



**MULTI-INNO TECHNOLOGY CO., LTD.**

**www.multi-inno.com**

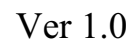
## **LCD MODULE SPECIFICATION**

**Model : MI4004F-W**

**For Customer's Acceptance:**

Customer	
Approved	
Comment	

Revision	1.0
Engineering	
Date	2013-07-18
Our Reference	

[illegible]

**MODE OF DISPLAY**

Display mode : STN yellow green

Display condition : Transflective type

Viewing direction : 6 O'clock

**GENERAL DESCRIPTION**

Display mode : 40 characters x 4 lines COB LCD module

Interface : 8-bit parallel

Driving method : 1/16 duty , 1/5 bias

Driver IC : SITRONIX ST7066U or equivalence

For the detailed information, please refer to the IC specifications.

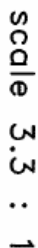
**MECHANICAL DIMENSIONS**

Item	Dimension	Unit	Item	Dimension	Unit
Outline Dimension	190.0(L)x54.0(W)x 15.0Max(H)	mm	Dot Size	0.5(L)x0.55(W)	mm
Viewing Area	147.0(L)x29.5(W)	mm	Dot Pitch	0.57(L)x0.62(W)	mm

**CONNECTOR PIN ASSIGNMENT**

Pin No.	Symbol	Function
1	DB7	Data bus
2	DB6	
3	DB5	
4	DB4	
5	DB3	
6	DB2	
7	DB1	
8	DB0	
9	E1	Enable trigger
10	R/W	H:Read L:Write
11	RS	H:Data L:Instruction Code
12	VEE	Negative voltage Supply for LCD
13	VSS	Power ground
14	VCC	Power positive
15	E2	Enable trigger
16	NC	NO Connect
*17	A	Backlight power supply (+)
*18	K	Backlight power supply (-)

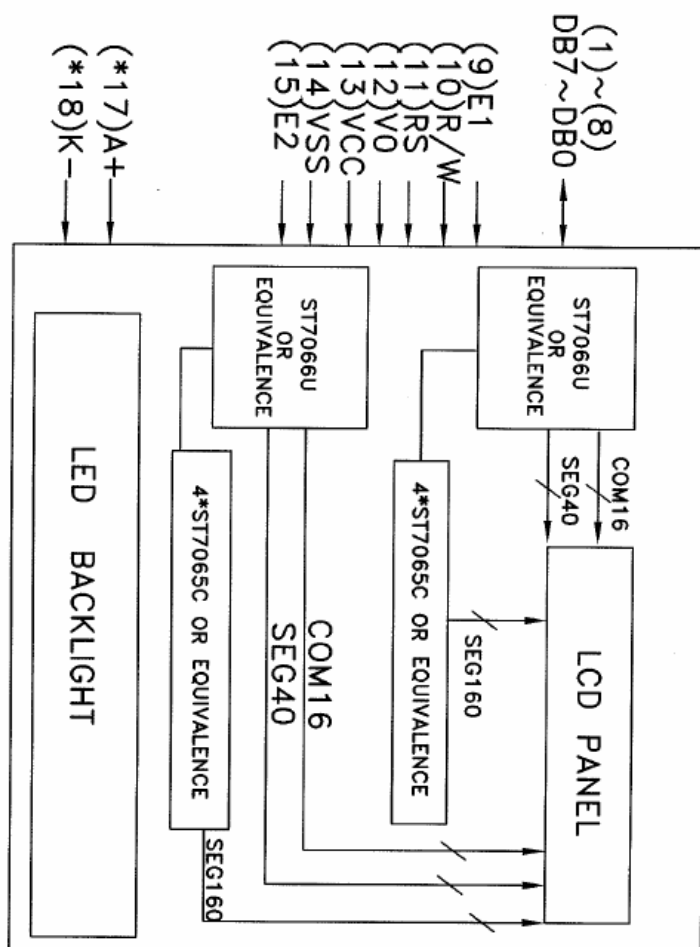
**Note (\*) : Pin 17, 18 are used for backlight version**

TOLERANCE IF NOT SPECIFY  $\pm 0.5\text{mm}$ 

---

P.4

# COUNTER DRAWING OF PIN OUT & BLOCK DIAGRAM



NOTE (\*): Pin (17) (18) is used for backlight version only

TOLERANCE IF NOT SPECIFY  $\pm 0.5\text{mm}$

PIN NO.	SYMBOL	FUNCTION
1	DB7	Data bus
2	DB6	
3	DB5	
4	DB4	
5	DB3	
6	DB2	
7	DB1	
8	DB0	
9	E1	Enable trigger
10	R/W	Read/Write
11	RS	Register select signal
12	V0	Supply voltage for LCD
13	VSS	Power ground
14	VCC	Power positive
15	E2	Enable trigger
16	NC	NO Connect
*17	A+	Backlight power supply(+)
*18	K-	Backlight power supply(-)

CUSTOMER APVL	DATE	TITLE
DRAWN	SCALE	MI4004F-W
DFG CHK	UNIT	mm
ENGR CHK	MODEL	
APPROVAL		
MULTI-INNO TECHNOLOGY CO.,LTD.	DWG NO	PAGE
		2/2

**ELECTRICAL CHARACTERISTICS**

Conditions: VSS=0V, @Ta=25°C

Item	Symbol	MIN.	TYP.	MAX.	Unit
Supply Voltage for Logic	VDD	4.75	5.0	5.25	V
Supply Current for Logic	IDD	—	0.44	0.66	mA
Voltage Adjust for LCD(*)	VLCD	4.5	4.7	4.9	V
“H”Level Input Voltage	VIH	0.7VDD	—	VDD	V
“L”Level Input Voltage	VIL	-0.3	—	0.6	V

**Note (\*): There is tolerance in optimum LCD driving voltage during production and it will be within the specified range.**

Side-lited LED backlight:

Constant voltage driving:

Item	Symbol	MIN.	TYP.	MAX.	Unit	Condition
White	I <sub>BL</sub>	—	60	90	mA	V <sub>BL</sub> = 4.2V

**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)	Unit
Supply Voltage for Logic	VDD	-0.3 to 7.0	V
Input Voltage for Logic	VIN	-0.3 to VDD+0.3	V
Operating Temperature	T <sub>opr</sub>	0 to 50	°C
Storage Temperature	T <sub>stg</sub>	-10 to 60	°C

## Instructions

Instruction	Instruction Code										Description	Description Time (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. and set DDRAM address to "00H" from AC	1.52 ms
Return Home	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52 ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	37 us
Display ON/OFF	0	0	0	0	0	0	1	D	C	B	D=1:entire display on C=1:cursor on B=1:cursor position on	37 us
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.	37 us
Function Set	0	0	0	0	1	DL	N	F	x	x	DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 us
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter	37 us
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter	37 us
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 can also be read.	0 us
Write data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM)	37 us
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM)	37 us

Note:

Be sure the ST7066U is not in the busy state (BF = 0) before sending an instruction from the MPU to the ST7066U. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to Instruction Table for the list of each instruction execution time.

### DISPLAY DD RAM AND CHARACTER POSITION

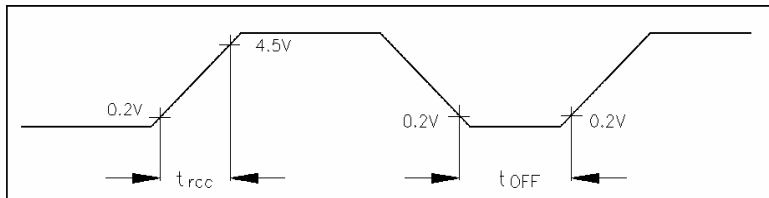
16x2, 1/16 DUTY CYCLE

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

## TIMING CHARACTERISTICS OF COMPATIBLE CONTROLLER CHIPS

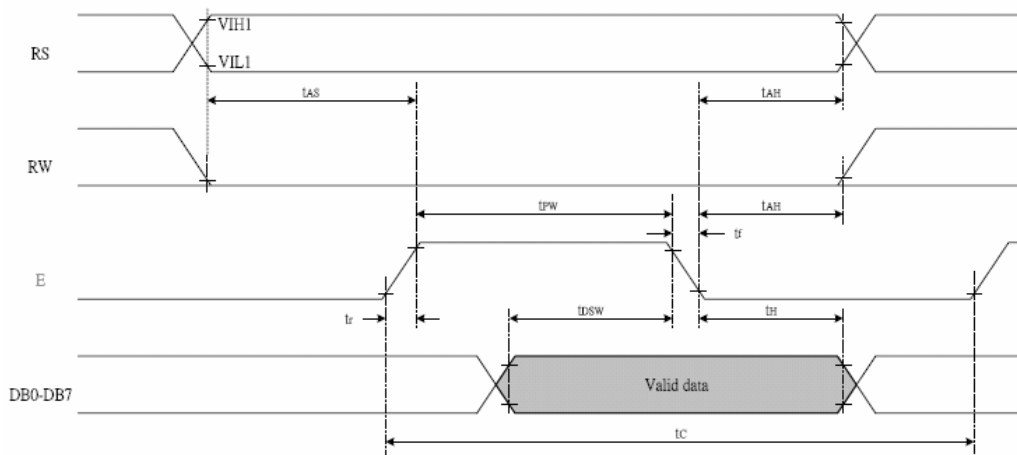
Parameters	Symbol	Recommended timing	Parameters	Symbol	Recommended timing
Enable Cycle Time	tC (min)	1000ns	Set-up Time	tB(min)	140ns
Enable Pulse Width			Data Set-up Time	tI (min)	195ns
High level	tW(min)	450ns	Data Delay Time	tD (max)	320ns
Low level	tL (min)	450ns	Address Hold Time	tA(min)	10ns
Enable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

**Figure 1 Power On Timing Diagram**

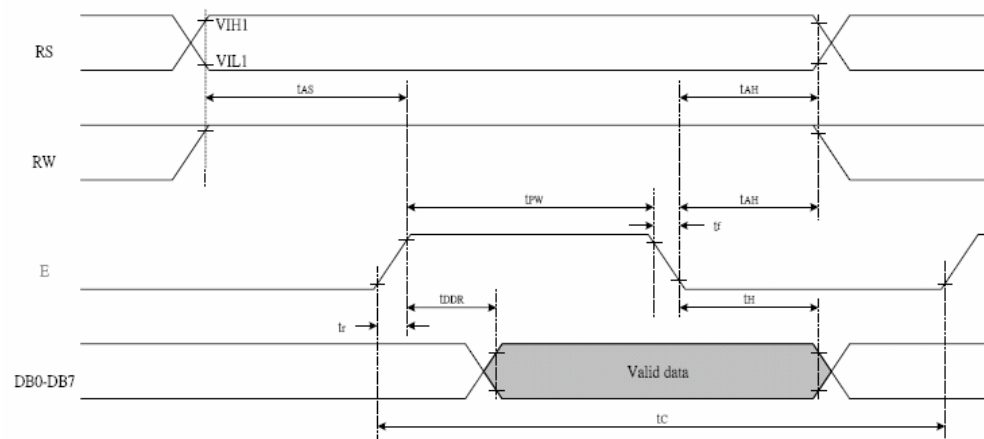


**Note:** Power on initialization depends on the rise time of the power supply when it is turned on. When the above power supply conditions is not met, the internal reset circuit will not operate normally and initialization will not be performed. Initialization by manual instruction is required. Use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

**Figure 2 Timing Characteristics of Write Operation**



**Figure 3 Timing Characteristics of Read Operation**



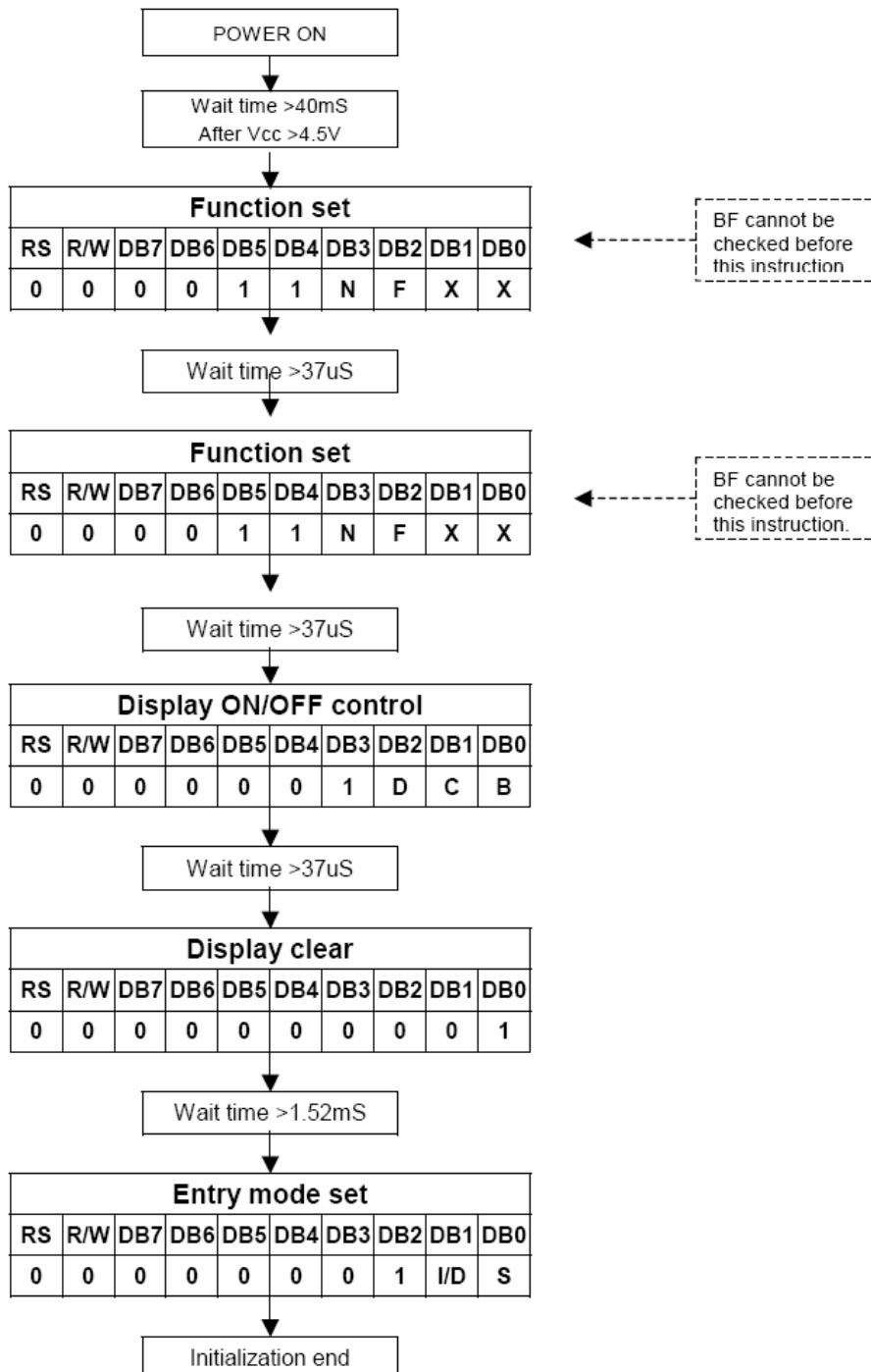


## INITIALIZATION METHOD

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**



**ELECTRO-OPTICAL CHARACTERISTICS**

MEASURING CONDITION: POWER SUPPLY =  $V_{OP}$  / 64 Hz  
TEMPERATURE =  $22 \pm 5$  °C  
RELATIVE HUMIDITY =  $60 \pm 15$  %

Item	Symbol	Unit	TYP. STN
RESPONSE TIME	Ton	ms	150
	Toff	ms	190
CONTRAST RATIO	Cr	-	15
VIEWING ANGLE (6 O'clock) (Cr ≥ 2)	V3:00	°	45
	V6:00	°	70
	V9:00	°	45
	V12:00	°	60

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 cycle
Vibration Test at LCM Level	Freq 10-55 Hz Sweep rate: 10-55-10 at 1 min Sweep mode Linear Displacement: 2 mm p-p 1 Hour each for X, Y, Z	Freq 10-55 Hz Sweep rate: 10-55-10 at 1 min Sweep mode Linear Displacement: 2 mm p-p 1 Hour each for X, Y, Z	—

**QUALITY STANDARD OF LCD MODULE**

1.0	<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%		
2.0	<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**

The polarizing plate on the surface of the panel is made from organic substances. Be very careful for chemicals not to touch the plate or it leads the polarizing plate to deteriorate.

If the use of a chemical is unavoidable, wipe the panel lightly with soft materials, such as gauze and absorbent cotton, soaked in a solvent.

\*Usable solvent: Alcohol (ethanol, IPA and the like)

\*Appropriate solvent: Ketones, ethyl alcohol

Avoid wiping with a dry cloth, since it could damage the surface of the polarizing plate and others.

**(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 to direct sunshine or high temperature/humidity for long periods.

**(4) CAUTION FOR OPERATION**

The viewing angle can be adjusted by varying the LCD driving voltage  $V_O$ .

Driving voltage should be kept within specified range, excess voltage shortens display life.

Response time increases with decrease in temperature.

Display may turn black or dark Blue at temperature above its operational range; this is however not destructive and the display will return to normal once the temperature falls back to range.

Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear “fractured”. They will recover once the display is turned off.

Condensation at terminals will cause malfunction and possible electrochemical reaction. Relative humidity of the environment should therefore be kept below 60%.

**(5) SAFETY**

Liquid crystal may leak out of a damaged LCD, it is recommended to wash off the liquid crystal by using solvents such as acetone or ethanol and should be burned up later.

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

**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.