



MULTI-INNO TECHNOLOGY CO., LTD.

# LCD MODULE SPECIFICATION

**Model : MI1602U**

Revision	
Engineering	
Date	
Our Reference	

**MODE OF DISPLAY****Display mode**

- TN positive
- TN negative
- STN :  Yellow green
- Grey
- Blue (negative)
- FSTN positive
- FSTN negative

**Display condition**

- Reflective type
- Transflective type
- Transmissive type
- Others

**Viewing direction**

- 6 O' clock
- 12 O' clock
- 3 O' clock
- 9 O' clock

**LCD MODULE NUMBER NOTATION:**

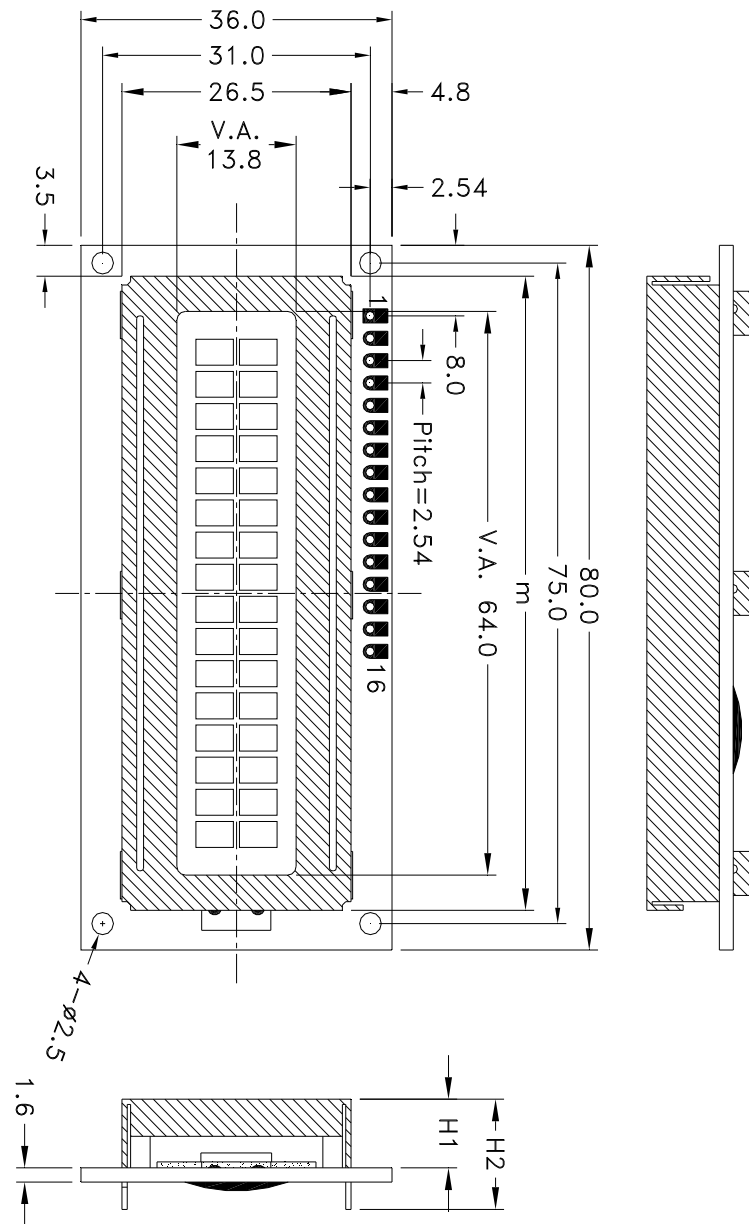
**GENERAL DESCRIPTION**

Display mode : 16 characters x 2 lines LCD module  
 Interface : 4-bit or 8-bit parallel  
 Driving method : 1/16 duty, 1/5 bias  
 IC driver : SITRONIX ST7066U&ST7065C or Equivalence  
 For the detailed information, please refer to IC specifications.

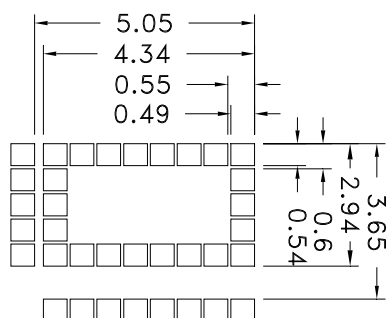
**MECHANICAL DIMENSIONS**

Item	Dimension		Unit	Item	Dimension		Unit
Outline Dimension	80.0(L)x36.0(W)x (H1/H2)		mm	Character Pitch	3.65(L)x5.05(W)		mm
Viewing Area	64.0(L)x13.8(W)		mm	Dot Size	0.54(L)x0.49(W)		mm
Character Size	2.94(L)x4.34(W)		mm	—	—		—
No Backlight (N)	H1	5.0	mm	Side Backlight (L)	H1	7.4	mm
	H2	9.1	mm		H2	11.0	mm
EL Backlight (E)	H1	5.0	mm	Array Backlight (M)	H1	8.0	mm
	H2	9.1	mm		H2	12.0	mm

COUNTER DRAWING OF MODULE DIMENSION

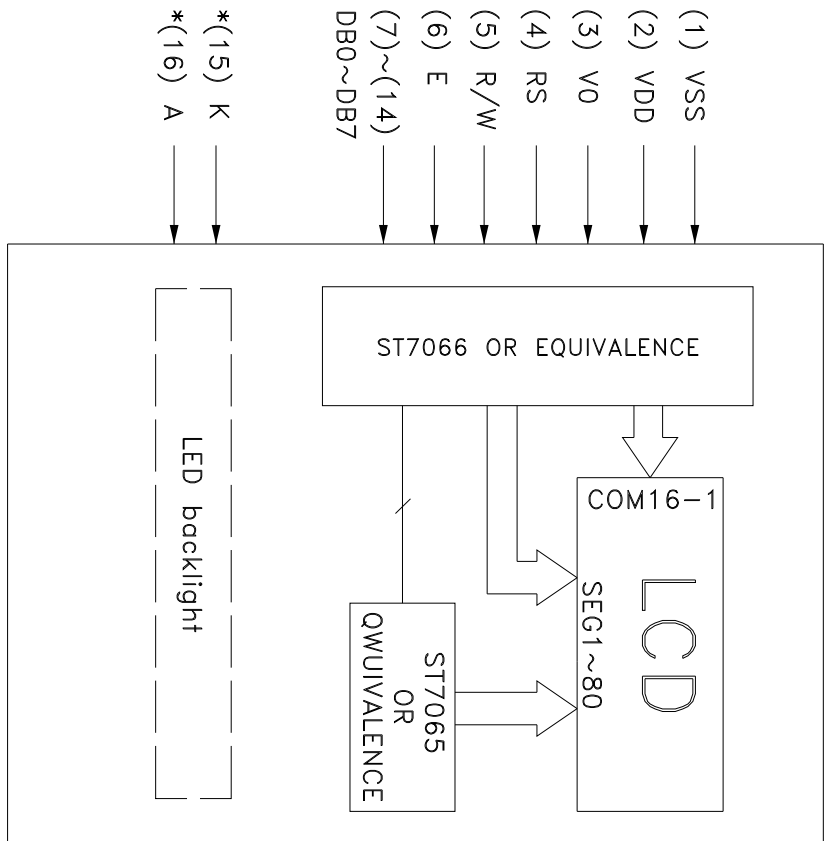


Model	m	H1	H2
No Backlight(N)	72.0	5.0	9.1
LED Backlight(M)	72.0	8.0	12.0
LED Backlight(L)	77.0	7.4	11.0



CUSTOMER APVL		CUSTOMER		DATE	
DRAWN		SCALE		TITLE	
DTG CHK		UNIT	mm	MI1602U	
ENGR CHK		MODEL			
APPROVAL					
MULTI-INNO TECHNOLOGY CO.,LTD.			DWG NO		PAGE
					1/1

**COUNTER DRAWING OF PINOUT & BLOCK DIAGRAM**



PIN NUMBER	SYMBOL	FUNCTION
1	VSS	Power supply for logic (0V)
2	VDD	Power supply for logic (VDD)
3	V0	Input voltage for LCD
4	RS	Register select input
5	R/w	Read/Write
6	E	Enable signal
7	DB0	Data bus
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	K	Backlight power supply(-)
16	A	Backlight power supply(+)

CUSTOMER APVL	CUSTOMER	DATE	
DRAWN	SCALE	TITLE	MI1602U
DFTG CHK	UNIT	MODEL	
ENGR CHK	mm		
APPROVAL			
MULTI-INNO TECHNOLOGY CO.,LTD.		DWG NO	PAGE
			1/1

**CONNECTOR PIN ASSIGNMENT**

Pin No.	Symbol	Function	Pin No.	Symbol	Function
1	VSS	Power supply for logic (0V)	9	DB2	Data bus
2	VDD	Power supply for logic	10	DB3	
3	VO	Input voltage for LCD (0V to VDD)	11	DB4	
4	RS	Register select input	12	DB5	
5	R/W	Read/Write	13	DB6	
6	E	Enable signal	14	DB7	
7	DB0	Data bus	15	K	
8	DB1		16	A	Backlight power supply (+)

**ELECTRICAL CHARACTERISTICS**

Conditions: VSS=0V, @Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit	Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage	VDD	4.75	5.00	5.25	V	“H”Level Input Voltage	VIH	2.2	—	VDD	V
Supply Current	IDD	—	1.00	1.90	mA	“L”Level Input Voltage	VIL	0	—	0.6	V
<b>Backlight Voltage</b>						<b>Backlight Current</b>					
EL (@ Frequency 400Hz)	VEL	—	100	150	V <sub>rms</sub>	—	—	—	—	—	—
<b>Side-lited LED</b>						<b>Side-lited LED</b>					
White	VBL	—	—	—	V	White	IBL	—	—	—	mA
Blue	VBL	3.20	3.40	3.60	V	Blue	IBL	—	40	45	mA
Yellow Green	VBL	4.05	4.25	4.45	V	Yellow Green	IBL	—	40	55	mA
<b>Array LED</b>						<b>Array LED</b>					
Yellow Green	VBL	4.05	4.2	4.35	V	Yellow Green	IBL	—	100	150	mA
Amber	VBL	—	—	—	V	Amber	IBL	—	—	—	mA
Orange	VBL	—	—	—	V	Orange	IBL	—	—	—	mA
Soft Orange	VBL	—	—	—	V	Soft Orange	IBL	—	—	—	mA

**ABSOLUTE MAXIMUM RATINGS**

Please make sure not to exceed the following maximum rating values under the worst application conditions

Item	Symbol	Rating (for normal temperature)	Rating (for wide temperature)	Unit
Supply Voltage	VDD	7	7	V
Input Voltage	VT	-0.3 to VDD +0.3	-0.3 to VDD +0.3	V
Operating Temperature	T <sub>opr</sub>	0 to 50	-20 to 70	°C
Storage Temperature	T <sub>stg</sub>	-10 to 60	-30 to 80	°C



**INSTRUCTIONS**

Instruction	Code										Description	Execution Time (max) (when fcp or fosc is 250 kHz)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears entire display	1.64ms
Return Home	0	0	0	0	0	0	0	0	1	*	Moves cursor to first position. DD RAM contents remain unchanged.	1.64ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies shift of display. These operations are performed during write and read.	40us
Display On/Off Control	0	0	0	0	0	0	1	D	C	B	Sets display (D) ON/OFF, cursor ON/OFF (C), and blinking ON/OFF (B).	40us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	Shifts display or moves cursor (S/C) and sets Displayed to shift RIGHT/LEFT (R/L)	40us
Function Set	0	0	0	0	1	DL	N	F	*	*	Sets 8-bit/4-bit interface (DL), no. of lines displayed (N) and character font (F).	40us
Set CG RAM Address	0	0	0	1	ACG					Sets CG RAM address. CG RAM data is sent and received after setting.	40us	
Set DD RAM Address	0	0	1	ADD					Sets DD RAM address. DD RAM data is sent and received after this setting.	40us		
Read Busy Flag & Address	0	1	BF	AC					Reads Busy flag (BF) indicating internal operation is being performed. Reads address counter contents.	0 us		
Write Data	1	0	Write Data					Writes data into DD RAM or CG RAM.	40us			
Read Data from CG or DD RAM	1	1	Read Data					Reads data from DD RAM or CG RAM.	40us			
	I/D = 1: Increment I/D = 0: Decrement S = 1: Accompanies display shift S/C = 1: Display shift S/C = 0: Cursor move R/L = 1: shift to the right R/L = 0: shift to the left DL = 1: 8 bits DL = 0: 4 bits N = 1: 2 lines N = 0: 1 line F = 1: 5 x 10 dots F = 0: 5 x 7 dots BF = 1: Internally operating BF = 0: Can accept instruction										DD RAM: Display data RAM CG RAM: Character generator RAM ACG: CG RAM address ADD: DD RAM address : Corresponds to cursor address AC: Address counter used for both DD and CG RAM address.  * Don't care	

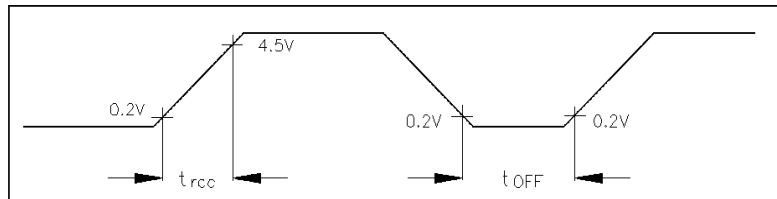
**DISPLAY DD RAM AND CHARACTER POSITION**

16x2, 1/16 DUTY CYCLE

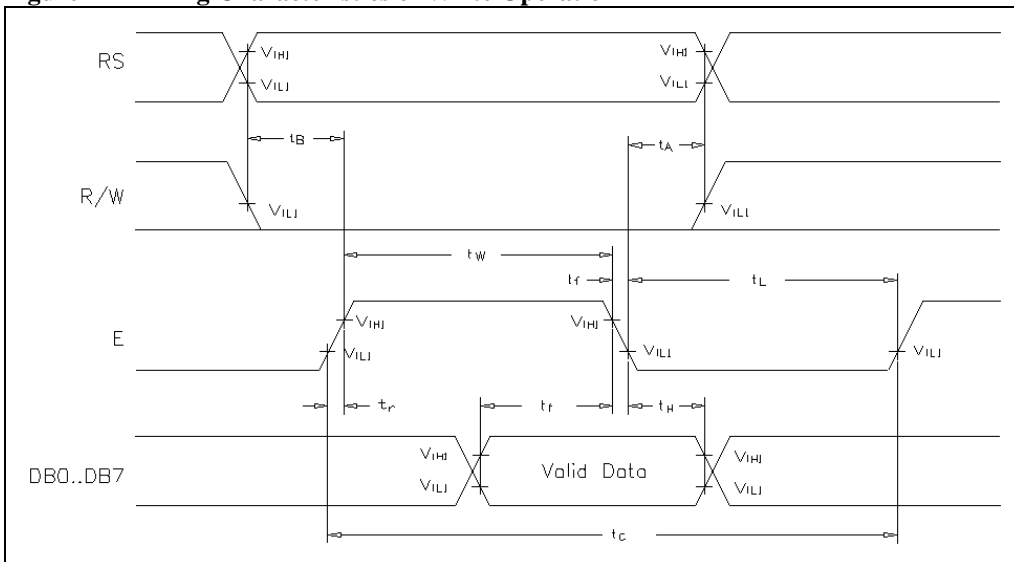
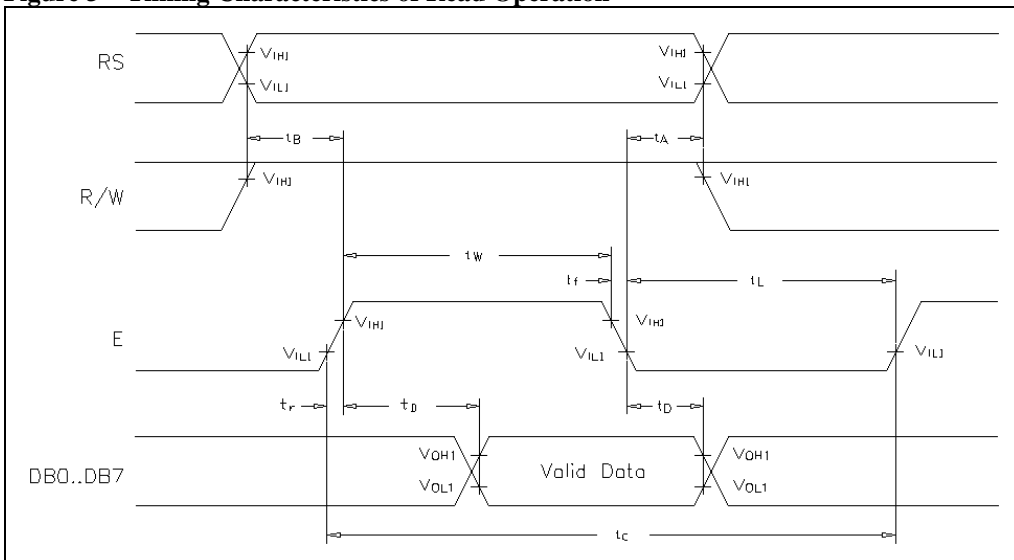
	1	2	.												16	DISPLAY POSITION
line 1	00	01	.												0F	DD RAM ADDRESS
line 2	40	41	.												4F	

**TIMING CHARACTERISTICS OF COMPATIBLE CONTROLLER CHIPS**

Parameters	Symbol	Recommended timing	Parameters	Symbol	Recommended timing
Enable Cycle Time	tC (min)	1000ns	Set-up Time	tB(min)	140ns
Enable Pulse Width	tW(min)	450ns	Data Set-up Time	tI (min)	195ns
			Data Delay Time	tD (max)	320ns
High level	tL (min)	450ns	Address Hold Time	tA(min)	10ns
Low level	tL (min)	450ns	Input Data Hold Time	tH (min)	10ns
Enable Raise Time	tr (max)	25ns	Output Data Hold Time	tD (min)	20ns
Enable Fall Time	tf (max)	25ns			

**Figure 1 Power On Timing Diagram**


**Note:** Power on initialization depends on the rise time of the power supply when it is turned on. When the above power supply conditions is not met, the internal reset circuit will not operate normally and initialization will not be performed. Initialization by manual instruction is required. Use the procedure in figures 4 and 5 for initialization.

**Figure 2 Timing Characteristics of Write Operation**

**Figure 3 Timing Characteristics of Read Operation**


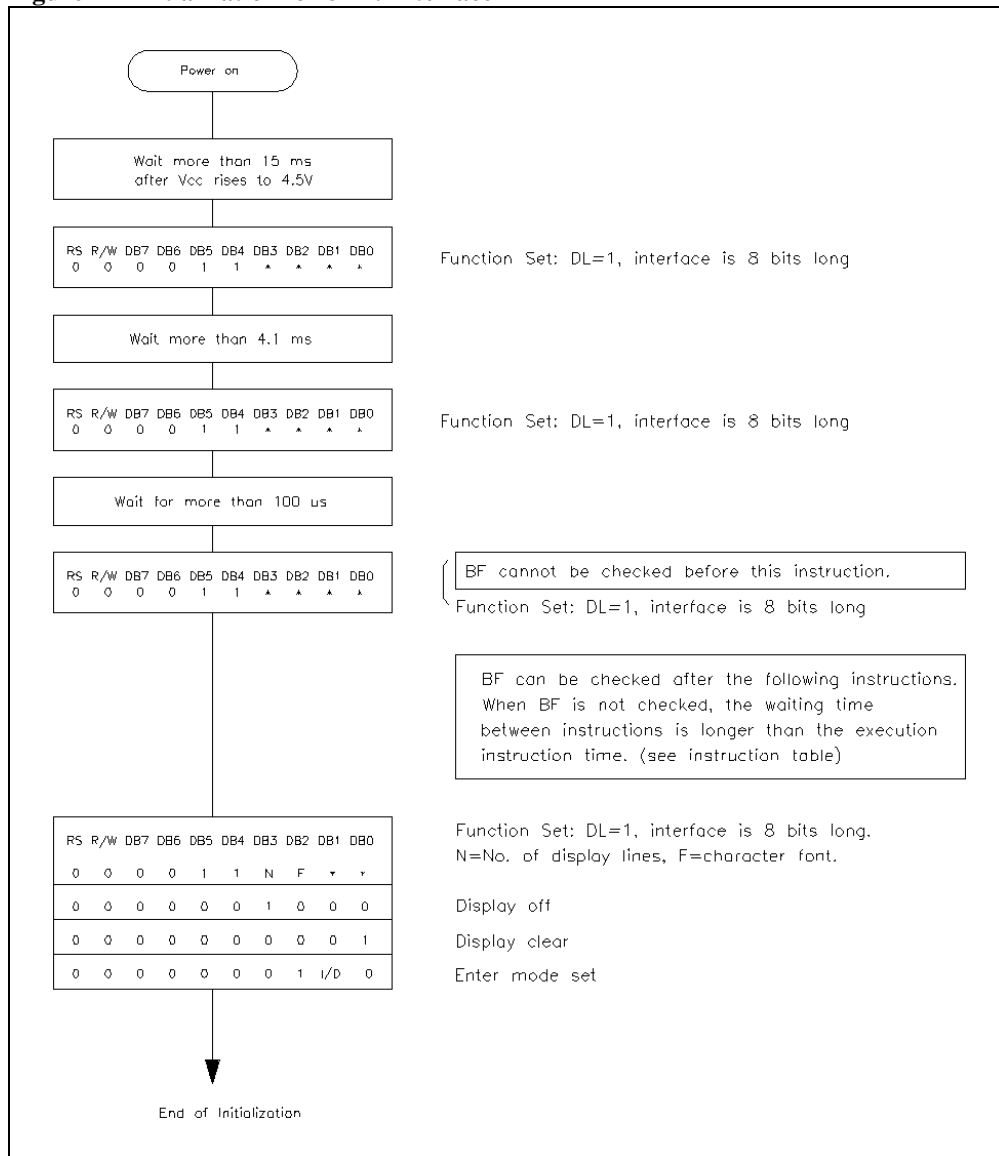


### INITIALIZATION METHOD

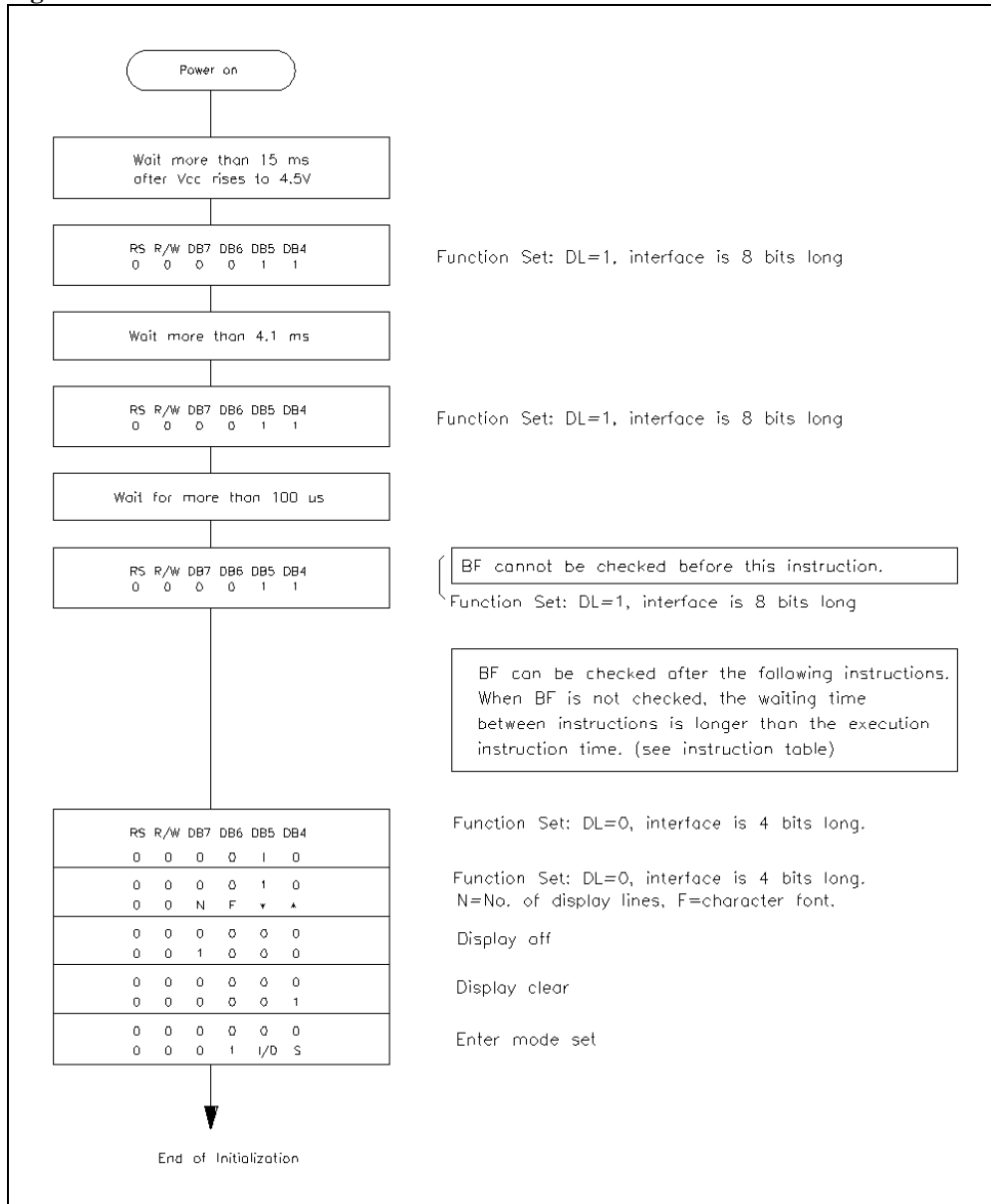
The module will automatically perform initialization using internal reset circuit when power is turned on. The following instructions are executed during initialization.

1. Display Clear  
The busy flag is kept in busy state high (BF=1). The busy state is 15ms..
2. Function set:
  - DL = 1: 8 bit long interface data
  - N = 0: 1 line display
  - F = 0: 5 x 7 dot character font
3. Display on / off control:
  - D = 0: Display off
  - C = 0: Cursor off
  - B = 0: Blink off
4. Entry mode set:
  - I / D = 1: +1 (increment)
  - S = 0: No shift

**Figure 4 Initialization for 8-Bit Interface**



**Figure 5 Initialization for 4-Bit interface**



**ELECTRO-OPTICAL CHARACTERISTICS**

MEASURING CONDITION: POWER SUPPLY = V<sub>OP</sub> / 64 Hz  
 TEMPERATURE = 22 ± 5 °C  
 RELATIVE HUMIDITY = 60 ± 15 %

Item	Symbol	Unit	TYP. TN	TYP. STN
RESPONSE TIME	T <sub>on</sub>	ms	100	200
	T <sub>off</sub>	ms	80	200
CONTRAST RATIO	Cr	-	10	10
VIEWING ANGLE (6 O'clock) (Cr ≥ 2)	V3:00	°	20	20
	V6:00	°	20	40
	V9:00	°	20	20
	V12:00	°	10	10

THE ELECTRO-OPTICAL CHARACTERISTICS ARE MEASURED VALUE BUT NOT GUARANTEED ONES.

**RELIABILITY OF LCD MODULE**

Item	Test Condition For normal temperature	Test Condition For wide temperature	Time
High temperature operating	50°C	70°C	240 hours
Low temperature operating	0°C	-20°C	240 hours
High temperature storage	60°C	80°C	240 hours
Low temperature storage	-10°C	-30°C	240 hours
Temperature-humidity storage	40°C 90% R.H.	60°C 90% R.H.	96 hours
Temperature cycling	-10°C to 60°C 30 Min Dwell	-30°C to 80°C 30 Min Dwell	5 cycles

**QUALITY STANDARD OF LCD MODULE**

<b>1.0</b>	<b>Sampling Method</b>		
	Sampling Plan : MIL STD 105 E Class of AQL : Level II/Single Sampling Critical : 0.25% Major 0.65% Minor 1.5%		
<b>2.0</b>	<b>Defect Group</b>	<b>Failure Category</b>	<b>Failure Reasons</b>
	Critical Defect 0.25% (AQL)	Malfunction	Open Short Burnt of dead component Missing part/improper part P.C.B. Broken
	Major Defect 0.65% (AQL)	Poor Insulation	Potential short High current Component damage or scratched or Lying too close improper coating
		Poor Conduction	Damage joint Wrong polarity Wrong spec. part Uneven/intermittent contact Loose part Copper peeling Rust or corrosion or dirt's
	Minor Defect 1.5% (AQL)	Cosmetic Defect	Minor scratch Flux residue Thin solder Poor plating Poor marking Crack solder Poor bending Poor packing Wrong size



## HANDLING PRECAUTIONS

### (1) CAUTION OF LCD HANDLING & CLEANING

Use soft cloth with solvent (recommended below) to clean the display surface and wipe lightly.

- Isopropyl alcohol, ethyl alcohol, trichlorotrifluoroethane

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

### (2) CAUTION AGAINST STATIC CHARGE

The LCD modules use CMOS LSI drivers, so customers are recommended that any unused input terminal would be connected to  $V_{DD}$  or  $V_{SS}$ , do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

### (3) PACKAGING

Avoid intense shock and falls from a height and do not operate or store them exposed direct to sunshine or high temperature/humidity.

### (4) CAUTION FOR OPERATION

It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life. The use of direct current drive should be avoided because an electrochemical reaction due to direct current causes LCD's undesirable deterioration.

Response time will be extremely delayed at low temperature, and LCD's show dark color at high temperature. However those phenomena do not mean malfunction or out of order with LCD's.

Some font will be abnormally displayed when the display area is pushed hard during operation. But it resumes normal condition after turning off once.

### (5) SAFETY

For crash damaged or unnecessary LCD's, it is recommended to wash off liquid crystal by either of solvents such as acetone and ethanol and should be burned up later.

When any liquid leaked out of a damaged glass cell comes in contact with your hands, wash it off with soap and water.

## WARRANTY

Multi-Inno will replace or repair any of her LCD module in accordance with her LCD specification for a period of one year from date of shipment. The warranty liability of Multi-Inno is limited to repair and/or replacement. Multi-Inno will not be responsible for any subsequent or consequential event.