



PRODUCT SPECIFICATION

MONO LCD MODULE

MODEL:G1206B1SGW7G-C0 Ver:1.0

DRAWING VERSION: Ver: A

<◇> Preliminary Specification

<◆> Finally Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY
	—		

Table of Contents

No.	Contents	Page
1.	FEATURES	4
2.	MECHANICAL SPECIFICATIONS	4
3.	ELECTRICAL SPECIFICATIONS	4
4.	TERMINAL FUNCTIONS AND BLOCK DIAGRAM	6
5.	TIMING CHARACTERISTICS	7
6.	COMMAND LIST	8
7.	QUALITY SPECIFICATIONS	9
8.	RELIABILITY	14
9.	HANDLING PRECAUTION	15
10.	OUTLINE DIMENSION	16

1. Features

The features of LCD are as follows

- * Display mode : STN / Blue / Transmissive / Negative
- * Controller IC : NT7538
- * Interface Input Data : Serial interface
- * Driving Method : 1/65 Duty, 1/9 Bias
- * Viewing Direction : 12 o'clock
- * Backlight : 3 LED/Side White
- * Sample No. : G1206B1SGW7G-C0_01/20230517

2. MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module Size	56(W) x 37(H) x 6.9(D)	mm
View display area	46MIN(W) x 26MIN(H)	mm
Activity Display Area	42.21(W) x 22.37(H)	mm
Number of Dots	128 x 64	Dots
Dot Size	0.3(W) x 0.32(H)	mm
Dot Pitch	0.33(W) x 0.35(H)	mm

3. ELECTRICAL SPECIFICATIONS

3-1 ABSOLUTE MAXIMUM RATINGS (Ta = 25 °C)

Item	Symbol	Standard Value			Unit
		Min.	Typ.	Max.	
Supply Voltage For Logic	V _{DD} – V _{SS}	-0.3	-	4.0	V
Supply Voltage For LCD Drive	V _{LCD}	-0.3	-	15	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}	Ta = 25 °C	2.8	3.0	3.2	V
LCD Drive	V _{LCD}		8.8	9.0	9.2	V
Input Voltage	"H" Level V _{IH}		0.8V _{DD}	-	V _{DD}	V
	"L" Level V _{IL}		V _{SS}	-	0.2V _{DD}	V
Frame Frequency	f _{FLM}		-	78	-	Hz
Current Consumption	I _{DD}		-	0.13	-	mA

3-3. BACKLIGHT

3-3-1. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Current	IF	Ta = 25 °C	-	-	25	mA
Power Dissipation	PD		-	-	75	mW
Reverse Current	Ir	Vr = 5.0V	-	-	10	uA

*. NOTE: This parameter is the maximum rating of a single LED.

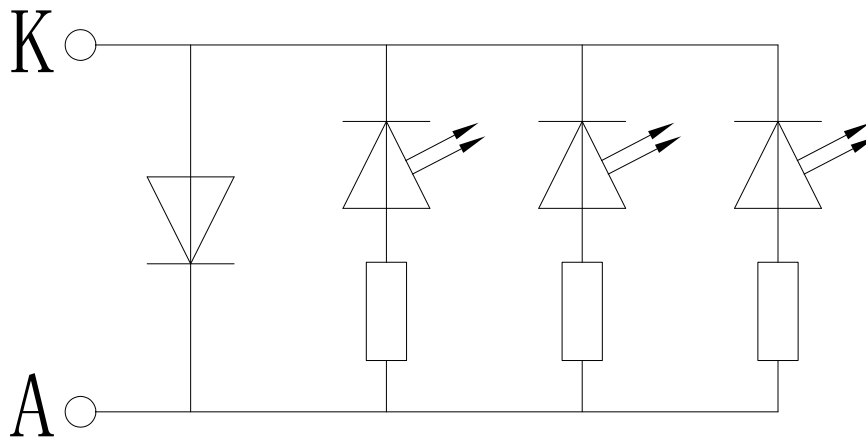
3-3-2. Electrical-optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	Vf	If = 45 mA Ta = 25 °C	3.7	4.0	4.3	V
Luminance	Lv		500	-	-	cd/m ²
Color coordinate	X		0.25	0.28	0.32	-
	Y	0.25	0.28	0.32		

*. NOTE: The brightness is measured without LCD panel.

3-3-3 Backlight circuit

For operation above 25 °C, The Ifm & Pd must be derated, the current derating is -0.36mA/ °C for DC drive and -0.86mA/ °C for Pulse drive, the Power dissipation is -1.5mW/ °C. The product working current must not more than the 60% of the Ifm or Ifp according to the working temperature.

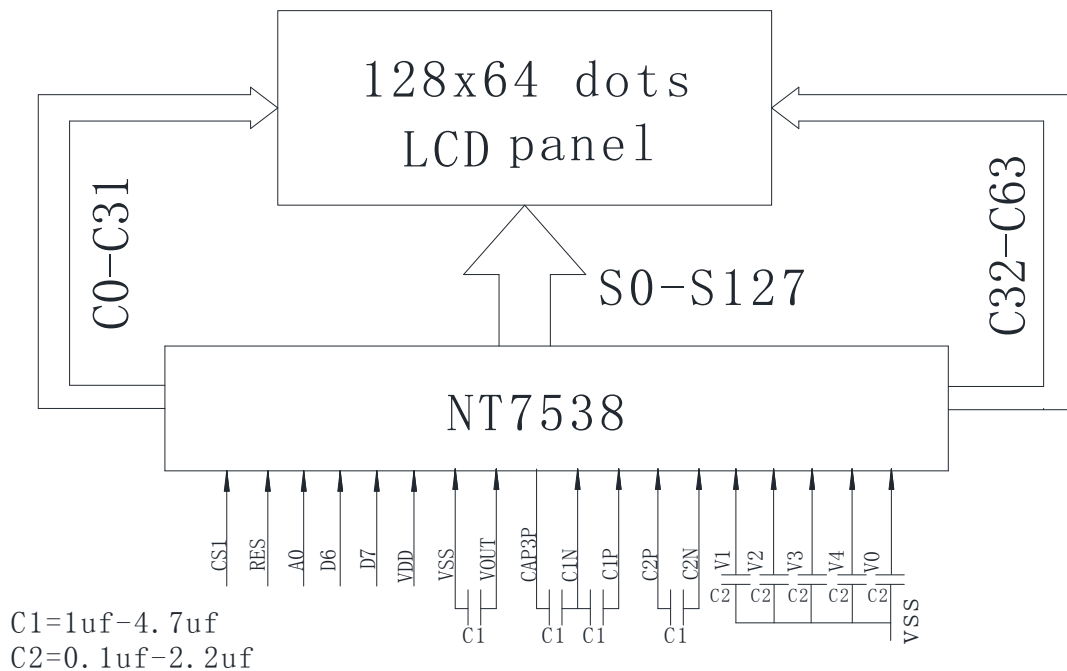


4. TERMINAL FUNCTIONS AND BLOCK DIAGRAM

4-1. INTERFACE PIN FUNCTION DESCRIPTION

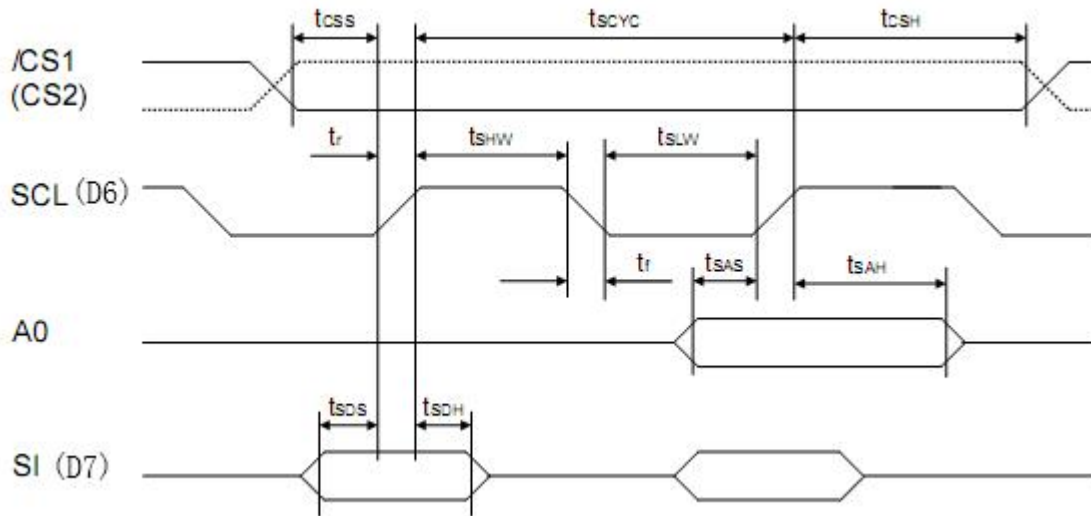
PIN NO.	SYMBOL	FUNCTIONS
1	/CS1	Chip selection signal , When /CS1="L", then the chip select becomes active
2	/RES	Reset signal, When /RES is set to "L", the settings are initialized.
3	A0	Select register signal
4	D6	the serial clock input terminal (SCL).
5	D7	the serial data input terminal (SI)
6	VDD	Supply voltage for logical circuit
7	VSS	Ground (0V)
8	VOUT	DC/DC voltage converter output
9	C3P	DC/DC voltage converter. Connect CAP between them.
10	C1N	
11	C1P	
12	C2P	
13	C2N	
14-17	V1-V4	A multi-level power supply for the liquid crystal drive.
18	V0	
19	A	BLACKLIGHT +
20	K	BLACKLIGHT -

4-2. BLOCK DIAGRAM



5. TIMING CHARACTERISTICS

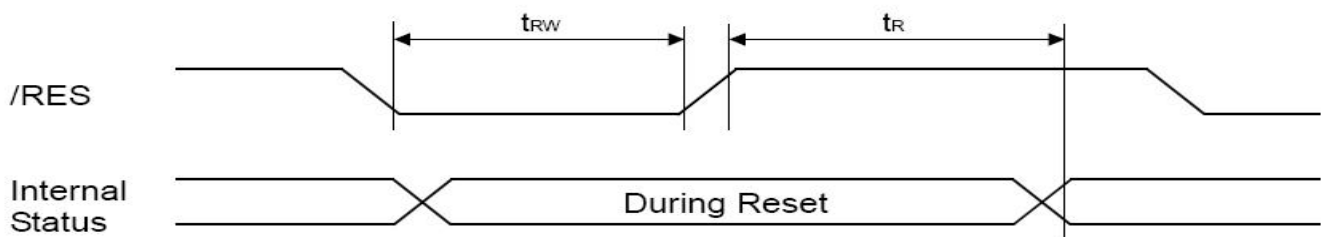
5-1. System Buses Read/Write Characteristics (for Seril Interfacer)



VDD=3.0V, Ta=-20° ~ +70°

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
tscyc	Serial clock cycle	120	-	-	ns	SCL
tshw	Serial clock H pulse width	60	-	-	ns	SCL
tslw	Serial clock L pulse width	60	-	-	ns	SCL
tsas	Address setup time	30	-	-	ns	A0
tсах	Address hold time	20	-	-	ns	A0
tlds	Data setup time	30	-	-	ns	SI
tldh	Data hold time	20	-	-	ns	SI
tcss	Chip select setup time	20	-	-	ns	/CS1, CS2
tcsH	Chip select hold time	40	-	-	ns	/CS1, CS2

5-2. Reset Timing



Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
tr	Reset Time	-	-	1.0	μs	
trw	Reset low pulse width	10	-	-	μs	/RES

6. COMMAND LIST

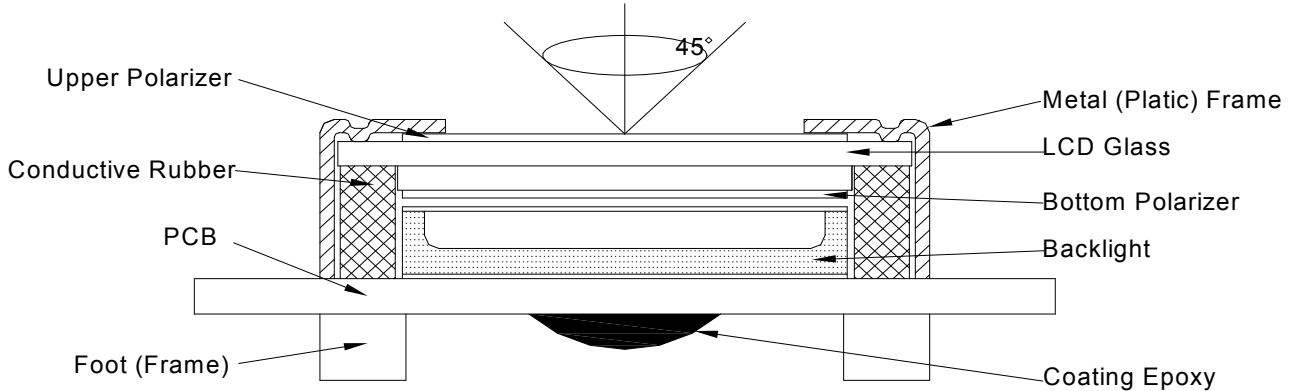
6-1. command table

Command	A0	/RD	/WR	Code											Function
				D7	D6	D5	D4	D3	D2	D1	D0	Hex			
(1) Display OFF	0	1	0	1	0	1	0	1	1	1	0	1	AEh AFh	Turn on LCD panel when high, and turn off when low	
(2) Display Start Line Set	0	1	0	0	1	Display Start Address						40h to 7Fh	Specifies RAM display line for COM0		
(3) Page Address Set	0	1	0	1	0	1	1	Page Address				B0h to B8h	Set the display data RAM page in Page Address register		
(4) Column Address Set	0	1	0	0	0	0	1	Higher Column Address				00h to 18h	Set 4 higher bits and 4 lower bits of column address of display data RAM in register		
	0	1	0	0	0	0	0	Lower Column Address							
(5) Read Status	0	0	1	Status				0	0	0	0	XX	Reads the status information		
(6) Write Display Data	1	1	0	Write Data								XX	Write data in display data RAM		
(7) Read Display Data	1	0	1	Read Data								XX	Read data from display data RAM		
(8) ADC Select	0	1	0	1	0	1	0	0	0	0	0	1	A0h A1h	Set the display data RAM address SEG output correspondence	
(9) Normal/Reverse Display	0	1	0	1	0	1	0	0	1	1	0	1	A6h A7h	Normal indication when low, but full indication when high	
(10) Entire Display ON/OFF	0	1	0	1	0	1	0	0	1	0	0	1	A4h A5h	Select normal display (0) or entire display on	
(11) LCD Bias Set	0	1	0	1	0	1	0	0	0	1	0	1	A2h A3h	Sets LCD driving voltage bias ratio	
(12) Read-Modify-Write	0	1	0	1	1	1	0	0	0	0	0	0	E0h	Increments column address counter during each write	
(13) End	0	1	0	1	1	1	0	1	1	1	0	0	Eh	Releases the Read-Modify-Write	
(14) Reset	0	1	0	1	1	1	0	0	0	1	0	0	E2h	Resets internal functions	
(15) Common Output Mode Select	0	1	0	1	1	0	0	0	1	*	*	*	C0h to CFh	Select COM output scan direction *: invalid data	
(16) Power Control Set	0	1	0	0	0	1	0	1	Operation Status			28h to 2Fh	Select the power circuit operation mode		
(17) V0 Voltage Regulator Internal Resistor ratio Set	0	1	0	0	0	1	0	0	Resistor Ratio			20h to 27h	Select internal resistor ratio Rb/Ra mode		
(18) Electronic Volume mode Set Electronic Volume Register Set	0	1	0	1	0	0	0	0	0	0	0	1	81h		
	0	1	0	*	*	Electronic Control Value						XX	Sets the V0 output voltage electronic volume register		
(19) Set Static indicator ON/OFF Set Static Indicator Register	0	1	0	1	0	1	0	1	1	0	0	1	ACH ADh	Sets static indicator ON/OFF 0: OFF, 1: ON	
	0	1	0	*	*	*	*	*	*	Mode		XX	Sets the flash mode		
(20) Power Save	0	1	0	-	-	-	-	-	-	-	-	-	-	Compound command of Display OFF and Entire Display ON	
(21) NOP	0	1	0	1	1	1	0	0	0	1	1	1	E3h	Command for non-operation	
(22) Oscillation Frequency Select	0	1	0	1	1	1	0	0	1	0	0	1	E4h E5h	Select the oscillation frequency	
(23) Partial Display mode Set	0	1	0	1	0	0	0	0	0	1	0	1	82h 83h	Enter/Release the partial display mode	
(24) Partial Display Duty Set	0	1	0	0	0	1	1	0	Duty Ratio			30h 37h	Sets the LCD duty ratio for partial display mode		
(25) Partial Display Bias Set	0	1	0	0	0	1	1	1	Bias Ratio			38h 3Fh	Sets the LCD bias ratio for partial display mode		
(26) Partial Start Line Set Partial Start Line Set	0	1	0	1	1	0	1	0	0	1	1	1	D3h	Enter Partial Start Line Set	
	0	1	0	1	1	Partial Start Line						XX	Sets the LCD Number of partial display start line		
(27) N-Line Inversion Set Number of Line Set	0	1	0	1	0	0	0	0	1	0	1	1	85h	Enter N-Line inversion	
	0	1	0	*	*	*	Number of Line					XX	Sets the number of line used for N-Line inversion		
(28) N-Line Inversion Release	0	1	0	1	0	0	0	0	1	0	0	0	84h	Exit N-Line Inversion	
(29) DC/DC Clock Set DC/DC Clock Division Set	0	1	0	1	1	1	0	0	1	1	0	0	E6h	Set DC/DC Clock Frequency	
	0	1	0	1	1	0	0	Clock Division				XX	Set the Division of DC/DC Clock Frequency		
(30) Test Command	0	1	0	1	1	1	1	*	*	*	*	*	F1h to FFh	IC test command. Do not use!	
(31) Test Mode Reset	0	1	0	1	1	1	1	0	0	0	0	0	F0h	Command of test mode reset	

7. QUALITY SPECIFICATIONS

7-1. LCM Appearance and Electric inspection Condition

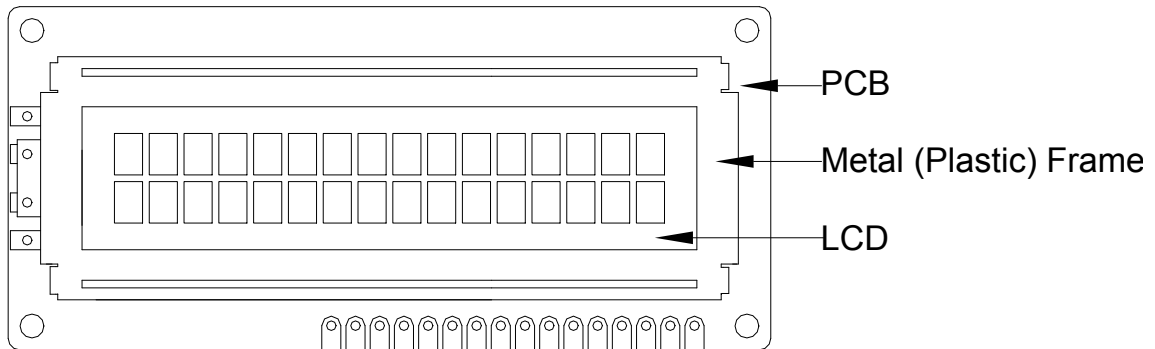
1. Inspection will be done by placing LCM 30cm away from inspector's eyeballs under normal illumination.



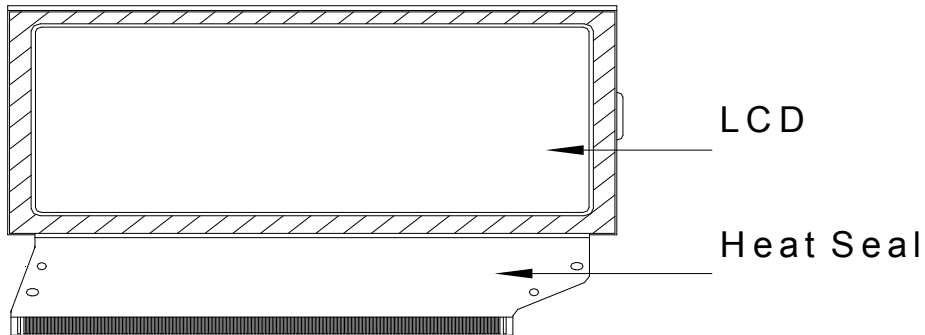
2. View Angle: with in 45° around perpendicular line.

7-2. Definition

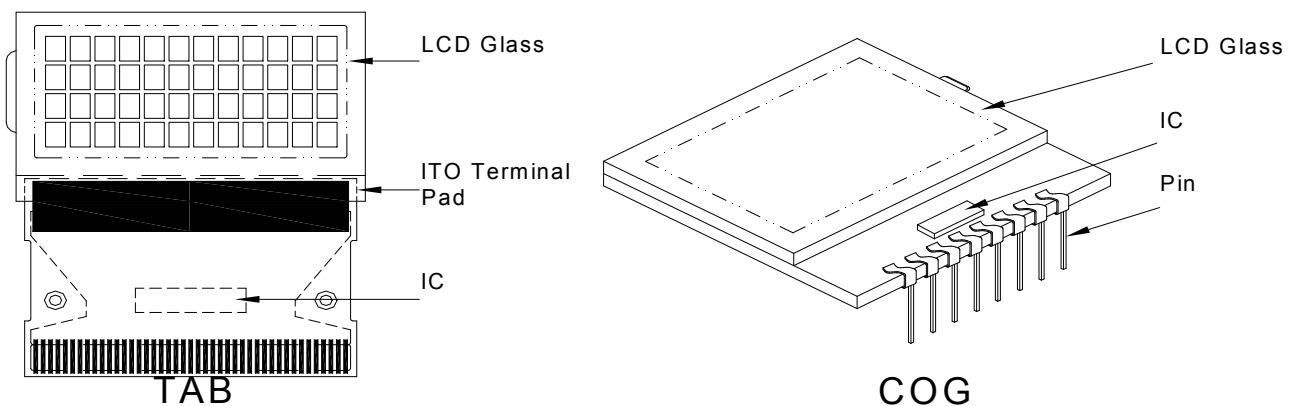
1. COB



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

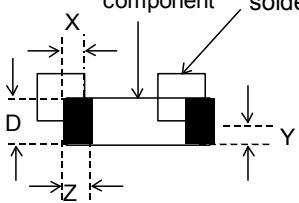
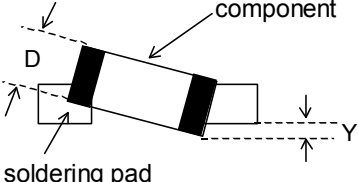
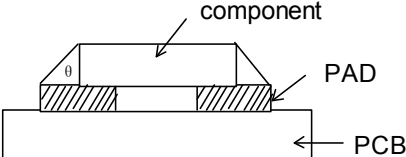
Minor defect: AQL = 1.5

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

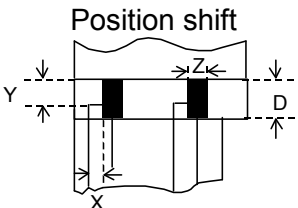
2. SMT

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		

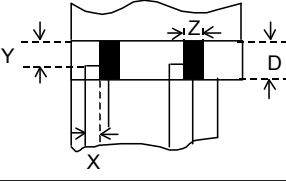
4. Flexible Film Connector (FFC)

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	 <p>Position shift</p>	$Y > 1/3D$	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

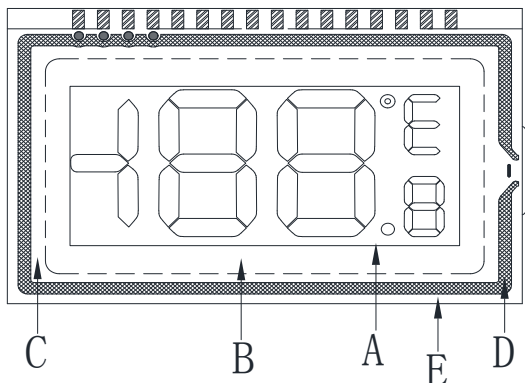
8. Electric Inspection

Defect	Inspection Item	Inspection Standards	
Major	Short		Reject
Major	Open		Reject

9. Inspection Specification of LCD

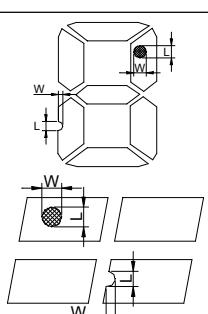
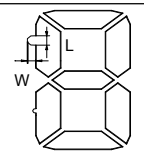
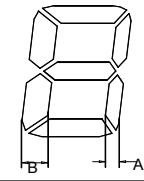
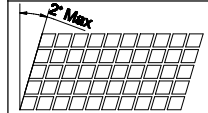
9-1: Definition: The area visible after LCD is assembled;

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/T2423.3-2016
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/T2423.22-2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X,Y,Z 30 min for each direction.	2	GB/T5170.14-2009
8	Electrical Static Discharge	Air: ±8KV 150pF/330 Ω 5 times Contact: ±4KV 150pF/330 Ω 5 times	2	GB/T17626.2-2018
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 our company 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 trifloro thane

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

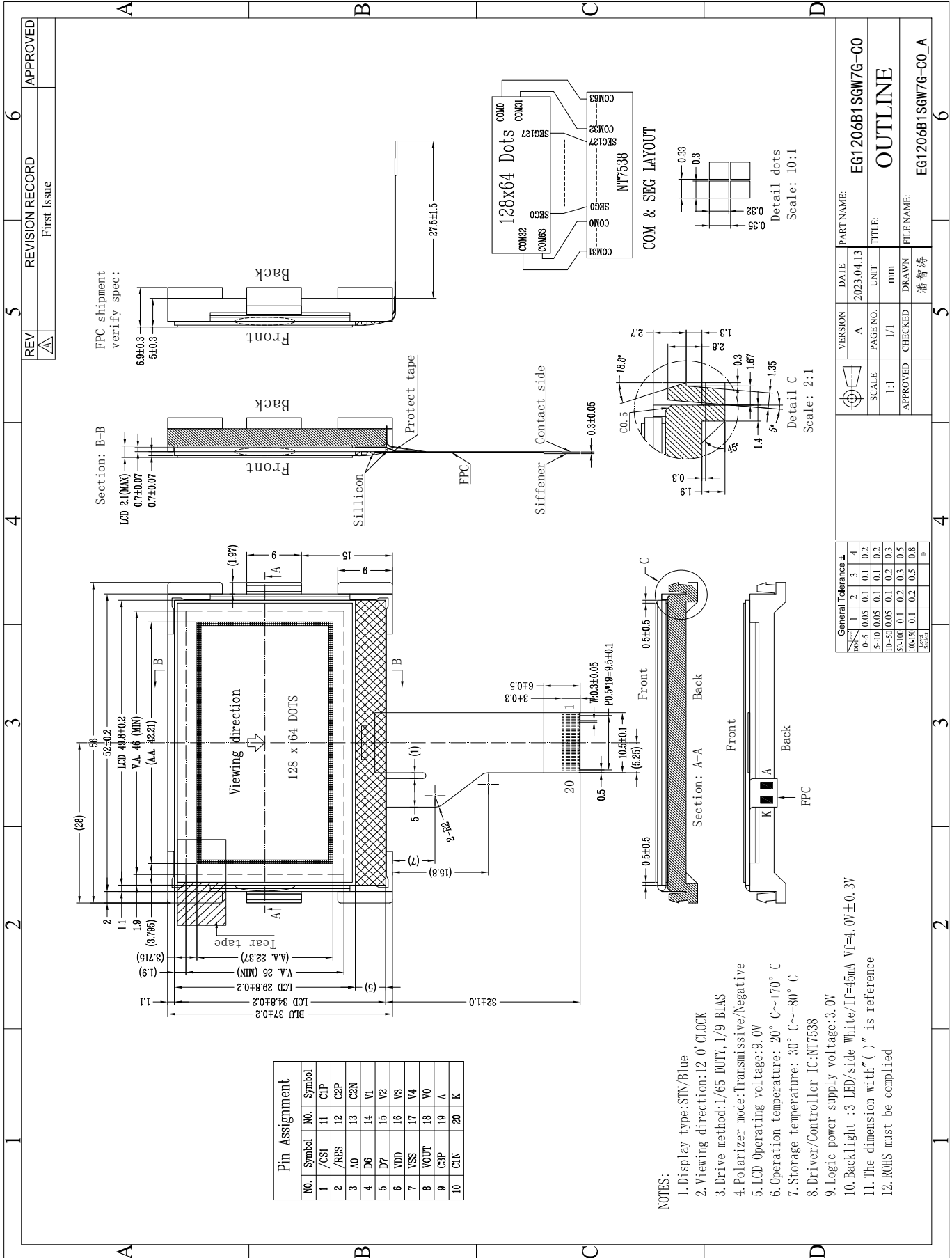
- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol.
Which should be burned up later.
When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and wate

(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

*NOTE:The dimensions with mark"(")" are reference



REV	REVISION RECORD	APPROVED
△	First Issue	

VERSION	DATE	PART NAME:
A	2023.04.13	EG1206B1SGW7G-C0
SCALE	PAGE NO. <td>TITLE:</td>	TITLE:
1:1	1/1	OUTLINE
UNIT	CHECKED	FILE NAME:
mm	潘智涛	EG1206B1SGW7G-C0_A

General Tolerance ±	1	2	3	4
0-5	0.05	0.1	0.1	0.2
5-10	0.05	0.1	0.1	0.2
10-50	0.05	0.1	0.2	0.3
50-100	0.1	0.2	0.3	0.5
100-500	0.1	0.2	0.5	0.8
500-1000	0.1	0.2	0.5	0.8

- NOTES:
1. Display type:STN/Blue
 2. Viewing direction:12 0' CLOCK
 3. Drive method:1/65 DUTY, 1/9 BIAS
 4. Polarizer mode:Transmissive/Negative
 5. LCD Operating voltage:9.0V
 6. Operation temperature:-20° C~+70° C
 7. Storage Temperature:-30° C~+80° C
 8. Driver/Controller IC:NT7538
 9. Logic power supply voltage:3.0V
 10. Backlight :3 LED/side White/If=45mA Vf=1.0V±0.3V
 11. The dimension with "*" is reference
 12. ROHS must be complied