

PRODUCT SPECIFICATION

MONO LCD MODULE
MODEL: G1203A8SBX6B-B0 Ver:1.0
DRAWING VERSION: Ver: A

- < ◇ > Preliminary Specification
< ◆ > Finally Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWD	PD REVIEWD	PREPARED By
	_____		

Revision Status

Version	Revise Date	Page	Content	Modified By
Ver. 1.0	2022-06-06	-	First Issued	

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1. Features

The features of LCD are as follows

* Display mode	: STN/Yellow-Green / Transflective / Positive
* IC	: 2*SBN1661G-M02
* Interface Input Data	: 6800 Series
* Driving Method	: 1/32 Duty, 1/6 Bias
* Viewing Direction	: 6 O'clock
* Backlight	:2LED/Yellow-Green
*Sample NO	: G1203A8SBX6B-B0_01/20220602

2. MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module Size	84.0(W) x 44.0(H) x 13.8MAX(T)	mm
Viewing Area	60.0 (W) x 18 (H)	mm
Activity Area	53.64(W) x 15.64(H)	mm
Number of Dots	122 x 32 Dots	-
Dot Size	0.4(W) x 0.45(H)	mm
Dot Pitch	0.44(W) x 0.49(H)	mm

3. ELECTRICAL SPECIFICATIONS

3-1 ABSOLUTR MAZIMUM RATINGS (Ta = 25 °C)

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	$V_{DD}-V_{SS}$	-0.3	-	7.0	V
Supply Voltage For LCD Drive	$V_{OP}= V_{DD}-V_0$	3.5	-	13	V
Input Voltage	V_{in}	-0.3	-	$V_{DD}+0.3$	V
Operating Temp.	T_{op}	-20	-	+70	°C
Storage Temp.	T_{st}	-30	-	+80	°C

*. NOTE: The response time will be extremely slow when the operating temperature is around -10°C, and the back ground will become darker at high temperature operating.

3-2 ELECTRICAL CHARACTERISTICS

Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Logic supply Voltage	$V_{DD}-V_{SS}$	$T_a = 25\text{ }^\circ\text{C}$ $V_{DD}=5V \pm 10\%$	4.8	5	5.2	V	
LCD Drive	$V_{OP}=V_{DD}-V_0$		4.5	4.7	4.9	V	
Input Voltage	"H" Level		V_{IH}	3.0	5.0	$V_{DD}+0.5$	V
	"L" Level		V_{IL}	0	0.7	1.1	V
Frame Frequency	f_{FLM}		-	84.3	-	Hz	
Current Consumption	I_{DD}		-	1.47	-	mA	

3-3. BACKLIGHT

3-3-1. Absolute Maximum Ratings

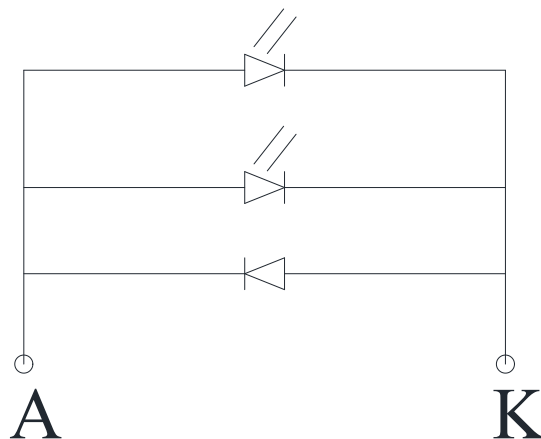
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Current	I_F	$T_a = 25\text{ }^\circ\text{C}$	-		$25*2$	mA
Reverse Voltage	V_R		-	-	5	V
Power Dissipation	P_D		-	-	$75*2$	mW

3-3-2. Electrical-optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Current	I_f	$T_a = 25\text{ }^\circ\text{C}$ $V_f=5.0V$	-	30	40	mA
Average Luminous Intensity	I_v		150	-	-	cd/m ²
Peak emission wavelength	λ_P		-	570	-	nm

*NOTE:The brightness is measured without LCD panel.

3-3-3.Backlight circuit

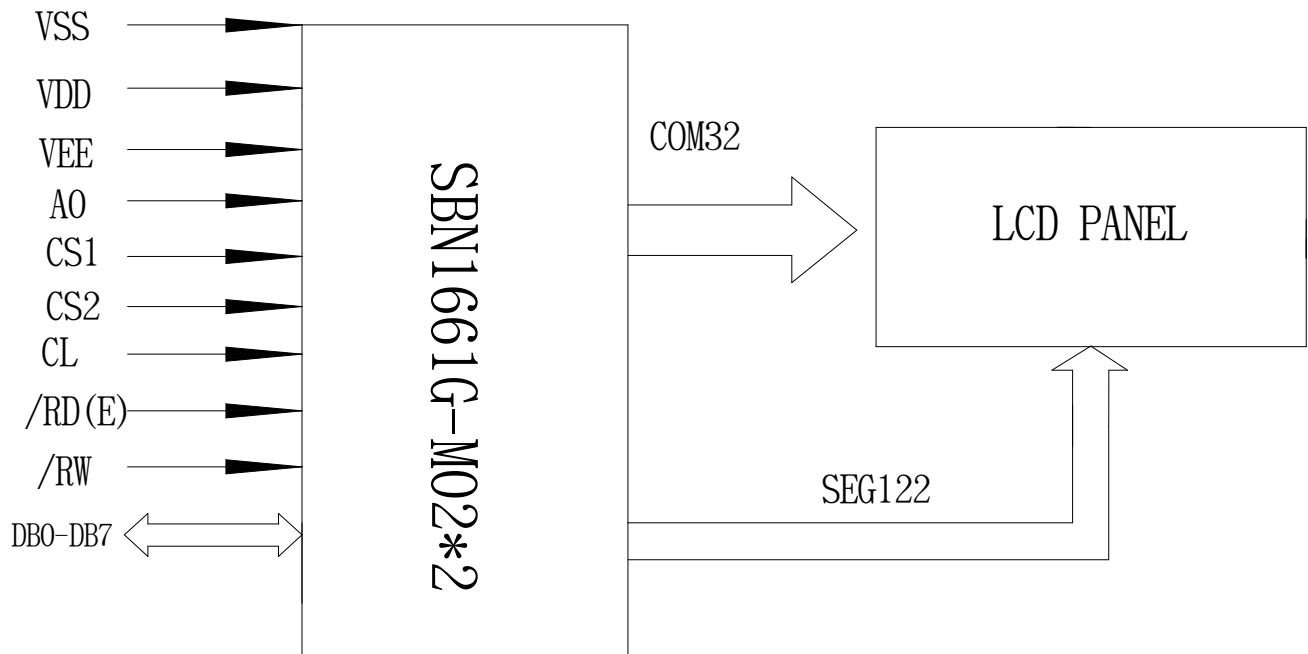


4. TERMINAL FUNCTIONS AND BLOCK DIAGRAM

4-1. INTERFACE PIN FUNCTION DESCRIPTION

Pin No.	Pin Name	Function
1	VSS	Ground
2	VDD	Supple power for LCD driving
3	VEE	Supply voltage for LCD driving
4	A0	Enable signal display data or control data
5	CS1	Chip selection signal
6	CS2	Chip selection signal
7	CL	Clock form master or an external clock source
8	/RD(E)	Enable signal
9	/RW	A signal selecting read or write actions
10~17	DB0~DB7	Data bus
18	RES	Reset signal
19	A	Backlight(+)
20	K	Backlight(-)

4-2. BLOCK DIAGRAM



5. TIMING CHARACTERISTICS

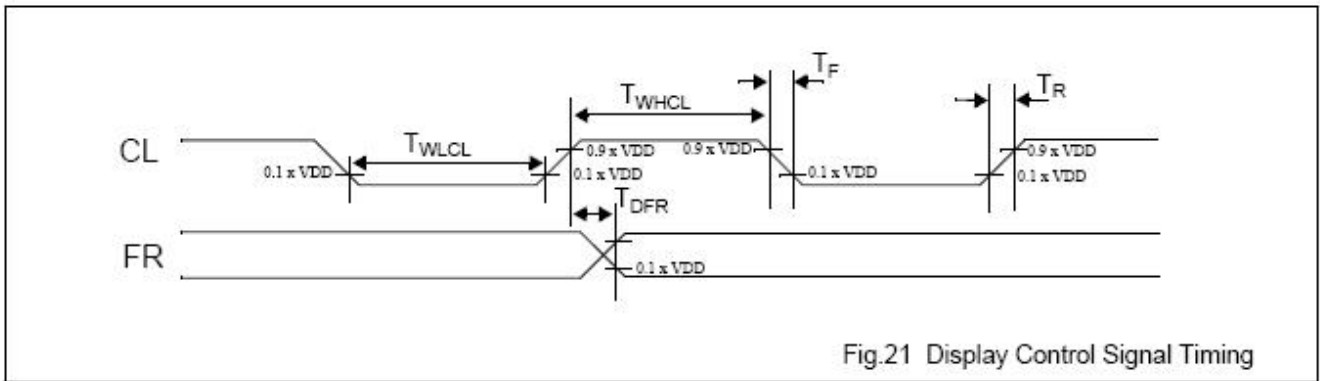


Table 40 CL and FR timing characteristics at $V_{DD}=5$ volts

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
T_{WHCL}	CL clock high pulse width		33			μs
T_{WLCL}	CL clock low pulse width		33			μs
T_R	CL clock rise time			28	120	ns
T_F	CL clock fall time			28	120	ns
$T_{DFR(input)}$	FR delay time (input)	When used as input in Slave Mode application	-2.0	0.2	1.6	μs
$T_{DFR(output)}$	FR delay time (output)	When used as output in Master Mode application, with $CL= 100 \text{ pF}$.		0.2	0.36	μs

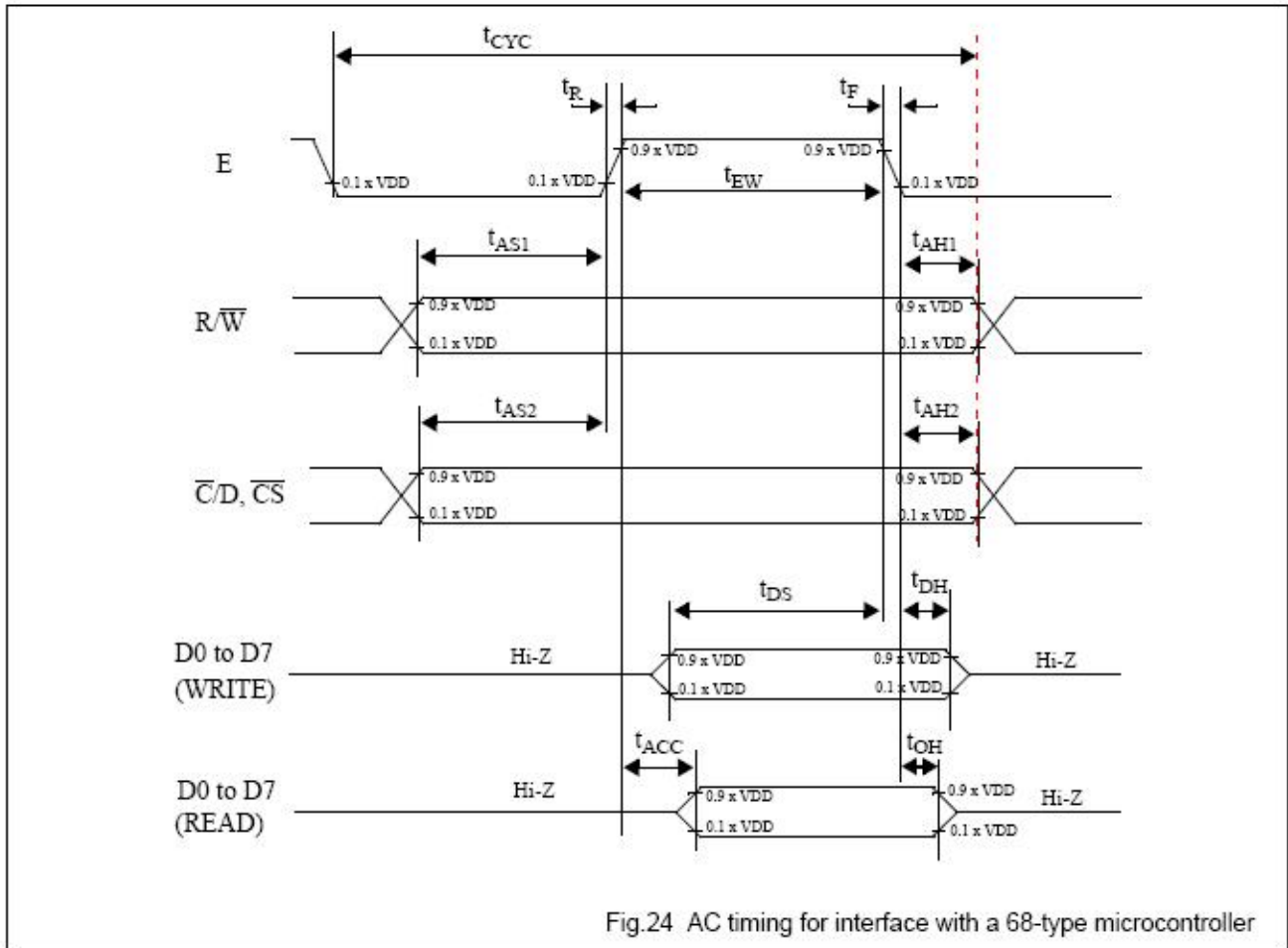


Fig.24 AC timing for interface with a 68-type microcontroller

Table 44 AC timing for interface with a 68-type microcontroller at $V_{DD}=5$ volts
 $V_{DD} = 5 V \pm 10\%$; $V_{SS} = 0 V$; $T_{amb} = -20\text{ }^{\circ}\text{C}$ to $+75\text{ }^{\circ}\text{C}$.

symbol	parameter	min.	max.	test conditons	unit
t_{AS1}	Address set-up time with respect to R/\bar{W}	20			ns
t_{AS2}	Address set-up time with respect to $\bar{C}/D, \bar{CS}$	20			ns
t_{AH1}	Address hold time with respect to R/\bar{W}	10			ns
t_{AH2}	Address hold time respect with to $\bar{C}/D, \bar{CS}$	10			ns
t_F, t_R	Enable (E) pulse falling/rising time		15		ns
t_{CYC}	System cycle time	1000		Note 1	ns
t_{EWR}	Enable pulse width for READ	100			ns
t_{EWW}	Enable pulse width for WRITE	80			ns
t_{DS}	Data setup time	80			ns
t_{DH}	Data hold time	10			ns
t_{ACC}	Data access time		90	CL= 100 pF.	ns
t_{OH}	Data output hold time	10	60	Refer to Fig. 23.	ns

6. INSTRUCTION SET

COMMAND	COMMAND CODE								FUNCTION
	D7	D6	D5	D4	D3	D2	D1	D0	
Write Display Data	Data to be written into the Display Data Memory.								Write a byte of data to the Display Data Memory.
Read Display Data	Data read from the Display Data Memory.								Read a byte of data from the Display Data Memory.
Read-Modify-Write	1	1	1	0	0	0	0	0	Start Read-Modify-Write operation.
END	1	1	1	0	1	1	1	0	Stop Read-Modify-Write operation.
Software Reset	1	1	1	0	0	0	1	0	Software Reset.

Table 28 The setting of the control bus for issuing Write Display Data command

\overline{C}/D	$E/(\overline{RD})$	$R/\overline{W}(\overline{WR})$
1	1	0

Table 29 The setting of the control bus for issuing Read Display Data command

\overline{C}/D	$E/(\overline{RD})$	$R/\overline{W}(\overline{WR})$
1	0	1

Table 30 The setting of the control bus for the Read-Modify-Write command

\overline{C}/D	$E/(\overline{RD})$	$R/\overline{W}(\overline{WR})$
0	1	0

Table 31 The setting of the data bus for the Read-Modify-Write command

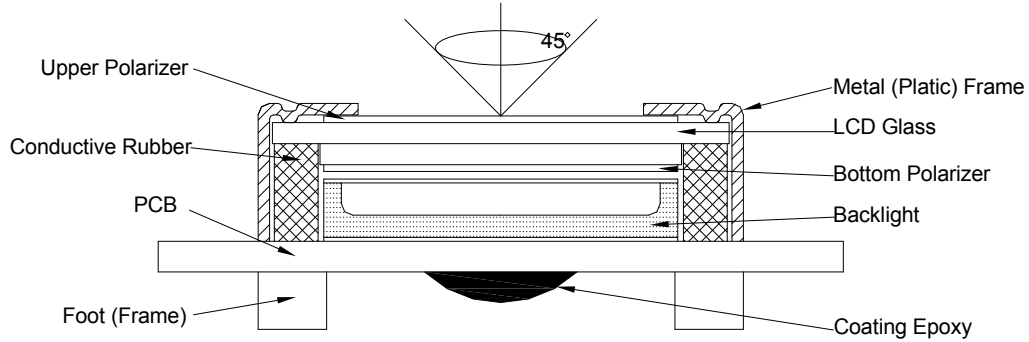
D7(MSB)	D6	D5	D4	D3	D2	D1	D0(LSB)
1	1	1	0	0	0	0	0

The command code is E0 Hex.

7. QUALITY SPECIFICATIONS

7 - 1. LCM Appearance and Electric inspection Condition

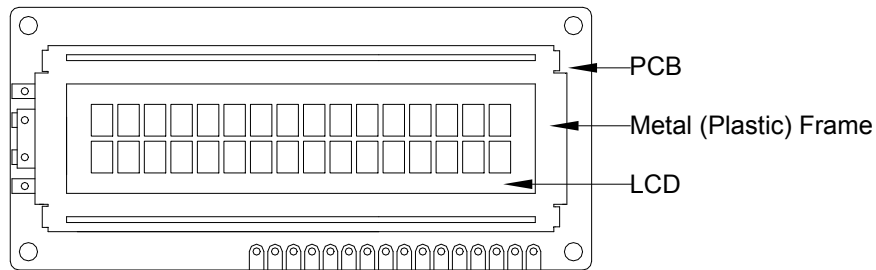
1. Inspection will be done by placing LCM 30cm away from inspector's eyeballs under normal illumination.



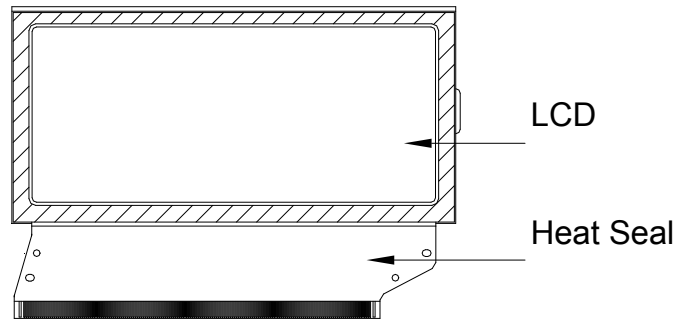
2. View Angle: with in 45° around perpendicular line.

7 - 2. Definition

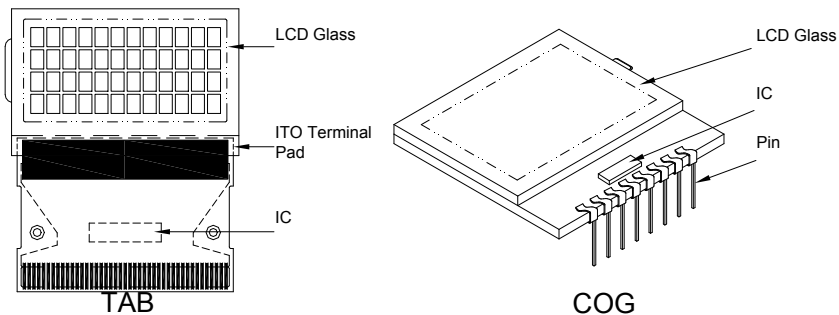
1. COB



2. Heat Seal



3. TAB and COG



7-3. Sampling Plan and Acceptance

1. Sampling Plan

GB2828.1.2012 (||) ordinary single inspection is used.

2. Acceptance

Major defect: AQL = 0.65

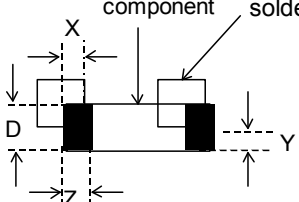
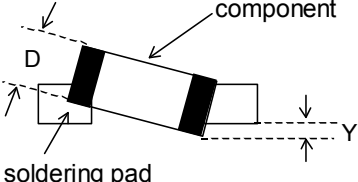
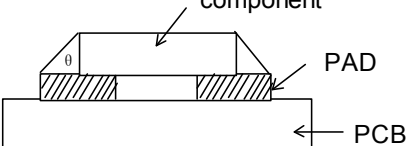
Minor defect: AQL = 1.5

7-4. Criteria

1. 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

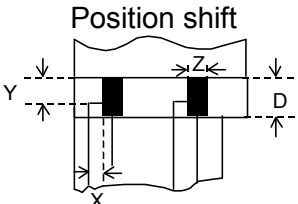
2. SMT

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	Component position shift 	$X < 3/4Z$ $Y > 1/3D$	Reject Reject
Minor	Component tilt 	$Y > 1/3D$	Reject
Minor	Insufficient solder 	$\theta \leq 20^\circ$	Reject

3. Metal (Plastic) Frame

Defect	Inspection Item	Inspection Standards		
Major	Crack / breakage	Anywhere		
			Reject	
Minor	Frame Scratch	W	L	Acceptable of Scratch
		$w < 0.1\text{mm}$	Any	Ignore
		$0.1 \leq w < 0.2\text{mm}$	$L \leq 5.0\text{mm}$	2
		$0.2 \leq w < 0.3\text{mm}$	$L \leq 3.0\text{mm}$	1
		$w \geq 0.3\text{mm}$	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		

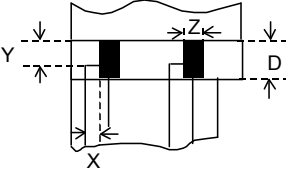
4. Flexible Film Connector (FFC)

Defect	Inspection Item	Inspection Standards	
Minor	Tilted soldering	Within the angle $+5^\circ$	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		$Y > 1/3D$	Reject
		$X > 1/2Z$	Reject

5. 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

6. Heatseal 、 TCP 、 FPC

Defect	Inspection Item	Inspection Standards	
Major	Scratch expose conductive layer		Reject
Minor	HS Hole $\Phi = \frac{L+W}{2}$	$\Phi > 0.5\text{mm}$	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

7. 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 $\geq 5\text{mm}$ 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

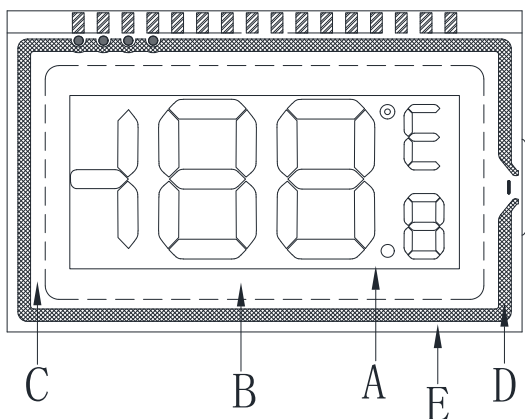
8. Electric Inspection

Defect	Inspection Item	Inspection Standards	
Major	Short		Reject
Major	Open		Reject

9. Inspection Specification of LCD

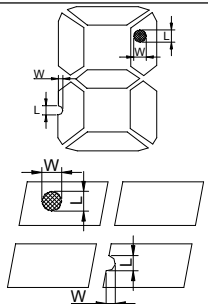
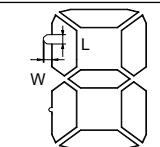
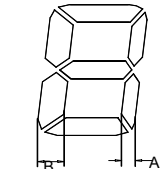
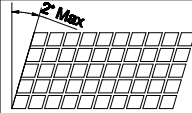
9-1: Definition: The area visible after LCD is assembled;

Illustration



- A: display area (AA area)
- B: View area (VA - AA area)
- C: Out of sight area
(Inside edge of frame glue to VA)
- D: Seating area (Box adhesive)
- E: Outside the frame glue area

9-2:Inspection Specification

Defect	Inspect Item	Inspection Standards				
Minor	Linear Defect * Glass Scratch * Polarizer Scratch * Fiber and Linear material	ZONE A				
		W	$W \leq 0.02$	$0.02 < W \leq 0.03$	$0.03 < W \leq 0.05$	$W > 0.05$
		L	Any	$L \leq 2.0$	$L \leq 5.0$	Any
		ACC. NO.	Any	2	1	Reject
		Note	The distance between lines must be at least 10mm or greater.			
		Zone B: 1.5times of acceptable largest diameter size of Zone A.				
		Zone C: Accept any number and size of appearance defects.				
Minor	Spot and Polarizer Pricked * Foreign material between glass and polarizer or glass and glass * Polarizer hole or protuberance by external force	ZONE A				
		Φ	$\Phi \leq 0.1$	$0.1 < \Phi \leq 0.2$	$\Phi > 0.2$	
		ACC. NO.	Any	3	0	
		Note	Φ is the average diameter of the defect. Distance between two defects ≥ 10 mm.			
		Zone B: 1.5times of acceptable largest diameter size of Zone A.				
		Zone C: Accept any number and size of appearance defects.				
Minor	Segment Defect 	Φ	$\Phi \leq 0.10$	$0.10 < \Phi \leq 0.20$	$0.20 < \Phi \leq 0.25$	$\Phi > 0.25$
		ACC. NO.	3EA / 100mm ²	2	1	0
		Note	W is more than 1/2 segment width			Reject
		$\Phi = \frac{L + W}{2}$ Distance between two defect is 10mm				
Minor	Protuberant Segment  $\Phi = (L + W) / 2$	Φ	$\Phi \leq 0.10$	$0.10 < \Phi \leq 0.20$	$0.20 < \Phi \leq 0.25$	$\Phi > 0.25$
		W	Glue	$W \leq 1/2$ Seg $W \leq 0.2$	$W \leq 1/2$ Seg $W \leq 0.2$	Ignore
		ACC. NO.	3EA / 100mm ²	2	1	0
Minor	Assembly Mis-alignment  	1. Segment				
		B	$B \leq 0.4$ mm	$0.4 < B \leq 1.0$ mm	$B > 1.0$ mm	
		B-A	$B-A < 1/2B$	$B-A < 0.2$	$B-A < 0.25$	
		Judge	Acceptable	Acceptable	Acceptable	
		2. Dot Matrix				
Deformation $> 2^\circ$				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"				

8. RELIABILITY

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	70°C, 96Hrs	2	GB/T2423.2 -2008
2	Low Temperature Operating	-20°C, 96Hrs	2	GB/T2423.1 -2008
3	High Humidity	60°C, 90%RH, 96Hrs	2	GB/T2423.3 -2006
4	High Temperature Storage	80°C, 96Hrs	2	GB/T2423.2 -2008
5	Low Temperature Storage	-30°C, 96Hrs	2	GB/T2423.1 -2008
6	Thermal Cycling Test	-20°C, 60min~70°C, 60min, 20 cycles.	2	GB/T2423.2 2 -2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X,Y,Z 30 min for each direction.	2	GB/T5170.1 4 -2009
8	Electrical Static Discharge	Air: ± 8KV 150pF/330 Ω 5 times	2	GB/T17626. 2 -2006
		Contact: ± 4KV 150pF/330 Ω 5 times		
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	2	GB/T2423.8 -1995

Note:1) Above conditions are suitable for standard products.

2) For restrict products, the test conditions listed as above must be revised.

9. 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
- Trichloro triflurothane

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.
- 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 dark color 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 40 C, 50%RH or less is reequired.

(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)

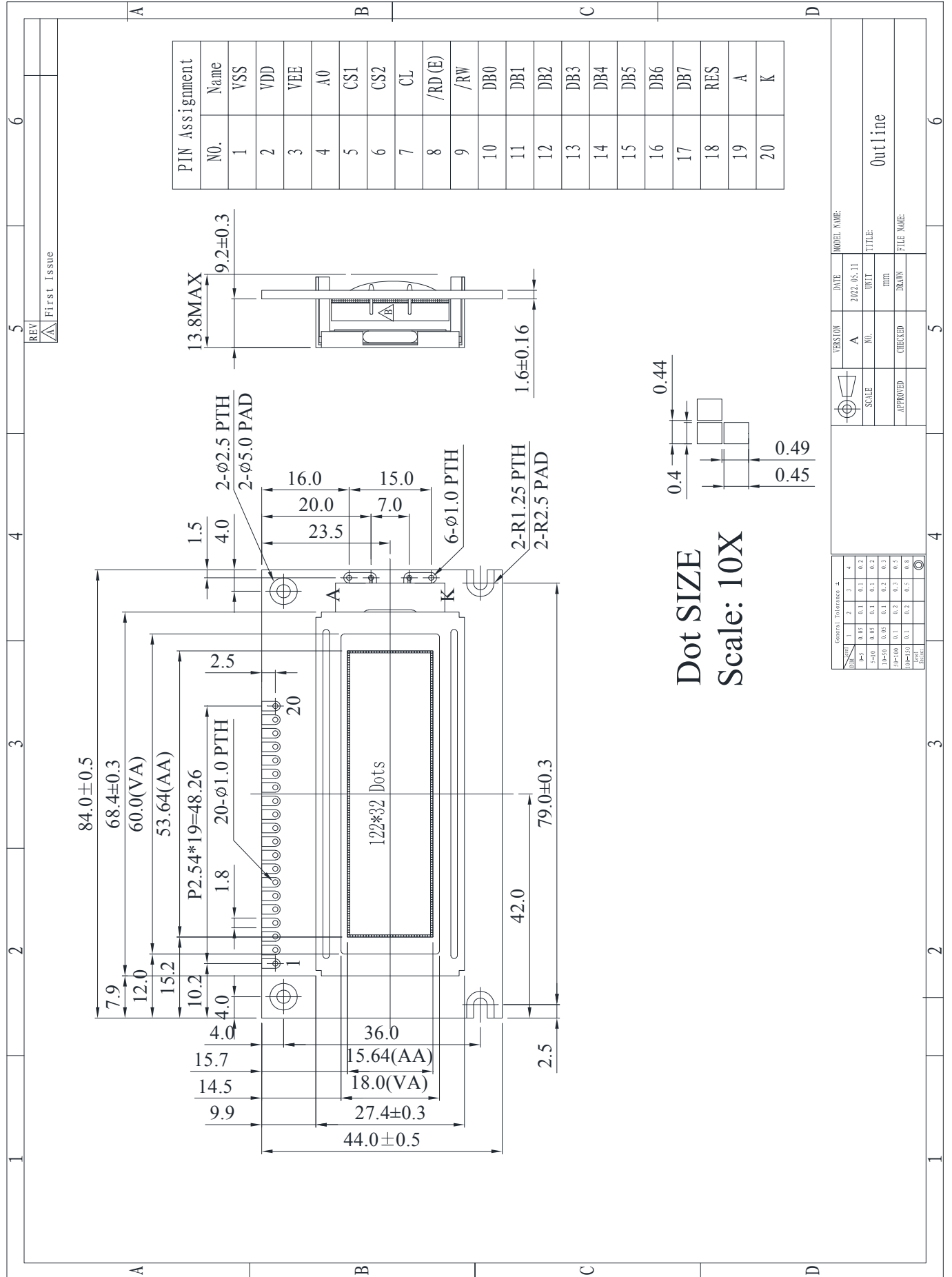
(7) Safety

- 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.

(8) Limited Warranty

- Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.
- If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used
- After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

10. OUTLINE DIMENSION



Dot SIZE
Scale: 10X

General Tolerance		Version				Model Name	
UNIT	1	2	3	4	VERSION	DATE	MODEL NAME
mm	±0.1	±0.05	±0.1	±0.2	A	2022.05.11	
mm	±0.05	±0.05	±0.1	±0.2	NO.	UNIT	TITLE
mm	±0.05	±0.05	±0.1	±0.2	CHECKED	DRAWN	FILE NAME
mm	±0.05	±0.1	±0.2	±0.5			
mm	±0.1	±0.2	±0.5	±0.8			

Outline