16文字×2行白色抜き文字表示タイプ
SC1602BBWB－XA－GB－G

FEATURE:

1. 5×7ドット+カーソル表示
2. 液晶コントローラ内蔵
3. 5V単一電源(低消費電流)
4. 1/16デューティサイクル
5. LED IF=20mA VF=3.4V
6. M1632, L1672ピンコンパチブル

MECHANICAL DATA

ITEM	DIMENSIONS	UNIT
Module Size (W × H × T)	85.0X30.0X8.8(12.7LED)	mm
Viewing Area (W × H)	66.0 × 16.0	mm
Character Size (W × H)	2.96 × 5.56	mm
Character Pitch(W × H)	3.55 × 5.94	mm
Dot Size(W × H)	0.56 × 0.66	mm
Dot Pitch(W × H)	0.60 × 0.70	mm

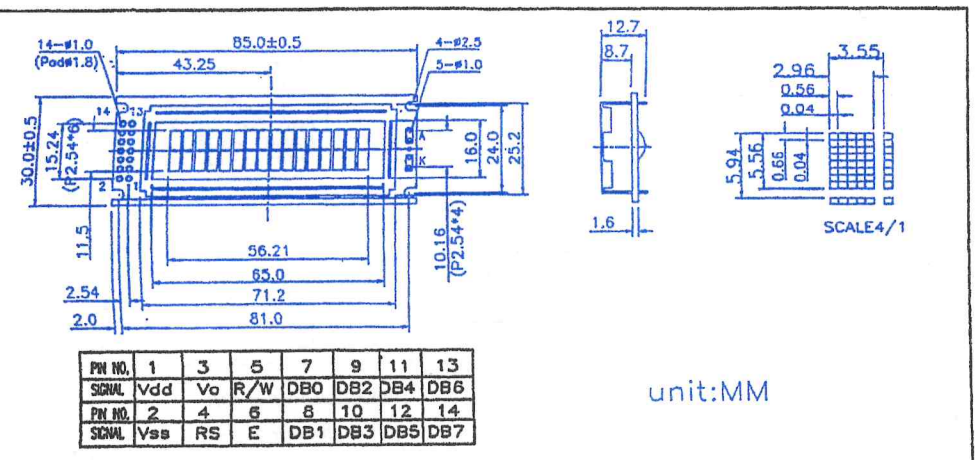
INTERFACE PIN CONNECTIONS:

No	Symbol	Function	No	Symbol	Function
1	VDD	5V	9	DB2	DATA BIT2
2	Vss	0V	10	DB3	DATA BIT3
3	Vo	CONTRAST ADJ.	11	DB4	DATA BIT4
4	RS	REGISTER SELECT	12	DB5	DATA BIT5
5	R/W	READ/WRITE	13	DB6	DATA BIT6
6	E	ENABLE SIGNAL	14	DB7	DATA BIT7
7	DB0	DATA BIT0			
8	DB1	DATA BIT1			

ELECTRICAL CHARACTERISTICS:

Item		Symbol	Condition	Min.	Typ.	Max.	Unit
LCD Operating Voltage		VDD-Vo	Ta=0 ℃	—	4.8	—	V
			Ta=25 ℃	—	4.5	—	V
			Ta=50 ℃	—	4.2	—	V
Suplly Voltage		VDD-Vss	—	4.7	5	5.3	V
Input Voltage	"High"Level	VIH	—	2.2	—	VDD	V
	"Low"Level	VIL	—	0	—	0.6	V
Output Voltage	"High"Level	VOH	—	2.4	—	—	V
	"Low"Level	VOL	—	—	—	0.4	V

EXTERNAL DIMENSION



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

unit:MM

■LEDバックライトについて

- 白抜き文字タイプですので、バックライトを点灯しないと、文字が見えません
- 液晶基板上のJ3部分をショートし、R9に100Ω抵抗1本を半田付けすると、バックライトが点灯します。
- 注意　抵抗は3本入っている場合がございますが、1本以上取り付けると、LEDが破損します。　必ず1本取り付けてください。

ELECTRICAL CHARACTERISTICS

1.DC Characteristics (Vdd=5V+10%,Vss=0V,Ta=25C)

Parameter	Symbol	Condition	Applicable PIN	Min.	Typ.	Max.	Unit
H level input voltage(1)	Vih1	——	DB0~DB7 RS,R/W,E	2.2	——	Vdd	V
L level input voltage(1)	Vil1	——		-0.3	——	0.6	V
H level input voltage(2)	Vih2	——	OSC1	Vdd-1.0	——	Vdd	V
L level input voltage(2)	Vil2	——		-0.2	——	1	V
H level output voltage(1)	Voh1	Ioh=-0.205mA	DB0~DB7	2.4	——	——	V
L level output voltage(1)	Vol1	Iol=1.2mA			——	0.4	V
H level output voltage(2)	Voh2	Ioh=-40uA	XSC LP DO	0.9Vdd	——	——	V
L level output voltage(2)	Vol2	Iol=40uA		——	——	0.1 Vdd	V
I/O leakage current	Iil	Vin=0 to Vdd		-1	——	1	uA
Pull-UP Mos Current	-Ip	Vdd=5V		50	125	250	uA
Supply current	Iop	Rf oscillation from external clock Vdd=5V fosc=270kHz	Vdd	——	0.35	0.6	uA

Internal clock operation (RF oscillation)

Oscillation frequency	fosc	Rf=91k+2%	OSC1~OSC2	190	270	350	kHz
Oscillation frequency	fosc	Ceramic filter	OSC1~OSC2	245	250	255	kHz
LCD driving voltage	Vlcd	Vdd-V5	V1~V5	3.0	——	11.0	V

2.AC Characteristics (Vdd=5V+10%,Vss=0V,Ta=25C)

1).Read Cycle

Parameter	Symbol	Min.	Typ.	Max.	Unit.	TEST PIN
Enable cycle time	tc	500	——	——	ns	E
Enable "H" level pulse width	tw	220	——	——	ns	E
Enable rise / fall time	tr,tf	——	——	25	ns	E
RS, R/W setup time	tsu	40	——	——	ns	R/W,RS
RS,R/W address hold time	th	10	——	——	ns	R/W,RS
Read data output delay	td	60	——	120	ns	DB0~DB7
Read data hold time	tdh	20	——	——	ns	DB0~DB7

2).Write Cycle

Parameter	Symbol	Min.	Typ.	Max.	Unit.	TEST PIN
Enable cycle time	tc	500	——	——	ns	E
Enable "H" level pulse width	tw	220	——	——	ns	E
Enable rise / fall time	tr,tf	——	——	25	ns	E
RS, R/W setup time	tsu1	40	——	——	ns	R/W,RS
RS,R/W address hold time	th1	10	——	——	ns	R/W,RS
Data setup time	tsu2	60	——	——	ns	DB0~DB7
Write data hold time	th2	10	——	——	ns	DB0~DB7

Absolute maximum ratings

Item	Symbol	Test condition	Standard value min.	Standard value max.	Unit
Supply voltage for logic	Vdd-Vss	Ta=25 ℃	-0.3	7	V
Supply voltage for LCD drive	Vlcd	Ta=25 ℃	Vdd-13.5	Vdd+0.3	V
Input voltage	Vin	Ta=25 ℃	-0.3	Vdd+0.3	V
Operating temperature	Topr	....	0	50	℃
Storage temperature	Tstg.	....	-20	70	℃

Relability conditions

LCD Module (Consumer Type)		
High temperature operation	Operation 96~100Hrs at 50±2℃ surrounding temp.	No visible inferiority in appearance no function.
Low temperature operation	Operation 96~100Hrs at 0±2℃ surrounding temp.No dew to be found.	
High temperature storage	Stroage 96~100Hrs at 60±2℃ surrounding temp.then storage 4Hrs at normal condition (Power Off).	
Low temperature storage	Strage 96~100Hrs at -20±2℃ surrounding temp.then storage 4Hrs at normal condition (Power Off). No dew to be found.	
Damp proof	Storage 96~100Hrs at 40±2℃ and 90~95% RH surrounding condition then storage 4Hrs at normal condition(Power Off).No dew to be found.	

Note:The above mentioned conditions are nominal ones.which may differ in special specifications.

Optical characteristics

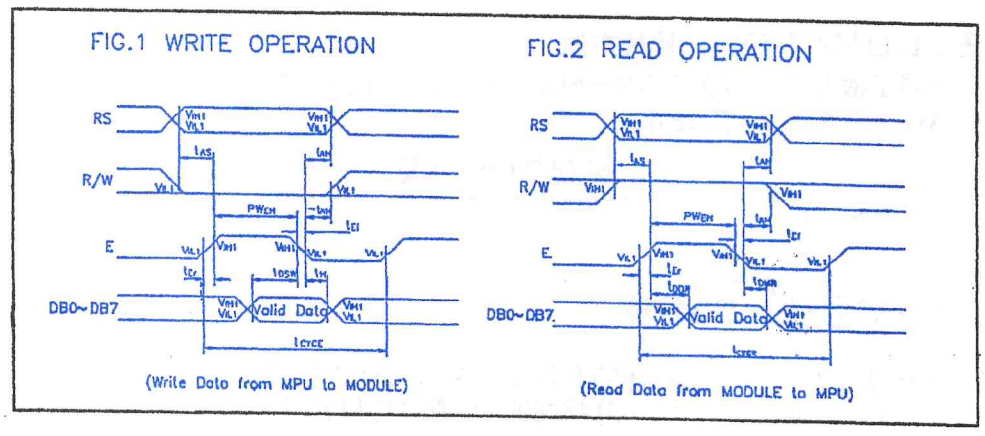
1.STN Type

Item	Symbol	Condition	min.	typ.	max.	Unit	Note
Viewing angle	φ2-φ1	K=2.0	60	....	....	deg.	A
Contrast ratio	K	φ=10, θ=0	5	....	....	....	B
Response time.(Rise)	tr	φ=10, θ=0	....	150	250	ms	C
Response time (Fall)	tf	φ=10, θ=0	....	200	300	ms	C

2.TN Type

Item	Symbol	Condition	min.	typ.	max.	Unit	Note
Viewing angle	φ2-φ1	K=2.0	....	40	....	deg.	A
Contrast ratio	K	φ=25, θ=0	....	5	....	....	B
Response time (Rise)	tr	φ=25, θ=0	....	80	120	ms	C
Response time (Fall)	tf	φ=25, θ=0	....	60	90	ms	C

Pin assignment



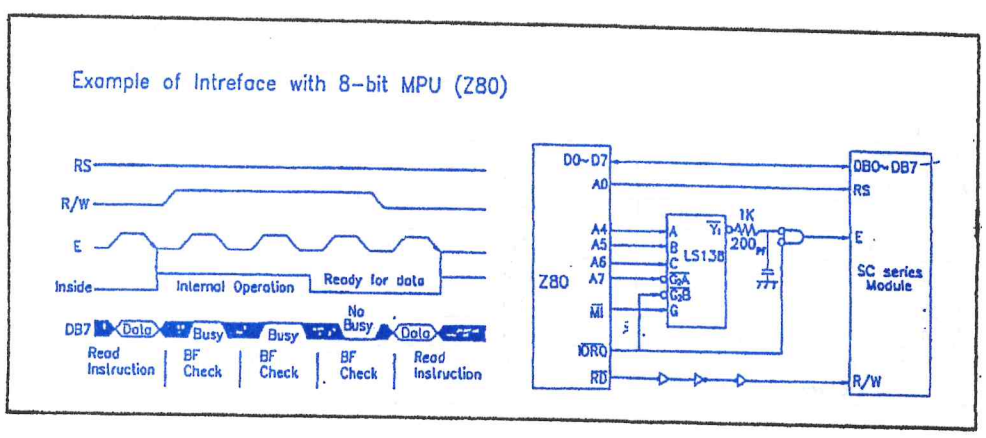
Pin No	Symbol	Level	Function	
1	Vdd	•••	Power Supply	5V
2	Vss	•••		0V(GND)
3	Vo	•••		for LCD Drive
4	RS	H/L	Register select signal Register H:Data input Select L:Instruction Input	
5	R/W	H/L	H:Data read(Module→MPU) L:Data Write(Module←MPU)	
6	E	H,H→L	Enable signal(no pull-up resistor)	
7	DB0	H/L	Data bus line	
8	DB1	H/L		
9	DB2	H/L		
10	DB3	H/L		
11	DB4	H/L		
12	DB5	H/L		
13	DB6	H/L		
14	DB7	H/L		

※Interface between data bus line and 4-bit or 8-bit MPU is available. Data transfer are made in twice in case of 4-bit MPU, and once in case of 8-bit MPU..

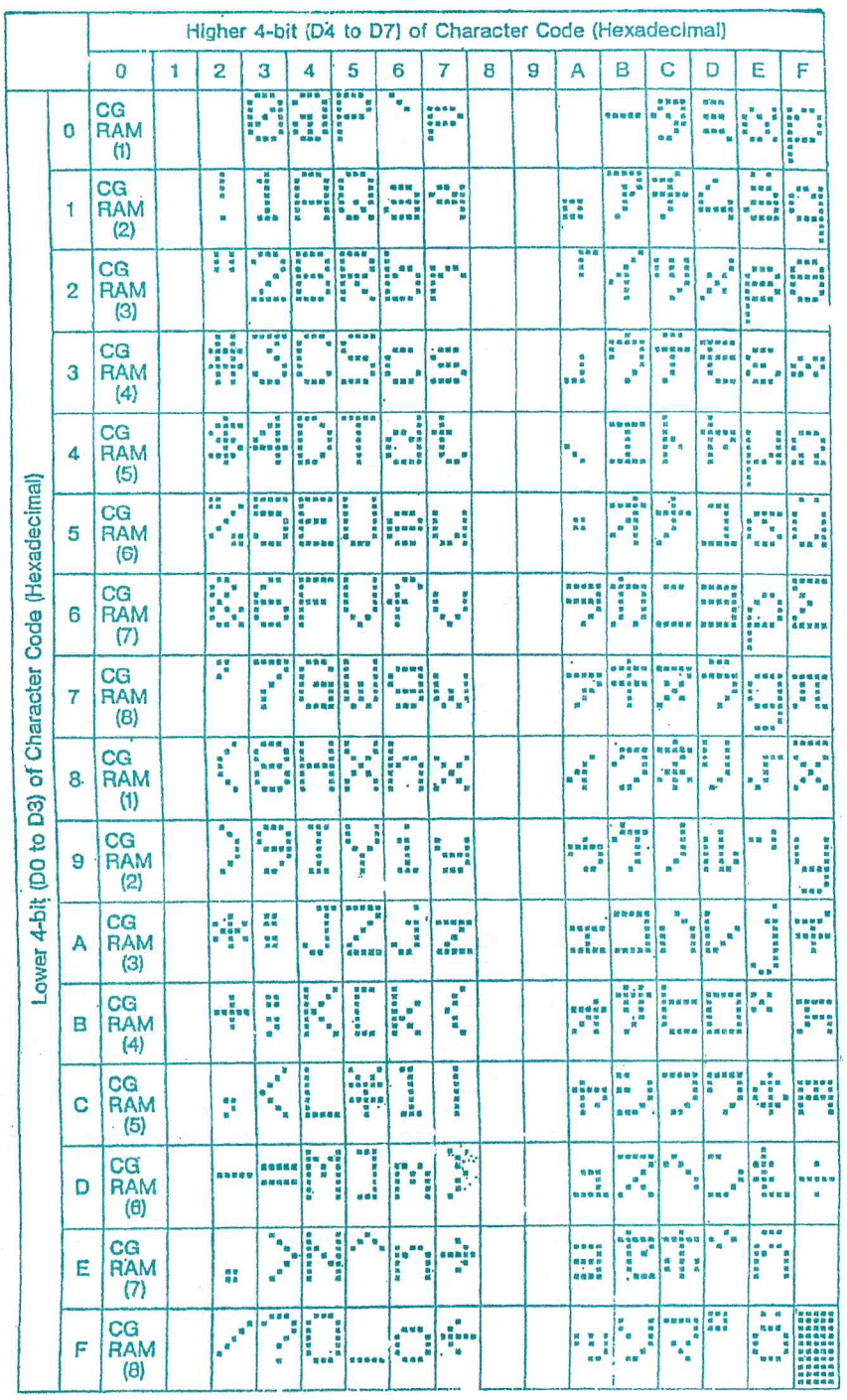
■If interface data is 4-bit long
Data transfer are made through 4 bus line from DB4 to DB7. While the rest of 4 bus line from DB0 to DB3 are not used. Data transfer with MPU are completed when 4-bit data are transferred in twice. First upper 4-bit data, then lower 4-bit data.

■If interface data is 8-bit long
Data transfer are made through all of 8 bus line from DB0 to DB7.

Interface with MPU



● Standard Character Pattern(S0)



■ Instructions

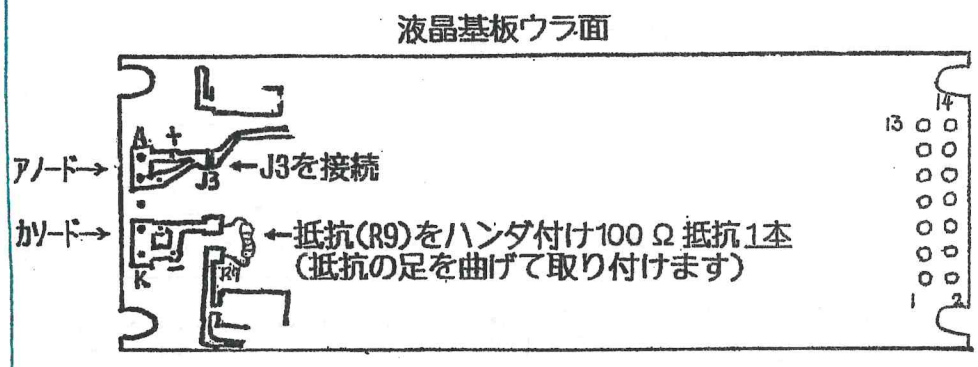
Instruction	Code RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Executed Timp(max.)
Clear Display	0	0	0	0	0	0	0	0	0	1	Clears all display and returns the cursor to home position (Address 0)	1.64ms
Cursor At Home	0	0	0	0	0	0	0	0	1	*	Returns the cursor to the home position(Address 0).Also returns the display being shifted to the original position DDAM contents remain unchanged. (during data write and read.)	1.64ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Sets the cursor move direction and specifies or not shift the display.These operations are performed during data write and read.	40 μ s
Display On/Off Control	0	0	0	0	0	0	1	D	C	B	Sets ON/OFF of all display(D) cursor ON/OFF(C),and blink of cursor position character(B).	40 μ s
Cousor/Display Shift	0	0	0	0	0	1	S/C	R/L	*	*	Moves the cursor and shifts the display without changing DDRAM contents.	40 μ s
Function Set	0	0	0	0	1	DL	N	F	*	*	Sets interface data-length(DL) number of display lines (N)and character font(F).	40 μ s
CGRAM Address Set	0	0	0	1	ACG						Sets the CGRAM address.CGRAM data is sent and received after this setting.	40 μ s
DDRAM Address Set	0	0	1	ADD							Sets the DDRAM address. DDRAM data is sent and received afterthis setting.	40 μ s
Busy Flag/ Address Read	0	1	BF	AC							Reads Busy flag (BF)indicating internal operation is being performed and read address counter contents.	40 μ s
CGRAM/DDRAM Data Write	1	0	WRITE ,DATA								Writes data into DDRAM or CGRAM	40 μ s
CGRAM/DDRAM Data Read	1	1	READ DATA								Reads data into DDRAM or CGRAM	40 μ s

Code		Description	Executed Time(max)
I/D=1:Increment I/D=0:Decrement S=1:With display shift S/C=1:Display shift S/C=0:Cursor movement R/L=1:Shift to the right R/L=0:Shift to the left DL=1:8-bit	DL=0:4bit N=1:2 lines N=0:1 lines F=1:5 × 10dots F=0:5 × 7dots BF=1:Internal operation is being performed BF=0:Instruction acceptable	DDRAM:Display Data RAM CGRAM:Character Generator RAM ACG:CGRAM Address ADD:DDRAM Address Corresponds to cursor address. AC:Address Counter,used for both DDRAM and CGRAM *:Invalid	fcp or fosc=250kHz However,when frequency changes,eecution time also changes EX if fcp or fosc is 270kHz, 40μS × 250/270=37μS

■ＬＥＤバックライト接続方法

液晶基板上のJ3部分をショートし、R9に100 Ω 抵抗1本を半田付けすると、バックライトが点灯します。

液晶基板ウラ面



■ Electrical characteristics

VDD=5V ± 5%
VSS=0V,Top=0-50 ℃

Item	Symbol	Condition	Standard Value min.	typ.	max.	Unit	Applicable terminal
Power Voltage	Vdd	••••	4.75	5	5.25	V	Vdd
Input H-level voltage	VIH	••••	2.2	•••	Vdd	V	RS,R/W,E
Input L-level voltage	VIL	••••	-0.3	•••	0.6	V	DB0~DB7
Output H-level voltage	VOH	IOH=0.205mA	2.4	•••	•••	V	DB0~DB7
Output L-level voltage	VOL	IOL=1.2mA	•••	•••	0.4	V	RS,R/W,E
I/O leakage current	IIL	VIN=0~VDD	-1	•••	1	μ A	DB0~DB7
Supply current	IDD	Vdd=5V	•••	0.35	0.6	mV	Vdd
LCD operation voltage	VLDC	Vdd-Vo	3	••••	11	V	V0

■ Timing chart

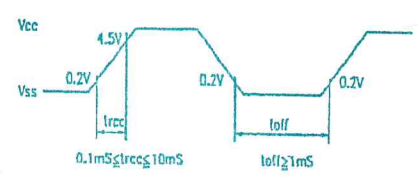
VDD=5V ± 5%
VSS=0V,Top=0-50 ℃

Item		Symbol	Min.	Max.	Unit
Enable cycle time		tcYCE	500	•••	ns
Enable pulse width	"High" Level	PWEH	220	•••	ns
Enable rise/fall time		tEr,tEf	•••	25	ns
Set-up time	RS,R/W-E	tAS	40	•••	ns
Address hold time		tAH	10	•••	ns
Data set-up time		tDSW	60	•••	ns
Data delay time		tDDR	60	120	ns
Data hold time (writing)		tH	10	•••	ns
Data hold time (reading)		tDHR	20	•••	ns
Colck oscillating frequence		tosc	270 (TYP)		KHZ

■ Power supply reset

The internal reset circle will be operated properly when the following power supply conditions are satisfied.If it is not operated properly,please perform initial setting along with the instruction.

Item	Symbol	Measuring Condition	Standard Value min.	typ.	max.	Unit
Power Supply Rise Time	trec	—	0.1	—	10	mS
Power Supply OFF Time	toff	—	1	—	—	mS



Note: toff defines period that power supply is off when power supply shut down momentarily or repeats on/off state.

■ Reset function

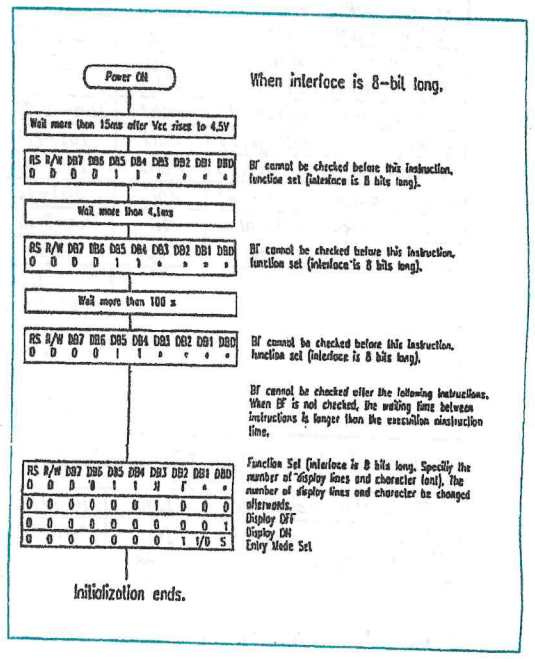
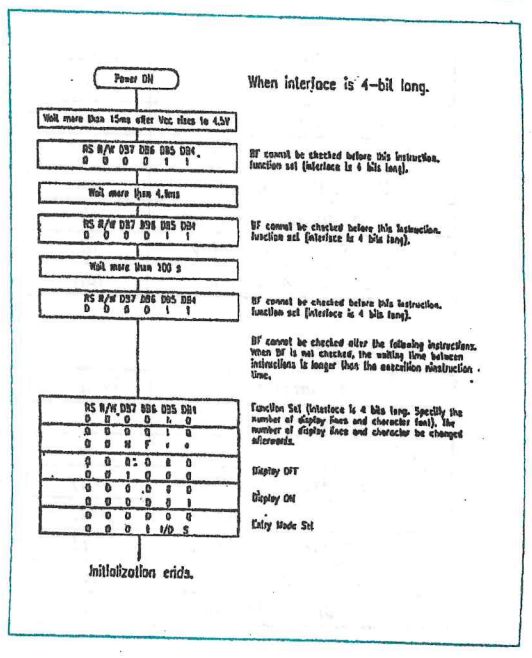
● Initialization mode by Internal Reset Circuit

HD44780 automatically initializes (resets)when power is supplied (built-in internal reset circuit). The following instructions are executed in initialization. The busy flag (BF)is kept in busy state until initialization ends. (BF=1)

The busy state is 10mS after Vdd reach to 4.5V.

1.Display clear
2.Function set
  DL=1:8bit long interface data
  DL=0:4bit F=0:5 × dot character font
  N=1:2 lines
  N=0:1 lines
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

Note:When coditions stated in "Power Supply Conditions Using Internal Reset Circuit" are not satisfied, the internal reset circuit will not operate properly and initialization will not be perfomed. Please make initialization using MPU along with Initialization (along with) instructions.

● Initialization along with Instruction

If power supply conditions are not satified, which for proper operation of internal reset circuit, it is required to make initialization along with instruction. Please make following procedures: