MULTI-INNO TECHNOLOGY CO., LTD.

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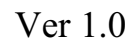
LCD MODULE SPECIFICATION

Model : MI1601Q

For Customer's Acceptance:

Customer	
Approved	
Comment	

Revision	1.0
Engineering	
Date	2013-03-14
Our Reference	

REVISION RECORD

REV NO.	REV DATE	CONTENTS	REMARKS
1.0	2013-03-14	First Release	

CONTENTS

■ GENERAL INFORMATION

Item	Contents	Unit
LCD type	STN Gray Positive Transflective Normal Temp	/
Display type	16×1 Characters	/
Viewing direction	6:00	O' Clock
LCM (L ×W × H)	80.00×36.00×14.50	mm
Viewing Area (L × W)	64.50×13.80	mm
Active area (L ×W)	59.62×6.56	mm
Character size (L ×W)	3.07×5.75	mm
Dot size (L ×W)	0.55×0.75	mm
Dot pitch (L ×W)	0.63×0.83	mm
Controller	ST7066U	/
Backlight	Y/G LED	/
Interface	MPU	/
Driver condition	1/16Duty, 1/4 Bias	/
Weight	35.8	g

■ EXTERNAL DIMENSIONS

PIN NO.	SIGNAL
1	Vss
2	Vdd
3	Vo
4	RS
5	R/W
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	A
16	K

■ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Condition	Min	Max	Unit
Power supply voltage	VDD	-	-0.3	7.0	V
LCD driver supply voltage	V$_{LCD}$	-	VDD-10	VDD+0.3	V
Input voltage	V$_{IN}$	-	-0.3	VDD+0.3	V
Operating temperature	T$_{OP}$	Excluded B/L	0	50	°C
Storage temperature	T$_{ST}$	Excluded B/L	-20	70	°C
Humidity	RH	Ta<40°C	-	90%	RH

■ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Logic supply voltage	VDD	-	4.5	5.0	5.5	V
Supply current	IDD	VDD=5.0V	-	1.5	3.0	mA
Input voltage ' H ' level	V$_{IH}$	-	0.7VDD	-	VDD	V
Input voltage ' L ' level	V$_{IL}$	-	-0.3	-	0.6	V
Output voltage ' H ' level	V$_{OH}$	I$_{OH}$=-0.1mA	3.9	-	VDD	V
Output voltage ' L ' level	V$_{OL}$	I$_{OL}$=0.1mA	-	-	0.4	V
LCM driver voltage	V$_{OP}$	0°C	-	-	-	V
		25°C *1	4.2	4.4	4.6	
		50°C	-	-	-	

■BACKLIGHT CHARACTERISTICS

LCD Module with LED Backlight

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25°C	-	300	mA
Reverse Voltage	VR	Ta =25°C	-	8	V
Power Dissipation	PO	Ta =25°C	-	1.38	W

Electrical / Optical Characteristics

Ta =25℃

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF=120 mA	-	4.2	4.6	V
Reverse Current	IR	VR= 8 V	-	-	0.2	mA
Wavelength	λp	IF= 120 mA	569	-	576	nm
Luminous Intensity (without LCD)	Iv	IF=120 mA	220	290	-	cd/m^2
Color			YELLOW-GREEN			

■ELECTRO-OPTICAL CHARACTERISTICS

LCD Panel：1/16 Duty，1/4 Bias，V_{LCD} =3.9 V，Ta = 25℃

Item	Symbol	Conditions	Min.	Typ.	Max.	Reference
View Angle	θ	C≥2.0, ∅ = 0°	0°	-	40°	Notes 1 & 2
Contrast Ratio	C	θ = 5°, ∅ = 0°	4	6	-	Note 3
Response Time(rise)	tr	θ = 5°, ∅ = 0°	-	70 ms	105ms	Note 4
Response Time(fall)	tf	θ = 5°, ∅ = 0°	-	140 ms	210ms	Note 4

Note 1: Definition of angles θ and ∅

Light (when reflected)   z (θ=0°)

Sensor

Y'(∅=180°)   θ

LCD panel

X'   X(∅=90°)

Z'   ∅
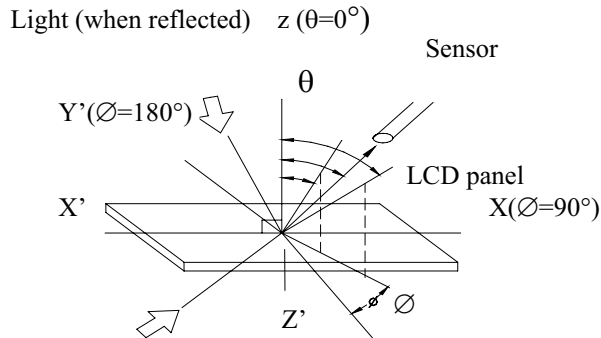
Light (when transmitted)   Y(∅=0°)

(θ=90°)

Note 2: Definition of viewing angles θ1 and θ2

Cmax.

Contrast

C   2.0
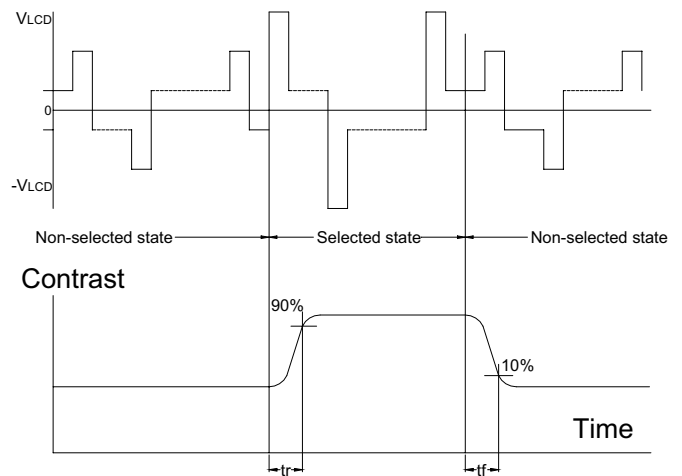
θ1   θ2

viewing angle θ (∅ fixed)
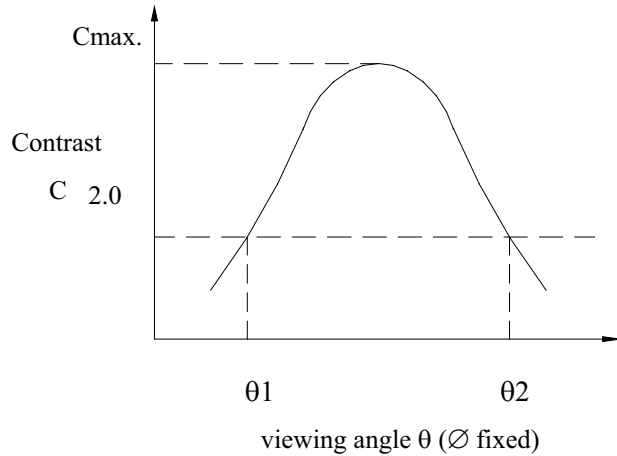
Note :   Optimum viewing angle with the

naked eye and viewing angle θ at

Cmax. Above are not always the same

Note 3: Definition of contrast C

$$C = \frac{\text{Brightness (reflection) of unselected dot (B2)}}{\text{Brightness (reflection) of selected dot (B1)}}$$

Brightness (reflection) of

selected dot

(%)

Brightness
(reflection)

B2

B1

Brightness
(reflection) of
unselected dot

0

operating voltage (v)
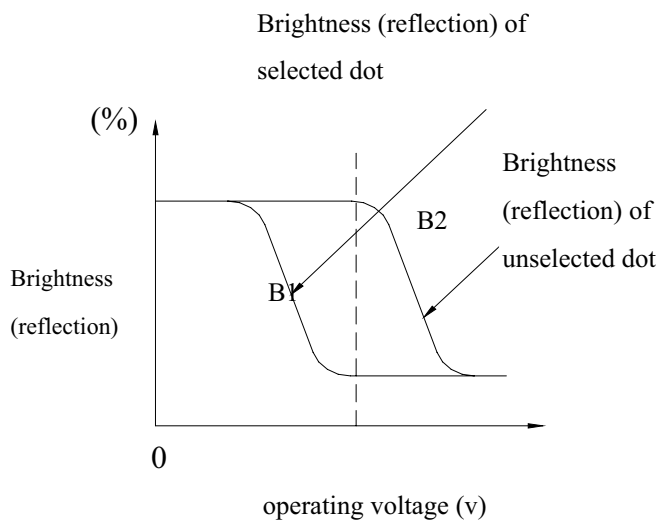
Note 4: Definition of response time

V_{LCD}

0

$-V_{LCD}$

Non-selected state   Selected state   Non-selected state

Contrast

90%

10%

Time

t_r t_f

Note: Measured with a transmissive LCD

panel which is displayed 1 cm^2

V_{LCD} : Operating voltage f_{FRM} : Frame frequency

t_r : Response time (rise) t_f : Response time (fall)

■ **INTERFACE DESCRIPTION**

| Pin No.	Symbol	Signal Description
1	VSS	Power Supply ($V_{SS}=0$)
2	VDD	Power Supply ($V_{DD}>V_{SS}$)
3	VO	Operating voltage for LCD (variable)
4	RS	Register Selection input High = Data register Low = Instruction register (for write) Busy flag address counter (for read)
5	$\overline{R/W}$	Read/Write signal input is used to select the read/write mode High = Read mode, Low = Write mode
6	E	Start enable signal to read or write the data
7~10	DB0 ~ DB3	Four low order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCD module. These four are not used during 4-bit operation.
11~14	DB4~DB7	Four high order bi-directional three-state data bus lines. Used for data transfer between the MPU and the LCD module. DB7 can be used as a busy flag.
15	A	Power supply for LED B / L (+)
16	K	Power supply for LED B / L (-)

Contrast Adjust
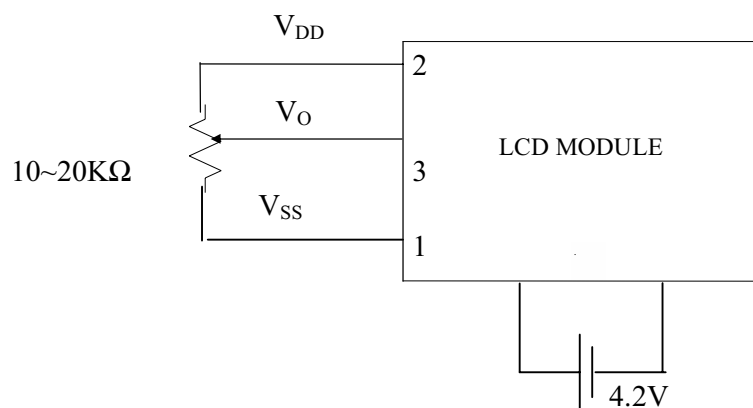
■ **APPLICATION NOTES**

1. Timing Characteristics

● Writing data from MPU to ST7066U
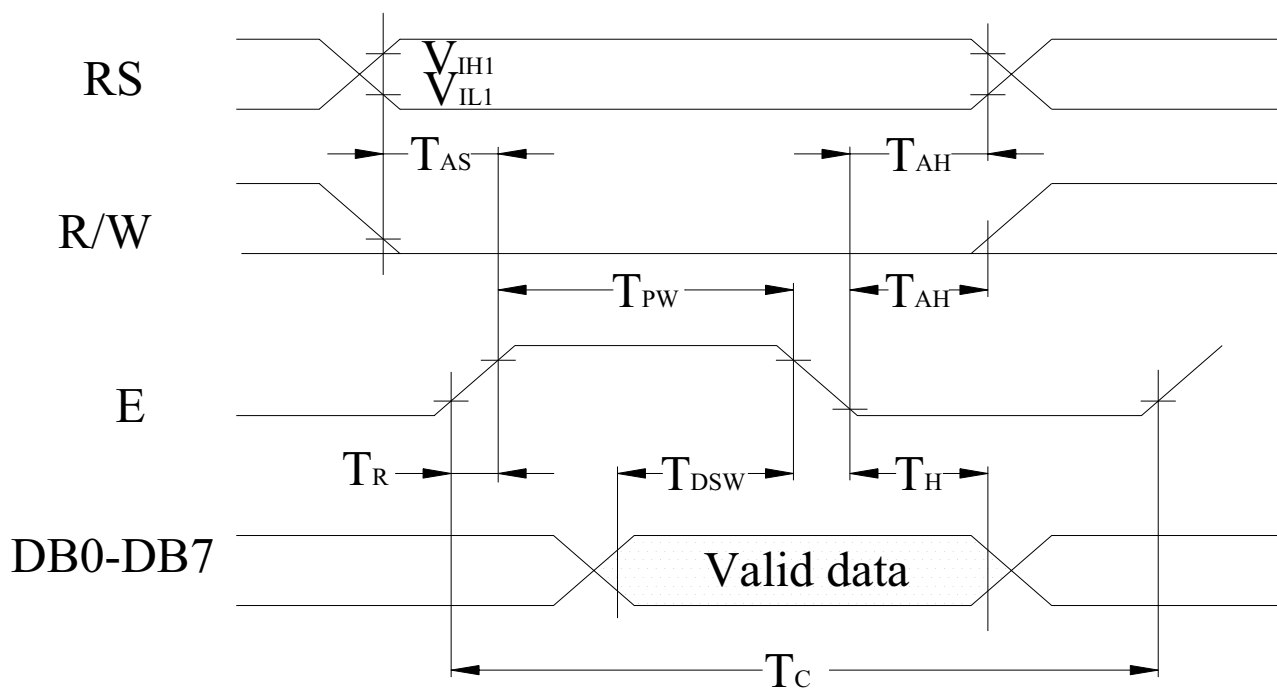
● Reading data from ST7066U to MPU
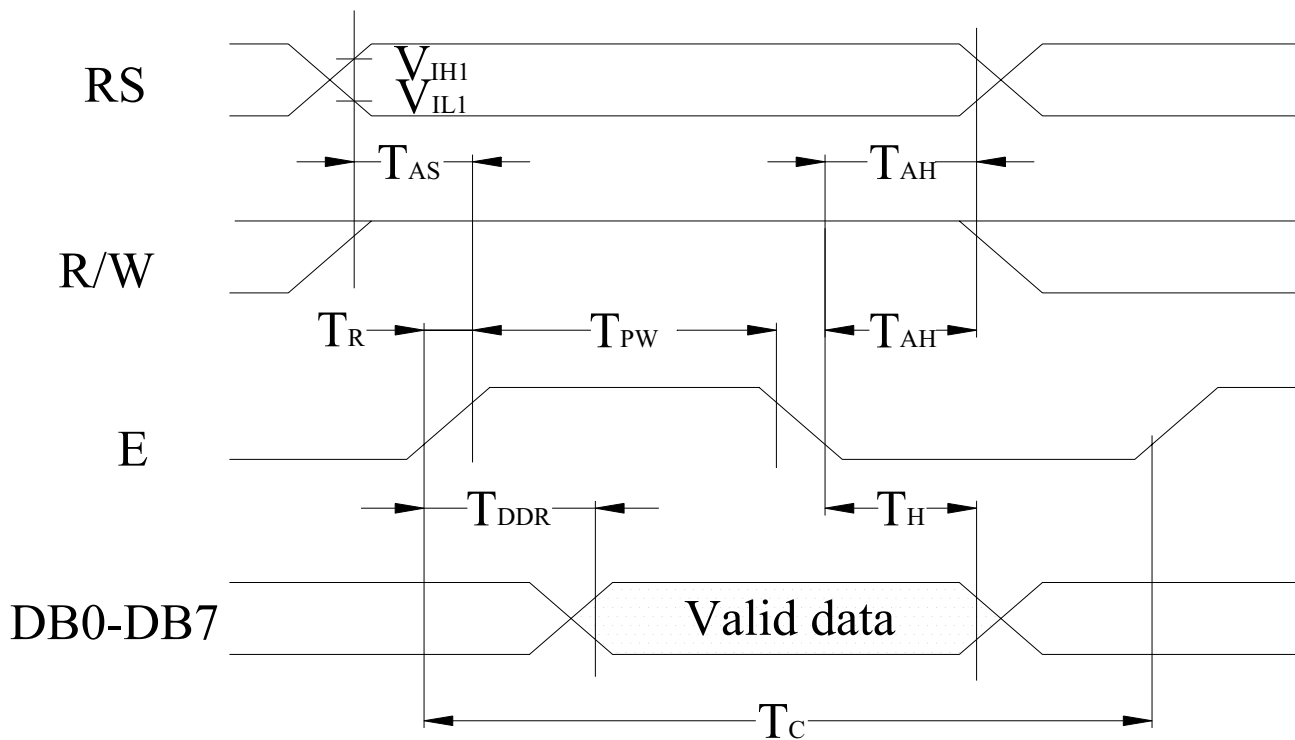
• Write Mode (Writing data from MPU to ST7066U)

(Vcc = +5V,Ta=25°C)

Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T_R , T_F	Enable Rise / Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS , RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins :RS,RW,E	10	-	-	ns
T_{DSW}	Data Setup Time	Pins:DB0~DB7	40	-	-	ns
T_H	Data Hold Time	Pins:DB0~DB7	10	-	-	ns

• Read Mode (Reading data from ST7066U to MPU)

cc = +5V,Ta=25°C)

| Symbol	Characteristics	Test Condition	Min.	Typ.	Max.	Unit
T_C	Enable Cycle Time	Pin E	1200	-	-	ns
T_{PW}	Enable Pulse Width	Pin E	140	-	-	ns
T_R , T_F	Enable Rise / Fall Time	Pin E	-	-	25	ns
T_{AS}	Address Setup Time	Pins: RS , RW,E	0	-	-	ns
T_{AH}	Address Hold Time	Pins :RS,RW,E	10	-	-	ns
T_{DDR}	Data Setup Time	Pins:DB0~DB7	-	-	100	ns
T_H	Data Hold Time	Pins:DB0~DB7	10	-	-	ns

For 4-bit interface date, only four bus lines (DB4 to DB7) are used for transfer.

Example of busy flag check timing sequence
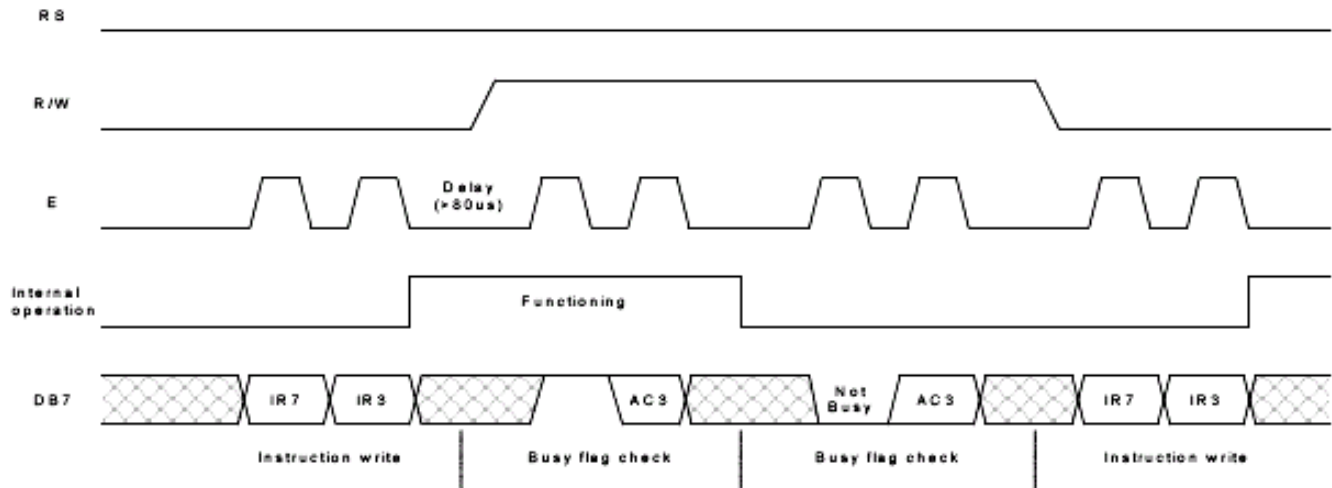
For 8-bit interface date, all eight bus lines (DB0 to DB7) are used .

Example of busy flag check timing sequence
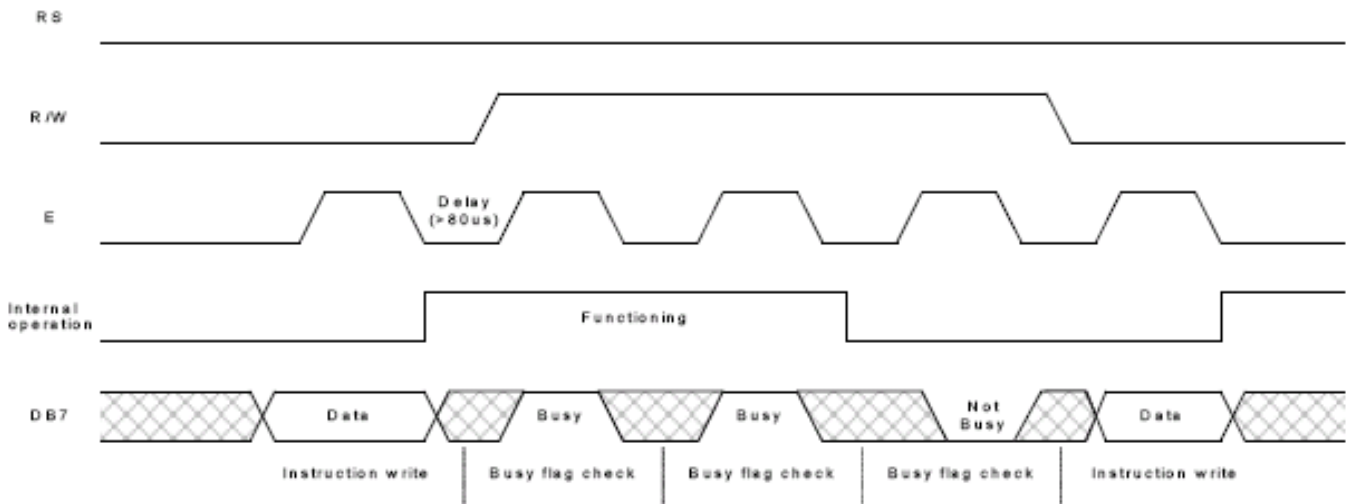
2. Display Command

Instructions	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.	1.52ms
Return Home	0	0	0	0	0	0	0	0	1	×	Set DDRAM address to "00H" from AC and return cursor to it's 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	S	Sets cursor move direction and specifies display shift. These operations are performed during data write and read .	37μs
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	37μs
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 of DDRAM data.	37μs
Function Set	0	0	0	0	1	DL	N	F	×	×	DL: interface data is 8/4 bits NL: number of line is 2/1 F: font size is 5×11/5×8	37μs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	37μs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	37μs

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.	0µs
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	37µs
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	37µs

Note:

Be sure the ST7066U is not in the busy state (BF=0) before sending an instruction from the MPU to the ST7066.

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.

Before checking BF, be sure to wait at least 80us.. Do not keep "E" always "High" for checking BF.

Refer to Instruction Table for the list of each instruction execution time.

3. Character Pattern
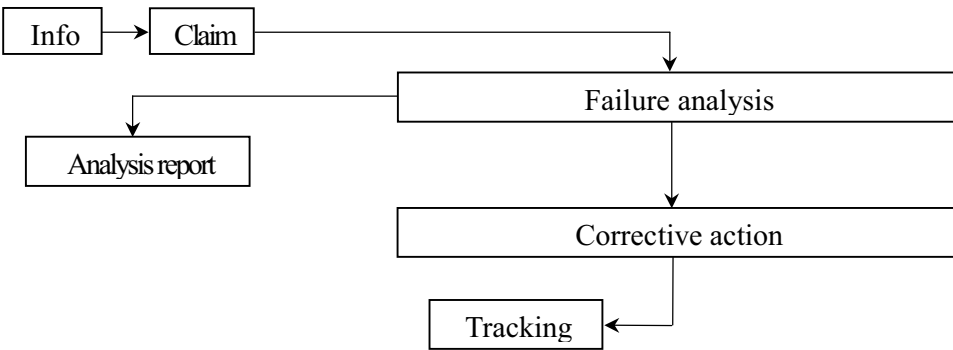
■ CHARACTER PATTERN(SO/HO/EA,WA)

■ **RELIABILITY TEST**

NO.	TEST ITEM	TEST CONDITION	
1	High Temperature Storage Test	Keep in 70 ±2℃ 96 hrs Surrounding temperature, then storage at normal condition 4hrs	
2	Low Temperature Storage Test	Keep in -20 ±2℃ 96 hrs Surrounding temperature, then storage at normal condition 4hrs	
3	High Humidity Storage	Keep in +60℃/90%RH duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs (Excluding the polarizer)Or Keep in +40℃/90%RH duration for 96 hrs Surrounding temperature, then storage at normal condition 4hrs	
4	Vibration Test	1. Sine wave 10～55HZ frequency (1 min) 2. The amplitude of vibration :1.5 mm 3. Each direction (XYZ) duration for 2 Hrs	
5	ESD Test	Air Discharge: Apply 6 KV with 5 times Discharge foreach polarity +/-	Contact Discharge: Apply 250V with 5 times discharge foreach polarity +/-
		1. Temperature ambinace:15℃～35℃ 2. Humidity relative:30%～60% 3. Energy Storage Capacitance(Cs+Cd):150pF±10% 4. Discharge Resistance(Rd):330Ω±10% 5. Discharge, mode of operation: Single Discharge (time between successive discharges at least 1 s) (Tolerance lf the output voltage indication: ±5%)	
6	Temperature Cycling Test	-20℃ → 25℃ → 70℃ → 25℃ (30mins) (5mins) (30mins) (5mins) 10 Cycle Surrounding temperature, then storage at normal condition 4hrs	
7	Vibration Test (Packaged)	1. Sine wave 10～55HZ frequency (1 min) 2. The amplitude of vibration :1.5 mm 3. Each direction (XYZ) duration for 2 Hrs	
8	Drop Test (Packaged)	Packing Weight (Kg) / Drop Height (cm): 0～45.4 → 122 45.4～90.8 → 76 90.8～454 → 61 Over 454 → 46 Drop direction :※3 comer /1 edges /6 sides etch 1times	

■ QUALITY ASSURANCE SYSTEM

Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Marketing & Design								
Sample Approval								
Pilot Run & Mass Product								
Ship Out								

Info → Survey

Request → Inquiry → Project evaluation

NG ← Project Validation ←

Quote ← OK

Contract

Design check

Sample test

NG — Verification

OK

NG — Sample approval — OK

Pilot run & Reliability test

NG — Verification

OK

Specification preparation

Mass production

OK — Inspection — NG

Shipment

Ship out

Item	Customer	Sales	R&D	Q.A	Manufacturing	Product control	Purchase	Inventory control
Sales Service								
Q.A Activity	1. ISO 9001 Maintenance Activities　　2. Process improvement proposal 3. Equipment calibration　　　　　　4. Education And Training Activities 5. Standardization Management							

Sales Service flow:

Info → Claim → Failure analysis → Corrective action → Tracking

Analysis report

■ **INSPECTION CRITERION**
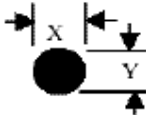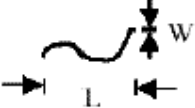
◆Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level Ⅱ .
◆Equipment : Gauge、MIL-STD、Powertip Tester、**Sample**
◆Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5 .
◆OUT Going Defect Level : Sampling .
◆Manner of appearance test :
　(1). The test be under 40W×2 fluorescent light ' and distance of view must be at 30 cm.
　(2). The test direction is base on about around 45° of vertical line.   (Fig. 1)
　(3). Definition of area . (Fig. 2)
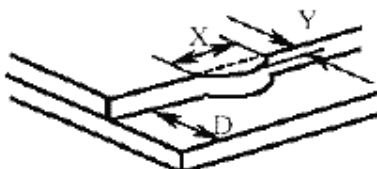
◆ Specification:

NO	Item	Criterion	level
01	Product condition	1.1 The part number is inconsistent with work order of Production.	Major
		1.2 Mixed production types.	Major
		1.3 Assembled in inverse direction.	Major
02	Quantity	2.1 The quantity is inconsistent with work order of production.	Major
03	Outline dimension	3.1 Product dimension and structure must conform to Structure diagram.	Major
04	Electrical Testing	4.1 Missing line character、dot and icon.	Major
		4.2 No function or no display.	Major
		4.3 Output data is error.	Major
		4.4 LCD viewing angle defect.	Major
		4.5 Current consumption exceeds product specifications.	Major
05	Black or white dot、scratch、contamination Round type	5.1 Round type: 　5.1.1 display only : 　　・White and black spots on display ≦ 0.25mm, no more 　　　than Four white or black spots present. 　　・Densely spaced : NO more than two spots or lines within 　　　3mm	Minor
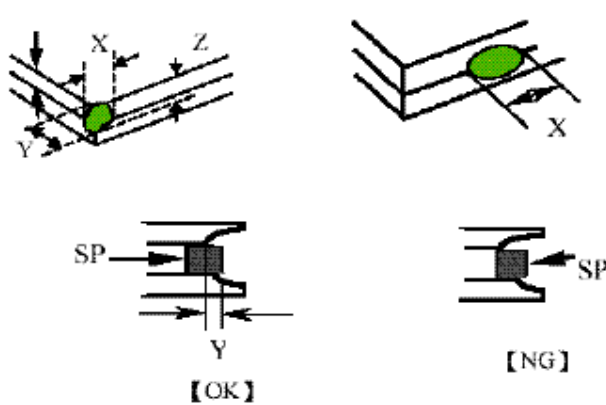
◆Specification :

NO	Item	Criterion	level
05	Black or white dot、scratch、contamination Round type $\Phi=(x+y)/2$	5.1.2 Nom-display : 5.1.3 Line type:	Minor
06	Polarizer Bubble		Minor
07	The crack of glass	● Glass Crack: 7.1 Crack on the circuit of electrode terminal :	Minor

Item 05 — 5.1.2 Nom-display:

Dimension (diameter : Φ)	Acceptance(Q'ty)
$\Phi \leqq 0.10mm$	Accept no dense
$0.10mm < \Phi \leqq 0.20mm$	3
$0.20mm < \Phi \leqq 0.25mm$	2
Total	4

5.1.3 Line type:

Dimension (diameter : Φ)		Acceptance (Q'ty)	
Length	width	A area	B area
---	$w \leqq 0.03mm$	Accept no dense	Don't count
$L \leqq 3.0mm$	$0.03mm < \Phi \leqq 0.05mm$	4	Don't count
$L \leqq 2.5mm$	$0.05mm < \Phi \leqq 0.075mm$		Don't count
---	$w > 0.075mm$	As round type	

Item 06 — Polarizer Bubble:

Dimension (diameter : Φ)	Acceptance(Q'ty)	
	A area	B area
$\Phi \leqq 0.20mm$	Accept no dense	Don't count
$0.20mm < \Phi \leqq 0.50mm$	3	Don't count
$0.50mm < \Phi \leqq 1.00mm$	2	Don't count
$\Phi > 1.00mm$	0	Don't count
Total quantity	4	Don't count

Item 07 — Glass Crack:

	X	Y	Z
Front	$X \leqq 1/5\ a$	$Y \leqq 1/2\ D$	$Z \leqq t$
Back	Neglect		

◆Specification :

NO	Item	Criterion	Level
07	The crack of glass X: The length of Crack Y: The width of crack Z: The thickness of crack D: terminal length T: The thickness of glass A : The length of glass	● Glass Crack: 7.2 General glass crack and corner edge: 7.2.1 | X	Y	Z
---	---	---
Neglect	Out A area	Neglect | 7.2.2 | X	Y	Z
---	---	---
Neglect	Out A area	Neglect		Minor
		7.3 Glass remain: | X	Y
---	---
Neglect	≦ 1/3 d		Minor

◆Specification :

NO	Item	Criterion	Level
07	The crack of glass X: The length of Crack Y: The width of crack Z: The thickness of crack D: terminal length T: The thickness of glass A : The length of glass	7.4 Corner crack and medial crack: | X	Y	Z
---	---	---
$\leqq 1/5a$	Crack can't enter viewing area	$\leqq 1/2t$
$\leqq 1/5a$	Crack can't exceed the half of width of SP width of SP	$1/2t<Z\leqq 2t$		Minor
08	Backlight elements	8.1 Backlight can't work normally.	Major
		8.2 Backlight doesn't light or color is wrong.	Major
		8.3 Illumination source flickers when lit.	Major
09	General appearance	9.1 pin type must match type in specification sheet	Major
		9.2 No short circuits in components on PCB or FPC	Major
		9.3 Product packaging must the same as specified on packaging specification sheet.	Major
		9.4 The folding and peeled off in polarizer are not acceptable	Major
		9.5 The PCB or FPC between B/L assembled distance (PCB or FPC) is $\leqq 1.5mm$	Major

■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.
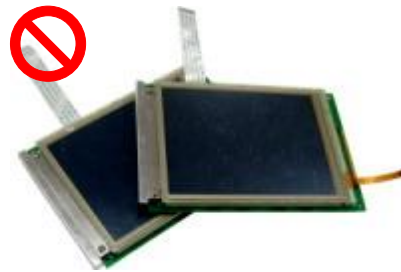**Correct handling:**

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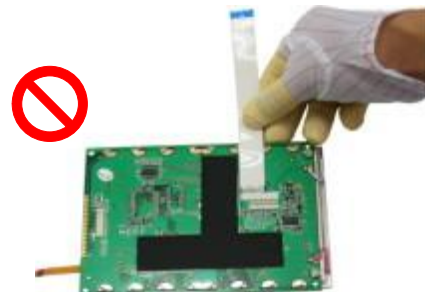
Incorrect handling:

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.
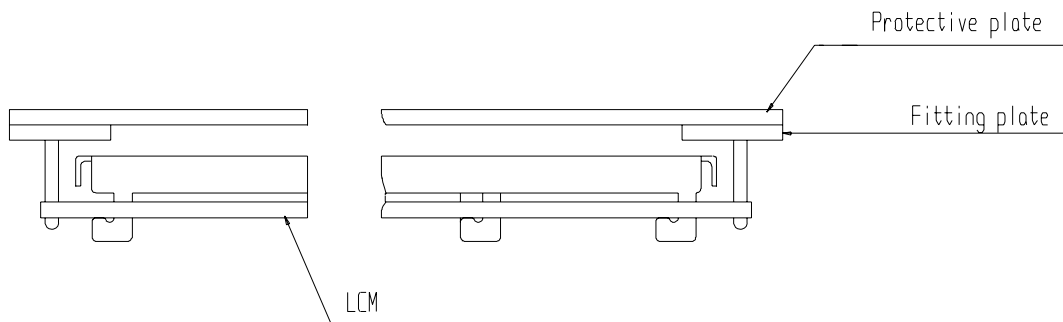
- Exposed area of the printed circuit board.

-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
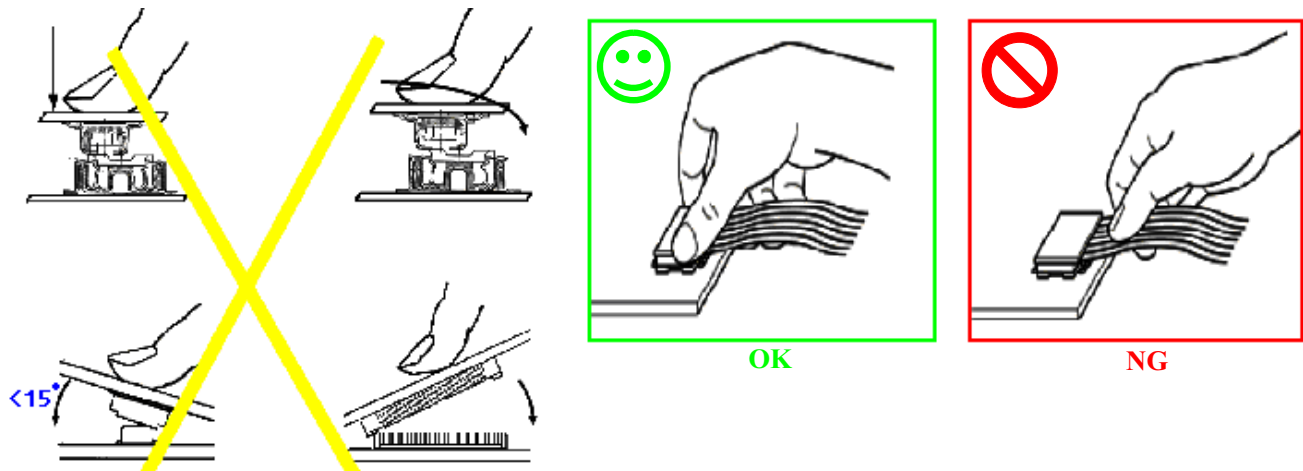
Precaution for soldering the LCM

	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.