



## PRODUCT SPECIFICATION

### MONO LCD MODULE MODEL: G1206O2SGW6G-A1 Ver:1.0

< ◇ > Preliminary Specification

< ◆ > Finally Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY

### Revision Status

<b>Version</b>	<b>Revise Date</b>	<b>Page</b>	<b>Content</b>	<b>Modified By</b>
Ver. 1.0	2010.10.19		First Issued	

## 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.	INSTRUCTION SET .....	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
- \* IC : RA8808
- \* Interface Input Data : 6800 Series
- \* Driving Method : 1/64 Duty, 1/9 Bias
- \* Viewing Direction : 6 O'clock
- \* Backlight : LED/White
- \* Sample NO : G1206O2SGW6G-A1\_01/20101016

## 2. MECHANICAL SPECIFICATIONS

Item	Specification	Unit
Module Size	75(W) x 52.7(H) x 9 Max(D)	mm
Number of Dots	128 x 64 Dots	
Viewing Area	60 (W) x32.6 (H)	mm
Activity Area	55.01(W) x27.49(H)	mm
Dot Size	0.4(W) x 0.4(H)	mm
Dot Pitch	0.43(W) x 0.43(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	$V_{OP}=V_0-V_{SS}$	VDD-19.0	-	VDD+0.3	V
Input Voltage	$V_{in}$	-0.3	-	VDD+0.3	V
Operating Temp.	Top	-20	-	+70	°C
Storage Temp.	Tst	-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		$V_{DD}-V_{SS}$	$T_a = 25\text{ }^\circ\text{C}$ $V_{DD}=5V \pm 10\%$	4.5	5	5.5	V
LCD Drive		$V_{OP}=V_0-V_{SS}$		7.2	7.5	7.8	V
Input Voltage	"H" Level	$V_{IH}$		$0.7V_{DD}$	-	$V_{DD}$	V
	"L" Level	$V_{IL}$		$V_{SS}$	-	$0.3V_{DD}$	V
Frame Frequency		$f_{FLM}$		50	-	600	kHz
Current Consumption		$I_{DD}$		-	1.73	-	mA

**3-3. BACKLIGHT****3-3-1. Absolute Maximum Ratings**

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Current	IF	$T_a = 25\text{ }^\circ\text{C}$	-	-	90	mA
Reverse Voltage	VR		-	-	5	V
Power Dissipation	PD		-	-	288	mW

**3-3-2. Electrical-optical Characteristics**

Item	Symbol	Condition	Min.		Typ.		Max.	Unit	
Forward Voltage	VF	$T_a = 25\text{ }^\circ\text{C}$ $I_f=90\text{mA}$	2.8		3.0		3.2	V	
Average Luminous Intensity	$I_v$		350		500		-	$\text{cd/m}^2$	
Colour coordinates	-		X	Y	X	Y	X	Y	-
			0.25	0.25	0.28	0.28	0.31	0.31	

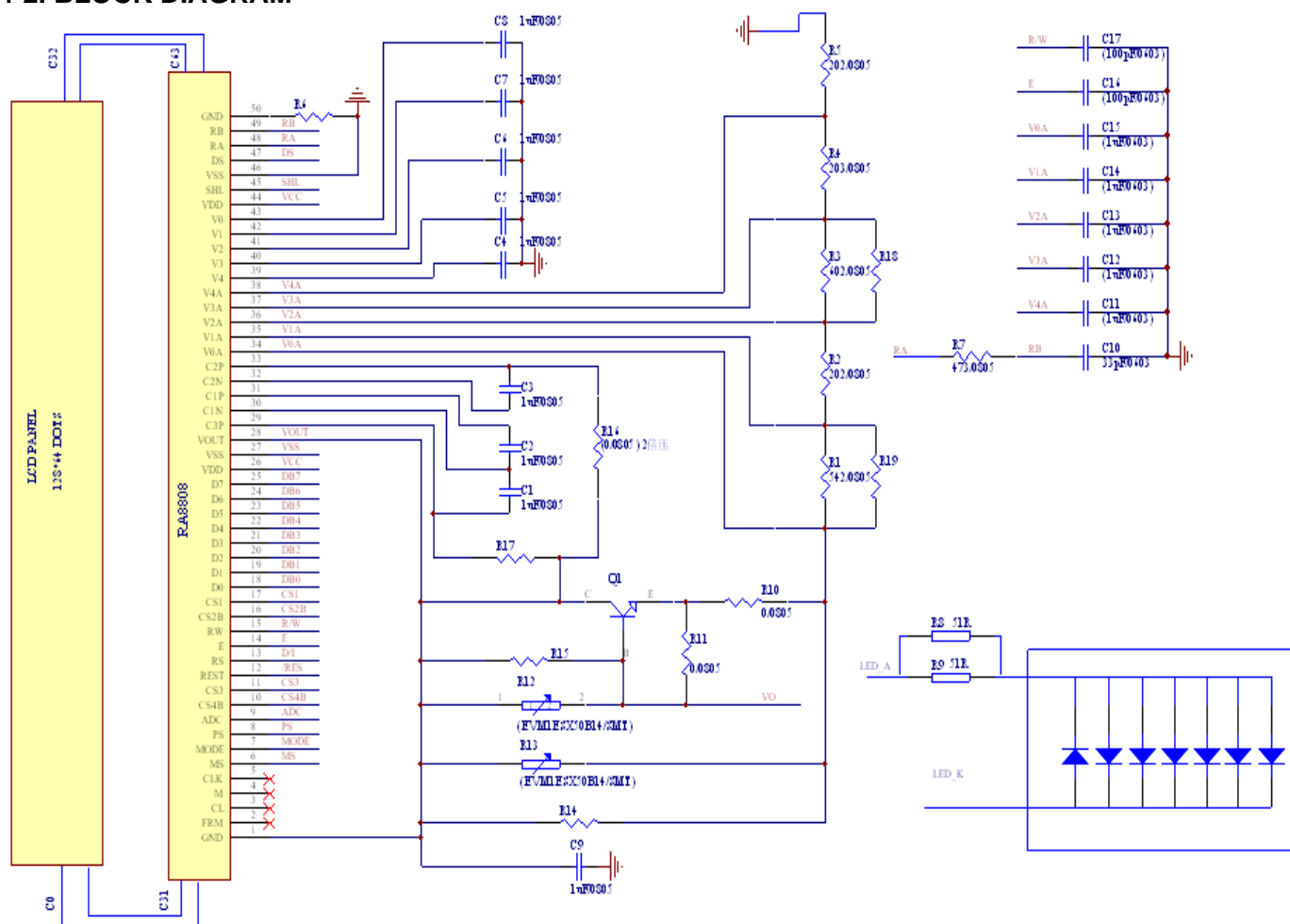
The brightness is measured without LCD panel

## 4. TERMINAL FUNCTIONS AND BLOCK DIAGRAM

### 4-1. INTERFACE PIN FUNCTION DESCRIPTION

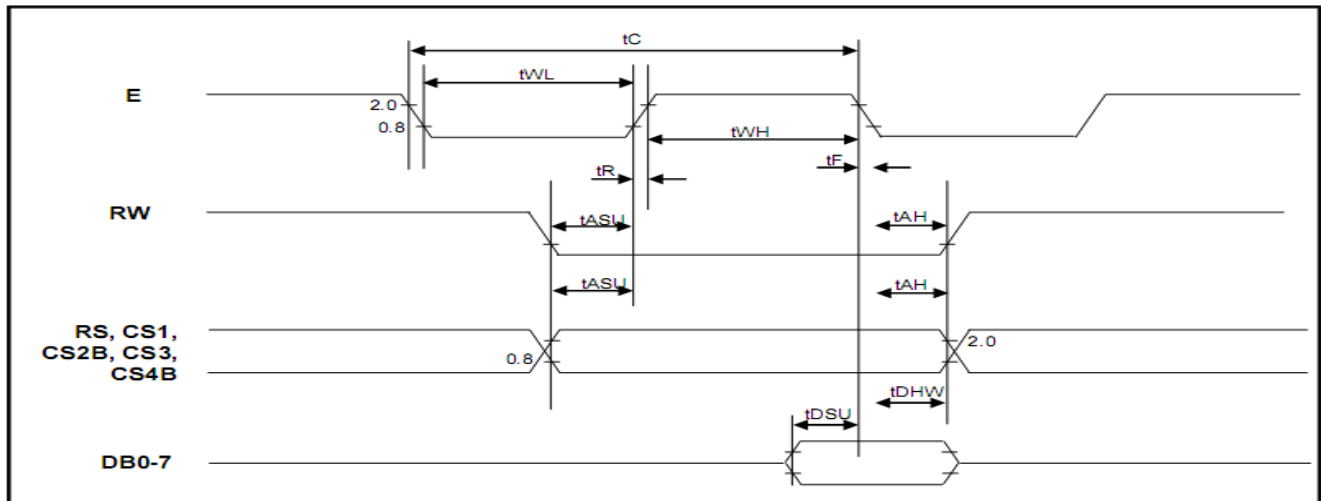
Pin No.	Pin Name	Function
1	VDD	Logic power supply voltage
2	GND	Ground
3	V0	Supply voltage for LCD driving
4-11	DB0-DB7	8-Bit data bus
12	/CS1	Chip selection
13	/CS2	Chip selection
14	/RES	Reset signal
15	R/W	Read or Write signal
16	D/I	Register select input pin
17	E	Enable signal
18	VEE	Voltage converter input
19	LED_A	Backlight unit anode(+5.0V)
20	LED_K	Backlight unit cathode

### 4-2. BLOCK DIAGRAM

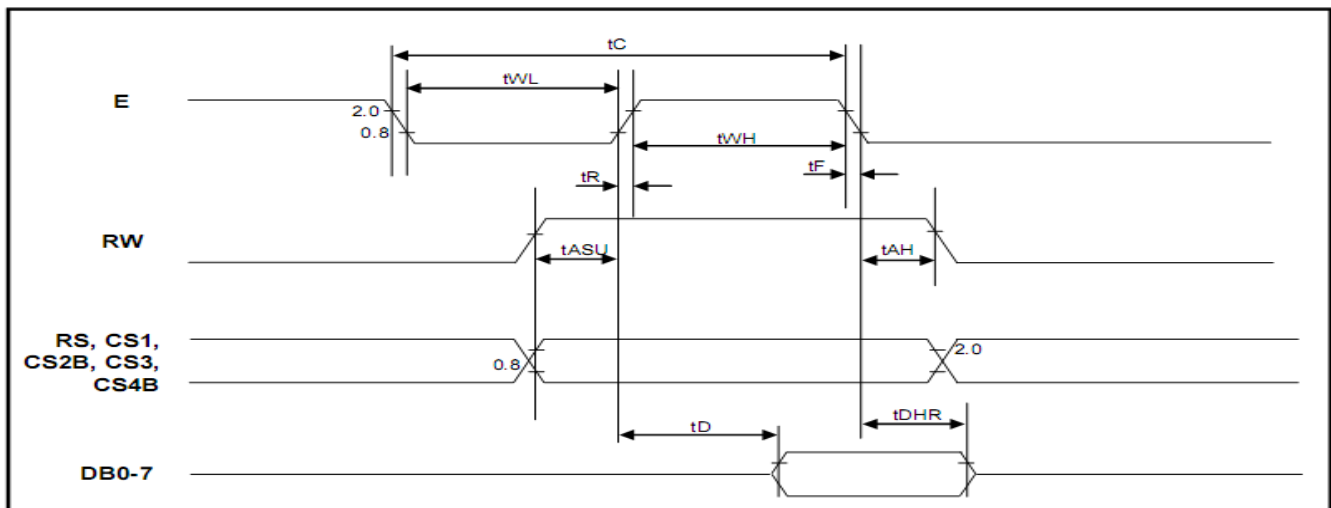


## 5. TIMING CHARACTERISTICS

### MPU 6800 Write Timing



### MPU 6800 Read Timing



Characteristic	Symbol	Min	Typ	Max	Unit
E cycle	tC	1000	-	-	ns
E high level width	tWH	450	-	-	ns
E low level width	tWL	450	-	-	ns
E rise time	tR	-	-	25	ns
E fall time	tF	-	-	25	ns
Address set-up time	tASU	140	-	-	ns
Address hold time	tAH	10	-	-	ns
Data set-up time	tDSU	200	-	-	ns
Data delay time	tD	-	-	320	ns
Data hold time (write)	tDHW	10	-	-	ns
Data hold time (read)	tDHR	20	-	-	ns

## 6. INSTRUCTION SET

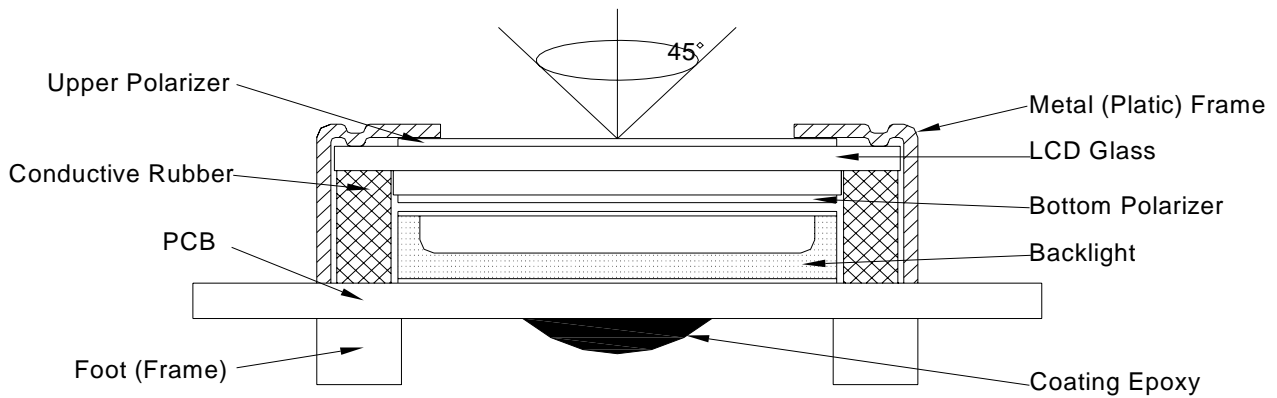
Instruction	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display on/off	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L: OFF, H: ON
Set Address (Y address)	L	H	Y address (0 ~ 63)						Sets the Y address in the Y address counter.
Set page (X address)	H	L	H	H	H	Page (0 ~ 7)			Sets the X address at the X address register.
Display start line (Z address)	H	H	Display start line (0 ~ 63)						Indicates the display data RAM displayed at the top of the screen.
Status Read	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Status read	Busy	L	On/Off	Reset	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset
Data Write	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Write display data	Write data								Writes data(DB7~0) into display data RAM. After writing instruction, Y address is increased by 1 automatically.
Data Read	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Read display data	Read data								Reads data(DB7~0) from display data RAM to the data bus. After reading instruction, Y address is increased by 1 automatically.



## 7. QUALITY SPECIFICATIONS

### 7- 1. LCM Appearance and Electric inspection Condition

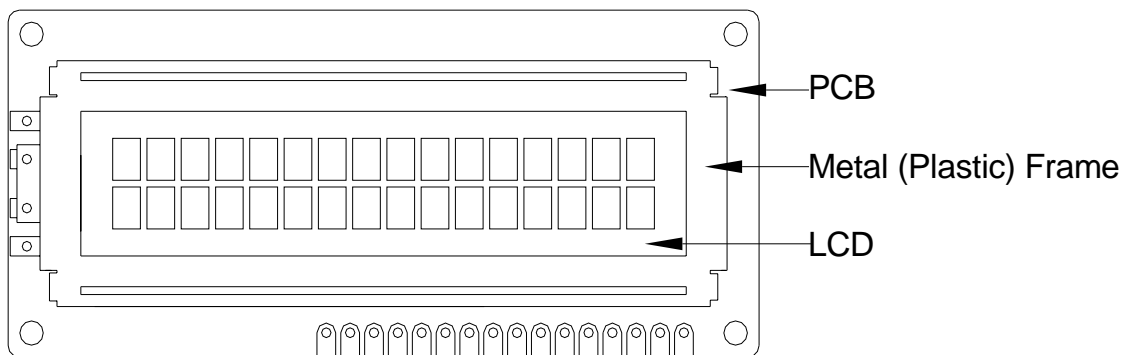
1. Inspection will be done by placing LCM 30cm away from inspector's eyeballs under normal illumination.



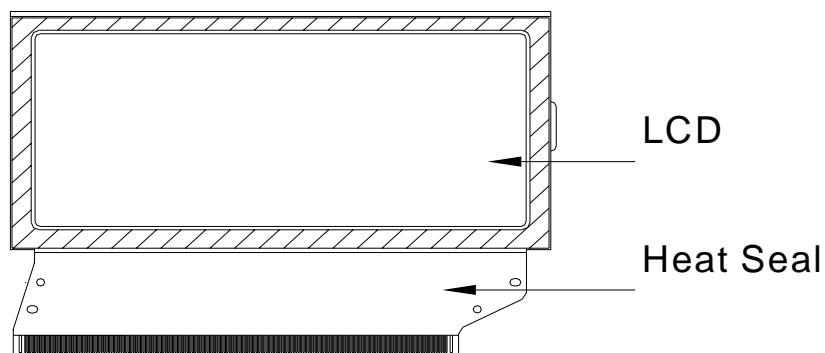
2. View Angle: with in 45° around perpendicular line.

### 7- 2. Definition

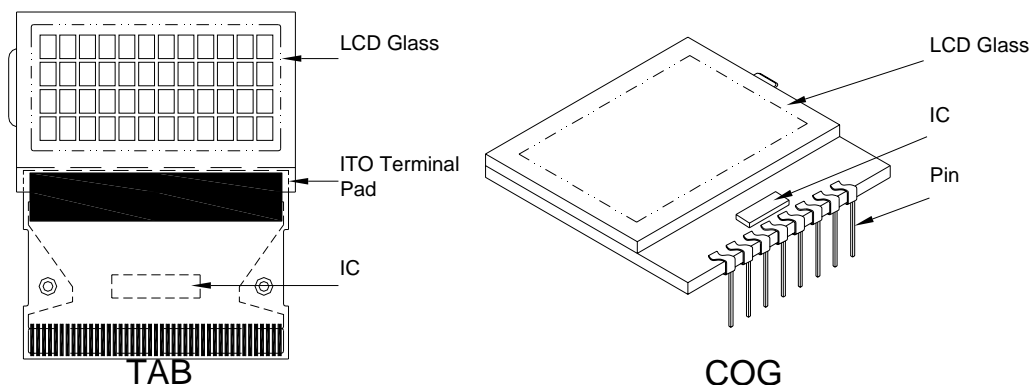
#### 1. COB



#### 2. Heat Seal



#### 3. TAB and COG



**7-3. Sampling Plan and Acceptance**

## 1. Sampling Plan

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

## 2. Acceptance

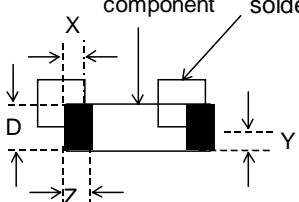
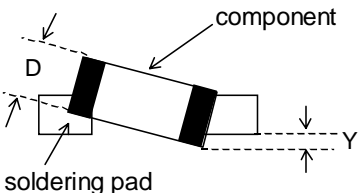
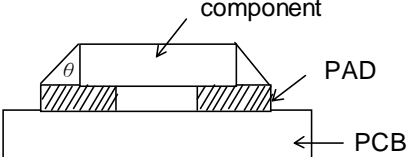
Major defect: AQL = 0.25%

Minor defect: AQL = 0.65%

**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 <sup>2</sup>	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

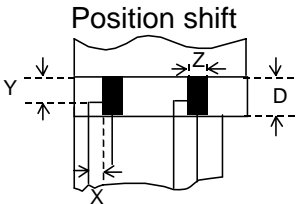
**2. SMT**

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		

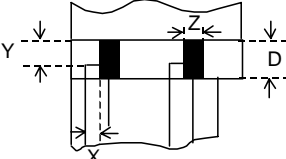
**4. Flexible Film Connector (FFC)**

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

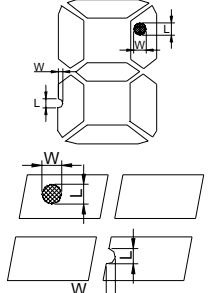
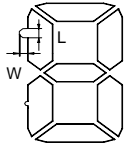
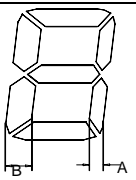
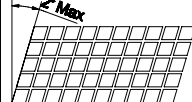
**7. LED Backing Protective Film and Others**

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

Defect	Inspect Item	Inspection Standards				
		W	$W \leq 0.03$	$0.03 < W \leq 0.05$	$W > 0.05$	
Minor	Linear Defect * Glass Scratch * Polarizer Scratch * Fiber and Linear material	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	$\Phi$	$\Phi \leq 0.1$	$0.1 < \Phi \leq 0.15$	$0.15 < \Phi \leq 0.2$	$\Phi > 0.2$
		ACC. NO.	3EA / 100mm <sup>2</sup>	2	1	0
		Note	$\Phi$ 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 * Air protuberance between polarizer and glass	$\Phi$	$\Phi \leq 0.3$	$0.3 < \Phi \leq 0.5$	$0.5 < \Phi$	
		ACC. NO.	3EA / 100mm <sup>2</sup>	1	0	
		Note	$\Phi$ is the average diameter of the defect. Distance between two defects > 10mm.			
Minor	Segment Defect 	$\Phi$	$\Phi \leq 0.10$	$0.10 < \Phi \leq 0.20$	$0.20 < \Phi \leq 0.25$	$\Phi > 0.25$
		ACC. NO.	3EA / 100mm <sup>2</sup>	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  $\Phi = (L + W) / 2$	$\Phi$	$\Phi \leq 0.10$	$0.10 < \Phi \leq 0.20$	$0.20 < \Phi \leq 0.25$	$\Phi > 0.25$
		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 <sup>2</sup>	2	1	0
Minor	Assembly Mis-alignment  	1. Segment				
		B	$B \leq 0.4\text{mm}$	$0.4 < B \leq 1.0\text{mm}$	$B > 1.0\text{mm}$	
		B-A	$B-A < 1/2B$	$B-A < 0.2$	$B-A < 0.25$	
		Judge	Acceptable	Acceptable	Acceptable	
		2. Dot Matrix				
			Deformation > 2°			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	Criterion
1	High Temperature Operating	70°C, 96Hrs	No defect in cosmetic and operational function allowable. Total current Consumption should be below double of initial value.
2	Low Temperature Operating	-20°C, 96Hrs	
3	High Humidity	60°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)	
7	Thermal Shock	-20°C to 25°C to 70°C (60Min) (5Min) (60Min) 16Cycles	
8	ESD Testing	Contract Discharge Voltage: +1 ~ 5kV and -1 ~ -5kV  Air Discharge Voltage: +1 ~ 8kV and -1 ~ -8kV	There will be discharged ten times at every discharging voltage cycle. The voltage gap is 1kV.

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 trifluro 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.

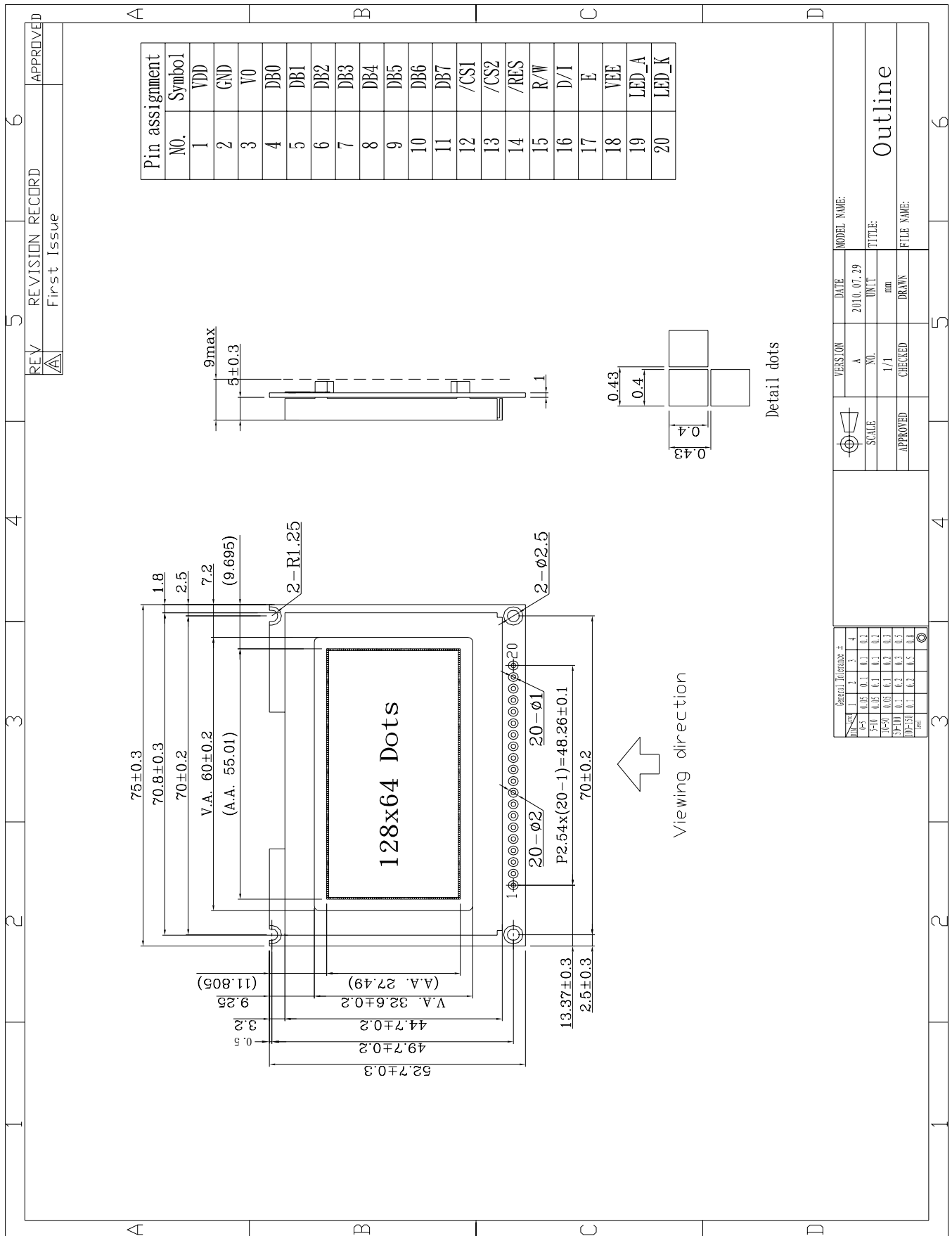
- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping temperature in the specified storage temperature range.
- Storing with no touch on polarizer surface 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 water.

# 10. OUTLINE DIMENSION



REV	REVISION RECORD	APPROVED
5	First Issue	
6		

VERSION	DATE	MODEL NAME:
A	2010.07.29	

SCALE	UNIT	TITLE:
1/1	mm	Outline

APPROVED	CHECKED	DRAWN	FILE NAME:

General Tolerances		
mm	mm	mm
1	2	3
±0.15	±0.1	±0.2
±0.1	±0.1	±0.2
±0.1	±0.1	±0.2
±0.1	±0.1	±0.2
±0.1	±0.1	±0.2
±0.1	±0.1	±0.2
±0.1	±0.1	±0.2
±0.1	±0.1	±0.2