) Metal (Plastic) Frame

Defect	Inspection Item	Inspection Standards		
Major	Crack / breakage	Anywhere		Reject
Minor	Frame Scratch	W	L	Acceptable of Scratch
		$w < 0.03\text{mm}$	Any	Ignore
		$0.03\text{mm} \leq w < 0.05\text{mm}$	$L \leq 5.0\text{mm}$	2
		$0.05\text{mm} < w < 0.1\text{mm}$	$L < 3.0\text{mm}$	1
		$w > 0.1\text{mm}$	Any	0
Note: 1. Above criteria applicable to scratch lines with distance greater than 5mm. 2. Scratch on the back side of frame (not visible) can be ignored.				
Minor	Frame Dent, Prick $\Phi = \frac{L + W}{2}$			Acceptable of Dents / Pricks
		$\Phi \leq 1.0\text{mm}$		2
		$1.0 < \Phi \leq 1.5\text{mm}$		1
		$1.5\text{mm} > \Phi$		0
Note: 1. Above criteria applicable to any two dents / pricks with distance greater than 5mm 2. Dent / prick on the back side of frame (not visible) can be ignored				
Minor	Frame Deformation	Exceed the dimension of drawing		
Minor	Metal Frame Oxidation	Any rust		

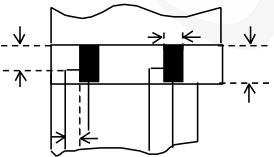
d) Flexible Film Connector (FFC)

Defect	Inspection Item		Inspection Standards	
Minor	Tilted soldering		Within the angle $\pm 3^\circ$	Acceptable
Minor	Uneven solder joint /bump			Reject
Minor	Hole	$\Phi = \frac{L + W}{2}$	Expose the conductive line	Reject
			$\Phi > 1.0\text{mm}$	Reject
Minor	Position shift 		$Y > 1/3D$	Reject
			$X > 1/2Z$	Reject

e) Screw

Defect	Inspection Item	Inspection Standards	
Major	Screw missing/loosen		Reject
Minor	Screw oxidation	Any rust	Reject
Minor	Screw deformation	Difficult to accept screw driver	Reject

f) Heat seal 、 TCP 、 FPC

Defect	Inspection Item		Inspection Standards	
Major	Scratch expose conductive layer			Reject
Minor	HS Hole	$\Phi = \frac{L + W}{2}$	$\Phi > 0.2\text{mm}$	Reject
Major	Adhesion strength		Less than the specification	Reject
Minor	Position shift 		$Y > 1/3D$	Reject
			$X > 1/2Z$	Reject
Major	Conductive line break			Reject

g) LED Backing Protective Film and Others

Defect	Inspection Item	Inspection Standards	
Minor	LED dirty, prick	Acceptable number of units	
		$\Phi \leq 0.10\text{mm}$	Ignore
		$0.10 < \Phi \leq 0.15\text{mm}$	2
		$0.15 < \Phi \leq 0.2\text{mm}$	1
		$\Phi > 0.2\text{mm}$	0
		The distance between any two spots should be $\geq 10\text{mm}$ Any spot/dot/void outside of viewing area is acceptable	
Minor	Protective film tilt	Not fully cover LCD	Reject
Major	COG coating	Not fully cover ITO circuit	Reject

h) Electric Inspection

Defect	Inspection Item	Inspection Standards	
Major	Short		Reject
Major	Open		Reject

i) Inspection Specification of LCD

Defect	Inspect Item	Inspection Standards					
		W	W<0.03	0.03<W<0.05	W>0.05		
Minor	Linear Defect	* Glass Scratch	L	L<5	L<3	Any	
		* Polarizer Scratch	ACC. NO.	1	1	Reject	
		* Fiber and Linear material	Note	L is the length and W is the width of the defect			
Minor	Black Spot and Polarizer Pricked	* Foreign material between glass and polarizer or glass and glass	Φ	Φ≤0.1	0.1<Φ≤0.15	0.15<Φ≤0.2	Φ>0.2
		* Polarizer hole or protuberance by external force	ACC. NO.	3EA/1PC	2	1	0
			Note	Φ is the average diameter of the defect. Distance between two defects > 10mm.			
Minor	White Spot and Bubble in polarizer	* Unobvious transparent foreign material between glass and glass or glass and polarizer	Φ	Φ≤0.1	0.1<Φ≤0.15	0.15<Φ≤0.2	Φ>0.2
		* Air protuberance between polarizer and glass	ACC. NO.	3EA / 1PC	2	1	0
			Note	Φ is the average diameter of the defect. Distance between two defects > 10mm.			
Minor	Segment Defect		Φ	Φ≤0.10	0.10<Φ≤0.20	Φ>0.2	
			ACC. NO.	3EA/1PC	2	0	
				W is more than 1/2 segment width		Reject	
			Note	$\Phi = \frac{L + W}{2}$ Distance between two defect is 10mm			
Minor	Protuberant Segment	<p style="text-align: center;">$\Phi = (L + W) / 2$</p>	Φ	Φ≤0.10	0.10<Φ≤0.20	Φ>0.2	
			W	Glue	W≤1/2 Seg , W≤0.2	Ignore	
			ACC. NO.	3EA/1PC	2	0	
Minor	Assembly Misalignment		1. Segment				
			B	B≤0.4mm	0.4<B≤1.0mm	B>1.0mm	
			B-A	B-A<1/2B	B-A<0.2	B-A<0.25	
			Judge	Acceptable	Acceptable	Acceptable	
		2. Dot Matrix					
		Deformation>0.35mm			Reject		

Minor	Stain on LCD Panel Surface		Accept when stains can be wiped lightly with a soft cloth or a similar one. Otherwise, judged according to the above items: "Black spot" and "White Spot"
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9. Reliability:

NO.	Item	Condition	Criterion
1	High Temperature Operating	70°C, 96Hrs	No defect in cosmetic and operational function allowable.
2	Low Temperature Operating	-20°C, 96Hrs	
3	High Humidity	40°C, 90%RH, 96Hrs	
4	High Temperature Storage	80°C, 96Hrs	
5	Low Temperature Storage	-30°C, 96Hrs	
6	Vibration	Random wave 10 ~ 100Hz Acceleration: 2g 2 Hrs per direction(X,Y,Z)	Total current Consumption should be below double of initial value.
7	Thermal Shock	-10°C to 25°C to 60°C (60Min) (5Min) (60Min) 16Cycles	
8	ESD Testing	Contract Discharge Voltage: +1 ~ 5kV and -1 ~ -5kV	There will be discharged ten times at every discharging voltage cycle. The voltage gap is 1kV.
		Air Discharge Voltage: +1 ~ 8kV and -1 ~ -8kV	

- Note:** 1) Above conditions are suitable for xinnuoya standard products.
2) For restrict products, the test conditions listed as above must be revised.

10. Handling Precaution:

(1) Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizers which easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling the LCD Modules.

(2) Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Ketone
- Aromatics

(3) Caution against static charge

The LCD Module use C-MOS LSI drivers, so we recommend that you connect any unused input terminal to VDD or VSS, do not input any signals before power is turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

(4) Packaging

- Modules use LCD elements, and must be treated as such. Avoid intense shock and falls from a height.
- To prevent modules from degradation. Do not operate or store them exposed directly to sunshine or high temperature/humidity.

(5) Caution for operation

- It is indispensable to drive LCD's within the specified voltage limit since the higher voltage than the limit shorten LCD life. An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.

Handling Precaution (Continued):

- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show darkcolor in them. However those phenomena do not mean malfunction or out of order with LCD's. Which will come back in the specified operating temperature range.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.

- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 60°C, 90%RH or less is required.

(6) Storage

In the case of storing for a long period of time (for instance, for years) for the purpose or replacement use, The following ways are recommended.

- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.

- Placing in a dark place where neither exposure to direct sunlight nor light is.

Keeping temperature in the specified storage temperature range.

- Storing with no touch on polarizer surface by the anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery)

(7) Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol.

Which should be burned up later.

When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

11. Outline Dimensions:

