

Deepakshi display devices pvt ltd.

CHARACTER MODULE INITIALIZATION

Internal Reset Circuit

The module is automatically initialized when the power is applied. The following commands are executed during initialization. The busy flag is kept in the busy state until initialization is complete. The busy state lasts for 10 ms after V_{DD} reaches 4.5 volts.

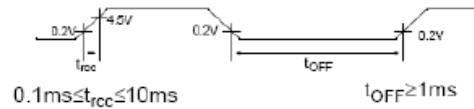
- 1) Clear Display
- 2) Function set
 - DL=1.....8-bit data length for interface
 - N=0.....Single-line display
 - F=0.....5x7 dot matrix character font
- 3) Display ON/OFF Control
 - D=0.....Display OFF
 - C=0.....Cursor OFF
 - B=0.....Blink function OFF
- 4) Entry Mode Set
 - I/D=1.....Increment Mode
 - S=0.....Display shift OFF

NOTE:

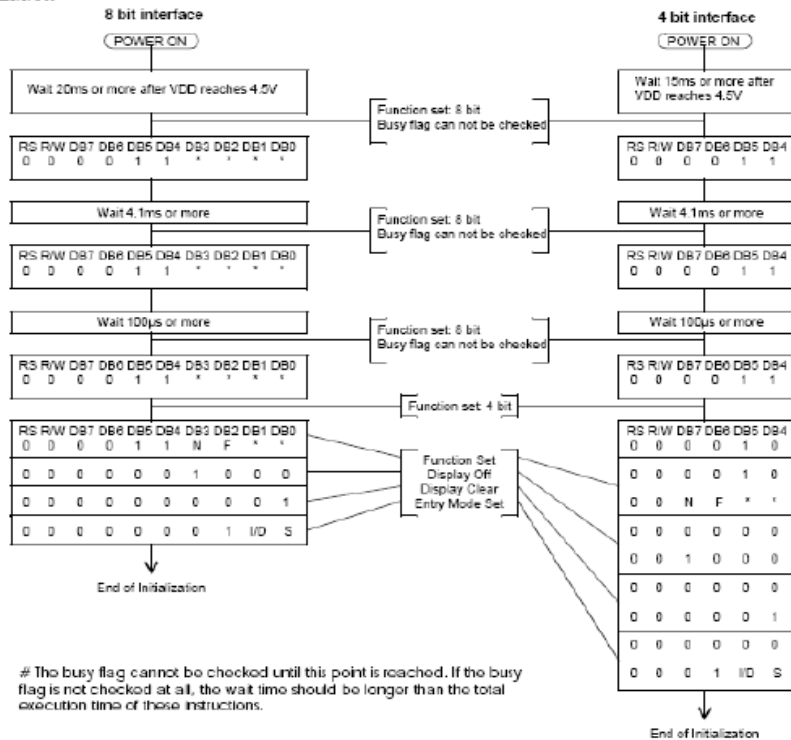
If the following power conditions are not satisfied, the internal reset circuit does not function properly. In this case, the initialization should be executed by the series of instructions from outside the MPU (Software Initialization).

Power Conditions for Internal Reset

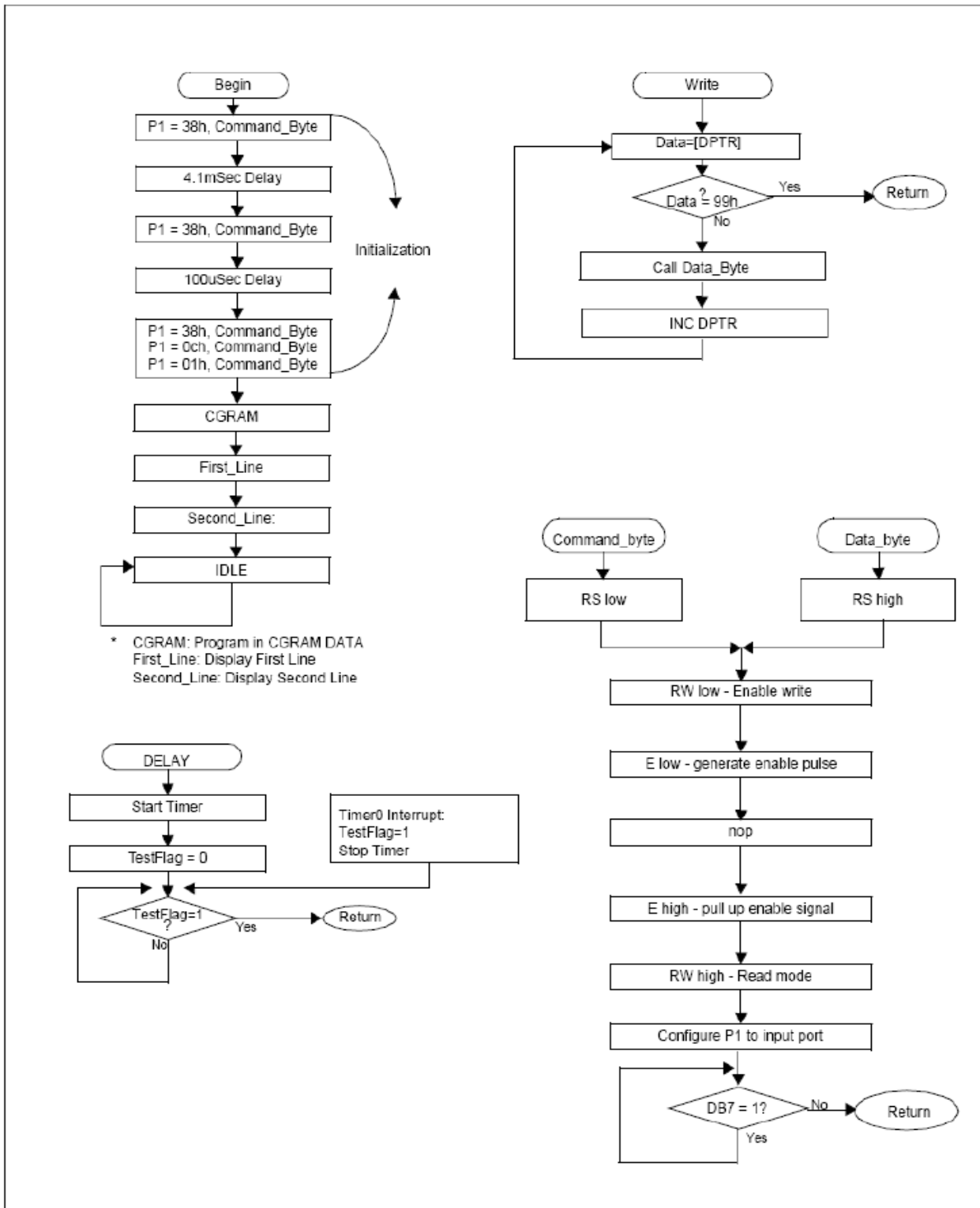
ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Power Supply Rise Time	t_{rcc}	0.1	-	10	ms
Power Supply Off Time	t_{OFF}	1.0	-	-	ms



Software Initialization



III. Software Flowchart:



PIN ASSIGNMENT

PIN NO.	SYMBOL	LEVEL	FUNCTION
1	VSS	-	Power Supply
2	VDD	-	
3	Vo	-	
4	RS	H / L	Selects Registers H : Data register (When Writing And Reading) L : Instruction Register (Writing) Busy Flag And Address Counter (Reading)
5	R / W	H / L	Read/Write Select Signal H : Data read (Module →MPU) L : Data write (Module →MPU)
6	E	H, H→L	Enable Signal
7	DB0	H / L	Databus lines, see description below DB4~DB7: High-order lines of data bus with three-state, bi-directional function for use in data transfer with the MPU. DB7 may also be used to check the busy flag. DB0~DB3: Low-order lines of data bus with three-state, bi-directional function for use in data transfer with the MPU. These lines are not used when interfacing with a 4-bit microprocessor.
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	

ELECTRIC MAXIMUM RATINGS

ITEM	SYMBOL	MIN	MAX	UNIT	REMARKS
Power Supply For Logic	VDD-VSS	-0.3	7.0	V	
Signal Input Voltage	VIN	$-3 \leq V_{IN} \leq V_{DD}+0.3$		V	
Static Electricity	-	-	100	V	See Note

Note: Electro-static discharge resistance is tested by charging a 200pf capacitor and discharging it by contact with a interface connector pin .

EXAMPLE OF POWER SUPPLY

FIG.1 Normal Temperature Type

FIG.2 Extended Temperature Type

*Note: If V vary from recommended value, you cannot get proper contrast or viewing angle.

■ Examples of Temperature Compensation Circuits for Extended Temp Type. (Only for reference)

(A) 1/8Duty - 1/4Bias

(B) 1/16Duty - 1/5Bias

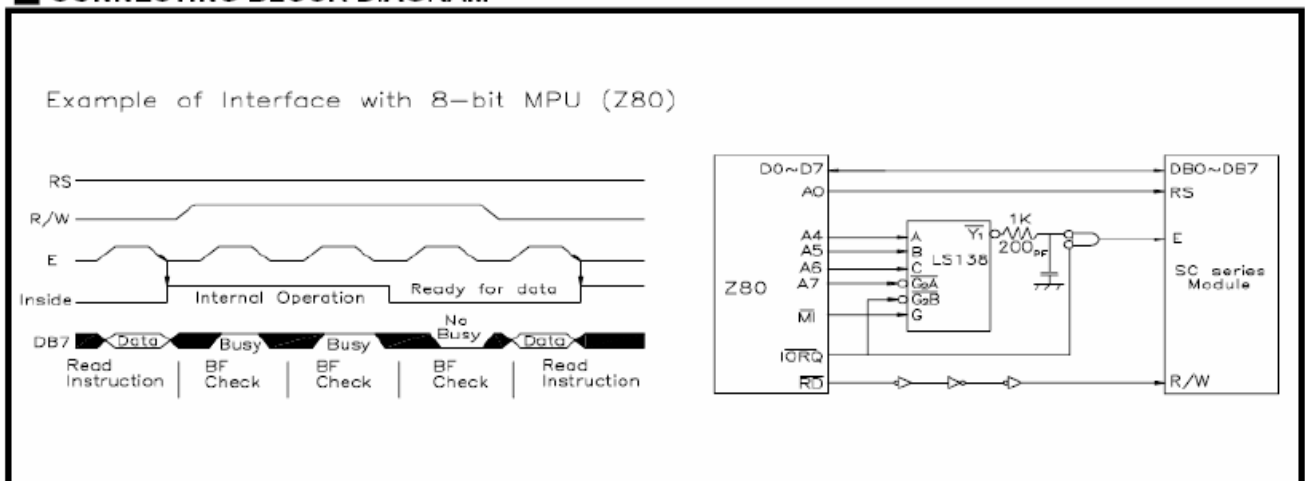
Thermistor: $R_{th}(25^{\circ}C) = 15[k\text{-ohm}], B = 4200[K]$
 Resistors: $R_p = 30[k\text{-ohm}], R_b = 6.8[k\text{-ohm}], R_m = 3.3[k\text{-ohm}]$
 Transistors: PNP Type.
 $V_{cc} = +5V, V_{ee} = 0V(\text{Logic Supply})$
 $V_z = -8V(-7.8V \sim -8.2V)$
 $V_{ee} < V_z, R_z = (V_z - V_{ee})/5 [k\text{-ohm}]$

Thermistor: $R_{th}(25^{\circ}C) = 15[k\text{-ohm}], B = 4200[K]$
 Resistors: $R_p = 150[k\text{-ohm}], R_b = 8.2[k\text{-ohm}], R_m = 3.6[k\text{-ohm}]$
 Transistors: PNP Type.
 $V_{cc} = +5V, V_{ee} = 0V(\text{Logic Supply})$
 $V_z = -11V(-10.725V \sim -11.275V)$
 $V_{ee} < V_z, R_z = (V_z - V_{ee})/5 [k\text{-ohm}]$

■ DISPLAY COMMANDS

INSTRUCTION	CODE										Description
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	
1: Clear Display	0	0	0	0	0	0	0	0	0	1	Clears entire display and sets DD RAM address 0 in address counter .
2: Return Home	0	0	0	0	0	0	0	0	1	*	Sets DD RAM address 0 in address counter . Also returns display from being shifted to original position . DD RAM contents remain unchanged .
3: Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	I/D=1 : Increment I/D=0 : Decrement S=1 : Accompanies display shift
4: Display On/Off	0	0	0	0	0	0	1	D	C	B	I/D=1/0 : Display on/off I/D=0/1 : cursor on/off S=1 : Blink of cursor
5: Cursor/Display shift	0	0	0	0	0	1	S/C	R/L	*	*	S/C=1 : Display shift S/C=0 : Cursor move R/L=0 : Shift to left R/L=1 : Shift to right
6: Function Set	0	0	0	0	1	DL	N	F	*	*	DL=1 : 8 bits , DL=0 : 4 bits N=1 : 2 lines , N=0 : 1 line F=1 : 5*10 dots , F=0 : 5*8 dots
7: Set CG RAM Address	0	0	0	1	Acc					A ₀₅ : CG RAM address	
8: Set DD RAM address	0	0	1	Acc					A ₀₀ : DD RAM address corresponds to cursor address		
9: Read busy flag/address counter	0	1	BF	Ac					BF=1 : Busy , BF=0 : Not busy Ac : Address counter used for both of CG and DD RAM address		
10: Write data	1	0	WRITE DATA								Write data to CG or DD RAM
11: Read data	1	1	READ DATA								Read data from CG or DD RAM
☆ Execution Time (Et) of Instruction : (Under condition of fosc = 270 KHz) 1 & 2 : Et=1.52 ms 3~11 : Et=37 μs ☆ "*" : Either 0 or 1											

■ CONNECTING BLOCK DIAGRAM



Deepakshi Display Devices Pvt Ltd.

Application Note

```
*****
;
;Displaying Characters on 4001 LCD Module
;Description: Demo software to display
;             characters.
; Controller: AT89S52
;*****
```

Equates

```
*****
```

;Equates

```
*****
```

```
lcdport      data      p1
e             equ       p3.3
rw           equ       p3.1
rs           equ       p3.0
```

```
*****
```

; Interrupt Vectors

```
*****
```

```
org 000h
jmp start ; Power up reset vector
org 003h
reti     ; External interrupt 0 vector
org 00bh
reti     ; Counter/ Timer 0 int vector
org 013h
reti     ; External int 1 vector
org 01bh ;
reti     ; Timer 1 int vector
org 023h
reti     ; I2C serial int vector
```

```
*****
```

;Start Program

```
*****
```

```
start:
    acall init

main:  acall delay_large

    mov dptr,#ka
    acall nxt

    call init1

    mov dptr,#k1
    acall nxt

here:  ajmp here
```

```
nxt:      clr a
          movc a,@a+dptr
          cjne a,#0ffh,go_on
          ret

go_on:    acall datawr
          acall delay
          inc dptr
          mov p1,a
          ajmp nxt

command:  setb e
          clr rs
          clr rw
          mov p1,a
          clr e
          ret

datawr:   setb e
          setb rs
          clr rw
          mov p1,a
          acall delay
          clr e
          ret

;*****
;INITIALIZATION
;*****
init:     mov a,#38h ;function set
          acall command
          acall delay

          mov a,#38h ; function set
          acall command
          acall delay

          mov a,#38h ;function set
          acall command
          acall delay

          mov a,#0ch ;display on/off
          acall command
          acall delay

          mov a,#01h ;clear display
          acall command
          acall delay

          mov a,#80h ;set ddram
          acall command
          acall delay

          ret
```

```

init1:
    mov a,#0c0h ; set ddram
    acall command
    acall delay

    ret
;*****
ka:      db  '**DEEPAKSHI DISPLAY',0ffh
k1:      db  'DEVICES PVT. LTD. **',0ffh
;*****
;DELAY
;*****

delay_large:    mov r4,#32
abc:            mov r5,#100
sm:            mov r6,#100
mn:            djnz r6,mn
               djnz r5,sm
               djnz r4,abc
               ret

delay:          mov r4,#05d
delay1:         mov r5,#60d
la:            djnz r5,la
               djnz r4,delay1
               ret
               end

```