MULTI-INNO TECHNOLOGY CO., LTD.

www.multi-inno.com

LCD MODULE SPECIFICATION

Model : MI2002M2-1

This module uses ROHS material

For Customer's Acceptance:

Customer	
Approved	
Comment	

The standard product specification may change without prior notice in order to improve performance or quality. Please contact Multi-Inno for updated specification and product status before design for the standard product or release of the order.	Revision	1.0
	Engineering	
	Date	2014-11-21
	Our Reference	

REVISION RECORD

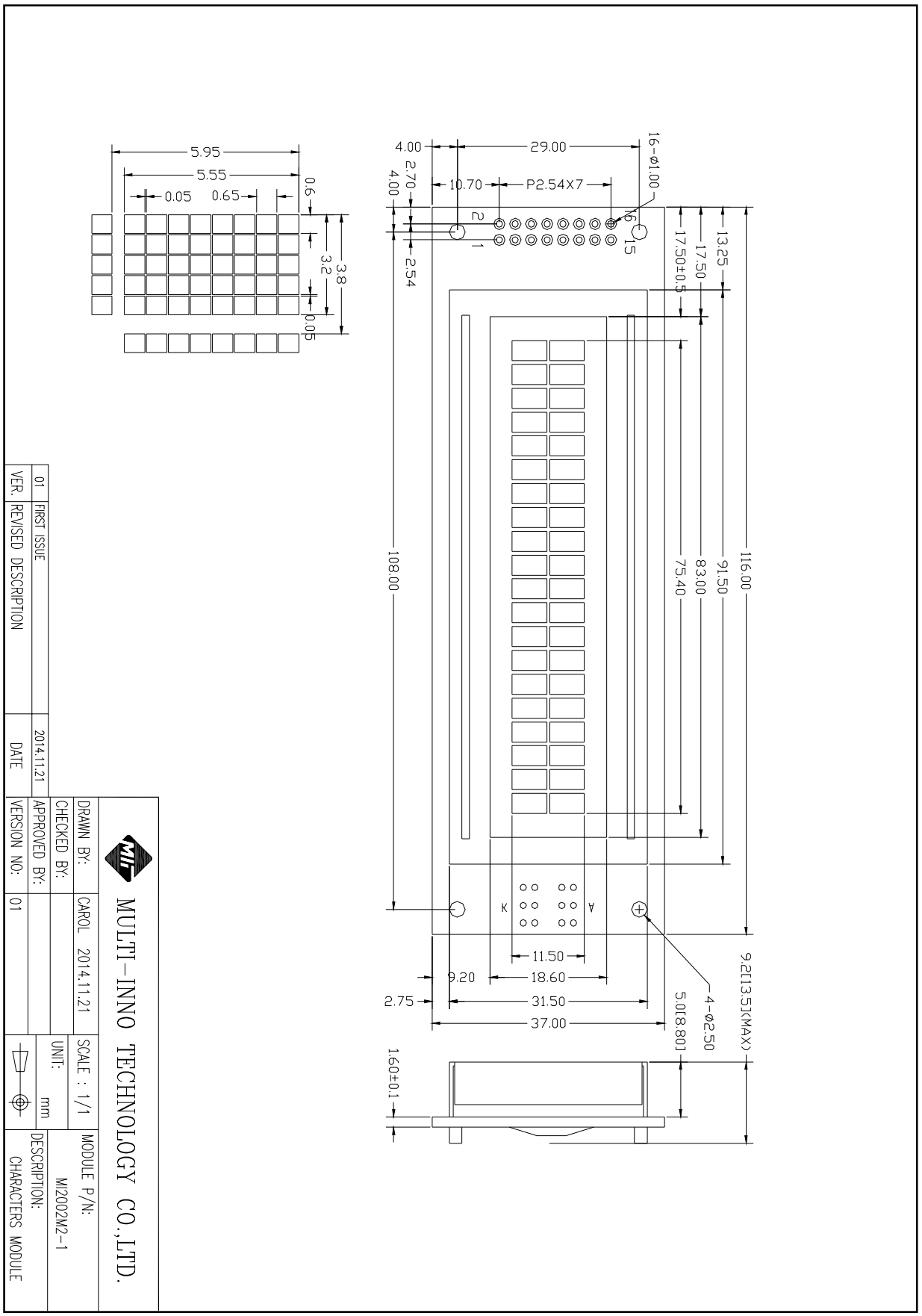
REV NO.	REV DATE	CONTENTS	REVISED PAGE NO.
1.0	2014-11-21	First Release	

CONTENTS

■ GENERAL INFORMATION

Item	Contents	Unit
LCD type	STN,Yellow-green,Negative,Transmissive	/
Display type	20×2 Characters	/
Viewing direction	6:00	O' Clock
LCM (L ×W× H)	116.0×37.0×13.5	mm
Viewing Area (L × W)	83.0 ×18.6	mm
Active area (L ×W)	75.4×11.5	mm
Character size(L×W)	3.2×5.55	mm
Character pitch(L×W)	3.8×5.95	mm
Dot size(L ×W)	0.6 ×0.65	mm
Dot pitch (L ×W)	0.65× 0.7	mm
Controller	S6A0069 or equivalent	/
Backlight	Yellow-green LED	/
Interface	4/8-bit MPU	/
Display duty	1/16	/
Driving bias	1/5	/
Weight	TBD	g

■ EXTERNAL DIMENSIONS



■ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Condition	Standard Value		Unit
			Min	Max	
Supply Voltage for logic	Vdd		-0.3	7.0	V
Supply Voltage for LCD	V0		Vdd-10.0	Vdd+0.3	V
Input Voltage	Vi		-0.3	Vdd+0.3	V
Operating Temperature(T)	Top	-	-20	70	℃
Storage Temperature(T)	Tstg	-	-30	80	℃

■ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Standard Value			Unit
			Min	Type	Max	
Supply Voltage for logic	Vdd-GND	-	4.5	5.0	5.5	V
Supply Current for logic	Idd	Vdd=5V	-	1.0	-	mA
Driving Current for LCD	Io		-	0.6	-	mA
Driving Voltage for LCD	Vdd-V0		4.3	4.5	4.7	V
Input Voltage H level	Vih		2.2	-	Vdd	V
Input Voltage L level	Vil		-0.3	-	0.6	V
Output Voltage H	Voh	Ioh=-0.205mA	2.4	-	-	V
Output Voltage L	Vol	Io1=1.2mA	-	-	0.4	V

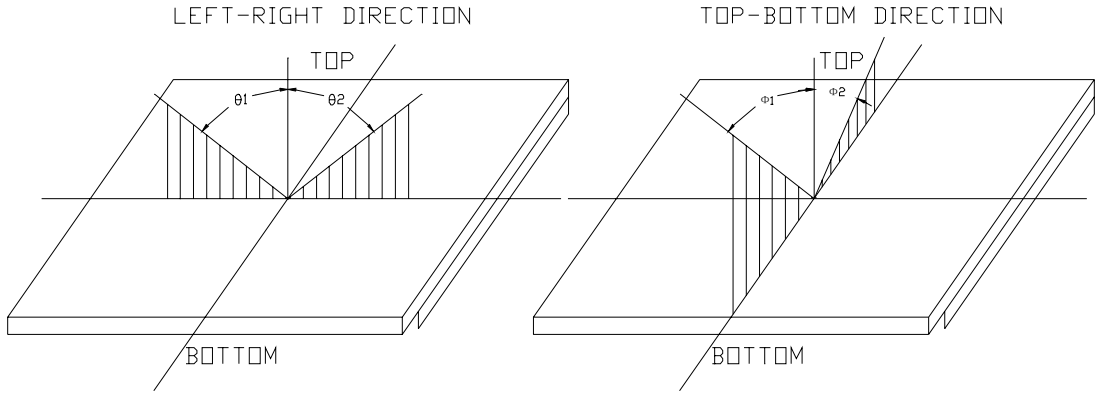
■ BACKLIGHT CHARACTERISTICS

Parameter	Symbol	Test condition	Min	Type	Max	Unit
LED Forward Consumption Current	I_f	Ta=25^{0}C	-	30	40	mA
LED Allowable Dissipation	P_d	Vf=3.3V	-	99	132	mW

■ELECTRO-OPTICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REF.
Contrast	CR	25℃, Vdd=5V, θ =0, Ø=0	--	4	--		(2)
Rise Time	Tr	25℃, Vdd=5V, θ =0, Ø=0	--	160	240	ms	(3)
Fall Time	Tf	25℃, Vdd=5V, θ =0, Ø=0	--	100	150	ms	(3)
Viewing Angle	θ 1- θ 2	25℃	--	--	60	DEG	(1)
	Ø1, Ø2		-40	--	40		

(1)Definition of viewing Angle:



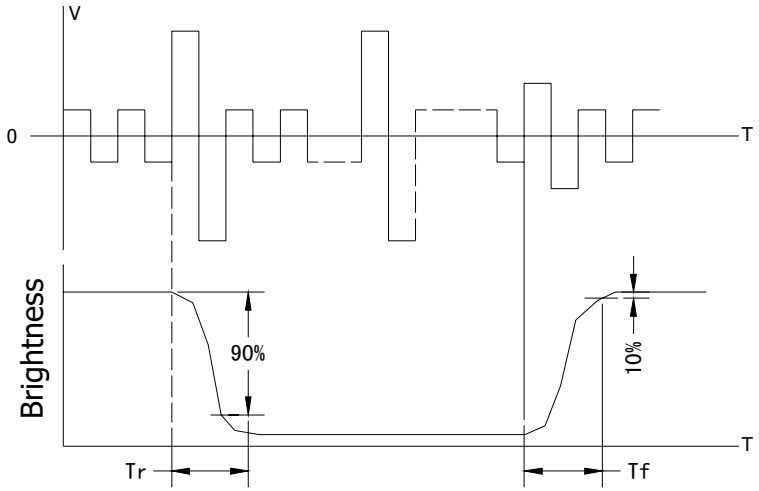
(2)Definition of Contrast Ratio:

$$\text{Contrast Ratio} = \frac{\text{Brightness of non-selected condition}}{\text{Brightness of selected condition}}$$

Test condition: standard A light source

(3)Response Time:

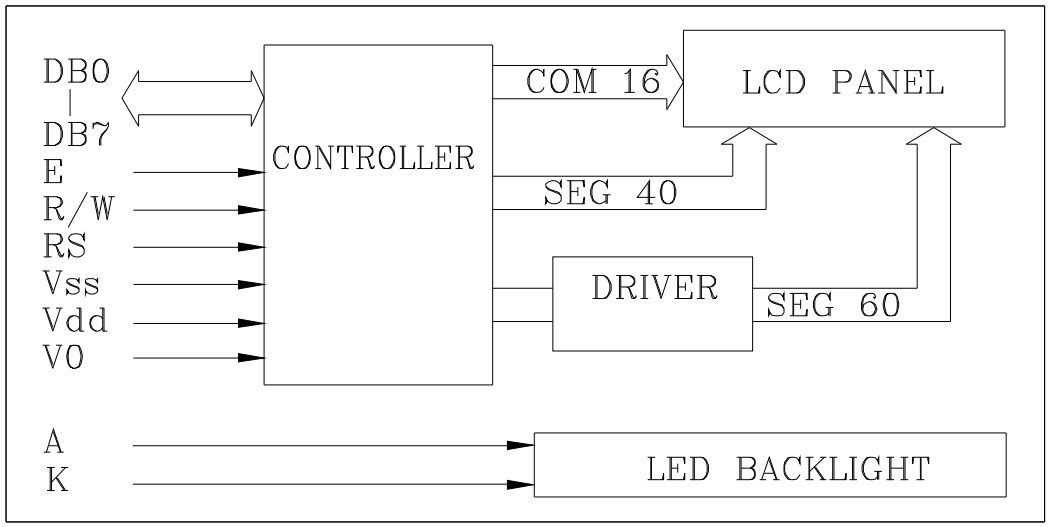
Response time is measured as the shortest period of possible between the change in state of an LCD segments as demonstrated below:



■INTERFACE DESCRIPTION

Pin NO.	Symbol	Function		Remark
1	Vss	Power Supply	0V	
2	Vdd		+5V	
3	Vo		For LCD	Variable
4	RS	Data or Instruction select(H: Data L: Instruction)		
5	R/W	Signal for selecting read or write actions. 1: read; 0: write.		
6	E	Start signal for reading or writing data.		
7	DB0	Data Bit 0		
8	DB1	Data Bit 1		
9	DB2	Data Bit 2		
10	DB3	Data Bit 3		
11	DB4	Data Bit 4		
12	DB5	Data Bit 5		
13	DB6	Data Bit 6		
14	DB7	Data Bit 7		
15	A	Anode of LED Unit (3.3V)		
16	K	Cathode of LED Unit (0V)		

■BLOCK DIAGRAM

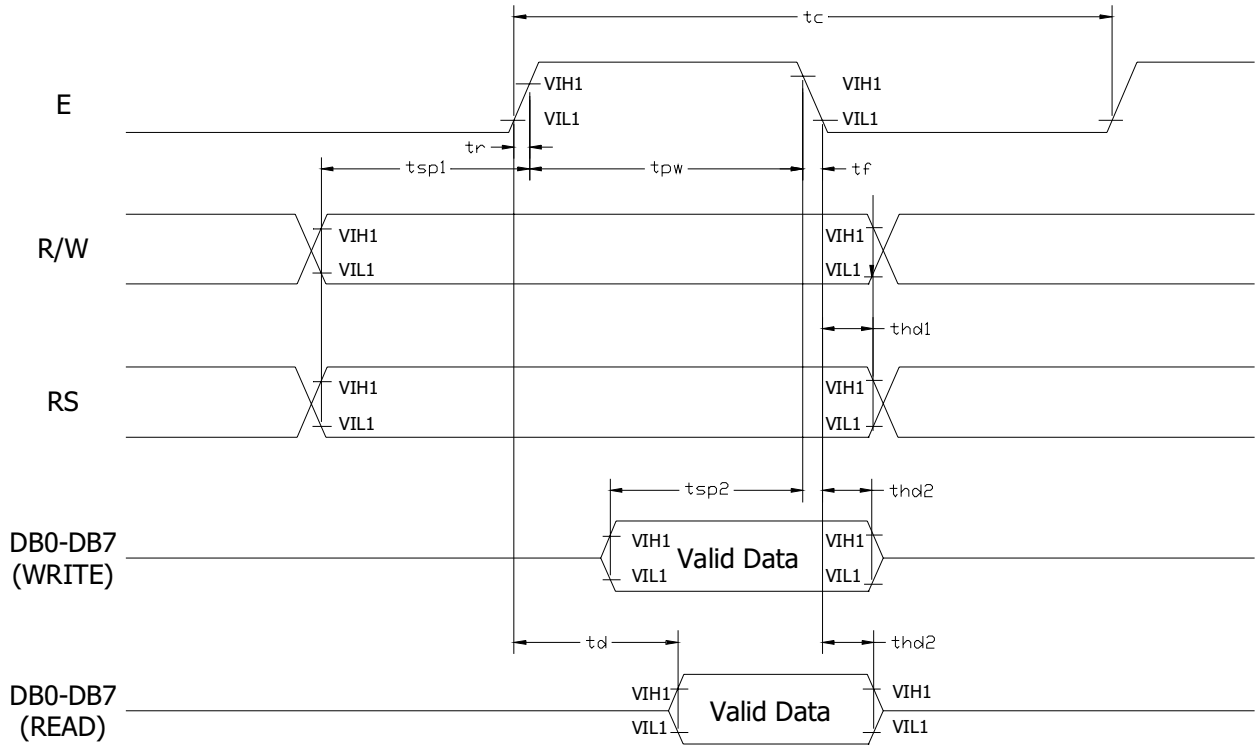


■ APPLICATION NOTES

1. MPU Interface (VDD=4.5V~5.5V,Ta=-20~70℃)

Mode	Characteristic	Symbol	Min.	Type	Max	Unit
Write Mode	E Cycle Time	t_C	500	-	-	ns
	E Rise/Fall Time	t_R,t_F	-	-	20	
	E Pulse Width (High, Low)	t_{PW}	230	-	-	
	R/W and RS Setup time	t_{SP1}	40	-	-	
	R/W and RS Hold Time	t_{HD1}	10	-	-	
	Data Setup Time	t_{SP2}	80	-	-	
	Data Hold Time	t_{HD2}	10	-	-	
Read Mode	E Cycle Time	t_C	500	-	-	ns
	E Rise/Fall Time	t_R,t_F	-	-	20	
	E Pulse Width(High, Low)	t_{PW}	230	-	-	
	R/W and RS Setup Time	t_{SP1}	40	-	-	
	R/W and RS Hold Time	t_{HD2}	10	-	-	
	Data Output Delay Time	t_D	-	-	120	
	Data Hold Time	t_{HD2}	5	-	-	

2. Timing diagram



3. Reflector of Screen and Display RAM

Display position	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10
DDRAM address	00	01	02	03	04	05	06	07	08	09
Display position	1-11	1-12	1-13	1-14	1-15	1-16	1-17	1-18	1-19	1-20
DDRAM address	0A	0B	0C	0D	0E	0F	10	11	12	13
Display position	2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10
DDRAM address	40	41	42	43	44	45	46	47	48	49
Display position	2-11	2-12	2-13	2-14	2-15	2-16	2-17	2-18	2-19	2-20
DDRAM address	4A	4B	4C	4D	4E	4F	50	51	52	53

-1 means first character of line 1 on screen

4. Display Control Instruction

Instruction	Instruction Code										Description	ExecutionTime(fosc=270kHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write “20H” to DDRAM set DDRAM address to “00H” from AC	1.52ms
Return Home	0	0	0	0	0	0	0	0	1	-	Set DDRAM address to “00H” from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed	1.52ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and enable the shift of entire display	38μs
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Set display (D) cursor(C) and blinking of cursor(B) on/off	38μs
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	-	-	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data	38μs
Function Set	0	0	0	0	1	DL	N	F	-	-	Set interface data length of display line (N: 2line/1line)and, display font type F:5X11dots/5X8dots	38μs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	38μs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	38μs
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF The contents of address counter of address counter can also be read	0μs
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM)	38μs
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	38μs

Instruction Description

Clear Display

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	0	1

Clear all the display data by writing “20H” (space code) to all DDRAM address, and set DDRAM address to “00H” into AC(address counter).Return cursor to the original status, namely, bring the cursor to the left edge on the first line of the display. Make the entry mode increment(I/D=HIGH)

Return Home

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	1	-

Set DDRAM address to “00H” into the address counter. Return cursor to its original site and return display to its original status, if shifted. Contents of DDRAM do not change.

Entry Mode Set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	1	I/D	SH

Set the moving direction of cursor and display.

I/D: Increment/decrement of DDRAM address (cursor or blink)

When I/D=High, cursor/blink moves to right and DDRAM address is increased by 1.

When I/D=low, cursor/blink moves to left and DDRAM address is decreased by 1.

*CGRAM operates the same as DDRAM, when reading from or writing to CGRAM.

SH: Shift of entire display

When DDRAM read (CGRAM read/write) operation or SH="Low", shifting of entire display is not performed. If SH=High, and DDRAM write operation, shift of entire display is performed according to I/D value(I/D=High, shift left, I/D=Low, shift right).

Display ON/OFF Control

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	1	D	C	B

D: Display ON/OFF control bit

When D=High, entire display is turned on.

When D=Low, display is turned off, but display data remains in DDRAM.

C: Cursor ON/OFF control bit

When C=High, cursor is turned on.

When C=Low, cursor is disappeared in current display, but I/D register preserves its data.

B: Cursor Blink ON/OFF control bit

When B=High, cursor blink is on ,which performs alternately between all the high data and display characters at the cursor position. When B=Low, Blink is off.

Cursor or Display Shift

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	1	S/C	R/L	-	-

Shifting of right/left cursor position or display without writing or reading of display data. This instruction is used to correct or search display data. During 2-line mode display ,cursor moves to the 2nd line after the 40th digit of the 1st line. Note that display shift is performed simultaneously in all the lines. When displayed data is shifted repeatedly, each line is shifted individually. When display shift is performed, the contents of the address counter are not changed.

S/C	R/L	Operation
0	0	Shift cursor to the left, AC is decreased by 1
0	1	Shift cursor to the right, AC is increased by 1
1	0	Shift all the display to the left, Cursor moves according to the display
1	1	Shift all the display to the right, cursor moves according to the display

Function set

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	DL	N	F	-	-

DL: Interface data length control bit

When DL=High, it means 8-bit bus mode with MPU.

When DL=Low, it means 4-bit bus mode with MPU. When 4-bit bus mode, it needs to transfer 4-bit data twice.

N: Display line number control bit

When N=Low, 1-line display mode is set.

When N=High,2-line display mode is set.

F: Display font type control bit

When F=Low, 5X8 dots format display mode is set .

When F=High, 5X11 dots format display mode.

Set CGRAM Address

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0

Set CGRAM address to AC. This instruction makes CGRAM data available from MPU.

Set DDRAM Address

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0

Set DDRAM address to AC. This instruction makes DDRAM data available from MPU. When 1-line display mode (N=Low),DDRAM address is from "00H" to "4FH"In 2-line display mode(N=High), DDRAM address in the1st line is from "00H" to "27H" and DDRAM address in the 2nd line is from "40H" to "67H".

Read Busy Flag & Address

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0

This instruction shows whether IC is in internal operation or not. If BF is high internal operation is in progress and should wait until BF is to be Low, which by then the next instruction can be performed. In this instruction you can also read the value lf the address counter.

Write data to RAM

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	0	D7	D6	D5	D4	D3	D2	D1	D0

Write binary 8-bit data to DDRAM/CGRAM. The selection of RAM from DDRAM, and CGRAM, is set by the previous address set instruction(DDRAM address set, CGRAM address set). RAM set instruction can also determine the AC direction to RAM. After write operation, the address is automatically increased/decreased by 1, according the entry mode.

Read data from RAM

RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
1	1	D7	D6	D5	D4	D3	D2	D1	D0

Rea nary 8- t ata rom DDRAM CGRAM. T e se ect on o RAM s set y t e prev ous a ress set instruction. If the address set instruction of RAM is not performed before this instruction, the data that has been read first is invalid, as the direction of AC is not yet determined. If RAM data is read several times without RAM address instructions set before read operation, the correct RAM data can be obtained from the second. But the first data would be incorrect, as there is no time margin to transfer RAM data. In case of DDRAM read operation, cursor shift instruction plays the same role as DDRAM

address set instruction, it also transfers RAM data to output data register. After read operation, address counter is automatically increased/decreased by 1 according to the entry mode.
After CGRAM read operation, display shift may not be executed correctly.

Note:

In case of RAM write operation, AC is increased/decreased by 1 as in read operation. At this time, AC indicates the next address position, but only the previous data can be read by the read instruction.

Relationship between Character Code and CGRAM

Character code	CGRAM Address	CGRAM Data	Pattern number
D7 D6 D5 D4 D3 D2 D1 D0	A5 A4 A3 A2 A1 A0	P7 P6 P5 P4 P3 P2 P1 P0	
0 0 0 0 x 0 0 0	0 0 0 0 0 0	x x x 0 1 1 1 0	Pattern1
	0 0 1	x x x 1 0 0 0 0
	0 1 0	x x x 1 0 0 0 0
	0 1 1	x x x 0 1 1 1 0
	1 0 0	x x x 0 0 0 0 1
	1 0 1	x x x 0 0 0 0 1
	1 1 0	x x x 0 1 1 1 0
	1 1 1	x x x 0 0 0 0 0
0 0 0 0 x 1 1 1	0 0 0 0 0 0	x x x 0 1 1 1 0	Pattern8
	0 0 1	x x x 1 0 0 0 1
	0 1 0	x x x 1 0 0 0 1
	0 1 1	x x x 1 1 1 1 1
	1 0 0	x x x 1 0 0 0 1
	1 0 1	x x x 1 0 0 0 1
	1 1 0	x x x 1 0 0 0 1
	1 1 1	x x x 0 0 0 0 0

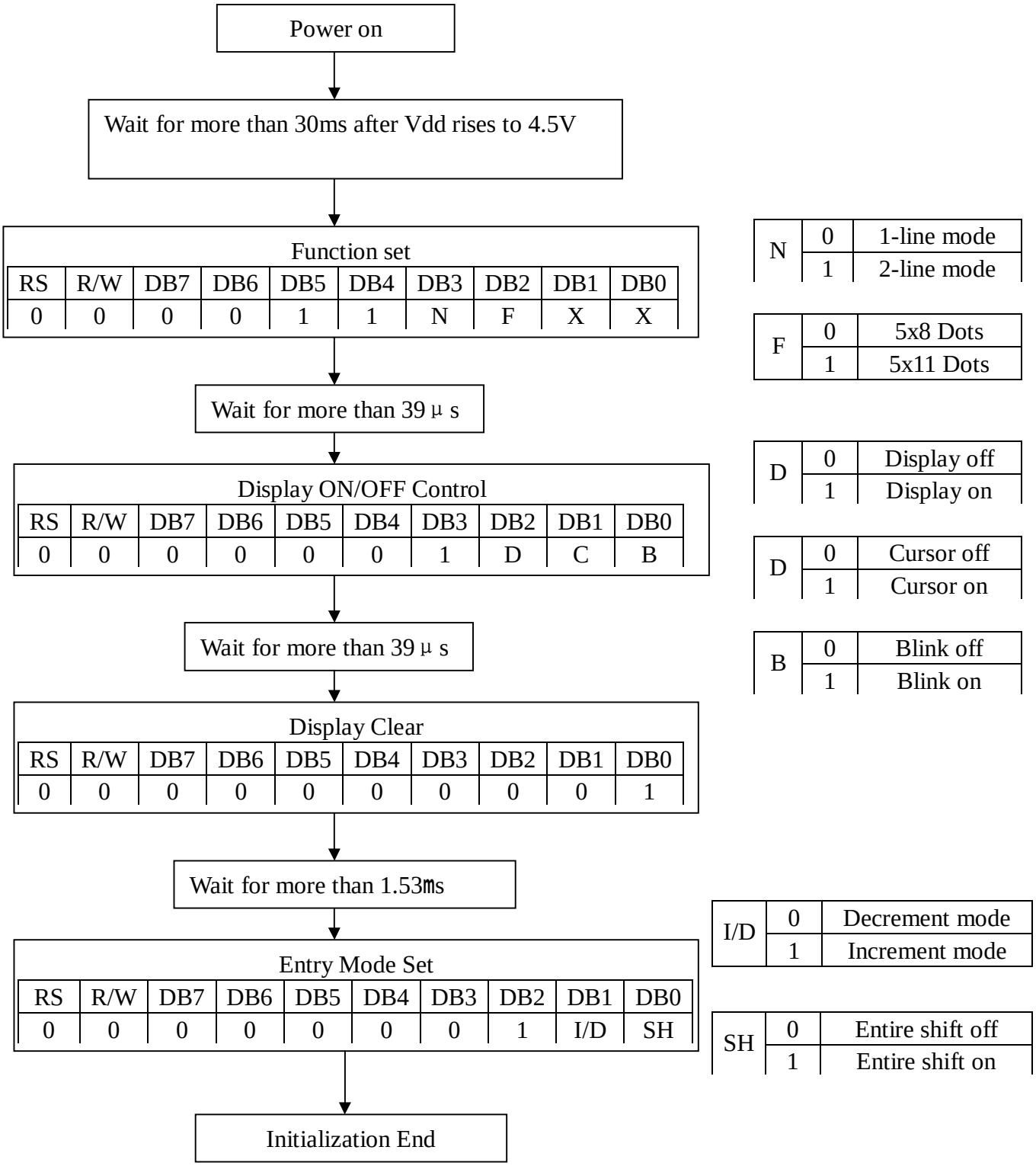
Display Data RAM(DDRAM)

DDRAM stores display data of maximum 80x8bits (80 characters). DDRAM address is set in the address counter (AC) as a hexadecimal number

MSB LSB

AC6	AC5	AC4	AC3	AC2	AC1	AC0

8-bit Initializing Flowchart (Condition: fosc=270KHZ)



N	0	1-line mode
	1	2-line mode

F	0	5x8 Dots
	1	5x11 Dots

D	0	Display off
	1	Display on

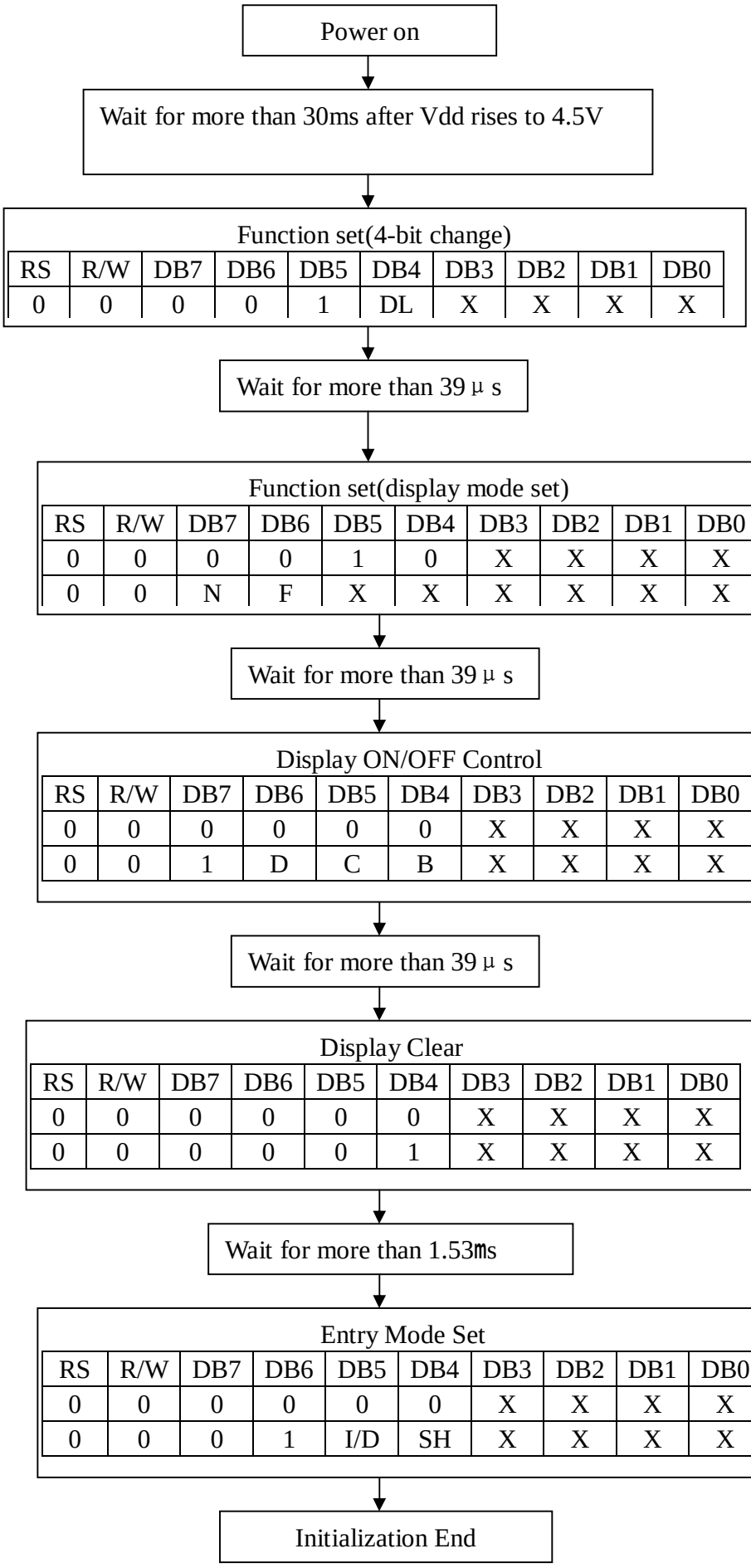
D	0	Cursor off
	1	Cursor on

B	0	Blink off
	1	Blink on

I/D	0	Decrement mode
	1	Increment mode

SH	0	Entire shift off
	1	Entire shift on

4-bit Initializing Flowchart (Condition: fosc=270KHZ)



DL	0	4-bit mode
	1	8-bit mode

N	0	1-line mode
	1	2-line mode

F	0	5x8 Dots
	1	5x11 Dots

D	0	Display off
	1	Display on

D	0	Cursor off
	1	Cursor on

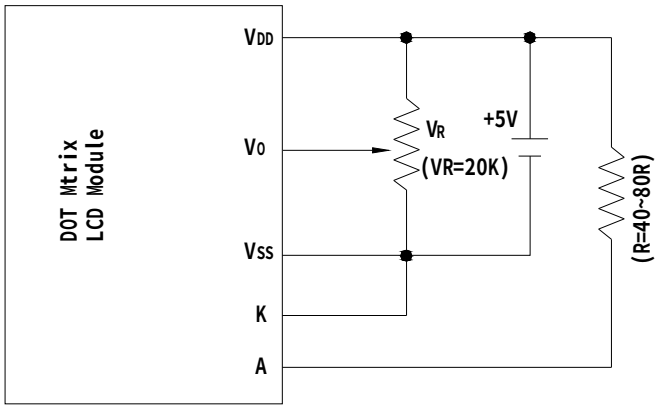
B	0	Blink off
	1	Blink on

I/D	0	Decrement mode
	1	Increment mode

SH	0	Entire shift off
	1	Entire shift on

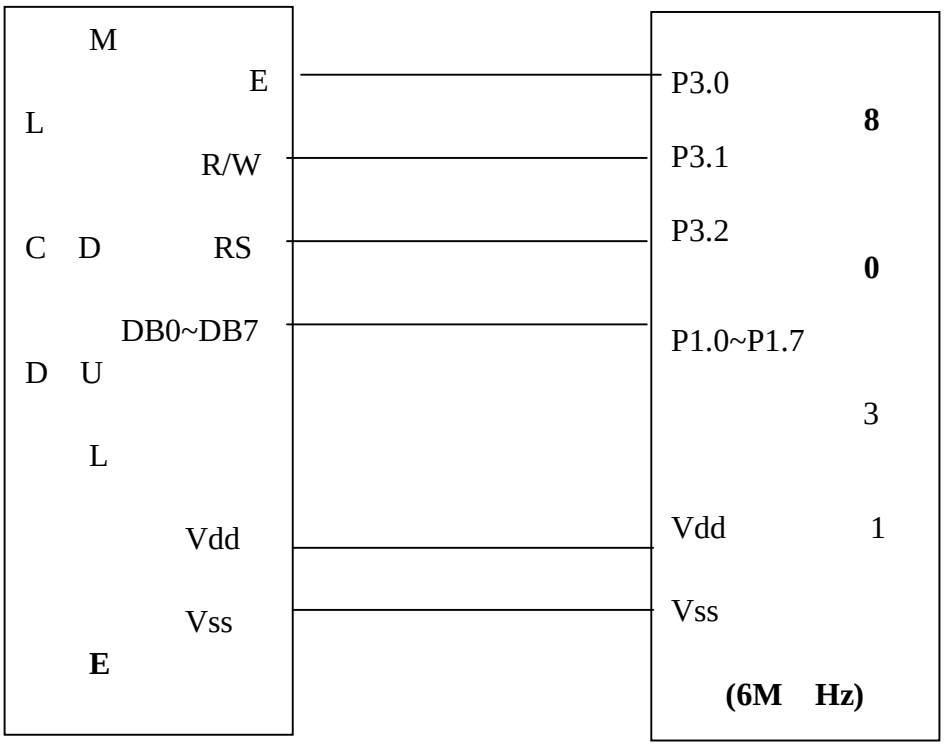
■ POWER SUPPLY SCHEMATICS

For Single Source

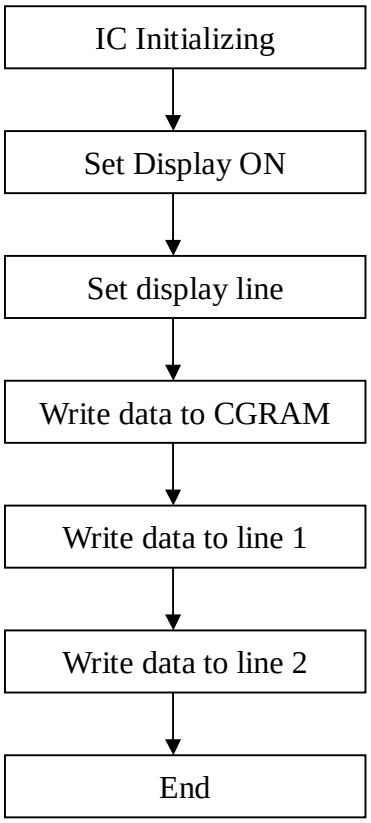


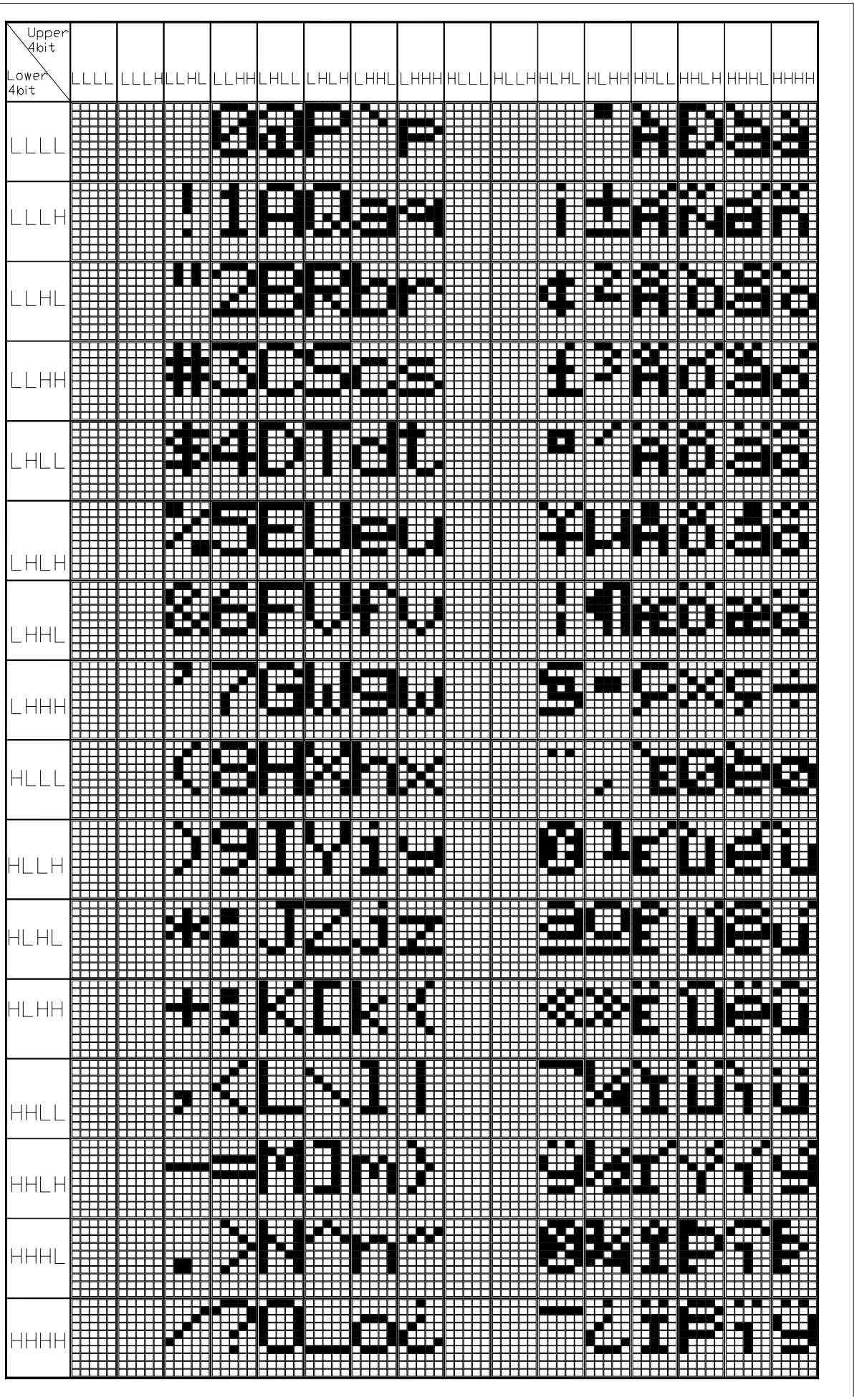
■ APPLICATION EXAMPLE

Application Circuit



Application Flowchart




Upper 4bit
Lower 4bit
LLLL
LLLH
LLHL
LLHH
LHLL
LHLH
LHHL
LHHH
HLLL
HLLH
HLHL
HLHH
HHLL
HHLH
HHHL
HHHH

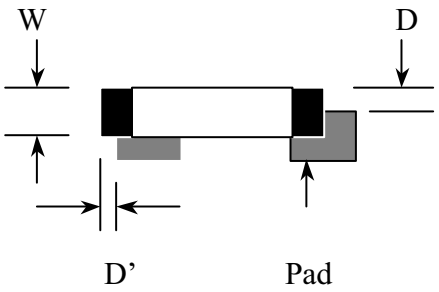
■ RELIABILITY TEST

NO	Item	Test Condition	
1	High Temperature Storage	Storage at 80 ±2℃ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
2	Low Temperature Storage	Storage at -30 ±2℃ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs	
3	High Temperature /Humidity Storage	1.Storage 96~100 hrs 60±2℃, 90~95%RH surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer). or 2.Storage 96~100 hrs 40±2℃, 90~95%RH surrounding temperature, then storage at normal condition 4 hrs.	
4	Temperature Cycling	-20℃ → 25℃ → 70℃ → 25℃ (30mins) (5mins) (30mins) (5mins) 10 Cycle	
5	Vibration	10~55Hz (1 minute) 1.5mm X,Y and Z direction * (each 2hrs)	
6	ESD Test	Air Discharge: Apply 6 KV with 5 times discharge for each polarity +/-	Contact Discharge: Apply 250V with 5 times discharge for each polarity +/-
		Testing location: Around the face of LCD	Testing location: 1.Apply to bezel. 2.Apply to Vdd, Vss.
7	Drop Test	Packing Weight (Kg)	Drop Height (cm)
		0 ~ 45.4	122
		45.4 ~ 90.8	76
		90.8 ~ 454	61
		Over 454	46

■ INSPECTION CRITERION

Inspection Standard：MIL-STD-105E Table Normal Inspection Single Sampling Level Ⅱ。
Equipment：Gauge、MIL-STD、Powertip Tester、Sample。
IQC Defect Level：Major Defect AQL 0.4; Minor Defect AQL 1.5。
FQC Defect Level：100% Inspection。
OUT Going Defect Level：Sampling。
Specification：

NO	Item	Specification	Judge	Level
1	Part Number	The part number is inconsistent with work order of production	N.G.	Major
2	Quantity	The quantity is inconsistent with work order of production	N.G.	Major
3	Electronic characteristics of LCM A=(L + W)÷2	The display lacks of some patterns.	N.G.	Major
		Missing line.	N.G.	Major
		The size of missing dot, A is＞1/2 Dot size	N.G.	Major
		There is no function.	N.G.	Major
		Output data is error	N.G.	Major
4	Appearance of LCD A=(L + W)÷2 Dirty particle (Including scratch、bubble)	Material is different with work order of production	N.G.	Major
		LCD is assembled in inverse direction	N.G.	Major
		Bezel is assembled in inverse direction	N.G.	Major
		Shadow is within LCD viewing area + 0.5 mm	N.G.	Major
		The diameter of dirty particle, A is＞0.4 mm	N.G.	Minor
		Dirty particle length is ＞3.0mm, and 0.01mm＜width ≦0.05mm	N.G.	Minor
		Display is without protective film	N.G.	Minor
		Conductive rubber is over bezel 1mm	N.G.	Minor
		Polarizer exceeds over viewing area of LCD	N.G.	Minor
		Area of bubble in polarizer, A＞1.0mm, the number of bubble is ＞1 piece.	N.G.	Minor
		0.4mm＜Area of bubble in polarizer, A＜1.0mm, the number of bubble is ＞4 pieces.	N.G.	Minor
5	Appearance of PCB A=(L + W)÷2	Burned area or wrong part number is on PCB	N.G.	Major
		The symbol, character, and mark of PCB are unidentifiable.	N.G	Minor
		The stripped solder mask , A is＞1.0mm	N.G.	Minor
		0.3mm＜stripped solder mask or visible circuit, A ＜ 1.0mm, and the number is ≧4 pieces	N.G.	Minor
		There is particle between the circuits in solder mask	N.G	Minor
		The circuit is peeled off or cracked	N.G	Minor
		There is any circuits risen or exposed.	N.G	Minor
		0.2mm＜Area of solder ball, A is ≦0.4mm The number of solder ball is ≧3 pieces	N.G	Minor
		The magnitude of solder ball, A is ＞0.4mm.	N.G	Minor

NO	Item	Specification	Judge	Level
6	Appearance of molding A=(L + W)÷2	The shape of modeling is deformed by touching.	N.G.	Major
		Insufficient epoxy: Circuit or pad of IC is visible	N.G.	Minor
		Excessive epoxy: Diameter of modeling is ＞20mm or height is ＞2.5mm	N.G.	Minor
		The diameter of pinhole in modeling, A is ＞0.2mm.	N.G.	Minor
7	Appearance of frame A=(L + W)÷2	The folding angle of frame must be ＞45 +10	N.G.	Minor
		The area of stripped electroplate in top-view of frame, A is ＞1.0mm.	N.G.	Minor
		Rust or crack is (Top view only)	N.G.	Minor
		The scratched width of frame is ＞0.06mm. (Top view only)	N.G.	Minor
8	Electrical characteristic of backlight A=(L + W)÷2	The color of backlight is nonconforming	N.G.	Major
		Backlight can't work normally.	N.G.	Major
		The LED lamp can't work normally	N.G.	Major
		The unsoldering area of pin for backlight, A is ＞1/2 solder joint area.	N.G.	Minor
		The height of solder pin for backlight is ＞2.0mm	N.G.	Minor
10	Assembly parts A=(L + W)÷2	The mark or polarity of component is unidentifiable.	N.G.	Minor
		The height between bottom of component and surface of the PCB is floating ＞0.7mm	N.G.	Minor
		D＞1/4W 	N.G.	Minor
		End solder joint width, D' is ＞50% width of component termination or width of pad	N.G.	Minor
		Side overhang, D is ＞25% width of component termination.	N.G.	Minor
		Component is cracked, deformed, and burned, etc.	N.G.	Minor
		The polarity of component is placed in inverse direction.	N.G.	Minor
		Maximum fillet height of solder extends onto the component body or minimum fillet height is ＜0.5mm.	N.G.	Minor

■PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents

- Isopropyl alcohol
- Ethyl alcohol

Do not scrub hard to avoid damaging the display surface.

(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.

- Water
- Ketone
- Aromatic solvents

Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.

(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) Electro-Static Discharge Control，Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential. Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded. make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended. As far as possible make the electric potential of your work clothes and that of the work bench the ground potential
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated

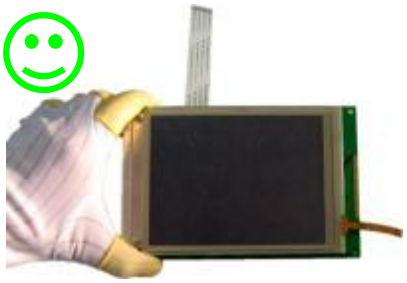
（13）Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter, modify or change the shape of the tab on the metal frame.
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Do not damage or modify the pattern writing on the printed circuit board.
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist LCM.

Handling precaution for LCM

LCM is easy to be damaged. Please note below and be careful for handling.

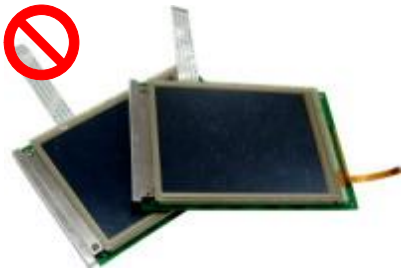
Correct handling:



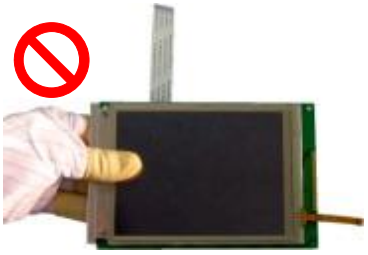
As above picture, please handle with anti-static gloves around LCM edges.

Incorrect handling:

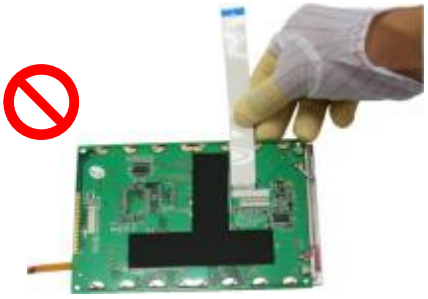
Please don't touch IC directly.



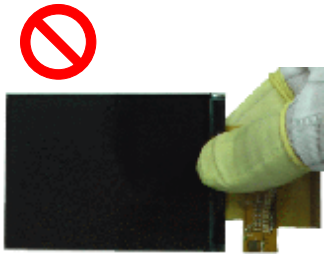
Please don't stack LCM.



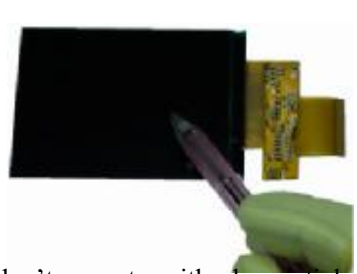
Please don't hold the surface of panel.



Please don't stretch interface of output, such as FPC cable.



Please don't hold the surface of IC.



Please don't operate with sharp stick such as pens.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C, and keep the relative humidity between 40%RH and 60%RH.

(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the anti-static electricity container in which they were shipped.

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

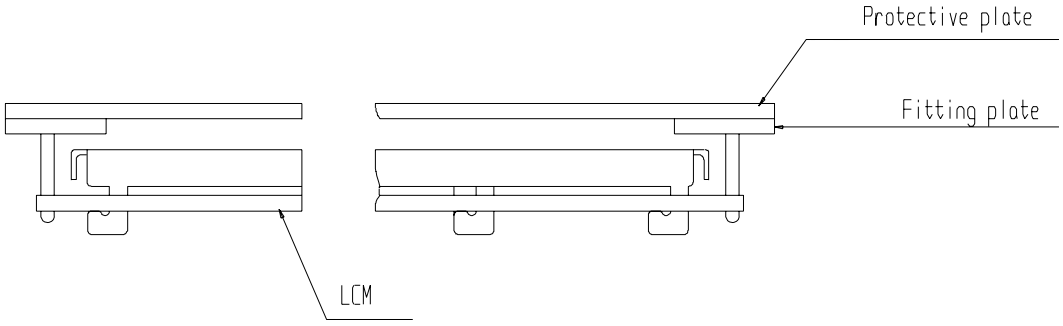
- Exposed area of the printed circuit board.
-Terminal electrode sections.

■ USING LCD MODULES

Installing LCD Modules

The hole in the printed circuit board is used to fix LCM as shown in the picture below. Attend to the following items when installing the LCM.

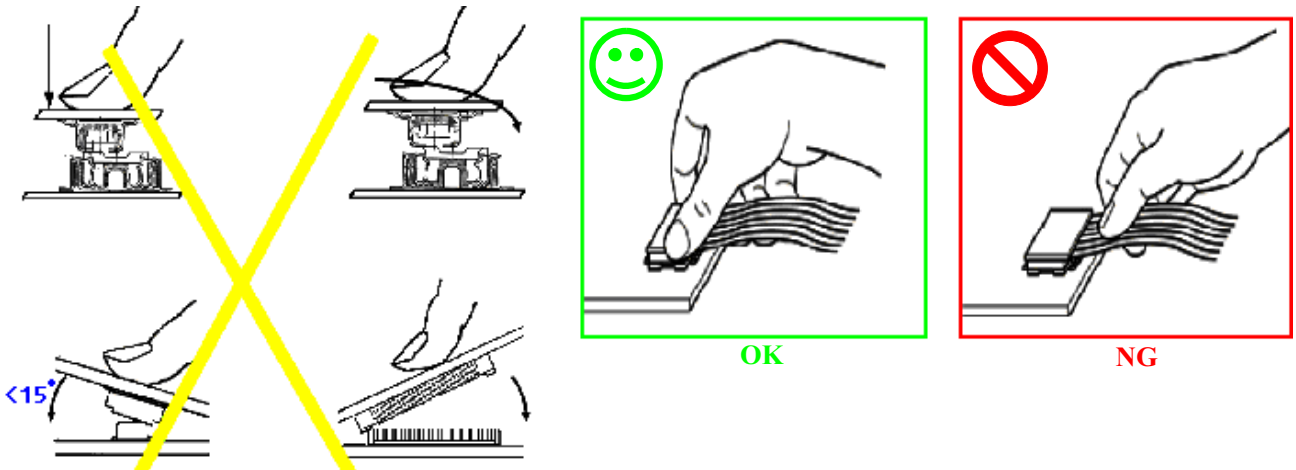
(1) Cover the surface with a transparent protective plate to protect the polarizer and LC cell.



(2) When assembling the LCM into other equipment, the spacer to the bit between the LCM and the fitting plate should have enough height to avoid causing stress to the module surface, refer to the individual specifications for measurements. The measurement tolerance should be ±0.1mm.

Precaution for assemble the module with BTB connector:

Please note the position of the male and female connector position, don't assemble or assemble like the method which the following picture shows



Precaution for soldering the LCM

	Manual soldering	Machine drag soldering	Machine press soldering
No ROHS product	290°C ~350°C. Time : 3-5S.	330°C ~350°C. Speed : 4-8 mm/s.	300°C ~330°C. Time : 3-6S. Press: 0.8~1.2Mpa
ROHS product	340°C ~370°C. Time : 3-5S.	350°C ~370°C. Time : 4-8 mm/s.	330°C ~360°C. Time : 3-6S. Press: 0.8~1.2Mpa

(1) If soldering flux is used, be sure to remove any remaining flux after finishing to soldering operation. (This does not apply in the case of a non-halogen type of flux.) It is recommended that you protect the LCD surface with a cover during soldering to prevent any damage due to flux spatters.

(2) When soldering the electroluminescent panel and PC board, the panel and board should not be detached more than three times. This maximum number is determined by the temperature and time conditions mentioned above, though there may be some variance depending on the temperature of the soldering iron.

(3) When remove the electroluminescent panel from the PC board, be sure the solder has completely melted, the soldered pad on the PC board could be damaged.

Precautions for Operation

(1) Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

(2) It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life. An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.

(3) 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.

(4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

(5) A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature, 50%RH or less is required.

(6) Input logic voltage before apply analog high voltage such as LCD driving voltage when power on. Remove analog high voltage before logic voltage when power off the module. Input each signal after the positive/negative voltage becomes stable.

(7) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

Safety

(1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

(2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

Limited Warranty

Unless agreed between Multi-Inno and customer, Multi-Inno will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with Multi-Inno LCD acceptance standards (copies available upon request) for a period of one year from date of production. Cosmetic/visual defects must be returned to Multi-Inno within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of Multi-Inno limited to repair and/or replacement on the terms set forth above. Multi-Inno will not be responsible for any subsequent or consequential events.

Return LCM under warranty

No warranty can be granted if the precautions stated above have been disregarded. The typical examples of violations are :

- Broken LCD glass.
- PCB eyelet is damaged or modified.
- PCB conductors damaged.
- Circuit modified in any way, including addition of components.
- PCB tampered with by grinding, engraving or painting varnish.
- Soldering to or modifying the bezel in any manner.

Module repairs will be invoiced to the customer upon mutual agreement. Modules must be returned with sufficient description of the failures or defects. Any connectors or cable installed by the customer must be removed completely without damaging the PCB eyelet, conductors and terminals.

■ PRIOR CONSULT MATTER

1.①For Multi-Inno standard products, we keep the right to change material, process ... for improving the product property without notice on our customer.
②For OEM products, if any change needed which may affect the product property, we will consult with our customer in advance.
2.If you have special requirement about reliability condition, please let us know before you start the test on our samples.