

**DM-LCD1602-410
CHARACTER LCD PANEL WITH 8
BIT MCU INTERFACE**

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1 Revision History

Date	Changes
2015-04-03	First release

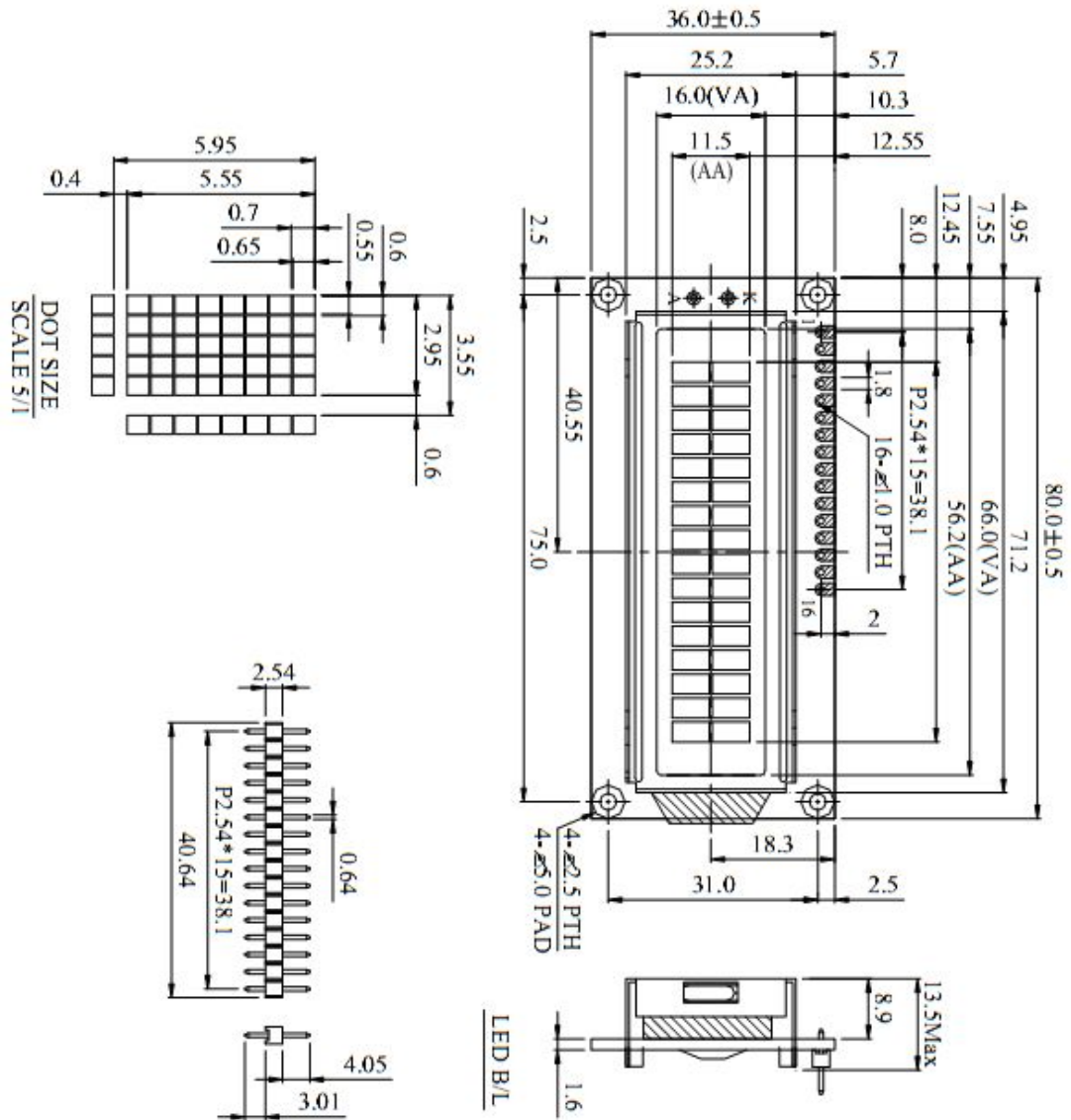
2 Functions and Features

Item	Specification	Unit
Number of Characters	16 characters x 2 lines	
Module Dimension	80.0 x 36.0 x 13.5(MAX)	mm
LCD Type	FSTN Positive Transflective	
Controller IC	ST7066U	
Interface	8 bit MCU	
Duty	1/16	
Power Supply	5.0	V
Backlight Type	White LED	
View Direction	6 o'clock	
Weight	33	g

3 Pin Description

Pin No.	Symbol	Level	Description
1	VSS	0V	Ground
2	VDD	5.0V	Supply Voltage for logic
3	VO	(Variable)	Operating voltage for LCD
4	RS	H/L	H: Data, L: Instruction code
5	R/W	H/L	H: Read(MPU→Module) L: Write(MPU→Module)
6	E	H,H→L	Chip enable signal
7	DB0	H/L	Data bus line
8	DB1	H/L	Data bus line
9	DB2	H/L	Data bus line
10	DB3	H/L	Data bus line
11	DB4	H/L	Data bus line
12	DB5	H/L	Data bus line
13	DB6	H/L	Data bus line
14	DB7	H/L	Data bus line
15	A		LED+
16	K		LED-

4 Mechanical Drawing



PIN NO.	SYMBOL
1	V _{SS}
2	V _{DD}
3	V _O
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

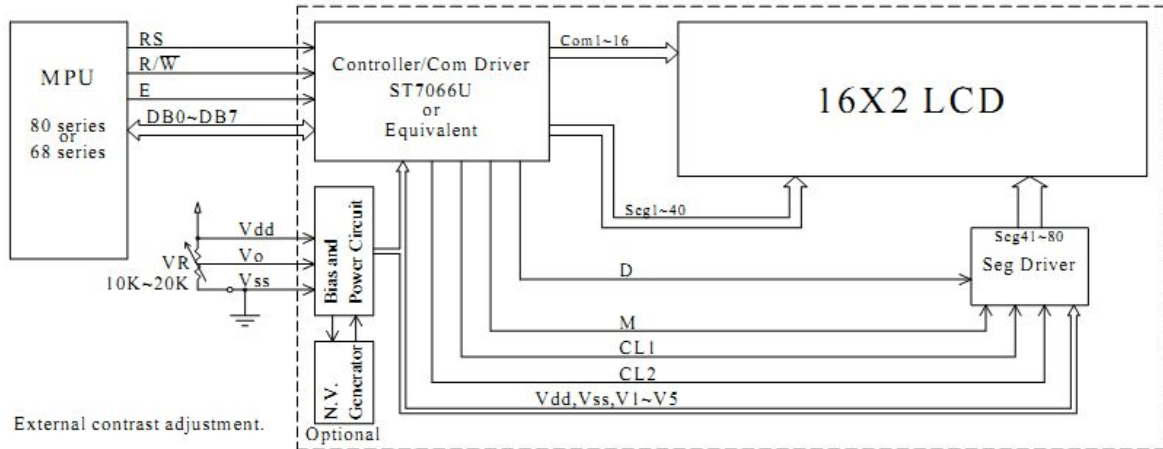
5 Electrical Characteristics

Item	Symbol	Condition	Min	Typ.	Max	Unit
Supply Voltage For Logic	VDD-VSS	-	4.5	5.0	5.5	
Supply Voltage For LCD	VDD-V0	Ta=25°C	4.6	4.7	4.8	V
Supply Current For LCD	IDD	VDD=5.0V	1.0	1.2	1.5	mA
Low Level Input Voltage	V _{IL}		GND	-	0.6VDD	V
High Level Input Voltage	V _{IH}		0.7VDD	-	VDD	V
Low Level Output Voltage	V _{OL}		-	-	0.4	V
High Level Output Voltage	V _{OH}		3.9	-	-	V
Backlight Forward Voltage	V _{LED}		4.9	5.0	5.1	V
Backlight Forward Current	I _{LED}		-	32	40	mA
Operating Temperature	TOP	Absolute Max	-20	-	+70	°C
Storage Temperature	TST	Absolute Max	-30	-	+80	°C

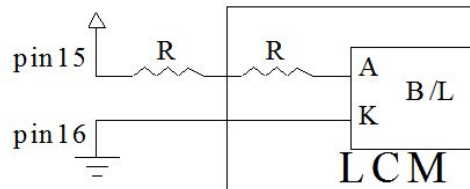
6 Optical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
View Angle - Vertical	AV	Cr≥2	30	-	60	°
View Angle - Horizontal	AH	Cr≥2	-45	-	45	°
Contrast Ratio	Cr	-	-	5	-	-
Response Time (rise)	Tr	-	-	150	200	ms
Response Time (fall)	Tf	-	-	150	200	ms
Luminance	LV		400	500		cd/m ²

7 Block Characteristics



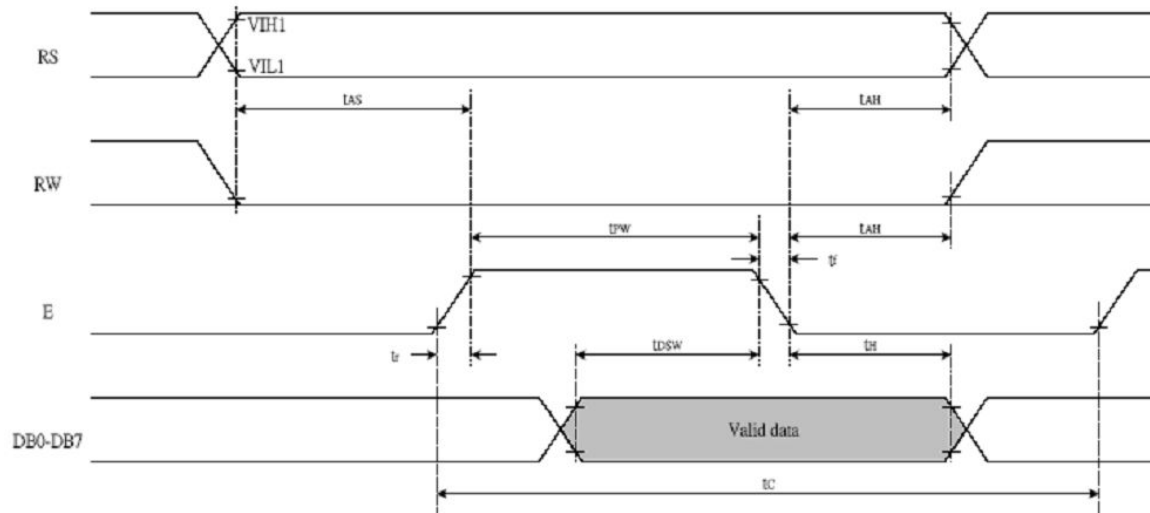
Character located	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
DDRAM address	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
DDRAM address	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F



Backlight drive from pin15, pin16

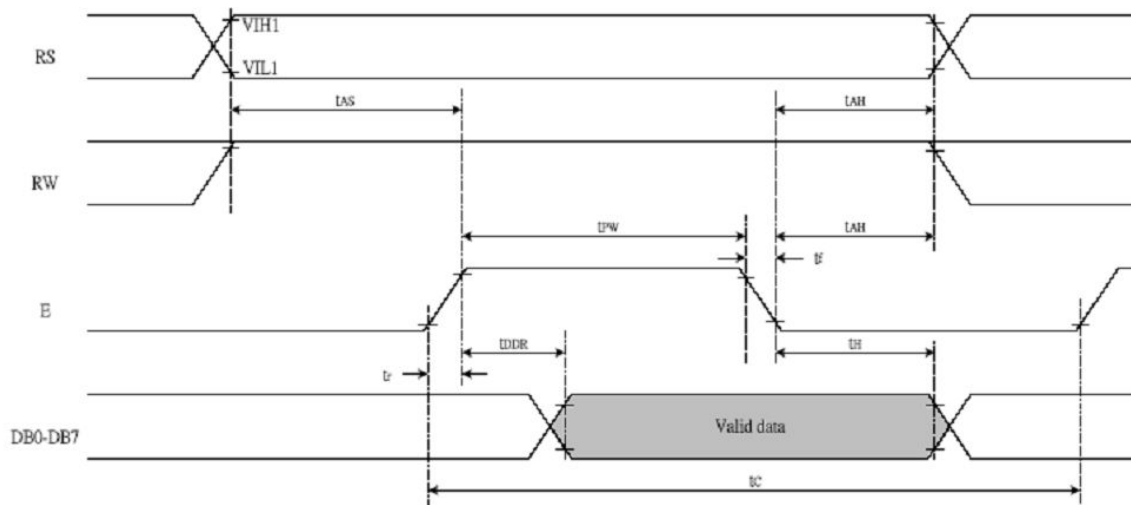
8 Timing Characteristics

8.1 Writing data from MPU to ST7066U



TC	Enable Cycle Time	Pin E	1200	-	-	ns
TPW	Enable Pulse Width	Pin E	140	-	-	ns
TR,TF	Enable Rise/Fall Time	Pin E	-	-	25	ns
TAS	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
TAH	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
TDSW	Data Setup Time	Pins: DB0 - DB7	40	-	-	ns
TH	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns

8.2 Reading data from st7066u to MPU



TC	Enable Cycle Time	Pin E	1200	-	-	ns
TPW	Enable Pulse Width	Pin E	140	-	-	ns
TR,TF	Enable Rise/Fall Time	Pin E	-	-	25	ns
TAS	Address Setup Time	Pins: RS,RW,E	0	-	-	ns
TAH	Address Hold Time	Pins: RS,RW,E	10	-	-	ns
TDD R	Data Setup Time	Pins: DB0 - DB7	-	-	100	ns
TH	Data Hold Time	Pins: DB0 - DB7	10	-	-	ns

9 Driver/Controller Information

Built-in ST7066U IC

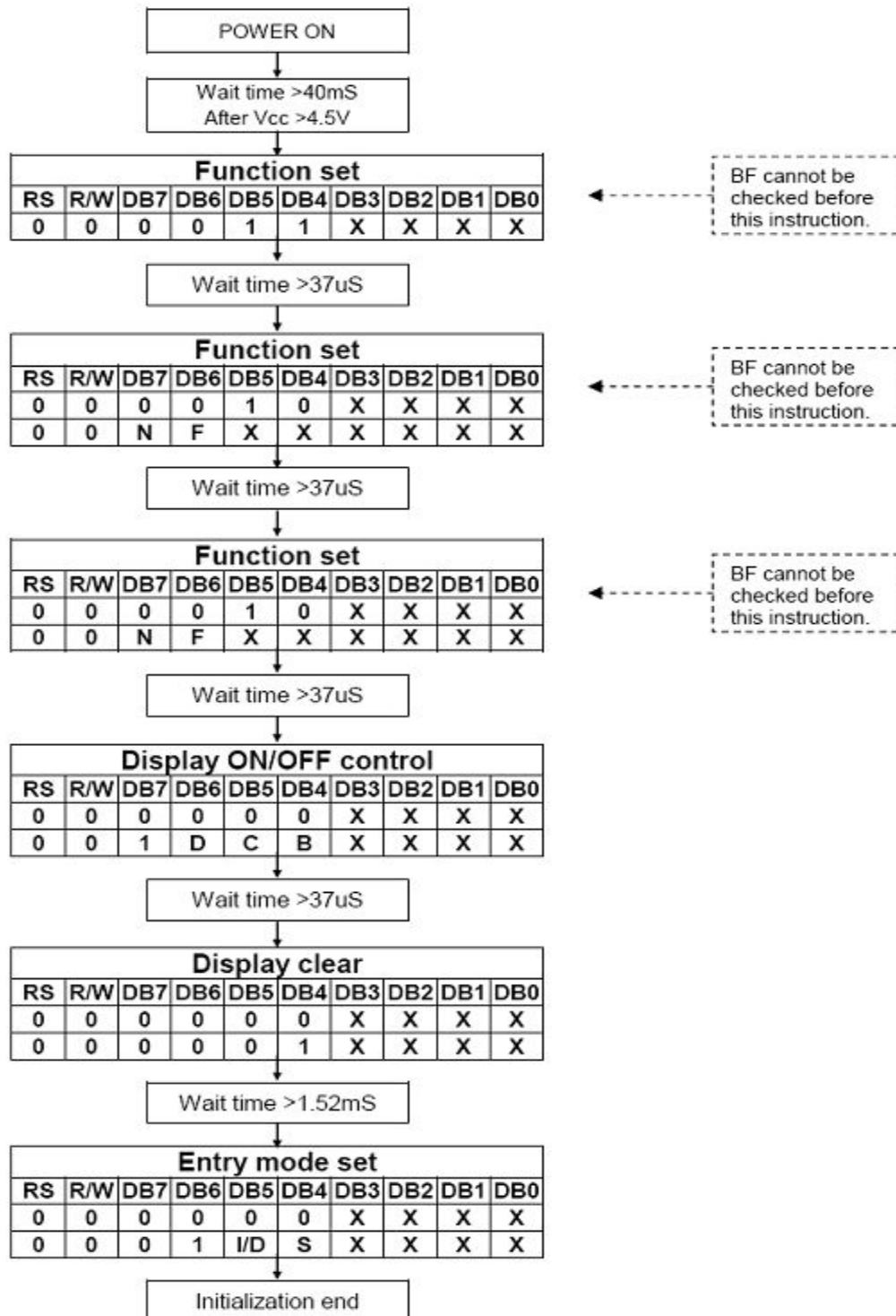
<https://drive.google.com/file/d/0B0U8oRNrY9XuNOl0WWWsRk5DR0k/view?usp=sharing>

11 Instruction Table

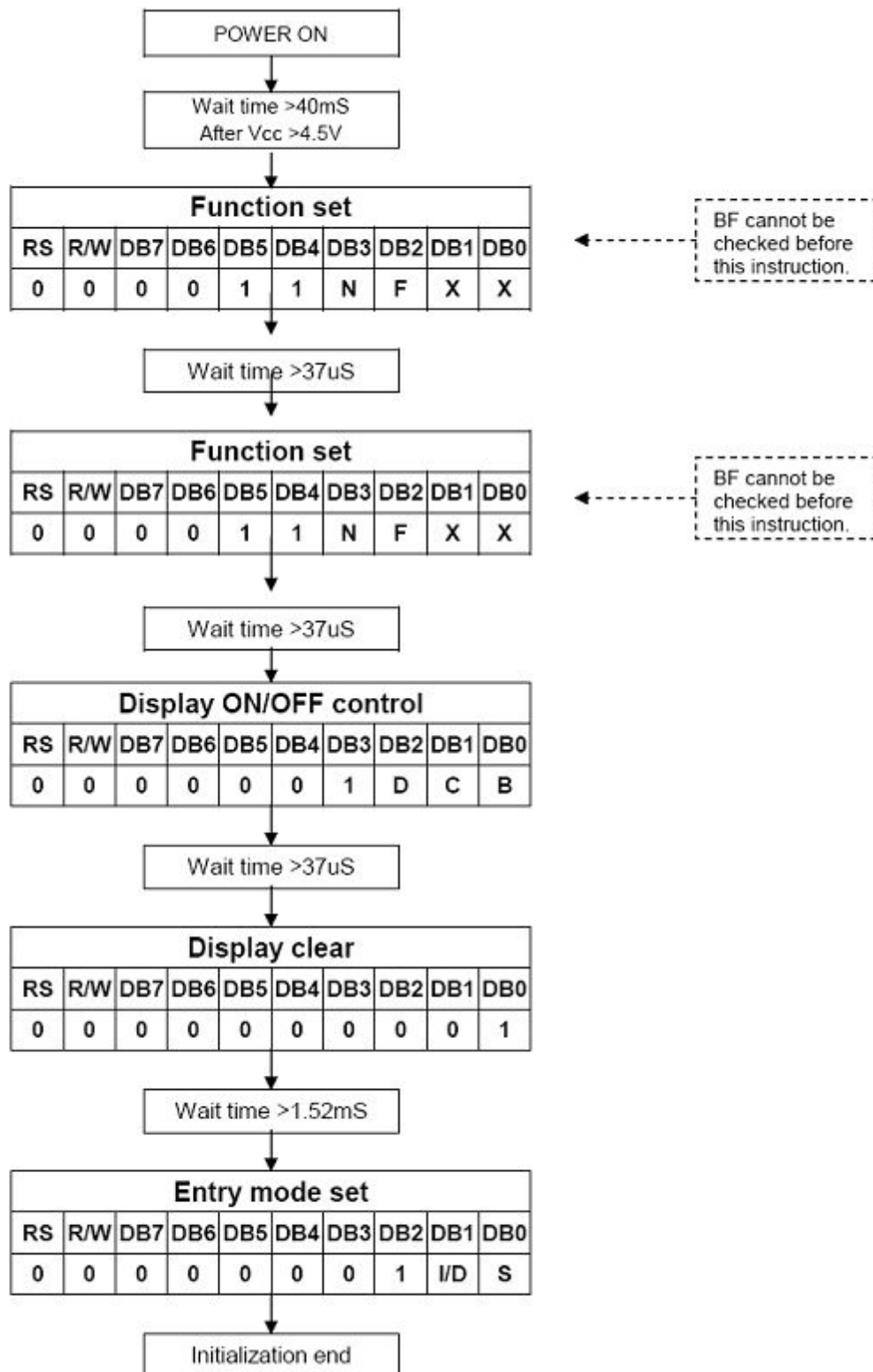
Instruction	Instruction Code										Description	Execution time (fosc=270Khz)	
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0			
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC	1.52ms	
Return Home	0	0	0	0	0	0	0	0	0	1	Set DDRAM address to "00H" from AC and return 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	0	1	I/D	SH	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.	37 μ s
Display ON/OFF Control	0	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 μ s
Cursor or Display Shift	0	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.	37 μ s
Function Set	0	0	0	0	0	1	DL	N	F	—	—	DL:interface data is 8/4 bits N:number of line is 2/1 F:font size is 5x11/5x8	37 μ s
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	—	Set CGRAM address in address counter	37 μ s
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	—	Set DDRAM address in address counter	37 μ s
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 μ s
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	—	Write data into internal RAM (DDRAM/CGRAM)	37 μ s
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	—	Read data from internal RAM (DDRAM/CGRAM)	37 μ s

12 Initializing of LCM

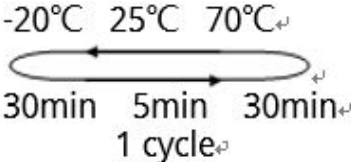
12.1 4-bit Interface (fosc=270 KHz)



12.2 8-bit Interface (fosc=270 KHz)



13 Reliability

Test Item	Content of Test	Test Condition	Note
High Temperature Storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature Storage	Endurance test applying the high storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	-
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20 °C 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60°C,90%RH max, for 96hrs under no-load condition excluding the polarizer. Then taking it out and drying it at normal temperature.	60°C,90%RH 96hrs	1,2
Thermal Shock Resistance	The sample should be allowed stand the following 10 cycles of operation. 	-20°C/70°C 10 cycles	-
Vibration Test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude: 15mm; Vibration: 10~55Hz; One cycle 60 seconds to 3 directions of X, Y, Z, for each 16 minutes.	3
Static Electricity Test	Endurance test apply the electric stress to the terminal.	VS=800V, RS=1.5kΩ, CS=100pF, 1 time.	-

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal. Temperature and humidity after remove from the rest chamber.

Note3: The packing have to including into the vibration testing.

14 Warranty and Conditions

<http://www.displaymodule.com/pages/faq>