ROHS

PRODUCT SPECIFICATION

122X32DOTS LCD MODULE
MODEL: G1203A9FSW6B-G0 Ver:1.0

< ◇> Preliminary Specification

< ◆> Finally Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY
2015-04-20	/		邱信隆

Revision Status

Version	Revise Date	Page	Content	Modified By
Ver. 1.0	**2015-04-20**		**First Issued**	

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1. FEATURES

The features of LCD are as follows

* Display mode : FSTN/ Transflective/Positvie
* Drive IC : SBN1661G-M02
* Interface : 6800 interface/8080 interface
* Driving Method : 1/32 DUTY ,1/5 BIAS
* Viewing Direction : 6 O'clock
* Backlight : Side White
*Sample NO. : G1203A9SGW7B-G0_01/20150417

2. MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module Size	80(W) x 36(H) x 13.6 max(T)	mm
Number of Dots	122 x 32 Dots	-
View display area	60.5(W) x 18.5(H)	mm
Activity Area	53.64(W)x15.64(H)	mm
Dot Size	0.40(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}	-0.3	-	7.0	V
Supply Voltage For LCD Drive	V_{LCD}	3.5	-	+13	V
Input Voltage	Vin	-0.3	-	$V_{DD+0.3}$	V
LCM Operating Temp.	Top	-20	-	+70	°C
LCM Storage Temp.	Tst	-30	-	+80	°C

*****. NOTE: The response time will be extremely slow when the operating temperature is around -10℃, 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 V_{DD}=5.0V ± 10%	-	5.0	-	V
LCD Drive		V_{LCD} =V_{DD}-V_0		4.3	4.5	4.7	V
Input Voltage	"H" Level	V_{IH}		3.5	-	5.0	V
	"L" Level	V_{IL}		0	-	1.1	V
Frame Frequency		f_{FLM}		-	64	-	Hz
Current Consumption		I_{DD}		-	1.14	-	mA

3-3. BACKLIGHT

3-3-1. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Current	IF	Ta = 25 °C	-	-	44	mA
Power Dissipation	PD		-	-	154	mW
Reverse Current	IR	VR=5.0V/LED	-	-	15	uA

3-3-2. Electrical-optical Characteristics

Item	Symbol		Condition	Min.		Typ.		Max.		Unit
Forward Voltage	VF		If=40mA Ta = 25 °C	2.9		3.2		3.5		V
Average Luminous Intensity	Lv			350		-		-		cd/m^2
Chromaticity coordiantes	X	Y		0.25	0.25	0.28	0.28	0.31	0.31	-
Luminous Uniformity	△Lv		MIN/MAX*100%	75		-		-		%

The brightness is measured without LCD panel

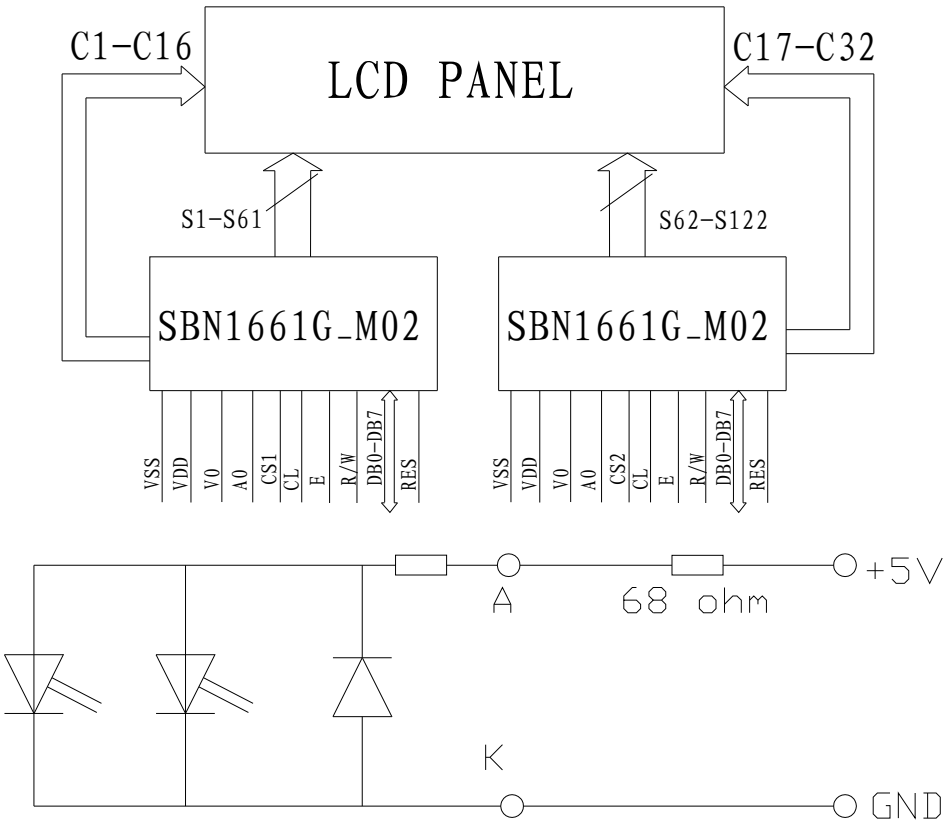
For operation above 25℃, The Ifm Ifp &Pd must be derated,the current derating is -0.36mA/℃ for DC drive and -0.86 mA/℃ for Pulse drive, the Power dissipation is -0.75mW/℃.The produt working current must not more than the 60% of the Ifm or Ifp according to the working temperature.

4. TERMINAL FUNCTIONS AND BLOCK DIAGRAM

4-1. INTERFACE PIN FUNCTION DESCRIPTION

PIN NO.	SYMBOL	FUNCTION
1	VSS	Ground (0V)
2	VDD	Supply voltage for logical circuit
3	V0	Supply voltage for LCD driving
4	A0	Select register signal, L= Command, H= Data
5	CS1	Chip Select (active low)
6	CS2	Chip Select (active low)
7	CL	For the SBN1661G_M02. Clock from master or an external clock source should be added to this pin.
8	E	Enable signal for the 68-type microcontroller.
.9	R/W	H: Data Read (LCM to MPU) ; L: Data Write (MPU to LCM)
10-17	DB0~DB7	Data bus
18	RES	Hardware RESET and interface type selection.
19	NC	NO CONECTION
20	NC	NO CONECTION

4-2. BLOCK DIAGRAM

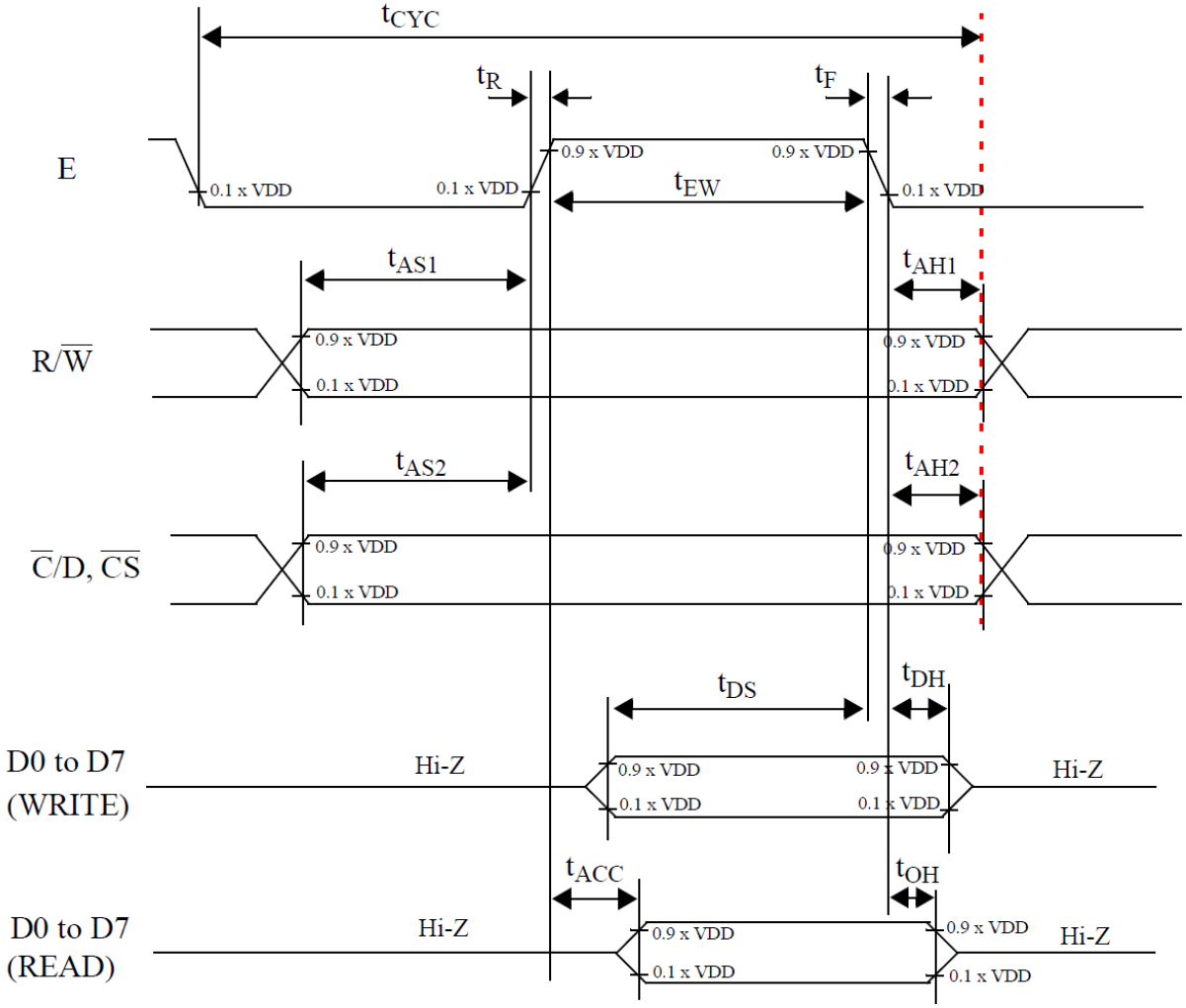


2X1=2 Pcs

INTERNAL CIRCUIT DIAGRAM

5. TIMING CHARACTERISTICS

5-1 AC timing for interface with an 68ype microcontroller

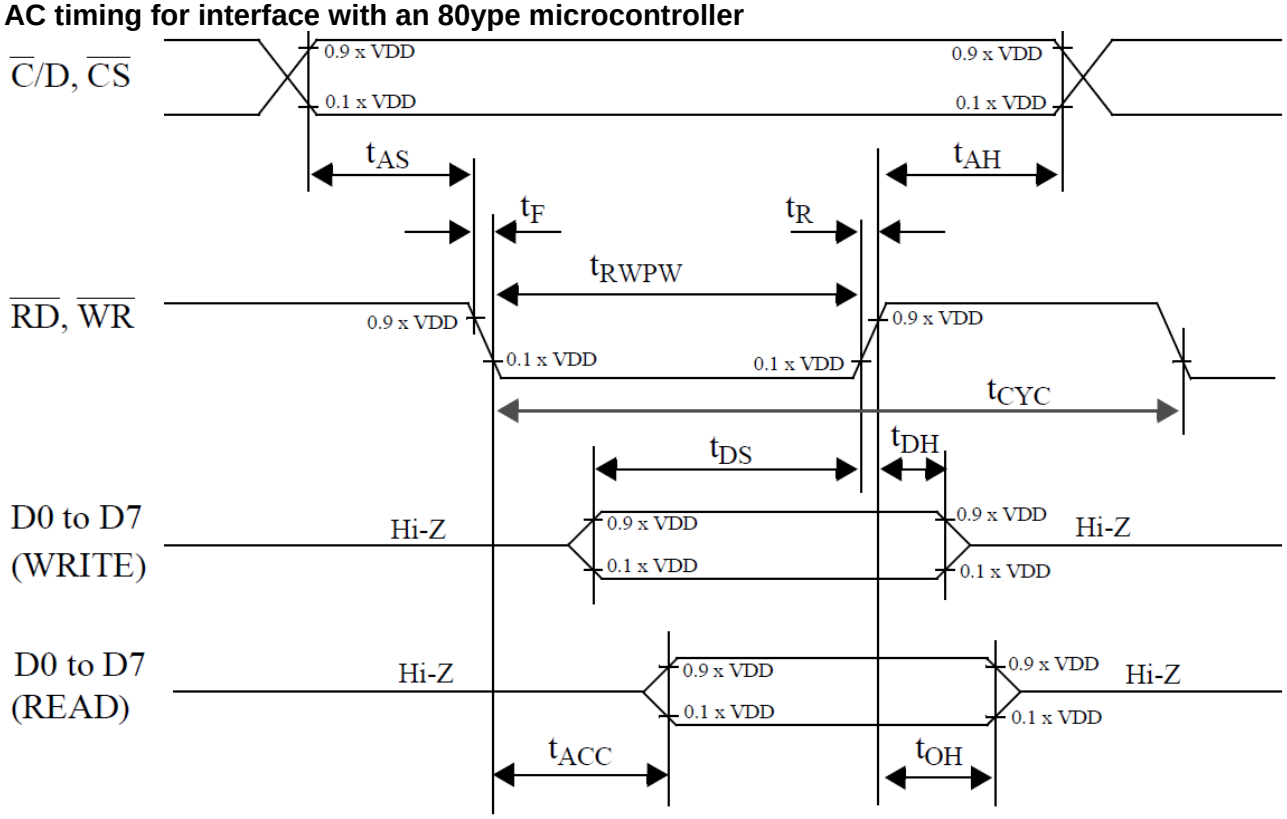


VDD=5V, Ta = 25 °C

symbol	parameter	min.	max.	test conditons	unit
t_{AS1}	Address set-up time with respect to R/$\overline{W}$	20			ns
t_{AS2}	Address set-up time with respect to $\overline{C}$/D, $\overline{CS}$	20			ns
t_{AH1}	Address hold time with respect to R/$\overline{W}$	10			ns
t_{AH2}	Address hold time respect with to $\overline{C}$/D, $\overline{CS}$	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

NOTE:
1.The system cycle time(tCYC) is the time duration from the time when Chip Enable is enabled to the time when Chip Select is released.

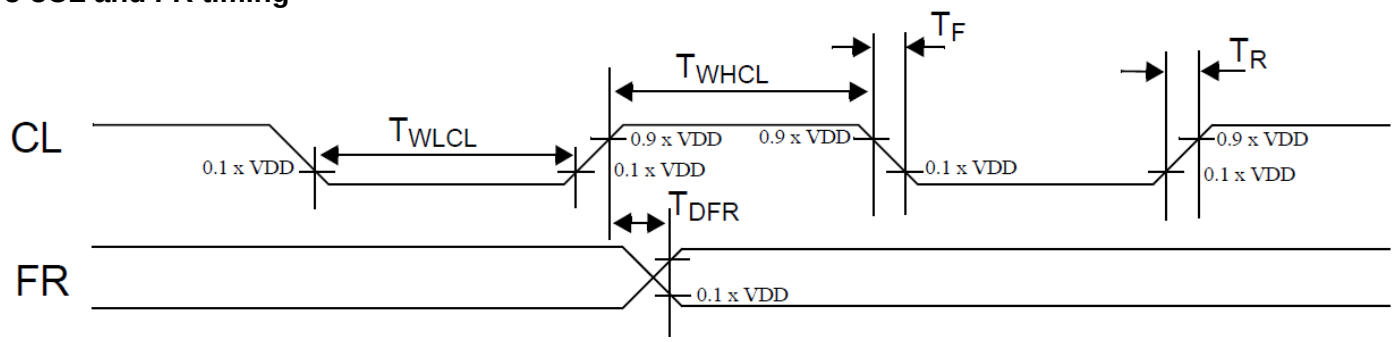
5-2 AC timing for interface with an 80ype microcontroller



VDD=5V, Ta = 25 °C

symbol	parameter	min.	max.	test conditons	unit
t_{AS}	Address set-up time	20			ns
t_{AH}	Address hold time	10			ns
t_F, t_R	Read/Write pulse falling/rising time		15		ns
t_{RWPW}	Read/Write pulse width	200			ns
t_{CYC}	System cycle time	1000			ns
t_{DS}	Data setup time	80			ns
t_{DH}	Data hold time	10			ns
t_{ACC}	Data READ access time		90	CL= 100 pF.	ns
t_{OH}	Data READ output hold time	10	60	Refer to Fig. 23.	ns

5-3CL and FR timing



VDD=5V, Ta = 25 °C

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
T_{WHCL}	CL clock high pulse width		33			μs
T_{WLCL}	CL cock 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 pF.		0.2	0.36	μS

6. COMMAND LIST

6-1 Registers and their states after RESET

Register Name	Description	States after RESET
Display ON/OFF Register	The Display ON/OFF Register is a 1-bit register. After RESET, its value is LOW and, therefore, the LCD display is turned OFF.	0
Display Start Line Register	The Display Start Line Register is a 6-bit register. After RESET, its value is 0 0000 and Row0 of the Display Data Memory is mapped to COM0.	00 0000
Page Addres Register	The Page Address Register is a 2-bit register. After RESET, its value is 11 and, therefore, it points to Page 3 of the Display Data Memory.	11
Column Address Register	The Column Address Register is a 7-bit register. After RESET, its value is 000 0000 and, therefore, it points to column 0 of the Display Data Memory.	000 0000
Static Drive ON/OFF Register	The Static Drive ON/OFF Register is a 1-bit register. After RESET, its value is LOW and static display is turned OFF.	0
Duty Select Register	The Duty Select Register is a 1-bit register. After RESET, its value is HIGH and 1/32 display duty is selected.	1
Column/Segment Mapping Register	The Column/Segment Mapping Register is a 1-bit register. After RESET, its value is LOW and normal mapping is selected.	0
Status Register	The Status Register shows the current state of the SBN1661G_X. It is a 4-bit register, with each bit showing the status of a programmed function.	0000 0000

6-2 Display ON/OFF Register

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

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

When D0=1, the code is AF(Hex) and the display is turned ON. When D0=0, the code is AE(Hex) and the display is turned OFF.

6-3 Display Start Line Register

D7(MSB)	D6	D5	D4	D3	D2	D1	D0(LSB)
1	1	0	A4	A3	A2	A1	A0

A4, A3, A2, A1, and A0 are Start Line address bits and they can be programmed with a value in the range from 0 to 31. Therefore, the code can be from 1100 0000 (C0 Hex) to 1101 1111 (DF Hex).

6-4 Page Address Register

D7(MSB)	D6	D5	D4	D3	D2	D1	D0(LSB)
1	0	1	1	1	0	A1	A0

A1and A0 are page address bits and can be programmed with a value in the range from 0 to 3. A1A0=00 selects Page 0, A1A0=01 selects Page 1, A1A0=10 selects Page 2, and A1A0=11 selects Page 3. Therefore, the code can be from 1011 1000 (B8 Hex) to 1011 1011 (BB Hex).

6-5 Column Address Register

D7(MSB)	D6	D5	D4	D3	D2	D1	D0(LSB)
0	A6	A5	A4	A3	A2	A1	A0

A6~A0 are column address bits and can be programmed with a value in the range from 0 to 79. Therefore, the code can be from 0000 0000 (00 Hex) to 0100 1111 (4F Hex).

6-6 Status Read and Status Register

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

D7(MSB)	D6	D5	D4	D3	D2	D1	D0(LSB)
BUSY	MAPPING	ON/OFF	RESET	0	0	0	0

6-7 The Status Register bit description

Bit	Description
BUSY	BUSY=1 indicates that the SBN1661G_X is currently busy and can not accept new command or data. The SBN1661G_X is executing a command or is in the process of reset. BUSY=0 indicates that the SBN1661G_X is not busy and is ready to accept new command or data.
MAPPING	MAPPING=1 indicates that the Column/Segment Mapping Register has been programmed with a value of "1" and the SEG0 is mapped to Column 79 of the Display Data Memory (inverted mapping). MAPPING=0 indicates that the Column/Segment Mapping Register has been programmed with a value of "0" and the SEG0 is mapped to Column 0 of the Display Data Memory (normal mapping).
ON/OFF	The ON/OFF bit indicates the current of status of display. If ON/OFF=0, then the display has been turned ON. If ON/OFF=1, then the display has been turned OFF. Note that the polarity of this bit is inverse to that of the Display ON/OFF Register.
RESET	RESET=1 indicates that the SBN1661G_X is currently in the process of being reset. RESET=0 indicates that the SBN1661G_X is currently in normal operation.

6-8 COMMANDS

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.

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

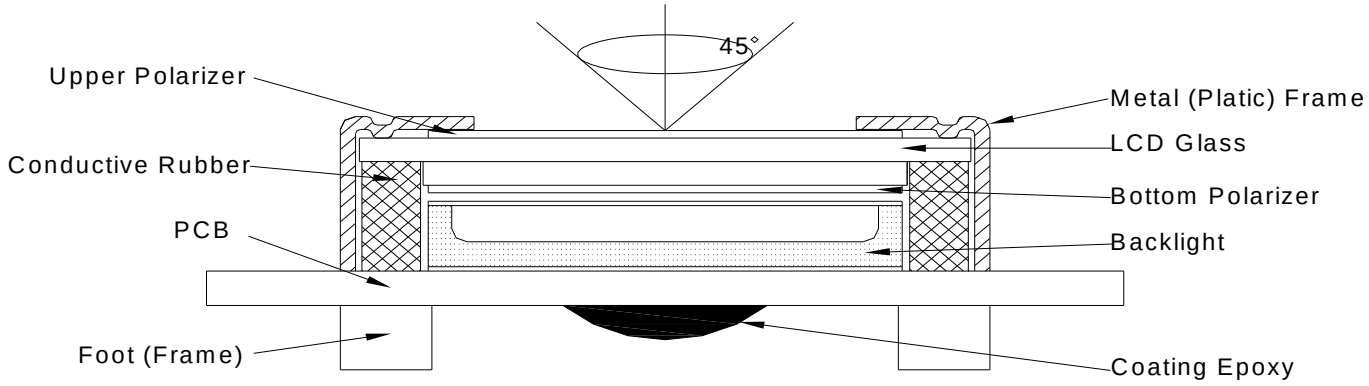
The setting of the control bus for issuing Read Display Data command

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

7. QUALITY SPECIFICATIONS

7-1. LCM Appearance and Electric inspection Condition

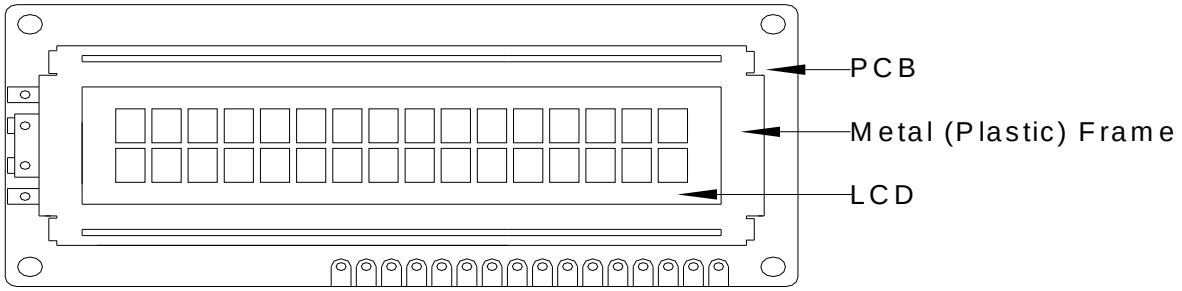
1. Inspection will be done by placing LCM 30cm away from inspector's eyeballs under normal illumination.



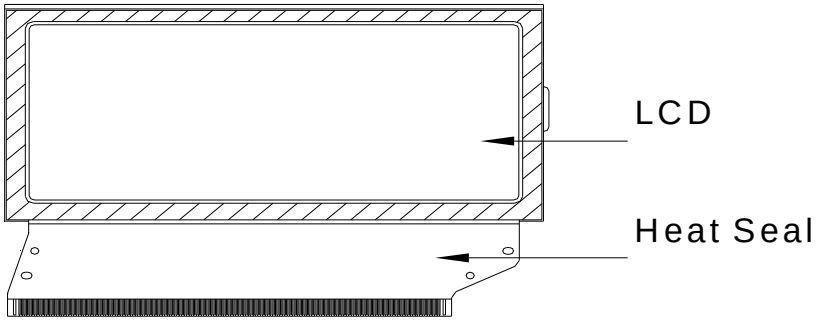
View Angle: with in 45˚around perpendicular line.

7-2. Definition

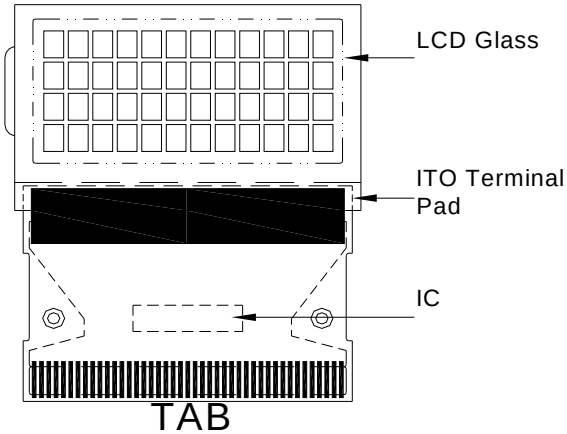
1. COB



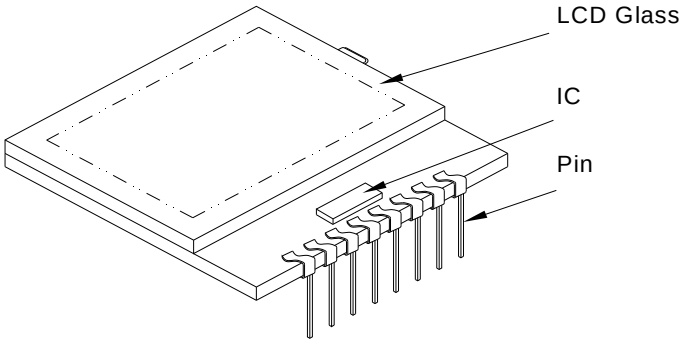
2. Heat Seal



3. TAB and COG



TAB



COG

7-3. Sampling Plan and Acceptance

1. Sampling Plan

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

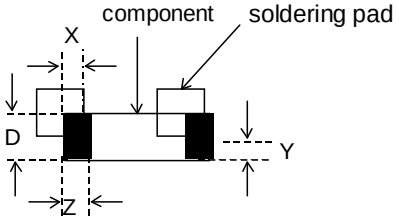
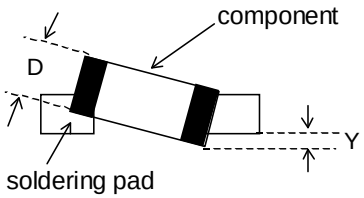
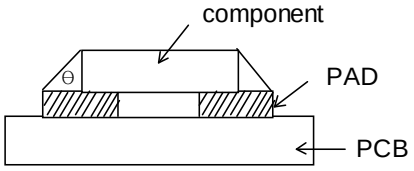
2. Acceptance
Major defect: AQL = 0.65%
Minor defect: AQL = 1.5%

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

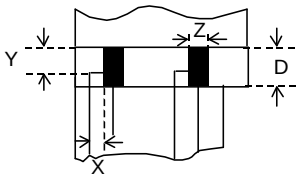
Defect	Inspection Item	Inspection Standards	
Minor	Component marking not readable		Reject
Minor	Component height	Exceed the dimension Of drawing	Reject
Major	Component solder defect (missing , extra, wrong component or wrong orientation		Reject
Minor	Component position shift 	X < 3/4Z Y > 1/3D	Reject 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<0.1mm	Any	Ignore
		0.1≤w<0.2mm	L≤5.0mm	2
		0.2≤w<0.3mm	L≤3.0mm	1

		w≥0.3mm	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
		$\Phi \leq 1.0$mm		2
		$1.0 < \Phi \leq 1.5$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)

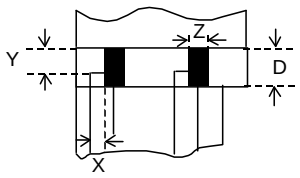
Defect	Inspection Item	Inspection Standards	
Minor	Tilted soldering	Within the angle +5°	Acceptable
Minor	Uneven solder joint /bump		Reject
Minor	Hole $\Phi = \frac{L+W}{2}$	Expose the conductive line	Reject
		Φ > 1.0mm	Reject
Minor	Position shift 	Y > 1/3D	Reject
		X > 1/2Z	Reject

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	$\Phi = \frac{L+W}{2}$	Φ> 0.5mm	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

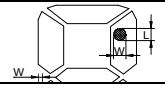
7. LED Backing Protective Film and Others

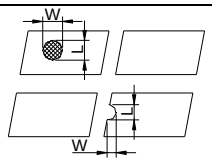
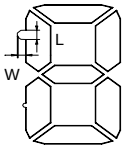
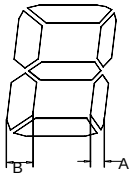
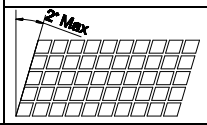
Defect	Inspection Item	Inspection Standards	
Minor	LED dirty, prick	Acceptable number of units	
		Φ≤0.10mm	Ignore
		0.10<Φ≤0.15mm	2
		0.15<Φ≤0.2mm	1
		Φ>0.2mm	0
		The distance between any two spots should be ≥5mm Any spot/dot/void outside of viewing area is acceptable	
Minor	Protective film tilt	Not 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

Defect	Inspect Item		Inspection Standards			
Minor	**Linear Defect**	∗ Glass Scratch ∗ Polarizer Scratch ∗ Fiber and Linear material	**W**	**W≤0.03**	**0.03<W≤0.05**	**W>0.05**
			L	**L<5**	**L<3**	**Any**
			ACC. NO.	**1**	**1**	**Reject**
			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 ∗ Polarizer hole or protuberance by external force	**Φ**	**Φ≤0.1**	**0.1<Φ≤0.15**	**0.15<Φ≤0.2**	**Φ>0.2**
			ACC. NO.	**3EA / 100mm²**	**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 transparant foreign material between glass and glass or glass and polarizer ∗ Air protuberance between polarizer and glass	**Φ**	**Φ≤0.3**	**0.3<Φ≤0.5**	**0.5<Φ**
			ACC. NO.	**3EA / 100mm²**	**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**	**0.20<Φ≤0.25**	**Φ>0.25**
			ACC.	**3EA /**	**2**	**1**	**0**

<table>
<tr><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2">  </td><td>NO.</td><td colspan="3">100mm²</td></tr>
<tr><td>Note</td><td colspan="3">W is more than 1/2 segment width
$\Phi = \frac{L+W}{2}$
Distance between two defect is 10mm</td><td>Reject</td></tr>
<tr><td rowspan="4">Minor</td><td rowspan="4">Protuberant Segment</td><td rowspan="4"> 
$\Phi = (L + W) / 2$</td><td>Φ</td><td>Φ≤0.10</td><td>0.10<Φ≤0.20</td><td>0.20<Φ≤0.25</td><td>Φ>0.25</td></tr>
<tr><td>W</td><td>Glue</td><td>W≤1/2 Seg
W≤0.2</td><td>W≤1/2 Seg
W≤0.2</td><td>Ignore</td></tr>
<tr><td>ACC. NO.</td><td>3EA / 100mm²</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td colspan="5"></td></tr>
<tr><td rowspan="5">Minor</td><td rowspan="5">Assembly Mis-alignment</td><td rowspan="3">  </td><td colspan="5">1. Segment</td></tr>
<tr><td>B</td><td>B≤0.4mm</td><td>0.4<B≤1.0mm</td><td>B>1.0mm</td></tr>
<tr><td>B-A</td><td>B-A<1/2B</td><td>B-A<0.2</td><td>B-A<0.25</td></tr>
<tr><td>Judge</td><td>Acceptable</td><td>Acceptable</td><td>Acceptable</td></tr>
<tr><td>  </td><td colspan="5">2. Dot Matrix</td></tr>
<tr><td colspan="4">Deformation>2°</td><td>Reject</td></tr>
<tr><td>Minor</td><td>Stain on LCD Panel Surface</td><td></td><td colspan="5">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”</td></tr>
</table>

8. RELIABILITY

NO.	Item	Condition	Criterion
1	High Temperature Operating	70℃, 96Hrs	No defect in cosmetic and operational function allowable. Total current Consumption should be below double of initial value.
2	Low Temperature Operating	-20℃, 96Hrs	
3	High Humidity	40℃, 90%RH, 96Hrs	
4	High Temperature Storage	80℃, 96Hrs	
5	Low Temperature Storage	-30℃, 96Hrs	
6	Vibration	Random wave 10 ~ 100Hz Acceleration: 2g 2 Hrs per direction(X,Y,Z)	
7	Thermal Shock	-20℃ to 25℃ to 70℃ (60Min) (15Min) (60Min) 16Cycles	
8	ESD Testing	Contract Discharge Voltage: +1 ~ 4kV and –1 ~ –4kV	There will be discharged ten times at every discharging voltage cycle. The voltage gapis 1kV.
		Air Discharge Voltage: +1 ~ 6kV and –1 ~ -6kV	

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

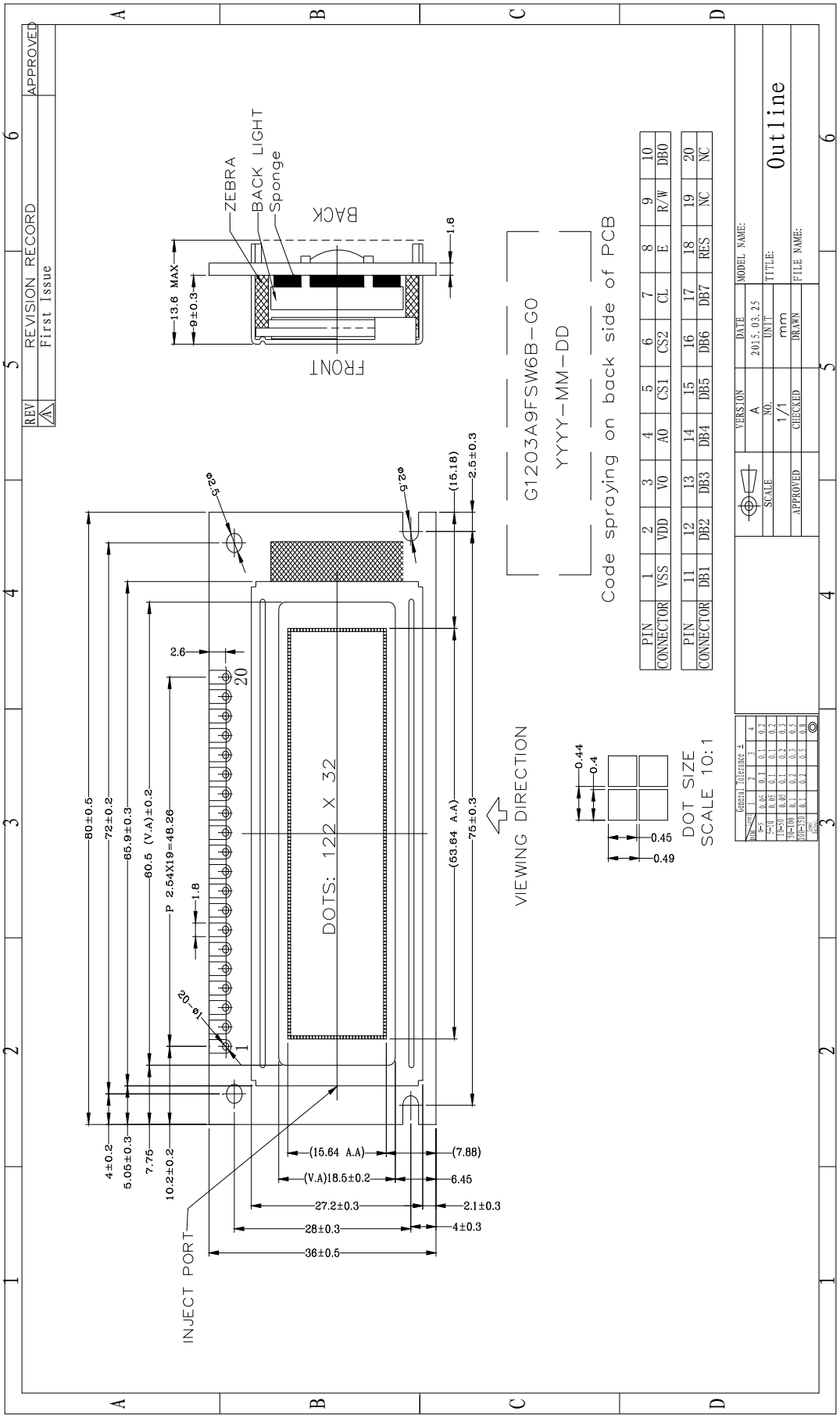
In the case of storing for a long period of time (for instance.) For years) for the purpose or replacement use, The following ways are recommended.

- 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)

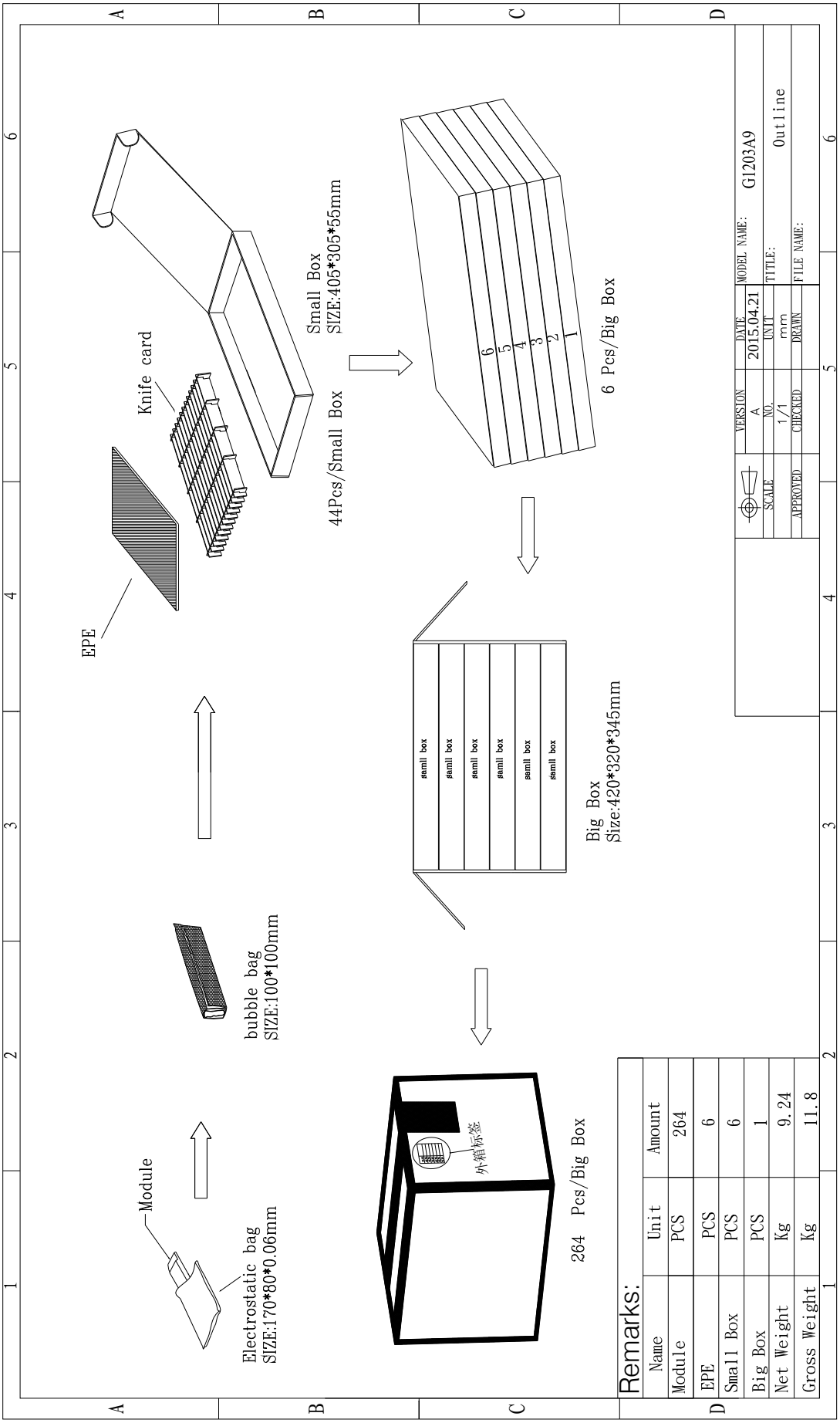
(7) Safety

- 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 contac with your hands, please wash it off well with soap and wate

10. OUTLINE DIMENSION



11.PACKING INSTRUCTION



Remarks:

Name	Unit	Amount
Module	PCS	264
EPE	PCS	6
Small Box	PCS	6
Big Box	PCS	1
Net Weight	Kg	9.24
Gross Weight	Kg	11.8